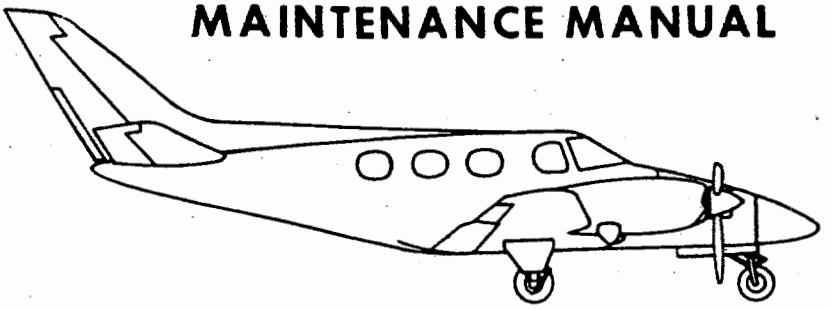
Beechcraft® DUKE

MODEL 60 (P-4 thru P-126 except P-123)
MODEL A60 (P-123, P-127 thru P-246)
MODEL B60 (P-247 and after)

MAINTENANCE MANUAL



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LIST OF EFFECTIVE REVISIONS

Always destroy superseded pages when you insert revised pages.

Title Page.....November 20, 1987
"A" Page.....A18
"B" Page.....A18

LOG OF REVISIONS

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60-590001-25	November 2, 1973	Original
60-590001-25A1	August 16, 1974	61, 71
60-590001-25A2	May 30, 1975	Intro, 5, 12, 21, 25, 27, 30, 32, 36, 56, 61, 71, 91, Insp.
60-590001-25A3	October 27, 1975	Intro, 7, 12, 22, 28, 30, 32, 53, 57, 91
60-590001-25A4	October 19, 1977	12, 24, 25, 28, 30, 32, 33, 61, 73, 79
60-590001-25A5	May 12, 1978	Intro, 5, 11, 12, 20, 23, 24, 30
60-590001-25A6	September 14, 1979	Intro, 5, 27
60-590001-25A7	February 22, 1980	Intro, 5, 12, 21, 57, 91
60-590001-25A8	April 18, 1980	Intro, 11, 12, 20, 25, 33, 52
60-590001-9A9	August 15, 1980	Intro, 25, 38
60-590001-25A10	November 28, 1980	5
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60-590001-25A13	June 21, 1982	5, 30

98 36416C

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

A18

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

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

LIST OF EFFECTIVE REVISIONS

Always destroy superseded pages when you insert revised pages.

60-590001-25A14	November 30, 1983	Intro, 5, 12, 20, 57, 91
60-590001-25A15	June 13, 1984	23, 32, 57
60-590001-25A16	September 20, 1985	Intro, 27
60-590001-25A17	January 9, 1986	12
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INTRODUCTION

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	4	Nov 30/83
	5	Nov 30/83
	6	Nov 30/83
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	17	Aug 15/80
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	20	Aug 15/80

"END"

INTRODUCTION

This BEECHCRAFT Duke 60 Maintenance Manual is prepared in accordance with the ATA (Air Transport Association) Specification No. 100 format. Additional airframe manuals, which supplement this maintenance manual are the BEECHCRAFT Duke 60 Wiring Diagram Manual, P/N 60-590001-29 and the BEECHCRAFT Duke 60 Beech Manufactured Component Maintenance Manual, P/N 60-590001-27.

NOTICE

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

NOTE

Service publication reissues or revisions are not automatically provided to the holders of this manual. For information on how to obtain a revision service applicable to this manual, refer to BEECHCRAFT Service Instructions No. 0250-010, Rev. I or subsequent revisions.

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 at four levels: Group, System/Chapter, Sub-System/Section, and Unit/Subject.

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

System/Chapter - The various groups are broken down into major systems such as Air Conditioning, Electrical Power, Landing Gear, etc. The systems are arranged more or less alphabetically rather than by precedence or importance. They are assigned a number, which becomes the first element of a standardized numbering system. Thus, the element "28" of the number 28-00-00 refers to the chapter "Fuel". Everything concerning the fuel system will be covered in this chapter.

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

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

APPLICATION

Any publication conforming to the ATA format will use the same basic numbering system. Thus, whether the manual be a BEECHCRAFT Duke 60 Maintenance Manual, or Wiring Diagram Manual for a Beech Duke 60, the person wishing information concerning the indicating portion of the fuel system would refer to the Tab System/Chapter 28, Fuel. The table of contents in the front of the chapter will provide a list of sub-systems covered in the chapter.

For example:

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

Carrying this example further, Fuel Indication, Left Indicator Panel, could be assigned the number 28-41-01.

The table of contents in front of each chapter will list the items covered and the numbers assigned.

All publications will use the standard numbering system, even though all chapters may not be applicable to the aircraft or to the publication.

ATA 100 PAGE BLOCK GUIDE

Following is a guide to the assignment of the blocks of pages within each System/Chapter, Sub-System/Section, Unit/Subject number in the maintenance manual.

Description and Operation	Pages 1 to 100
Troubleshooting	Pages 101 to 200
Maintenance Practices	Pages 201 to 300

The text providing the coverage of the description and operation of a system or component would appear on pages numbered consecutively 1 through 100, if needed. The information pertaining to the troubleshooting of this same system or component would appear on pages numbered consecutively 101 through 200, if needed. The maintenance practices information would appear on pages numbered 201 through 300. The word "END" at the bottom of a page would indicate the last page in that block.

LIST OF EFFECTIVE REVISIONS

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

LIST OF EFFECTIVE PAGES

The List of Effective Pages and the Table of Contents in the front of each chapter will each start with page 1 and be numbered consecutively, thereafter, as necessary.

ALPHABETICAL INDEX

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

MICROFICHE - AEROFICHE

The General Aircraft Manufacturers Association has developed a specification for microfiche and registered the name Aerofiche for use by all GAMA Members. Consult the current issue of the Publications Price List for a enumeration of the maintenance information available Aerofiche form for order from Beech Aircraft Corporation

ATA 100 INDEX GUIDE

The following is an ATA-100 System/Chapter, Sub System/Section Index Guide for use with Maintenanc Manuals, Parts Catalogs, Wiring Diagram Manuals an Component Maintenance Manuals as required.

WARNING

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

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

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

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

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.

ATA-100 SYSTEM/CHAPTER INDEX GUIDE

The following chapters are not covered within this Maintenance Manual: 26, 29, 31, 37, 39, 49, 54, 60, 70, 75, 76, 78, and 83

SYSTEM/ CHAPTER	SUB-SYSTEM/ SECTION	TITLE
INTRODUCTION		
AIRCRAFT GENERAL		
5	**TIME LIMITS/MAINTENANCE CHECKS**	
	10	Time Limits
	20	Scheduled Maintenance Checks
6	**DIMENSIONS AND AREAS**	
7	**LIFTING AND SHORING**	
	00	General
8	**LEVELING AND WEIGHING**	
	00	General
9	**TOWING AND TAXIING**	
	00	General
10	**PARKING AND MOORING**	
	00	General
11	**PLACARDS AND MARKINGS**	
	00	General
12	**SERVICING**	
	00	General
	10	Replenishing
	20	Scheduled Servicing
AIRFRAME SYSTEMS		
20	**STANDARD PRACTICES-AIRFRAME**	
	00	Standard Practices-Airframe

SYSTEM/ CHAPTER	SUB-SYSTEM/ SECTION	TITLE
21	AIR CONDITIONING	
	00	General
	10	Compression
	20	Distribution
	30	Pressurization Control
	40	Heating
	50	Cooling
22	AUTO FLIGHT	
	00	General
	10	Autopilot (H14)
	11	Autopilot (New-Matic)
23	COMMUNICATIONS	
	60	Static Discharging
24	ELECTRIC POWER	
	00	General
	30	DC Generation
	31	DC Generation (Battery)
	32	DC Generation (Charge Current Detector)
	40	External Power
	50	Electrical Load Distribution
25	EQUIPMENT/FURNISHINGS	
	00	General
	60	Emergency
26	FIRE PROTECTION	
27	FLIGHT CONTROLS	
	00	General
	10	Aileron and Tab
	20	Rudder and Tab
	30	Elevator and Tab
	50	Flaps
	60	Spoiler, Drag Devices and Variable Aerodynamic Fairings
	70	Gust Lock and Dampener
28	FUEL	
	00	General
	10	Storage
	20	Distribution
	40	Indicating

SYSTEM/ CHAPTER	SUB-SYSTEM/ SECTION	TITLE
30	**ICE AND RAIN PROTECTION**	
	00	General
	10	Airfoil
	20	Air Intakes
	30	Pitot and Static
	40	Windows and Windshields
	60	Propellers/Rotors
32	**LANDING GEAR**	
	00	General
	10	Main Gear and Doors
	20	Nose Gear and Doors
	30	Extension and Retraction
	40	Wheels and Brakes
	50	Steering
	60	Position and Warning
33	**LIGHTS**	
	00	General
	40	Exterior
34	**NAVIGATION**	
	10	Flight Environment Data
35	**OXYGEN**	
	00	General
36	**PNEUMATIC**	
	00	General
AIRFRAME SYSTEMS		
38	**WATER/WASTE**	
	30	Waste Disposal
STRUCTURES		
51	**STRUCTURES**	
	00	General

SYSTEM/ CHAPTER	SUB-SYSTEM/ SECTION	TITLE
52	**DOORS**	
	00	General
	10	Passenger/Crew
	60	Entrance Stairs
	70	Door Warning
53	**FUSELAGE**	
	30	Plates/Skin
55	**STABILIZERS**	
	00	General
	10	Horizontal Stabilizers
	20	Elevator
	30	Vertical Stabilizer
	40	Rudder
56	**WINDOWS**	
	00	General
	10	Flight Compartment
	20	Cabin
57	**WINGS**	
	00	General
	30	Plates/Skin
	40	Attach Fittings
	50	Flight Surfaces
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61	**PROPELLERS**	
	00	General
POWER PLANT		
71	**POWER PLANT**	
	00	General
	10	Cowling
72	**ENGINE RECIPROCATING**	
73	**ENGINE FUEL AND CONTROL**	
	30	Indicating

SYSTEM/ CHAPTER	SUB-SYSTEM/ SECTION	TITLE
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	00	General
	10	Electrical Power Supply
	20	Distribution
77	**ENGINE INDICATING**	
	00	General
79	**OIL**	
	00	General
80	**STARTING**	
	00	General
	10	Cranking
81	**TURBINES**	
	00	General
91	**CHARTS**	
	00	Charts

SUPPLEMENTARY PUBLICATIONS

The following is a list of publications providing servicing, overhaul and parts information on various components on the BEECHCRAFT Duke 60 Series airplanes which you may obtain to supplement the BEECHCRAFT Duke 60 Series Maintenance Manual. In most instances you should obtain the publications directly from the manufacturer or his distributor. Only a few, such as Beech supplementary publications, are available from Parts and Service Operations, Beech Aircraft Corporation. Those which are so available are listed in the current Publications Price List. Since a wide variety of radio components and equipment is available and because radio manufacturers normally supply parts and servicing manuals with each set, radio publications have not been included in the list. As publications on additional components become available, they will be added to the list of publications.

BEECH PUBLICATIONS

98-33857 Installation, Maintenance and Illustrated Parts Breakdown for 60-389017 Voltage Regulator.

98-36235 Installation, Maintenance and Illustrated Parts Breakdown for 60-389017-1 Voltage Regulator.

98-33702 Overhaul and Parts Breakdown for 50-921560 Engine Driven Fuel Pump.

98-37031 Inspection Procedures and Maintenance Guide for the OECO 20139 and 20051 Inverter.

98-35655 Brittain B-5 and B-7 Autopilot Operating Manual.

98-35850 Brittain B-5 and B-7 Autopilot Maintenance Manual and Illustrated Parts Breakdown.

98-34350 Operation Manual for 3-Button Flight Controller.

98-35636 Operation Manual for 4-Button Flight Controller (With Heading Selector).

98-32751 Maintenance Instructions for Goodyear Wheel, Brake and Tire Assembly.

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

98-36374 Overhaul and Cleaning Procedure for Pressurization Controllers, Outflow and Safety Valves

H-14 AUTOPILOT

130333C Maintenance Manual.

98-30603 Maintenance Manual Supplement.

92-30103B Overhaul Instructions for BG274B2, C1, C2 Computer.

92-30105 Overhaul Instructions for CG136A1 Heading Selector.

92-30106B Overhaul Instructions for MG113A1, MG113A2, MG113A3, MG114A4 Actuator and SG28A1, SG28A3 Pressure Switch.

92-30107A1 Overhaul Instructions for PG51A1 Altitude Control.

92-30229 Overhaul Instructions for GG205A3, GG205A4, (GG205B4) Turn and Bank Indicator Gyro.

92-30411B Overhaul Instructions for GG201A1, GG201B1 Vertical Gyro.

92-30412B Overhaul Instructions for GG2021, GG202B1 Directional Gyro.

H-14 AUTOPILOT (Cont'd.)

98-32523 Overhaul Instructions for MG112A1, MG112B1 Trim Actuator.

98-32839 Overhaul Instructions for CG417B1, CG417B2 Flight Controller.

VENDOR PUBLICATIONS

ENGINE

Parts Catalog PC-120, Avco Lycoming Division, Williamsport, Pennsylvania. Overhaul Manual 60294-6, Avco Lycoming Division, Williamsport, Pennsylvania. Operator's Manual 60297-13, Avco Lycoming Division, Williamsport, Pennsylvania.

FUEL INJECTION

Operation and Service Manual, Form 15-468, Bendix Corporation, South Bend, Indiana.

PROPELLER

Overhaul Instructions 117B for Hartzell Propeller, Hartzell Propeller Inc., Piqua, Ohio.

Owners Manual 115E for Hartzell HCF3YR2/C7479-2R and Hartzell HCF3YR2F/FC7479B2R Propellers, Hartzell Propeller Inc., Piqua, Ohio.

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

Maintenance Handbook for Constant Speed Hydraulic Propeller Governor Type CSSA, Number 33002, Woodward Governor Company, Rockford, Illinois.

MAGNETOS

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

Service Parts List for Bendix S-1200 Series Magnetos, Form L-608, Scintilla Division, Bendix Aviation Corporation, Sidney, New York.

STARTING MOTOR

Overhaul Instructions, Form OE-A1, Prestolite Company, Toledo, Ohio.

DEICER DISTRIBUTOR VALVE

Overhaul Instructions with Parts Breakdown, Publication Number 38U-2-142, Fluid Power Division, Bendix Aviation Corp. Utica, New York.

Operation and Service Instructions, Publication Number 39U-1-810E Fluid Power Division, Bendix Aviation Corp. Utica, New York.

ELECTRONIC SYNCHRONIZER

Installation Manual, Bulletin Number 33032A, Woodward Governor Company, Rockford, Illinois.

Propeller Synchronizer for Light Twin Engine Aircraft, Bulletin Number 33049C, Woodward Governor Company, Rockford, Illinois.

HYDRAULIC ACCUMULATOR

Maintenance Manual Number 33058, Woodward Governor Company, Rockford, Illinois.

GENERATOR

Overhaul and Parts Breakdown, File 30204, Lear Siegler Inc., Cleveland, Ohio.

BATTERY

Operator and Service Manual for Vented-Cell Nickel-Cadmium Battery, GET3593A, General Electric Company, Gainesville, Florida.

Maintenance Manual for Nickel-Cadmium Battery, ABD1100, Gulton Industries, Inc., Metuchen, New Jersey.

Marathon Battery Installation Manua, BA89, Marathon Battery Co., Cold Springs, N.Y.

ELECTRIC PROPELLER DEICER

Installation of Deicer Boots, Report 59-728, B.F. Goodrich Company, Akron, Ohio.

Installation, Inspection and Testing of Propeller Deicer System, Report 68-04-708, B.F. Goodrich Company, Akron, Ohio.

HEATER VENT BLOWER

Overhaul Instructions for Vane Axial Blower Number M6921N6A, with Motor M3416DA, Dynamic Air Engineering Inc., Santa Ana, California.

HEATER

Maintenance Instructions for Janitrol A34D51 Aircraft Heater, Publication Number 57D83, Janitrol Aero Division, Midland-Ross Corporation, Columbus, Ohio.

Maintenance Instructions for Janitrol 52D70 Aircraft Heater Ignition Unit, Publication Number 58D42, Janitrol Aero Division, Midland-Ross Corporation, Columbus, Ohio.

AIR CONDITIONER COMPRESSOR

Series 67 Compressor Service Manual, Form 180.33NM, York Corporation, York, Pennsylvania.

Renewal Parts List, Form 180.33RP, York Corporation, York, Pennsylvania.

OUTFLOW AND SAFETY VALVE

Operation and Maintenance Instructions, Report No. 4-268, 15 April 1975, Garrett Airesearch Manufacturing Division, Los Angeles, CA.

FUEL CELLS

Recommended Handling and Storage Procedures for Bladder Type Fuel and Oil Cells, Publication Number FC1473-73, Uniroyal Inc., Mishawaka, Indiana 46544.

Repair Procedures for Heated Repairs to Bladder and Self-sealing Fuel Cells, Repair Procedure RK-72, February 3, 1977, Uniroyal, Inc., Mishawaka, Indiana 46544.

NEWMATIC AUTOPILOT

B-8 Ground and Flight Check Procedures Manual Number 3957, Brittain Industries, Torrance, California.

LANDING GEAR MOTOR

Component Maintenance Manual with Illustrated Parts List for Landing Gear Motor P/N 27-4 and 27-8, Electro-Mech, Inc., Wichita, Ks.

BRAKES

Overhaul Information for A22 Brake Shuttle Valve, Publication Number 74456, Hoof Products, Co., Chicago, Illinois.

Overhaul Information for Brake Shuttle Valve, A-SA404, Publication Number 23595, Paramount Machine Co., Stow, Ohio.

EMERGENCY LOCATOR TRANSMITTER

Operating Instructions for Model CIR-10( ) Emergency Locator Transmitter System, Transmitter P/N TR 70-17, Collins/Communications Components Corporation, Costa Mesa, California.

Operating Instructions for Model CIR-11( ) Emergency Locator Transmitter System, Transmitter P/N TR 70-13, Collins/Communication 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.

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AILERON CONTROL CABLE INSTALLATION	FLIGHT CONTROLS	27-10-00
AILERON CONTROL CABLE REMOVAL	FLIGHT CONTROLS	27-10-00
AILERON CONTROL SYSTEM RIGGING	FLIGHT CONTROLS	27-10-00
AILERON INSTALLATION	FLIGHT CONTROLS	27-10-00
AILERON MAINTENANCE	WINGS	57-50-00
AILERON REMOVAL	FLIGHT CONTROLS	27-10-00
AILERON SERVO PRESSURE REGULATOR	PNEUMATIC	36-00-00
AILERON TRIM TAB ACTUATOR INSTALLATION	FLIGHT CONTROLS	27-10-00
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AIR SCOOP RIGGING AIR CONDITIONING	AIR CONDITIONING	21-50-00
AIRPLANE FINISH CARE	STANDARD PRACTICES-AIRFRAME	20-00-00
AIRPLANE FINISH CLEANING & WAXING	SERVICING	12-20-00
ALCAL CALIBRATION UNIT	ENGINE INDICATING	77-00-00
ALTITUDE CONTROLLER INSTALLATION,CABIN	AIR CONDITIONING	21-30-00
ALTITUDE CONTROLLER REMOVAL,CABIN	AIR CONDITIONING	21-30-00
ASSIST STEP ADJUSTMENT-FOLDED	DOORS	52-60-00
ASSIST STEP BELL CRANK INSTALLATION	DOORS	52-60-00
ASSIST STEP BELL CRANK REMOVAL	DOORS	52-60-00
ASSIST STEP CABLE INST (P-4 THRU P-509)	DOORS	52-60-00
ASSIST STEP CABLE INST (P-510 & AFTER)	DOORS	52-60-00
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AUTOPILOT-H-14	AUTO FLIGHT	22-10-00
AUTOPILOT-NEW-MATIC	AUTO FLIGHT	22-11-00
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BATTERY	SERVICING	12-20-00
BATTERY CAPACITY CHECK	ELECTRICAL POWER	24-31-00
BATTERY CAPACITY RECONDITIONING	ELECTRICAL POWER	24-31-00
BATTERY CHARGE CURRENT DETECTOR SYSTEM	ELECTRICAL POWER	24-00-00
BATTERY CHARGE CURRENT DETECTOR SYSTEM	ELECTRICAL POWER	24-32-00
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BATTERY ELECTROLYTE LEVEL ADJUSTMENT	ELECTRICAL POWER	24-31-00
BATTERY EMERGENCY LOCATOR	EQUIPMENT AND FURNISHINGS	25-60-00
BATTERY INSTALLATION	ELECTRICAL POWER	24-31-00
BATTERY MAINTENANCE LOG	ELECTRICAL POWER	24-31-00
BATTERY MAINTENANCE PROGRAM	ELECTRICAL POWER	24-31-00
BATTERY PRE-INSTALLATION INSTRUCTION	ELECTRICAL POWER	24-31-00
BATTERY RECONDITIONING FREQUENCY	ELECTRICAL POWER	24-31-00
BATTERY RECONDITIONING PROCEDURE	ELECTRICAL POWER	24-31-00
BATTERY REMOVAL	ELECTRICAL POWER	24-31-00
BATTERY REPL, NARCO ELT	EQUIPMENT/FURNISHINGS	25-60-00
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BRAKE ASSEMBLY INSTALLATION	LANDING GEAR	32-40-00
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BRAKE GRAVITY BLEEDING	LANDING GEAR	32-40-00
BRAKE HYDRAULIC SYSTEM	LANDING GEAR	32-40-00
BRAKE MASTER CYLINDER INSTALLATION	LANDING GEAR	32-40-00
BRAKE MASTER CYLINDER LINKAGE ADJUST	LANDING GEAR	32-40-00
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BRAKE PRESSURE BLEEDING	LANDING GEAR	32-40-00
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CHAPTER 5

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CHAPTER 5 - TIME LIMITS/MAINTENANCE CHECKS

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OVERHAUL AND REPLACEMENT SCHEDULE

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 aforementioned 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 as well as the igniter power relay and Landing Gear Control relay.

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

NOTE

The 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.

NOTE

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

ITEM	OVERHAUL OR REPLACE

NOTE

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

LANDING GEAR	
Main gear	Every 2000 hours

OVERHAUL AND REPLACEMENT SCHEDULE (Cont'd)

ITEM	OVERHAUL OR REPLACE
LANDING GEAR (Cont'd)	
Nose Gear	Every 2000 hours
Actuator assembly	Every 4000 hours or on condition
Retract motor	Every 2000 hours
Retract motor brushes	Every 500 hours or on condition
Shimmy damper	Every 2000 hours or 3 years
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 hose	On condition
POWER PLANT	
Engine	Every 1600 hours for new engines with serial numbers L-804-59 and up and remanufactured engines shipped after March 1, 1976 and remanufactured and overhauled engines which incorporate improved cylinder assemblies (as described in the latest edition of Avco Lycoming Service Bulletin No. 334); every 1200 hours for all other engines
Engine controls	On condition
Engine vibration isolator mounts	On condition
Exhaust system	On Condition

OVERHAUL AND REPLACEMENT SCHEDULE (Cont'd)

ITEM	OVERHAUL OR REPLACE
POWER PLANT (Cont'd)	
Turbocharger and waste gate	On condition
Oil cooler	On condition (replace when contaminated)
Propeller (Hartzell)	Every 2000 hours or 5 calendar years, whichever occurs first
Propeller controls	On condition
Propeller governor	every 1600 hours
Dry air pressure pump	Every 600 hours or on condition
Propeller Accumulator	Every 1600 hours
Hoses carrying flammable liquids	When condition warrants, 5 years from date of delivery, or at engine overhaul, whichever occurs first
All other hoses	On condition
FUEL SYSTEM	
Fuel cells	On condition
Nacelle fuel quantity transmitter	On condition.
Wing fuel quantity transmitter	On condition.
Fuel cell drain valve	On condition
Fuel system check valves	On condition
Fuel selector valve	Every 1000 hours
Fuel boost pump	Every 800 hours
Float valve	On condition
Hoses carrying flammable liquids	When condition warrants, 5 years from date of delivery, or at engine overhaul, whichever occurs first
All other hoses	On condition

OVERHAUL AND REPLACEMENT SCHEDULE (Cont'd)

ITEM	OVERHAUL OR REPLACE
FUEL SYSTEM (Cont'd)	
Fuel pump, engine driven	Every 1200 hours
INSTRUMENTS	
Turn and bank indicator	On condition
Altimeter	Every 24 months per FAA directive
Directional gyro	On condition
Gyro horizon	On condtion
Dry air pressure gage	On condition
Cabin altitude control	On condition
Cabin altitude controller filter - standard	On condition
Cabin altitude controller filter - motorized	Every 100 hours
Manifold pressure gage	On condition
Airspeed indicator	On condition
Cabin differential pressure gage	On condition
Cabin altitude and pressure differential indicator	On condition
Rate-of-climb indicator	On condition
Fuel pressure gage	On condition
Fuel flow gage	On condition
Tachometer	On condition
Flap position indicator	On condition
Free air temperature indicator	On condition
Gyro instrument filter	Every 500 hours
Air pump inlet filter	On condition
All hoses	On condition

OVERHAUL AND REPLACEMENT SCHEDULE (Cont'd)

ITEM	OVERHAUL OR REPLACE
INSTRUMENTS (Cont'd)	
Air pump inline filter	300 hours
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	Replace at heater overhaul
Starter	Inspect at engine overhaul and overhaul or replace on condition
Starter relay	On condition
Generator	On condition
Battery (Emergency Locator Transmitter)	At 50% of useful life (as stated on the battery) or any time transmitter is used more than one cumulative hour or after inadvertent activation of unknown duration
UTILITY SYSTEM	
Cabin heater	Every 1000 hours or whenever pressure decay test requirements cannot be met. See appropriate manufacturer's manual
Heater igniter and plug	On condition
Heater fuel pump	On condition
Heater fuel spray nozzle	Replace at heater overhaul.

OVERHAUL AND REPLACEMENT SCHEDULE (Cont'd)

ITEM	OVERHAUL OR REPLACE
UTILITY SYSTEM (Cont'd)	
Heater fuel shut-off valve	On condition
Combustion blower	On condition
Combustion blower brushes	Every 500 hours
Vent blower	On condition
Vent blower brushes	Every 500 hours
Condenser blower	On condition
Condenser blower brushes	On condition
Oxygen regulator	Every 2000 hours or 48 months
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
Differential control valve (P-4 thru P-307)	Inspect every 100 hours, replace on condition
Outflow valve (308 and after)	Perform functional test every 500 hours
Safety valve (P-4 thru P-307)	Inspect every 100 hours, replace on condition
Safety valve (P-308 and after)	Perform functional test every 500 hours
FLAPS AND FLIGHT CONTROLS	
Flight controls	On condition
Aileron tab actuator	On condition
Elevator tab actuator	On condition
Rudder tab actuator	On condition
Rudder pedal arm	On condition or at 2000 hours

OVERHAUL AND REPLACEMENT SCHEDULE (Cont'd)

ITEM	OVERHAUL OR REPLACE
FLAPS AND FLIGHT CONTROLS (Cont'd)	
Flap motor and drives	Every 2000 hours
Flap gearbox	Every 2000 hours
Flap actuators	Every 2000 hours
Flap flexible shaft	Every 2000 hours
MISCELLANEOUS	
Wing bolts	Replace 10 years after the initial inspection. or on condition. See Chapter 57-00-00

"END"

SCHEDULED MAINTENANCE CHECKS - MAINTENANCE PRACTICES

NOTE

For a listing of alternative inspection programs available for use with this airplane, refer to the latest issue of the BEECHCRAFT Publications Price List (P/N 118556).

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. Airplanes operated less than 100 hours a year must have a 100-Hour Inspection performed no later than 12 months following the date of the preceding 100-Hour Inspection. The 100-hour interval between performance of the procedures specified herein should NEVER be exceeded by more than 10 hours, which can be used only if the additional time is required to reach a place where the inspection can be satisfactorily accomplished. However, any extension of a 100-hour interval must be subtracted from the following 100-hour interval, with no time extension permitted. For example, if an inspection is done at 110 hours, the next inspection is due 90 hours later with no extension allowed.

NOTE

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

NOTE

Beech Aircraft's Recommended Inspection Program in accordance with FAR Parts 43 and 91 consists of, but is not limited to, inspection items listed in this Inspection Guide, any applicable Airworthiness Directives issued against the airframe or any equipment installed therein, conformity to Type Certificate Data Sheet and Maintenance Manual Airworthiness Limitations Chapter (Chapter 4) as applicable.

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

While this guide may be used as an outline, detailed information of the many systems and components in the airplane will be found in the various sections/chapters of the shop/maintenance manual and the pertinent vendor publications. It is also recommended that reference be made to the applicable Maintenance Handbooks, previously issued Service Instructions, Beechcraft Service Bulletins, applicable FAA Regulations and Publications, Vendors Bulletins and Specifications for torque values, clearances, settings, tolerances, and other requirements. It is the responsibility of the owner or operator to ensure that the airframe and power plant mechanic inspecting the airplane has access to the previously noted documents as well as to this inspection guide.

Beech Aircraft Corporation 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 his particular set o operating conditions.

In the final analysis it is the responsi bility of the owner or operator to ensur that all previously issued Class I and I Service Instructions and Beechcraft Ser vice Bulletins which are pertinent to hi particular operation are complied with.

NOTE

In addition to the inspections prescribed by this schedule, the altimeter instrument and static system and all ATC transponders MUST be tested and inspected at 24-month intervals in compliance with the requirements specified in FAR Part 91.

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 - Check for proper operation.			
6. PROPELLER DEICER - Check for proper operation and amperage drawn on ammeter.			

A. OPERATIONAL INSPECTION (Cont'd)	MECH		INSP
	L	R	
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. Check for proper lubrication of the connection bolts and excessive free play.			
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.			

A. OPERATIONAL INSPECTION (Cont'd)	MECH		INSP
	L	R	
16. IDLE RPM AND MIXTURE SETTINGS - Check for both proper rpm and mixture settings. Check controls for freedom of operation.			
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. HEATING AND VENTILATING SYSTEM - Check for proper operation, heat and airflow output. Check controls for freedom of operation.			
19. PRESSURIZATION SYSTEM - Check for proper operation.			
20. FUEL QUANTITY AND FUEL FLOW GAGES - Check for proper operation and unusual fluctuations.			
21. FUEL BOOST PUMPS - Check for proper operation.			
22. FUEL TANK SELECTOR - Check for proper operation and feel for positive detent and proper placarding.			
23. ALL LIGHTS - Check for condition, attachment, cracked or broken lenses. Check switches, knobs and circuit breakers for looseness and operation.			
24. STALL WARNING SYSTEM - Check for proper operation.			

A. OPERATIONAL INSPECTION (Cont'd)	MECH		INSP
	L	R	
25. RADIO OPERATION - Check for proper operation, security of switches and knobs.			
26. FLAPS - Check for noisy operation, full travel and proper indication.			
27. PITOT HEAT - Check for proper heating of the unit.			
28. BRAKES - Check for condition and wear, ease of operation and proper release of the parking brake. Check for unusual brake chatter.			
29. 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.			
30. OXYGEN SYSTEM - Functionally check the oxygen system for proper operation. Check the oxygen bottle shutoff valve for proper operation.			
31. SWITCHES, CIRCUIT BREAKERS - Check for proper operation.			
32. 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.			
33. IDLE CUT-OFF - Check for proper operation and freedom of movement.			

B. POWER PLANT	MECH		INSP
	L	R	
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. COWLING - Check for condition and security. Remove the upper and lower cowling and clean. Inspect for cracks.			
2. COWL FLAPS - Check for travel, deformation and security. 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 attachment. Check plumbing clearance and secure against possible chafing.			
6. ENGINE OIL SUMP - Check for cracks, leaks, deformation and security.			
7. OIL DIPSTICK - Check the dipstick for rust and general condition. Inspect the dipstick tabs for security and that the tabs are not bent.			
8. OIL SUMP DRAINS AND FILTERS - Check for metal particles on filters. Check for proper torque after installation. Check drain plugs for leaks.			

B. POWER PLANT (Cont'd)	MECH		INSP
	L	R	
NOTE Change oil and oil filter per Lycoming T10-541 Series Operating Manual.			
9. OIL COOLER - Check oil cooler, lines and fittings for condition, security, chafing and leaks.			
10. 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 Beech Aircraft Corporation. Inspect the blades for cracks, dents, nicks, scratches, erosion, corrosion, security and movement in the hub.			
11. PROPELLER SPINNER - Check for deformation, security and cracks.			
12. PROPELLER HUB - Check for cracks, excessively leaking seals and condition. Check propeller dome pressure.			
13. PROPELLER ACCUMULATOR - Check for proper operation.			
14. STARTER - Check for condition, attachment and chafed or loose wires.			
15. 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.			
16. IGNITION HARNESS - Inspect for fraying and attachment.			

B. POWER PLANT (Cont'd)	MECH		INSP
	L	R	
17. CYLINDERS AND BAFFLES - Check cylinders and exhaust manifold for obvious leaks, security and cracks; check baffles for cracks and security. Check cylinders for broken cooling fins and loose or missing base nuts. NOTE Accomplish valve inspection every 400 hours of operation per Lycoming T10-541 Series Operating Manual.			
18. 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.			
19. FIREWALL - Check for wrinkles, damage or cracks. Check all electrical and control access holes for proper sealing.			
20. HOSE AND DUCTS - Check all fuel, oil and air hose or duct for leakage, cracks, deterioration and damage. Check fittings for security.			
21. ENGINE ACCESSORIES - Check for condition, security and leaks. Check wiring, hoses and tubes for chafing, security and leaks.			
22. GENERATOR - Check for condition, attachment and chafed or loose wires.			
23. ENGINE MOUNTS - Check for cracks, corrosion and security. Inspect rubber cushions, mount bolts and nuts, and grounding straps for condition and security.			
24. PROPELLER GOVERNOR - Check for leaks and control arm for security.			

B. POWER PLANT (Cont'd)	MECH		INSP
	L	R	
25. ENGINE CONTROLS - Check controls and associated equipment for condition, attachment, alignment and rigging. Each 300 hours remove the throttle cable connection bolts and check for wear.			
26. ELECTRICAL WIRING AND EQUIPMENT - Inspect electrical wiring and associated equipment and accessories for fraying and attachment.			
27. AIR CONDITIONER COMPRESSOR - Check for security and attachment. Check refrigerant and oil levels. Check belt for tension and worn or frayed condition.			
28. INDUCTION AIR FILTER - Check for condition, cleanliness and security.			
29. 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.			
30. FUEL INJECTION CONTROL VALVE - Clean the screen and check for damage. Install screen and check for leaks.			
31. FUEL INJECTION SYSTEM - Inspect all fuel injection components, lines and fittings for evidence of fuel leaks, fraying and cracking.			
32. TURBOCHARGERS - Check the compressor wheel for nicks and cracks. Check linkages for security and proper operation.			
33. TURBINE INLET TEMPERATURE INDICATOR - Check the indicator for accuracy and calibrate as outlined under the heading TIT INDICATOR CALIBRATION in Chapter 77-00-00.			

B. POWER PLANT (Cont'd)	MECH		INSP
	L	R	
34. 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	MECH		INSP
	L	R	
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. INLINE FILTERS - Clean or replace, as required, the filter in each nacelle as outlined under the heading SERVICING in Chapter 36-00-00.			
5. BATTERY - Inspect for clean, tight connections and correct fluid level. Add distilled water as required. Inspect the vent hose at the battery box for obstructions. The battery box should be washed out thoroughly and dried each time the battery is removed and cleaned.			
6. FUEL QUANTITY TRANSMITTER - Check for attachment and electrical connection.			

C. NACELLES (Cont'd)	MECH		INSP
	L	R	
7. FUEL CELLS AND VENTS - Inspect fuel cells for leakage and vent lines for security as outlined in Chapter 28-10-00.			
8. PLUMBING - Check for leakage, chafing, condition and security.			
9. ELECTRICAL WIRING AND EQUIPMENT - Inspect for chafing, damage, security and attachment.			
10. AIR CONDITIONING - Check for condition, security and attachment.			
D. WINGS AND CARRY-THROUGH STRUCTURE	MECH		INSP
	L	R	
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.			
4. 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 at the first inspection and every 100-hours thereafter.			

D. WINGS AND CARRY-THROUGH STRUCTURE (Cont'd)	MECH		INSP
	L	R	
5. 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.			
6. AILERON TRIM TAB - Check for attachment and freedom of movement. Check free play as outlined under the heading CHECKING AILERON TAB FREE PLAY IN Chapter 27-00-00.			
7. FUEL CELLS AND VENTS - Inspect fuel cells for leakage and vent lines for security as outlined in Chapter 28-10-00.			
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.			

D. WINGS AND CARRY-THROUGH STRUCTURE (Cont'd)	MECH		INSP
	L	R	
14. WING SPAR CAP - Inspect the wing spar cap for corrosion as outlined in Chapter 57-00-00.			
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 for wing bolt, nut and fitting inspection criterion and frequency.			
16. STALL WARNING VANE - Check for condition and obstructions.			
17. FUEL QUANTITY TRANSMITTER - Check for attachment and electrical connection.			
18. NAVIGATION LIGHTS - Check for cracked or broken lenses and replace bulbs as necessary.			
19. LANDING LIGHTS - Check for security and operation. Replace lens and bulbs as necessary.			
20. FUEL BOOST PUMPS AND FUEL LINES - Check for condition, security and leaks. Check lines for signs of chafing or cracks.			
21. FUEL SELECTOR VALVE - Check for security, operation and leakage.			
22. FUEL STRAINERS - Inspect and clean as outlined under the heading ENGINE FUEL FILTERS AND SCREENS in Chapter 12-10-00 of this Maintenance Manual.			

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. CABLES, PULLEYS AND PRESSURE SEALS - 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 at the first inspection and every 100-hours thereafter.		
4. PRESSURIZATION CONTROL VALVES - On airplane serials P-4 thru P-307, check the cabin pressurization safety valve and outflow valve differential adjustment every 300 hours of airplane operation or annually. On airplane serials P-308 and after,perform a functional test of the outflow and safety valves every 500 hours. On airplane serials P-308 and after, clean the cabin pressurization controller filter and orifice each 500 hours; clean the safety valve filter and orifice each 1000 hours. For checking, cleaning and testing procedures, refer to Chapter 21-30-00.		
5. FLAP MOTOR AND SHAFTS - Check for condition, security and wear at all points. Check cable housing for security and check jam nuts for tightness.		
6. BRAKE MASTER CYLINDER AND PARKING BRAKE VALVE - Check for condition, security and leaks. Check lines for signs of chafing or cracks.		

E. CABIN AND BAGGAGE COMPARTMENT (Cont'd)	MECH	INSP
7. RUDDER PEDALS - Check for freedom of movement. Check cables, push/pull rods, bell cranks, 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. NOTE On airplane serials P-555 and after, and earlier airplanes with the noted replacement rudder pedal arms, the following inspection is accomplished at 300-hour intervals.		
8. RUDDER PEDAL ARMS - Check pedal arms for cracks and replace at 2000 hours or sooner if cracks are found. Replace P/N 50-524326-7 with P/N 50-524326-17 amd P/N 50-524326-8 with P/N 50-524326-18.		
9. 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.		
10. ELECTRICAL WIRING AND EQUIPMENT - Check for condition, security and signs of chafing.		
11. WINDSHIELD HEATER - Check the voltge as outlined under the heading ELECTRICALLY HEATED WINDSHIELD VOLTAGE CHECK in Chapter 30-40-00.		
12. PLUMBING - Check all plumbing and connections for security, leakage and general condition.		
13. WINDOWS AND DOORS - Inspect windows for scratches, crazing and general condition. Check doors for condition and attachment. Check latching mechanism for proper engagement and ease of operation. Check that the CABIN DOOR warning light in the annunciator panel remains illuminated until the door is closed, latched and locked.		

E. CABIN AND BAGGAGE COMPARTMENT (Cont'd)	MECH	INSP
14. 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.		
15. 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.		
16. OXYGEN - Check the oxygen masks for cleanliness and stowage. Check the system for leakage. Replace any component that is leaking.		
17. VENTILATING SYSTEM - Check all fresh air and heat outlet vents for proper movement and operation.		
18. FUEL SELECTOR VALVE - Inspect for security, freedom of movement, proper detent feel and condition. Check for proper placarding.		
19. FILTERS - Replace individual instrument air filters.		
20. EMERGENCY EXIT HATCH - 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.		
21. STATIC SYSTEM - Check and drain water from the static lines.		

F. NOSE SECTION	MECH	INSP
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. BRAKE FLUID RESERVOIR - Check reservoir for security, attachment, open vent, proper fluid level and for leaks.		
5. ELECTRICAL WIRING AND EQUIPMENT - Inspect electrical wiring and associated equipment and accessories for condition, fraying, and attachment.		
6. HEATER FUEL SYSTEM - Check lines for connection and chafing.		
7. HEATER DUCTING AND WIRING - Check security and chafing.		
8. AIR CONDITIONER EVAPORATOR - Check for condition and attachment.		
9. OXYGEN (If applicable) - Inspect oxygen cylinder and valves for condition and security of attachment. Check the valves for proper condition.		
10. TAXI LIGHT - Check for security and operation. Replace if necessary.		
11. BAGGAGE DOOR - Check for condition and proper latching.		

F. NOSE SECTION (Cont'd)	MECH	INSP
12. PITOT MAST - Check for condition and obstruction. Check heating if applicable.		
G. REAR FUSELAGE AND EMPENNAGE	MECH	INSP
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. CABLES, PULLEYS AND TURNBUCKLES AND PRESSURE SEALS - 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 at the first inspection and every 100-hours thereafter.		
4. 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.		
5. STRUCTURE - Check for cracks, deformation and concealed damage.		
6. TRIM TABS AND ACTUATORS Check for security and wear. Check allowable free play as outlined in Chapter 27-20-00 and 27-30-00. 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.		

G. REAR FUSELAGE AND EMPENNAGE (Cont'd)	MECH	INSP
7. RUDDER TORQUE TUBE (P-4 thru P-533 of S.I. 1115 has not been complied with) - Inspect the rudder torque tube for possible elongated taper pin holes and corrosion as outlined in BEECHCRAFT Service Instructions No. 1115.		
8. STATIC PORTS - Check for obstruction and clean as necessary.		
9. PLUMBING - Check for leakage, cracks, chafing, condition and security.		
10. ELECTRICAL WIRING AND EQUIPMENT - Inspect for chafing, damage, security and attachment.		
11. STATIC LINES - Check condition of static lines and drain.		
12. ASSIST STEP - Inspect for condition and attachment. The step may be adjusted as outlined under the heading STEP ADJUSTMENT (FOLDING POSITION) in Chapter 52-60-00.		
13. ANTENNAS - Check for condition and security.		
14. SCUPPER DRAINS - Check that the drain guards are open facing aft and drain holes are free from obstruction.		
15. OXYGEN (If applicable) - 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.			
3. LANDING GEAR STRUTS - Inspect the shock struts and components for cracks, attachment, corrosion, proper inflation and evidence of leakage.			
4. ACTUATING LINKAGE - Check for wear and cracks at attach points. Check for condition and security.			
5. 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.			
6. STRUT FLUID LEVEL - Check and maintain the proper hydraulic fluid level in the struts as outlined in Chapter 12-20-00.			
7. STRUT AND A-FRAME HINGE BOLTS - Inspect for cracks and security of attachment.			
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.			

I. NOSE GEAR (Cont'd)	MECH	INSP
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.		
7. STRUT FLUID LEVEL - Check and maintain the proper hydraulic fluid level in the strut as outlined in Chapter 12-20-00.		
8. STRUT AND A-FRAME HINGE BOLTS - Inspect for cracks, corrosion and security of attachment.		
9. NOSE GEAR UPLOCK PIN - Remove and inspect for corrosion. Lubricate with MIL-G-81322 prior to reinstallation.		
10. NOSE GEAR ASSEMBLY (P-3 thru P-296) - After the first 1000 flight hours and each 1200 flight hours thereafter, inspect the nose gear assembly as noted in BEECHCRAFT Service Instructions No. 0669-206, Rev I (or subsequent).		

J. LANDING GEAR OPERATION	MECH	INSP
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 ±.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.		
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. LANDING GEAR GEARBOX AND ACTUATING LINKAGE - Check for leakage, wear, condition and attachment. Check for unusual noise. 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. Check actuator gearbox, motor and switches for leakage, condition and security.		
3. DOORS - Check door operation, fit and fair. Check for unusual noise.		

J. LANDING GEAR OPERATION (Cont'd)	MECH	INSP
4. GENERAL OPERATION - Cycle the landing gear while checking to ascertain that the position light switches operate in conjunction with the landing gear position. Check the condition and operation of the complete landing gear system as outlined in Chapter 32-30-00.		
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.		
7. LIMIT SWITCH RIGGING - Check for security and proper adjustment of the limit switches. Refer to Chapter 32-30-00 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. NOTE Downlock tension should be checked at the first 100-hour inspection and every 200 hours thereafter.		
10. UPLOCK CABLE TENSION - Check uplock cable mechanism for condition and security. Check uplock cable for proper tension and for possible fraying.		
11. DOWNLOCK TENSION (MAIN GEAR) - Check for proper deflection force on the main gear knee joints.		

J. LANDING GEAR OPERATION (Cont'd)	MECH	INSP
12. DOWNLOCK TENSION (NOSE GEAR) - Check the downlock tension on the nose gear as outlined in Chapter 32-30-00.		
13. UPLOCK ROLLERS - Check condition and clearance of uplock rollers per Chapter 32-30-00 and lubricate as outlined in Chapter 12-20-00. 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.		
16. NOSE GEAR STEERING - Check for condition and security.		
K. GENERAL	MECH	INSP
1. Airplane cleaned and serviced.		
2. Airplane lubricated, after cleaning, as outlined in Chapter 12-20-00 and BEECHCRAFT 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, BEECHCRAFT 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.		

PILOT'S DISCREPANCIES	REMARKS

PILOT'S DISCREPANCIES	REMARKS

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.

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.

CAUTION

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

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.

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 PD680 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 .005 inch, or if over any 4-inch arc it exceeds .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 bracke until the brush is properly located.

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

k. With the deicer system operatin and a man in the pilot's compartmen observing the ammeter, visually inspec and physically flex the wiring from th brush block to each component of th deicer system and to the airplane powe supply. Jumps of the ammeter needle, othe than the momentary flicker that may occu when the step switch of the timer cycles indicate loose or broken wiring in th area under examination at the moment. I such instances, continue to flex the wir ing in the area that first indicate trouble while checking the continuit through the individual wires of th affected harness until the source o trouble is located. Use the applicabl Wiring Diagram Manual to trace the circu itry of the deicer system.

CAUTION

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

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.

"END"

CHAPTER 6

LIST OF PAGE EFFECTIVITY

CHAPTER SECTION SUBJECT	PAGE	DATE
6-EFFECTIVITY/CONTENTS	1	Nov 2/73
6-00-00	1	Nov 2/73
	2	Nov 2/73

CHAPTER 6 - DIMENSIONS AND AREAS

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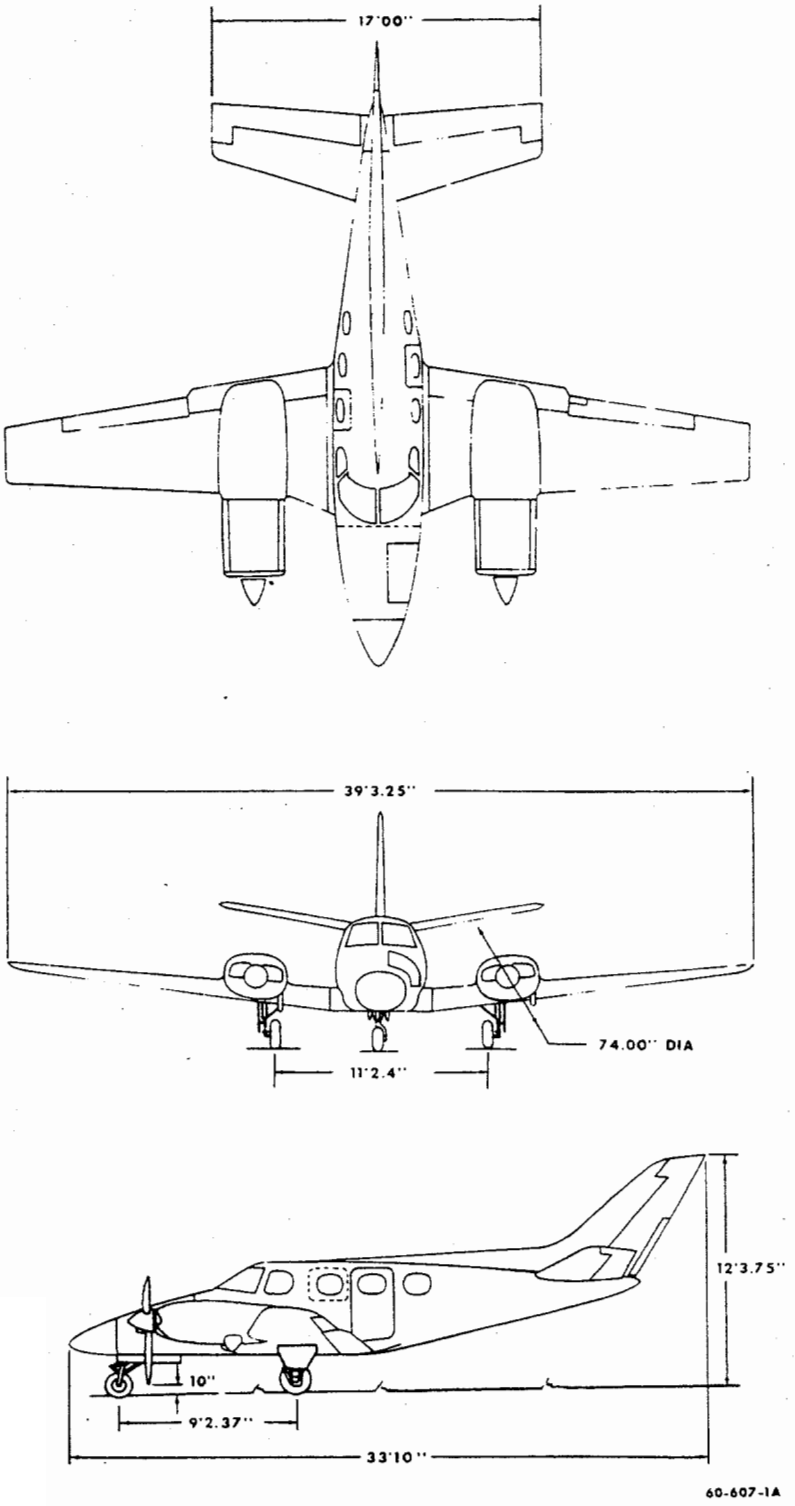
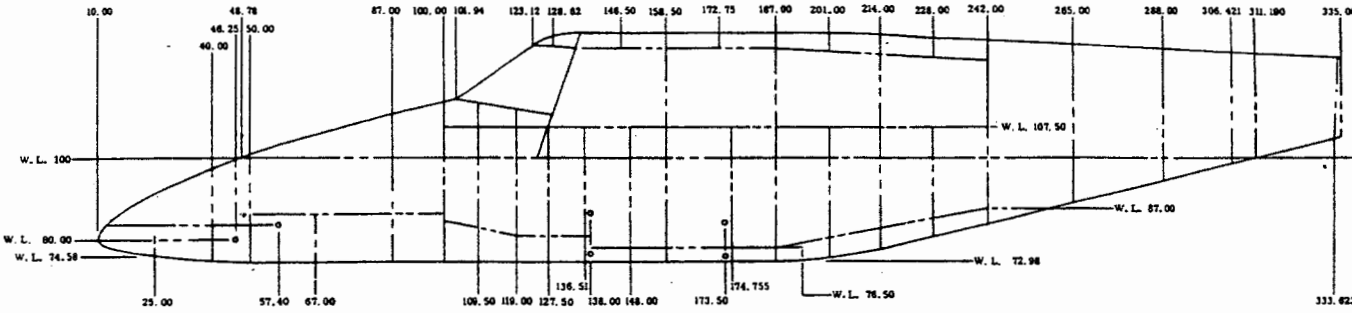
DIMENSIONS AND AREAS	6-00-00	1
Description and Operation		1
Aircraft Dimensions		1
Stations Diagram		2

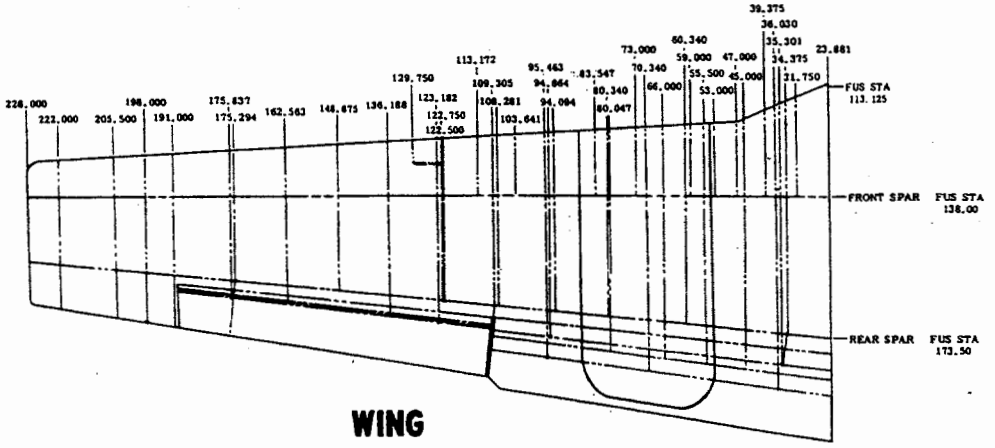
"END"



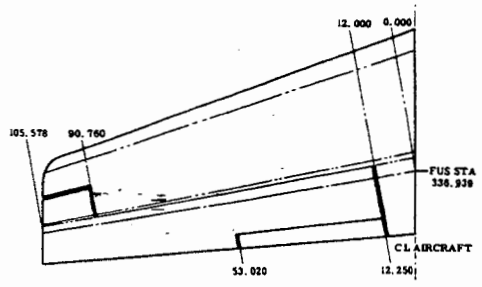
Aircraft Dimensions
Figure 1



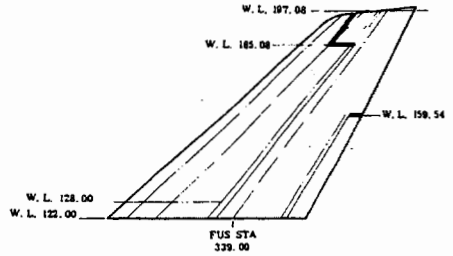
FUSELAGE



WING



HORIZONTAL STABILIZER



VERTICAL STABILIZER

60-603-10

Stations Diagram
Figure 2

"END"

CHAPTER 7

LIST OF PAGE EFFECTIVITY

CHAPTER SECTION SUBJECT	PAGE	DATE
7-EFFECTIVITY/CONTENTS	1	Oct 27/75
7-00-00	1	Oct 27/75

CHAPTER 7 - LIFTING AND SHORING

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SUBJECT	CHAPTER SECTION SUBJECT	PAGE
LIFTING AND SHORING	7-00-00	1
Description and Operation		1
Jacking		1

"END"

LIFTING AND SHORING - DESCRIPTION AND OPERATION

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 jacks.

A three-point jack is used to lift the airplane off the ground. Each jack pad is identified and located on the under side of the fuselage. One jack pad is located on each lower wing-to-fuselage attachment fitting along the rear spar. The forward jack pad is located in the middle of the fuselage just aft of the nose gear wheel well.

The Model 400 service jack and three adapters (P/N 60-590013 on P-3 through P-61, 60-590013-1, P-62 and after) are designed to be used with this airplane.

When one engine or one wing is to be removed, a stand should be placed under the opposite wing and the tail to counteract the resulting unbalanced condition of the airplane. Individual main wheels may be jacked by placing a floor jack under the jacking point located under each axle.

"END"

CHAPTER 8

LIST OF PAGE EFFECTIVITY

CHAPTER SECTION SUBJECT	PAGE	DATE
8-EFFECTIVITY/CONTENTS	1	Nov 2/73
8-00-00	201	Nov 2/73

CHAPTER 8 - LEVELING AND WEIGHING

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SUBJECT	CHAPTER SECTION SUBJECT	PAGE
GENERAL	8-00-00	201
Maintenance Practices		201
Leveling		201

"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 9

LIST OF PAGE EFFECTIVITY

CHAPTER SECTION SUBJECT	PAGE	DATE
9-EFFECTIVITY/CONTENTS	1	Nov 2/73
9-00-00	201	Nov 2/73

CHAPTER 9 - TOWING AND TAXIING

TABLE OF CONTENTS

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GENERAL	9-00-00	201
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"END"

GENERAL - MAINTENANCE PRACTICES

Attach the hand towbar to the tow lug on the nose gear lower torque knee.

CAUTION

When towing with a tug, observe turn limits as placarded on the nose gear to prevent damage to the gear.

CAUTION

Do not push on propeller or control surfaces. Do not place your weight on the horizontal stabilizers to raise the nose wheel off the ground.

"END"

CHAPTER 10

LIST OF PAGE EFFECTIVITY

CHAPTER SECTION SUBJECT	PAGE	DATE
10-EFFECTIVITY/CONTENTS	1	Nov 2/73
10-00-00	1	Nov 2/73

CHAPTER 10 - PARKING AND MOORING

TABLE OF CONTENTS

SUBJECT	CHAPTER SECTION SUBJECT	PAGE
GENERAL	10-00-00	1
Description and Operaton		1
Parking		1
Mooring		1

"END"

GENERAL - DESCRIPTION AND OPERATION

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 moor 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"

CHAPTER 11

LIST OF PAGE EFFECTIVITY

CHAPTER SECTION SUBJECT	PAGE	DATE
11-EFFECTIVITY/CONTENTS	1	Apr 18/80
11-00-00	1	Apr 18/80

CHAPTER 11 - PLACARDS AND MARKINGS

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PLACARDS AND MARKINGS	11-00-00	
Description and Operation		1
Model Designation Placard		1

"END"

PLACARDS AND MARKINGS - DESCRIPTION AND OPERATION

MODEL DESIGNATION PLACARD

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

NOTE

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

"END"

CHAPTER 12

LIST OF PAGE EFFECTIVITY

CHAPTER SECTION SUBJECT	PAGE	DATE
12-EFFECTIVITY	1	Jan 9/86
12-CONTENTS	1	Nov 30/83
12-00-00	1	Oct 19/77
12-10-00	201	Jan 9/86
	202	Jan 9/86
	202A	Jan 9/86
	203	Nov 2/73
	204	Nov 2/73
	205	Nov 2/73
12-20-00	201	May 12/78
	202	May 12/78
	202A	May 12/78
	203	Apr 18/80
	204	Nov 2/73
	205	Nov 30/83
	206	Nov 30/83
	207	Nov 30/83
	208	Nov 30/83
	209	Nov 30/83
	210	Nov 30/83
	211	Nov 30/83
	212	Nov 30/83
	212A	Nov 30/83
	212B	Nov 30/83
	213	Feb 22/80
	214	May 30/75
	215	Nov 2/73
	216	May 30/75
	217	May 30/75
	218	May 30/75
	219	May 30/75
	220	May 30/75
	221	Nov 2/73
	222	Nov 2/73
	223	Nov 2/73
	224	Oct 27/75
	225	Oct 27/75
	226	Nov 2/73
	227	Nov 30/83
	228	Oct 27/75

"END"

CHAPTER 12 - SERVICING

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Engine Fuel Filters and Screens		201
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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 following chapters. For overhaul procedures for components of a system refer to the BEECHCRAFT Duke 60 Beech Manufactured Components Maintenance Manual, P/N 60-590001-27. For electrical wiring diagrams refer to the BEECHCRAFT Duke 60 Wiring Diagram Manual, P/N 60-590001-29.

"END"

REPLENISHING - MAINTENANCE PRACTICES

FILLING THE FUEL CELLS

NOTE

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

The fuel system installation consists of an inboard main fuel cell and an outboard cell in the leading edge, a nacelle tank, a wing panel fuel cell in each wing and a wet wing tip tank (optional on serials P-348, P-365 and after). All of the fuel cells in each wing and wing tip are interconnected in order to make all of the usable fuel in each wing available to its engine when the fuel selector valve is turned ON. The interconnecting fuel cells are serviced either through the single filler on each wing or the filler in each of the optional wet wing tips, providing single point filling for each side. The fuel sight gage (P-402 and after) located outboard of each nacelle may be used for partial filling of the fuel system, or for balancing the fuel load, when the fuel load is within the range of this gage (40 to 60 gallons for each wing). The combined capacity of the standard and optional system is shown below:

SERIALS	CAPACITY IN GALLONS	USABLE IN GALLONS
P-3 thru P-195 inboard leading edge fuel cells unbaffled	207	192
P-3 and after with inboard leading edge baffled fuel cells	207	202
Optional fuel system P-348, P-365 and after	237	232

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

a. Service the fuel cells with grade 100 (blue) or 100LL (green) 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 the 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 localitites 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. On the optional system (P-348, P-365 and after) open the fuel drain in the wet wing tip using the special tool P/N 101-590020-1.

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 13 quarts. The oil system may be checked through access doors in the

engine cowling. A calibrated dip stick attached to the filler cap indicates the oil level. Due to the canted position of the engines, the dip sticks are calibrated for either right or left engines and are not interchangeable. The oil should be changed every 75 to 100 hours under normal operating conditions and the oil filter changed every 50 hours.

CAUTION

Any Time the oil system has been contaminated by metal particles, the oil cooler must be replaced and the oil system flushed to prevent engine damage.

All TIO-541 series engines are limited to using only MIL-L-22851 ashless dispersant multi-grade oil (2, Chart 202, 12-20-00). Oil equivalent to SAE 50 or SAE 60 above 60°F; below 30°F SAE 40 is recommended. However, newly overhauled engines of this series may be run-in on the test stand with single viscosity, grade SAE 50 oil conforming with MIL-L-6082, (6, Chart 202, 12-20-00).

The oil drain is accessible through the cowl flap opening. The engines should be warmed to operating temperature to assure complete drainage.

NOTE

The engine oil must be of the proper viscosity and meet the requirements of the current Avco Lycoming specification 301 and Avco Lycoming Service Instruction 1014K or subsequent.

The determining factor for choosing the correct grade of oil is the oil inlet temperature observed furing flight; however, inlet temperatures consistently near the maximum allowable indicate a heavier oil is needed. Lycoming recommends use of the lightest weight oil that will give adequate cooling.

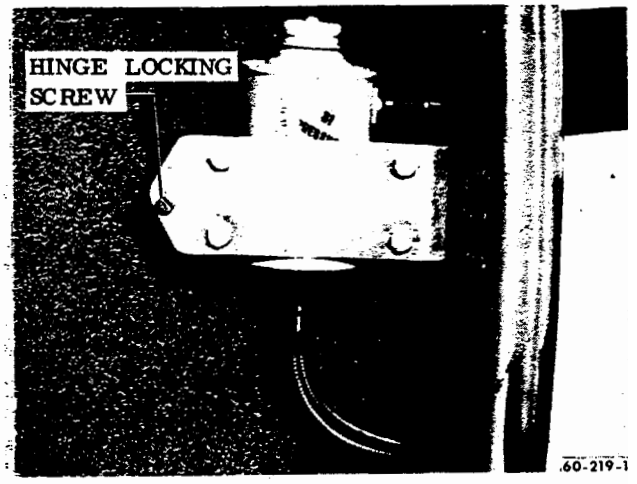
CHANGING THE OIL FILTER

The oil filter should be replaced every 50 hours. Replace the filter as follows.

a. Disconnect the fuel line to the inlet side of the engine-driven fuel pump. Cap the fuel line (P-3 through P-20) and push the line down to allow clearance for oil filter removal.

b. Cut the safety wire and remove the filter housing.

c. After making sure all traces of gasket material and cement are removed from the oil filter adapter recess, install



Brake Fluid Reservoir
Figure 201

the new aluminum ring and O-ring seal which replace th existing rubber gasket. (Refer to Lycoming Service Bulleti No. 337.)

d. Torque the retainer bolt to 30-35 foot-pounds an safety.

e. Remove cap (P-3 through P-20) and reinstall th fuel line.

BRAKE SYSTEM
(Figure 201)

Brake system servicing is limited primarily to maintaining th hydraulic fluid level in the reservoir. The brake fluid reservoi accessible through the forward baggage compartment doo is hinged on the aft frame of the door.

Loosening the screw securing the reservoir to the airplan structure allows the reservoir to swing out for easy servicin Fill the reservoir with MIL-H-5606 hydraulic fluid (13, Cha 202, 12-20-00) to the full mark on the dip stick. Mainta fluid level between "full" and "add" marks. Do not overfi For detailed information relating to the proper inspecti and repair procedures for the brake assembly, refer to th Beech Manufactured Component Maintenance Manua P/N 60-590001-27.

AIR CONDITIONING SYSTEM

Servicing the air conditioning system consits of periodical checking the refrigerant level, checking compressor oil leve and changing the system air filter. Recharge the system a outlined under CHARGING THE AIR CONDITIONING SYS TEM whenever the refrigerant level is low, air has entered th system, or components carrying refrigerant are replace Refrigerant leaks may be detected by inspection with flameless leak detector.

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 R-12 refrigerant (17, Chart 202, 12-20-00) in this system. 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.

Hook the service unit to the connections on the compressor. The abbreviation DISCH or the letter D on the compressor cylinder head designates the discharge service valve. The word SUCTION or the letter S on the compressor cylinder designates the suction service valve.
When charging a completely purged system, charge with 5 pounds of refrigerant. 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 ¼ to ½ pound of refrigerant.

NOTE

After the system has been charged, the compressor oil level should be checked as outlined under CHECKING COMPRESSOR OIL LEVEL.

CHECKING COMPRESSOR OIL LEVEL (Figure 202)

The compressor oil level should be checked by a qualified air conditioner man at the following times:

a. After the air conditioner has operated for the first time.
b. At the beginning of each season's operation.
c. When oil is emitted from the compressor during servicing operation.
d. After the air conditioning system has been recharged.
e. If a component is replaced.

The compressor is charged with Texaco Capella E or Suniso No. 5 oil (18, Chart 202, 12-20-00). Only these or equivalent oils should be used when adding oil. To check the compressor oil level, use the following procedure:

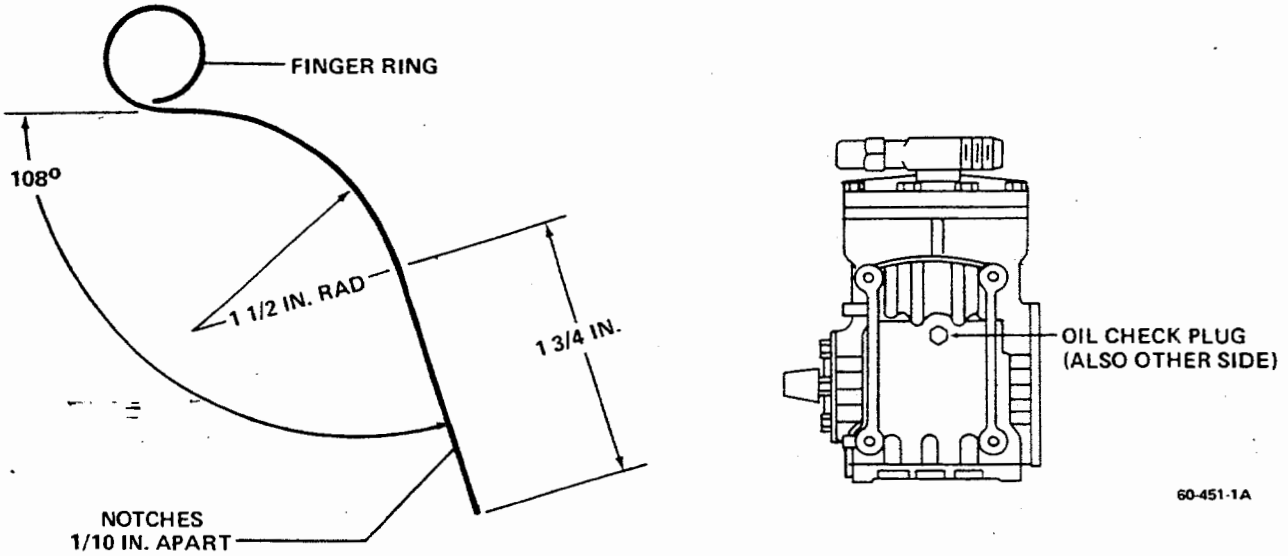
a. Operate the air conditioner for approximately 15 minutes in which the last 5 minutes should be at low engine rpm (1,000 to 1,100). This allows the oil to accumulate in the compressor for an accurate oil level reading.
b. Attach service gages to compressor service valve ports.
c. With air conditioner operating, slowly close the suction service valve until the suction pressure gage reads zero or slightly below.
d. Stop the air conditioner and quickly close the suction service valve when the suction gage reads a little above zero.
e. Close the discharge service valve.
f. With both service valves closed, the suction pressure will slowly rise to about five pounds gage pressure.
g. The remaining pressure is relieved by unscrewing the plug for 5 full turns and bleed to zero pressure.
h. Remove the oil plug and O-ring.
i. To place the crank throw in the best position for dip stick insertion, point the keyway on the compressor shaft up toward the cylinder head.
j. Insert an oil dipstick until the end contacts the bottom of the crankcase. Remove and measure the oil depth.

NOTE

A compressor oil level depth of 1.5 to 1.8 inches is satisfactory. If the oil level is below 1.5 inches, add oil per Chart 202, then remeasure.

CHART 202
CHECKING COMPRESSOR OIL LEVEL

Dip Stick Depth (In.)	Oil to be Added (Oz.)
.6	8.0
.8	6.5
1.0	5.0
1.2	3.0
1.4	1.5



Dipstick and Compressor Oil Check Plug
Figure 202

Oil should be removed when depths greater than 1.8 inch are observed.

Compressor oil level reduces .4 to .7 inches during operation at maximum rpm and also drops slightly with reduced evaporator loads. Approximately 7 ounces of oil is required to initially wet the system and circulate with the refrigerant. When an evaporator or condenser coil is changed, add approximately 2 ounces of oil on installation, then check and adjust the oil level as recommended. A locally manufactured dip stick (see Figure 202) may be fabricated from 1/8 inch diameter rod; a nonferrous material, which is not subject to corrosion, is preferred. Notches cut 1/10 inch apart will aid in visually detecting oil depth.

k. Install the oil plug and O-ring and check for leaks using a flameless leak detector.

l. Unseat both the suction service valve and the discharge service valve and turn to the full aft position.

m. Remove the service gages and install the caps to the service ports.

n. The aircraft may now be returned to service.

EVAPORATOR AIR FILTER REPLACEMENT

The evaporator air filter should normally be replaced annually. Actual replacement may be required more often due to extremely dusty operating conditions.

a. Remove the necessary equipment in the nose compartment to gain access to the floorboards forward of the pressure bulkhead.

b. Remove the screws securing the top of the evaporator filter access plate.

c. Cut the cord securing the filter to the evaporator plumbing.

d. Remove the old filter.

e. When installing the new filter, be sure the reinforced backing of the filter is placed against the evaporator coil.

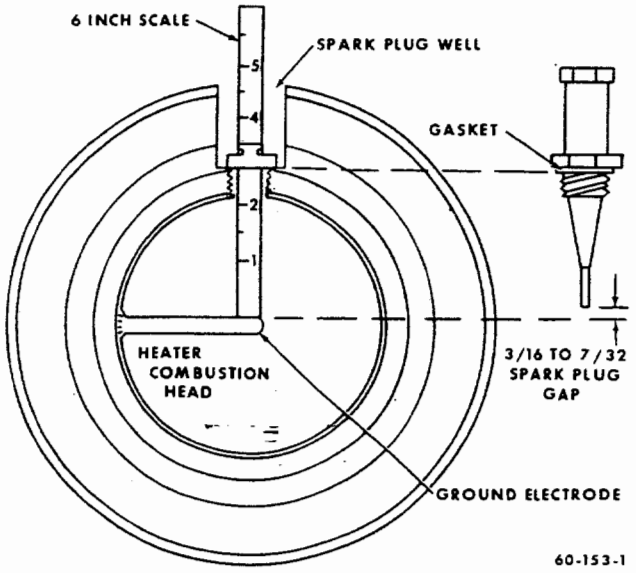
COMPRESSOR BELT TENSION ADJUSTMENT

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 moving the compressor up and down in its slotted mounts) so that a belt tension gage, placed at a point midway between the longest span will register a tension of 100 to 105 pounds. After adjusting tension on a new belt, be sure the belt has ample clearance on all sides.

HEATING SYSTEM

HEATER SPARK PLUG
(Figure 203)

If the spark plug appears to be in good condition, except for a mild coating of oxide on the procelain and electrodes, it may be cleaned and reused. Cleaning is accomplished on a conventional aircraft 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 carbon tetrachloride. 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 3/16 to 7/32 (.188 to .218) inches. 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.



Heater Spark Plug Gap
Figure 203

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.

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.

OXYGEN SYSTEM

CAUTION

All persons handling and servicing oxygen systems should review proper precautions to be observed during servicing. FAA Advisory Circular 43.13-1 contains the necessary information.

The oxygen system consists of an oxygen regulator, six outlets, a nose or rear mounted cylinder and recharging valve. The system may be fitted with an 11, 22, 49 or 65 cubic foot cylinder. When the system is not in use, the control valve on the console should be shut off to prevent oxygen loss.

To recharge the oxygen system, remove the protective cap from the filler valve.

WARNING

Keep fires, cigarettes and sparks away when outlets are in use. Open and close all oxygen valves slowly. Inspect the filler connection for cleanliness before attaching it to the filler valve. 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.

Attach a hose from an oxygen recharging cart to the filler valve. 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. This pressure may be increased an additional 3.5 psi for each degree of increase in temperature; similarly, for each degree of drop in temperature, reduce the pressure by 3.5 psi. When the oxygen system is properly charged, disconnect the hose from the filler valve and replace the protective cap. If at any time, in the process of servicing and purging the system or replacing the oxygen cylinder, it becomes necessary to disconnect a fitting, the threads should be treated with MIL-T-27730 tetrafluoroethylene tape (Chart 201, 12-20-00). The system should then be checked for leaks with MIL-L-25567 leak testing compound (14, Chart 202, 12-20-00). After testing, if no leaks are found, wipe the system clean and dry.

"END"

SCHEDULED SERVICING - MAINTENANCE PRACTICES

TIRES

NOTE

"Aero Seal" is a tire additive which is very effective in stopping small leaks and weep-hole leaks in tubeless tires. The proper procedure for the use of this additive may be obtained by referring to Service Instructions No. 0916.

The nose gear is equipped with a 15 x 6.00 x 6, 4 ply, type VI, tube type tire. The main gear tires are either 6.50 x 8, 8 ply tubeless, rim-inflated type (P-4 through P-191, except P-190) or 19.5 x 6.75 x 8, 10 ply, tube type (P-190 and after, except P-191 and those airplanes prior to P-190 which have complied with Service Instructions No. 0536-202, Rev II). A maximum outside diameter of 15 inches on the nose gear tire is required to ensure proper clearance of the nose gear shock absorber assembly. Inflate the nose gear tire to 47-50 psi. Inflate the 8 ply main gear tires to 69-75 psi and the 10 ply main gear tires to 76-82 psi. If necessary to comply with landing restrictions, main gear tire inflation may be reduced to 65 psi for 8 ply tires. Maintaining recommended tire inflation will help to avoid damage from landing shock and contact with sharp stones and ruts, and will minimize tread wear. When inflating tires, inspect them visually for cracks, breaks or evidence of external damage.

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 outboard of the left engine nacelle. The receptacle is designed for a standard AN type plug. To supply power for ground checks and air conditioner operation, a ground power source capable of delivering 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 precaution 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 generator switches, but leave the battery 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 unit does not have a standard AN plug, check the polarity and connect the positive lead from the external power unit to the center post and the negative lead to the front post of the airplane's external power receptacle. The small pin of the receptacle must be supplied with + 24 vdc to close the external power relay that provides protection against damage by reverse polarity.

BATTERY

Airplanes prior to P-446 are equipped with 24 volt, 13.5 ampere-hour batteries. To obtain optimum service from the nickel-cadmium battery, proper and regular maintenance of the battery must be performed.

Serials P-4 through P-225 are equipped with either General Electric or Gulton batteries. Serials P-226 through P-445 are equipped with General Electric air cooled batteries.

Airplanes, P-446 and after, are equipped with two 25 ampere-hour, 12 volt, lead-acid batteries connected in series and supplying a total system capacity of 24 volts.

A Systematic Battery Maintenance Program should be established and carefully followed:

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

b. A log of the services performed on each battery should be maintained.

c. The battery should be removed from the airplane and serviced after: 100 Flight Hours or 30 days, whichever occurs first. If the ambient temperatures are above 90°F or the time between engine starts averages less than 30 minutes, the duty cycle should be reduced.

d. The log of battery services performed should be evaluated to determine the need to service the battery at the above recommended intervals or to extend the intervals if justified. Accurate water consumption data is a valid barometer to use for adjustment of the servicing intervals.

CAUTION

Methods of servicing lead-acid batteries do not apply for the servicing of nickel-cadmium batteries.

Since the proper servicing of nickel-cadmium batteries requires two days, an additional battery (or batteries) will be required where airplane utilization warrants. For additional information on battery maintenance, refer to Gulton Instructions for Use and Care of Sintered Plate Vented Nickel-Cadmium Storage Batteries (P/N ABD-1100), or Marathon Battery Instruction Manual (P/N BA-89), or Operating and Service Manual for General Electric Nickel-Cadmium Vented-Cell Batteries (P/N GET-3593A), which ever the airplane is equipped with. Advisory Circular AC 00-33, printed by Department of Transportation, Federal Aviation Administration, is another good source of battery maintenance information.

DEICE BOOTS

Because the deice 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, and 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.

NOTE

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

For surface deice boot maintenance, refer to Chapter 30-10-00.

SHOCK STRUTS

The shock struts are filled with compressed dry air or nitrogen and MIL-H-5606 or MIL-H-83282 hydraulic fluid (13, Chart 202). The same procedure is used for servicing both the main and nose gear 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 personnel or property damage.

b. Remove the air valve assembly.

c. Compress the strut and fill through the air valve assembly hole with MIL-H-5606 or MIL-H-83282 hydraulic fluid (13, Chart 202) (approximately one pint) until the fluid overflows.

d. Cycle the strut (full extension to compressed) and refill. Repeat until fluid can not 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.

e. Install the air valve assembly.

f. With the airplane resting on the ground and the fuel cells full; inflate the nose gear strut until 4-1/16 to 4-5/16 inches of the piston is exposed, and inflate the gear strut until 3 inches of pistion is exposed. Rock the airplane gently to prevent possible binding of the pistion in the barrel while infating.

NOTE

It is recommended that the nose strut inflation dimension and the tire inflation pressure be carefully adheared to. Properly inflated tires and struts reduce the possibility of ground damage occurring to the propellers. Exercise caution when taxiing over rough surfaces.

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

PROPELLER BLADE BEARING LUBRICATION (Figure 201)

a. Remove the propeller spinner.

b. Remove the safety wire and covers from the six zerks. See Figure 201 for location.

c. Remove one zerk from each blade.

d. Lubricate the blade bearings with Hartzell DG Grease by placing the grease gun fitting on the remaining

zerk of each blade. Fill until the grease is visible in the hole where the opposite zerk was removed.

e. Reinstall the zerk on each blade.

f. Clean excess grease from the propeller, reinstall the grease zerk covers and safety.

g. Reinstall the spinner.

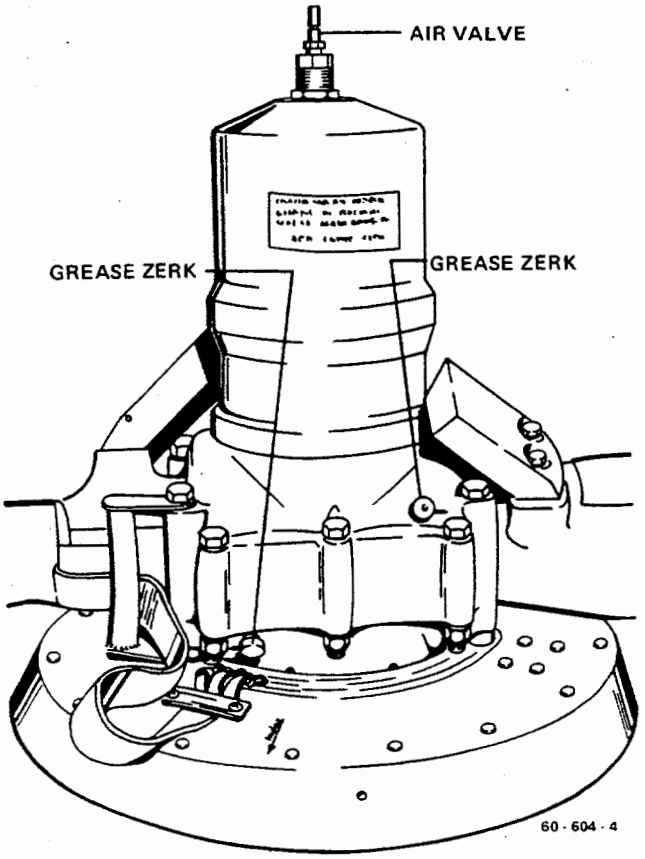
PROPELLER SERVICING POINTS
(Figure 201)

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

b. Charge the dome with dry air or nitrogen to a pressure of 80 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.

PROPELLER ACCUMULATOR

The propeller accumulators are located on the lower rear section of each engine. The accumulators should be inspected every 100 hours and charged with dry air or nitrogen to 125 psi. If a unit will not hold 70% of its normal charge, from inspection to the next, it should be replaced.



Propeller Servicing Points
Figure 201

INDUCTION AIR FILTER
(Wet or Dry Element)

The induction air filter should be cleaned every 50 hours and replaced every 500 hours of service. Clean the filter as specified by the manufacturer's instructions stamped on the filter.

ROTON LOCKS
(Figure 202)

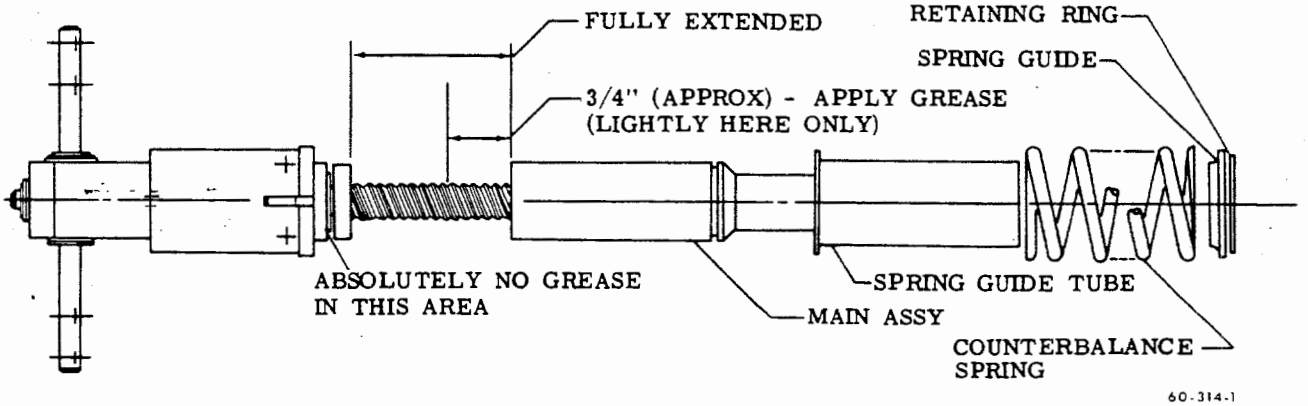
Usually, Roton locks will need no service. If there is a grinding and binding in the lock as the seat reclines or the return action becomes jerky, a little grease properly applied as follows should improve the operation.

a. Apply grease (30, Chart 207, 91-00-00) to the threads as shown in Figure 202.
b. Compress the spring guide and counter-balance spring approximately one inch.
c. Remove the retaining ring.
d. Relax pressure on the spring guide and counter-balance spring slowly until the spring is fully extended.
e. Remove the lock from the fixture and remove the spring guide, counter-balance 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 a new lock will need to be purchased.

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



Roton Lock
Figure 202

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

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

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

Cleaning of the acrylic plastic windows should never be attempted when dry. The window should first be flushed with water or a mild soap solution, then rubbed slightly with a grit-free soft cloth, chamois or sponge. Stubborn grease or oil deposits are readily removed with aliphatic naphtha or hexane. Rinse with clear water.

CAUTION

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

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. Pittsburg, 8 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
Autopilot (Pipe Threads Only)	Anti-Seize, White Lead Base	JAN-A-669	
Brakes	Hydraulic Fluid or Anti-Seize, White Lead Base	MIL-H-5606 or TT-A-580	

CHART 201 (Cont'd)
THREAD LUBRICANTS

SYSTEM	MATERIAL	SPECIFICATIONS	VENDOR PRODUCTS
Air Conditioner	Anti-Seize, Graphite Petrolatum or Anti-Seize, White Lead Base	MIL-T-5544 or TT-A-580	
Oxygen	Tetrafluoroethylene Tape	MIL-T-27730	Johnson and Johnson Inc., Permacel Div., U.S. Highway 1, New Brunswick, New Jersey 08901
Turbocharger Inlet Probe	Anti-Seize Compound	MIL-A-907D	Anti-Seize Compound C5A, Fel-Pro Inc., 7450 McCormick, Skokie, Illinois

CHART 202
CONSUMABLE MATERIALS

Only the basic number of each Military Specification is included in the Consumable Materials Chart. No attempt has been made to update the basic number with the letter suffix that designates the current issues of the various specifications.

Vendors that are listed as meeting the 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, 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*	*VENDOR PRODUCTS*
1.	Fuel, Engine	100/130 octane (If not available, use 115/145) Never use 91/96 octane fuel.	
2.	Oil, Engine (Ashless Dispersant)	MIL-L-22851	Global Concentrate A Delta Petroleum Company Inc. P.O. Box 10397 New Orleans, La. 70121 Paranox 160 and 165 Enjay Chemical Company 60 West 49th Street New York, N.Y. 10020 RT-451, RM-173E, RM-180E Mobil Oil Corporation 150 East 42nd Street New York, N.Y. 10017

CHART 202 (Cont'd)
CONSUMABLE MATERIALS

ITEM	MATERIAL	SPECIFICATIONS	VENDOR PRODUCTS
2.	Oil, Engine (Ashless Dispersent Cont'd.)		Shell Concentrate A Code 60068 Aeroshell W120, Aeroshell W80 Shell Oil Company One Shell Plaza Houston, Texas 77002 TX-6309 Aircraft Engine Oil, Premium AD120, Premium AD80 Texaco Inc. 135 East 42nd Street New York, N.Y. 10017 PQ Aviation Lubricant 753 American Oil and Supply Co. 238 Wilson Avenue Newark, N.J. 07105 Chevron Aero Oil Grade 120 Chevron Oil Co. 1200 State Street Perth Amboy, N.J. 08861 Esso Aviation Oil E-120, Enco Aviation Oil E-120, Esso Aviation Oil A-100, Enco Aviation Oil A-100, Esso Aviation Oil E-80, Enco Aviation Oil E-80 Exxon Company, U.S.A. P. O. Box 2180 Houston, Texas 77001 Chevron Aero Oil Grade 120 Standard Oil Co. of Calif. 225 Bush Street San Francisco, Calif. 94120
3.	Corrosion Preventive Compound	MIL-C-6529	Anti-Corrode No. 205, Cities Service Oil Co. 60 Wall Tower, New York 5, N.Y. Rust Foil No. 652-2 Franklin Oil and Gas Co. Bedford, Ohio Kendex No. 7038, Kendall Refining Co., Bradford, Pa.

CHART 202 (Cont'd)
CONSUMABLE MATERIALS

ITEM	MATERIAL	SPECIFICATIONS	VENDOR PRODUCTS
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. 10020 Jet Engine Oil No. 1010 Texaco Inc., 135 East 42nd Street, New York, N.Y. 10017
5.	Lubricating Oil	SAE 20 or SAE 10W30	
6.	Lubricating Oil, Aircraft Reciprocating (Piston) Engine	MIL-L-6082	Conoco Aero Oil No. 1065 Continental Oil Co. Ponca City, Oklahoma Phillips 66 Aviation Engine Oil, Grade 1065 Phillips Petroleum Co. Bartlesville, Oklahoma Skilflite No. 100, Skelly Oil Co., El Dorado, Kansas Avrey 10V1100, Socony Mobil Oil Co. Inc., 150 East 42nd Street New York, N.Y. 10017 Or any approved aircraft engine oil (graded at 1065 or 1100).
7.	Lubricating Oil (Gear)	MIL-L-6086 Grade M	Trojan Gear Oil No. 6086 M. Cities Service Oil Co. 60 Wall Tower, New York 5, N.Y. Aeroshell Fluid 5 M, Shell Oil Co., 50 West 50th Street, New York, N.Y. 10020 L-1195, Sinclair Refining Co., 600 Fifth Avenue, New York, N.Y.

CHART 202 (Cont'd)
CONSUMABLE MATERIALS

ITEM	MATERIAL	SPECIFICATIONS	VENDOR PRODUCTS
8.	Lubricating Grease	MIL-G-7711 (Superseded by MIL-G-81322, see Item 9)	
9.	Lubricating Grease NOTE MIL-G-81322 is not compatible with Aeroshell No. 5 and contains chemicals harmful to painted surfaces.	MIL-G-81322	Mobilgrease 28 Mobil Oil Corporation Shoreham Building Washington, D.C. 20005 Aeroshell Grease 22 Shell Oil Co., 50 West 50th Street, New York, N.Y. 10020
10.	Lubricating Grease (Gear)	Mobile Compound G.G.	
11.	Lubricating Grease (Aircraft and Instruments, Low and High Temperature) NOTE Precautions should be taken when using MIL-G-23827 and MIL-G-81322, since these greases contain chemicals harmful to painted surfaces.	MIL-G-23827	Supermil Grease No. A72832, American Oil Co., 910 South Michigan Avenue Chicago, Ill. 60680 Royco 27A, Royal Lubricants Co., River Road, P.O. Box 95, Hanover, N.J. 07936 Shell 6249 Grease, Shell Oil Co., 50 West 50th Street, New York 20, 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 91502 Moly-Paul No. 4, K.S. Paul Products Ltd. Nobel Road, London, England

CHART 202 (Cont'd)
CONSUMABLE MATERIALS

ITEM	*MATERIAL*	*SPECIFICATION*	*VENDOR PRODUCTS*
13.	Hydraulic Fluid	MIL-H-5606	Brayco 756D, Bray Oil Co. 3344 Medford Street Los Angeles 63, California PED 3656, Standard Oil Co. of California, 225 Bush Street, San Francisco 20, California
14.	Oyxgen-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	
18.	Oil (Air Conditioner Compressor) 500 Viscosity		Suniso No. 5, Virginia Chemical and Smelting Co. West Norfolk, Virginia Texaco Capella E, Texaco Inc., 135 East 42nd Street, New York, N.Y. 10017
19.	Aviator's Breathing Oxygen	MIL-O-27210	
20.	Naphtha	TT-N-95	
21.	Methyl Ethyl Ketone	MIL-M-13999	
22.	Toluol (Toluene)	TT-T-548	
23.	Paint Remover		Turco No. 4260, Turco Products Inc., Los Angeles, California
24.	Epoxy Primer		Ameron Industrial Coatings Division, P.O. Box 2153, Wichita, Kansas
25.	Wash Primer	EX2016G	Ameron Industrial Coatings Division, P.O. Box 2153, Wichita, Kansas

CHART 202 (Cont'd)
CONSUMABLE MATERIALS

ITEM	MATERIAL	SPECIFICATIONS	VENDOR PRODUCTS
26.	Zinc Chromate Primer	MIL-P-8585	
27.	Rubber Hose	MIL-H-5593	
28.	Oil, Engine Preservative	MIL-H-5593	
29.	Graphite, Lubricating NOTE Lubricating Graphite Superseded by Item 12	SS-G-659 (Supersedes MIL-G-6711)	
30.	Lubricating Grease	Enco Andok-B	Humble Oil Co. Houston, Texas
31.	Solvent		CRC-2-26, Corrosion Reaction Consultants Limeklim Pike Dresher, Pa.
32.	Laminated Glass Cloth	MIL-F-9084	Trevano, Coast Manufacturing and Supply Inc., Box 71 Livermore, California Uniglass, United Merchants and Manufacturing Inc. 1407 Broadway, New York, New York 10018
33.	Resin	MIL-R-7575	Laminac 4116, American Cyanamid Co., Wallingford, Connecticut Glidpol 1001, The Glidden Company, 925 Euclid Ave. Cleveland, Ohio 44114
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 P.O. Box 8151 Wichita, Kansas 67208 Ameron Industrial Coating Division, P.O. Box 2153, Wichita, Kansas

CHART 202 (Cont'd)
CONSUMABLE MATERIALS

ITEM	MATERIAL	SPECIFICATIONS	VENDOR PRODUCTS
36.	Thread Locking Compound	Loctite Sealant, Grade A	Loctite Corp. 705 N. Mountain Road Newington, Conn. 06111
37.	Penetrating Oil	Mouse Milk	Worldwide Aircraft Filters Corp., 1685 Abram Ct. San Leandro, Calif. 94577
		Kano Kroil	Kano Labratories Inc. Nashville, Tennessee
38.	Lubricating Grease	MIL-G-3545	Aeroshell Grease 5 Shell Oil Co., 50 West 50th Street, New York, N.Y.
39.	Cement	EC2262	Minnesota Mining and Manufacturing Company St. Paul, Minnesota
40.	Primer	Locquic "N"	Loctite Corp. 705 N. Mountain Road Newington, Conn. 06111
41.	Cleaner	Turco Metal-glo No. 3	Turco Products Inc. 24600 S. Main Los Anglels, California 90746
42.	Paint Stripper	Turco 4260	Turco Products Inc. 26400 S. Main Los Angeles, California 90746
43.	Corrosion Preventive Compound	MIL-C-16173 Grade 2	Braycote 137, Bray Oil Co. 1925 N. Marianna Ave. Los Angeles, California 90032
			Petrotech 1-4 Pamreco, P.O. Box 671, Butler, Pa. 16001
44.	Lubricating Grease	MIL-G-7118	
45.	Primer, Degreasing	EC3911	Minnesota Mining and Manufacturing Co., St. Paul, Minnesota

ITEM	MATERIAL	SPECIFICATIONS	VENDOR PRODUCTS
46.	Lubricating Silicone	G-322L	General Electric Waterford, New York 12188
47.	Anti-Seize Compound	Locatite 76764 Paste Form 1 lb. Brush Top Can	Loctite Corp. 705 N. Mountain Road Newington, Conn. 06111
48.	Coating	Alodine 1200, 1200S or 1201	Amchem Products Inc. Spring Garden Street Ambler, Pennsylvania

CHART 203
SERVICING

ITEM	*LOCATION*	*SERVICE WITH*	*INTERVAL*
CHECK			
Engine Oil Level	Access door on upper cowling (2)	MIL-L-22851	Preflight
Battery Electrolyte	Access plate on LH rear nacelle (1)	See Chapter 24 for detailed instructions	Every 100 hrs.
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 location and special instructions.	Refrigerant No. 12	As Required
Propeller Air Dome	Access cap on propeller spinner (2)	Dry air or nitrogen	Every 100 hrs.
Propeller Accumulator	Lower rear of engine (2)	Dry air or nitrogen	Every 100 hrs.
Differential Control Valve and Safety Valve (P-4 thru P-307)	Aft pressure bulkhead	Refer to Chapter 21-30-00	Every 100 hrs. or Annually
Outflow and Safety Valve (P-308 and After)	Aft pressure bulkhead	Refer to Chapter 21-30-00	Perform Functional Test Every 500 Hours
CHANGE			
Engine Oil	Access plate on lower nacelle (2)	MIL-L-22851	Every 75 - 100 hrs.
Engine Oil Filter	RH side of engine (2)		Every 50 hrs.
CLEAN			
Air Pump Intake Filter	Forward side of aft engine baffle (2) (P-3 through P-246)	Wash with soap and water, rinse and dry	Every 100 hrs.
Induction Air Filter	RH rear side of engine (2)	Clean per instructions on filter	Every 50 hrs.
Servo Fuel Filter	Fuel injection (2)	Clean with solvent and blow dry with air pressure.	Every 100 hrs.
Manual Cabin Altitude Control Filter (P-3 thru P-307)	RH subpanel (1)	Clean with solvent and blow dry with air pressure.	Every 100 hrs.
Cabin Pressurization Controller Filter and Orifice (P-308 and after)	RH Subpanel (1)	Remove filter, disassemble, clean with solvent and air dry. Ensure orifice is open, reassemble and reinstall.	Every 500 hrs.

CHART 203 (Cont'd)
SERVICING

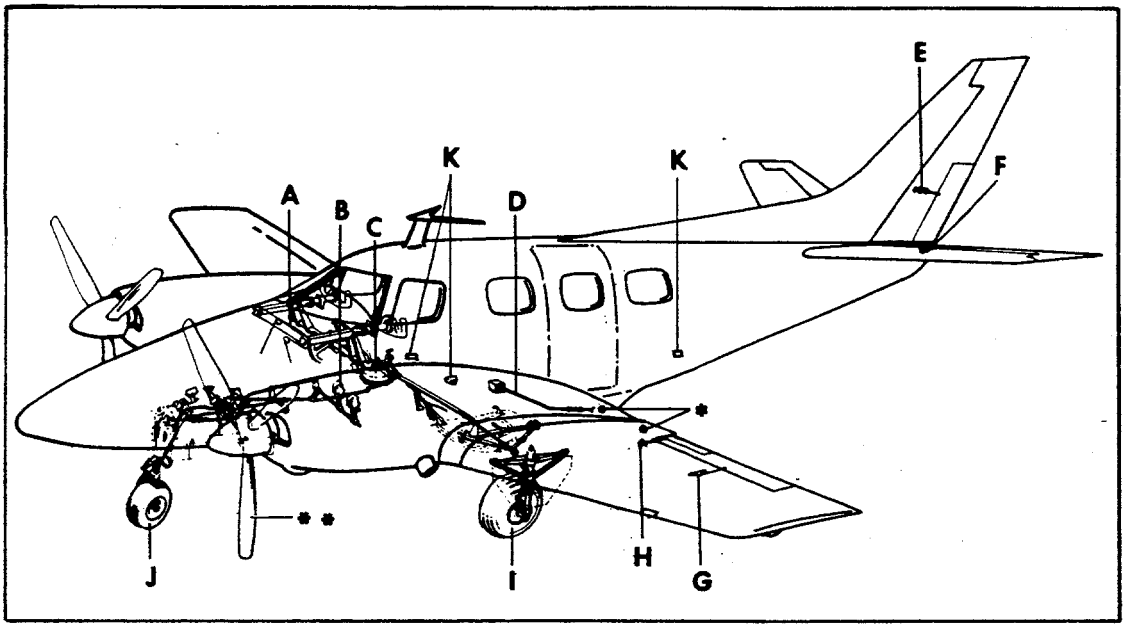
ITEM	*LOCATION*	*SERVICE WITH*	*INTERVAL*
CLEAN (Cont'd)			
Cabin Pressurization Safety Valve Filter and Orifice (P-308 and after)	Aft Pressure Bulkhead (1)	Remove filter, disassemble, clean with solvent and air dry. Ensure orifice is open, reassemble and reinstall.	Every 1000 hrs.
Static Air Button	Aft fuselage skin (4)	Clean with solvent and wipe dry with clean rag.	Every 100 hrs.
Engine Oil Screen	Engine oil sump (2)	Clean with solvent and blow dry with air pressure.	At Oil Change.
Heater Fuel-Supply Strainer	LH wing stub (1)	Clean with solvent and blow dry with air pressure.	Every 100 hrs. of heater operation.
Heater Fuel Pump Filter	LH wing stub (1)	Clean with solvent and blow dry with air pressure.	Every 100 hrs. of heater operation.
Heater Inline Fuel Filter	Nose Wheel Well (1)	Clean with solvent and blow dry with air pressure.	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
Heater Fuel Drain	Aft bulkhead of nose wheel well		Preflight
Static Drain	On upholstery panel below copilot's subpanel (1)		Every 100 hrs.
REPLACE			
Pressure System Inline Air Filter	RH rear side of nacelle (2) (P-3 through P-159, except P-158)		Every 150 hrs.
Pressure System Inline Air Filter	RH rear side of nacelle (2) (P-158, P-160 and after)		Every 300 hrs.
Air Pump Intake Filter	Forward side of aft engine baffle (P-247 and after)		Every 300-500 hrs.
Induction Air Filter	RH rear side of each engine (2)		Every 500 hrs.
Motorized Cabin Altitude Controller Filter	Mounted on controller behind RH subpanel		Every 1000 hrs.
Electric Trim Tab Actuator Motor Brushes	Aft fuselage		Every 1000 hrs.

CHART 203 (Cont'd)
SERVICING

ITEM	LOCATION	SERVICE WITH	INTERVA
REPLACE (Cont'd)			
Emergency Locator Transmitter (ELT) Battery	Aft fuselage		One half of battery service life or when in use for one cumulative hour, or after inadvertant activation of unknown duration.
SERVICE			
Brake Fluid Reservoir	Forward baggage compartment (1)	MIL-H-5606 hydraulic fluid	As Required
Oxygen Cylinder	Forward baggage compartment (1)	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 compressed air.	Every 100 hrs.

( ) Indicates number of points to be serviced.

CHART 204
LUBRICATION SCHEDULE



NOTE

Apply MIL-G-81322 lubricating grease at all points of friction in the cabin door except where Oilite bearings are installed. The time interval for lubrication is as required.

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

* Flaps track rollers (pre-lubed sealed bearings). Pressure lubricate at 1000 hours inspection using MIL-G-23827 lubricating grease.

** MIL-G-23827 grease is recommended for use in lubricating the blade bearings in the Hartzell Propeller. This grease will insure 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 hours inspection. (6)

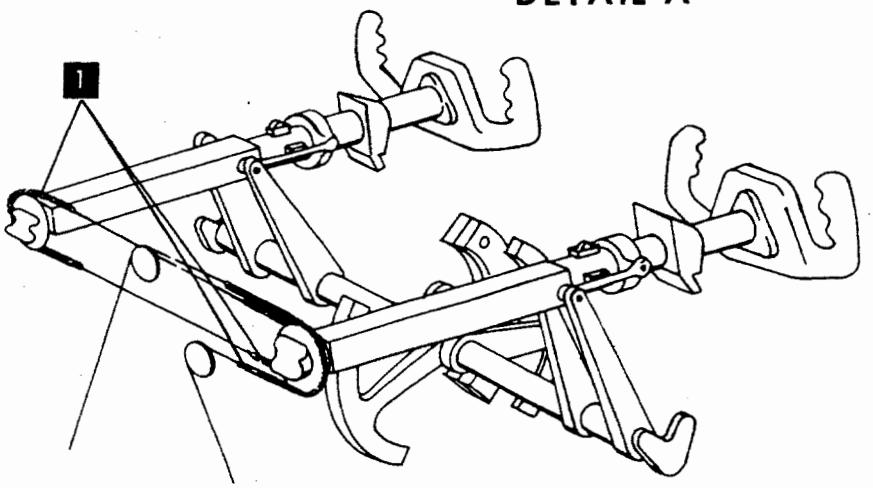
( ) Indicates the number of points to be lubricated.

A60-604-7B

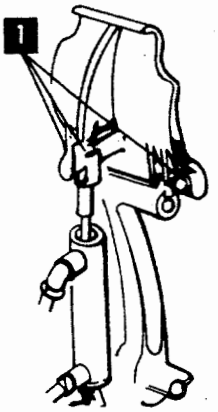
CHART 204 (Cont'd)
LUBRICATION SCHEDULE

INDEX	LOCATION	LUBRICANT	INTERVAL
	CONTROL COLUMN	DETAIL A	
1	Control column chain (3)	SAE-20	100 hrs.

DETAIL A



DETAIL B



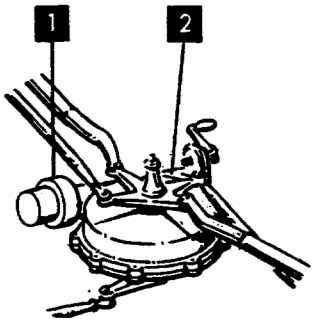
INDEX	LOCATION	LUBRICANT	INTERVAL
	RUDDER PEDALS	DETAIL B	
1	Pedals linkage (6)	SAE-20	100 hrs.

A60-604-8A

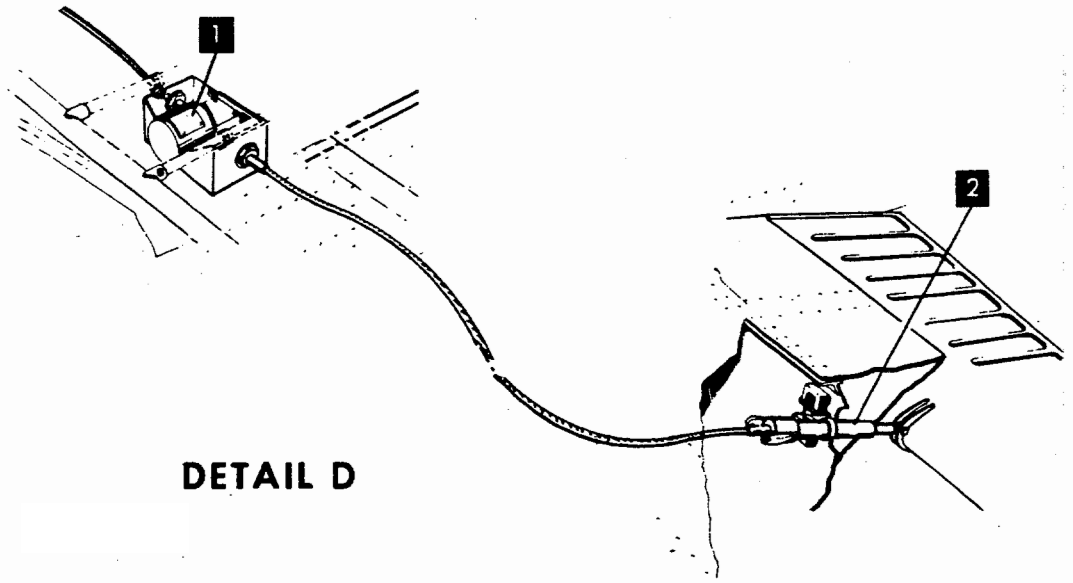
CHART 204 (Cont'd)
LUBRICATION SCHEDULE

INDEX		LOCATION	LUBRICANT	INTERVAL
		LANDING GEAR ACTUATOR	DETAIL C	
1		Landing gear motor gear box (1)	MIL-G-81322	300 hrs.
2	†	Landing gear actuator gear box (1)	Mobile Compound GG	300 hrs.

DETAIL C



† When properly filled, the oil level on a dip stick inserted through the filler hole will be approximately ¼ inch.



DETAIL D

INDEX	LOCATION	LUBRICANT	INTERVAL
	FLAP ACTUATOR	DETAIL D	
1	Flap motor gear box (1)	MIL-G-23827	300 hrs.
2	Flap actuator (2)	MIL-L-6086 Grade M	1000 hrs.

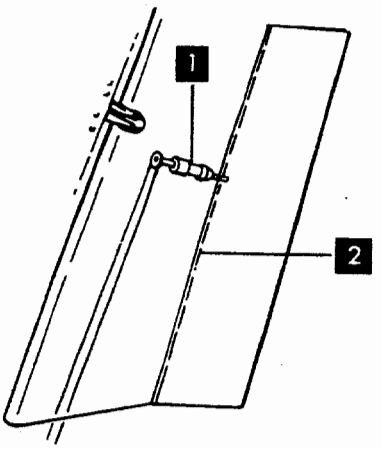
A60-604-98

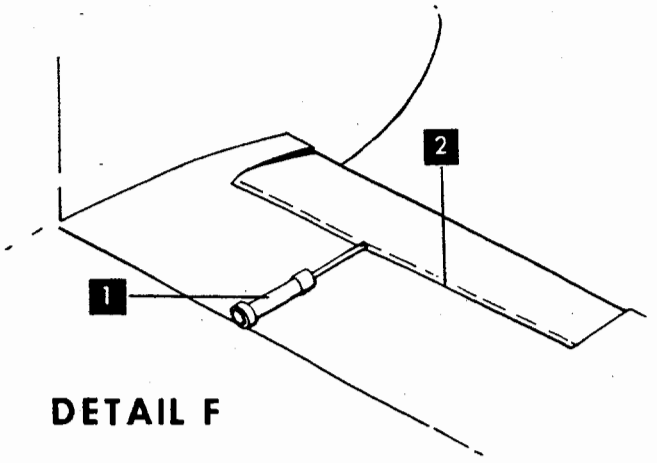
CHART 204 (Cont'd)
LUBRICATION SCHEDULE

INDEX	LOCATION	LUBRICANT	INTERVAL
	RUDDER TRIM	DETAIL E	
1	Rudder trim tab actuator (1)	MIL-G-23827	AR
2	†Rudder trim tab hinge (1)	MIL-M-7866	100 hrs.

† Mix MIL-M-7866 with naptha and apply with a brush

DETAIL E





DETAIL F

INDEX	LOCATION	LUBRICANT	INTERVAL
	ELEVATOR TRIM	DETAIL F	
1	Elevator trim tab actuator (1)	MIL-G-23827	AR
2	†Elevator trim tab hinge (1)	MIL-M-7866	100 hrs.

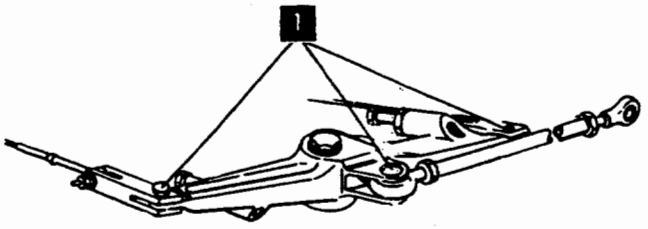
†Mix MIL-M-7866 with Naphtha and apply with a brush.

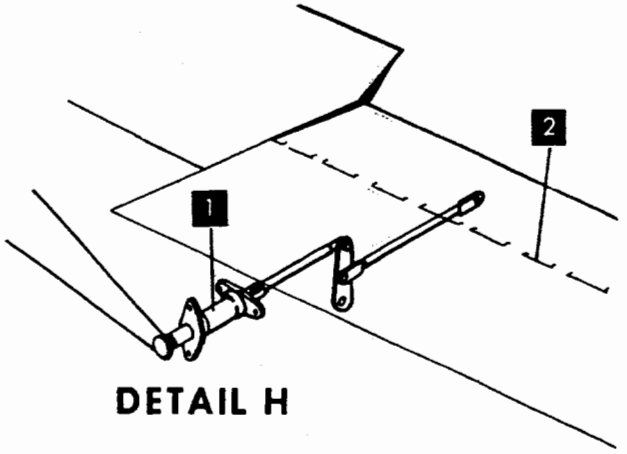
A60-604-108

CHART 204 (Cont'd)
LUBRICATION SCHEDULE

INDEX	LOCATION	LUBRICANT	INTERVAL
	AILERON BELL CRANK	DETAIL G	
1	Aileron bell crank (6)	SAE10W-30	100 hrs.

DETAIL G





DETAIL H

INDEX	LOCATION	LUBRICANT	INTERVAL
	AILERON TRIM TAB	DETAIL H	
1	Aileron trim tab actuator (1)	MIL-G-23827	AR
2	†Aileron trim tab hinge (1)	MIL-M-7866	100 hrs.

†Mix MIL-M-7866 with naphtha and apply with a brush

A60-604-11B

CHART 204 (Cont'd)
LUBRICATION SCHEDULE

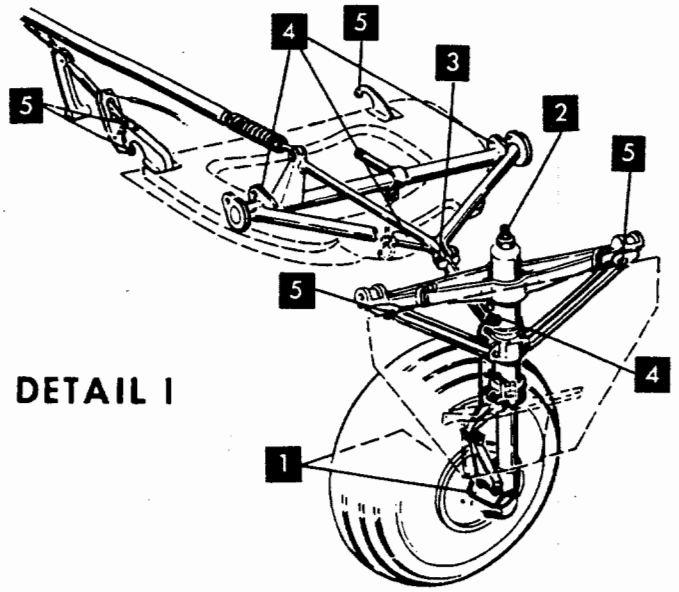
INDEX	LOCATION	LUBRICATION	INTERVAL
	MAIN LANDING GEAR	DETAIL I	
1	Main wheel bearings (4)	MIL-G-3545	100 hrs.
2	Main shock struts (2)	MIL-H-5606	100 hrs.
3	Uplock rollers (2)	*SAE10W-30	50 hrs.
		HAND PACK WITH MIL-G-23827	100 hrs.
		**MIL-G-23827	100 hrs.

*P-3 THRU P-154, P-156 THRU P-162, P-167 THRU P-171 AND P-182, PRIOR TO COMPLIANCE WITH S.I. 0482-211.

**P-155, P-163 THRU P-166, P-172 THRU P-181, P-183 AND AFTER, AND PREVIOUS AIRPLANE SERIALS IN COMPLIANCE WITH S.I. 0482-211.

NOTE

Refer to Chapter 32 of the Maintenance Manual for instructions on periodic lubrication of uplock rollers.



DETAIL I

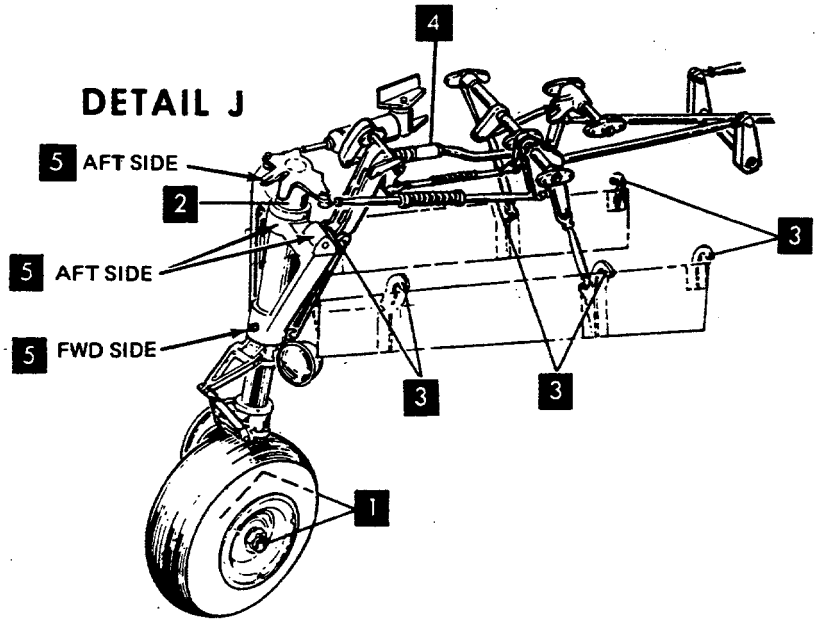
INDEX	LOCATION	LUBRICANT	INTERVAL
4	Main retract fittings (8)	MIL-G-81322	100 hrs.
5	Main gear door hinges (10)	SAE10W-30	100 hrs.

A60-604-15

CHART 204 (Cont'd)
LUBRICATION SCHEDULE

INDEX	LOCATION	LUBRICANT	INTERVAL
	NOSE LANDING GEAR	DETAIL J	
1	Nose wheel bearings (2)	MIL-G-3545	100 hrs.
2	Nose shock strut (1)	MIL-H-5606	100 hrs.
3	Nose gear door hinges (6)	SAE10W-30	100 hrs.
4	Nose gear forward retract rod (1)	MIL-G-7118	600 hrs.
*5	Nose gear brace bushings (4)	MIL-G-81322	100 hrs.

*P-297 and after

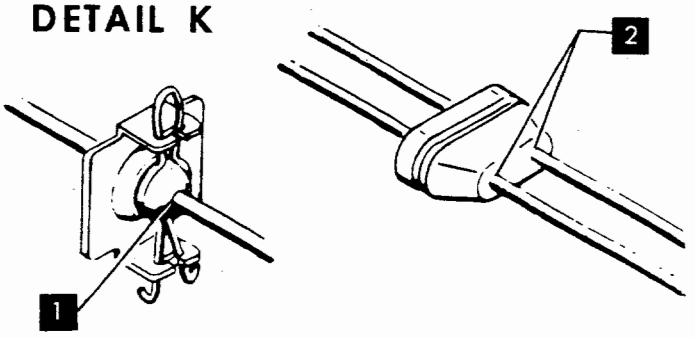


A60-604-138

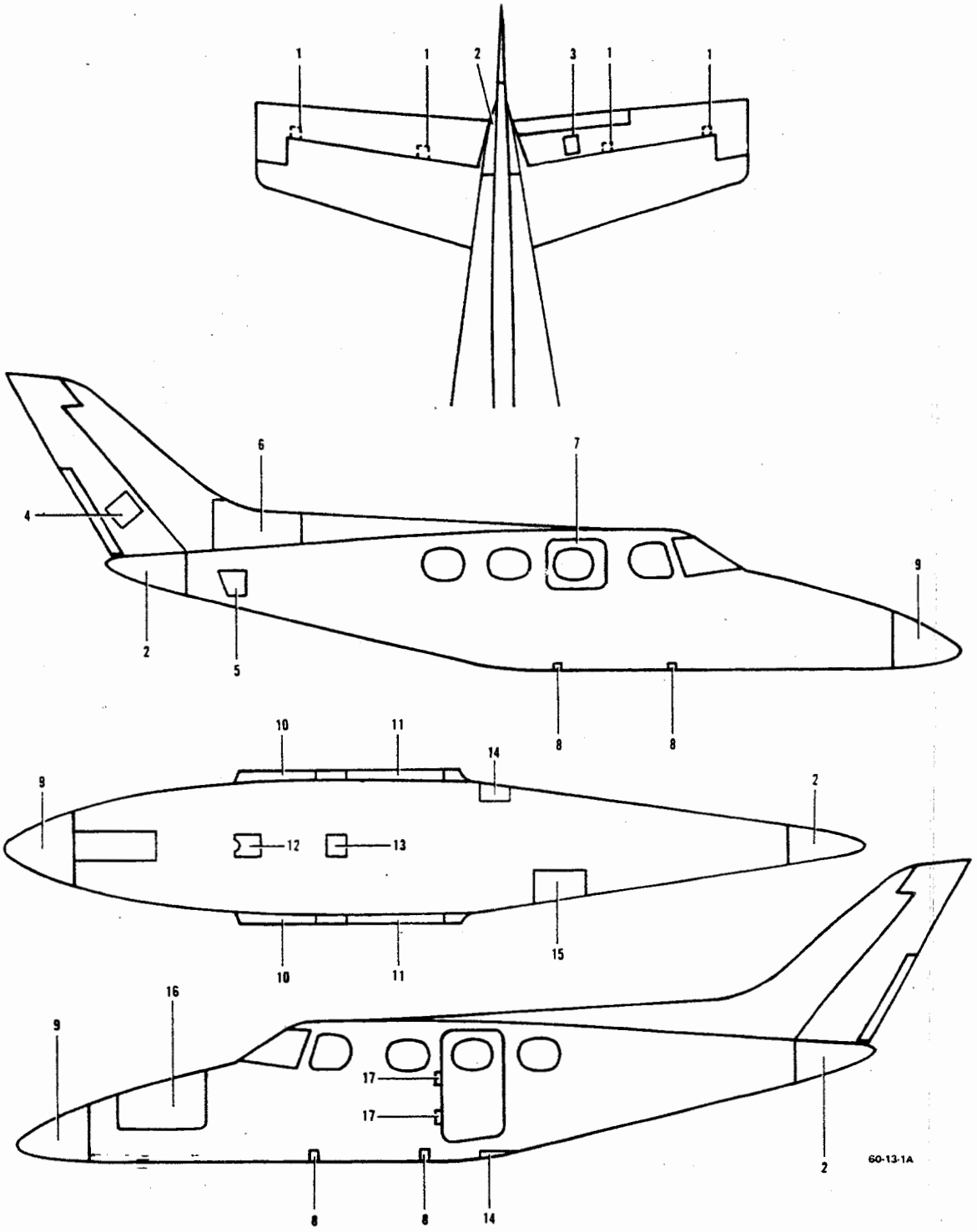
CHART 204 (Cont'd)
LUBRICATION SCHEDULE

INDEX	LOCATION	LUBRICANT	INTERVAL
	CABLE PRESSURE SEALS	DETAIL K	
1	Control cable pressure seals (8)	MIL-G-23827	1000 hrs.
2	Trim tab cable pressure seals (3)	MIL-G-23827	1000 hrs.

DETAIL K



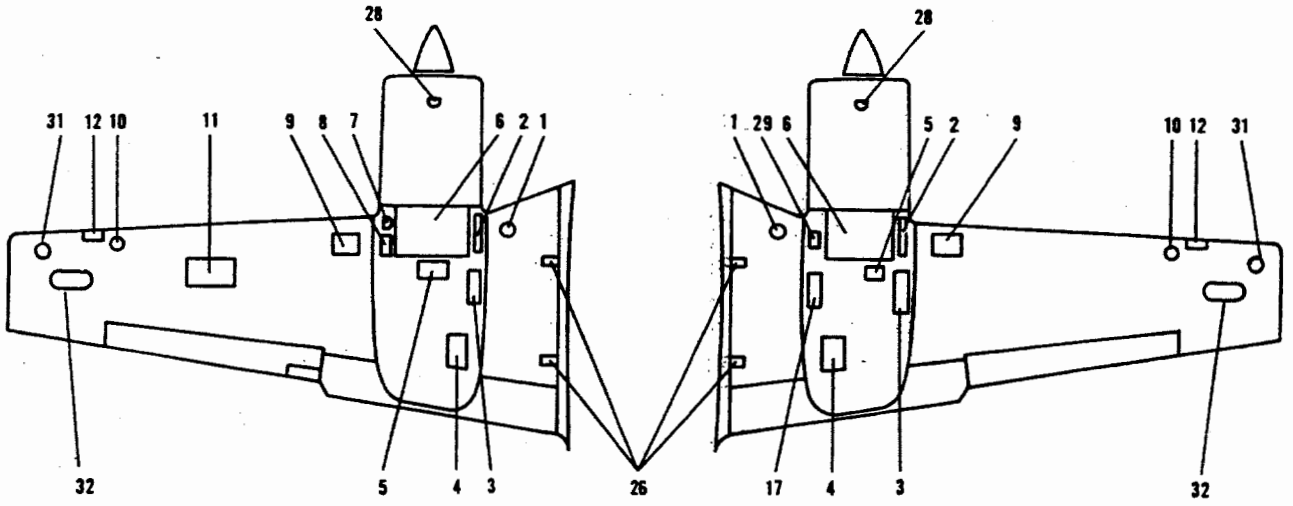
A60-604-14A



Fuselage Access Openings (Sheet 1 of 2)
Figure 203

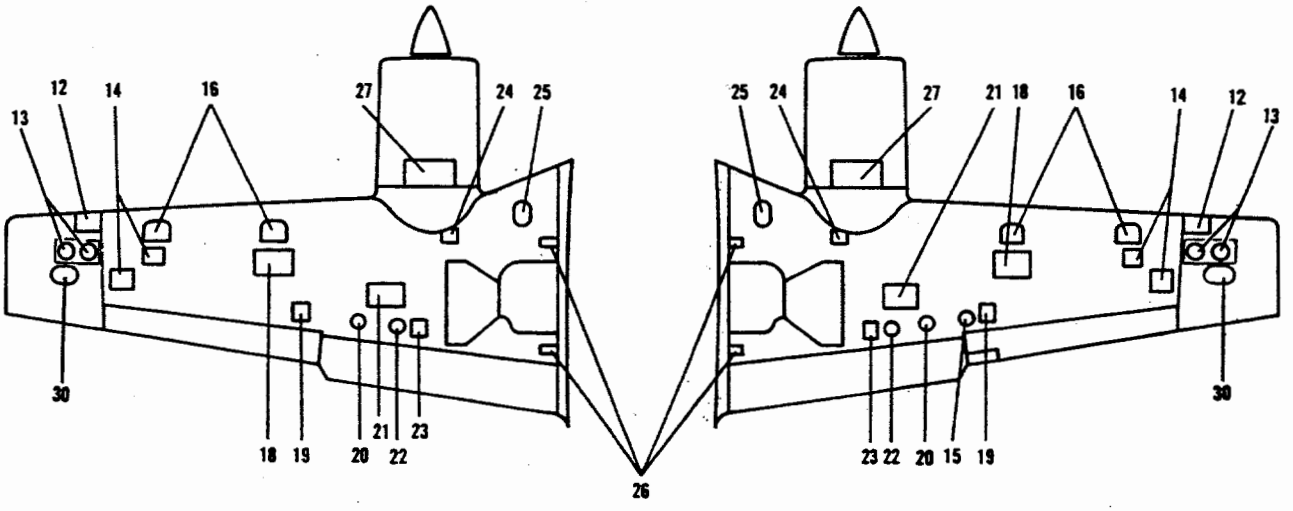
1. Elevator Hinges
2. Tail Cone
3. Elevator Trim Tab Actuator
4. Rudder Trim Tab Actuator
5. Deicer Dump Valve, Elevator Bell Crank, Rudder Bell Crank and Control Cables
6. Vertical Stabilizer Deicer Hose
7. Emergency Exit
8. Wing Bolts
9. Nose Cone
10. Intercooler
11. Uplock Cable, Retract Rods, Retract Rod Pressure Seals and Wing Stub Fuel Fittings
12. Lower Pedestal
13. Landing Gear, Gearbox and Actuator
14. Assist Step Mechanism
15. Autopilot Aileron, Rudder and Elevator Servos, Magnetic Navigation Sensing Element (B-5P Autopilot) and Autopilot Computer (H-14 Autopilot)
16. Oxygen Filler and Bottle, Heater, Ram Air Plenum, Brake Fluid Reservoir, Avionics Equipment and Baggage Compartment
17. Cabin Door Hinges

Fuselage Access Openings (Sheet 2 of 2)
Figure 203



LEFT WING (UPPER)

RIGHT WING (UPPER)



RIGHT WING (LOWER)

LEFT WING (LOWER)

60-12-1A

Wing Access Openings
Figure 204 (Sheet 1 of 2)

1. Leading Edge Fuel Cell Transmitter
2. Alternate Air and Fuel Pressure Solenoid
3. Nacelle Fuel Cell Transmitter and Plumbing
4. Nacelle Fuel Cell and Vent Line Plumbing
5. Fuel Vent Check Valve and Plumbing
6. Battery, Battery Relays, Voltage Regulators, Overvoltage Relays, Starter Relays, Paralleling Rheostat, Fuel Flow Inverter, Loadmeter Shunt, Fuse Block, Radio Inverter, Radio Inverter Circuit Breaker and Relay, External Power Diode and Current Limiter for Battery
7. External Power Receptacle
8. Reverse Current Diode, External Power and LH Control Relay
9. Leading Edge Fuel Cell Transmitter and Fuel Cell Installation
10. Fuel Filler
11. Remote Compass

** 12. Landing Light

* 13. Wing Tip Wiring and Fuel Vent Float Valve

14. Fuel Siphon Valve
15. Aileron Tab Actuator
16. Leading Edge Fuel Cell
17. Nacelle Fuel Cell Plumbing
18. Box Section Fuel Cell
19. Aileron Actuator and Pulley
20. Aileron Cable, Fuel Vent and Battery Vent
21. Box Section Fuel Cell
22. Fuel Vent Line and Aileron Tab Cable
23. Fuel Vent Line
24. Landing Gear Attach Bolt
25. Fuel Boost Pump
26. Wing Attach Bolt
27. Cowl Flap
28. Oil Level Indicator
29. Reverse Current Diode

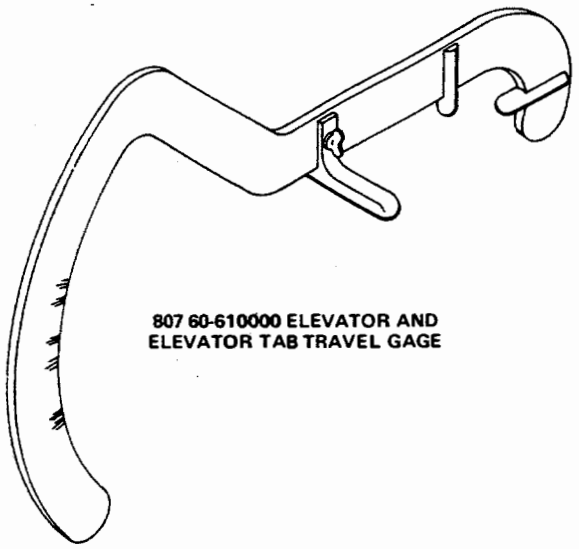
** 30. Remote Compass Detector

† 31. Fuel Filler

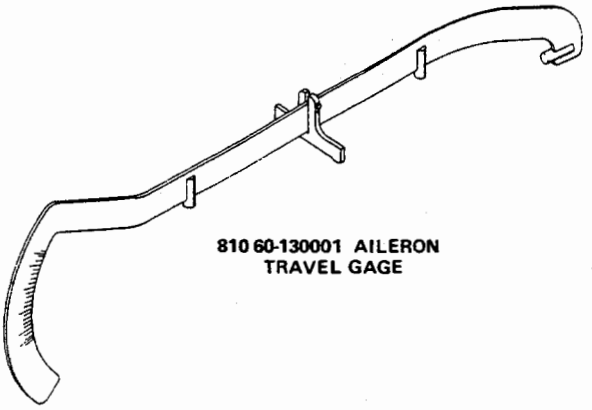
† 32. Wing Tip Access Openings

One rectangular opening on P-223 through P-347, P-349 through P-364
P-223 through P-347, P-349 through P-364
Optional P-348, P-365 and after

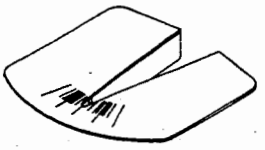
Wing Acess Openings (Sheet 2 of 2)
Figure 204



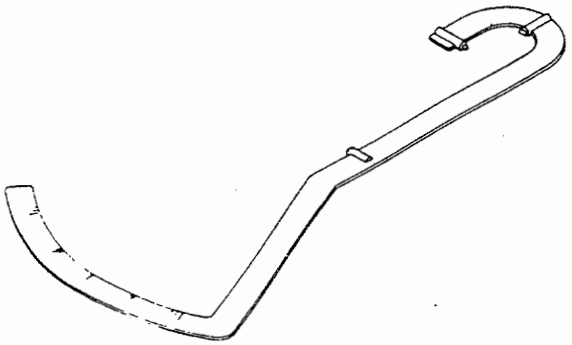
807 60-610000 ELEVATOR AND
ELEVATOR TAB TRAVEL GAGE



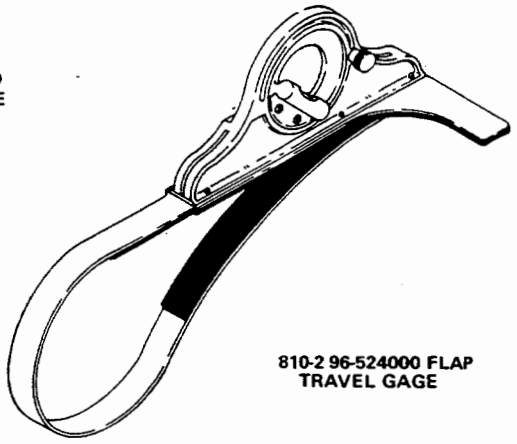
810 60-130001 AILERON
TRAVEL GAGE



810-1 60-130001 AILERON TAB
TRAVEL GAGE



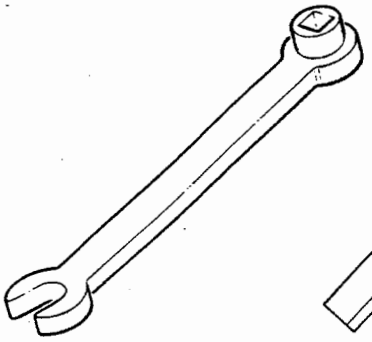
807 60-630001 RUDDER AND
RUDDER TAB TRAVEL GAGE



810-2 96-524000 FLAP
TRAVEL GAGE

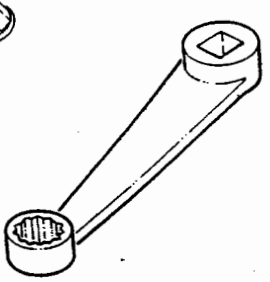
60-17-4

Special Tools (Sheet 1 of 3)
Figure 205



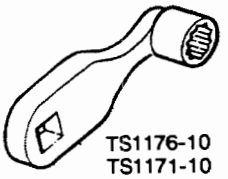
922 60-960000 PROPELLER TORQUE WRENCH ADAPTER

TS1222-4
TS1222-8



50-590014

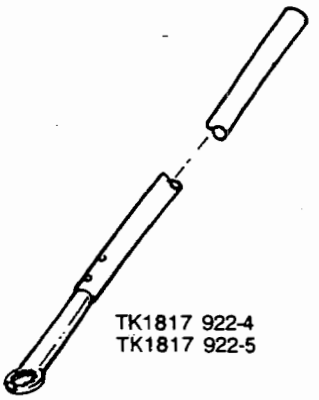
50-590013
TS1171-1
TS1176-1
TS1176-2
TS1171-2



TS1176-10
TS1171-10

WING BOLT WRENCHES

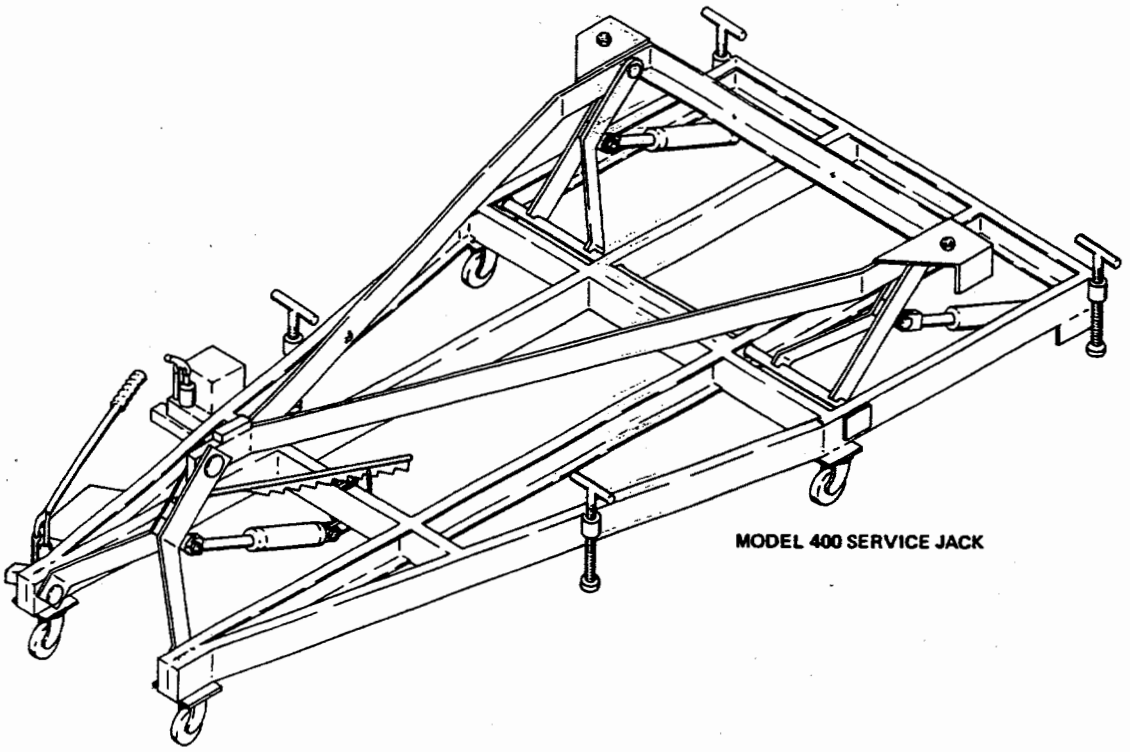
TK1817 922-4	UPPER FORWARD WING BOLT WRENCH.
TS1171-2 or TS1176-2	UPPER FORWARD WING NUT TORQUE WRENCH ADAPTER (for internal wrenching nut).
TS1171-10 or TS1176-10	UPPER FORWARD WING NUT TORQUE WRENCH ADAPTER (for external wrenching nut).
TK1817 922-5	LOWER FORWARD WING BOLT WRENCH.
50-590014	LOWER FORWARD WING NUT TORQUE WRENCH ADAPTER.
TS1222-4 or TS1222-8	UPPER AFT WING BOLT WRENCH.
TS1171-1 or TS1176-1 or 50-590013	UPPER AFT WING NUT TORQUE WRENCH ADAPTER.
TK1817 922-4	LOWER AFT WING BOLT WRENCH.
TS1171-2 or TS1176-2	LOWER AFT WING NUT TORQUE WRENCH ADAPTER (for internal wrenching nut).
TS1171-10 or TS1176-10	LOWER AFT WING NUT TORQUE WRENCH ADAPTER (for external wrenching nut).



TK1817 922-4
TK1817 922-5

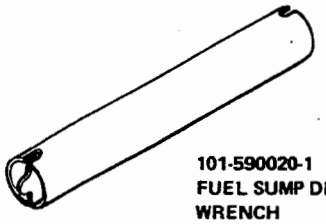
60-17-7

Special Tools (Sheet 2 of 3)
Figure 205



MODEL 400 SERVICE JACK

P/N 60-590013 (P-3 thru P-61)
P/N 60-590013-1 (P-62 and after)



101-590020-1
FUEL SUMP DRAIN
WRENCH

SERVICE JACK ADAPTER

60-17-8A

Special Tools (Sheet 3 of 3)
Figure 205

"END"

CHAPTER 20

LIST OF PAGE EFFECTIVITY

CHAPTER SECTION SUBJECT	PAGE	DATE
20-EFFECTIVITY	1	Nov 30/83
20-CONTENTS	1	May 12/78
20-00-00	201	Apr 18/80
	202	Nov 30/83
	203	May 12/78
	204	May 12/78
	205	May 12/78
	206	May 12/78
	207	May 12/78
	208	May 12/78

"END"

CHAPTER 20 - STANDARD PRACTICES - AIRFRAME

TABLE OF CONTENTS

SUBJECT	CHAPTER SECTION SUBJECT	PAGE
STANDARD PRACTICES	20-00-00	
Torque Wrenches		201
Airplane Finish Care		202
Cleaning and Waxing Airplane Finish		202
During Curing Period (90 days)		202
After Curing Period		202
Exterior and Interior Finishes		202
Exterior and Interior Primers		202
Enamel (Exterior Colors)		203
Urethane (Exterior Colors)		203
Lacquer (Interior Colors)		203
Enamel (Interior Colors)		204
Painting Magnesium		204
Enamel Paint		204
Urethane Paint		204
Special Paint Procedures		207

"END"

STANDARD PRACTICES - AIRFRAME

TORQUE WRENCHES

When a torque wrench and adapter is used, (Figure 201) 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:

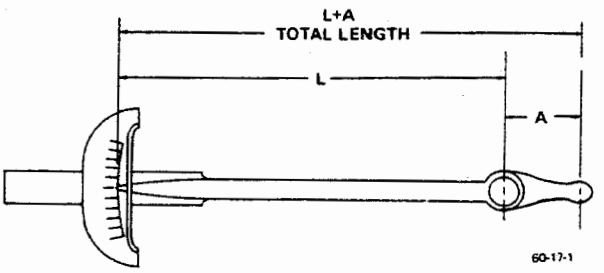
$$\frac{\text{Original wrench length} \times \text{specified torque}}{\text{length of wrench + adapter}} = \text{Desired reading}$$

Example:

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

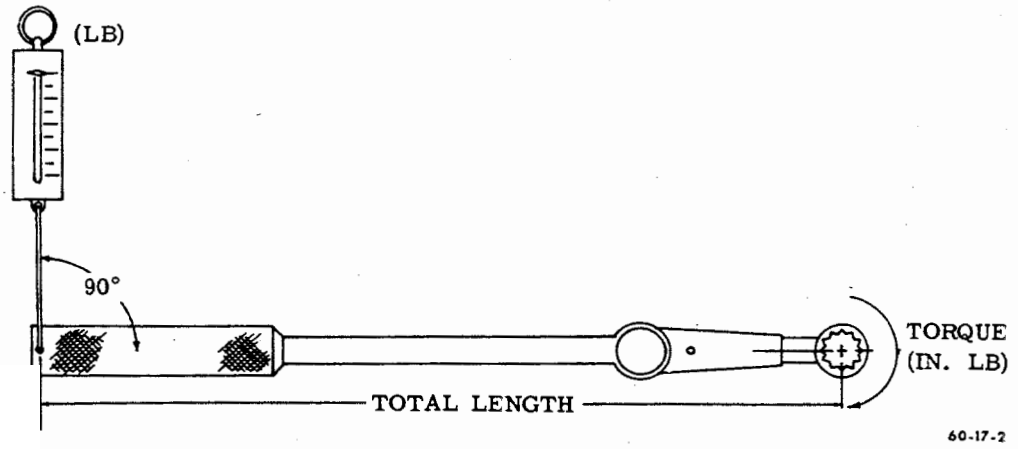
D	=	?
L	=	33 inches
A	=	11 inches
T	=	5,000 inch-pounds

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



Torque Wrench and Adapter
Figure 201

An acceptable method of checking the torque if a torque wrench is not available (Figure 202), 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.



Computing Torque with Spring Scale
Figure 202

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. Unless torque values are specified as wet (lubricated), 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 a typical example in finding a desired value.

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

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

AIRPLANE FINISH CARE

CLEANING AND WAXING THE AIRPLANE FINISH

NOTE

Urethane finishes are fully cured at time of delivery, may be cleaned with detergents and require no waxing.

Enamel finishes will maintain the original beauty for many years if a few timely suggestions are followed. To preserve this finish, the following care is recommended:

DURING CURING PERIOD (90 days)

a. The airplane should be cleaned with cold or lukewarm water and a mild nondetergent soap. Any rubbing of the painted surfaces should be done gently and held to a minimum to avoid cracking of the paint film. Rinse with cold water and dry with cloths or chamois.
b. Avoid use of waxes or polish. They seal the paint from the air and delay the curing process.
c. Do not rub or buff the finish.
d. Flights through rain, hail or sleet should be avoided.
e. Avoid fluids containing dyes, such as fuel and hydraulic oil, being accidentally spilled on the painted surfaces.

AFTER CURING PERIOD

a. Always wash the airplane with a mild soap a water. Rinse thoroughly.
b. Remove oil and grease with naphtha.
c. Wax with any good grade of automobile wax i shaded area. A heavier coating of wax on the leading ed will help to reduce abrasions in those areas. (Urethane p requires no waxing.)
d. Never use strong detergents to clean the airpla

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

NOTE

Any time an airplane is repainted or touched up, inspect all placards to ensure that they are not covered with paint, are legible and are securely attached.

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

EXTERIOR AND INTERIOR PRIMERS

Interior (Aluminum)	MIL-P-8585
Interior (Magnesium)	Enmar EX1479
Exterior (Aluminum)	Enmar EX2016G or MIL-P-8585
Exterior (Magnesium)	Enmar Epoxy Primer
Urethane Acid Etch Wash (Exterior Surface)	Enmar EX2016G Ba Enmar T6070 Catal
Urethane Intermediate Coat (Exterior Surface)	U.S. Paint 6165 Ba U.S. Paint AA-92-C- Catalyst

ENAMEL

(Exterior Colors)

Pacific Blue	118684-1
Morning Glory Blue	118684-3
Blueberry Blue	118684-5
Surf Green	118684-7
Shamrock Green	118684-9
Turquoise	118684-11
San Mateo Wheat	118684-13
Lemon Yellow	118684-15
Saturn Gold	118684-17
Castle Tan	118684-19
Beaver Brown	118684-21
Flamingo	118684-23
Huntsman Red	118684-25
Toreador Red	118684-27
Chianti Red	118684-29
Matterhorn White	118684-31
Black	118684-33
Champagne Gold	118684-39
Jubilee Gold	118684-221
Sable Brown	118684-223
Sunshine Yellow	118684-231
Capri Blue	118684-265
Omaha Orange	118684-273
Kingston Gray	118684-299
Peacock Turquoise	118684-333
Terrace Blue	118684-335
Sahara Tan	118684-337
Prairie Beige	118684-339
Antique Gold	118684-341
Beachwood	118684-345
Embassy Red	118684-347
Marlin Blue	118684-349
Bahama Blue	118684-351
Pavonne Blue	118684-353
Matador Red	118684-355
Sunburst Yellow	118684-357
Jade Mist Green	118684-359
Astro Blue	118684-361

URETHANE

(Exterior Colors)

Jubilee Gold	118684-302
Morning Glory Blue	118684-304
Blueberry Blue	118684-305
Surf Green	118684-306
Shamrock Green	118684-307
Turquoise	118684-308
Lemon Yellow	118684-310
Castle Tan	118684-312
Huntsman Red	118684-315
Toreador Red	118684-316
Chianti Red	118684-317
Matterhorn White	118684-318
Black	118684-319
Sable Brown	118684-320
Capri Blue	118684-322
Champagne Gold	118684-323
Omaha Orange	118684-324
Kingston Gray	118684-325
Marlin Blue	118684-393
Bahama Blue	118684-395
Pavonne Blue	118684-397
Matador Red	118684-399
Sunburst Yellow	118684-401
Jade Mist Green	118684-403
Astro Blue	118684-405
Peacock Turquoise	118684-407
Terrace Blue	118684-409
Sahara Tan	118684-411
Prairie Beige	118684-413
Antique Gold	118684-415
Beechwood	118684-419
Embassy Red	118684-421

LACQUER

(Interior Colors)

Alpine Blue	118684-63
Anchor Gray	118684-75
Dull Black	118684-133
Autumn Smoke	118684-155
Desert Beige	118684-181
Driftwood	118684-183
Artic Beige	118684-235
Sandusky (Gold)	118684-237
Frontier (Gold)	118684-239
Banff Blue	118684-241
Sable Brown	118684-257
Turquoise	118684-275
Mist Green	118684-277
Pumpkin	118684-279
Broadway Blue	118684-283
Sun Beige	118684-285
Torch Red	118684-329
Spanish Gold	118684-423
Canyon Blue	118684-427
Gulf Blue	118684-429
Maize Gold	118684-455
Silver Gray	118684-457
Green	118684-461
New Blue	118684-471
New Bronze	118684-475
Varsity Blue	119694-477

ENAMEL

(Interior Colors)

Insignia Red	94-509
Black	94-515
Instrument Black	Color No. 514 per ANA Bulletin No. 157

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 W., Wichita, Kansas 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 airplane.

b. Sand scratches and rough areas to improve smoothness.

c. Clean surface 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 ensure 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 priod. Primer mixed longer than eight hours must be discarded.

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

NOTE

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

c. Proceed to prime with a wet coat of MIL-P-8585 zinc chromate primer (26, Chart 207, 91-00-00) thinned one part primer and two parts toluol. A heavy hiding coat of this primer is not desired and will impair performance.

d. The exterior surfaces are now ready for color coat.

e. Spray on two thin topcoats of enamel.

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 then is absolutely necessary.

e. Wash the sanded area with a solvent, such as naphtha or toluol. 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 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.

Dukes 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 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 Enmar Paint Company, Wichita, Kansas) are used in equal parts as a pretreatment wash primer at the factory.

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

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

URETHANE PRIMER

a. Mix 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 no longer visible.

h. Spray on two topcoats.

PAINTING MAGNESIUM

PAINT REMOVAL FROM MAGNESIUM SURFACES

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

b. Apply paint stripper (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 Dow No. 19 to aid in the prevention of 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.

AIR CONDITIONER EVAPORATOR COMPARTMENT

Apply epoxy primer (24, Chart 207, 91-00-00) to the entire surface area of the parts which make up the compartment.

NOSE RADOME

Sanding surfacer or filler may be used to obtain a smooth surface. Sand with 180 sandpaper just enough to remove the glaze. After sanding, the radome contour shall be free of pits, holes or irregularities which may reduce radar transmissivity and range. If glass laminate fibers are exposed, a hot resin wipe should be applied to seal the laminate and followed with a light sanding with No. 400 sandpaper to remove the glaze. Do not repair with Devcon, body putty or any other plastics which have a different expansion coefficient than the original resin. Apply three thin cross-coats of white elastromeric polyurethane (product of Hughson Chemical Co. Erie, Penn.) consisting of CD 857-40A (two parts by volume) and CD 857-40B (one part by volume) to the forward 15 to 17 inches of the nose cone. The accelerator and base are available in the kit form (P/N CD857-40 1-1/2 pint) through the BEECHCRAFT Dealer Organization. Allow one hour drying time between coats and 48 hours drying time before application of urethane topcoat.

SURFACES SUSCEPTIBLE TO MUD AND SPRAY

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

1. Main and nose landing gear wheel wells.
2. Interior surface of landing gear doors.
3. 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 top coat 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.

LOWER WING AND FLAP SKINS

If inspection of the lower wing and flap area aft of the exhaust stacks disclose corrosion from fuel lead deposits, remove with a mild soap and water solution. Use a stainless steel wire brush to remove deeper, more resistive corrosion. If corrosion is so deep that 15% or more of the skin thickness is removed, the surface should be replaced. If skin thickness has been reduced by less than 15% (after the corrosion has been removed), the area should be treated with cleaner (41, Chart 207, 91-00-00) or an equivalent corrosion removing compound conforming to MIL-C-38334. The skin should be treated both externally and (where accessible) internally and given a protective coating as described below, then primed and painted. Inspection door nut plates should be removed prior to treating the skins with corrosion removing compound. If corroded, the nut plates should be replaced.

CAUTION

The corrosion removing compound should be applied in accordance with the manufacturers instructions and cautions.

In addition to the above noted treated skins, new flaps and new skin splices should be treated externally with a protective coating, as described below, primed and painted, and all accessible interior aluminum wing parts on the lower side of the wing, between wing stations 66.00 and 108.281 and aft of the second stringer aft of the front wing spar, should be given a protective coating, as described, and then primed with zinc chromate.

a. Mix Alodine 1200 or 1200S (a product of Amchem Products, Inc., Ambler, Pennsylvania) with water in a ratio of 3 to 4 ounces per gallon of water.

b. Place in a plastic container and allow to dissolve at least one hour.

c. Add 10 milliliters nitric acid per gallon of solution.

d. Prepare the surface by wiping with Stoddard Solvent or methyl ethyl ketone, then scrubbing with a nylon abrasive pad to remove oxide films. Rinse with water and

repeat the above procedure until water will not bead on the surface.

e. After cleaning, immediately treat the surface, using a cheesecloth pad, cellulose sponge, or nylon brush to apply the solution with light pressure and continuous, even motion. On curved or inclined surfaces, begin application at the lower edge of the work to minimize streaking. Keep the surface wet with the solution for 1 to 3 minutes so that a continuous film is obtained, with neither a grayish appearance nor a dark, powdery, non-adherent coating. Generally, a light coating, rather than a heavier coating is preferable for a paint base, especially for epoxy primers. Streaks from brushing, or rundown of excess solution are allowable, as are slight chromic acid stains.

f. Remove excess solution with cold running water or a cheesecloth pad wetted with clean water. Never use a high pressure hose rinse, since the freshly formed chemical film will be removed or damaged. All treated parts should be kept clean before priming and painting, which should follow the chemical film application as soon as practical.

"END"

CHAPTER 21

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CHAPTER 21 - AIR CONDITIONING

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GENERAL - DESCRIPTION AND OPERATION

PRESSURIZATION SYSTEM

Pressurized air for the cabin is taken downstream from the turbocharger compressor of each engine and reduced to a usable flow by a sonic nozzle (or venturi). When sonic velocity is reached by the air flowing through the throat of the nozzle, each engine is producing the maximum flow rate of 4 to 5 pounds per minute. Total air flow from both engines will deliver approximately 8 to 10 pounds per minute and maintain a cabin pressure differential of 4.6 psi.

The air then passes through a firewall shutoff valve, through an intercooler and into the cabin 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 leading edge of each wing root. Within the cabin pressure vessel a check valve is installed at each pressurization outlet. In the event of an engine failure at altitude the check valve will close on the dead engine side, preventing a loss of cabin pressurization.

Located on the forward side of the aft pressure bulkhead (P-3 through P-246) and on the aft side of the aft pressure bulkhead (P-247 and after) are two valves; the differential control valve and the safety/dump valve. A pressurization controller on the right subpanel pneumatically regulates the differential control valve to maintain the selected cabin altitude.

AIR CONDITIONING SYSTEM

The optional air conditioning system is a recirculating air cooling system containing a 16,000 BTU refrigerative type cooler. The unit is controlled by an automatic temperature control and three sensing elements.

A six position mode switch controls the heater and air conditioner system; however, each system operates independently of the other. When placed in AUTO position, the temperature is automatically controlled through the temperature controller located on the forward pressure bulkhead above the pilot pedals. It also regulates the cabin temperature variations monitored at the sensing units. The sensing units are located in the ram air inlet, heater outlet duct and forward of the two pressure control valves on the rear pressure bulkhead. When placed in the MANUAL COOL HI position, the switch bypasses the automatic controls and allows maximum air conditioning output. The maximum output is limited by an evaporator thermal switch and an overpressure switch. The MANUAL COOL LO position allows a hot-gas bypass valve (if installed) to be cycled on and off by a timer. The bypass valve regulates the flow of the refrigerant to the condenser allowing partial cooling of the cabin.

On serials P-123, P-127 and after, and prior airplanes which have complied with Service Instructions 0320-426 a MANUAL COOL position replaces the MANUAL COOL HI and LO positions on the mode selector switch. Two BLOWER positions are placed on the mode switch to allow the blower to be selected without cycling through the opposite mode.

The air scoop and ramp assembly located in the upper RH nacelle controls the air circulation through the condenser compartment and is completely automatic. The air scoop and ramp assembly has three positions; "closed" (when the air conditioning is not in use), "flight" (air scoop extended about 2 inches above the nacelle), and "ground" (air scoop fully extended). When the air conditioning is turned on, a switch incorporated on the landing gear selects air scoop position; gear down, the air scoop will open to the "ground" position; gear off the ground, the air scoop will open or lower to the "flight" position. The condenser fan, which is wired in circuit with the landing gear uplock switch, operates only when the air conditioning mode is selected and the airplane is on the ground.

The air conditioning system is similar to many home and automotive units and consists of six major components. The belt-driven compressor, which is coupled by 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 gas, condensing it to a liquid state. The liquid is then passed through the receiver-dryer where any moisture or foreign material is removed from the system. The refrigerant flows to the expansion valve where it is metered into the evaporator at a rate which allows all 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. For partial cooling, a hot gas bypass valve allows a portion of the gas to bleed off from the condenser, cycling back through the compressor.

NOTE

Beginning with airplane serials P-123, P-127 and after, and prior airplanes having installed Kit Number 60-5006, the hot gas bypass valve, line and suction accumulator were removed from the system.

An overpressure switch and a pressure relief valve are incorporated into the system to regulate system (compressor discharge) pressure. The overpressure switch is located in the condenser compartment of the right nacelle and is set to actuate at 375 ± 10 psi. When this switch is actuated, power is removed from the compressor magnetic clutch and the 3 amp fuse is shorted through a resistor to the airplane structure. The fuse is thus opened, preventing further operation of the compressor magnetic clutch and the compressor until the system has been serviced. A pressure relief valve, located on the compressor discharge line immediately before it enters the condenser, is set to bleed off pressure at 450 psi.

On airplane serials, P-275 and after, and on those prior airplanes which are in compliance with the Service Instructions 0599-427, a low pressure switch is installed on the evaporator. This switch is designed to actuate when the refrigerant pressure drops to 7 ± 1 psi. The actuation of the low pressure switch shorts the 3 ampere fuse to airplane structure through the resistor located near the evaporator. The fuse, located in the right nacelle, is thus opened, preventing further operation of the compressor magnetic clutch and the compressor until the air conditioner system has been serviced.

NOTE

The low pressure switch which was originally installed on airplane serials P-275 through P-292 and P-294, prior to compliance with Service Instructions 0599-427, actuated at a pressure of 18 ± 2 psi.

HEATER SYSTEM

The heater system consists of a 45,000 BTU combustion air heater, (located under the nose baggage compartment floor), a six position mode switch, vent air blower, combustion air blower, heater fuel pump, five outlets, an automatic temperature control and three sensing elements.

In flight, when pressurized, the vent blower obtains air through the cabin air check valve, forces it through the heater and to the cabin outlets. In the unpressurized mode, in flight and for ground operations, the vent blower obtains air from the cabin and the ram air plenum chamber and forces it through the heater and to the cabin outlets.

On serials P-3 through P-126, except P-123, a vent air distribution bypass valve, located on the forward pressure bulkhead, allows air to be directed into the pilot's compartment area and is regulated by a control knob on the pilot's left subpanel.

"END"

TROUBLESHOOTING
PRESSURIZATION SYSTEM
(P-3 THRU P-307)

TROUBLE	*PROBABLE CAUSE*	*REMARKS*
1. Unable to pressurize	a. Cabin altitude control inoperative.	a. Check by isolating control from system (see PRESSURIZATION TEST PROCEDURE in this chapter).
	b. Differential control valve inoperative.	b. Check by isolating control valve from system (see PRESSURIZATION TEST PROCEDURE in this chapter).
	c. Dump solenoid stuck in open position.	c. Cycle pressure circuit breaker, listen for operation of dump solenoid; replace if inoperative.
	d. Vacuum solenoid stuck in open position.	d. Cycle pressure circuit breaker, listen for operation of vacuum solenoid; replace if inoperative.
	e. Cabin altitude control sense line restricted.	e. Disconnect sense line at both ends and purge.
	f. Differential control valve seats dirty.	f. Clean the valve seats with a lint-free cloth moistened with alcohol. For additional information relating to overhaul and cleaning procedures refer to Component Maintenance Manual P/N 60-590001-27.
	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. Press-to-test switch inoperative.	a. Replace switch.
	b. Rate-of-climb indicator inoperative.	b. Replace indicator.
	c. Dump switch in dump position.	c. Place switch in pressure position.
	d. Manifold pressure too low during check.	d. Increase manifold pressure to a minimum of 20 in. Hg.

TROUBLESHOOTING
PRESSURIZATION SYSTEM (Cont'd)
(P-3 THRU P-307)

TROUBLE	PROBABLE CAUSE	REMARKS
3. Maximum cabin differential pressure exceeds 4.6 psi.	a. Differential control valve inoperative.	a. Clean valve as described in the Component Maintenance Manual, P/N 60-590001-27, or replace valve.
	b. Cabin altitude and differential pressure indicator inoperative.	b. Replace indicator.
	c. Ambient air sense line between safety and differential control valve leaking.	c. Inspect lines and fittings; tighten or replace as required.
4. Maximum cabin differential pressure exceeds 4.9 psi.	a. Safety valve and differential control valve inoperative.	a. Clean valve as described in the Component Maintenance Manual, P/N 60-590001-27, or replace valve.
	b. Ambient air sense line between safety and differential control valve ruptured, loose fittings.	b. Inspect lines and fittings; tighten or replace as required.
5. Cabin pressure slow to respond to change in selected cabin altitude.	a. Cabin altitude control sense line kinked or restricted.	a. Inspect and repair or replace as required.
	b. Cabin altitude control filter clogged.	b. Replace filter.
6. Cabin altitude higher than selected altitude.	a. Cabin altitude controller out of adjustment.	a. Adjust controller.
	b. Cabin altitude indicator inoperative.	b. Replace indicator.
	c. Cabin altitude control sense line kinked or restricted.	c. Inspect and repair or replace as required.
	d. Cabin altitude control inoperative.	d. Replace control.
	e. Cabin altitude control filter restricted.	e. Clean filter.
7. Cabin altitude lower than selected altitude (not exceeding maximum cabin differential pressure).	a. Cabin altitude controller out of adjustment.	a. Adjust controller.
	b. Cabin altitude control sense line leaks.	b. Inspect and repair or replace as required.

TROUBLESHOOTING
PRESSURIZATION SYSTEM (Cont'd)
(P-3 THRU P-307)

	TROUBLE	*PROBABLE CAUSE*	*REMARKS*
7.	Cabin altitude lower than selected altitude (Not exceeding maximum cabin differential pressure).	c. Cabin altitude indicator inoperative.	c. Replace indicator.
8.	Cabin pressure fluctuation.	a. Valve seats dirty.	a. Clean the valve seats with a lint-free cloth moistened with alcohol. For additional information relating to overhaul and cleaning procedures refer to Components Maintenance Manual P/N 60-590001-27.
9.	Cabin pressure fluctuates when deice system is cycled (with dump switch in either dump or pressure mode).	a. The check valve in the differential control valve vacuum line is installed backward.	a. Install check valve properly.
		b. Check valve is dirty.	b. Clean check valve.
10.	Cabin pressure fluctuates with dump switch in dump mode.	a. Vacuum solenoid inoperative	a. Replace vacuum solenoid.
		b. Dump solenoid inoperative.	b. Replace safety valve.
11.	Pressure circuit breaker tripped.	a. Dump solenoid shorted.	a. Locate cause, repair and reset circuit breaker.
		b. Vacuum solenoid shorted.	b. Locate cause, repair and reset circuit breaker.
		c. Press-to-test switch shorted.	c. Locate cause, repair and reset circuit breaker.
		d. Landing gear safety switch shorted.	d. Locate cause, repair and reset circuit breaker.
		e. Wire harness shorted.	e. Locate cause and repair.
		f. Wire harness improperly installed.	f. Inspect and rewire as required.
		g. Pressure circuit breaker inoperative.	g. Replace circuit breaker.
12.	Airplane pressurizes on ground.	a. Landing gear safety switch inoperative.	a. Replace switch.
		b. Open lead in wire bundle.	b. Locate and repair.

TROUBLESHOOTING
PRESSURIZATION SYSTEM (Cont'd)
(P-3 THRU P-307)

TROUBLE	PROBABLE CAUSE	REMARKS
12. Airplane pressurizes on ground.	c. Circuit breaker tripped.	c. See "11" above.
	d. Press-to-test switch inoperative.	d. Replace switch.

TROUBLESHOOTING
PRESSURIZATION SYSTEM
(P-308 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.

TROUBLESHOOTING
PRESSURIZATION SYSTEM (Cont'd)
(P-308 and after)

	TROUBLE	*PROBABLE CAUSE*	*REMARKS*
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 4.6 psi.	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.
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.

TROUBLESHOOTING
PRESSURIZATION SYSTEM (Cont'd)
(P-308 and after)

	TROUBLE	*PROBABLE CAUSE*	*REMARKS*
6.	Cabin altitude lower than selected altitude (not exceeding maximum differential pressure).	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.
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.

TROUBLESHOOTING
HEATER SYSTEM

TROUBLE	PROBABLE CAUSE	REMARKS
1. Heater fails to light.	a. Master switch or circuit breaker off.	a. Turn on master switch or close circuit breaker.
	b. Low voltage supply.	b. Apply external power supply. Attempt to start heater.
	c. Fuel cut off from tank.	c. Turn on manual shutoff valve (if used) or master solenoid.
	d. Suction leak ahead of pump.	d. Secure all fittings.
	e. Insufficient fuel pressure.	e. Low or no current to fuel pump. Check for operation of pump and remove for repairs if not operating.
	f. Regulator not operating properly.	f. Check for low pressure or replace regulator.
	g. Fuel pump operating but not building up sufficient pressure.	g. Remove and repair or replace fuel pump.
	h. Restriction in fuel nozzle orifice.	h. Remove the nozzle and clean or replace it.
	i. Fuel heater solenoid not operating.	i. Remove and check solenoid. Replace if faulty.
	j. Fuel lines clogged or broken.	j. Inspect all lines and connections. It may be necessary to disconnect lines at various points to determine where the restriction is located.
	k. Fuel filter clogged.	k. Clean fuel filter element.
	l. Ignition vibrator inoperative.	l. Replace vibrator; check for defective radio noise filter.
	m. Manual reset limit (overheat) switch open.	m. Press reset button firmly and recheck to determine reason for switch opening.
	n. Combustion air pressure switch open. (Defective switch or low combustion air blower output.)	n. Check for low blower output due to low voltage and correct it. If switch is defective, replace it.
	o. Cycling switch open.	o. Replace if defective.
	p. Duct switch open.	p. Operate control to see if switch will come on. Replace switch if defective.

TROUBLESHOOTING
HEATER SYSTEM (Cont'd)

TROUBLE	PROBABLE CAUSE	REMARKS
2. Ventilating air blower fails to run.	a. MASTER switch OFF. Broken or loose wiring to motor.	a. Energize the MASTER switch. Check and repair wiring.
	b. Circuit breaker open.	b. Close circuit breaker.
	c. Worn motor brushes.	c. Replace motor brushes.
	d. Blower wheel jammed.	d. Remove and check the ventilating 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 shut-off valve, solenoid valve, fuel filter, 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.

TROUBLESHOOTING
HEATER SYSTEM (Cont'd)

	TROUBLE	*PROBABLE CAUSE*	*REMARKS*
4.	Heater fires but burns unsteadily (Cont'd).	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.
		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. Attach external power.
6.	Heater fails to shut off.	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 MASTER switch.	c. Replace the MASTER switch.

AIR CONDITIONING SYSTEM

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.
		f. Hot gas bypass valve defective.	f. Replace.

TROUBLESHOOTING
AIR CONDITIONING SYSTEM (Cont'd)

TROUBLE	PROBABLE CAUSE	REMARKS
2. No cooling.	a. Loose connection.	a. Check connections, continuity.
	b. Blower not functioning.	b. Repair.
	c. Leak in system.	c. Leak-test and recharge.
	d. Compressor reed valves inoperative.	d. Repair or replace.
	e. Expansion valve stuck open.	e. Replace.
	f. Blown fuse.	f. Service air conditioning system. Check for over-pressure, purge and recharge if necessary. Leak-test and recharge if pressure is low.
3. Air conditioner will not operate in AUTO mode but will function in the MAN COOL mode.	a. Misadjustment of heater control box.	a. Replace.
	b. Malfunction of control box.	b. Replace.
	c. Malfunction of temperature sensing elements.	c. Replace.
4. Air conditioner runs constantly in either AUTO or MAN COOL.	a. Malfunction of temperature sensing elements.	a. Replace.
5. 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.
6. Noisy unit.	a. Compressor oil level low.	a. Add oil.
	b. Defective belt.	b. Replace.
	c. Low refrigerant level.	c. Add refrigerant.
	d. Excessive moisture in system.	d. Replace receiver-dryer and recharge.

TROUBLESHOOTING
AIR CONDITIONING SYSTEM (Cont'd)

	TROUBLE	*PROBABLE CAUSE*	*REMARKS*
6.	Noisy unit. (Cont'd)	e. Fan hitting shroud.	e. Align and tighten shroud.
		f. Defective compressor.	f. Replace.
7.	Hissing in evaporator case.	a. Low charge.	a. Add refrigerant.
8.	Chatter or knock in evaporator case.	a. Defective expansion valve.	a. Replace.
9.	Belt slipping.	a. Loose	a. Adjust.
		b. Overcharged.	b. Correct refrigerant level.
		c. Air in system.	c. Evacuate and recharge.
10.	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.
11.	Broken belt.	a. Check all causes above.	a. Replace.

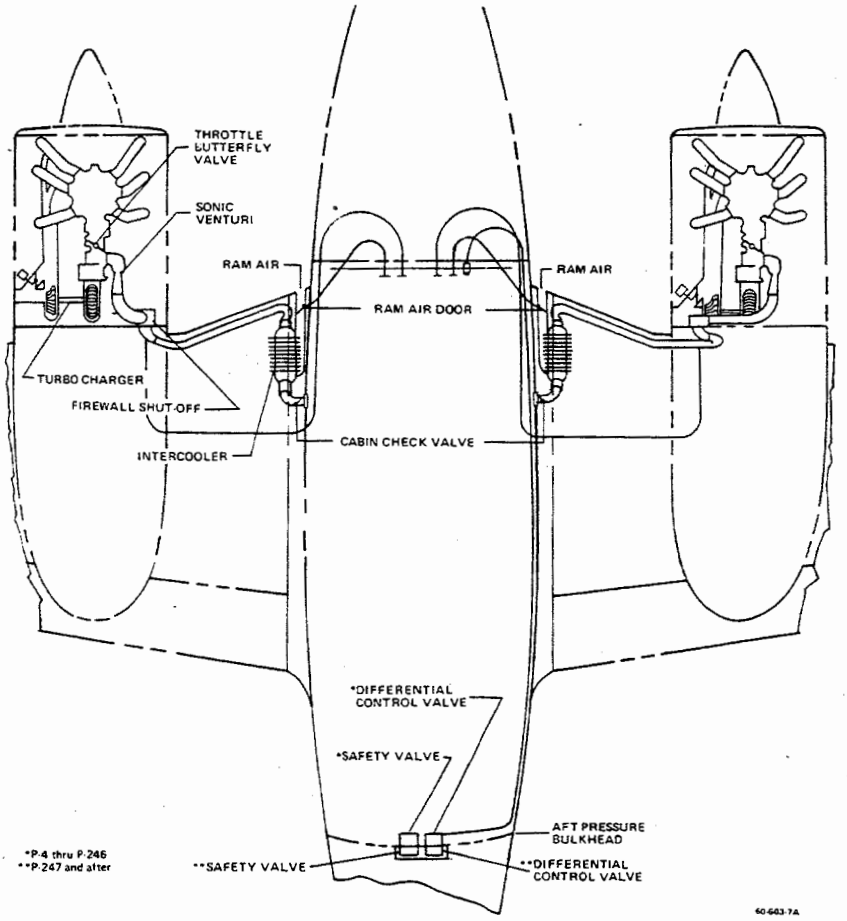
"END"

COMPRESSION - DESCRIPTION AND OPERATION

(Figure 1)

Pressurized air for the cabin is supplied by the turbocharger compressor mounted on the same shaft as the turbocharger. In operation, engine exhaust gas passing over the turbine wheel causes the turbocharger compressor to rotate. Ambient ram air, supplied through the RH cowl door, is filtered and routed to the compressor where it is compressed and delivered to the cabin through a sonic nozzle. When sonic velocity is reached by the air flowing through the throat of the nozzle, each engine is producing the maximum flow rate of 4 to 5 pounds per minute. Total air flow from both engines will deliver approximately 8 to 10 pounds per minute and maintain a cabin pressure differential of 4.6 psi.

A pressurization air intercooler, located in each wing root, is used for temperature control of pressurization air before it enters the cabin. Air flow through the intercoolers is controlled by a butterfly valve located in a ram air scoop under each wing root leading edge. The butterfly valves are manually actuated by the intercooler temperature controls located on the RH subpanel. For maximum temperature control and to reduce the load on the heating and air conditioning system, the intercooler temperature controls should be positioned in the closed position when the air condition system is in the HEAT mode and in the oper position when in the COOL mode.



Pressurization System
Figure 1

"END"

COMPRESSION - MAINTENANCE PRACTICES

INTERCOOLER REMOVAL

a. Remove the fiberglass air intake duct located on the lower forward side of the wing stub.

b. Remove the skin panel under the air intake duct.

c. Loosen the clamps attaching the flex duct on each end of the intercooler.

d. Loosen the set screw and remove the push-pull control cable.

e. Remove the three lower screws and the upper bolt attaching the intercooler to the outboard wing stub rib.

f. Remove the intercooler through the bottom access opening.

INTERCOOLER INSTALLATION

a. Position the intercooler in place through the bottom access opening.

b. Install the three lower screws and the upper bolt attaching the intercooler to the outboard wing stub rib.

c. Attach the push-pull control cable and tighten the set screw.

d. Attach the flex duct on each end of the intercooler and tighten the clamps.

e. Install the skin panel under the air intake duct.

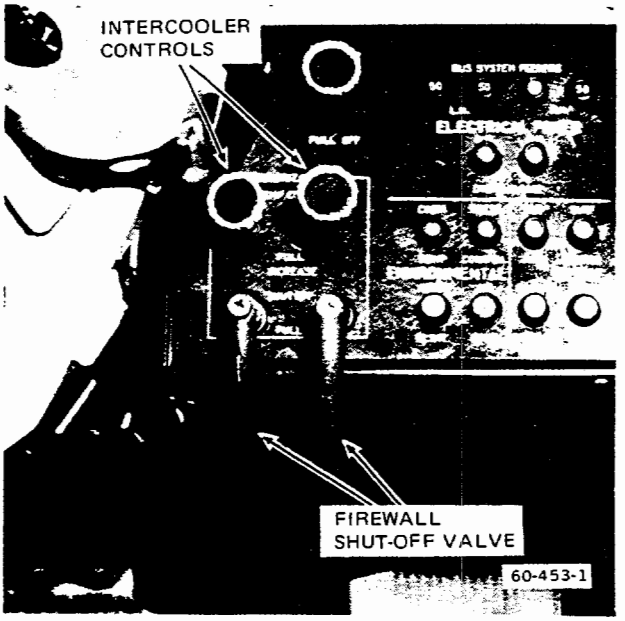
f. Install the fiberglass air intake duct and seal with EC 1792 sealant (Chart 205, Chapter 91-00-00).

INTERCOOLER CONTROL RIGGING
(Figure 201)

The controls used on the intercooler installation are the push-pull type. In the event the control needs minor adjustment, a set pin with a hole provided for the control wire, may be tightened if loose.

NOTE

Make an operational check of the push-pull control for correct adjustment and full travel.



Intercooler and Firewall Shut-off Valve Controls
Figure 201

FIREWALL SHUT-OFF VALVE
(Figure 201)

During normal flight operations, the FIREWALL SHUT-OFF VALVE controls are pushed in against the lower RH 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 pressurization airflow inlet will close and prevent complete loss of cabin pressurization.

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

"END"

PRESSURIZATION CONTROL - DESCRIPTION AND OPERATION (P-3 THRU P-307)

Cabin altitude is selected and controlled by the cabin altitude controller, located on the RH subpanel. A standard, manual controller is utilized by the various series of the Duke which do not use the optional motorized controller. The optional motorized controller is utilized by the various series of the Duke as either a factory installed unit or upon compliance with Service Instructions 0479-453. The motorized controller is similar to the manual controller except in the method of changing cabin altitude. Both controllers employ an aneroid bellows-controlled valve to allow a calibrated amount of air flow to the control diaphragm of the differential control valve.

PRESSURIZATION SYSTEM OPERATIONAL CHARACTERISTICS

a. Power Changes - Normal application of power from a standing start or 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 1,500 fpm (1,000 fpm for airplane with a dashpot installed on safety valve) 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.

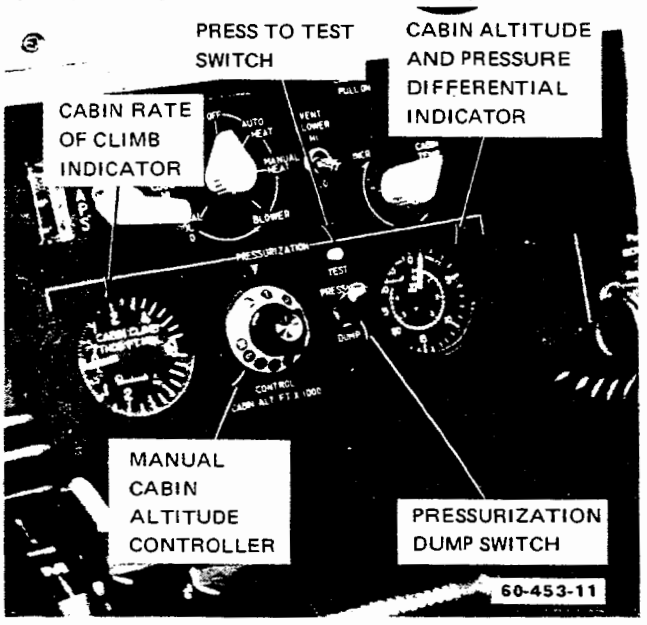
d. Maximum Differential Pressure - As the cabin leaves the isobaric altitude control and goes on maximum differential pressure control, it will make an adjustment and a fluctuation of 500 fpm may be noted before it stabilizes to the normal rate-of-climb of the airplane. Again little or no passenger discomfort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

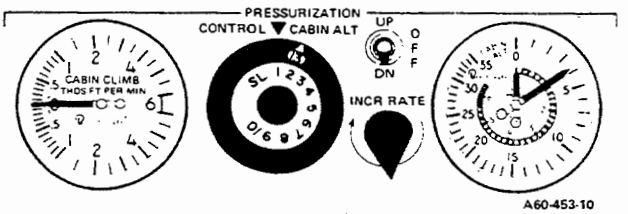
e. Power Reductions - A sudden power reduction or loss of power on one engine below 20 in. Hg MP will cause a change in engine pressurization air flow. Therefore, cabin pressure will be affected and cabin pressure fluctuation will be experienced. A fluctuation of 2,000 fpm is normal under these conditions.

f. Pressurization at Minimum Power - A maximum differential pressure (4.6 psi) may be expected at any throttle setting of 20 in. Hg MP or above on both engines or during single engine operation with the operating engine at 65% power or above, at an altitude of 20,000 feet or above.

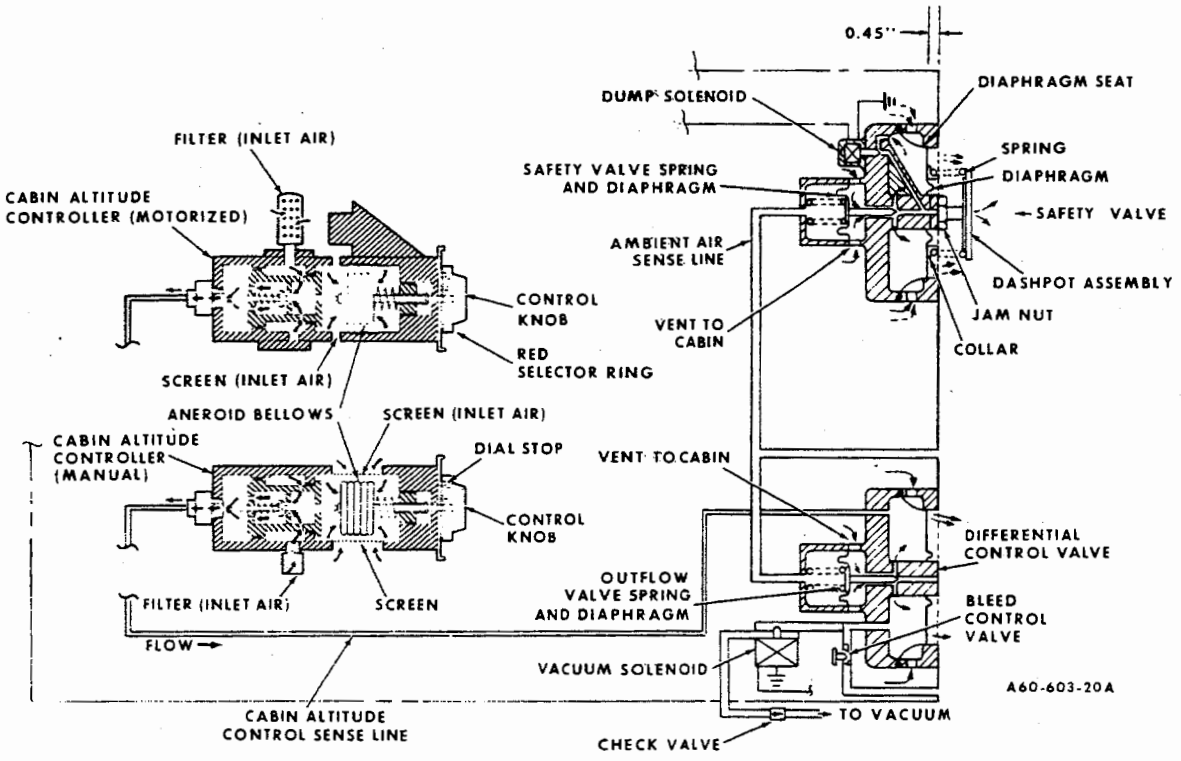
Once the isobaric altitude is set (this is the altitude at which the cabin starts to pressurize), it should be left there until the cabin reaches maximum differential pressure. Once this altitude is reached, the controller can be reset to any lower altitude with no effect on cabin altitude. To change it under any other condition should be done with caution as rapid fluctuations can take place. A recommended practice is, prior to take-off, set the controller to 1,000 feet above the altitude of the departure field or the arrival field whichever is the highest. By doing this the controller does not have to be reset in flight and a smooth comfortable pressurized flight can be expected.

The following graph is provided to determine the relationship between cruise altitude, cabin altitude and differential pressure. The zero differential pressure line



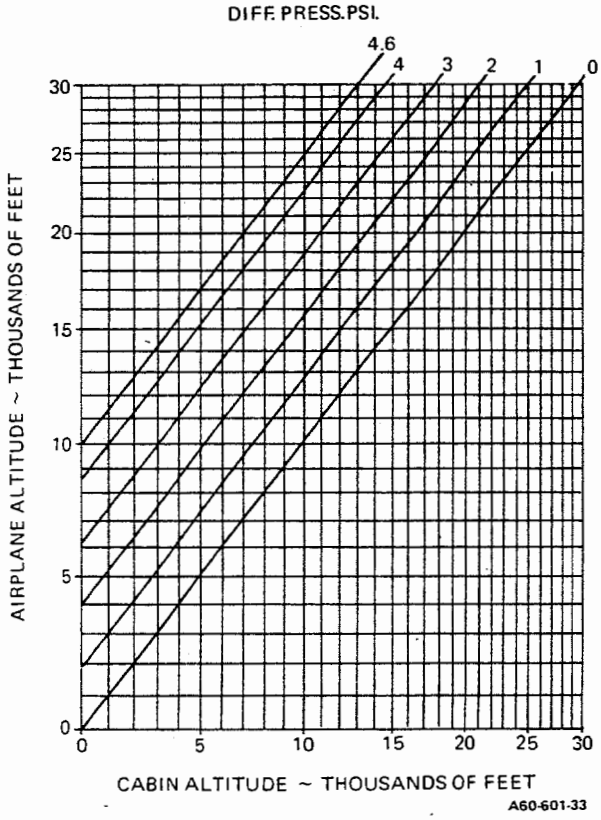


Pressurization Controls
Figure 1



Pressurization Control System Schematic
(P-3 thru P-307)
Figure 2

indicates that the cruise altitude and the cabin altitude are identical (unpressurized). The 4.6 psi line indicates the maximum differential pressure obtainable in the cabin. To determine the lowest cabin altitude which can be maintained for a given cruise altitude: enter the graph at the desired cruise altitude and read right to the 4.6 psi differential pressure line. Then read down the graph to the altitude which can be maintained in the cabin.



Effectual Pressure Graph
Figure 3

CABIN ALTITUDE CONTROLLER (MANUAL) (PRIOR TO P-308)

Cabin altitude is maintained by the cabin altitude controller with the control anywhere from zero pressure to the maximum differential of 4.6 psi.

The controller is rotated until the desired cabin altitude for flight is at the 12 o'clock position under 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 4.6 psi 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 with a minimum of abrupt cabin pressure change by turning the selector dial very slowly and monitoring the rate of change on the cabin pressure indicator. A time lapse of approximately two minutes for each thousand-foot increment change on the dial will effect a comfortable change of pressure. Rapid cabin pressure changes will be experienced if the altitude selector is moved quickly before reaching the maximum differential pressure of 4.6 psi.

CABIN ALTITUDE CONTROLLER (MOTORIZED) (PRIOR TO P-308)

The motorized controller is designed to maintain a constant cabin altitude rate of change during airplane climbs and descents and to make available a means of cabin altitude programming. It can best be described as an adjustable isobaric controller incorporating a variable speed drive motor with automatic shut off. The additional controls for the unit are the red altitude selector ring, the motor rate rheostat and the directional toggle switch. The inner cabin altitude selector is normally operated with the directional toggle switch. The control can be moved to override the motor drive but under normal operation all movement should be made with the toggle switch. The inner scale shows the cabin altitude when read at the index mark (12 o'clock position). The outer scale under the window shows the selected airplane altitude. The inner scale adjacent to the window shows what the cabin altitude will be when maximum differential pressure (4.6 psi) is reached.

To ready the unit for operation, place the rate rheostat knob in the mid-range and insure that the directional toggle switch is in the off position.

CAUTION

In event the directional toggle switch is positioned improperly, the controller will drive to the end of the scale and damage to the slip clutch may result.

Manually set the cabin altitude controller (inner scale) to approximately 1,000 feet above the take-off field elevation. (The red altitude selector ring will turn with the inner scale when this adjustment is made). Now set the window on the red altitude selector ring to 1,000 feet above the planned airplane's cruise altitude. This will avoid reaching maximum differential pressure in the cabin prior to achieving cruise altitude.

After take-off and during the climb when the cabin rate of climb has returned to zero, move the directional toggle switch to the up position. This gradually climbs the cabin to the altitude which is opposite the altitude in the window on the red selector ring. The controller should be driven at a rate to arrive at the cabin altitude shortly before the

airplane arrives at the cruise altitude. This can be accomplished by increasing or decreasing the rate rheostat knob. A few seconds lag time must be allowed for the pressurization controls to respond and stabilize before reading the cabin altitude rate of climb indicator. The controller will automatically turn off when the window in the red selector ring reaches the 12 o'clock position. However, the directional switch should be placed in the OFF position.

CAUTION

In the event the directional toggle switch is positioned improperly, the controller will drive to the end of the scale and damage to the slip clutch may result.

For normal descent turn the red selector ring until the window is opposite the altitude which is 1,000 feet above the landing altitude. After departing the original altitude, place the directional toggle switch in the down position. In the event that a rapid descent rate is required, set the rate rheostat for an increased rate of descent so as to maintain a higher airplane altitude than cabin altitude throughout the descent.

If the cruise altitude selected is less than 11,000 feet or corresponding cabin altitude (below the window) is less than the take-off field elevation, then the controller need not be moved. However, if the landing altitude is less than the take-off field elevation then the controller can be driven down to the selected cruise altitude.

DIFFERENTIAL CONTROL VALVE AND SAFETY VALVE (PRIOR TO P-308)

A differential control valve and a safety valve are located on the forward side of the aft pressure bulkhead.

NOTE

On airplane serials P-247 and after the outflow valve and safety valve are mounted within a box structure which is a portion of the aft pressure bulkhead.

The differential control valve regulates cabin pressure up to maximum differential pressures of 4.6 to 4.7 psi. A diaphragm in the valve, controlled by the cabin altitude control, closes but allows a preset amount of cabin air to bleed off into the tail section through an adjustable bleed valve. This maintains the selected cabin altitudes up to maximum differential pressure. The differential control feature of the valve maintains cabin pressure at maximum differential pressure (4.6 to 4.7 psi) 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 the proper pressure.

On serials P-3 through P-126, except P-123, the safety valve incorporates a solenoid valve which is wired to the landing gear safety switch. When the airplane touches down, the safety valve will energize and dump the cabin pressure overboard. A manual dump switch, located on the RH subpanel will also energize the solenoid and dump pressure overboard while in flight. On serials P-123, P-127 and after, the dump solenoid is actuated by the dump switch only, while the vacuum solenoid is actuated by the landing gear safety switch. The safety valve functions the same as the differential control section of the differential control valve except that the pressure setting is slightly higher.

A solenoid valve is also located on the differential control valve. The primary function of this solenoid is to eliminate pressurization fluctuation during ground run-up and flight in the unpressurized mode. 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 in the aft fuselage which obtains its air supply from the instrument air or deicer system.

PRESSURIZATION TEST SWITCH

A pressurization press-to-test switch is located on the RH subpanel. The press-to-test switch de-energizes the solenoid valves on the differential control valve and the safety 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.

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

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

PRESSURIZATION CONTROL - DESCRIPTION AND OPERATION (P-308 AND AFTER)

The pressurization control system consists of a system mode switch, cabin altitude controller, auxiliary volume tank, outflow valve and safety valve. The system mode switch has three positions, TEST, NOR (normal) and DUMP, to permit the operation of the system in the ground test, pressurized flight and unpressurized flight modes.

The controller contains a visual display of the selected altitude, an altitude selector and a rate control. The outer scale of the selected altitude visual display indicates the selected cabin altitude, the inner scale indicates the corresponding altitude at which the maximum differential pressure would occur. The rate control regulates the rate at which cabin pressure ascends or descends to the selected altitude. When the pointer of the rate control knob is set to the 12 o'clock position, the rate of change is approximately 500 feet per minute.

The outflow valve and the safety valve are mounted within a box structure which is a portion of the aft pressure bulkhead. Each valve consists of two sections, a head and a base section. Within the head section of each valve, is a control chamber. The control chamber of the outflow valve is closed except for the pneumatic fitting, designated port "2", which connects the control chamber to the reference pressure developed in the cabin altitude controller. The control chamber of the safety valve is connected to the airplane vacuum system through port "2" and is vented to the cabin air through a filter and orifice. A differential control assembly mounted on the head section of each valve is vented to static atmosphere through the pneumatic fitting designated port "1". The base section of each valve houses the poppet valve, poppet valve seat and noise suppression screen. The poppet valves are spring loaded to the closed position whenever there is no controlling pressure applied.

The following description of the system operation is made, assuming that the system is functioning normally, both engines are operating, bleed air from the turbochargers is flowing normally and the airplane vacuum system is functioning.

Prior to a normal pressurized flight, with the system switch placed in the NOR (normal) position, electrical power is routed to a ram air door magnetic latch and, through a portion of the RH landing gear safety switch, to actuate a pair of solenoid air valves. One, a normally closed air valve, is actuated to open and permit the application of a negative pressure from the airplane vacuum system to the control chamber of the safety valve. The safety valve poppet valve is thus opened to prevent pressurization of the airplane.

The second solenoid air valve, a normally open valve, is energized to close the supply line to the cabin altitude controller, permitting it to be preset to the desired cabin altitude, prior to take-off for the flight.

When the airplane leaves the ground, the contacts of the RH safety switch change over, thus, opening the coil circuits of the solenoid valves. The normally closed air valve closes to remove the safety valve control chamber from the airplane vacuum system. Cabin air enters the control chamber of the safety valve through a filter and orifice. This permits the poppet valve return spring to close the poppet valve. Simultaneously, the normally open air valve opens, thus, connecting the cabin altitude controller to the airplane vacuum system. The controller pre-rates to the selected cabin altitude. If the cabin altitude is above the field elevation, the outflow valve poppet valve will modulate open, preventing pressurization of the airplane until the selected altitude is reached. As the airplane reaches the selected cabin altitude, the reference pressure developed within the cabin altitude controller decreases, permitting the outflow valve poppet valve to modulate toward the closed position, thus, restricting the outflow of cabin air. The outflow valve poppet valve will modulate to restrict the outflow of cabin air as required to maintain the selected altitude.

If the flight plan requires an airplane altitude greater than the altitude indicated on the inner scale of the visual display of selected cabin altitude, the airplane cabin will be pressurized at the maximum differential pressure. At this time the differential pressure across the differential pressure control diaphragm assemblies of the safety valve and the outflow valve will cause these valves to modulate open, maintaining the maximum differential pressure of the airplane. As the airplane continues to climb the cabin altitude will climb at the same rate of climb as the airplane climbs.

NOTE

During a rapid rate of airplane assent, if the cabin rate selector is set at a low rate, the maximum differential pressure could be achieved prior to reaching the selected airplane altitude.

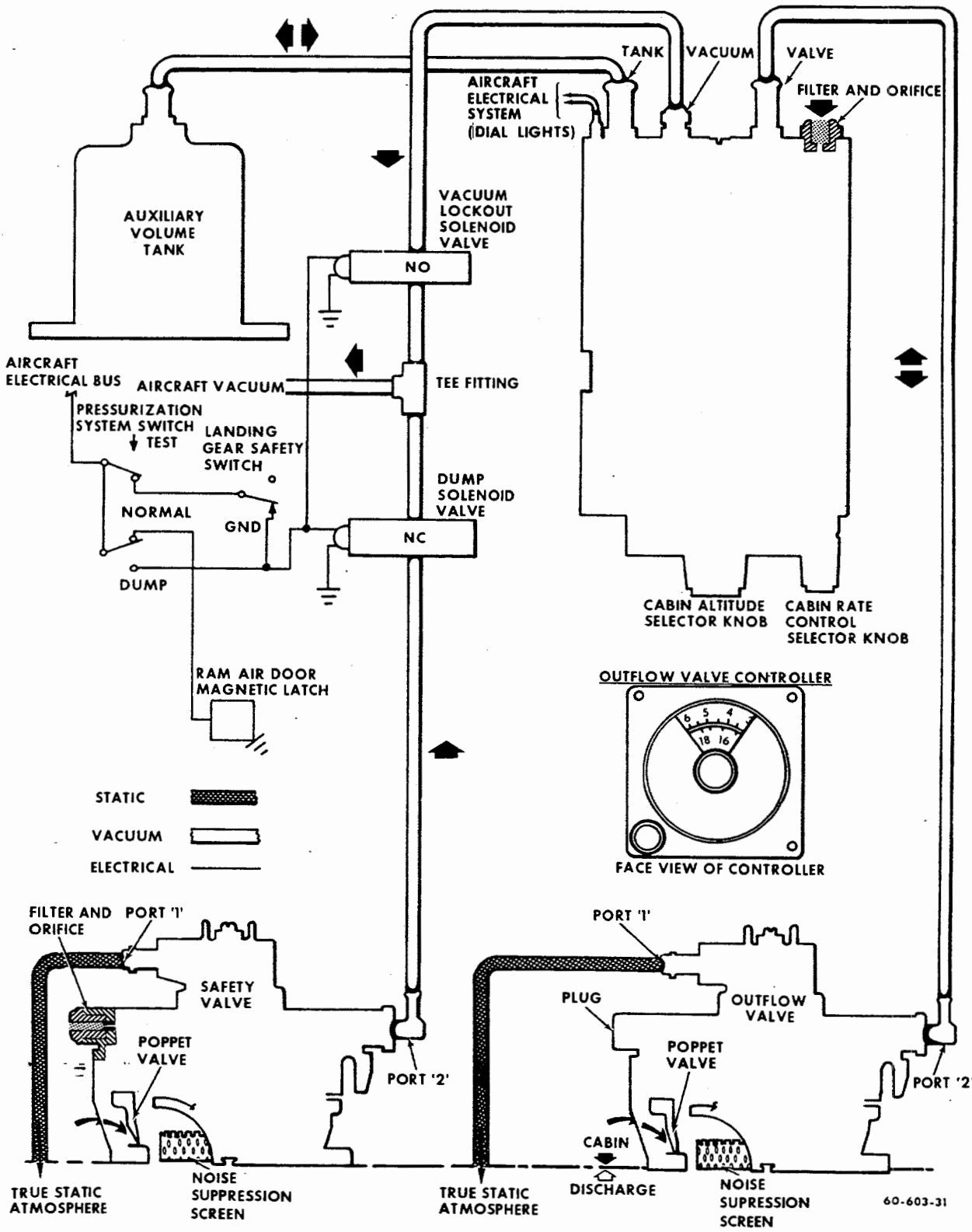
If the cabin altitude is greater than the selected cabin altitude and the airplane decends, the cabin altitude will decend at the selected cabin rate until the selected cabin altitude is achieved.

Should there be a loss of cabin airflow from the turbochargers and the airplane decends to an altitude where the atmospheric pressure exceeds the cabin pressure, a

negative pressure differential will exist across the inner diaphragms of both the outflow valve and the safety valve. When the control chamber-to-atmosphere pressure differential is sufficient to overcome the force of the poppet valve return springs, the poppet valves will open permitting air at atmospheric pressure to flow into the cabin counteracting the negative pressure differential.

Depressurizing the cabin for emergencies, such as smoke in the cabin, may be accomplished by placing the mode select switch in the DUMP position. The normally closed solenoid air valve opens to connect the control chamber of the safety valve to the airplane vacuum system. The safety valve poppet valve is thus opened, permitting the cabin air flow to exhaust to the atmosphere without restriction.

When the airplane touches down after a pressurized flight, the actuation of the RH landing gear safety switch will again energize the two solenoid air valves to open the safety valve poppet valve and to block the source of vacuum from the cabin air controller.



Cabin Pressure Control System Schematic
(P-308 and after)
Figure 4

"END"

PRESSURIZATION CONTROLS - MAINTENANCE PRACTICES (P-3 THRU P-307)

CABIN ALTITUDE CONTROLLER FILTER (MOTORIZED)

A cabin altitude controller filter is utilized on Duke serials P-229 and after, and those prior airplane's which have complied with Service Instructions 0528-453 that have the optional motorized cabin altitude controller installed.

The filter is designed to improve filtration and prevent the poppet valve from sticking due to tobacco tars and other contaminents. Under normal operating conditions the average life of the filter is 1,000 hours. This will vary according to extremes in cabin smoke density. An indication of need for filter replacement would be a slow response to variations in altitude.

DIFFERENTIAL CONTROL VALVE AND SAFETY VALVE REMOVAL

a. Remove the upper and middle upholstery panels from the forward side of the aft lower pressure bulkhead making the valve accessible. On airplane serials, P-247 and after, remove the plate which is attached by two AN4-5A bolts and sixteen AN3-5A bolts, to gain access to the differential control valve and the safety valve.

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 six attaching bolts and remove the valve.

DIFFERENTIAL CONTROL VALVE AND SAFETY VALVE INSTALLATION

a. Station a man inside the aft fuselage to position the valve and install the six attaching bolts.

NOTE

Tighten the attaching bolts to a torque of 15 inch-pounds.

b. Remove the caps and install all plumbing to the valves.

NOTE

Tighten the differential control valve ELBOW or the safety valve TEE fitting to 50 ± 10 inch-pounds and secure with safety wire.

c. On airplane serials P-247 and after; install the plate over the differential control valve and the safety valve. Secure it with the two AN4-5A bolts, top and bottom, and sixteen AN3-5A bolts. Tighten the bolts evenly to a torque of 50 to 70 inch-pounds for the AN4-5A bolts, and 20 to 25 inch-pounds for the AN3-5A bolts.

WARNING

The airplane must not be pressurized prior to installation of the plate.

d. Install the access door on the lower LH fuselage.

e. Reinstall the upholstery panel.

DIFFERENTIAL CONTROL VALVE AND SAFETY VALVE ADJUSTMENT

NOTE

Check the differential control valve and safety valve for adjustment every 300 hours or annually.

The differential control valve and safety valve adjustments may be made in accordance with PRESSURIZATION SYSTEM ADJUSTMENT PROCEDURES. For information relating to overhaul and cleaning procedures, refer to Component Maintenance Manual, P/N 60-590001-27.

PRESSURIZATION SYSTEM ADJUSTMENT PROCEDURES

a. Remove the middle upholstery panels from the aft pressure bulkhead to provide access to the differential control valve and safety valve.

b. Open the bleed control valve 1-1/4 turns counterclockwise.

c. Preset the cabin altitude controller to the nearest index mark above field altitude. (Minimum of 1,000 feet.)

d. Adjust the dashpot spring to position the diaphragm approximately 0.45 inch from valve mounting face surface.

e. Check ram air door for resistance to opening by

pushing with a long stiff rod with pressurization switch in pressurization mode and power on.

f. Cabin bleed-off rate at 4.6 psi should not exceed 6,000 fpm. (Required only if excessive leak rate is suspected.)

g. Execute a normal take-off and record maximum cabin descent which occurs approximately 20 seconds after lift-off. Acceptable range is 300 to 1,000 fpm.

h. Place the airplane in a 1,000 fpm climb at normal climb power and record maximum cabin descent as the airplane begins to pressurize. Maximum descent rate is 500 fpm.

i. After climbing through an altitude 2,000 feet above the altitude selected on the cabin altitude controller, adjust the bleed control valve (if required) as follows:

1. If the cabin climbs as the airplane climbs, close the bleed control valve to obtain a zero rate-of-climb on the cabin rate-of-climb indicator.

NOTE

Because of the sensitivity of the pressurization control system, the bleed control valve should be moved in increments of no more than 1/8 turn.

2. If the cabin dives as the airplane climbs, OPEN the bleed control valve to obtain a zero rate-of-climb on the cabin rate-of-climb indicator.

j. Level the airplane at an altitude approximately 8,000 feet above the selected cabin altitude and compare the selected altitude on the controller with the indicated cabin altitude on the cabin altimeter. If the difference in the two altitudes is in excess of 500 feet, the control head on the cabin altitude controller should be removed and adjusted to correspond with the altitude on the cabin altimeter.

NOTE

The manual controller should be removed from the subpanel prior to take-off if the need for adjustment is anticipated.

k. After landing, if lift-off descent is excessive and isobaric descent is small, as recorded in steps "g." and "h.", adjust the dashpot clockwise approximately 1/2 turn for each 400 fpm. Maximum clockwise adjustment is one turn.

l. If lift-off descent is small and isobaric descent is excessive, as recorded in steps "g." and "h.", adjust the dashpot counterclockwise approximately 1/2 turn for each 400 fpm.

m. Reinstall the upholstery panels to the aft pressure bulkhead.

CABIN ALTITUDE CONTROLLER REMOVAL (MANUAL)

a. Remove the four attaching screws at the subpanel.

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 (MANUAL)

a. Remove plumbing cap and install plumbing to controller.

b. Position the controller in the subpanel.

c. Install the four attaching screws at the subpanel.

CABIN ALTITUDE CONTROLLER ADJUSTMENT (MANUAL)

a. Make a reference mark on the outer ring of the controller control head to match the triangular mark on the edge light panel directly above the control.

b. Remove the controller from the subpanel.

NOTE

The controller should be removed from the subpanel prior to take-off if the need for adjustment is anticipated.

c. Loosen the control head retention Allen screw and slide the control head off the bellows shaft without turning the shaft.

NOTE

Do not loosen the slot head screw in the knob on the control head.

d. Hold the outer ring of the control head and rotate the cabin altitude selection knob until the actual cabin altitude, as indicated on the cabin altimeter, aligns with the reference mark (see step "a.").

e. Align the guide pin and slide the control head back on the bellows shaft without turning the shaft.

f. Secure the control head in place with the Allen screw and reinstall the controller in the subpanel.

For proper information relating to overhaul and cleaning procedures refer to Component Maintenance Manual, P/N 60-590001-27.

CABIN ALTITUDE CONTROLLER REMOVAL (MOTORIZED)

a. Remove the four attaching screws at the subpanel.
b. Remove the screw, washer and support clamp, located behind the subpanel, from the controller.
c. Loosen and remove plumbing from the controller. Cap open plumbing to keep shop soil, dirt and foreign objects from entering.
d. Remove the controller.

CABIN ALTITUDE CONTROLLER INSTALLATION (MOTORIZED)

a. Remove plumbing cap and install plumbing to controller.
b. Position the controller in the subpanel.
c. Install the support clamp on the controller and attach with the screw and washer.
d. Install the four attaching screws at the subpanel.

CABIN ALTITUDE CONTROLLER ADJUSTMENT (MOTORIZED)

NOTE

The controller does not need to be removed from the subpanel for this adjustment.

a. Loosen the control head retention Allen screws and slide the control head off the bellows shaft without turning the shaft.

NOTE

Do not loosen the slot head screw in the knob on the control head.

b. Rotate the control head until the altitude in the 12 o'clock position on the selection knob is the same as the actual cabin altitude, as indicated on the cabin altimeter.
c. Align the guide pin and slide the control head back on the bellows shaft without turning the shaft.

CAUTION

Incorrect positioning of the control head on the bellows shaft may cause improper travel clearances and result in damage to the slip clutch.

d. Tighten the Allen screws to secure the control head on the bellows shaft.

For proper information relating to overhaul and cleaning procedures refer to Component Maintenance Manual, P/N 60-590001-27.

PRESSURIZATION TEST PROCEDURE

(Refer to "1.a." and "1.b." under TROUBLESHOOTING PRESSURIZATION SYSTEM.

This test provides a means of isolating the cabin altitude control to determine if it or the differential control valve is defective when the system cannot be properly pressurized.

a. Remove the upholstery panels providing access to the differential control valve at the aft pressure bulkhead.
b. Disconnect the cabin altitude control sense line from the differential control valve.
c. Pull the pressurization control circuit breaker.
d. Start both engines and VERY SLOWLY increase power to a minimum of 20 in. Hg manifold pressure (cabin rate-of-descent not to exceed 1,000 feet per minute).

WARNING

Increasing power rapidly could cause the cabin to pressurize to maximum differential within a short time, to the subsequent discomfort of personnel in the airplane.

e. If the cabin rate-of-climb indicator shows a descent as power is increased above a minimum of 20 in. Hg manifold pressure, the cabin altitude control is defective.
f. If the cabin rate-of-climb does not show a descent as power is increased above a minimum of 20 in. Hg manifold pressure, the isobaric control portion of the differential control valve is defective. The differential control portion of the valve may also be checked by allowing the cabin to pressurize to maximum differential pressure. If cabin pressure stabilizes at 4.6 to 4.7 psi as monitored by the cabin differential pressure gage, the differential control portion of the valve is functioning properly.
g. SLOWLY decrease power until the cabin is depressurized, then shut down both engines.
h. If any components were found defective, replace them and repeat the test.
i. Reset the pressurization control circuit breaker.
j. Reconnect the cabin altitude control sense line to the differential control valve, then reinstall the upholstery panels on the aft pressure bulkhead.

PRESSURIZATION CONTROL - MAINTENANCE PRACTICES (P-308 AND AFTER)

OUTFLOW VALVE AND SAFETY VALVE REMOVAL

The safety valve and the outflow valve are nearly identical. The safety valve is installed in the lower position and the outflow valve is installed in the upper position.

a. Remove the upholstery panel from the aft pressure bulkhead.
b. Remove the plate to gain access to the outflow and safety valves. The plate is secured with two AN4-5A bolts and sixteen AN3-5A bolts.
c. Loosen and remove the plumbing, as necessary, to permit removal of the valve. Tag the plumbing as removed to facilitate reinstallation. Cap all open plumbing and valve fittings to prevent shop soil and foreign objects from entering.
d. Remove the access door on the lower LH fuselage, just aft of the rear pressure bulkhead.
e. Station a man inside the aft fuselage to remove the six attaching nuts and washers securing each valve.
f. Remove the valve.
g. Remove and discard the old gasket.

OUTFLOW VALVE AND SAFETY VALVE INSTALLATION

a. Remove all traces of the old gasket.
b. Station a man inside the aft fuselage to install the attaching washers and nuts that secure each valve.
c. Install the safety valve in the lower position and/or the outflow valve in the upper position, using a new gasket.
d. Secure the valve to the pressure bulkhead structure by installing a washer and a nut at each of the six plates. Tighten the nuts evenly to a torque of 4 ± 1 inch-pounds.

NOTE

Earlier airplane serials have valves with flared fittings, while later serials, equipped with plastic outflow valves, use a beaded tube fitting and clamps to secure the plumbing. Use water only as a lubricant on EVA tubing being installed over beaded tubing or fittings.

e. Remove the caps and install the plumbing as tagged when the plumbing was removed.
f. Install the plate over the outflow and safety valves. Secure it with the two AN4-5A bolts, at top and bottom, and the sixteen AN3-5A bolts. Tighten the bolts evenly to a torque of 50 to 70 inch-pounds for the AN4-5A and 20 to 25 inch-pounds for the AN3-5A bolts.

WARNING

The airplane must not be pressurized prior to installation of the plate.

g. Reinstall the access door on the lower LH fuselage, aft of the rear pressure bulkhead.
h. Reinstall the upholstery panel.

OUTFLOW VALVE AND SAFETY VALVE ADJUSTMENT

The outflow valve and the safety valve are each preset at the factory to regulate the cabin pressurization to a maximum differential pressurization of 4.6 ± .1 psi. Field adjustment of these valves is not recommended. In the event of a malfunction, the valves should be returned to Beech Aircraft Corporation in exchange for an Overhauled Exchange unit.

OUTFLOW AND SAFETY VALVE CLEANING

CAUTION

The outflow and safety valves are preset at the factory and field adjustment is not recommended. Any time the valve seal is broken, the WARRANTY (6 months in duration) is VOIDED.

Fluctuation of cabin pressure often indicates dirty outflow and safety valves. The seats of these valves should be cleaned at 100 hour inspections, or more frequently if needed. The inspection and cleaning of the valve seat and bellows may be accomplished by the following suggested procedure:

a. Remove the aft fuselage access panel from the lower LH fuselage aft of the aft pressure bulkhead.
b. Compress the bellows to permit inspection and cleaning.
c. Clean the bellows and the inner rim of the valve housing where the bellows contacts the housing when the bellows is extended, using a clean rag dampened with isopropyl alcohol (45, Chart 207, 91-00-00).

SAFETY VALVE FILTER AND ORIFICE CLEANING

The filter and orifice in the head section of the safety valve should be removed, cleaned and inspected every 1,000 hours. The filter may be cleaned by the following suggested procedure:

a. Remove the upholstery panel.

b. Remove the plate to gain access to the safety valve. The plate is secured with two AN4-5A bolts and sixteen AN3-5A bolts.

c. Remove the filter from the head section of the safety valve. Do not lose the packing.

d. Remove the retaining ring from the filter assembly housing. Remove one screen, the copper ribbon and the remaining screen from the housing of the filter assembly.

e. Wash both screens, the copper ribbon, and the filter assembly housing in solvent (15, Chart 207, 91-00-00). Ensure that the orifice of the filter housing is free of foreign material.

f. Install one screen in the housing of the filter assembly. Install the copper ribbon in the filter assembly housing. Do not over compress the ribbon. Install the remaining screen and secure the filter in the housing using the retaining ring.

g. Install the filter assembly in the safety valve, using the packing removed with the filter assembly. Tighten to a torque of 15 to 20 inch-pounds.

h. Reinstall the plate over the outflow and safety valves. Secure it with the two AN4-5A bolts, at top and bottom, and the sixteen AN3-5A bolts around the perimeter of the plate. Tighten the bolts evenly to a torque of 50 to 70 inch-pounds for the AN4-5A bolts and 20 to 25 inch-pounds for the AN3-5A bolts.

WARNING

The airplane must not be pressurized prior to installation of the plate.

i. Reinstall the upholstery panel.

FUNCTIONAL TEST OF OUTFLOW VALVE AND SAFETY VALVE (P-308 and after)

OUTFLOW VALVE FLIGHT CHECK

The following check must be accomplished with the airplane in flight.

a. If the cabin pressure can be controlled at 1/2 psid (pounds per square inch differential) less than maximum differential of 4.6 ± .1 psi, the outflow valve is operating satisfactorily.

b. If the cabin pressure goes to maximum differential and cannot be controlled at 1/2 psid below maximum differential, the outflow valve must be replaced.

c. The outflow valve is removed and installed as described in this Chapter under the headings OUTFLOW VALVE AND SAFETY VALVE REMOVAL and OUTFLOW VALVE AND SAFETY VALVE INSTALLATION.

SAFETY VALVE GROUND CHECK

a. Connect a regulated cabin pressurization test unit to the airplane as outlined under the heading CABIN PRESSURIZATION LEAKAGE TEST (P-4 and after) in this Chapter. (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 knobs, handles, screws, etc. to facilitate the removal of the edge-lighted panel from the RH inboard subpanel.

b. Tag the plumbing as removed to facilitate reinstallation. Loosen and remove all plumbing from the cabin pressurization controller, as necessary to permit removal of the controller. Cap all open plumbing to keep shop soil and foreign material from entering the plumbing and the controller. Disconnect the electrical wiring from the controller lamp wires.

c. Remove the three screws securing the cabin altitude controller to the printed circuit board of the RH inboard subpanel.

d. Remove the cabin altitude controller.

CABIN ALTITUDE CONTROLLER INSTALLATION

a. Install the cabin altitude controller in the printed circuit board of the RH inboard subpanel. Secure with the three screws.

b. Remove the caps and reinstall the plumbing as tagged during removal. Reconnect the wiring to the controller lamps.

c. Install the edge-lighted panel. Secure with the screws. Replace the knobs and handles.

CABIN PRESSURIZATION CONTROLLER ADJUSTMENT

The cabin pressurization controller is preset at the factory. Field adjustments and maintenance of the controller is not recommended. In the event of a malfunction, the cabin pressurization controller should be returned to Beech Aircraft Corporation in exchange for an Overhauled-Exchanged unit.

CABIN ALTITUDE CONTROLLER FILTER AND ORIFICE CLEANING

The filter and orifice in the cabin altitude controller should be removed, cleaned, and inspected every 500 hours. The filter may be removed and cleaned by the following suggested procedure:

a. Remove the filter assembly from the housing of the cabin altitude controller. Do not lose the packing.

b. Remove the retaining ring from the filter assembly housing. Remove one screen, the copper ribbon and the remaining screen from the housing of the filter assembly.

c. Wash both screens, the copper ribbon and the filter assembly housing in solvent (15, Chart 207, 91-00-00). Ensure that the orifice of the filter housing is free of foreign material.

d. Install one screen in the housing of the filter assembly. Install the copper ribbon in the filter assembly housing. Do not over compress the copper ribbon. Install the remaining screen and secure the filter in the housing using the retaining ring.

e. Install the filter assembly in the cabin altitude controller using the packing removed with the filter assembly. Tighten to a torque of 15 to 20 inch-pounds.

AUXILIARY VOLUME TANK REMOVAL

a. Loosen and remove the plumbing. Cap the plumbing and the auxiliary volume tank to prevent shop soil, dirt and foreign material from entering the auxiliary volume tank or the plumbing.

b. Remove the two screws securing the auxiliary volume tank to the forward cabin pressurization bulkhead. Remove the tank.

AUXILIARY VOLUME TANK INSTALLATION

a. Mount the auxiliary volume tank on the forward cabin pressure bulkhead and secure with the two screws previously removed.

b. Remove the caps and connect the plumbing to the auxiliary volume tank.

PRESSURIZATION TEST PROCEDURE (P-308 AND AFTER)

The pressurization system may be functionally checked for operation by the following suggested procedure:

a. If the outflow valve and the safety valve are to be tested for proper differential pressure operation, proceed as follows:

1. Remove the upholstery panel from the aft pressure bulkhead. Remove the access plate to gain access to the outflow valve and safety valves.

2. Loosen and remove the plumbing from the true static air vent (port 1) on the head section of each valve. (Tag each tube to facilitate reinstallation.) Add a section of tubing to each static air vent of sufficient length to reach through the holes in the access plate after it has been reinstalled, since the airplane must not be pressurized prior to installation of the plate. Provide a means of disconnecting and capping each true static air vent with the plate reinstalled. Tag each tube for identification during the test.

3. Reinstall the plate. Secure the plate and tighten the bolts evenly to a torque of 50 to 70 inch-pounds for the AN4-5A bolts at the top and bottom of the plate and 20 to 25 inch-pounds for the remaining bolts.

WARNING

The airplane must not be pressurized prior to installation of the plate.

b. Close and secure the cabin door.

c. Rotate the cabin rate control selector knob to the 12 o'clock position.

d. Select a cabin altitude that is approximately 500 feet above the field elevation.

e. Set the airplane brakes and start the engines as instructed in the applicable Duke Pilot's Operating Manual. Operate both engines at a minimum power setting of 20 in. Hg manifold pressure to establish a steady flow of cabin air.

f. Open the pressurization system circuit breaker. Note that the safety valve on the aft pressure bulkhead closes and the airplane starts to pressurize.

g. Select a cabin altitude that is approximately 1,500 feet below the field elevation. The cabin will pressurize at a rate-of-change rate to decrease the cabin altitude.

h. Rotate the rate control selector knob counterclockwise and note a reduction in rate-of-change of cabin pressurization.

i. Rotate the rate control selector knob clockwise and note a reduction in the rate-of-change of cabin pressurization.

j. Rotate the cabin altitude selector knob to the full counterclockwise stop and select a rate-of-change that is comfortable. The cabin-to-atmosphere pressure differential will increase. The value of the differential pressure attained will depend upon the field elevation at which the test is conducted.

k. When the cabin pressure has stabilized, disconnect and cap the plumbing from the cabin pressurization controller port labeled VACUUM. Cap the plumbing and the controller port to prevent the entrance of foreign materials.

The cabin-to-atmosphere pressure differential will now increase to the normal positive differential pressure setting of the outflow valve and the safety valve.

NOTE

Cabin pressure will increase to the maximum differential value at an uncontrolled rate when the vacuum line is disconnected.

l. After the cabin pressure has again stabilized, note the readings on the CABIN ALT and DIFF PRESS indicator.

m. Disconnect the true static air vent which is connected to the outflow valve. (Refer to step "a." of this procedure.) The DIFF PRESS indicator shall indicate a change that is no greater than .1 psi.

n. Reconnect the static air vent to the outflow valve and disconnect and cap the true static air vent from the safety valve. The DIFF PRESS indicator should again indicate a change that is not greater than .1 psi. Reconnect the safety valve true static air vent.

o. Reconnect the plumbing to the VACUUM fitting of the cabin pressurization controller. The cabin altitude will return to the altitude selected on the cabin pressurization controller. The cabin altitude, as indicated on the CABIN ALT indicator, should stabilize at an altitude within 500 feet of the selected cabin altitude.

p. Rotate the cabin altitude selector to select an altitude that is approximately 500 feet above the field elevation. After the cabin altitude has again stabilized, reset the cabin pressurization circuit breaker. Shut down the engines as described in the applicable Duke Pilot's Operating Manual.

q. Remove the plate over the outflow and safety valves. Remove the test plumbing installed in step "a.", above. Reconnect the true static air vent tubes to the outflow valve and the safety valve. Reinstall the plate. Tighten the bolts evenly to a torque of 50 to 70 inch-pounds for the AN4-5A bolts at the top and bottom of the plate and 20 to 25 inch-pounds for the remaining bolts.

WARNING

The airplane must not be pressurized prior to installation of the plate.

r. Reinstall the upholstery panel.

CABIN PRESSURIZATION LEAKAGE TEST (P-4 and after)
(Figure 201)

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, and pressure instruments.

TEST EQUIPMENT (P-4 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 firewall's.

c. Two pieces of 1/4-inch high pressure hose is used to connect the PNEUMATIC AIR fitting on the test unit to the pneumatic line in each nacelle, forward of the pressure regulator.

d. High pressure hose, 3/8-inch in diameter, connects the INSTRUMENT AIR or CABIN PRESSURE fitting on the test unit to the brake reservoir sense line at the forward pressure bulkhead, located in the nose baggage compartment.

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

f. High strength webbing or restraining straps to encompass fuselage doors and windows for safety of testing personnel during performance of test. (P/N 60-000000-D939-1 or equivalent.)

TEST PROCEDURE (P-4 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 the 3/8-inch high pressure hose from the INSTRUMENT AIR or CABIN PRESSURE fitting on the test unit to the brake reservoir sense line at the forward pressure bulkhead, located in the nose baggage compartment. The air supply must be capable of maintaining 4.50 psi.

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 high strength webbing, P/N 60-000000-D939-1 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 pneumatic line in each nacelle, forward of the pressure regulator.

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.

f. 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 4.6 ± .1 psi as observed on the CABIN PRESSURE indicator.

g. Pressurize the cabin to a differential pressure of 4.00 ± .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 "g."

2. If leaks through the outflow or safety valves are suspected, a 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 "g".

3. 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.

4. Gain access to the points where the contro cables, electrical wire bundles, plumbing, and landing gea

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 202, 12-20-00 and 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 202, 12-20-00 and 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 "g".

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

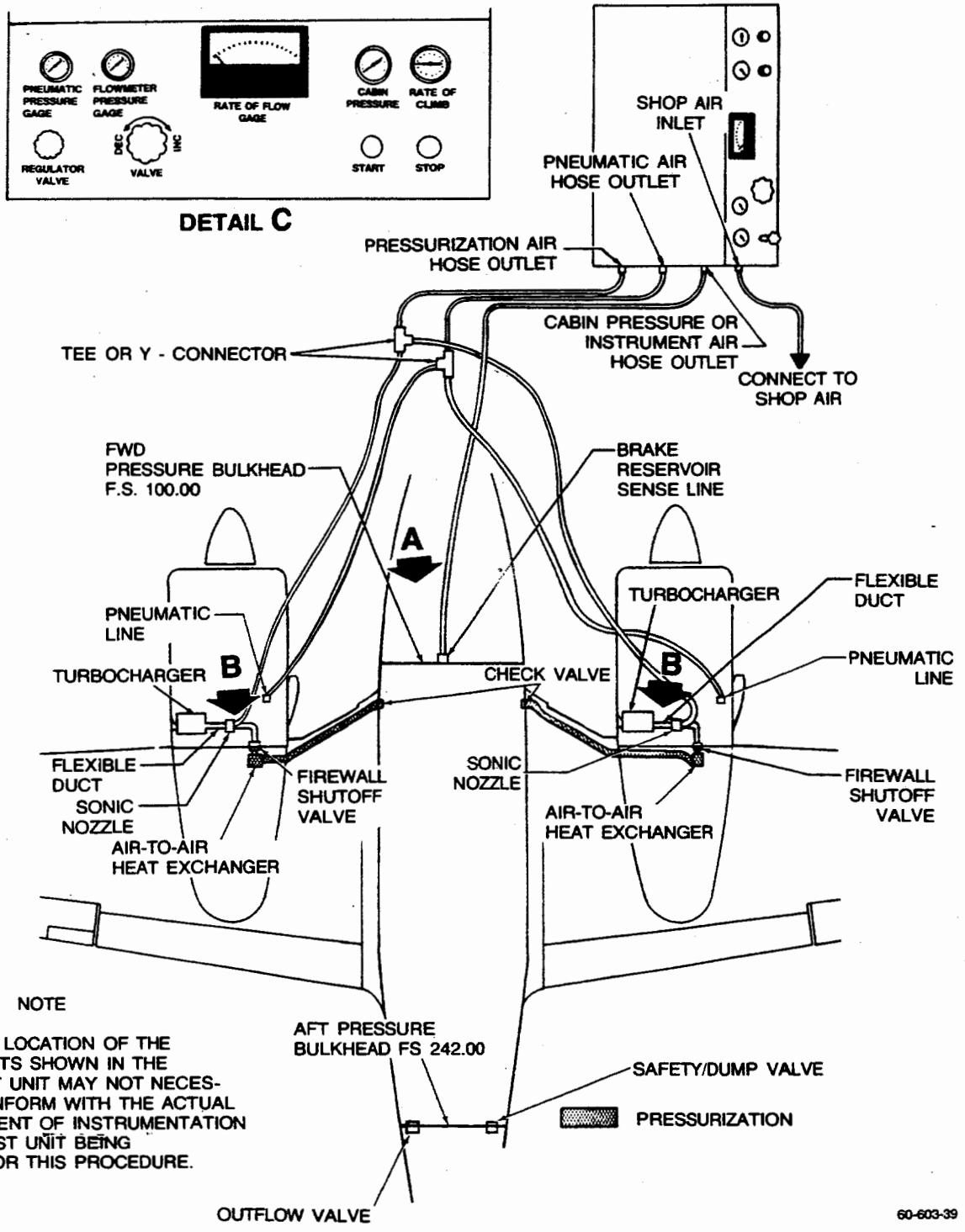
h. With the pressure leak test within tolerance, depressurize the pressure vessel and remove the safety net.

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

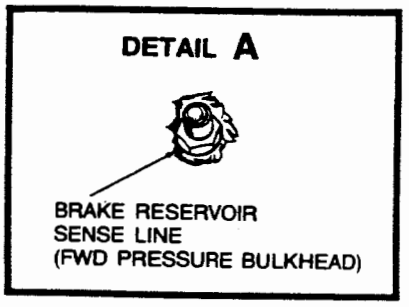
j. Install the control port tubing on each outflow and safety valves.

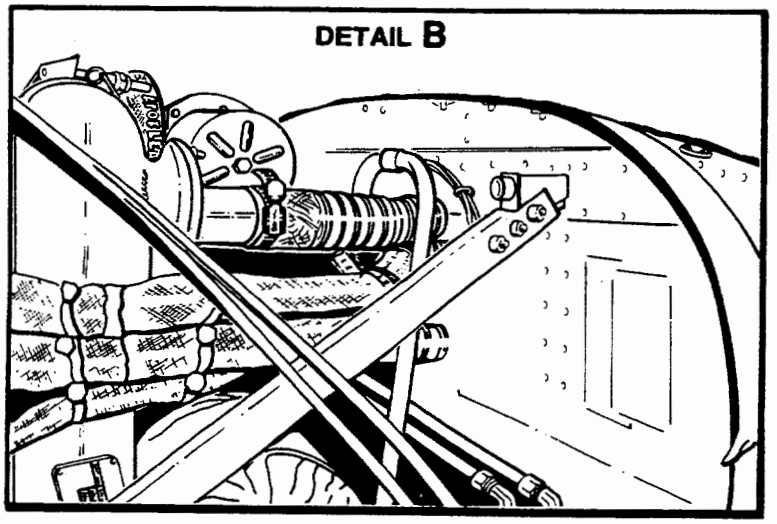
k. Remove the plug from the atmosphere port of the outflow valve and ensure that the back pressure test hose is removed from the atmosphere vent fitting of the safety valve (located on the aft side of the aft bulkhead).

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



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





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

"END"

HEATING - DESCRIPTION AND OPERATION

The heater system consists of a 45,000 BTU combustion air heater, (located under the nose baggage compartment floor), a six position mode switch, vent air blower, combustion air blower, heater fuel pump, five outlets, an automatic temperature control and three sensing elements.

In flight, when pressurized, the vent blower obtains air through the cabin air check valve, forces it through the heater and to the cabin outlets. In the unpressurized mode in flight and for ground operations, the vent blower obtains air from the cabin and the ram air plenum chamber and forces it through the heater and to the cabin outlets.

On serials P-4 through P-126, except P-123, a vent air distribution bypass valve, located on the forward pressure bulkhead, allows air to be directed into the pilot's compartment area and is regulated by a control knob on the pilot's left subpanel.

Exchanging the cabin air is accomplished by exhausting a controlled amount of air through the isobaric control valve on the aft pressure bulkhead.

HEATER CONTROL SYSTEM

(Figure 1)

The heater controls are located on the copilot's LH subpanel. Serials P-4 through P-126, except P-123, incorporates a six-position switch placarded; AUTO HEAT, MANUAL HEAT, BLOWER, AUTO COOL, MANUAL COOL, HI, MANUAL COOL LO, and OFF. On serials P-123, P-127 and after the mode selector switch differs slightly in that a MANUAL COOL position replaces the MANUAL COOL HI and MANUAL COOL LO positions. In addition, two blower positions are placed on the selector switch to allow the blower to be selected without cycling through the opposite mode. The mode switch controls both the heating and cooling systems; however, each system operates independently of the other. In the manual heat position, the switch bypasses the automatic cabin heat controls and allows maximum heat output. However, the heater output in the manual position is limited by a heater cycling switch. In the automatic heat position a temperature control rheostat placarded CABIN TEMP INCREASE can be set for the desired cabin temperature.

Outlet air velocity may be changed in either MANUAL HEAT or AUTO HEAT mode by moving the VENT BLOWER switch, located in the copilot's LH subpanel to either the HI or LO position.

Cabin Temperature Controls
Figure 1

HEATER OPERATION

a. To place the heating system in operation select an operational mode; either MANUAL HEAT or AUTO HEAT.

b. If the AUTO position is chosen, set the control rheostat for the desired heat. The heater is now set up for normal operation providing thermostatic temperature regulation.

c. If MANUAL heat control is desired or required by a malfunction in the AUTO system, move the switch to the MANUAL position. This removes the automatic controller and the sensing elements from the control system. The heater will then cycle continuously by the preset integral heater cycling switch.

d. The CABIN AIR control which regulates the amount of outside ram air to the cabin is located on the copilot's LH subpanel. Pull the CABIN AIR control full aft for maximum air. The CABIN AIR control is overridden when the cabin is pressurized.

e. For windshield defrosting, operate the heater in either the auto or manual mode and pull out the DEFROST control located on the pilot's LH subpanel.

f. Heated air is normally directed onto the pilot's feet. To shut off this air, pull out the PILOT AIR control located on the pilot's LH subpanel.

g. The COPILOT AIR control, identical to the PILOT AIR control is located on the copilot's RH subpanel.

NOTE

The volume of air available for the pilot outlet and copilot outlet can be divided between the two outlets as desired by adjusting each control individually. More heated air will be available for defrosting by reducing the flow of air from the pilot and/or copilot outlets.

If a malfunction resulting in dangerously high temperatures (300°F. to 400°F.) should occur, the heater over-temperature switch will lock out and blow either the over-temperature fuse (manual mode) or the over-temperature fuse (auto mode) in the heater power circuit. This renders the heater system, except the blower, inoperative. The over-temperature fuses are located behind the LH upper side panel. The heater over-temperature switch is located on the heater assembly. The switch must be manually reset during heater system servicing after an over-temperature condition has occured.

CAUTION

Make certain any malfunction causing an overheat condition is corrected before attempting to operate the heater.

For additional heat, the PRESSURIZATION AIR TEMI CONTROLS located on the copilot's RH subpanel can b pulled out to restrict cooling air flow through the cabin ai heat intercooler. For maximum heat in the unpressurize mode, push the CABIN AIR control full forward to sto the flow of incoming cold air.

NOTE

The intercooler doors should be closed during all heating operations to reduce the load on the heater. Conversely, the doors should be open to reduce load during all cooling operations.

"END"

HEATING - MAINTENANCE PRACTICES

HEATER REMOVAL

The heater should be removed from the aircraft 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 floorboards 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 line from the heater.
e. Remove the safety wire and 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 aircraft.

HEATER INSTALLATION

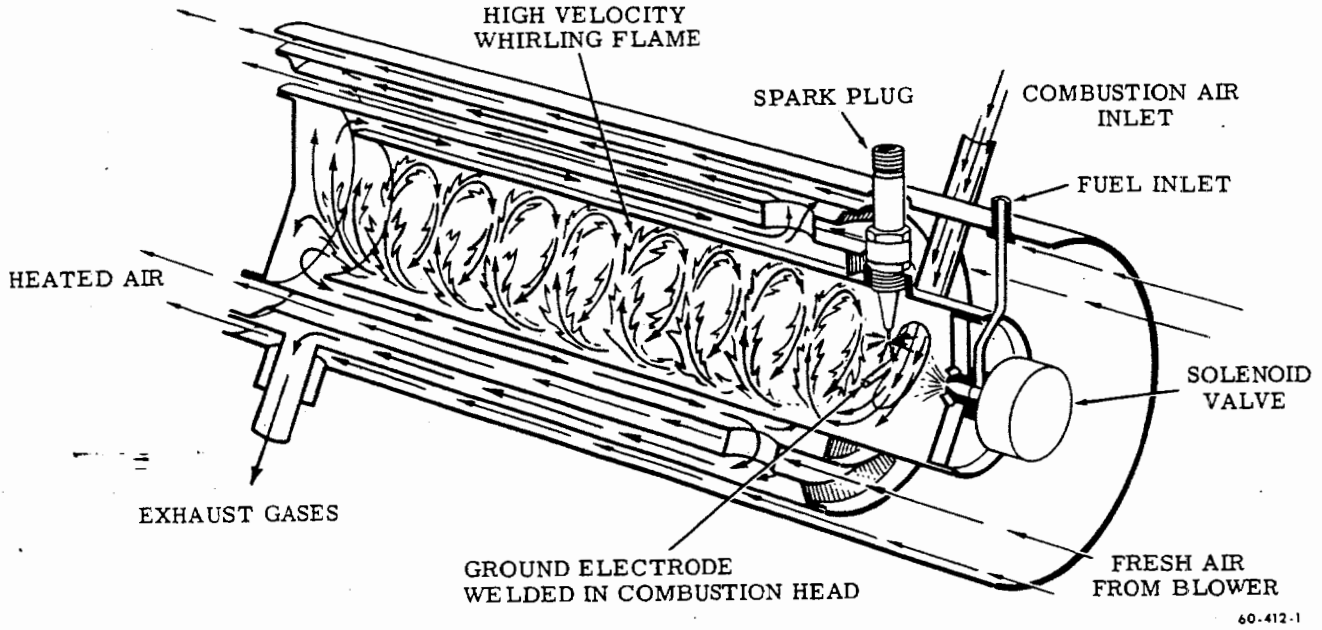
a. Position the heater in the aircraft taking care to guide the fuel drain through the grommet in the skin and the exhaust shroud through its opening.
b. Install the clamps at each end of the heater.
c. Position the clamp on the heater exhaust shroud located under the heater and secure and safety.
d. Install the fuel line to the heater. Slide the boot down the fuel line and secure the clamps around the boot.
e. Install the wire harness to the heater.
f. Connect the duct to the combustion air blower and secure the clamps.
g. Install the nose baggage compartment floorboards.

COMBUSTION AIR BLOWER REMOVAL

a. Remove the heater.
b. Tag the wires and disconnect the wiring from the combustion air blower and combustion air controller.
c. Loosen the clamps and disconnect the ducts on the combustion air blower.
d. Remove the attaching screws from the combustion air blower and the two controller mounting brackets.
e. Remove the combustion air blower and controller from the aircraft as a unit.

COMBUSTION AIR BLOWER INSTALLATION

a. Install the combustion air blower and controller in the aircraft as a unit.
b. Install the two controller mounting brackets and secure the combustion air blower with the attaching screws.
c. Install the ducts on the combustion air blower and secure with the clamps.
d. Install the wiring to the combustion air blower and



Aircraft Heater
Figure 201

combustion air controller.

e. Install the heater.

HEATER IGNITION
(Figure 201)

The controlled atomized spray from a specially designed spray nozzle, coupled with high-voltage spark plug ignition, insures 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. Therefore, 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 necessary access panels, in the nose compartment, 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.

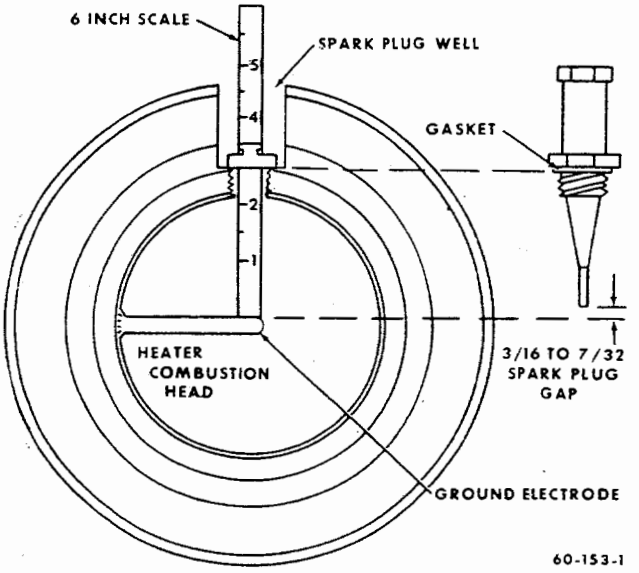
VIBRATOR INSTALLATION

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 on a conventional aircraft 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 carbon tetrachloride. 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



Heater Spark Plug Gap
Figure 202

between the two measurements is the spark plug gap. The gap should be 3/16 to 7/32 (0.188 to 0.218) inches. 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.

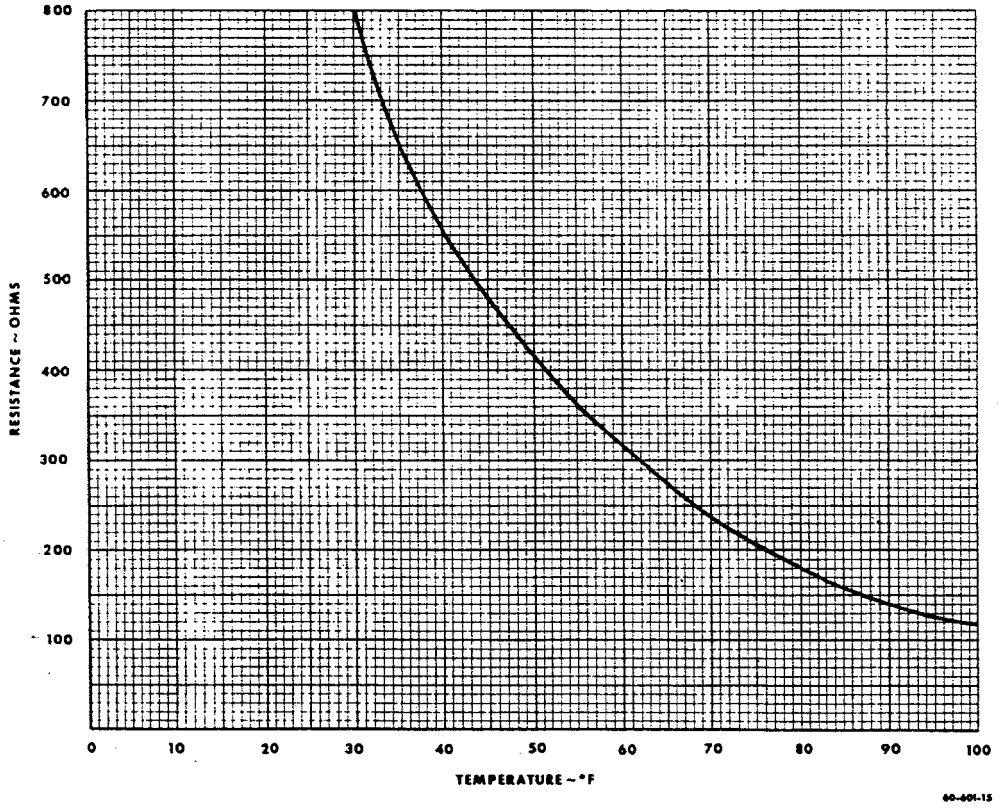
WARNING

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.

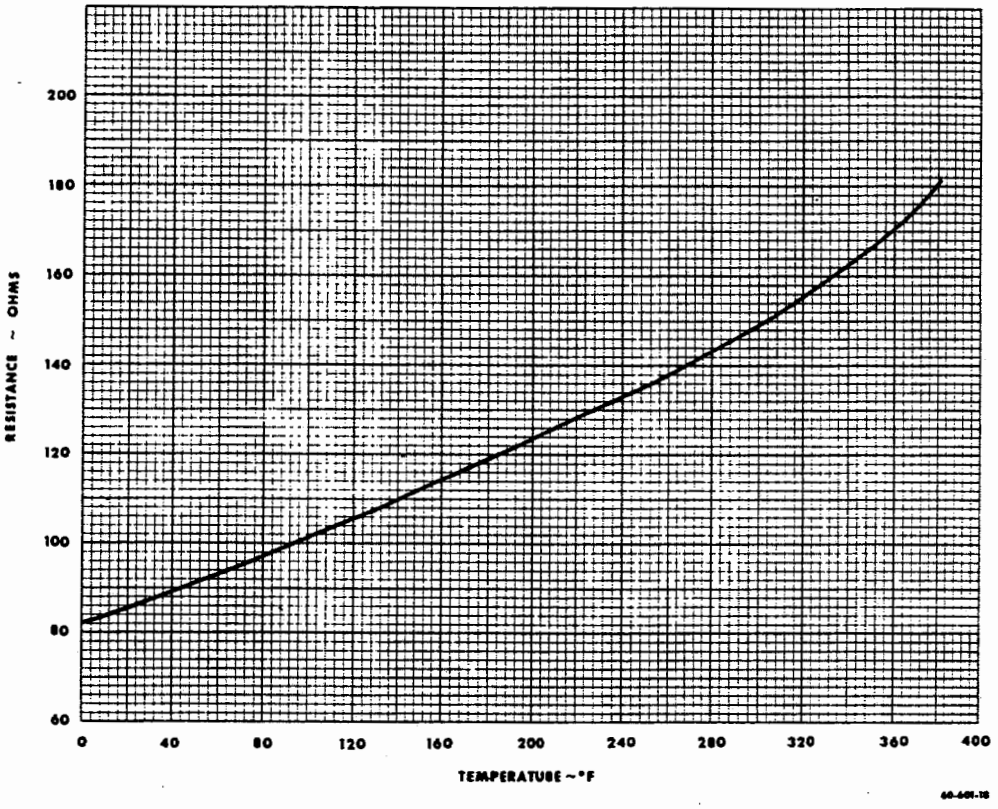
TEMPERATURE SENSORS AND CONTROL RHEOSTAT TEST

NOTE

The aircraft must be in a location, such as a hangar, where temperatures inside and outside of the aircraft are equal and stable. When making the tests, slight variances may occur; however, a defective component will give a definite indication.



Temperature Resistance Curve for Cabin Sensing Element
Figure 203



Temperature Resistance Curve for Heater Discharge Sensing Element
Figure 204

a. Using the graph in Figure 203, determine the correct resistance for the cabin air sensing element. Disconnect wire number H78E18 from terminal "8" of the temperature control box terminal strip. Measure the resistance between the terminal on wire number H78E18 and terminal "6" on the temperature control box terminal strip. Disconnect wire number H75B18 from terminal "5" of the temperature control box terminal strip. Measure the resistance between the terminal on wire number H75B18 and terminal "10" on the temperature control box terminal strip. If the measured resistances do not correspond to the value obtained from the graph, the cabin air sensing element is defective.

NOTE

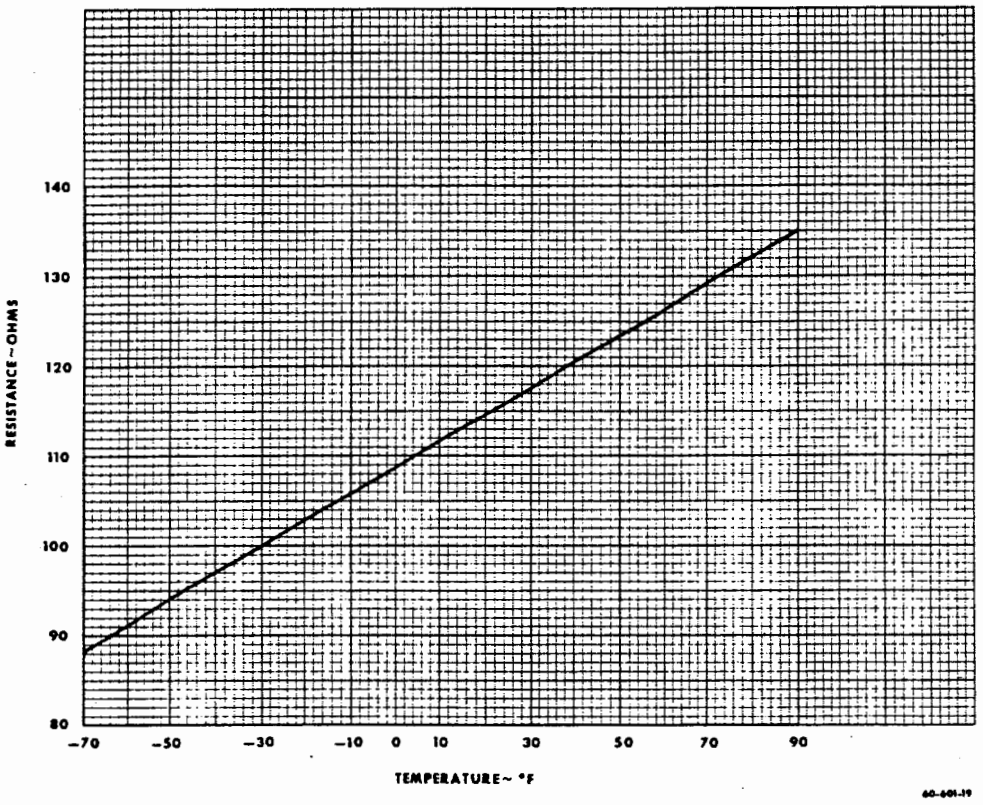
Do not reinstall the disconnected wires on the terminal strip until all tests are complete.

b. Using the graphs in Figures 204 and 205, determine the correct resistance for the heater discharge sensing element and the outside air sensing element respectively, then add these resistance values. Remove wire number H73F18 from terminal "8" of the temperature control box terminal strip. Measure the resistance between the terminal on wire number H73F18 and the terminal on wire H75A18 on terminal "5" of the temperature control box terminal strip. This resistance should equal the added resistance of the two sensing elements. If not, measure the resistance of the two sensing elements. If the resistance does not equal the determined amount, it is defective. If the resistance is correct, the heater discharge sensing element is defective.

c. Rotate the cabin temperature control to the full increase position. Using the graph in Figure 204, determine the resistance for heater discharge sensing element.

d. Disconnect wire number H77B18 from terminal "2" of the temperature control box terminal strip. Measure the resistance between the terminal on wire H77B18 and terminal "1" of the temperature control box terminal strip. If the resistance does not equal the determined value, the heater discharge sensing element is defective.

e. With the test probes still attached as noted in step "d", rotate the cabin temperature control to the full decrease position.



Temperature Resistance Curve for Outside Air Sensing Element
Figure 205

The resistance on the ohmeter should increase 250 ohms. If the resistance increase is higher or lower, the cabin temperature control rheostat is defective.

f. Reinstall all disconnected wires to their respective terminals.

FUEL PUMP

An electric fuel pump, located in the LH wing stub, provides fuel to the heater at a pressure of 7 psi. A solenoid operated fuel regulator regulates fuel pressure and acts as a remote shutoff for the heater, regardless of fuel inlet pressure variations.

"END"

COOLING - DESCRIPTION AND OPERATION

The optional air conditioning system is a recirculating air cooling system containing a 16,000 BTU refrigerative type cooler. The unit is controlled by an automatic temperature control and three sensing elements.

A six position mode switch controls the heater and air conditioner systems: however, each system operates independently of the other. When placed in AUTO position, the temperature is automatically controlled through the temperature controller located on the forward pressure bulkhead above the pilot pedals. It also regulates the cabin temperature variations monitored at the sensing units. The sensing units are located in the ram air inlet, heater outlet duct and forward of the two pressure control valves on the rear pressure bulkhead. When placed in the MANUAL COOL HI position, the switch bypasses the automatic controls and allows maximum air conditioning output. The maximum output is limited by an evaporator thermal switch and an overpressure switch. The MANUAL COOL LO position allows a hot-gas bypass valve (if installed) to be cycled on and off by a timer. The bypass valve regulates the flow of refrigerant to the condenser allowing partial cooling of the cabin.

On serials P-123, P-127 and after, a MANUAL COOL position replaced the MANUAL COOL HI and LO positions on the mode selector switch. Two BLOWER positions are placed on the mode switch to allow the blower to be selected without cycling through the opposite mode.

The air scoop and ramp assembly located in the upper RH nacelle controls the air circulation through the condenser compartment and is completely automatic. The air scoop and ramp assembly has three positions, "closed" (when the air conditioning is not in use), "flight" (air scoop extended about 2 inches above the nacelle), and "ground" (air scoop fully extended). When the air conditioning is turned on, a switch incorporated on the landing gear selects air scoop position; gear down, the air scoop will open to the "ground" position; gear off the ground, the air scoop will open or lower to the "flight" position. The condenser fan, which is wired in circuit with the landing gear safety switch, operates only when the air conditioning mode is selected and the airplane is on the ground.

REFRIGERATIVE AIR COOLING SYSTEM

The air conditioning system is similar to many home and automotive units and consists of six major components. The belt-driven compressor, which is coupled by 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 gas, condensing it to a liquid state. The liquid is then stored in the receiver-dryer where any moisture or foreign material is removed from the system. The refrigerant flows to the expansion valve where it is metered into the evaporator at a rate which allows all 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. For partial cooling, a hot gas bypass valve allows a portion of the gas to bleed off from the condenser, cycling back through the compressor.

NOTE

Beginning with airplane serials P-123, P-127 and after, and prior airplane's having installed Kit Number 60-5006, the hot gas bypass valve, line and suction accumulator were removed from the system.

An overpressure switch and a pressure relief valve are incorporated into the system to regulate system (compressor discharge) pressure. The overpressure switch is located in the condenser compartment of the right nacelle and is set to actuate at 375 ± 10 psi. When this switch is actuated, power is removed from the compressor magnetic clutch and the 3 amp fuse is shorted through a resistor to ground. A pressure relief valve, located on the compressor discharge line immediately before it enters the condenser, is set to bleed off pressure at 450 psi.

On airplane serials, P-275 and after, and on those prior airplanes which have complied with Service Instructions 0599-427, a low pressure switch is installed on the evaporator. This switch is designed to actuate when the refrigerant pressure drops to 7 ± 1 psi. The actuation of the low pressure switch shorts the 3 ampere fuse to the airplane structure through the resistor located near the evaporator. The fuse, located in the right nacelle, is thus opened, preventing further operation of the compressor magnetic clutch and the compressor until the air conditioner system has been serviced.

NOTE

The low pressure switch which was originally installed on airplane serials P-275 through P-292 and P-294, prior to compliance with Service Instructions 0599-427, actuated at a pressure of 18 ± 2 psi.

"END"

COOLING - MAINTENANCE PRACTICES

Servicing the air conditioning system consists of periodically checking the refrigerant level, checking compressor oil level and changing the system air filter. Recharge the 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 flameless leak detector.

The refrigerant level may be observed through the sight glass located in the RH wheel well (P-4 through P-144) or by removing a plug button from the forward section floorboard forward of the copilot's seat (P-145 and after).

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.

Hook the service unit to the connections on the compressor. The abbreviation DISCH or the letter "D" on the compressor cylinder head designates the discharge service valve. The word SUCTION or the letter "S" on the compressor cylinder designates the suction service valve.

When charging a completely purged system, charge with 5 pounds of refrigerant. 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.

NOTE

After the system has been charged the compressor oil level should be checked as outlined under CHECKING COMPRESSOR OIL LEVEL.

AIR CONDITIONING FUNCTIONAL TEST

With the compressor running at 1,100 rpm a functional check may be made in accordance with Chart 201. Charge the system as outlined in CHARGING THE AIR CONDITIONING SYSTEM.

CHECKING COMPRESSOR OIL LEVEL
(Figure 201)

The compressor oil level should be checked by a qualified air conditioner man at the following times:

a. After the air conditioner has operated for the first time.

b. At the beginning of each season's operation.

c. When oil is emitted from the compressor during servicing operation.

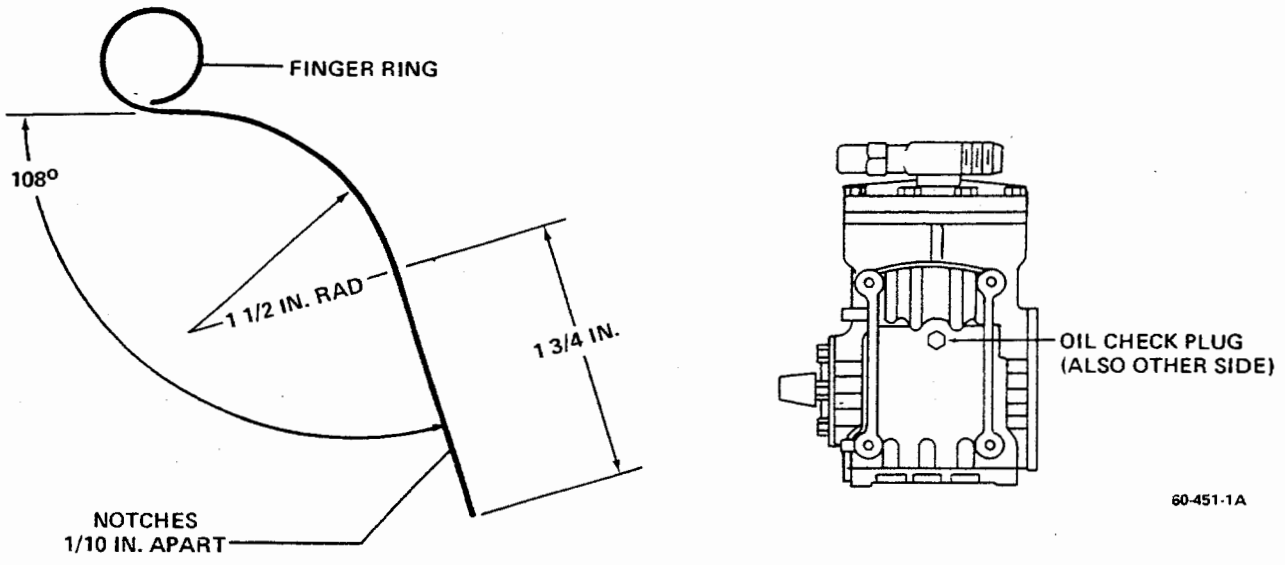
d. After the air conditioning system has been recharged.

e. If a component is replaced.

The compressor is serviced with oil (18, Chart 207, 91-00-00). Only these or equivalent oils should be used when adding oil. To check the compressor oil level, use the following procedure:

CHART 201
AIR CONDITIONING FUNCTIONAL TEST

TEMPERATURE °F		COMPRESSOR PRESSURE (PSI)	
AMBIENT (OAT)	PLENUM (MAX)*	SUCTION	DISCHARGE
60	45	15 - 20	120 - 170
70	49	15 - 22	140 - 200
80	54	15 - 25	165 - 230
90	59	18 - 30	185 - 260
100	64	20 - 35	205 - 290
110	69	22 - 40	230 - 320
*Measure temperature at outlet nearest plenum			



Dipstick and Compressor Oil Check Plug
Figure 201

a. Operate the air conditioner for approximately 15 minutes in which the last 5 minutes should be at low engine rpm (1,000 to 1,100). This allows the oil to accumulate in the compressor for an accurate oil level reading.

b. Attach service gages to compressor service valve ports.

c. With air conditioner operating, slowly close the suction service valve until the suction pressure gage reads 0 or slightly below.

d. Stop the air conditioner and quickly close the suction service valve when the suction gage reads a little above zero.

e. Close the discharge service valve.

f. With both service valves closed, the suction pressure will slowly rise to about five pounds gage pressure.

g. The remaining pressure is relieved by unscrewing the plug for 5 full turns and bled to zero pressure.

h. Remove the oil plug and O-ring.

i. To place the crank throw in the best position for dip stick insertion, point the keyway on the compressor shaft up toward the cylinder head.

j. Insert an oil dipstick until the end contacts the bottom of the crankcase. Remove and measure the oil depth.

NOTE

A compressor oil level depth of 1.5 to 1.8 inches is satisfactory. If the oil level is below 1.5 inches, add oil (18, Chart 207, 91-00-00), then remeasure.

CHART 202
CHECKING COMPRESSOR OIL LEVEL

Dip Stick Depth (In.)	Oil to be Added (Oz.)
.6	8.0
.8	6.5
1.0	5.0
1.2	3.0
1.4	1.5

Oil should be removed when depths greater than 1.8 inch are observed.

Compressor oil level reduces .4 to .7 inches during operation at maximum rpm and also drops slightly with reduced evaporator loads. Approximately 7 oz. of oil is required to initially wet the system and circulate with the refrigerant. When an evaporator or condenser coil is changed, add approximately 2 oz. of oil on installation, then check and adjust the oil level as recommended. A locally manufactured dip stick (see Figure 201) may be fabricated from 1/8 inch diameter rod; a nonferrous material, which is not subject to corrosion, is preferred. Notches cut 1/10 inch apart will aid in visually detecting oil depth.

k. Install the oil plug and O-ring and check for leaks using a flameless leak detector.

l. Unseat both the suction service valve and the discharge service valve and turn to the full aft position.

m. Remove the service gages and install the caps on the service ports.

n. The aircraft may now be returned to service.

EVAPORATOR AIR FILTER REPLACEMENT

The evaporator air filter should normally be replaced annually. Actual replacement may be required more often due to extremely dusty operating conditions.

a. Remove the necessary equipment in the nose compartment to gain access to the floorboards forward of the pressure bulkhead.

b. Remove the screws securing the top of the evaporator filter access plate.

c. Cut the cord securing the filter to the evaporator plumbing.

d. Remove the old filter.

e. When installing the new filter, be sure the reinforced backing of the filter is placed against the evaporator coil.

RIGGING THE AIR SCOOP

(Figure 202)

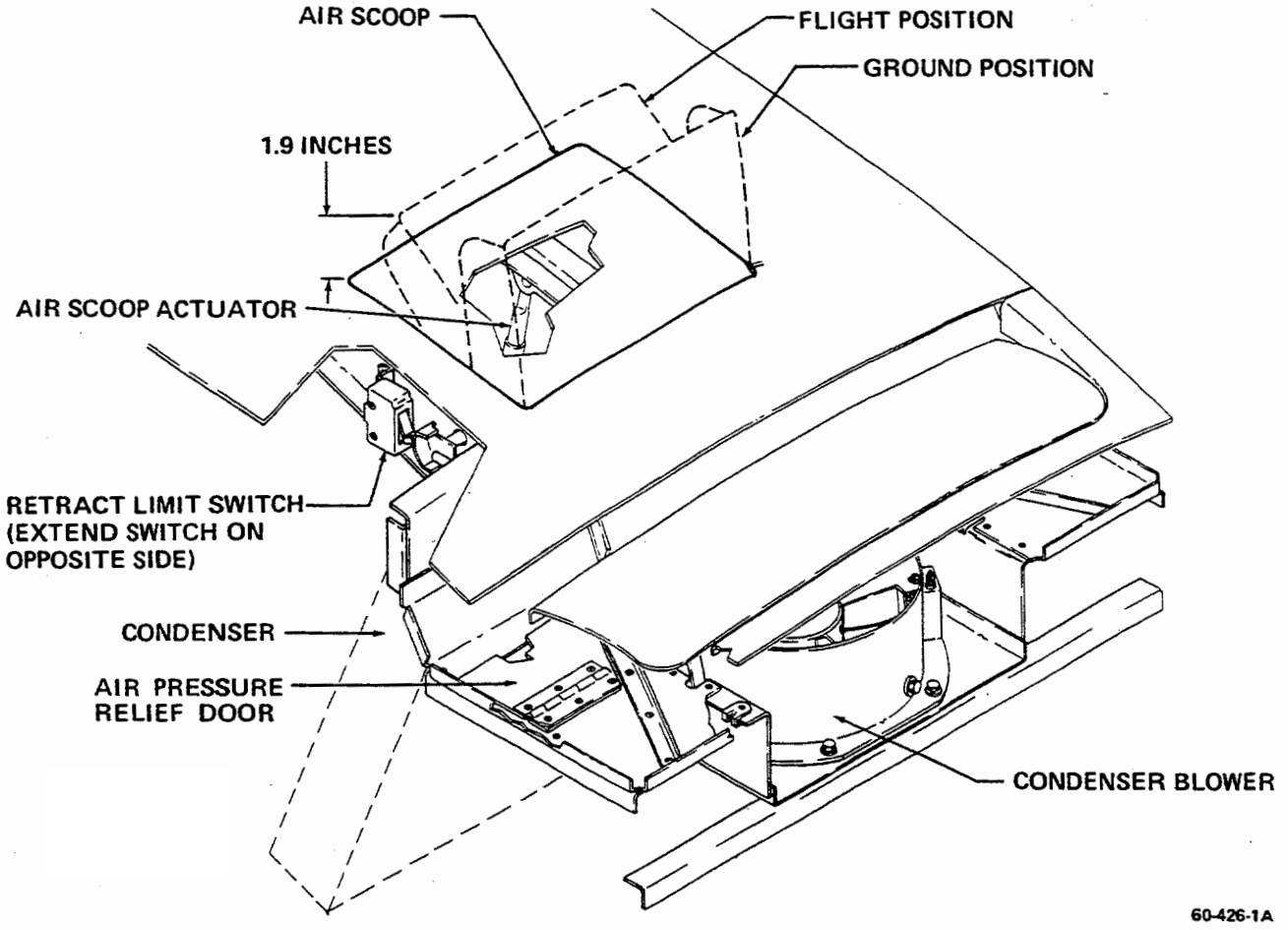
Two limit switches control the air scoop actuator travel for the flight and ground positions. The extend limit switch limits the air scoop travel from the closed position to the flight position. The retract switch limits the air scoop travel from the ground position to the flight position. The air scoop and limit switches may be adjusted as follows:

a. Disconnect the air scoop actuator rod end by removing the attaching bolt and nut.

b. With power on, run the actuator in to its internal limit and loosen the rod end check nut.

c. With the air scoop faired to the nacelle adjust the rod end to the attaching bolt but do not secure the actuator to the air scoop at this time. Tighten the rod end check nut.

d. Manually raise the air scoop 1.9 inches above the top of the nacelle and hold this position while adjusting the switches.



Air Scoop
Figure 202

e. Loosen the attaching screws and move the switches in their slotted mounts until they actuate (a distinct click is audible) in the following order: the extend switch actuates first when the air scoop moves up from the closed position; the retract switch actuates first when the air scoop moves down from the ground position. Secure with the attaching screws.

f. Because the ground position is automatically achieved by the internal limits of the actuator no adjustment is needed.

g. Install the actuator rod end to the attaching bolt and secure the nut.

h. Check for proper operation.

CONDENSER BLOWER REMOVAL

The condenser compartment is located aft of the right nacelle firewall.

a. Remove the screws securing the skin covering the condenser compartment. Position the air scoop and ramp vertically to remove the skin.

b. Remove the pins at the air ramp hinge points and lift the air ramp out.

c. Disconnect the electrical wiring at the terminals on the condenser blower. Remove the screws securing the blower to its mounting bracket and then lift out the blower.

d. Remove the screws securing the blower mount bracket and the two baffles to the condenser compartment. Lift out the mounting bracket and baffles.

e. Disconnect the fittings on the condenser and cap.

WARNING

The lines connected to the condenser are under high pressure. Refer to CHARGING THE AIR CONDITIONING SYSTEM, in this chapter before disconnecting any fitting in the refrigerant system.

f. Remove the screws securing the condenser to its mounting flange and lift the condenser out of the compartment.

CONDENSER BLOWER INSTALLATION

a. Position condenser in condenser compartment and secure with attaching screws.

b. Remove cap and install the fittings to the condenser.

c. Position the two baffles to the condenser compartment and the blower mount bracket and secure with attaching screws.

d. Position the blower to its mounting bracket and secure with attaching screws. Attach the electrical wiring at the terminals on the blower.

e. Position the air ramp to align the air ramp hinges and install the hinge pins.

f. Position the air scoop and ramp vertically to install the skin covering the condenser compartment.

g. Secure the skin with attaching screws.

COMPRESSOR BELT TENSION ADJUSTMENT

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 moving the compressor up and down in its slotted mounts) so that a belt tension gage, placed at a point midway between the longest span will register a tension of 100 to 105 pounds. After adjusting the tension on a new belt, be sure the belt has ample clearance on all sides.

COMPRESSOR BELT REMOVAL

a. Remove the RH engine cowling to gain access to the compressor belt.

b. Loosen compressor attaching nuts and slide the compressor upward in its slotted mount to relieve tension on the belt. Roll the belt off the compressor pulley.

c. Remove the bolts attaching the compressor/turbocharger mount support to the engine.

d. Remove the belt from the engine crankshaft pulley and slip it out between the compressor/turbocharger mount and the engine.

COMPRESSOR BELT INSTALLATION

a. Slip the compressor belt between the compressor/turbocharger mount and the engine and position the belt on the crankshaft pulley.

b. Secure the compressor/turbocharger mount support to the engine with attaching screws.

c. Roll the belt onto the compressor pulley. Slide the compressor downward in its slotted mount to apply tension on the belt and secure the compressor attaching nuts.

d. Install the RH engine cowling.

COMPRESSOR REMOVAL

a. Remove the RH engine cowling to gain access to the air conditioner compressor.

b. Disconnect electrical leads to the magnetic clutch.

c. Disconnect refrigerant lines at compressor service valves.

WARNING

The lines connected to the compressor are under high pressure. Refer to CHARGING THE AIR CONDITIONING SYSTEM, in this chapter before disconnecting any fitting in the refrigerant system.

d. Loosen the compressor mounting nuts.

e. Slide the compressor up in its slotted mounting to relieve tension on the drive belt. Roll belt off the compressor pulley.

f. Remove mounting nuts and washers and remove compressor.

COMPRESSOR INSTALLATION

a. Position the compressor in its slotted mounting brackets. Position washers on the compressor studs and loosely install the attaching nuts.

b. Roll the compressor drive belt onto the compressor pulley. For adjustment of the belt refer to COMPRESSOR BELT TENSION ADJUSTMENT.

c. Torque the compressor mounting nuts to 160-190 inch-pounds.

d. Install the refrigerant lines to the compressor service valves.

e. Install the electrical leads to the magnetic clutch.

f. Install the RH engine cowling.

"END"

CHAPTER 22

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CHAPTER 22 - AUTO FLIGHT

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"END"

GENERAL - DESCRIPTION AND OPERATION

H-14 AUTOPILOT

The primary components of the autopilot pneumatic system are shown in Figures 202 and 204 in Chapter 36-00-00. Air pressure picked up from the pressure manifold is admitted to the autopilot pneumatic system through the autopilot control valves.

Servo actuators, powered by air pressure move the aircraft control surfaces. The autopilot may be turned on anytime after the aircraft engines have been started. Because the equipment is transistorized, no warm-up time is required; however, make certain that the gyros are erect and stable prior to engaging the system. Electrical power to the autopilot is interrupted by pulling the autopilot circuit breaker.

"END"

GENERAL - MAINTENANCE PRACTICES

H-14 AUTOPILOT

For maintenance, repair, troubleshooting and testing refer to the procedures described in the BEECHCRAFT H-14 Autopilot Maintenance Manual (P/N 130333F) and the Maintenance Manual Supplement (P/N 98-30603).

Access for adjustment of the autopilot is through a removable panel on the left underside of the fuselage immediately aft of the rear pressure bulkhead.

Adjustment of the pneumatic pressure system is performed by adjusting the various regulators in a specified sequence. A PRESSURIZATION SYSTEM ADJUSTMENT CHART corresponding to applicable illustrations and a general adjustment procedure for each individual regulator are provided in Chapter 36-00-00.

"END"

TROUBLESHOOTING
NEW-MATIC AUTOPILOT

TROUBLE	PROBABLE CAUSE	REMARKS
ROLL AXIS		
1. Insufficient or excessive pressure indicated on aircraft system gage.	a. Leak in aircraft pressure system.	a. Check all lines and fittings for breaks, looseness, kinks, etc.
	b. Regulator valve improperly adjusted.	b. Adjust regulator valve as outlined in Chapter 36.
	c. Regulator improperly adjusted.	c. Adjust regulator as outlined in Chapter 36.
	d. Faulty (pressure) pump.	d. Replace pump.
	e. Ambient air filter clogged.	e. Clean or replace filter.
	f. Clogged system filter.	f. Check filters as outlined in Chapter 36 and replace if necessary.
2. Aircraft hunts or recovers slowly from turn in one direction.	a. Regulator valve improperly adjusted.	a. Adjust regulator valve as in Chapter 36.
	b. Loose aircraft primary cables or excessive friction in aileron and/or rudder cables, pulleys, bell cranks or loose servo cables.	b. Check security of attachment, binding, etc. and adjust as outlined in Chapter 27.
	c. Leak in servo or servo lines.	c. Check for leaks.
	d. Obstruction in servo lines.	d. Check for foreign matter.
	e. Faulty turn coordinator gyro.	e. Replace turn coordinator.
3. Autopilot sluggish.	a. Low system pressure setting.	a. Check system filters and adjust as outlined in Chapter 36.
4. Aircraft turns continuously on basic stabilization. (Controller "OFF").	a. Aircraft out of trim or improperly rigged.	a. Trim aircraft or check controls for proper rig as outlined in Chapter 27.
	b. Loose primary cables or excessive friction in cables and system. Loose servo cable.	b. Check security of attachment, binding, etc, and adjust as outlined in Chapter 27.
	c. Defective turn coordinator gyro.	c. Replace turn coordinator gyro.
	d. Leak in servo or servo line.	d. Check for servo or line leaks.

TROUBLESHOOTING
NEW-MATIC AUTOPILOT (Cont'd)

TROUBLE	PROBABLE CAUSE	REMARKS
ROLL AXIS (Cont'd)		
5. Aircraft rate of turn too fast or too slow.	a. Improper regulator adjustment.	a. Adjust regulator as outlined in Chapter 36.
	b. Turn coordinator faulty.	b. Replace turn coordinator.
6. Continuous control wheel oscillation in smooth air.	a. Turn coordinator faulty.	a. Replace turn coordinator.
	b. Improper gyro speed or excessive pressure in system.	b. Adjust system pressure as outlined in Chapter 36.
7. No turns or turns in one direction only, in response to turn control or on all modes of navigation coupler operation.	a. Faulty turn coordinator.	a. Replace turn coordinator.
	b. Faulty controller/amplifier.	b. Replace controller/amplifier.
8. Aircraft rolls in one direction only either left or right.	a. Servos improperly phased.	a. See System Block Diagram, Figure 2.
	b. Turn coordinator not plumbed properly.	b. Plumb per System Block Diagram, Figure 2.
9. Aircraft turns in the wrong direction in "CAP" and "TRK" modes.	a. Nav input signal reversed.	a. Reverse connectors to VOR.
10. No aircraft response from navigation coupler in any mode, ground check shows electrical.	a. Faulty turn coordinator gyro.	a. Replace turn coordinator.
	b. Obstruction in pressure lines.	b. Check for foreign matter.
11. Aircraft fails to turn to and hold magnetic headings.	a. Faulty magnetic heading sensor.	a. Replace magnetic heading sensor.
	b. Faulty heading selector resolver.	b. Replace controller/amplifier.
	c. Faulty controller/amplifier.	c. Replace controller/amplifier.
12. Magnetic heading consistently high or low.	a. Heading sensor misaligned in aircraft.	a. Check for proper installation.
	b. Heading azimuth dial shifted on shaft.	b. Tighten screw and recalibrate.
	c. Improper adjustment of controller/amplifier.	c. Calibrate for the magnetic cardinal points.
13. Cardinal headings inaccurate.	a. Controller/amplifier improperly adjusted.	a. Calibrate for the magnetic cardinal points.

TROUBLESHOOTING
NEW-MATIC AUTOPILOT (Cont'd)

	TROUBLE		PROBABLE CAUSE		REMARKS
ROLL AXIS (Cont'd)					
13.	Cardinal headings inaccurate. (Cont'd)	b.	Leak in servo system.	b.	Check for leaks.
		c.	Low primary pressure.	c.	Adjust system as outlined in Chapter 36.
14.	Cardinal headings accurate but intermediate headings inaccurate.	a.	Faulty heading sensor.	a.	Replace the heading sensor.
		b.	Faulty controller/amplifier.	b.	Replace controller/amplifier.
15.	Insufficient or no control in "CAP" and "TRK" modes.	a.	Faulty controller/amplifier.	a.	Replace controller/amplifier.
		b.	Faulty omni converter.	b.	Replace omni converter.
		c.	Insufficient signal from omni.	c.	Repair or replace omni indicator.
		d.	"NAV SENS" improperly adjusted.	d.	Readjust.
16.	Localizer approach is either sluggish or too sensitive.	a.	"LOC GAIN" is set high or low.	a.	Adjust.
17.	No electrical output left or right on controller/amplifier test jacks.	a.	No A+ input or improperly grounded.	a.	Check A+ and ground.
		b.	Defective controller/amplifier or power supply.	b.	Replace controller/amplifier or power supply.
18.	Output only one way on controller/amplifier test jacks.	a.	Defective controller/amplifier.	a.	Replace controller/amplifier.
19.	No output on HDG mode on controller/amplifier test jacks.	a.	Defective controller/amplifier, or harness, or heading sensor.	a.	Replace controller/amplifier; or harness, or heading sensor.
20.	Heading output on two reciprocal headings, but not on the other two.	a.	Defective sensor; or harness; or faulty controller/amplifier.	a.	Replace heading sensor, or check harness. Replace controller/amplifier.
21.	"O" output when in CAP, TRK, or APP mode, with nav signal.	a.	Defective nav switching console; or no nav information; or defective controller/amplifier.	a.	Check nav input leads. Replace controller/amplifier.
22.	Output voltage in CAP mode decays to "O" voltage.	a.	Wrong nav input signals.	a.	Check wiring.
		b.	Defective switching console (if installed).	b.	Repair or replace console.

TROUBLESHOOTING
NEW-MATIC AUTOPILOT (Cont'd)

TROUBLE	*PROBABLE CAUSE*	*REMARKS*
ROLL AXIS (Cont'd)		
22. Output voltage in CAP mode decays to "0" voltage. (Cont'd)	c. Dirty input signal (AC volts).	c. Check indicators.
23. Voltage output in MAN, CAP, TRK, and APP mode but none in HDG mode.	a. Polarization pins reversed on heading sensor plug.	a. Reverse pins. See System Block Diagram, Figure 2.
24. Nav indicator needle deflects left or right when controller/amplifier or radio is turned on.	a. One of the components is shorted to ground.	a. Check for shorts.
25. Low or high intercept angle.	a. Incorrect setting on controller/amplifier.	a. Adjust intercept angle.
	b. Low or high voltage output on nav indicators.	b. Check nav indicators to manufacturer's specs.
PITCH AXIS		
1. Pitch channel will not center up electrically.	a. Defective pitch/altitude sensor or amplifier.	a. Check on Test Set TS-108 or replace one at a time.
2. Altitude channel will not center up electrically.	a. Defective pitch/altitude sensor or amplifier.	a. Check on Test Set TS-108 or replace one at a time.
3. Altitude hold solenoid valve will not actuate.	a. Pressure switch on servo control valve out of circuit.	a. Check for faulty switch and replace if necessary.
	b. Defective solenoid valve.	b. Replace solenoid valve.
	c. Defective altitude switch on controller/amplifier.	c. Check continuity. See System Block Diagram, Figure 2.
4. Servo control valve will not center.	a. Improper pressure adjustment.	a. Adjust pressure as outlined in Chapter 36.
	b. Sticky valve.	b. Replace valve.
5. Output voltage is inadequate.	a. Pitch/altitude amplifier sensor or harness shorted or improperly wired.	a. See System Block Diagram, Figure 2, run check for shorts.
6. Pressure switch will not make contact when pressure is on.	a. Defective pressure switch or not set at proper pressure.	a. Replace pressure switch.
7. Output voltage one way only on pitch and altitude channels.	a. Servo control valve shorted to ground.	a. Replace valve.

TROUBLESHOOTING
NEW-MATIC AUTOPILOT (Cont'd)

TROUBLE		*PROBABLE CAUSE*		*REMARKS*
PITCH AXIS (Cont'd)				
8. System will not maintain trimmed configuration even though centered electrically.	a.	Servo control valve not pneumatically centered.	a.	Disconnect electrical power. Center valve pneumatically by use of differential gage to ± .04 in Hg.
	b.	Leak in servos or improperly rigged.	b.	Check for leaks and rig.
	c.	Leak in pitch/altitude sensor.	c.	Replace sensor.
9. System will not respond to airspeed changes.	a.	Primary vacuum (pressure) not set properly.	a.	Adjust pressure as outlined in Chapter 36.
	b.	Pitot pressure inadequate.	b.	Check pitot plumbing.
	c.	Decay rate improperly adjusted.	c.	Adjust as required.
10. System will not respond to up command adjustment.	a.	Defective pitch/altitude amplifier.	a.	Replace pitch/altitude amplifier.
	b.	No EVT potentiometer.	b.	Replace turn coordinator.
11. System will not respond to altitude gain adjustment.	a.	Pitch/altitude amplifier limiter improperly set.	a.	Adjust as required.
12. Aircraft has long term oscillation about pitch axis with altitude hold OFF.	a.	Decay rate improperly adjusted.	a.	Adjust as required.
	b.	Pitch altitude gain improperly adjusted.	b.	Adjust as required.
	c.	Friction in elevator or servo system.	c.	Check for friction and correct.
13. Aircraft has short term oscillation about pitch axis.	a.	Decay rate too tight.	a.	Adjust as required.
	b.	Pitch gain too high.	b.	Adjust as required.
	c.	Primary pressure too high.	c.	Readjust pressure as outlined in Chapter 36.
14. Aircraft oscillates with altitude hold ON.	a.	Altitude gain too high.	a.	Adjust as required
	b.	Decay rate improperly adjusted.	b.	Adjust as required.
15. Aircraft does not return to altitude when displaced.	a.	Altitude hold solenoid inoperative.	a.	Replace solenoid.

TROUBLESHOOTING
NEW-MATIC AUTOPILOT (Cont'd)

TROUBLE	*PROBABLE CAUSE*	*REMARKS*
PITCH AXIS (Cont'd)		
15. Aircraft does not return to altitude when displaced. (Cont'd)	b. Leak in altitude system.	b. Check for leaks.
	c. Altitude limiter improperly adjusted.	c. Adjust as required.
16. Aircraft descends or ascends continually when system engaged.	a. Servo control valve not phased correctly.	a. Apply positive 6.0 volts (max) to blue lead and verify nose up response.

"END"

GENERAL - MAINTENANCE PRACTICES

NEW-MATIC AUTOPILOT

For maintenance, repair, troubleshooting and testing refer to the procedures described in the BEECHCRAFT New-Matic Autopilot B-8 Ground and Flight Check Procedures Manual (P/N 3957).

"END"

CHAPTER 23

LIST OF PAGE EFFECTIVITY

CHAPTER SECTION SUBJECT	PAGE	DATE
23-EFFECTIVITY/CONTENTS	1	Jun 13/84
23-60-00	1	Jun 13/84
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CHAPTER 23 - COMMUNICATIONS

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"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. It is also dangerous to personnel disembarking after landing and to personnel servicing the airplane. Therefore, static wicks are installed on the trailing edges of the flight surfaces and wing tips to aid in the dissipation of the electrical charge. Prior to serial P-581 two static wicks are installed on each wing tip, two on each elevator, and two on the rudder. At serial P-581 and after three static wicks are installed on each wing tip, three on each elevator, and three on the rudder.

"END"

STATIC DISCHARGING - MAINTENANCE PRACTICES

Prior to serial P-581 static wicks, two on each wing tip, two on each elevator, and two on the rudder, are bolted to the flight surfaces. Each of these ten static wicks are removed and installed in the same manner. Starting at serial P-581 and after, there are three static wicks on each wing tip, each elevator, and the rudder. These fifteen static wicks are screwed into their bases which are riveted to the flight surfaces. These bases should not need to be removed in normal service.

STATIC WICK REMOVAL (Prior to P-581)

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 P-581)

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, and solvent (41, Chart 201, 91-00-00). The mating surfaces must be smooth and contoured so that maximum surface area is in actual contact.

NOTE

Acceptable substitutes for the preceding may be used in accordance with MIL-B-5087B or the surface may be prepared in accordance with MIL-M-3171C.

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.

b. Install the wick, using the two screws and lock washers.
c. Refinish the surface area around the wick attachment point with the original finish or a clear laquer conforming to MIL-L-6806.

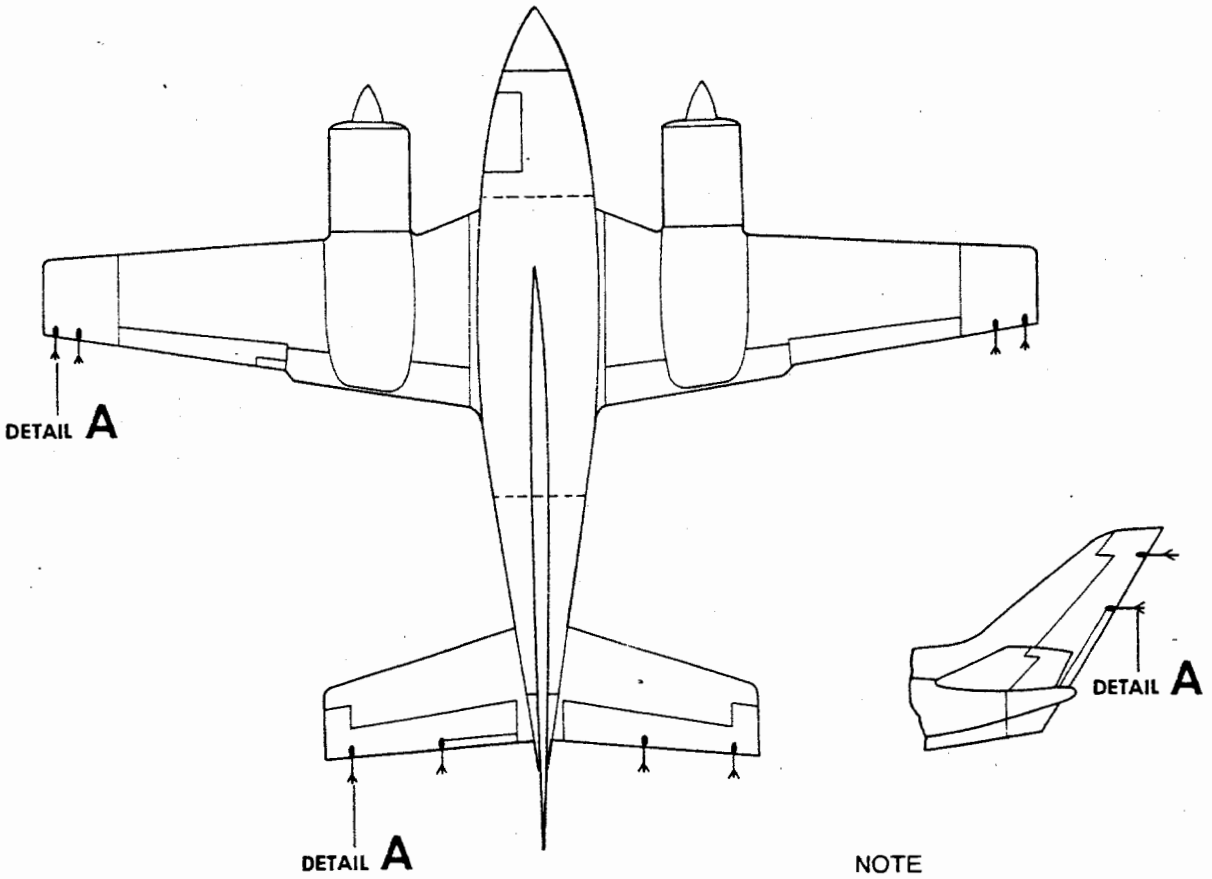
STATIC WICK REMOVAL (P-581 and after)

a. Unscrew the static wick from the base.
b. Remove the static wick and lock washer.

STATIC WICK INSTALLATION (P-581 and after)

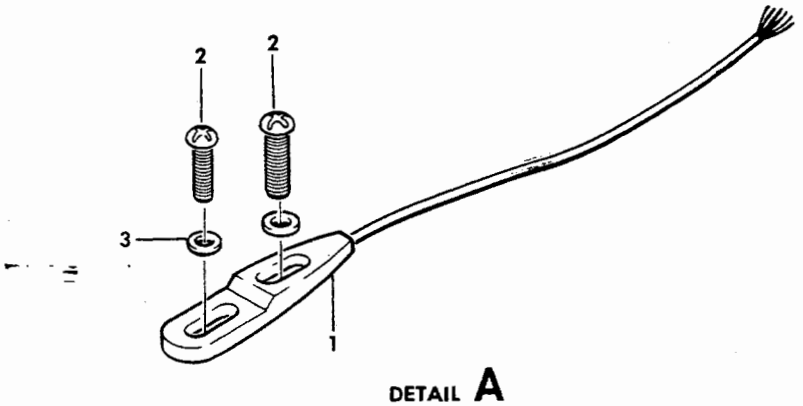
The threads must be clean and free of grease, oil and paint.

a. Install the static wick and lock washer.
b. Torque the static wick to 4.7 inch-pounds.



NOTE

The static wick installation shown is for airplanes prior to P-581 with static wicks installed in groups of two (ten per airplane). On later serials the static wicks are installed in the same general location, in groups of three (fifteen per airplane). Detail "A" is only for the earlier installation.



Static Wicks
Figure 201

"END"

BEECHCRAFT
DUKE 60 SERIES
MAINTENANCE MANUAL

CHAPTER 24

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"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 only the fuel flow indicator, windshield heat, and some avionics. The inverter for the fuel flow indicator is a small unit designed to supply power only to this instrument. An inverter is installed for the operation of the left windshield heat and is activated by a switch on the pilot's subpanel marked L. WSHLD - OFF. This inverter is also used as a standby for the avionics inverter.

Avionics power is obtained by two switches mounted on the upper switch panel. One is marked MASTER - OFF and activates power to the avionics equipment. For that equipment requiring ac current, a three position switch marked MN INV - OFF - STBY INV must be placed in the MN INV position. Should a failure occur in the main inverter, the switch can be placed in the STBY INV position. This opens a relay to direct the current from the windshield heat inverter to the avionics provided the L. WSHLD switch is on. Because the STBY INV switch position is designed only to direct the current flow, no power can be supplied to the avionics with the L. WSHLD switch in the OFF position. Power for the operation of both systems cannot be supplied by this inverter at the same time.

AC VOLTAGE FREQUENCY INDICATOR

On airplanes that are equipped with the AC Voltage Frequency Indicator, the instrument is located in the pilot's instrument panel below and to the left of the standard turn and slip instrument. This instrument informs the flight crew when the ac voltage and frequency are not within the required limits for accurate operation of the ac power to the turn and slip, directional gyro, attitude and gyro horizon. Two terminal posts are located on the back of the instrument. The electrical wire leading from the main bus is connected to the left terminal post and the line supply is connected to the right terminal post.

DC GENERATION

GENERATORS

The Duke 60 Series electrical system includes two 125 ampere generators. The generators are isolated from the airplane bus by reverse current diodes and generator control relays, and are regulated individually by a carbon-pile type regulator. The circuit of each generator contains an overvoltage relay to protect the airplane system from excessive voltage. Paralleling relays are used to connect the equalization circuits of the voltage regulators and to sense generator output to the annunciators in the pilot's compartment.

BATTERY

The Duke 60 Series airplanes, P-4 through P-225, are equipped with either General Electric or Gulton nickel-cadmium batteries. P-226 through P-445 are equipped with General Electric air cooled nickel-cadmium batteries. For maintenance on these type batteries, refer to BATTERY MAINTENANCE PROGRAM (Airplanes prior to P-446), Chapter 24-31-00.

Airplanes P-446 and after are equipped with two 12 volt lead-acid batteries connected in series to provide 24 volts. To obtain optimum service from the twin battery, proper and regular maintenance of the batteries must be performed. For maintenance procedures on the lead-acid batteries, refer to BATTERY MAINTENANCE PROGRAM (P-446 and after), Chapter 24-31-00.

BATTERY CHARGE CURRENT DETECTOR SYSTEM

The battery charge current detector system installed on airplane serials P-243 through P-445 and those prior airplanes which have complied with Service Instructions No. 0587-356, provides an indication of the amount of battery charge current.

The system consists of a shunt in the negative lead of the battery, a current detector assembly located adjacent to the battery and a yellow caution light (BATTERY CHARGE) on the annunciator panel. The detector assembly receives power through a 5 ampere circuit breaker. The system senses the battery current through the shunt. Any time the battery charge current exceeds approximately 3 amperes for a period longer than approximately 6 seconds, the yellow light will be illuminated.

"END"

TROUBLESHOOTING
GENERATOR SYSTEM

	TROUBLE		*PROBABLE CAUSE*		*REMARKS*
1.	Zero or low charge indicated.	a.	Engine speed too low.	a.	Increase speed.
		b.	Loose connections.	b.	Check connections throughout system.
		c.	Open or shorted field circuit in generator; defective armature.	c.	Test resistance of field. Check field circuit connections. Replace generator if defective.
		d.	Brushes not contacting commutator.	d.	Clean brushes and holders with a clean lint-free, dry cloth. Replace weak springs.
		e.	Brushes worn out.	e.	Replace brushes if worn to a length of 1/2 inch or less.
		f.	Dirty commutator.	f.	With generator running, clean commutator with No. 0000 sandpaper. Use filtered air jet to remove grit.
		g.	Defective voltage regulator.	g.	Replace regulator.
		h.	Defective loadmeter.	h.	Replace loadmeter.
2.	No generator output.	a.	Current limiter blown.	a.	Check for short circuit; replace.
		b.	Open circuit.	b.	Check continuity of circuit.
		c.	Defective generator control switches, generator control relay, or reverse current diode.	c.	Test switches, relay, or diode. Replace if defective.
		d.	Generator not turning.	d.	Check generator drive belts. Replace if necessary.
3.	Low generator output.	a.	Generators not paralleled.	a.	Readjust minimum-load voltage. Then readjust paralleling rheostats.
4.	Loadmeter reads off scale in wrong direction.	a.	Generator field magnetized in wrong direction.	a.	Flash field. (Do not flash field when generator is running.)
5.	Loadmeter does not read.	a.	Loose connection or ground in airplane wiring.	a.	Check entire system.
		b.	Open fuse in loadmeter circuit.	b.	Check for short circuit; replace.

"END"

DC GENERATION - MAINTENANCE PRACTICES

GENERATOR REMOVAL

a. Remove the lower engine cowling.
b. Remove the generator wiring.
c. Remove the generator cooling air duct.
d. Remove the bolt from the adjusting bracket and loosen the attaching bolts of the mounting bracket until the generator can be rotated to permit removal of the drive belts from the generator.
e. Remove the attaching bolts and remove the generator from the airplane.

GENERATOR INSTALLATION

a. Secure the generator to the mounting brackets with the attaching bolts. Leave the bolts loose enough to allow the generator to rotate sufficiently to install the drive belts.

NOTE

To equalize belt service life, the belts must be replaced in pairs.

b. Install the bolt and washer in the adjusting bracket.
c. Position the generator in the mounting brackets so that a four pound pressure applied at the center of the belts will result in 1/4 inch deflection. Tighten the attaching bolts to a torque of 160 to 190 inch-pounds.
d. Safety as necessary.
e. Attach the generator cooling air duct.
f. Attach the electrical wiring and tighten securely.

GENERATOR BRUSH REPLACEMENT

During periodic maintenance inspections, the generator brushes should be inspected for cracks, chipped edges, loose or frayed wire. A lateral groove in the edge of the brush is an indication of the minimum wear length (approximately 1/2 inch). The brush should be replaced if it has been worn to the indicator or if it is obvious that the brush will reach the minimum length before the next inspection time.

New brushes must be properly seated on the commutator surface before the generator is subjected to heavy loads to prevent arcing which will cause burning and pitting of the commutator. New brushes should be sanded and run-in to properly seat them on the commutator surface. Refer to the applicable Vendor Publication (Chapter 20-00-00) for replacement and run-in procedures.

OVERVOLTAGE RELAYS

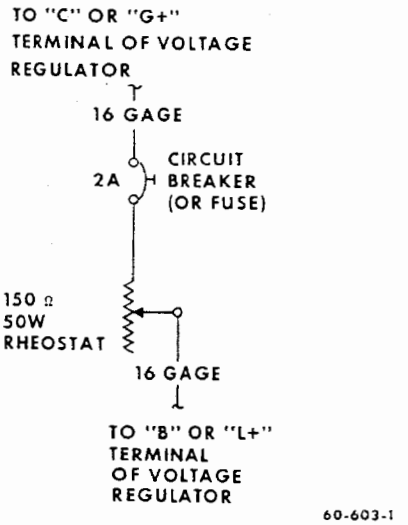
No attempt should be made to adjust the overvoltage relays. They are preset at the factory to trip at a voltage of 33.00 + 0.0 − 0.25 volts. When the relay is determined defective, it should be replaced with a new or exchange relay.

OVERVOLTAGE RELAY CHECK (Figure 201)

The overvoltage relays should be functionally checked for proper operation at 500 hour intervals or whenever an overvoltage relay, voltage regulator or generator is replaced. This test may best be accomplished in the airplane.

A variable resistance introduced in series with the voltage regulator input will allow the generator system to be driven into an overvoltage condition without disturbing the voltage regulator adjustment. The electrical components involved in this check are located in the electrical equipment compartment, immediately aft of the LH nacelle firewall. Test each overvoltage relay separately as outlined in the following procedure:

a. Attach a set of 16 gage test leads to a 2 ampere circuit breaker (or fuse) and a 150 ohm rheostat with a minimum rating of 50 watts.
b. Disconnect the wire, P117A18, from the voltage regulator base terminal which may be marked "B" or "L+". Then, disconnect the wire P116A18 from the terminal marked "C" or "G+".



Overvoltage Test Circuit
Figure 201

NOTE

Refer to the Wiring Diagram Manual, P/N 60-590001-29, for the applicable wiring code.

Attach the test lead from the wiper contact of the 150 ohm rheostat to the "B" or "L+" terminal of the RH voltage regulator.

c. Attach the test lead from the 2 ampere circuit breaker (or fuse) to the "C" or "G+" terminal of the RH voltage regulator. Do not remove the existing wire from the "C" or "G+" terminal.

d. Monitor the overvoltage relay trip voltage with a precision voltmeter that is known to be accurate within one percent over a range of 0 to 50 volts. Connect the voltmeter test leads to the voltage test jacks located on the right circuit breaker panel (P-436 and after). On airplanes prior to P-436, connect the positive lead of the circuit breaker bus behind the subpanel. Connect the negative lead of the voltmeter to the airplane structure.

e. Adjust the 150 ohm rheostat to its minimum resistance setting.

CAUTION

To prevent excessive overvoltage, check the resistance with an ohmmeter to ensure the rheostat is set for minimum resistance prior to initiating this test. Do not operate the system above 29 volts for more than two minutes during the test. If the battery is subjected to voltages in excess of 32 volts for more than two minutes, the battery must be removed from the airplane and completely serviced.

f. Start the engines and advance the throttles as required to obtain desired voltage output.

g. Turn off all switches and circuit breakers except the battery master switch and the generator protection circuit breakers.

CAUTION

Should the test equipment be improperly installed, the airplane electrical equipment may be damaged unless all switches and circuit breakers except those noted above are turned off.

h. After the airplane's loadmeters stabilize at a point below 10 percent of full scale, observe the precision voltmeter while slowly increasing the resistance setting of the 150 ohm rheostat. A sharp drop in voltage will indicate the operation of the voltage relay. This should occur when the precision voltmeter registers a reading of 32 to 34 volts. The GENERATOR OUT light on the annunciator panel should illuminate at the same time the overvoltage relay trips. If the overvoltage relay does not operate within the prescribed limits, it should be replaced with a new one, then rechecked for proper operation as in steps "f" through "h".

VOLTAGE REGULATOR ADJUSTMENT AND GENERATOR PARALLELING

It is desirable that both generators share the electrical load equally. To obtain this condition, the voltage regulators and the paralleling rheostats must be properly adjusted. The paralleling rheostats and voltage adjustment potentiometers are located in the cabin (P-466 and after) for convenient and precise adjustments. The adjustment procedure is outlined in the following paragraphs.

PRELIMINARY POTENTIOMETER CHECK

A potentiometer located on each voltage regulator in the left nacelle, must be permanently adjusted to minimum resistance (fully ccw). If the regulators have been changed or the setting altered for any reason, remove the access cover on top of the left nacelle, aft of the engine cowling, and ensure that these potentiometers are adjusted fully counterclockwise. No other adjustments or connections to component located within the nacelle compartment will be necessary for voltage and paralleling settings.

PRELIMINARY ADUSTMENT OF PARALLELING RHEOSTATS.

a. On airplanes prior to P-466, open the electrical components compartment access cover on top of the left nacelle aft of the engine cowling. On P-466 and after, remove the access panel (placarded GENERATOR VOLTAGE ADJUSTMENT) located behind the copilot's seat on the right side.

b. On airplanes prior to P-466, connect the negative lead of a voltmeter to terminal "D" on the left voltage regulator base and the positive lead to the airplane structure. (Terminal "D" carries a voltage that is negative with respect to the airplane structure.) On P-466, connect the negative lead of a voltmeter to the terminal point of wire P113B18 on the left paralleling rheostat and the positive lead to the terminal point of wire P113C18N on the same rheostat. (The negative test point carries a voltage that is negative with respect to the airplane structure.)

c. Operate the LH engine with the generator charging and carrying a moderate to heavy electrical load.

CAUTION

Monitor the bus voltage as soon as the generators are turned on. Voltages in excess of 32 volts for two minutes will damage the battery.

d. Monitor the voltmeter and turn the LH paralleling rheostat first clockwise then counterclockwise to determine which direction of rheostat rotation results in an increasing negative voltage.

e. Turn the LH paralleling rheostat to a maximum negative voltage then decrease the voltage by turning the rheostat back 1/8 turn.

f. Repeat steps "c", "d", and "e" for the RH system.

STABILIZATION OF GENERATOR SYSTEM

The generators and regulators must be stabilized for temperature changes before any final adjustments are attempted. Operate both engines at approximaely 1,000 rpm with both generators ON and a heavy electrical load turned on. Use the lights, blowers, radio equipment, etc. to obtain a 20% electrical load for each generator. Allow a minimum of 20 minutes to stabilize the system.

CAUTION

Do not operate the heated windshield or pitot heat for extended periods during ground operation. Excessive heat buildup may cause damage to these components.

VOLTAGE ADJUSTMENT (MINIMUM LOAD)

PRIOR TO P-466

On airplanes prior to P-466, the voltage regulators are adjusted to produce a voltage of 28.25 ± 0.25 volts measured at the battery relay with a minimum electrical load on the system as follows:

NOTE

If the airplane is to be operated continuously where temperatures are 32°F or below, the voltage should be adjusted to 28.50 ± 0.25 volts.

a. Connect the positive lead of a portable precision voltmeter to the battery relay. The meter must be capable of measuring 28.25 volts with an accuracy of 1%. Connect the negative lead of the voltmeter to a good ground.

b. Operate both engines at 1 300 to 1 500 rpm with both generators ON, and the electrical load reduced to a minimum.

c. Turn the RH generator OFF. Determine the bus voltage as maintained by the LH generator.

d. Turn RH generator ON and LH generator OFF. Determine the bus voltage as maintained by the RH generator.

e. Turn the LH generator ON, and idle the engines.

NOTE

Maintain temperature stabilization by operating the generators individually for only short periods.

f. Make the necessary voltage adjustments by turning the voltage adjusting potentiometer on the voltage regulator clockwise to increase the voltage and counterclockwise to decrease the voltage. Make the adjustments in small increments only. Allow ample time for the voltage to stabilize before making further adjustment.

g. Repeat steps "b" through "f" until the minimum load voltage is satisfactory.

CAUTION

Never adjust the core or carbon pile adjusting screw (slotted heads in the ends of the regulators). The regulating characteristics of the regulators will be altered as well as the voltage setting.

P-466 AND AFTER

On airplanes P-466 and after, the voltage regulators are adjusted to produce a voltage of 28.25 ± 0.25 volts measured at the main bus with a minimum electrical load on the system as follows:

NOTE

If the airplane is to be operated continuously where temperatures are 32°F or below, the voltage should be adjusted to 28.50 ± 0.25 volts.

a. Connect the positive lead of a portable precision voltmeter to the positive (red) test jack located on the right circuit breaker panel. Connect the negative lead to the negative (black) test jack. The meter must be capable of measuring 28.25 volts with an accuracy of ± 0.25 volts.

b. Operate both engines at 1300 to 1500 rpm with both generators ON, and the electrical load reduced to a minimum. Adjustment of both voltage potentiometers in steps "c" and "d" will provide an increase in voltage when the potentiometers are turned clockwise. Make the adjustment in small increments only. Allow ample time for the voltage to stabilize before making further adjustments.

c. Turn the right generator OFF and adjust the left voltage potentiometer to 28.25 ± 0.25 volts.

d. Turn the right generator ON and the left generator OFF and adjust the right voltage potentiometer to 28.25 ± 0.25 volts.

e. Repeat steps "c" and "d" until the minimum load voltage is satisfactory.

CURRENT ADJUSTMENT (MAXIMUM LOAD)

The paralleling rheostats are adjusted to produce equal outputs from the generators at heavy loads.

a. Check the accuracy of the loadmeters on the instrument panel by alternately switching from one generator to the other while a normal load is turned on. If equal readings are obtained as each generator supplies the current individually, the loadmeters are satisfactory. If excessive deviation in loadmeter readings exist, the loadmeters should be replaced.

b. Operate both engines at 1 300 to 1 500 rpm with both generators ON. Turn on all feasible electrical loads using lights, blowers, radio equipment, etc, except pitot heat and heated windshield.

c. Read the loadmeters. Each generator should take its share of the load within 10% of the loadmeter full scale reading.

d. Adjust the paralleling rheostats until the load is equally shared by increasing the output from the low generator and decreasing the output from the high generator.

NOTE

To maintain sensitivity, keep both rheostats as near the maximum voltage end of the rheostat as possible. There is a possibility of excessive sensitivity resulting in a "hunting" condition. Should such a condition be encountered, sensitivity may be reduced by turning both paralleling rheostats away from the high voltage end.

e. Check both minimum current voltage and ma imum current paralleling at cruise engine rpm (2,750 rpm

FINAL PARALLELING CHECKS

PRIOR TO P-466

a. Secure the access cover in place using sufficie fasteners to hold the cover securely in place during engi operation.

b. Stabilize the regulator and generator temperatur as outlined in STABILIZATION OF GENERATOR SYSTEI

c. Check both minimum load voltage and maximu current paralleling at cruise engine rpm (2,750 rpm).

d. Remove the cover and make any necessary a justments. Replace the access cover and repeat the chec

e. After determining that the adjustments are sat factory, secure the access cover in place using all fastene

P-466 AND AFTER

a. Stabilize the regulator and generator temperatur as outlined in STABILIZATION OF GENERATOR SYSTE

b. Check both minimum load voltage and maximu current paralleling at cruise engine rpm (2750 rpm).

c. Make all necessary adjustments before replaci the access panel.

"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 master switch.	b.	Check continuity.
		c.	Master switch defective.	c.	Check switch for operation.
		d.	Defective relay.	d.	Check relay operation.
2.	Power on with master switch in OFF position.	a.	Master switch defective.	a.	Check switch for operation.
		b.	Relay contacts stuck.	b.	Check and replace relay if necessary.

TROUBLESHOOTING
NICKEL-CADMIUM BATTERY

1.	Apparent loss of capacity.	a.	Cells unbalanced.	a.	Equalize cell voltage by performing full capacity discharge cycle.
		b.	Electrolyte level too low.	b.	Charge, adjust electrolyte level, and capacity test.
		c.	Charging rate too low in airplane.	c.	Check and adjust airplane charging system.
		d.	Too little usage or shallow discharges.	d.	See "a" above.
2.	Complete failure to operate.	a.	Loose or broken lead.	a.	Repair or replace.
		b.	Loose or disengaged terminals in battery.	b.	Repair or replace any damaged hardware, and capacity test.
		c.	Battery not charged.	c.	Charge and capacity test.
		d.	Cell open internally.	d.	Replace defective cell and capacity test.
3.	Excessive spewage (crystalline deposits on outside of cells).	a.	Excessive charge rate.	a.	Clean the battery, recondition, adjust the electrolyte level and capacity test. Adjust voltage regulator of airplane.
		b.	Electrolyte level too high.	b.	Clean cell.
		c.	Vent caps loose or broken.	c.	Clean cell, replace or tighten vent cap.
		d.	Cracked cell case.	d.	Replace cell, clean battery.

TROUBLESHOOTING
NICKEL - CADMIUM BATTERY (Cont'd)

	TROUBLE		*PROBABLE CAUSE*		*REMARKS*
4.	Cell cases distorted.	a.	Excessive charge rate.	a.	Clean the battery, recondition, adjust the electrolyte level and capacity test. Adjust voltage regulator of airplane.
		b.	Cell with internal short.	b.	Replace defective cell, recondition and capacity test.
		c.	Plugged vent caps, minor explosion.	c.	Disassemble, replace defective parts, clean the battery, recondition and capacity test.
5.	Unequal voltages among cells.	a.	Cells unbalanced.	a.	Equalize cell voltages (perform a full capacity discharge cycle) and capacity test.
6.	Foreign matter within cells.	a.	Impure or acid-contaminated water.	a.	Such cells will not normally respond to charging. They will show up as unbalanced cells and must be replaced.
7.	Frequent addition of water.	a.	Unbalanced cells.	a.	Equalize cell voltages.
		b.	Leaky or defective cells, damage to O-ring or vent cap.	b.	Replace defective parts and inspect for electrolyte leakage. Clean, recondition and level electrolyte.
8.	Burn marks on connectors.	a.	Loose connectors.	a.	Tighten connectors.
9.	Overheating of inter-cell connectors.	a.	Loose or dirty inter-cell connectors.	a.	Disassembly, clean, reassemble and properly torque inter-cell connectors, and capacity test.
10.	Foam or bubbling during charging.	a.	Oil or grease contamination in the electrolyte.	a.	Replace defective cells.
		b.	Low concentration of electrolyte.	b.	Recondition, replace cells that continue to foam.
11.	Below normal output.	a.	Battery switch left ON.	a.	Recharge and capacity test.
		b.	Voltage regulator set too low.	b.	Recharge and capacity test. Reset voltage regulator.
		c.	Internal connection links loose.	c.	Torque, recharge and capacity test.
		d.	External connector burned or pitted.	d.	Clean or replace, recharge and capacity test.
		e.	Cell case current leakage.	e.	Disassemble, clean and recondition, replace any defective cells, and capacity test.

TROUBLESHOOTING
LEAD-ACID BATTERY

	TROUBLE		*PROBABLE CAUSE*		*REMARKS*
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.
		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.

TROUBLESHOOTING
LEAD-ACID BATTERY

	TROUBLE		*PROBABLE CAUSE*		*REMARKS*
9.	Cracked cell jars.	a.	Hold down loose.	a.	Replace battery.
		b.	Frozen battery.	b.	Replace battery.

"END"

DC GENERATION - MAINTENANCE PRACTICES

BATTERY MAINTENANCE PROGRAM (Airplanes prior to P-446)

A Systematic Battery Maintenance Program should be established and carefully followed.

CAUTION

Methods of servicing lead-acid batteries do not apply for the servicing of nickel-cadmium batteries.

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

b. A log of the services performed on each battery should be maintained.

c. The battery should be removed from the airplane and serviced after: 100 flight hours or 30 days, whichever occurs first. If the ambient temperatures are above 90°F or the time between engine starts averages less than 30 minutes, the duty cycle should be reduced.

d. The log of battery services performed should be evaluated to determine the need to service the battery at the above recommended intervals or to extend the intervals if justified. Accurate water consumption data is a valid barometer to use for adjustment of the servicing intervals.

Since the proper battery servicing requires two days, an additional battery (or batteries) will be required where airplane utilization warrants. For additional information on battery maintenance, refer to Gulton Instructions for Use and Care of Sintered Plate Vented Nickel-Cadmium Storage Batteries (P/N ABD-1100), or Marathon Battery Instruction Manual (P/N BA-89), or Operating and Service Manual for General Electric Nickel-Cadmium Vented-Cell Batteries (P/N GET-3593A), which ever the airplane is equipped with. Advisory Circular AC 00-33, printed by Department of Transporation, Federal Aviation Administration, is another good source of battery maintenance information.

MAINTENANCE LOG

Customers are advised to keep a complete and up-to-date maintenance log on each battery. This information will help determine the source of any battery problems and will assist in substantiating warranty claims. A sample format for a maintenance log is illustrated on the following page.

BATTERY REMOVAL

a. Remove the upper access door to the electrical equipment compartment, aft of LH nacelle firewall.

b. Cut the safety wire and remove the battery quick-disconnect.

c. On serials P-226 through P-445, equipped with General Electric air cooled batteries, disconnect the cooling ducts.

d. Disconnect the battery vent tubing.

e. Cut the safety wire, remove the two nuts from the battery hold-down bar and lift the battery out of the well.

PRE-INSTALLATION INSTRUCTIONS FOR NICKEL-CADMIUM BATTERIES

Unless otherwise indicated by a red warning tag, a nickel-cadmium battery is shipped in fully discharged state and contains the proper amount of electrolyte.

Observe the following precautions to ensure maximum performance and to protect the battery warranty.

a. Do not remove the shorting strap until prepared to charge the battery. Batteries from which the shorting strap has been removed (for even a short period of time) must be considered in an unknown state of charge condition and must be completely discharged prior to charging and installation.

b. Inspect batteries shipped from the factory for shipping plugs in the vent holes of each of the battery cells. The blunt aluminum screws that serve as shipping plugs must be removed prior to operation of the battery. The Bunson valves, included with the battery in a separate plastic bag, should then be screwed into the vent cap assembly in place of the screw plugs. The Bunson valves will release excessive pressure from gas accumulation to prevent cell rupture.

NOTE

On batteries not equipped with the screw-type plugs and Bunson valves, remove the shipping plugs and clean the filler cap vent plugs as noted under CLEANING AND INSPECTION. Retighten the cell vents with the vent plug wrench included with the battery.

c. Check for a torque of 6 foot-pounds on the terminal screws securing the cross links connecting the cells together.

d. Before charging, determine that all cells are properly installed by making a cumulative voltage check.

e. After determining the battery is in good physical condition and is properly assembled, it should be charged as outlined under BATTERY CHARGING and the electrolyte level adjusted.

BATTERY INSTALLATION

a. Place the battery in the well, install the battery hold-down bar and the two nuts. Safety wire the nuts.

MAINTENANCE LOG

Catalog No. _____ Serial No. _____

Date Installed _____ On _____

REMOVAL DATE AND REASON	GENERAL CONDITION			END OF CC CHARGE VOLTAGE RANGE		ELECTROLYTE LEVEL	ELECTRICAL LEAK CHECK	CAPACITY	REMARKS
M — Maintenance F — Failure (Indicate Type)	Case and Cover	Hardware and Liners	Cells and Vents	Lowest Reading Minimum 1.50	Highest Reading Maximum 1.70				Indicate: Average water added, hardware or cell replacements, burns or discolorations, etc.

b. Connect the battery vent tubing.

c. On serials P-226 and after, connect the cooling ducts.

d. Install the battery quick-disconnect and safety wire.

e. Reinstall the upper access door aft of the LH nacelle firewall.

BATTERY CHARGING

The two basic methods of charging nickel-cadmium batteries are the constant potential and constant current methods. Variations of the two basic methods may be incorporated in automatic equipment.

WARNING

Complete servicing of the battery is required if the battery is subjected to more than 32 volts for 2 minutes.

SPECIAL NOTES ON CHARGING

The following special comments are made with respect to charging nickel-cadmium batteries:

a. Charging is most efficient at battery temperatures between 40°F and 80°F.

b. Two or more batteries may be charged in parallel on a constant potential charging bus, provided the charging equipment has the proper current producing capability.

c. Do not charge batteries in parallel using the constant current method.

d. Do not charge individual cells unless the plastic case is supported on each side. A special frame may be built to fit the cell, or two boards or plates may be placed on each side of the cell and held together by a C-clamp. The sides of the cell must be kept flat during charging.

e. Perform necessary inspection, cleaning and repairs before charging.

f. Do not energize charging equipment until after the battery has been connected to the charging circuit.

g. When charging a battery in the shop, a thermometer should be placed so that the bulb is below and between the top of the cells. Do not place on charge any battery that has a temperature of 100°F or higher.

h. The foam sometimes seen in cells during charging does not indicate a defect. Foaming usually occurs after water is added and will disappear after a few cycles of operation.

The various charging procedures for the nickel-cadmium battery are outlined in the following paragraphs:

CONSTANT CURRENT CHARGING

CAUTION

Monitor the battery closely during charging (especially during the latter stages) to prevent an overcharge that will heat up and damage or destroy the battery.

AIRCRAFT BATTERY INSTALLATION CHECKLIST

- ○ *INSPECT FOR VISIBLE DAMAGE*
- ○ *REMOVE SHIPPING HARDWARE*
- ○ *ENSURE THAT ALL CONNECTORS ARE PROPERLY TIGHTENED*
  (Do not level electrolyte on new battery prior to charging.)
- ○ *CONNECT BATTERY CORRECTLY TO CHARGER*
- ○ *CHARGE BATTERY (Constant current recommended)*
- ○ *MEASURE END-OF-CHARGE VOLTAGE*
- ○ *REST BATTERY 2 TO 4 HOURS*
- ○ *CHECK ELECTROLYTE LEVEL*
- ○ *CLEAN AND CHECK AIRCRAFT'S BATTERY CONNECTOR*
- ○ *INSTALL BATTERY*
- ○ *CHECK AIRCRAFT'S BATTERY CHARGER SYSTEM*

PREVENTIVE MAINTENANCE CHECKLIST

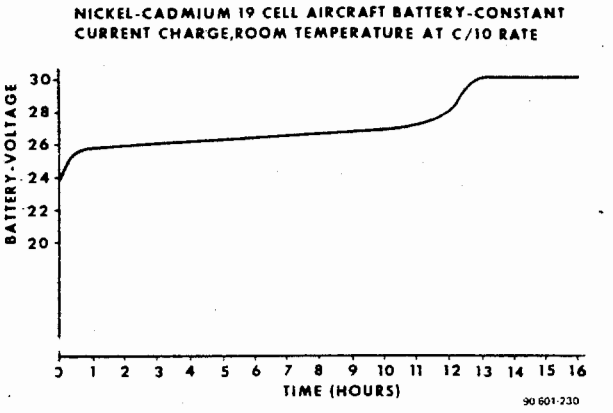
- ○ *CLEAN BATTERY*
- ○ *INSPECT FOR VISIBLE DAMAGE*
- ○ *WASH VENT CAPS*
- ○ *RECONDITION*
  - ○ *DISCHARGE AND SHORT*
  - ○ *CONSTANT CURRENT CHARGE*
  - ○ *MEASURE END-OF-CHARGE VOLTAGE*
- ○ *REST BATTERY 2 TO 4 HOURS*
- ○ *LEVEL ELECTROLYTE*
- ○ *MEASURE ELECTRICAL LEAKAGE*
- ○ *DISCHARGE, MEASURING CAPACITY*

Although slower, the constant current method is the recommended way of charging the battery. Most shops are equipped with constant current chargers. In cases where the chargers are limited to 6 ampere capability, it will be necessary to start the charge of most batteries at a lower rate than recommended on the battery nameplate. If a reduced rate is used, a longer charging time is required. The constant current method is much more effective in correcting cell imbalance and temporary loss of capacity, and it permits easy computation of the charge capacity in ampere-hours. When using this method, one must usually monitor and maintain the constant current by manually adjusting the charger.

The following procedures for constant current charging are generally applicable to all aircraft nickel-cadmium storage batteries:

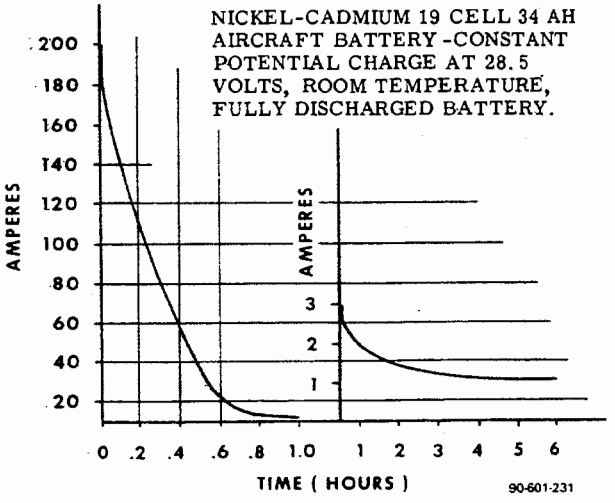
a. The time required to charge a nickel-cadmium storage battery varies with respect to the discharging current, capacity rating, and amount of charge already in the battery. If fully discharged, the battery should be charged to 140 percent of its nominal ampere-hour rating.

b. When using the constant current method of charging, the battery may be charged in two steps by using the START rate of current and the FINISH rate of current. (Lower starting rates may be used if required by such factors as equipment limitations.) These rates are usually given on the battery nameplate. The two step method is commonly used by the military. Single rates, slow or fast, are usually preferred by commercial service shops because of their simplicity. The single fast charging rate is 2.7



Constant Current Charge at C/10 Rate
Figure 201

amperes per hour for the 13.5 ampere-hour battery for seven hours. The slow charging rate is 1.4 amperes per hour for the 13.5 ampere-hour battery for 14 hours. See Figure 201 for slow (capacity/10), single rate, constant current charging voltage. A battery is charged at the START rate until the battery temperature takes a sharp rise or until the terminal voltage (while battery is charging) reaches 29.5 volts (for a 24-volt 19-cell battery). When the 29.5 volt point is reached or the temperature takes a sharp rise, the charging current is reduced to the FINISH rate and continued until one-third of the initial charge in ampere-hours is added. When the voltage rises to 29.5 volts, the charge received by the battery is approximately equal to that removed when it was previously discharged. The addition of ampere-hours at the FINISH rate equal to one-third of the ampere-hour input at the START rate will usually ensure that the battery is fully charged.



Constant Potential Charging
Figure 202

c. The time required for completing the charge at the FINISH rate may be computed by the following formula:

$$T_F = \frac{I_S \times T_S}{3 \times I_F}$$

T_F = Time, in hours, required for finishing charge.

I_S = Starting charge rate in amperes.

T_S = Time, in hours, of charge at the starting rate until 29.5 volts or temperature rise occurs.

I_F = Finish rate in amperes.

As an example, assume that a 20 ampere-hour battery is charged at a start rate of 8 amperes for 2 hours, at which time the voltage rises to 29.5 volts. The ampere-hour input at the start rate is then $I_S \times T_S = 16$ ampere-hours. The ampere-hours of additional charge required are $(I_S \times T_S)/3 = T_F \times I_F = 16/3 = 5.3$. If a finish rate of 2 amperes is used, the finish rate charge time will be:

$$T_F = \frac{I_S \times T_S}{3 \times I_F} = \frac{16}{3 \times 2} = 2.7 \text{ hours}$$

d. While the battery is being charged, the charging current should be kept constant at the rate being used. If the battery charger is not a self-regulating type, this operation can be achieved by manually adjusting the charger on a periodic basis.

e. During the finish charge, the individual cell voltages should be measured with a precision voltmeter to determine if all cells are rising evenly. Should some cells indicate a voltage lower than the others by .05 volts or more, it is advisable to leave the battery on charge a while longer for additional equalization. Do not allow the battery to overheat.

CONSTANT POTENTIAL CHARGING

Nickel-cadmium batteries can be charged much faster by the constant potential method, but the charging time will depend on the current-delivery capability (300 ampere generators are good charging sources). A disadvantage of constant potential charging is that full capacity cannot normally be restored if a battery suffers from temporary loss of capacity. It should also be noted that such a loss of capacity is quite common in batteries after prolonged use in the aircraft.

a. Vented, 19-cell, 24-volt, nickel-cadmium batteries will normally be charged at 28.5 volts in the shop when charging with a constant potential voltage. Note that charging a 19-cell battery at 28.5 volts is equivalent to charging each cell at 1.50 volts. The initial charging current may be as high as 10 times the ampere-hour rating of the battery, depending on the amount of charge already in the battery. The high initial current will not damage the battery, but the charging equipment should have an inherent current-limiting capability or be provided with overload protection.

b. The time required to charge will depend primarily on the current-delivery capability of the charging unit. The lower the charging current, the longer the time required to charge. If the battery does not suffer from temporary loss of capacity, nearly full charge (approximately 90 percent of rated capacity) may be restored within 1 hour at 28.5 volts charging potential, provided the charging equipment is also capable of delivering current equal to 2 to 3 times the ampere-hour rating of the battery. (See Figure 202.)

CAUTION

When a battery is connected to a constant potential charging source, the initial high charging current will damage any 0-25 or 0-50 ampere-scale ammeter connected in series with the battery.

c. An ammeter with a range of zero to 25 or zero to 50 amperes should be connected in series with the battery and power source to monitor the charging current when the master generator panel meter indicates that the current has dropped sufficiently. Charging should continue until the ammeter indicates a current flow of 1 ampere or less, or until a maximum time of 4 hours has elapsed.

d. Should a battery be severely discharged, charging by the constant potential method may produce a slight imbalance in cell capacity. The imbalance can be detected by a periodic check of the cell terminal voltages with a precision voltmeter after the charging current levels off to a few amperes while the battery is charging. Should some cells differ from others by more than .05 volts, connect the battery to a constant current source and charge for 14 hours at a rate of 1.4 amperes on a 13.5 ampere-hour battery. If the cells still fail to equalize, perform an equalization charge.

BATTERY STAND-BY CHARGING

Since the self-discharge rate of a nickel-cadmium battery is approximately 1.2 percent per day at normal temperatures, standby charging is required to maintain a battery at its full rated capacity. For standby charging in the temperature range of 60°F to 90°F, use a current equal to .003 ampere per each ampere hour of rated capacity. Batteries on stand-by charge must be regularly checked to ensure adequate electrolyte level.

CAPACITY RECONDITIONING

The capacity of a nickel-cadmium battery does not decrease appreciably with age. However, there can be a temporary

loss of capacity under certain duty cycles. A temporary loss of capacity is normally an indication of imbalance between cells. Imbalance can be caused by differences in temperature, charge efficiency, self-discharge rate, etc. The purpose of reconditioning is to restore a battery to its full capability and to prevent premature damage and failure. Effective reconditioning requires specific procedures for certain periods of time. No step in the procedure can be eliminated nor can any time period be shortened and still yield effective battery reconditioning.

FREQUENCY OF RECONDITIONING

Due to the variables involved in usage, it is impossible to establish a time interval for reconditioning that will cover all batteries. Until service experience dictates otherwise, a visual and electrolyte check of the battery should be made after the first 50 hours of flight. If the condition of the battery is normal and the level of electrolyte in the battery is satisfactory, schedule the initial reconditioning at 100 hours. Repeat the reconditioning procedure outlined below at 100-hour intervals until servicing experience justifies a change.

NOTE

The log of battery services performed should be evaluated to determine the need for servicing the battery at the above recommended intervals or extending the intervals. Accurate water consumption data is a valid barometer to use for adjustment of the servicing intervals.

RECONDITIONING PROCEDURE

a. Discharge the battery at a current equal to or less than the one-hour rate. Short out each cell as it drops below .5 volts. The cells may be shorted by clips or by wires having clips on each end. Allow the shorts to remain on the cells for a minimum of 16 hours, and preferably for 24 hours.

b. Remove the shorting clips and charge for 24 hours at 1.1 amperes for a 13.5 ampere-hour battery. After approximately 5 minutes of charge, measure the individual cell voltages. If any cell voltage is greater than 1.50 volts, add distilled water. The amount of water required is approximately 1 cc per rated ampere-hour capacity, for example, a 13.5 ampere-hour cell may require about 13.5 cc of water at this time.

c. After approximately 10 minutes of charge, remeasure the cell voltages. Replace any cell that measures below 1.20 volts or above 1.55 volts.

d. Continue charging for 20 hours. After 20 hours of charging, measure and record the individual cell voltages. If necessary, add distilled water to level the cell 1/8 to 1/4 inch above the baffle. Do not remove any electrolyte from the cells.

e. Measure and record the voltage at 24 charge hours and compare with the 20 hour reading. If the 24 hour voltage reading is below the 20 hour reading by more than .04 volts, replace the cell. Also replace any cell that measured below 1.50 volts at 24 charge hours. After removing the battery from charge, measure the electrolyte temperatures. If the electrolyte temperature of any cell is greater than 30°F above the ambient, replace that cell.

BATTERY ELECTROLYTE LEVEL ADJUSTMENT

Although the electrolyte level in the nickel-cadmium battery varies with the state of charge, it should be visible above the bottom of the baffle when the battery is fully charged. When the state of charge of the battery is low, the plates absorb some of the electrolyte, then release it as the battery is recharged. The electrolyte level on any battery must be adjusted after a full charge and a two to four hour rest on open circuit. Check the electrolyte level of the battery (fully charged) in the following manner:

CAUTION

Never use acid or tools contaminated with acid during this adjustment, for both bodily injury and equipment damage may result. If possible, use equipment reserved for nickel-cadmium batteries. If lead-acid battery equipment must be used, remove all possible acid contamination with a sodium bicarbonate solution and rinse. Even minute traces of acid can damage a nickel-cadmium battery.

a. Remove the battery from the aircraft.

b. With the battery removed from the aircraft, remove the filler cap vent plug on each cell, one cell at a time.

c. Insert a transparent tube (approximately 6 inches long and 1/4 inch in diameter) perpendicularily into the filler well until the open end rests lightly on the cell baffle, then place the index finger over the top open end and withdraw the tube.

CAUTION

Do not push down, for the light material of the baffle will give enough to result in a false indication of the electrolyte level.

d. The electrolyte level of a fully charged battery should be between 1/8 and 1/4 inch above the bottom of

the baffle. If the level of liquid in the tube exceeds 1/4 inch, remove the excess with a syringe or squeeze bottle. If the level of the electrolyte is less than 1/8 inch above the bottom of the baffle, add distilled water with a syringe or squeeze bottle.

CAUTION

Tap water contains minerals, chlorines, softening agents, and other foreign materials which will contaminate a storage battery and shorten its life.

WARNING

The battery may be damaged if the proper procedure is not followed when adding distilled water to the cells.

e. Clean and reinstall the filler cap, vent cap, vent plugs and check the battery terminal links for tightness. Discolored links or melted nylon around cell terminals indicate loose link connections.

CAUTION

If water or electrolyte is spilled into the battery container, the resultant electrolyte corrosion may cause battery failure. The battery case must be cleaned as instructed in CLEANING AND INSPECTION.

ELECTRICAL LEAKAGE CHECK

The self (internal) discharge rate of a vented nickel-cadmium battery cell is in the order of C/1000 when fully charged. "C" in this formula represents capacity in ampere-hours. This is about 13.5 ma for 13.5 ampere-hour batteries. The only pertinent measure of external leakage is the rate of discharge caused by the leakage. The rate is significant only when it approaches the rate of internal leakage. Therefore, external leakage need be considered excessive only when an ammeter shorting the battery positive or negative terminal to the battery case indicates 13.5 ma or more on 13.5 ampere-hour batteries. Any current less than the preceding limits indicates a magnitude of leakage that has a negligible effect on battery performance.

Perform the following test to determine if external leakage is sufficient to necessitate cleaning the battery. Set the range selector of a multi-range ammeter to the 500 ma scale or higher (a low cost meter is recommended to preclude possible damage to an expensive precision meter). Connect the positive terminal of the ammeter to the positive battery terminal and the negative ammeter terminal to the battery case. Decrease the ammeter current range to obtain a readable value of current and record the value. Perform the same measurement at the negative battery terminal by connecting it to the negative terminal of the ammeter and connecting the positive terminal of the ammeter to the battery case. If the current reading at either terminal is more than 13.5 ma on 13.5 ampere-hour batteries, the battery should be cleaned. This test should be made again after the battery has been completely cleaned and charged. If the current measure is again more than 13.5 ma on 13.5 ampere-hour batteries, it may be assumed that one of the cells has a seal leak. That cell may be found by measuring connector-to-battery case voltages. The lowest voltages will occur at the connectors on each side of the defective cell. A cell found leaking in this manner should be replaced.

CAPACITY CHECK

a. Discharge the battery at a rate of 6.0 amperes on 13.5 ampere-hour batteries until an average voltage of one volt per cell is reached. Measure the time required for the battery to reach that discharged state. Any battery that discharges to one volt per cell in 84 minutes or less should be given another reconditioning (deep) cycle.

b. After the second reconditioning cycle, recheck the battery capacity by discharging at the rate used in step "a". Measure the individual cell voltages after 84 minutes of discharge. If any cell is below one volt, replace it.

CLEANING AND INSPECTION

a. Scrub each cell with a 5 percent solution of boric acid in water, but take great care to prevent the solution from entering the cell.

b. Wash each cell off under running water and dry with an air hose or clean absorbent towel.

c. Inspect each cell for defects such as cracks, holes, or burn spots. Replace defective cells with new or rebuilt cells.

d. Make sure that battery hardware is clean and in good mechanical condition. Wash the hardware, liners, case, cover, and other associated parts in a warm soapy solution to remove accumulated dirt and carbonate deposits. Use a stiff brush to remove heavy deposits. After washing, rinse the parts free of soap and spread them out to dry.

e. Remove corrosion preventive from connectors, screws, nuts, and washers with alcohol or by degreasing.

f. Wash vent caps thoroughly with hot water and no soap.

g. After the parts are dry, sort out damaged or heavily corroded pieces. Scrap any links having burns, bends, or defective nickel plating. If a link is tarnished at the terminal connection, it should be polished with a wire

brush. It is recommended that new terminal screws and nuts be used to ensure proper electrical connection.

h. Check the battery receptacle for burns, cracks, and bent or pitted terminals. Defective receptacles can overheat, cause arcing, and decrease output voltage to result in premature battery failure.

i. Scrap bent or torn battery cases and covers that are beyond repair.

j. Replace or repair loose or damaged cover gaskets and cell holddown bars.

NOTE

Refer to the maintenance manual of the battery manufacturer for additional details on battery disassembly and assembly.

BATTERY MAINTENANCE PROGRAM (P-446 and after)

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. Remove the upper access door to the electrical equipment compartment aft of the left nacelle firewall.

b. Remove the nuts from the hold-down strap bolts.

c. Release the battery box lid latches and remove the box lid.

d. Remove the NEGATIVE battery cable from the batteries.

CAUTION

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

e. Remove the POSITIVE cable terminal from the batteries.

f. Remove the bus bar interconnect from the two batteries.

g. Remove the batteries 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.

CAUTION

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

c. Position the POSITIVE cable terminal on the battery and secure.

d. Position the NEGATIVE cable terminal on the battery and secure.

e. Install the bus bar interconnect on both batteries.

f. Remove any excess petroleum jelly from the terminals.

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

h. Install the nuts on the hold-down strap bolts.

i. Install the access 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 mechanical 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 auxiliary 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"

DC GENERATION-MAINTENANCE PRACTICES

BATTERY CHARGE CURRENT DETECTOR SYSTEM FUNCTIONAL CHECK (Prior to P-446)

NOTE

Satisfactory load change as used herein, is defined as deflection of the loadmeter needle equal to or less than a .025 load change (approximately 3 amperes) for airplanes with a 13.5 ampere-hour battery. A load change of .025 or .050 is barely perceptible.

The system may be checked in the airplane with either engine running. After the engine is started, turn the applicable generator ON. After a time delay of approximately 6 seconds (provided the battery is sufficiently discharged and will accept a charge), the amber caution light (BATTERY CHARGE) located on the instrument panel should illuminate. The light should remain illuminated until the battery is recharged. Under normal circumstances, the battery should be recharged and the light should go out within 5 minutes. However, if the battery has had unusually low or high drain, the recharge time could be considerably shorter or longer. When the light does go out, turn the battery switch OFF while observing the affected loadmeter; the loadmeter should indicate a satisfactory load change.

Listed below are possible situations that could be experienced and corresponding action that is recommended:

a. Light does not illuminate - If the bulb is operational but the light does not come on within approximately 6 seconds after the operating generator is turned ON, it is possible that the battery is not sufficiently discharged to accept a charge. This can be determined by turning the battery OFF while observing the loadmeter needle deflection. A satisfactory load change indicates the battery is charged and the light should not be on. An unsatisfactory load change indicates the light should be on and that there is a malfunction in the detector system. Repair or replace the defective parts and repeat the functional check. If the battery was not discharged enough to accept a charge, turn the generator OFF and partially discharge the battery by operating electrical equipment. Repeat the functional check.

b. Light stays on - Check the following possibilities:

1. Battery is partially discharged and is charging. If the light stays on after charging for approximately 5 minutes, careful attention should be given the airplane loadmeter. With a constant load on the airplane electrical system, continue to charge the battery. The loadmeter should indicate a constantly decreasing charge current until the battery is charged. When the loadmeter appears to stabilize (see NOTE in condition 2 below), turn the battery OFF while observing the loadmeter for load change. If the load change is satisfactory and the light has gone out, the battery is charged and the system is operating properly.

2. Battery is charged and is being excessively overcharged. If the loadmeter stabilizes and indicates an unsatisfactory load change when the battery is turned OFF, the battery is overcharging excessively and the light should not have gone out. Check the battery and charging circuit for condition and proper operation.

NOTE

As the battery approaches full charge, the charge current may decrease slowly enough that the loadmeter would appear to stabilize before the charge current has decreased enough for the light to go out.

In the event of doubt as to the amount of charge current after the loadmeter appears to have stabilized, an ammeter can be integrated into the charging circuit. Install the ammeter and check the charge current as follows:

(a) An ammeter that will indicate approximately 10 amperes, lead lines that will reach from the battery relay to the pilot's compartment and an on-off switch for the ammeter leads will be required.

(b) Wire the on-off switch into one of the leads and connect the leads to the ammeter.

(c) Connect the negative side of the ammeter to the battery side of the battery relay and the positive side of the ammeter to the generator side of the battery relay.

(d) With the switch in the ammeter lead turned off, start either engine. Allow the battery to charge until the loadmeter appears to stabilize.

(e) Turn the switch in the ammeter lead on and turn the battery switch OFF, in that order to prevent a current surge and possible damage to the ammeter.

(f) Note the charge current as indicated on the ammeter. The charge current should decrease until the light goes out at approximately 3 or 7 amperes and may continue to decrease to a lower level.

Repair or replace any parts found to be defective and repeat the functional check.

3. Battery is charged and is not being excessively overcharged. If the light is on and the charge current has dropped to a satisfactory level, the detector assembly is malfunctioning and should be replaced.

(a) Light is erratic or does not operate in unison with suitable charge current values as previously outlined. Check the wiring and detector assembly for proper operation. Repair or replace defective parts and repeat the functional check.

"END"

EXTERNAL POWER - MAINTENANCE PRACTICES

The aircraft 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 air conditioner operation, a ground power source capable of delivering 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 aircraft.

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 aircraft.

b. Before connecting the external power unit, turn off all radio equipment and generator switches, but leave the battery 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 unit does not have a standard AN plug, check the polarity and connect the positive lead from the external power unit to the center post and the negative lead to the front post of the aircraft's external power receptacle. The small pin of the receptacle must be supplied with + 24 VDC to close the external power relay that provides protection against damage by reverse polarity.

"END"

ELECTRICAL LOAD DISTRIBUTION - MAINTENANCE PRACTICES

The dual bus feeder diodes should be inspected at 600 flight hour intervals as instructed under PERIODIC INSPECTION OF DUAL BUS FEEDER DIODES. Whenever the dual bus has been modified or extensive repairs have been made that could result in the dual bus loops being interconnected or open, it is necessary to perform a DUAL BUS CONFORMITY INSPECTION. This will ensure that the original design of the dual bus is maintained.

PERIODIC INSPECTION OF DUAL BUS FEEDER DIODES (Figure 202)

An open or shorted dual bus feeder diode cannot be detected during the normal operation of the aircraft electrical system. Should a malfunction occur which would cause a bus isolation limiter to open, such as a ground fault on a generator bus, an open dual bus feeder diode could not supply power to its respective dual bus loop. A shorted diode would not isolate its respective dual bus from a ground fault. The inspection procedure outlined here will ensure the dual bus capability. The inspection may be performed at a normal periodic inspection of the aircraft and either battery power or an auxiliary ground power unit connected to the external power receptacle may be used. A suggested inspection procedure follows:

a. Remove all power from the aircraft.

b. Open the four 50 ampere bus feeder circuit breakers labeled ELECTRICAL POWER on the right circuit breaker subpanel.

c. Turn the battery and/or auxiliary ground power unit ON.

d. Confirm the continuity of each dual bus feeder diode. This may be accomplished by closing a single ELECTRICAL POWER feeder diode circuit breaker and confirming the presence of voltage on the corresponding dual bus loop. The presence of voltage may be determined by the operation of circuits which receive power from the dual bus loop. Refer to the Power Distribution Schematic, Figure 202, or to the applicable wiring diagram for the appropriate aircraft serial in the Wiring Diagram Manual, 60-590001-29, to determine which circuits receive power from each dual bus loop. Repeat for each circuit breaker.

e. Confirm that each dual bus is not shorted. This may be accomplished by closing a single ELECTRICAL POWER feeder circuit breaker and determining that no voltage is present at the load side of each of the three remaining ELECTRICAL POWER feeder circuit breakers. Repeat for each circuit breaker.

Should any diode prove to be either shorted or open, this diode must be replaced and the inspection repeated. After completion of the inspection, reset all circuit breakers and tighten all connections securely. Ensure that all wires and terminals are not chafing against the aircraft structure. Check the system for normal operation.

DUAL BUS CONFORMITY INSPECTION (Figure 201)

A dual bus conformity inspection shoud be performed whenever the console or subpanel bus system has been modified or whenever repairs have been made that may result in the dual bus loops being interconnected or open. Either battery or auxiliary power may be used when conducting this inspection. Check for correct circuit connections by actual operation of the circuit as described by the appropriate power distribution circuit in the Wiring Diagram Manual, P/N 60-590001-29. The conformity inspection may be performed as follows:

a. Open the four 50 ampere bus feeder circuit breakers labeled ELECTRICAL POWER on the right circuit breaker subpanel.

b. Turn the battery ON. External power may be used.

c. Close the LH # 1 bus feeder circuit breaker, check each circuit and record the results.

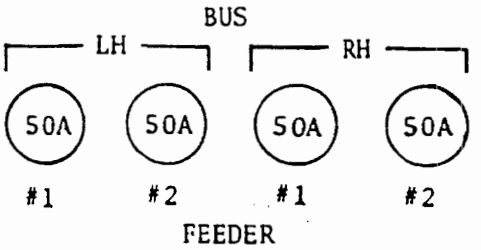
d. Open the LH # 1 bus feeder circuit breaker and close the LH # 2 bus feeder circuit breaker. Repeat the circuit checks and record the results.

e. Open the LH # 2 bus feeder circuit breaker and close the RH # 1 bus feeder circuit breaker. Repeat the circuit checks and record the results.

f. Open the RH # 1 bus feeder circuit breaker and close the RH # 2 bus feeder circuit breaker. Repeat the circuit checks and record the results.

g. If any of the results that have been recorded reveal a discrepancy, locate and repair to obtain the desired result.

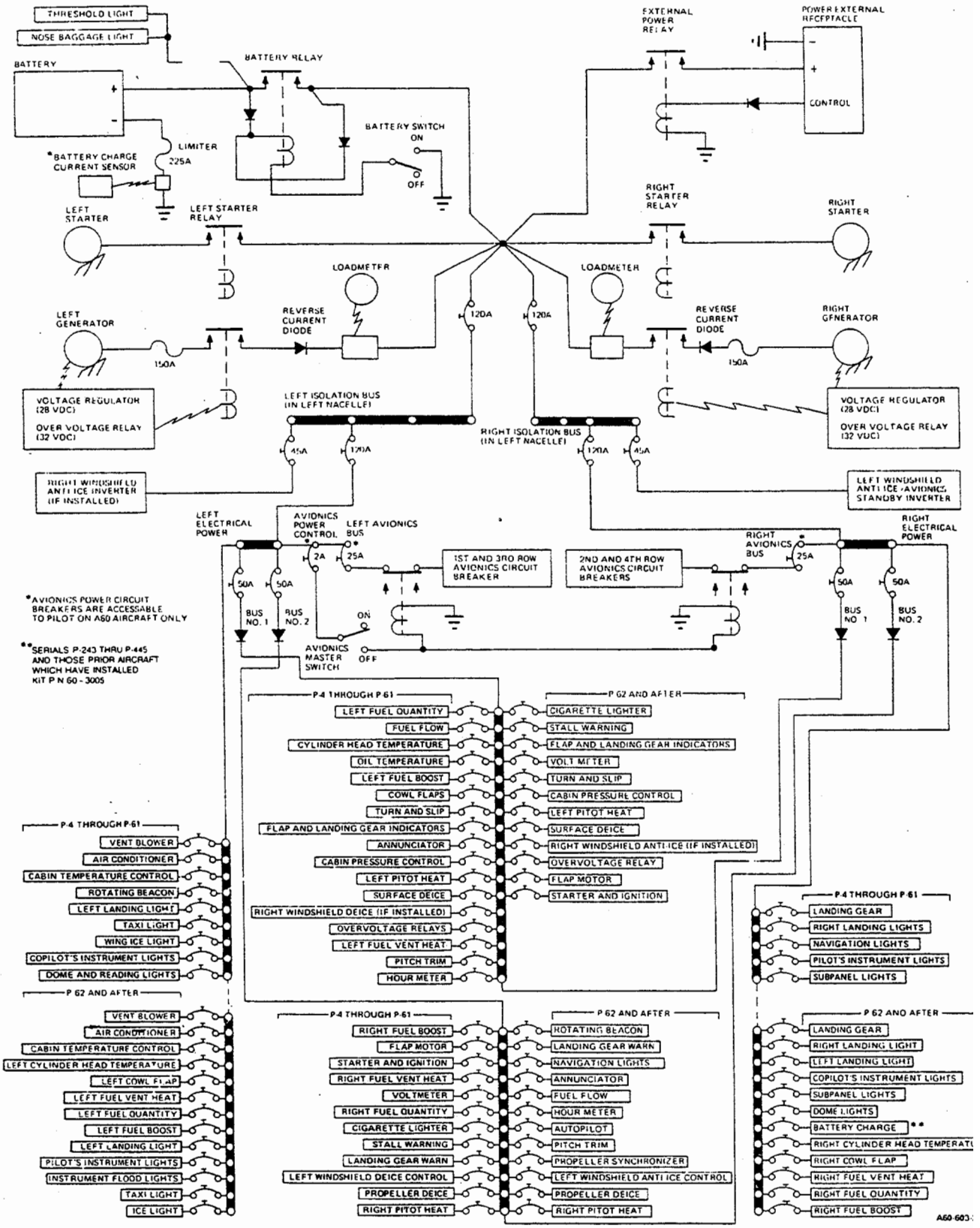
h. Close all circuit breakers and return the aircraft to normal.



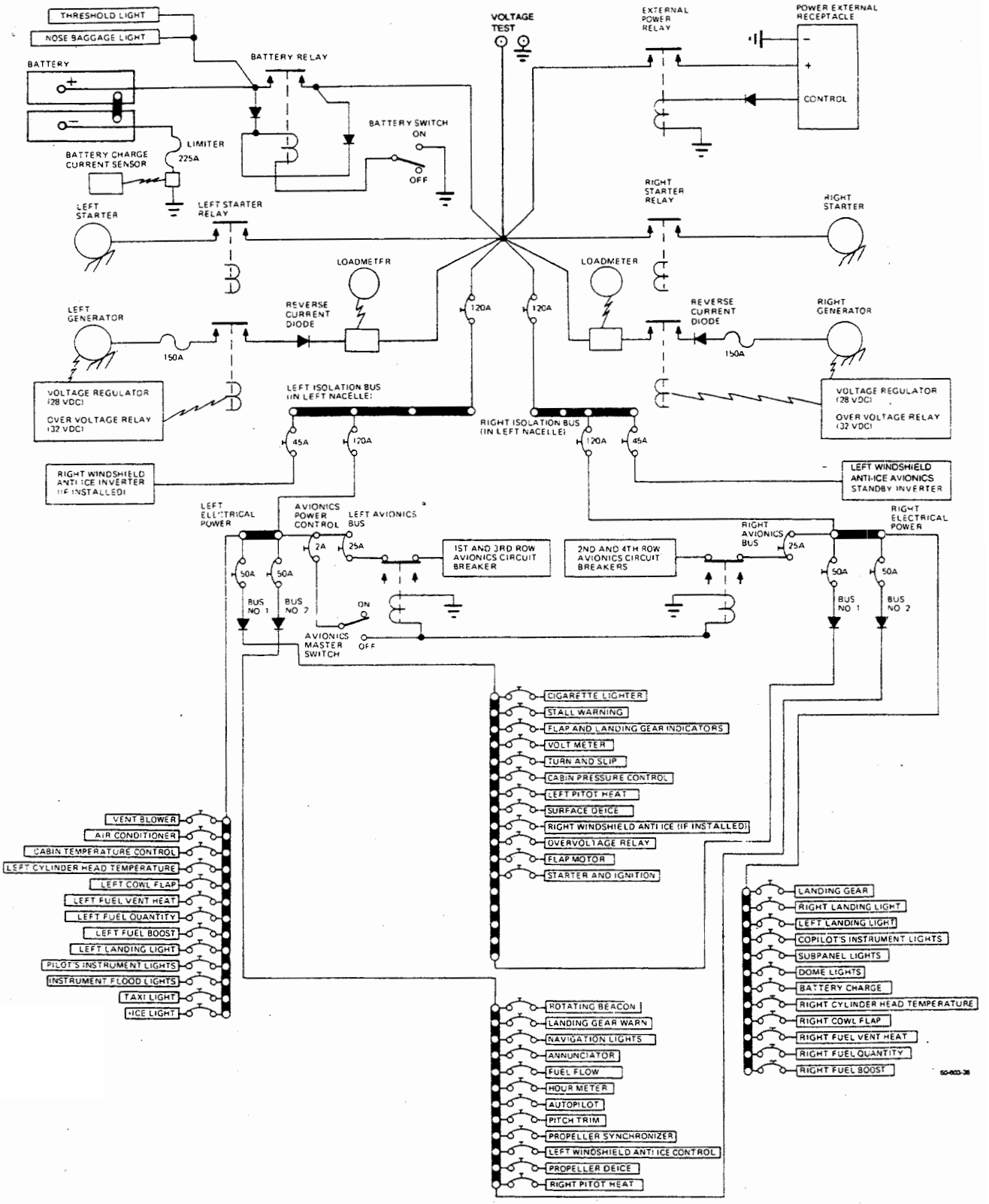
Dual Bus Conformity Inspection
Figure 201

ELECTRICAL UTILIZATION LOAD CHART

The following chart provides information pertaining to the capacity of the generator for supplying the electrical load on the aircraft while maintaining a full charge on the battery. To determine the total electrical load of the aircraft, add the continuous load for standard equipment to the load of the optional equipment installed in the aircraft (accessories and radio). Since the aircraft is equipped with two 28 volt, 125 ampere generators, the total load shall not exceed 80 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.



Power Distribution Schematic (P-4 thru P-445)
Figure 202



Power Distribution Schematic (P-446 and after)
Figure 203

CHART 201
ELECTRICAL UTILIZATION LOAD

	Number Per Aircraft	Load Per Unit In Amps.	Load Per Aircraft In Amps.
CONTINUOUS LOAD-STANDARD EQUIPMENT			
Battery Relay	1	0.60	0.60
Cabin Pressure Control System			
Ram Air Magnetic Door Catch	1	0.21	0.21
Isobaric Control Valve	1	0.90	0.90
Cabin Pressure Differential Control Valve	1	0.50	0.50
Cylinder Head and Oil Temperature System			
Cylinder Head Temperature Indicator	2	0.49	0.98
Oil Temperature Indicator	2	0.31	0.62
Flap Position System			
Flap Position Indicator	1	0.001	0.001
Flap Position Printed Circuit Board	1	0.059	0.059
Fuel System			
Fuel Flow Indicator Inverter	1	0.94	0.94
Fuel Quantity Indicator	2	0.05	0.10
Fuel Vent Heater	2	1.35	2.70
Heater System			
Vent Blower	1	17.00	17.00
* Vent Blower Relay	2	0.35	0.35
Combustion Air Blower	1	2.90	2.90
Manual or Automatic Select Relay	1	0.09	0.09
Heater Cycle Control Relay	1	0.09	0.09
Heater Fuel Pump	1	0.40	0.40
Remote Heater Solenoid Valve	1	0.33	0.33
Heater Assembly	1	1.30	1.30
Combustion Air Select Valve	1	0.63	0.63
Heater Safety Relay	1	0.09	0.09
Cabin Temperature Control Box	1	0.18	0.18
Cabin Air Sensing Element	1	0.25	0.25
Pitot Heater (LH)	1	3.30	3.30
Turn and Slip Indicator	1	0.15	0.15
Voltmeter	1	0.001	0.001
Lighting			
Dim Switches	8	0.05	0.40

*Only one used at a time.

CHART 201
ELECTRICAL UTILIZATION LOAD (Cont'd)

	Number Per Aircraft	Load Per Unit In Amps.	Load Per Aircraft In Amps.
CONTINUOUS LOAD-STANDARD EQUIPMENT			
Lighting (Cont'd)			
Edge Lights	163	0.04	6.52
Cabin Altitude Warning Light	2	0.04	0.08
Cabin Door Warning Light	2	0.04	0.08
Annunciator Lights Dim Relay	1	0.09	0.09
Inverter Out Light	2	0.04	0.08
* Landing Gear Position Lights			
Landing Gear Uplock Light	1	0.04	0.04
Landing Gear Down Lock Light	3	0.04	0.12
Compass Light	1	0.04	0.04
Engine Instrument Lights	10	0.04	0.40
Instrument Flood Lights (Red)	10	0.17	1.17
Instrument Flood Lights (White)	8	0.17	1.36
Outside Air Temperature (Post Light)	1	0.04	0.04
Pilot's Clock Light	1	0.04	0.04
Pilot's Instrument Lights (Post Light)	18	0.04	0.72
Pilot's Map Light	1	0.17	0.17
Reading Lights	6	0.30	1.80
Navigation Lights (Wing)	4	0.75	3.00
Navigation Light (Tail)	1	0.65	0.65
Rotating Beacon (Lower)	1	3.10	3.10
Rotating Beacon (Upper)	1	3.10	3.10
CONTINUOUS LOAD-OPTIONAL EQUIPMENT			
Air Conditioner			
Combustion Blower	1	2.90	2.90
Condenser Blower	1	15.00	15.00
Condenser Blower Relay	1	0.35	0.35
Cabin Temperature Control Box	1	0.17	0.17
Cabin Air Sensing Element	1	0.25	0.25
Heating or Cooling Temperature Control Relay	1	0.09	0.09
Hot Gas By-pass Solenoid Valve (P-4 through P-126, except P-123)	1	0.75	0.75
Solenoid Valve Timer	1	0.06	0.06
Magnetic Clutch	1	2.00	2.00
Nacelle Scoop Relay	1	0.35	0.35
Vent Blower	1	17.00	17.00
**Vent Blower Relay	2	0.35	0.35
Propeller Deice System	1	18.00	18.00
Pitot Heater (RH)	1	3.30	3.30
Cabin Air Inlet Deice Boot	1	2.50	2.50
Flight Hour Meter	1	0.02	0.02
Engine Hour Meter	1	0.02	0.02
Generator Control System Overvoltage Relay	2	0.03	0.03

*Maximum of three on at a time.
**Only one used at a time.

CHART 201
ELECTRICAL UTILIZATION LOAD (Cont'd)

	Number Per Aircraft	Load Per Unit In Amps.	Load Per Aircraft In Amps.
CONTINUOUS LOAD-OPTIONAL EQUIPMENT			
Generator Control System (Cont'd)			
Generator Out Light	4	0.04	0.16
Paralleling Relay	2	0.09	0.18
Generator Control Relay	2	0.60	1.20
LH Wing Ice Light	1	2.14	2.14
Oxygen Panel Post Light	1	0.04	0.04
Copilot's Instrument Post Lights	18	0.04	0.72
Copilot's Clock Light	1	0.04	0.04
Copilot's Map Light	1	0.17	0.17
LH Heated Windshield System			
Inverter	1	29.00	29.00
Windshield Temperature Control Box	1	0.03	0.03
Windshield Temperature Control Relay	1	0.35	0.35
RH Heated Windshield System			
Inverter	1	29.00	29.00
Windshield Temperature Control Box	1	0.03	0.03
Windshield Temperature Control Relay	1	0.35	0.35
INTERMITTENT LOAD-STANDARD EQUIPMENT			
Lights			
Landing Lights	2	8.90	17.80
Taxi Light	1	9.00	9.00
Threshold Light	1	0.17	0.17
Nose Baggage Compartment Light	1	0.30	0.30
Fuel Boost Out Lights	4	0.04	0.16
Cowl Flap Motor	2	1.20	2.40
*Cigarette Lighter	5	7.50	7.50
Fuel Boost Pumps	2	14.00	28.00
Landing Gear Warning Horn	1	1.50	1.50
Landing Gear Warning Flasher	1	0.40	0.40
Landing Gear Dynamic Brake Relay	1	0.40	0.40

*Only one used at a time.

CHART 201
ELECTRICAL UTILIZATION LOAD (Cont'd)

	Number Per Aircraft	Load Per Unit In Amps.	Load Per Aircraft In Amps.
INTERMITTENT LOAD-STANDARD EQUIPMENT			
Landing Gear Motor	1	20.00	20.00
Wing Flap Motor	1	13.00	13.00
*Starter Relay	2	0.06	0.06
**Starter	2	275.00	275.00
Starting Vibrator	1	2.00	2.00
Stall Warning Horn	1	1.50	1.50
INTERMITTENT LOAD-OPTIONAL EQUIPMENT			
Electric Trim System (Elevator)			
Trim Motor	1	0.85	0.85
Trim Clutch	1	0.50	0.50
Magic Hand Switch	1	2.50	2.50
Surface Deice System			
Deice Relay	1	0.09	0.09
Time Delay Relay	1	0.17	0.17
Deice Valve	2	0.59	1.18
Control Valve	1	1.75	1.75
Nacelle Scoop Actuator	1	1.20	1.20

*Only one used at a time.

**Maximum stall load, only one used at a time.

"END"

CHAPTER 25

LIST OF PAGE EFFECTIVITY

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"END"

CHAPTER 25-EQUIPMENT/FURNISHINGS

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"END"

GENERAL - MAINTENANCE PRACTICES

FLIGHT COMPARTMENT SEAT REMOVAL

a. Remove the three seat stops at the forward end of the three seat tracks.
b. Release the fore and aft seat adjustment lock.
c. Slide the seat forward and off the seat tracks.
d. Unhook the seat spring on the bottom of the seat.

FLIGHT COMPARTMENT SEAT INSTALLATION

a. Hook the seat spring on the bottom of the seat.
b. Position the seat and slide aft onto the seat track.
c. Secure the fore and aft seat adjustment lock.
d. Install the three seat stops at the forward end of the three seat tracks and secure.

FLIGHT COMPARTMENT SEAT BACK ADJUSTMENT

On airplanes P-4 and after, the pilot's seat back adjustments are controlled by a mechanical three-position stop. The adjustment selector is located at the base of the seat back, on the inboard side.

On airplanes P-4 thru P-510 and P-512 thru P-519, the copilot's seat back adjustments are controlled by a mechanical three-position stop or by a Roton lock for selected positioning. On airplanes P-511, P-520 and after, the copilot's seat back adjustments are controlled by a mechanical three-position stop or by a Hydrolok lock for selected positioning. The mechanical adjustment selectors are located at the base of the seat backs, on the inboard side. The Roton of Hydrolok adjustment lever is located on the inboard side of the seat. For information concerning Roton or Hydrolok servicing refer to ROTON LOCKS or HYDROLOK LOCKS in this chapter.

PASSENGER SEAT REMOVAL

a. Remove the seat stop from the middle seat track.
b. Release the fore and aft seat adjustment lock.
c. Slide the seat forward and off of the seat tracks.

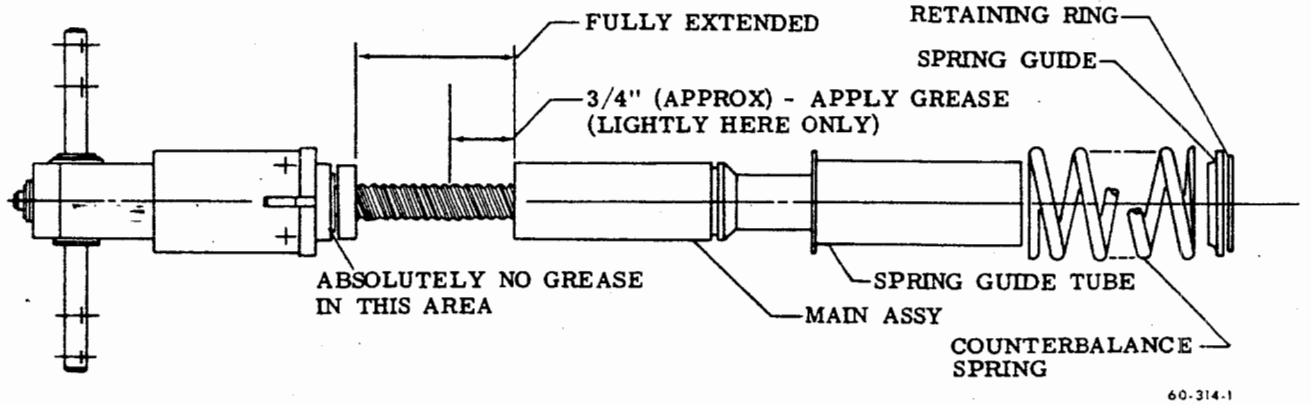
PASSENGER SEAT INSTALLATION

a. Position the seat and slide aft onto the seat tracks.
b. Secure the fore and aft seat adjustment lock.
c. Install the seat stop at the forward end of the middle seat track and secure.

PASSENGER SEAT BACK ADJUSTMENT

On airplanes P-4 thru P-510 and P-512 thru P-519, adjustment for the passenger seat backs is controlled by a mechanical three-position stop or by a Roton lock for selected positioning. On airplanes P-511, P-520 and after, adjustment for the passenger seat backs is controlled by a mechanical three-position stop or by a Hydrolok lock for selected positioning. The adjustment selector for the mechanical stop is located at the base of the seat back on the inboard side. The adjustment lever for the Roton or Hydrolok lock is located on the inboard side of the seat.

On airplanes P-511, P-520 and after, adjustment for the optional fifth and sixth passenger seat backs is controlled by



Roton Lock
Figure 201

two individually operated Hydrolok locks. The adjustment levers for the Hydrolok locks are located on the outboard armrests.

For information concerning Roton or Hydrolok servicing refer to ROTON LOCKS or HYDROLOK LOCKS in this chapter.

ROTON LOCKS

(Figure 201)

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 201. Too much grease or grease in the wrong place can cause improper operation.

b. Compress the spring guide and counter-balance spring approximately one inch.

c. Remove the retaining ring.

d. Relax pressure on the spring guide and counter-balance spring slowly until the spring is fully extended.

e. Remove the lock from the fixture and remove the spring guide, counter-balance spring, and spring guide tube.

f. Apply a small quantity of grease to the completely extended thrust screw (see Figure 201).

g. Reassemble the lock.

NOTE

A new lock will need to be purchased if service other than lubrication is required.

HYDROLOK LOCKS

Hydrolok locks will usually need no service, but if service is required return the unit to the manufacturer.

"END"

EMERGENCY - DESCRIPTION AND OPERATION

EMERGENCY LOCATOR TRANSMITTER

Airplane serials P-166, P-183 thru P-185, P-187 thru P-244 and P-246 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 P-166, P-183 thru P-185, P-187 thru P-244 and P-246 thru P-536 are equipped with Collins/Communications Corporation ELT units. Narco ELT units are installed on airplane serials P-537 and after and earlier airplanes equipped with Kit No. 101-3046-1.

The ELT is mounted in the aft fuselage on the RH side at approximately F.S. 290.00. An antenna for the ELT is mounted on top of the fuselage under the vertical stabilizer at approximately F.S. 297.00. The output frequencies of the ELT are 121.5 and 243.0 MHz simultaneously. Range is approximately line of sight. The ARM-OFF-ON switch located on the transmitter 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 P-166, P-183 thru P-185, P-187 thru P-244 and P-246 thru P-536 equipped with Kit No. 101-3039-1 have a remote switch located on the RH side of the rear fuselage. The remote switch, placarded REARM-ARM-XMIT, 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 accidently triggered. Airplane serials P-537 and after, and earlier airplanes equipped with Kit No. 101-3046-1 have a remote switch installed on the RH side of the rear fuselage. The remote switch, placarded ARM-XMIT, 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 that 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 unsecured 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 the transmitter is stored in an area where the temperature is normally above 38°C (100°F), battery life will be shortened.

CAUTION

Avoid storage of batteries at temperatures in excess of 55°C (130°F).

The information on battery life and replacement is included in the data furnished with each ELT, and is usually placarded on the battery.

NOTE

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

COLLINS/COMMUNICATIONS COMPONENTS CORPORATION BATTERY REPLACEMENT

NOTE

The Narco ELT may be supplied by Kit No. 101-3046 for airplanes originally equipped with units produced by Collins/Communications Components Corporation.

a. Place the RM-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 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. The new replacement date should be marked on the ELT in a visible area. This will aid in future inspections of the ELT. This date is 50% of the useful life of the battery as defined by the battery manufacturer.

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

To avoid damage to the antenna or the plastic tab on the upper end, care must be exercised in extending the portable antena and handling the control head.

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 transmitter PC board. Discard the old battery.

NOTE

Inspect for and properly treat any corrosion in the area when the battery is replaced.

WARNING

DO NOT discard the battery in fire.

g. Connect the terminals of the ne battery to the bottom of the transmitte PC board.

h. Using a stick, apply a bead o sealant (supplied with each battery pack around the area of the control head whic is joined with the battery case whe reassembled.

NOTE

This sealant provides a water-tight seal when the unit is assembled.

i. Insert the control head sectio into the battery case, being careful no to pinch the wires, and install the fou attaching screws. Wipe any excess sealan 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 th airplane and secure the mounting strap.

l. Connect the fixed antenna cabl to the ELT. Ensure that the (plastic contact separator is inserted between th portable antenna contact and the portabl antenna.

NOTE

Without the contact separator 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. The new replacement date should be marked on the ELT in a visible area. This will aid in future inspections of the ELT. This date is 50% of the useful life of the battery as defined by the battery manufacturer.

TESTING EMERGENCY LOCATOR TRANSMITTER.

Generally, tests will be performed following maintenance or repair of ELTs, other than battery replacement, to determine their operational capability. Testing 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.

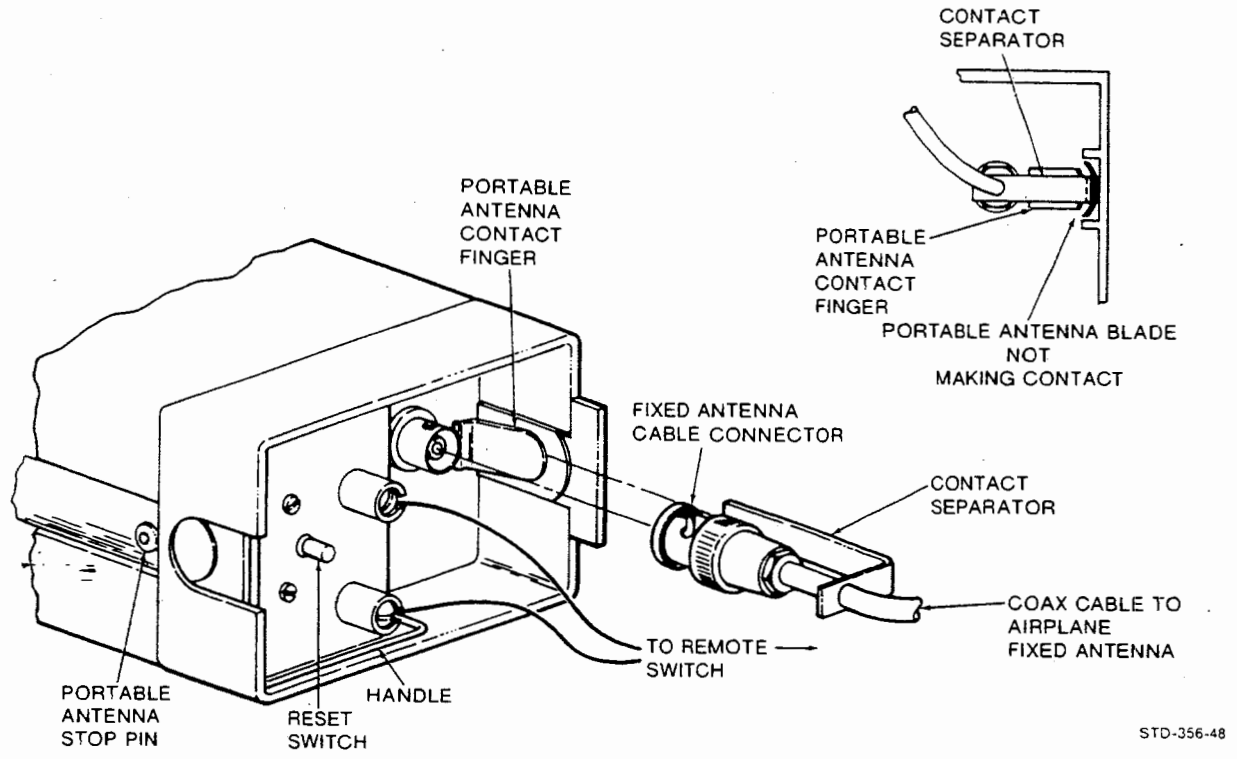
CAUTION

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 sweeps. One audio sweep may be defined as amplitude modulating the carrier with an audio frequency sweeping downward over a range of not less than 700



Narco ELT
Figure 201

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 COMM-1 ON 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 (TEST AUTO XMIT, XMIT ARM) switch to ON and monitor the ELT signal.

NOTE

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

d. Place the ARM-OFF-ON (TEST AU XMIT, XMIT ARM) switch on the ELT to OFF position. The audio signal shou disappear completely.

e. Place the switch in the ARM po tion. There should be no audio sig present.

NOTE

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

f. Firmly press the reset switch the front of the ELT and listen to ens the audio signal disappears from COMM-

"END"

CHAPTER 27
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 203
27-2	Nov 15/93			27-50-00 Page 203

NOTE: Insert this Record of Temporary Revisions after the Chapter 27 divider tab.

CHAPTER 27

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27-EFFECTIVITY	1	Sep 20/85
27-CONTENTS	1	Sep 20/85
	2	Sep 20/85
27-00-00	1	Nov 2/73
	201	Nov 2/73
	202	Nov 2/73
27-10-00	201	Nov 2/73
	202	Nov 2/73
	203	Sep 14/79
	204	Sep 14/79
	205	Sep 14/79
27-20-00	201	Nov 2/73
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	204	Sep 14/79
	205	Sep 14/79
27-30-00	201	Sep 20/85
	202	May 30/75
	203	Sep 20/85
	204	Sep 20/85
	204A	Sep 20/85
	205	Sep 14/79
	206	Sep 14/79
	207	Sep 14/79
27-50-00	1	Nov 2/73
	201	Nov 2/73
	202	Nov 2/73
	203	Nov 2/73
27-60-00	1	Nov 2/73
	101	Nov 2/73
	201	Nov 2/73
27-70-00	201	Nov 2/73

"END"

CHAPTER 27 - FLIGHT CONTROLS

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CHAPTER 27 - FLIGHT CONTROLS

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"END"

GENERAL - DESCRIPTION AND OPERATION

The flight controls, with the exception of the flaps, are conventional cable operated surfaces requiring no power assistance for normal control by the pilot or copilot. The aileron, elevator, and rudder have cable operated flight adjustable trim tabs. The flaps have electrically powered actuators controlled by a switch on the subpanel.

Positive stops on the control surface bell cranks limit their travel, while travel stops secured on the tab cables limit the trim tab movement.

Since the control cables can be disconnected at the turnbuckles, each cable has one right hand and one left hand threaded cable end. Cable routing off the pedestal, control column and actuator drums is shown in Figure 201 of 27-10-00, 27-20-00, and 27-30-00.

EFFECT OF TEMPERATURE UPON CABLE TENSION

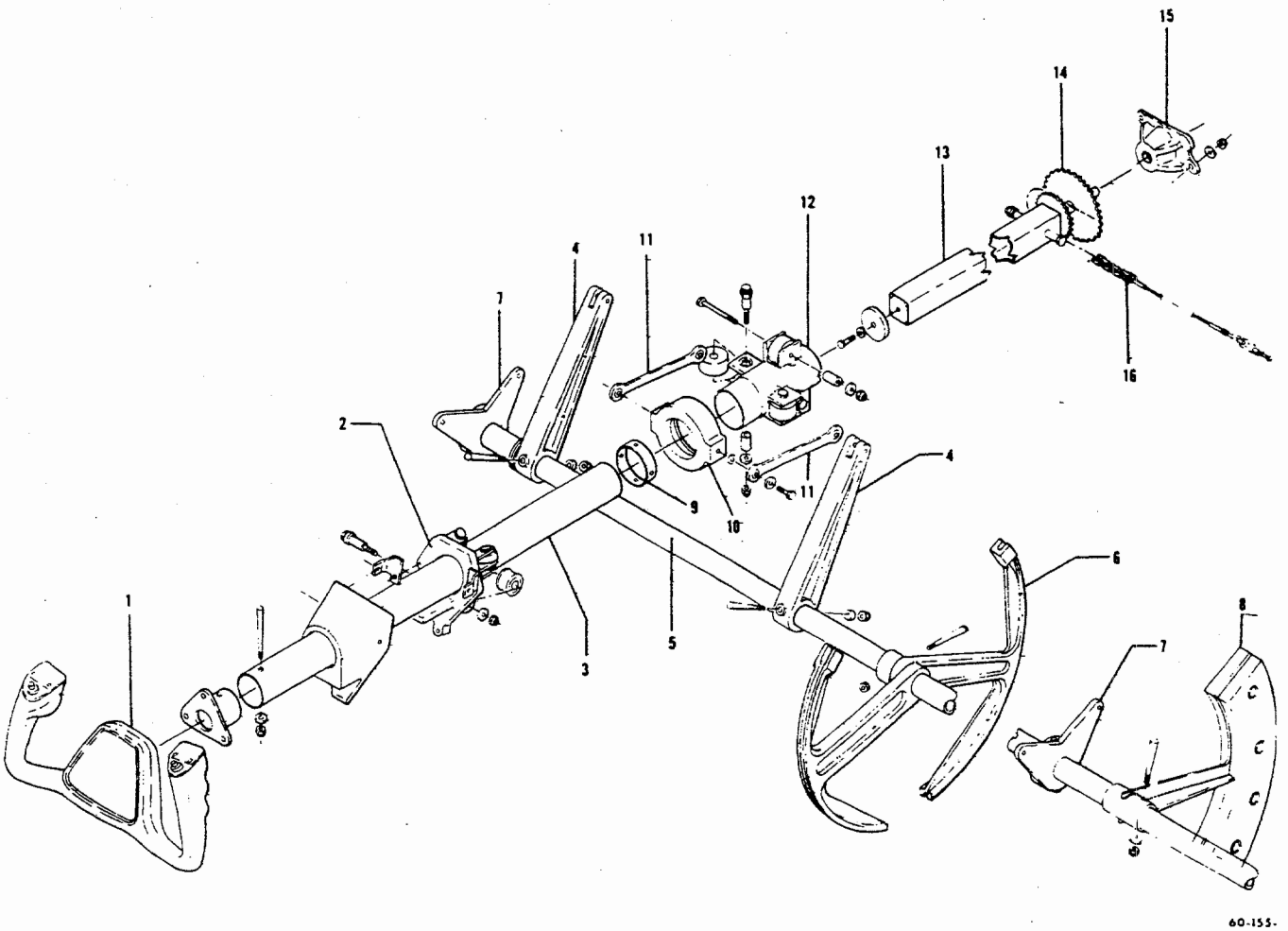
Graphs specifying the correct maximum and minimum cable tension permissible for the various controls appear on the individual rigging control system illustrations. The graphs provide rigging limits at temperatures varying from 30° to 110°F. The horizontal scale on the graphs designates the temperature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

"END"

GENERAL - MAINTENANCE PRACTICES

CONTROL COLUMN
(Figure 201)

Refer to the applicable rigging procedures for details regarding chain and cable tension, control wheel movement and force, and system friction. Any time the control column has been removed and disassembled, the following



1. Wheel
2. Collar Assembly
3. Column Torque Tube
4. Elevator Torque Arm
5. Elevator Torque Tube
6. Elevator Bell Crank
7. Elevator Torque Tube Support
8. Bob Weight Assembly
9. Collar
10. Collar Assembly
11. Elevator Push Rod
12. Connector
13. Inner Column
14. Sprocket
15. Bearing Support
16. Chain

Control Column
Figure 201

precautions should be observed:

a. When the taper pin just forward of the control wheel is to be installed, use a light weight rawhide or nylon mallet to set the pin. The small end of the tapered shank should be flush with, or extend no more than .06 inch over the surface.

CAUTION

The taper pin may crack the control column torque tube if driven excessively.

b. The procedure noted above shall apply to the taper pins used to install the torque arms and the bob weight assembly.

c. When installing the torque tube guide, apply thread locking compound (36, Chart 207, 91-00-00) to bolt threads prior to installation.

CONTROL COLUMN BUS CABLE REMOVAL

a. Disconnect the aileron cables from the control column at the turnbuckles.

b. Paint one tooth of each of the control column sprockets and its corresponding chain link to ensure proper alignment of the control wheels at installation.

c. Loosen the cable turnbuckle in the center of the control column horizontal cross member. Remove safety wire from the chains and sprockets. Remove the cable and chain assembly.

CONTROL COLUMN BUS CABLE INSTALLATION

a. Install the control column bus cable and chain assembly on the cross member of the control column with the painted links of the chains engaging the corresponding painted sprocket teeth.

b. Rig the control column bus cable and safety wire the chain to the sprockets as shown in Figure 202.

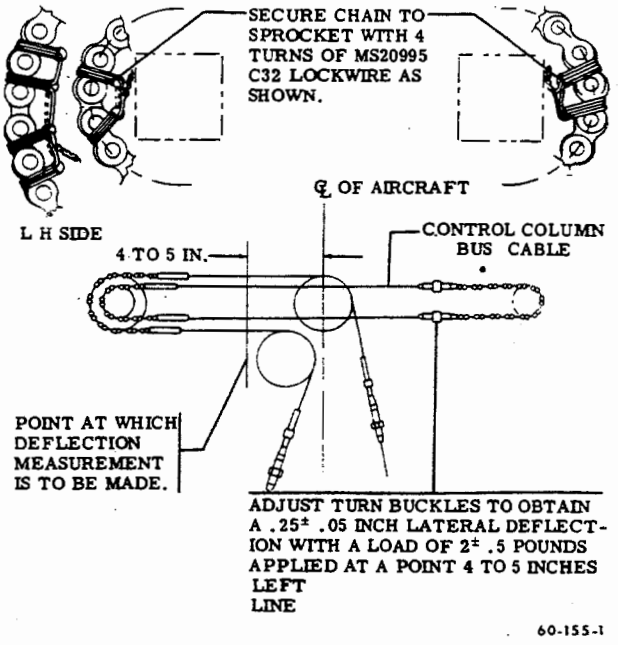
c. Rig the aileron control cable. (Refer to 27-10-00).

CONTROL COLUMN BUS CABLE RIGGING
(Figure 202)

Rigging of the control column bus cable can be accomplished by adjusting the bus cable turnbuckles to obtain a .25 ± .05 inch deflection with a load of 2 ± .5 pounds applied at a right angle, 4 to 5 inches to the left of the aircraft center line as shown in Figure 202.

NOTE

When final adjustment of the bus cable is established, the pilot and copilot control wheels should be in neutral position.



Control Column Bus Cable Adjustment
Figure 202

"END"

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 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.

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. Using 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).

g. 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 (Figure 201)

a. Place cockpit 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 upon completion of step "c", adjust push rod to place tab in neutral position.

e. Center the chain on the sprocket and tighten the cable. Rig cable tension and adjust travel as noted on the Aileron Tab Rigging Illustration (Figure 201).

f. Check trim tab travel, adjust cable stops and safety turnbuckles.

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 an anti-servo tab, every time the aileron moves up the tab should move up.

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.

CHECKING AILERON TAB FREE PLAY

Visually inspect the left aileron tab for damage, security of hinge attach points, and for tightness of the actuating system. Inconsistancies should be corrected prior to checking the free play of the tab. The aileron tab free play 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 the equivalent as shown in Figure 202, 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 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 2.30 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.

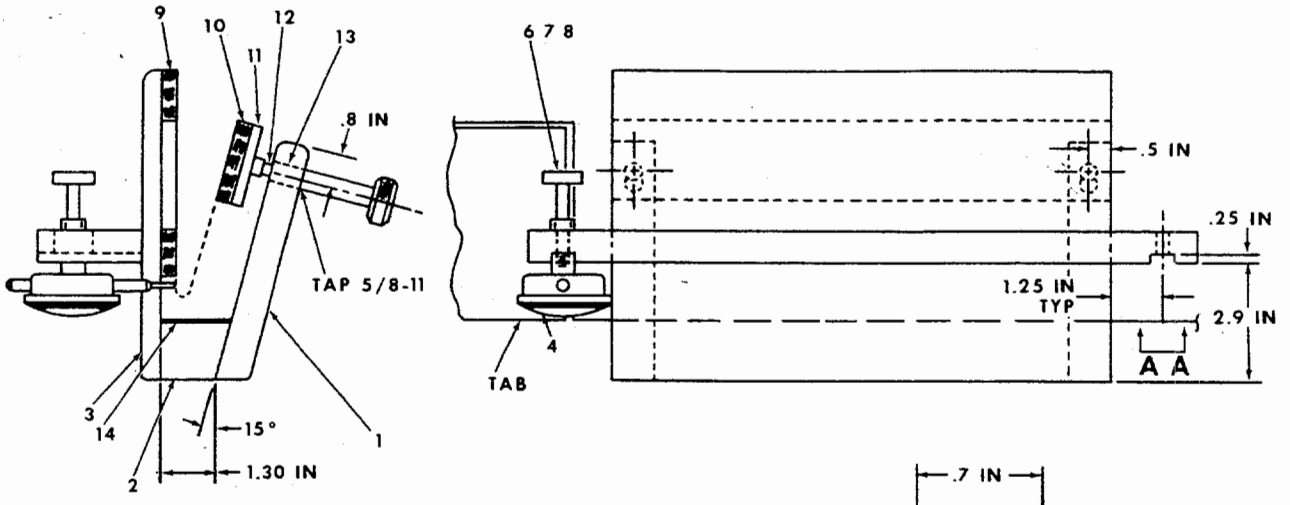
5. Add "X" and "Y" and record as "E".

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	_____	

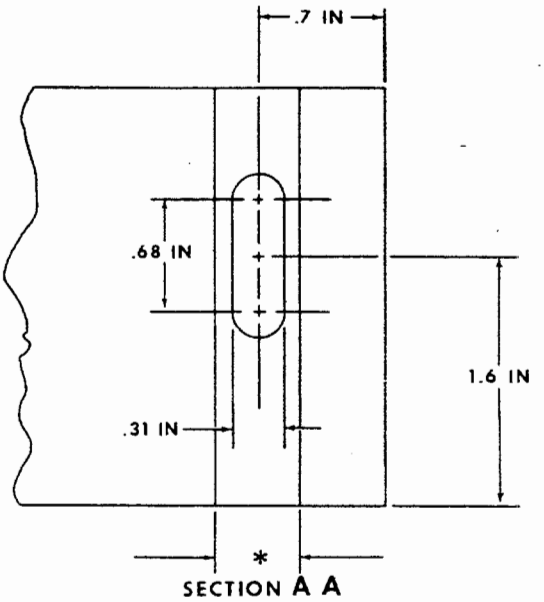
(E = 0.032 inch maximum)

k. If the aileron trim tab free play exceeds the 0.032 inch maximum noted above, inspect all components of the tab actuation system to determine the cause. All worn parts should be replaced.



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.



* THIS GROOVE TO BE A SNUG FIT TO THE SCREW BRACKET ON THE DIAL INDICATOR

100-135-8

(P/N 45-135030-9/810) Check Fixture for Tab Deflection
Figure 202

"END"

RH horizontal stabilizer, and the access panel in the aft floorboard.

RUDDER TRIM TAB CABLE REMOVAL
(Figure 201)

a. Remove the tail cone, the access plate beneath the RH horizontal stabilizer, and the access plate at the trim tab actuator.

b. Remove the pilot's seat and the left floorboard.

c. Remove both upholstery panels on the left side of the pedestal.

d. 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.

e. Remove the cable retaining pins from the pulley brackets and the pressure seals from the rear pressure bulkhead.

f. Disconnect the trim tab cables, in the aft fuselage, at the turnbuckles and connect lead lines to the forward cables. Identify the lead line for tab left and tab right movement to ensure proper cable rerouting.

g. 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.

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

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

RUDDER TRIM TAB CABLE INSTALLATION
(Figure 201)

a. With the rudder tab in neutral, position the aft chain and cable assembly on the trim tab actuator sprocket so that the ends of the chain are equi-distant 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 neutral position and wrap the forward cable around the reel the same number of revolutions noted during removal, maintaining the cable ends equi-distant.

d. Install the attaching shaft, washer and reel; align the shaft with the forward universal and install the taper pin.

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 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.

f. Using 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).

g. 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 rudder trim tab control system.

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 both upholstery panels on the left side of the pedestal.

k. Install the left floorboard and the pilot's seat.

l. Install the tail cone, the access plate beneath the RH horizontal stabilizer and the access plate at the trim tab actuator.

RUDDER TRIM TAB RIGGING

a. Disconnect the tab from its actuator.

b. Position the rudder in neutral and set the tab indicator at zero degrees.

c. Rig the tab cables to the proper tension as determined by the Temperature-Cable Tension Chart. Safety wire the turnbuckles.

d. Position the tab actuator screw at the midpoint of its travel.

e. Adjust the actuator linkage until the tab is in the neutral position with the chain centered on the actuator sprocket and connect the tab to the actuator.

f. Adjust the cable stops until the rudder tab has a travel of 19 to 21 degrees to both the left and right.

g. Torque the cable stops to 40 to 60 inch-pounds and safety.

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

i. Check the rudder trim tab control system for friction at the tab control wheel shaft. At room temperature, the maximum allowable torque limit is 12 inch-pounds.

RUDDER TRIM TAB ACTUATOR REMOVAL

a. Remove the access plate at the trim tab actuator.

b. Remove the tail cone and the access plate beneath the RH horizontal stabilizer.

c. Remove the access panel in the floorboard aft of the rear spar.

d. Disconnect the tab control cables at the turnbuckles in the aft fuselage.

e. Disconnect the tab actuator at the tab.

f. Remove the aft chain and cable assembly from the actuator sprocket.

g. Remove the bolt attaching the actuator to the actuator hinge. Remove the actuator.

RUDDER TRIM TAB ACTUATOR INSTALLATION

a. Position the tab actuator on the actuator hinge and install the attaching bolt.

b. Connect the actuator at the tab.

c. With the rudder tab in neutral, position the aft chain and cable assembly on the actuator sprocket so that the ends of the chain are equi-distant at the sprocket centerline within ± .20 inch.

d. Connect the tab control cables to the turnbuckles in the aft fuselage.

e. Rig the rudder tab control system.

f. Install the access panel in the floor board aft of the rear spar.

g. Install the tail cone and the access plate beneath the RH horizontal stabilizer.

h. Install the access plate at the trim tab actuator.

CHECKING RUDDER TAB FREE PLAY

Visually inspect the rudder tab for damage, security of hinge attach points, and for tightness of the actuating system. Inconsistancies should be corrected prior to checking the free play of the tab. The rudder tab free play 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 the equivalent as shown in Figure 202, 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 surface to prevent movement of the rudder. Set the rudder tab in the neutral position.

b. Tape the dial indicator check fixture to the rudder so that the dial indicator point is positioned 8.70 inches aft of the tab hinge line and at the top edge of the tab.

c. Apply a small piece of masking tape (for paint protection) 9.0 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 opposite side 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 load to the right. Record the dial reading as "A".

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

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

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

j. Enter the recorded values on a copy of Chart 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.

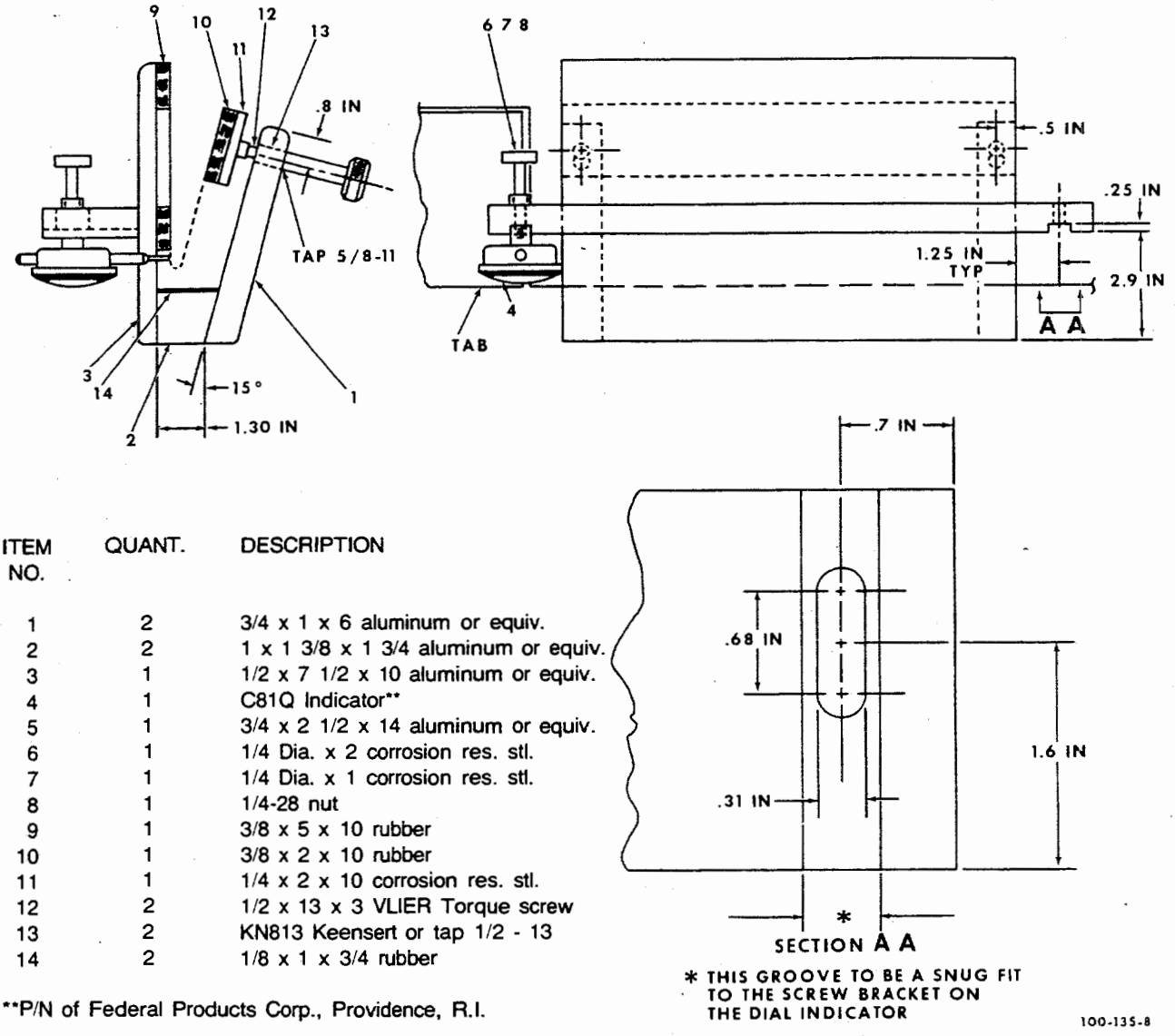
5. Add "X" and "Y" and record as "E".

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 = 0.061 inch maximum)

k. If the rudder trim tab free play exceeds the 0.061 inch maximum noted above, inspect all components of the tab actuation system to determine the cause. All worn parts should be replaced.



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.

(P/N 45-135030-9/810) Check Fixture for Tab Deflection
Figure 202

"END"

NOTE

To position the elevator in neutral on airplane serials P-438 and after, fabricate a tool from 5/16 inch diameter steel rod as shown in Figure 201A.

a. Remove the tail cone and the access plate on the side of the fuselage beneath the RH horizontal stabilizer.

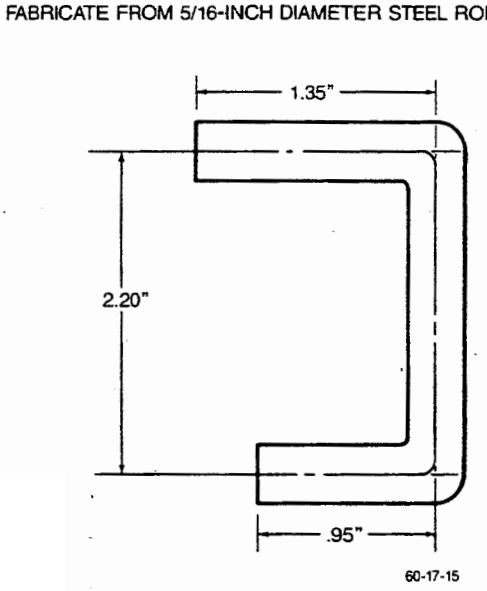
b. Position the aft elevator bell crank in neutral by inserting a 3/16 inch diameter rig pin through the bell crank and adjacent structure.

c. Adjust the elevator push rods to place the elevator in neutral.

NOTE

After the push rods are adjusted, the threads on the rod ends must be visible in the inspection holes at each end of the push rods.

d. Remove the rig pin from the aft elevator bell crank and adjust the elevator travel stops to obtain 17° ± 1° up travel and 15° ± 1° down travel.



Elevator Neutral Rigging Tool (P-438 and after) Figure 201A

e. On airplane serials prior to P-438, insert a 1/4 inch diameter rig pin in the control lock pin hole in the control column. Insert a 3/16 inch diameter rig pin in the aft elevator bell crank and adjacent structure.

f. To set the elevator controls in neutral on airplane serials P-438 and after, insert the short end of the fabricated tool (see Figure 201A) in the control column hanger. Move the control aft and insert the other end of the tool into the control shaft and torque tube. Insert a 3/16 inch diameter rig pin in the aft elevator bell crank and adjacent structure.

g. With the rig pins and elevator down springs installed, rig the elevator cable tension as noted on the Elevator Rigging Illustration, Figure 201.

h. Remove the rig pins, securely tighten all lock nuts and safety wire the turnbuckles.

NOTE

With the system fully installed (including the autopilot when installed) measure the force required to move the control column from the full forward position through neutral with a hand force gage. This force should measure between 32 and 36 pounds. The force required to restrain the control column when passing through neutral from a position not more than one inch aft of neutral should measure between 16 and 20 pounds when the system is properly rigged.

NOTE

After rigging the elevator and elevator 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 tab should move UP.

i. Install the tail cone and the access plate on the side of the fuselage beneath the RH horizontal stabilizer.

ELEVATOR TRIM TAB CABLE REMOVAL (Figure 201)

a. Remove the tail cone, the access plate beneath the RH horizontal stabilizer, and the access plate at the trim tab actuator.

b. Remove the pilot's seat and the left floorboard.

c. Remove both upholstery panels on the left side of the pedestal.

d. 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.

e. Remove the cable retaining pins from the pulley brackets and the pressure seals from the rear pressure bulkhead.

f. Disconnect the trim tab cables, in the aft fuselage, at the turnbuckles. Identify the cable for tab up movement and connect lead lines to the cables.

g. Remove the pressure seals in the rear pressure bulkhead.

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

i. Remove the bolt attaching the cable drum and sprocket to the lower pedestal. Note and record the number of cable revolutions on the reel.

j. Remove the cable through the pilot's compartment.

ELEVATOR TRIM TAB CABLE INSTALLATION (Figure 201)

a. Place the elevator trim tab control wheel in 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 the chain and sprocket teeth engaged, and install the attaching bolt. Route the forward cable aft to the LH trim cable pulley located in the lower fuselage area. Route the aft cable aft to the RH trim cable pulley located in the lower fuselage area.

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 tab in neutral, position the aft cable and chain assembly on the 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. Using 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).

g. 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.

NOTE

The force in line with the elevator tab cables required to move the cable shall not exceed 23 pounds measured with a hand held force gage, with or without electric trim.

i. Install the access panel in the floorboard aft of the rear spar, the floorboard between the main and aft spar, and the left passenger seat.

j. Install the left floorboard and the pilot's seat.

k. Install both upholstery panels on the pedestal.

l. Install the tail cone, the access plate beneath the RH horizontal stabilizer, and the access plate at the trim tab actuator.

ELEVATOR TRIM TAB RIGGING

NOTE

BEECHCRAFT recommends the use of the elevator travel gage shown in SPECIAL TOOLS in Chapter 12-20-00.

a. Place the elevator trim tab control in neutral position.

b. Place the elevator in neutral position and connect the trim tab to the trim 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 upon completion of step "c.", adjust the actuator push rod to place the tab in neutral position.

e. Center the chain on the sprocket and tighten the cable. Rig cable tension as noted on the Elevator Rigging Illustration, Figure 201.

f. Check trim tab travel, adjust stops and safety turnbuckles.

NOTE

Check the trim tab system for correct movement of the control surface with respect to the movement of the trim tab control. When the elevator tab control is moved toward the NOSE DOWN position, the tab should move up.

ELEVATOR TRIM TAB ACTUATOR REMOVAL

a. Remove the access plate at the trim tab actuator.
b. Remove the tail cone and the access plate beneath the RH horizontal stabilizer.
c. Remove the access panel in the floorboard aft of the rear spar.
d. Disconnect the tab control cables at the turnbuckles in the aft fuselage.
e. Disconnect the tab actuator at the tab.
f. Remove the bolt attaching the actuator to the elevator. Remove the actuator, and the chain and cable assembly from the actuator sprocket.

ELEVATOR TRIM TAB ACTUATOR INSTALLATION

a. Position the chain and cable assembly on the actuator sprocket so that the ends of the chain are equidistant at the sprocket centerline within ± .20 inch. Install the bolt attaching the actuator to the elevator.
b. Connect the actuator to the tab.
c. Connect the cables to the turnbuckles in the aft fuselage. Rig the tab control system.
d. Install the access panel in the floorboard.
e. Install the tail cone and the access plate beneath the RH horizontal stabilizer.
f. Install the access plate at the trim tab actuator.

ELECTRIC TRIM TAB ACTUATOR REMOVAL

a. Remove the access plate on the side of the fuselage beneath the RH horizontal stabilizer. The actuator is located on Fuselage Station 311.19 bulkhead adjacent to the trim tab cables.
b. Disconnect the actuator wire harness at the disconnect splices.
c. Disconnect the actuator cable at the turnbuckle, then tape the cable to the actuator to prevent the cable from unwinding.
d. Remove the three bolts securing the actuator to the bracket and remove the actuator from the airplane.

ELECTRIC TRIM TAB ACTUATOR INSTALLATION

a. Secure the actuator to the mounting bracket with the three attaching bolts.
b. Connect the actuator cables at the turnbuckles in the aft fuselage.
c. Connect the actuator wire harness at the splices.
d. Rig the tab control system.

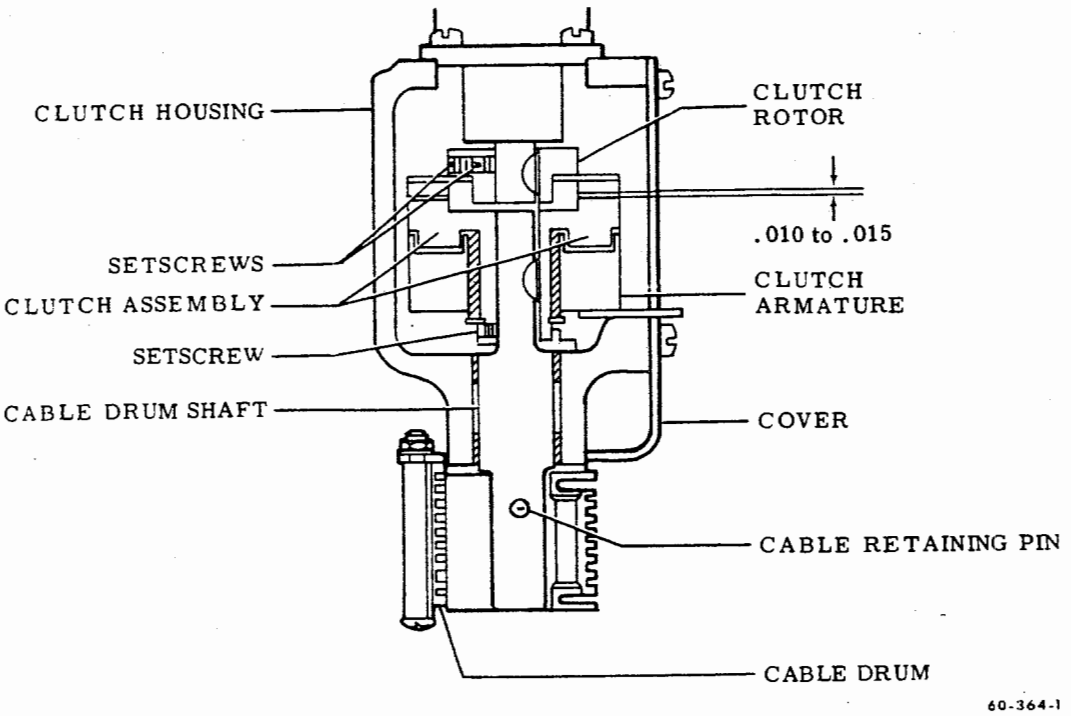
NOTE

The tab rigging and cable tension are identical to the manually operated tab.

e. Check that the elevator trim tab cable travels from stop to stop in 18 to 20 seconds with 28.5 VDC applied to the airplane electrical system. If necessary, adjust the resistor mounted adjacent to the actuator until cable travel is within the desired limit.
f. Install the access plate beneath the RH 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



Electric Trim Tab Actuator
Figure 202

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 cable travel as instructed in step "e." of the ELECTRIC TRIM TAB ACTUATOR INSTALLATION.

ELECTRIC TRIM TAB ACTUATOR MAGNETIC CLUTCH REMOVAL (Figure 202)

a. Remove the lid from the clutch housing.
b. Loosen the set screw in the clutch 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 (Figure 202)

a. Install the clutch in the clutch housing.
b. Slide the cable drum and shaft assembly into the clutch housing.
c. 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.

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.

ELECTRIC TRIM TAB ACTUATOR MAGNETIC CLUTCH TORQUE TEST

The following procedure should be performed any time the magnetic clutch is replaced.

a. Connect the red electrical lead of the magnetic clutch to ground and the white electrical lead to a 28 VDC power source. Check that the clutch holds with 30 inch-pounds of torque applied through a torque wrench 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. Use 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 mount the actuator on the plate.

2. Insert the retaining pin in the actuator shaft.

3. Slot the end of the tube so that it will fit snugly into the .375 inch diameter hole in the end of the shaft.

4. Insert the tube into the shaft until the slot engages the retaining pins.

5. Attach the free end of the tube to a slow speed (approximately 450 rpm) half-inch drill motor.

6. Remove the access plate from the clutch housing and blow the housing and clutch clean.

7. Connect the red electrical lead of the clutch to ground and the white electrical lead to a regulated power source set at 14 to 16 VDC.

8. Start the drill motor and run for fifteen seconds, then remove the white lead from the power source. Let the clutch cool for approximately one minute before reattaching the lead for another fifteen 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 compressed air.

CAUTION

Exceeding the fifteen second burn-in periods may overheat and damage the magnetic clutch.

CHECKING ELEVATOR TAB FREE PLAY

Visually inspect the elevator tabs for damage, security of hinge attach points, and for tightness of the actuating system. Inconsistancies should be corrected prior to checking the free play of the tabs. The elevator tab free play 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 the equivalent as shown in Figure 203, 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 elevators. Set the elevator tabs in the neutral position.

b. Using shot bags, affix the dial indicator check fixture so that the dial indicator point is positioned 2.90 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 the 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.

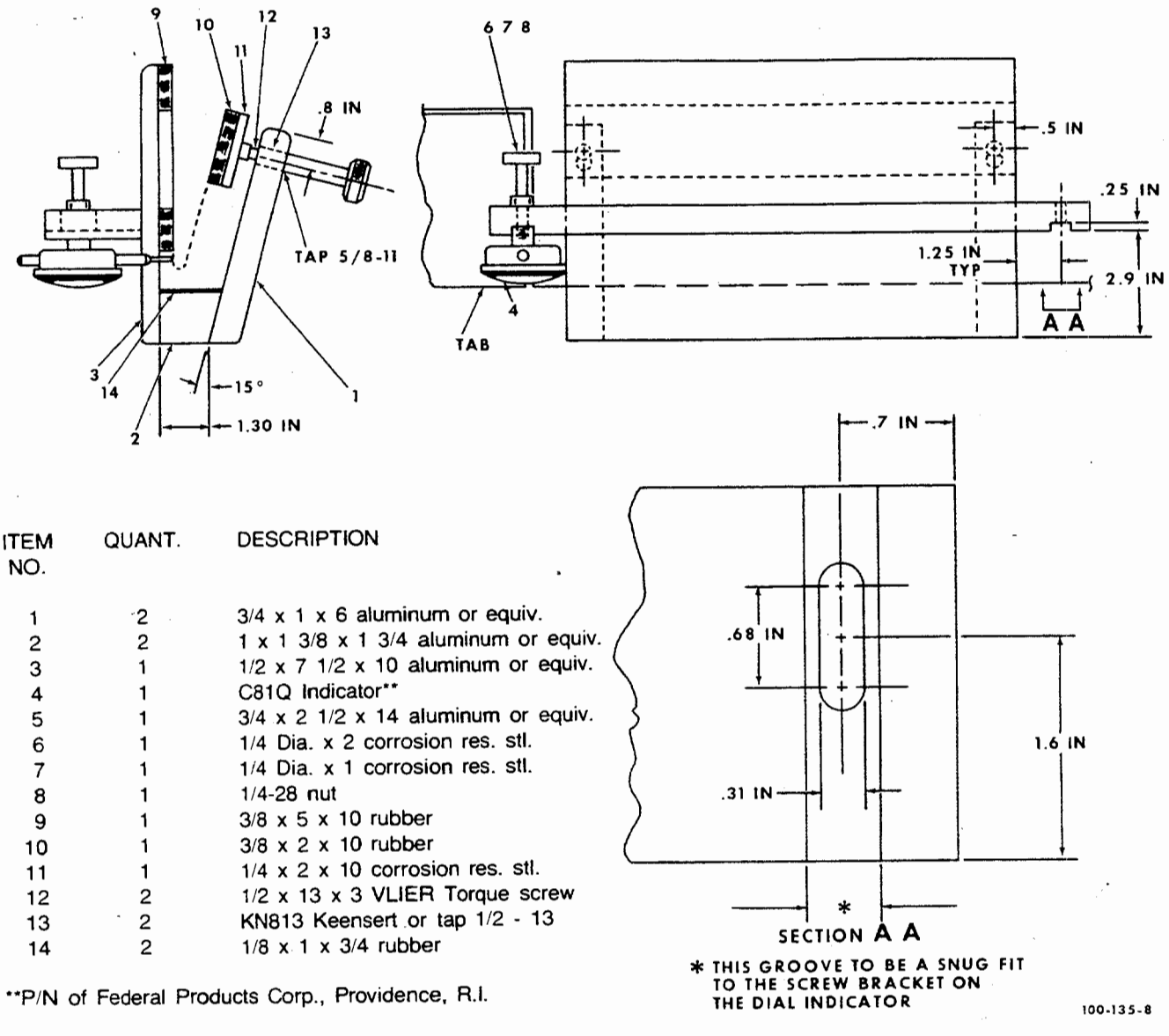
5. Add "X" and "Y" and record as "E".

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 = 0.020 inch maximum).

k. If the elevator trim tab free play exceeds the 0.020 inch maximum noted above, inspect all components of the tab actuation system to determine the cause. All worn parts should be replaced.



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.

(P/N 45-135030-9/810) Check Fixture for Tab Deflection
Figure 203

"END"

FLAPS - DESCRIPTION AND OPERATION

The flaps consist of a section on each wing driven by a single electric motor. A flexible drive shaft extends from the motor assembly to a jackscrew actuator for each section. 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 located to the right of the control console on the subpanel.

To indicate the position of the flaps on serials P-4 through P-246, an adjustable flap position transmitter is installed on the flap actuator in the right wing. An indicator on the right subpanel provides a visual indication of the flap position.

On serials P-247 and after, the position of the flaps are indicated by three indicator lights located on the right subpanel. The illumination of these lights are controlled by the flap limit switches. When the flaps are UP, all lights are out. A red TRANSIT light illuminates to indicate that the flaps are not in the selected position. The red TRANSIT light goes out and either the blue APH (approach) or the amber DN (down) light illuminates to indicate the flaps are in the position selected. The intensity of illumination is reduced for night operations when the NAV lights are turned on. The lights may be checked by pressing the PRESS-TO-TEST switch on the annunciator panel.

"END"

FLAPS - MAINTENANCE PRACTICES

FLAP REMOVAL

a. Fully extend the flaps and remove the bolt from the flap actuating arm.

b. Remove the bonding cable from the flap tracks.

c. Remove the bolts from the flap track brackets and remove the flap.

FLAP INSTALLATION

a. Hold flap in position and install the rollers and the bolts in the flap track bracket.

b. Connect the bonding cable and 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 inboard trailing edge of the flap must be within .20 inch above or below the trailing edge of the wing stub on either or both sides. The gap between the flap and aileron must be between .13 and .50 inch.

FLAP TRACK ROLLER INSTALLATION

Install the rollers (four per flap and two per track) in the flap track brackets with the flanges to the outboard side of the inboard track and to the inboard side of the outboard track. Install a 50-105000-3 washer between each of the aft rollers and its respective track. Use only the wide flanged rollers in the aft locations. The clearance between the roller and the front end of the forward slot in each track must be .03 to .12 inch.

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 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.

NOTE

An additional 16° limit switch is installed on serials P-247 and after.

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(es) 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 slots 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 flaps are removed for any reason the flap actuator switch should be in the "Neutral" position or the main power switch OFF.

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 sound of the flap motor near the completion of the flap up travel may indicate an excessive outward adjustment of the bumper.

FLAP FUNCTIONAL GROUND TEST

a. Connect a ground power unit (regulated at 28.25 ± .25 VDC) to the aircraft.

b. Check flap motor amperage during down and up cycles. (Maximum 7.0 amps down; 9.0 amps up.)

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.

d. Avoid continuous operation of the flaps to prevent overheating of the motor.

FLAP POSITION TRANSMITTER ADJUSTMENT (P-4 through P-246)
(Figure 201)

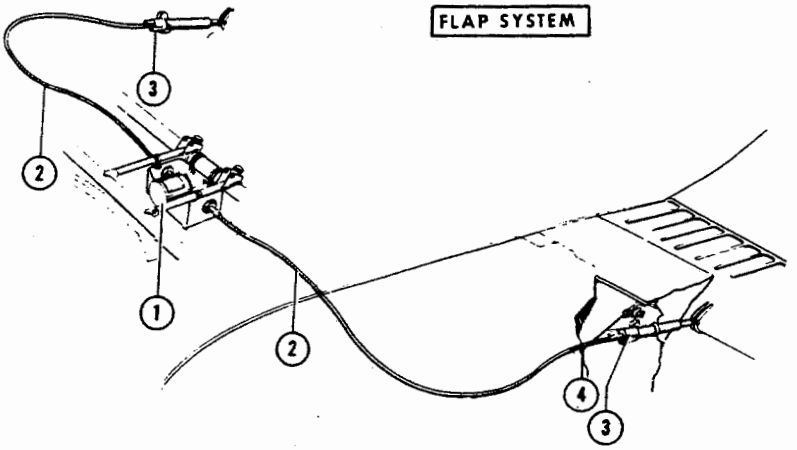
An adjustable flap position indicator transmitter is installed

FLAP SETTINGS

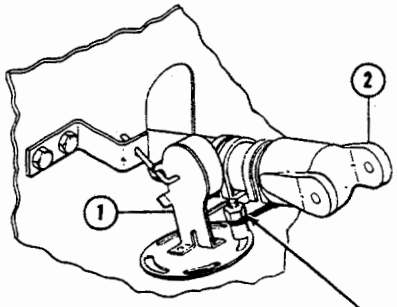
Approach- 15° from Neutral
Full Down- 30° from Neutral

1. Flap Motor Gearbox
2. Flap Shaft and Housing
3. Flap Actuator
4. Limit Switches

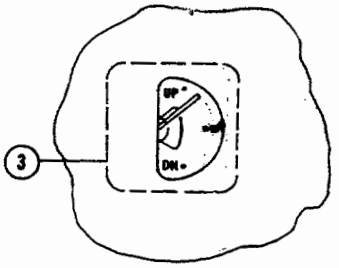
FLAP SYSTEM



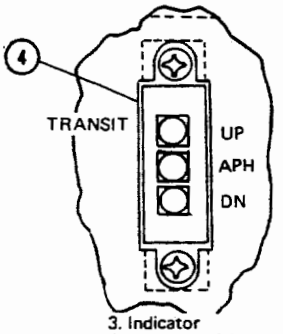
FLAP TRANSMITTER AND POSITION INDICATORS



TO ADJUST, LOOSEN MOUNTING BOLTS AND MOVE FORE AND AFT, OR RDTATE SLIGHTLY.

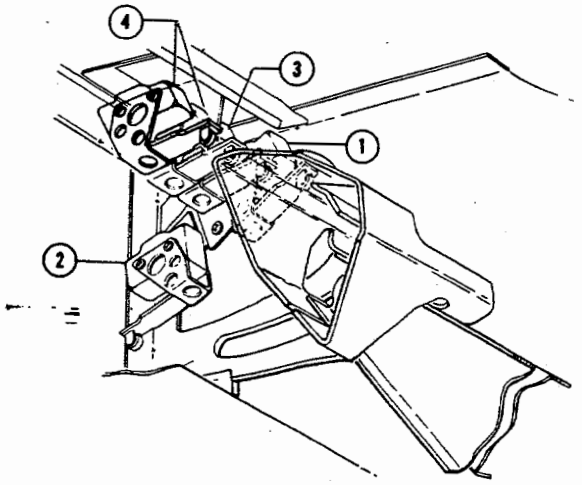


1. Transmitter
2. Flap Actuator



3. Indicator
*4. Indicator Lights

FLAP LIMIT SWITCHES



1. Down Limit Switch
2. Up Limit Switch
3. 14° Limit Switch
*4. 16° Limit Switches

*INDICATOR LIGHTS AND (2) 16° LIMIT SWITCHES ARE INSTALLED ON SERIALS P-247 AND AFTER.

60-161-1A

Flap System
Figure 201

TEMPORARY REVISION NO. 27-2

Manual Affected: Duke 60 Series Maintenance Manual (60-590001-25)

Filing Instructions: Insert adjacent to 27-50-00, Page 203, dated Nov 2/73.

Reason: Revise procedures for flap drive cable connection.

FLAP DRIVE CABLE CONNECTION

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.

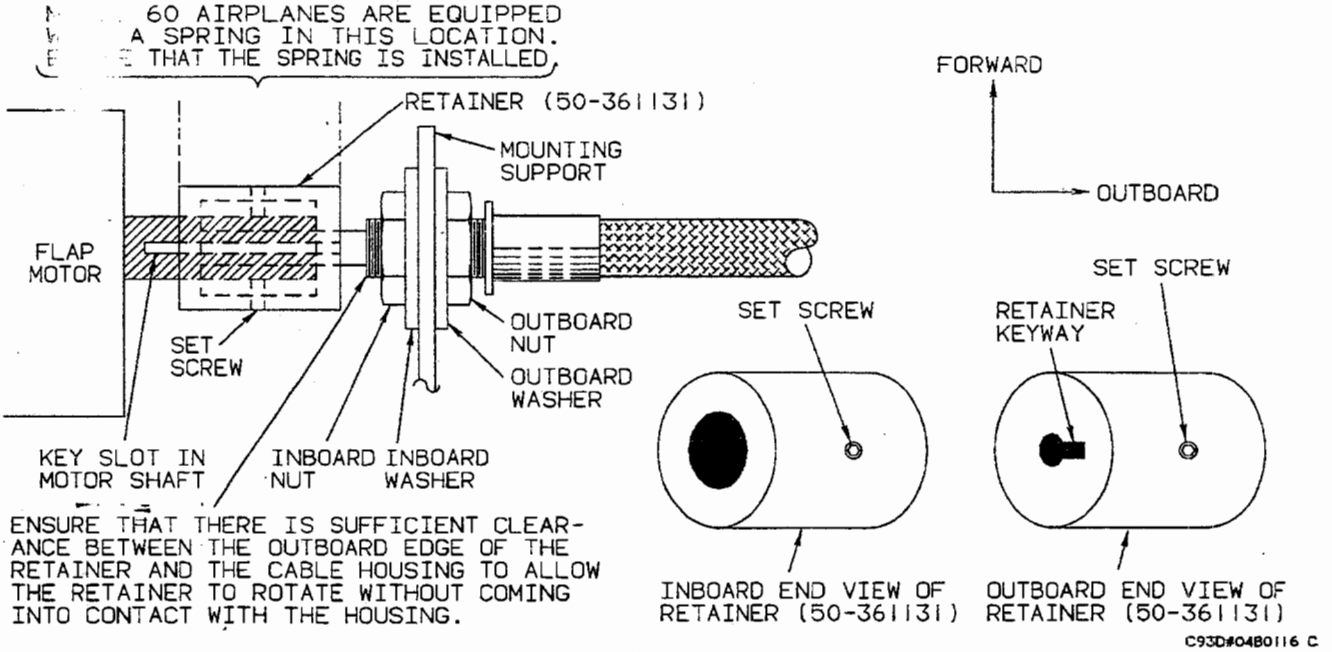
b. Insert the retainer through the mount support and onto the motor shaft as far as it will go. Align the retainer keyway with the key slot in the flap motor drive shaft and tighten one set screw temporarily.

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 the 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 thread length is reached. Tighten the outboard nut against the mounting support.



on the flap actuator in the right 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 and 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 POSITION INDICATOR LIGHTS - ADJUSTMENT AND FUNCTIONAL CHECK (P-247 and After)

(Figure 201)

The flap position indicator lights, installed on the right subpanel, provide the operator with a visual indication of the wing flap position. These lights are controlled by the flap limit switches.

a. Adjust the flap limit switches to provide the correct travel. (Refer to FLAP CONTROL SYSTEM RIGGING).

b. Select DN (down) position. Observe that the red TRANSIT light illuminates and remains illuminated until the amber DN (down) light illuminates.

c. Select the APH (approach) position. Observe that the amber DN (down) light goes out and the red TRANSIT light illuminates and remains illuminated until the blue APH (approach) light is illuminated.

d. Select the UP (full up) position. Observe that the blue APH (approach) light goes out and the red TRANSIT light illuminates. When the flaps are in UP (full up) position, the red TRANSIT light will go out.

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.

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.

b. Couple the flexible drive shaft to the actuator. Install the access plate on the lower surface of the wing.

c. Extend the actuator until the flap synchronizes with the opposite flap, then connect the actuator to the flap.

d. Check rigging of the wing flap control system.

e. 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 MOTOR/GEARBOX REMOVAL

a. Gain access to the flap motor through the cabin floor panel at the rear spar carry through.

b. Disconnect the electrical wiring at the motor.

c. Remove the drive shaft retainers on each side of the gearbox and disconnect both flexible drive shafts from the support bracket.

d. Remove the four bolts, attaching the motor/gearbox to the support bracket, and remove the motor/gearbox as a unit.

FLAP MOTOR/GEARBOX INSTALLATION

a. Position the flap motor/gearbox against the support bracket and install the four 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 shafts to the support bracket.

d. Degrease the retainer threads with primer (40, Chart 207, 91-00-00). Apply thread locking compound (36, Chart 207, 91-00-00) to the retainers prior to installation.

e. Connect electrical wiring at the motor.

f. Install the cabin floor access panel.

g. Perform a FLAP FUNCTIONAL GROUND TEST.

"END"

STALL WARNING SYSTEM - 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 circuit breaker, and a stall and pitot switch located on the pilot's subpanel.

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.

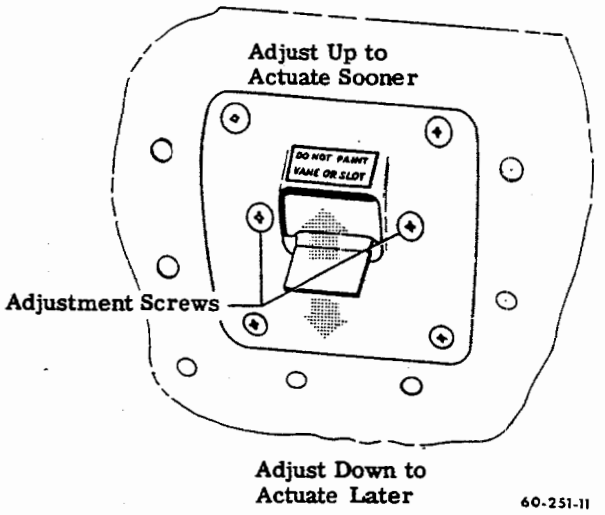
b. Position the indicator in the opening in the lower wing leading edge, install the doubler and the four screws.

c. Adjust the indicator. See STALL WARNING INDICATION SYSTEM ADJUSTMENT.

STALL WARNING INDICATING SYSTEM ADJUSTMENT

(Figure 201)

The stall warning switch is carefully 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 coming on too early, pull the vane back and down. If the stall warning has been coming on 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 4.4 knots 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 knot 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 5 to 7 knots 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"

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. Installing control locks may be done as follows:

a. Insert the spring end of the rudder control locking pin into the hole at the top of the pilot's left rudder pedal arm.

b. Neutralize the pedals with the locking pin spring compressed and insert the opposite end of the locking pin into the right pedal arm. The rudder pedals locking pin is placarded RUDDER PEDALS LOCKED.

c. Position the throttle control lock, placarded THROTTLE CONTROLS STOP, forward of the throttle levers in the closed position and secure it to the console with the Dzus fastener.

d. The aileron control locking device, placarded AILERON AND ELEVATOR CONTROLS LOCKED, is installed by inserting the pin through a hole in a flange protruding from the subpanel, and through a matching hole in the lower side of the control column tube.

To remove the control locks, remove in the following order: rudder, aileron/elevator and throttle.

"END"

CHAPTER 28

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"END"

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