PIPER

Malibu MATRIX
Information Manual

WARNING

This Information Manual may be used for general information purposes only.

This Information Manual is not kept current. It must not be used as a substitute for the official FAA approved Pilot's Operating Handbook required for operation of the airplane.

Piper™

Malibu MATRIX
PA-46R-350T
SN 4692001 AND UP

INFORMATION MANUAL

Piper®

MANUAL PART NUMBER 767-067

Published by
TECHNICAL PUBLICATIONS
Issued: OCTOBER 25, 2007

APPLICABILITY

Application of this handbook is limited to the specific Piper PA-46R-350T model airplane designated by serial number and registration number on the face of the title page of this handbook.

This handbook cannot be used for operational purposes unless kept in a current status.

WARNING

EXTREME CARE MUST BE EXERCISED TO LIMIT THE USE OF THIS HANDBOOK TO APPLICABLE AIRCRAFT. THIS HANDBOOK IS VALID FOR USE WITH THE AIRPLANE IDENTIFIED ON THE FACE OF THE TITLE PAGE. SUBSEQUENT REVISIONS SUPPLIED BY PIPER MUST BE PROPERLY INSERTED.

WARNING

INSPECTION, MAINTENANCE AND PARTS REQUIREMENTS FOR ALL NON-PIPER APPROVED STC INSTALLATIONS ARE NOT INCLUDED IN THIS HANDBOOK. WHEN A NON-PIPER APPROVED STC INSTALLATION IS INCORPORATED ON THE AIRPLANE, THOSE PORTIONS OF THE AIRPLANE AFFECTED BY THE INSTALLATION MUST BE INSPECTED IN ACCORDANCE WITH THE INSPECTION PROGRAM PUBLISHED BY THE OWNER OF THE STC. SINCE NON-PIPER APPROVED STC INSTALLATIONS MAY CHANGE SYSTEMS INTERFACE, OPERATING CHARACTERISTICS AND COMPONENT LOADS OR STRESSES ON ADJACENT STRUCTURES, PIPER PROVIDED INSPECTION CRITERIA MAY NOT BE VALID FOR AIRPLANES WITH NON-PIPER APPROVED STC INSTALLATIONS.

REVISIONS

The information compiled in the Pilot's Operating Handbook, with the exception of the equipment list, will be kept current by revisions distributed to the airplane owners. The equipment list was current at the time the airplane was licensed by the manufacturer and thereafter must be maintained by the owner.

Revision material will consist of information necessary to update the text of the present handbook and/or to add information to cover added airplane equipment.

I. Revisions

Revisions will be distributed whenever necessary as complete page replacements or additions and shall be inserted into the handbook in accordance with the instructions given below:

1. Revision pages will replace only pages with the same page number.
2. Insert all additional pages in proper numerical order within each section.
3. Insert page numbers followed by a small letter in direct sequence with the same common numbered page.

II. Identification of Revised Material

Each handbook page is dated at the bottom of the page showing the date of original issue and the date of the latest revision. Revised text and illustrations are indicated by a black vertical line located along the outside margin of each revised page opposite the revised, added, or deleted information. A vertical line next to the page number indicates that an entire page has been changed or added.

Vertical black lines indicate current revisions only. Correction of typographical or grammatical errors or the physical relocation of information on a page will not be indicated by a symbol.

ORIGINAL PAGES ISSUED

The original pages issued for this handbook prior to revision are given below:

Title, ii through viii, 1-1 through 1-12, 2-1 through 2-28, 3-1 through 3-68, 4-1 through 4-50, 5-1 through 5-36, 6-1 through 6-14, 7-1 through 7-62, 8-1 through 8-26, 9-1 through 9-62, and 10-1 through 10-2.

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS

Current Revisions to the PA-46R-350T Malibu Matrix Pilot's Operating Handbook, REPORT: VB-2007 issued OCTOBER 25, 2007.

Revision Number and Code	Revised Pages	Description of Revisions	FAA Approved Signature and Date
Rev. 1 (PR071210)	v 2-16	Added Rev. 1 to L of R. Revised table in para. 2.41.	Albert J. Mill December 10, 2007
Rev. 2 (PR071217)	v 2-21 2-23	Added Rev. 2 to L of R Revised para. 2.51 Revised para. 2.51	Albert J. Mill December 17, 2007
Rev. 3 (PR080109)	v 9-30 thru 9-33 9-37	Added Rev. 3 to L of R Revised Supp. 2, Section 2 Revised Supp. 2, Section 2 Revised Supp. 2, Section 2 Revised Supp. 2, Section 4	Albert J. Mill January 09, 2008
Rev. 4 (PR080109)	v 9-i 9-45 9-61 thru 9-70 9-71 thru 9-72	Added Rev. 4 to L of R Revised Section 9 TOC Removed Section 9, Supp. 4 Added Section 9, Supp. 7 Renumbered Section 9, Supp. 7 as Supp. 8	Albert J. Mill January 09, 2008
Rev. 5 (PR080116)	v 2-24 2-27	Added Rev. 5 to L of R Revised para. 2.51 placards Revised para. 2.51	Albert J. Mill January 16, 2008

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revisions	FAA Approved Signature and Date
Rev. 6 (PR080905)	i	Added EASA approval statement to POH title page.	
	ii	Updated copyright information.	
	vi	Added Rev. 6 to L of R.	Albert J. Mill September 5, 2008
Rev. 7 (PR090210)	vi	Added Rev. 7 to L of R.	
	vi-a, b	Added pages to L of R.	
	1-4	Revised Para. 1.5.	
	2-3	Revised Para. 2.7 (i).	
	3-5	Revised annunciator description text in Para. 3.1.	
	3-12	Added text to Para. 3.4f. Moved Note and checklist to Page 3-13.	Albert J. Mill February 10, 2009
	3-13	Revised Cabin Heat text and removed Temperature Control text in Para. 3.4f checklist.	
	3-30	Revised Indication text in Para. 3.4n checklist.	
	3-36	Added text to Para. 3.4u.	
	3-61	Revised Indication text in Para. 3.28 checklist.	
	3-64	Revised text in Para. 3.41.	
	4-15	Revised checklist items in Para. 4.5f.	
	4-36	Revised Para. 4.19.	
	4-49	Revised text in Para. 4.51.	
	7-21	Added note to Para. 7.8b.	
	7-48	Revised Para. 7.27.	
	9-i	Added page numbers to Supp. 8 entry in Section 9 T of C. Added Supp. 9 entry to T of C.	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revisions	FAA Approved Signature and Date
Rev. 7 (cont'd)	9-21 thru 9-24	Renumbered figure references and revised text.	
	9-25 thru 9-26	Renumbered figures.	
	9-45 thru 9-46	Updated page header information.	
	9-49 thru 9-54	Content unchanged; corrected order of pages.	
	9-53	Renumbered figure.	
	9-54 thru 9-56	Renumbered figure references.	
	9-59 thru 9-60	Renumbered figure and figure references.	
	9-61 thru 9-72	Added supplement page numbers to Supp. 7 and 8.	
	9-66	Renumbered figure and figure reference.	
	9-73 thru 9-78	Added Supplement 9.	
Rev. 8 (PR090417)	ii	Updated copyright information.	Albert J. Mill April 17,2009
	vi-a	Added Rev. 8 to L of R.	
	1-4	Revised test in Para. 1.5(c) and 1.5(e).	
	2-3	Revised text in Para. 2.7(i),(j) and 2.7(k).	
	4-41	Revised text in Para 4.27 (4.5j).	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revisions	FAA Approved Signature and Date
Rev. 8 (cont'd)	4-49	Revised text and added table in Para. 4.51.	
	8-3	Revised text in Para. 8.1.	
	8-12	Revised text in Para. 8.19.	
	9-22	Revised text in Sect. 7, Electric Propeller DeIce Para.	
	9-77	Revised text in Sect. 9, Propeller Heat Para.	

TABLE OF CONTENTS

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TABLE OF CONTENTS

SECTION 1

GENERAL

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SECTION 1

GENERAL

1.1 INTRODUCTION

This Pilot's Operating Handbook is designed for maximum utilization as an operating guide for the pilot. It includes the material required to be furnished to the pilot by the Federal Aviation Regulations and additional information provided by the manufacturer and constitutes the FAA Approved Airplane Flight Manual.

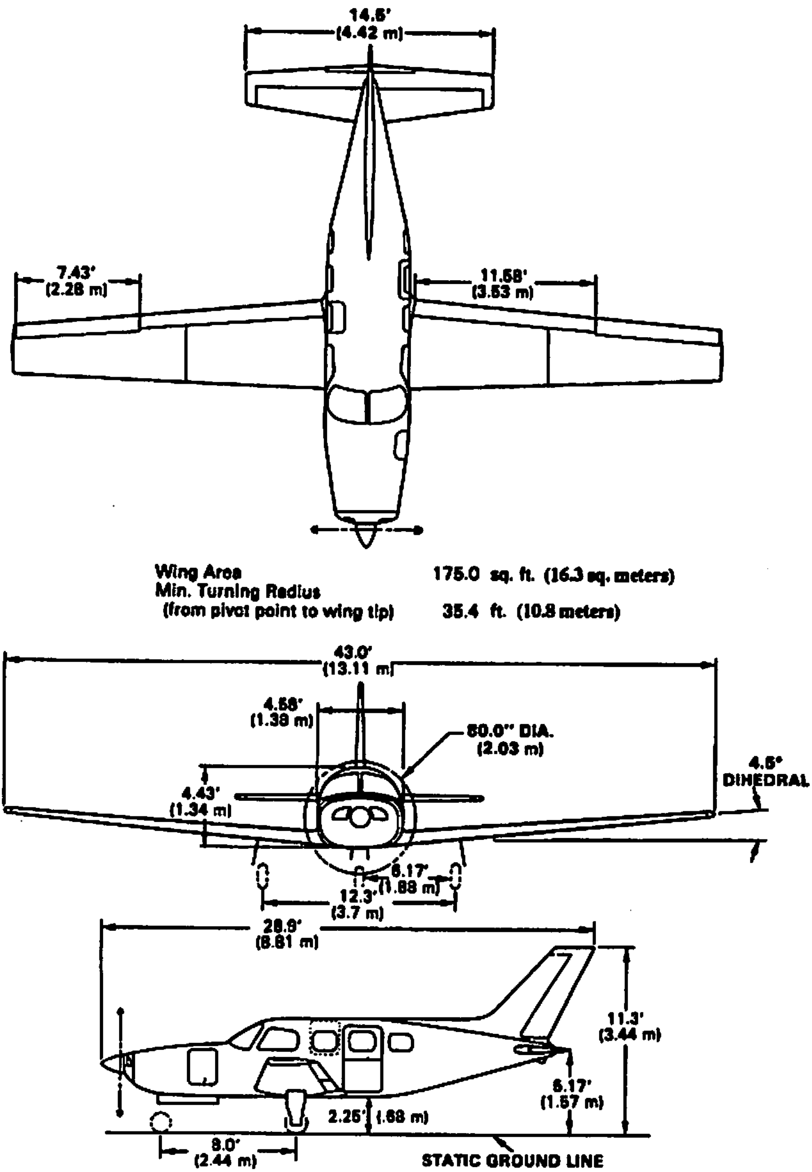
This handbook is not designed as a substitute for adequate and competent flight instruction, knowledge of current Airworthiness Directives, applicable Federal Aviation Regulations or Advisory Circulars. It is not intended to be a guide for basic flight instruction or a training manual and should not be used for operational purposes unless kept in a current status. The pilot should study the entire handbook to familiarize himself with the limitations, performance, procedures and operational handling characteristics of the airplane before flight.

Assurance that the airplane is in an airworthy condition is the responsibility of the owner. The pilot in command is responsible for determining that the airplane is safe for flight. The pilot is also responsible for remaining within the operating limitations as outlined by instrument markings, placards, and this handbook.

The handbook has been divided into numbered (arabic) sections each provided with a finger-tip tab divider for quick reference. Provisions for expansion of the handbook have been made by the deliberate omission of certain paragraph numbers, figure numbers, item numbers and pages noted as being intentionally left blank.

NOTE

In countries other than the United States of America, FAA operating rules may not apply. Operators must ensure that the aircraft is operated in accordance with national operating rules.



THREE VIEW
Figure 1-1

1.2 NOTATIONS

WARNING

Operating procedures or techniques which may result in personal injury or loss of life if not carefully followed.

CAUTION

Operating procedures or techniques which may result in damage to equipment if not carefully followed.

NOTE

Supplemental information or highlights considered of sufficient significance to require emphasizing.

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1.3 ENGINE

(a) Number of Engines	1
(b) Engine Manufacturer	Textron Lycoming
(c) Engine Model Number	TIO-540-AE2A
(d) Rated Horsepower	350
(e) Rated Speed (rpm)	2500
(f) Maximum Manifold Pressure (in. Hg.)	42.0
(g) Bore (inches)	5.125
(h) Stroke (inches)	4.375
(i) Displacement (cubic inches)	541.5
(j) Compression Ratio	7.3:1
(k) Engine Type	Six Cylinder, Direct Drive, Horizontally Opposed, Air Cooled, Turbocharged, Fuel Injected

1.5 PROPELLER

(a) Number of Propellers	1
(b) Propeller Manufacturer	Hartzell
(c) Blade Models	7890B 7890K N7605+2 N7605K+2
(d) Number of Blades	3
(e) Hub Models	HC-I3YR-1E HC-I3Y1R-1N
(f) Propeller Diameter (inches)	80
(g) Propeller Type	Constant Speed, Hydraulically Actuated

1.7 FUEL

AVGAS ONLY

(a) Fuel Capacity (U.S. gal.) (total)	122
(b) Usable Fuel (U.S. gal.) (total)	120
(c) Fuel	
(1) Minimum Grade	100- Green or 100LL Blue Aviation Grade
(2) Alternate Fuels	Refer to latest revision of Lycoming Service Instruction 1070, except alcohol is ***not*** approved for use in this airplane.

1.9 OIL

(a) Oil Capacity (U.S. quarts)	12
(b) Oil Specification	Refer to latest revision of Lycoming Service Instruction 1014.

(c) Oil Viscosity per Average Ambient Temperature for Starting

Average Ambient Temperature	MIL-L-22851 Ashless Dispersant SAE Grades
All Temperatures	15W-50 or 20W-50
Above 80F	60
Above 60F	40 or 50
30F to 90F	40
0F to 70F	30, 40 or 20W-40
Below 10F	30 or 20W-30

When operating temperatures overlap indicated ranges, use the lighter grade oil. Use ashless dispersant oil only per the latest revision of Textron Lycoming Service Instruction 1014.

1.11 MAXIMUM WEIGHTS

(a) Maximum Ramp Weight (lb)	4358
(b) Maximum Takeoff Weight (lb)	4340
(c) Maximum Landing Weight (lb)	4123
(d) Maximum Zero Fuel Weight (lb)	4123
(e) Maximum Weights in Baggage Compartments (lb)	
(1) Forward	100
(2) Aft	100

1.13 STANDARD AIRPLANE WEIGHTS

Refer to Figure 6-5 for the Standard Empty Weight and the Useful Load.

1.15 CABIN AND ENTRY DIMENSIONS (IN.)

(a) Cabin Width (max.)	49.5
(b) Cabin Length (Instrument panel to rear bulkhead)	148
(c) Cabin Height (max.)	47
(d) Entry Width	24
(e) Entry Height	46

1.17 BAGGAGE SPACE AND ENTRY DIMENSIONS

(a) Compartment Volume (cu. ft.)	
(1) Forward	13
(2) Aft	20
(b) Entry Dimensions (in.)	
(1) Forward	19 x 23
(2) Aft	24 x 46

1.19 SPECIFIC LOADING

(a) Wing Loading (lbs. per sq. ft.)	24.8
(b) Power Loading (lbs. per hp)	12.4

1.21 SYMBOLS, ABBREVIATIONS AND TERMINOLOGY

The following definitions are of symbols, abbreviations and terminology used throughout the handbook and those which may be of added operational significance to the pilot.

(a) General Airspeed Terminology and Symbols

CAS	Calibrated Airspeed means the indicated speed of an aircraft, corrected for position and instrument error. Calibrated airspeed is equal to true airspeed in standard atmosphere at sea level.
KCAS	Calibrated Airspeed expressed in "Knots."
GS	Ground Speed is the speed of an airplane relative to the ground.
IAS	Indicated Airspeed is the speed of an aircraft as shown on the airspeed indicator when corrected for instrument error. IAS values published in this handbook assume zero instrument error.
KIAS	Indicated Airspeed expressed in "Knots."
M	Mach Number is the ratio of true airspeed to the speed of sound.
TAS	True Airspeed is the airspeed of an airplane relative to undisturbed air which is the CAS corrected for altitude, temperature and compressibility.
V_A	Maneuvering Speed is the maximum speed at which application of full available aerodynamic control will not overstress the airplane.
V_{FE}	Maximum Flap Extended Speed is the highest speed permissible with wing flaps in a prescribed extended position.

1.21 SYMBOLS, ABBREVIATIONS AND TERMINOLOGY (continued)

V_{LE}	Maximum Landing Gear Extended Speed is the maximum speed at which an aircraft can be safely flown with the landing gear extended.
V_{LO}	Maximum Landing Gear Operating Speed is the maximum speed at which the landing gear can be safely extended or retracted.
V_{NE}/M_{NE}	Never Exceed Speed or Mach Number is the speed limit that may not be exceeded at any time.
V_{NO}	Maximum Structural Cruising Speed is the speed that should not be exceeded except in smooth air and then only with caution.
V_S	Stalling Speed or the minimum steady flight speed at which the airplane is controllable.
V_{SO}	Stalling Speed or the minimum steady flight speed at which the airplane is controllable in the landing configuration at maximum gross weight.
V_X	Best Angle-of-Climb Speed is the airspeed which delivers the greatest gain of altitude in the shortest possible horizontal distance.
V_Y	Best Rate-of-Climb Speed is the airspeed which delivers the greatest gain in altitude in the shortest possible time.

1.21 SYMBOLS, ABBREVIATIONS AND TERMINOLOGY (continued)

(b) Meteorological Terminology

ISA	International Standard Atmosphere in which: (1) The air is a dry perfect gas; (2) The temperature at sea level is 15° Celsius (59° Fahrenheit); (3) The pressure at sea level is 29.92 inches hg. (1013.2 mb); (4) The temperature gradient from sea level to the altitude at which the temperature is -56.5C (-69.7F) is -0.00198C (-0.003564F) per foot and zero above that altitude.
OAT	Outside Air Temperature is the free air static temperature obtained either from inflight temperature indications or ground meteorological sources, adjusted for instrument error and compressibility effects.
Indicated Pressure Altitude	The number actually read from an altimeter when the barometric subscale has been set to 29.92 inches of mercury (1013.2 millibars).
Pressure Altitude	Altitude measured from standard sea-level pressure (29.92 in. Hg) by a pressure or barometric altimeter. It is the indicated pressure altitude corrected for position and instrument error. In this handbook, altimeter instrument errors are assumed to be zero.
Station Pressure	Actual atmospheric pressure at field elevation.
Wind	The wind velocities recorded as variables on the charts of this handbook are to be understood as the headwind or tailwind components of the reported winds.

1.21 SYMBOLS, ABBREVIATIONS AND TERMINOLOGY (continued)

(c) Power Terminology

Takeoff Power	Maximum power permissible for takeoff.
Maximum Continuous Power	Maximum power permissible continuously during flight.
Maximum Climb Power	Maximum power permissible during climb.
Maximum Cruise Power	Maximum power permissible during cruise.

(d) Engine Instruments

T.I.T. Gauge	Turbine Inlet Temperature

(e) Airplane Performance and Flight Planning Terminology

Climb Gradient	The demonstrated ratio of the change in height during a portion of a climb, to the horizontal distance traversed in the same time interval.
Demonstrated Crosswind Velocity	The demonstrated crosswind velocity is the velocity of the crosswind component for which adequate control of the airplane during takeoff and landing was actually demonstrated during certification tests.
Accelerate-Stop Distance	The distance required to accelerate an airplane to a specified speed and, assuming failure of an engine at the instant that speed is attained, to bring the airplane to a stop.
Route Segment	A part of a route. Each end of that part is identified by (1) a geographical location or (2) a point at which a definite radio fix can be established.

1.21 SYMBOLS, ABBREVIATIONS AND TERMINOLOGY (continued)

(f) Weight and Balance Terminology

Reference Datum	An imaginary vertical plane from which all horizontal distances are measured for balance purposes.
Station	A location along the airplane fuselage usually given in terms of distance from the reference datum.
Arm	The horizontal distance from the reference datum to the center of gravity (C.G.) of an item.
Moment	The product of the weight of an item multiplied by its arm. (Moment divided by a constant is used to simplify balance calculations by reducing the number of digits.)
Center of Gravity (C.G.)	The point at which an airplane would balance if suspended. Its distance from the reference datum is found by dividing the total moment by the total weight of the airplane.
C.G. Arm	The arm obtained by adding the airplane's individual moments and dividing the sum by the total weight.
C.G. Limits	The extreme center of gravity locations within which the airplane must be operated at a given weight.
Usable Fuel	Fuel available for flight planning.
Unusable Fuel	Fuel remaining after a runout test has been completed in accordance with governmental regulations.
Standard Empty Weight	Weight of a standard airplane including unusable fuel, full operating fluids and full oil.

1.21 SYMBOLS, ABBREVIATIONS AND TERMINOLOGY (continued)

Basic Empty Weight	Standard empty weight plus optional equipment.
Payload	Weight of occupants, cargo and baggage.
Useful Load	Difference between takeoff weight, or ramp weight if applicable, and basic empty weight.
Maximum Ramp Weight	Maximum weight approved for ground maneuver. (It includes weight of start, taxi and run up fuel.)
Maximum Takeoff Weight	Maximum Weight approved for the start of the takeoff run.
Maximum Landing Weight	Maximum weight approved for the landing touchdown.
Maximum Zero Fuel Weight	Maximum weight exclusive of usable fuel.

TABLE OF CONTENTS

SECTION 2

LIMITATIONS

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SECTION 2

LIMITATIONS

2.1 GENERAL

This section provides the FAA Approved operating limitations, instrument markings, color coding and basic placards necessary for operation of the airplane and its systems.

Limitations associated with those optional systems and equipment which require handbook supplements can be found in Section 9 (Supplements).

2.3 AIRSPEED LIMITATIONS

Speed	KIAS	KCAS
Never Exceed Speed (V_{NE}) - Do not exceed this speed in any operation.	198	200
Maximum Structural Cruising Speed (V_{NO}) - Do not exceed this speed except in smooth air and then only with caution.	168	170
Design Maneuvering Speed (V_A) - Do not make full or abrupt control movements above this speed.		
At 4340 LBS. Gross Weight	133	135
At 2900 LBS. Gross Weight	108	110

CAUTION

Maneuvering speed decreases at lighter weight as the effects of aerodynamic forces become more pronounced. Linear interpolation may be used for intermediate gross weights. Maneuvering speed should not be exceeded while operating in rough air.

2.3 AIRSPEED LIMITATIONS (continued)

Speed	KIAS	KCAS
Maximum Speed for Pneumatic Boot Inflation (optional equipment).	178	180
Maximum Flaps Extended Speed (V_{FE}) - Do not exceed this speed at the given flap setting.		
10°	165	167
20°	130	132
36°	116	115
Maximum Landing Gear Extension Speed (V_{LO}) - Do not exceed this speed when extending the landing gear.	165	167
Maximum Landing Gear Retraction Speed (V_{LO}) - Do not exceed this speed when retracting the landing gear.	126	128
Maximum Landing Gear Extended Speed (V_{LE}) Do not exceed this speed with the landing gear extended.	195	197

2.5 AIRSPEED INDICATOR MARKINGS

Avidyne PFD	KIAS
Red Radial Line (Never Exceed)	198 KTS
Yellow Arc (Caution Range - Smooth Air Only)	168 KTS to 198 KTS
Green Arc (Normal Operating Range)	69 KTS to 168 KTS
White Arc (Flaps Down)	58 KTS to 116 KTS
Red Line	58 KTS

Standby Airspeed Indicator	
Red Radial Line (Never Exceed)	198 KTS
Yellow Arc (Caution Range - Smooth Air Only)	168 KTS to 198 KTS
Green Arc (Normal Operating Range)	69 KTS to 168 KTS
White Arc (Flaps Down)	58 KTS to 116 KTS

2.7 POWER PLANT LIMITATIONS

(a) Number of Engines	1
(b) Engine Manufacturer	Textron Lycoming
(c) Engine Model No.	TIO-540-AE2A
(d) Engine Operating Limits	
(1 Maximum Engine Speed	2500 RPM
(2) Maximum Oil Temperature	245°F
(3) Maximum Cylinder Head Temperature	500°F
(4) Maximum Turbine Inlet Temperature	1750°F
(5) Maximum Manifold Pressure (inches of mercury)	
To 20,600 feet	42
20,600 to 25,000 feet	42 -1.6 per 1000 foot increase
(e) Oil Pressure	
Minimum (red line)	25 PSI
Maximum (red line)	115 PSI
(f) Fuel (AVGAS ONLY) (minimum grade)	100 or 100LL Aviation Grade
(g) Number of Propellers	1
(h) Propeller Manufacturer	Hartzell
(i) Propeller Hub and Blade Model	HC-I3YR-1E/7890K HC-I3YR-1E/7890B HC-I3Y1R-1N/N7605K+2 HC-I3Y1R-1N/N7605+2
(j) Propeller Diameter (inches)	80
(k) Blade Angle Limits	
7890K/7890B	
Low Pitch Stop Min./Max.	13.5°/13.8°
High Pitch Stop Min./Max.	38.2°/39.2
N7605K+2/N7605+2	
Low Pitch Stop Min./Max.	13.8°/14.2°
High Pitch Stop Min./Max.	37.0°/39.0°

2.9 LEANING LIMITATIONS

Mixture full RICH at all engine powers above high speed cruise power.

2.11 POWER PLANT INSTRUMENT MARKINGS

(a) Tachometer	
Green Arc (Normal Operating Range)	600 to 2500 RPM
Red Line (Maximum)	2500 RPM
(b) Manifold Pressure	
Green Arc (Normal Operating Range)	10 to 42.0 in. Hg
Red Line (Takeoff Power)	42.0 in. Hg
(c) Oil Temperature	
Green Arc (Normal Cruise Range)	100° to 245°F
Red Line (Maximum)	245°F
(d) Oil Pressure	
Green Arc (Normal Cruise Range)	55 PSI to 95 PSI
Yellow Arc (Caution Range) (Idle)	25 PSI to 55 PSI
Yellow Arc (Caution Range) (Start and Warm Up)	95 PSI to 115 PSI
Red Line (Minimum)	25 PSI
Red Line (Maximum)	115 PSI
(e) Turbine Inlet Temperature	
Green Arc (Normal Operating Range)	1200°F to 1750°F
Red Line (Maximum)	1750°F
(f) Cylinder Head Temperature	
Green Arc (Normal Operating Range)	200°F to 500°F
Red Line (Maximum)	500°F
(h) Vacuum Pressure	
Green Arc (Normal Operating Range)	4.5 to 5.2 in. Hg
Red Line (Minimum)	4.5 In. Hg
Red Line (Maximum)	5.2 In. Hg

2.13 WEIGHT LIMITS

(a) Maximum Ramp Weight	4358 LB
(b) Maximum Takeoff Weight	4340 LB
(c) Maximum Landing Weight	4123 LB
(d) Maximum Zero Fuel Weight	4123 LB
(e) Maximum Baggage (100 lb each compartment)	200 LB

NOTE

Refer to Section 5 (Performance) for maximum weight as limited by performance.

2.15 CENTER OF GRAVITY LIMITS

Weight Pounds	Forward Limit Inches Aft of Datum	Rearward Limit Inches Aft of Datum
4358	144.5	147.1
4340	144.1	147.1
4123	139.6	147.1
4000	137.0	146.5
2900	132.5	140.2

NOTES

Straight line variation between points given.

The datum used is 100.0 inches ahead of the forward bulkhead.

It is the responsibility of the airplane owner and the pilot to ensure that the airplane is properly loaded. See Section 6 (Weight and Balance) for proper loading instructions.

2.17 MANEUVER LIMITS

No acrobatic maneuvers including spins approved.

2.19 FLIGHT LOAD FACTORS

(a) Positive Load Factor (Maximum)	
(1) Flaps Up	3.8 G
(2) Flaps Down	2.0 G
(b) Negative Load Factor (Maximum)	No inverted maneuvers approved

2.20 FLIGHT CREW LIMITS

The minimum required flight crew is one pilot in the left seat.

2.21 AVIDYNE PFD LIMITATIONS

IFR flight is prohibited when the PFD or any standby instrument is inoperative (altimeter, airspeed indicator, artificial horizon, or whiskey compass).

The Avidyne FlightMax Entegra series Primary Flight Display Pilot's Guide, p/n 600-00104-002 revision 4, or later appropriate revision, must be available to the pilot during all flight operations.

2.23 AVIDYNE MFD LIMITATIONS

The Avidyne moving map displays visual advisory of the airplane's GPS position against a moving map. This information supplements CDI course deviation and information presented on the GPS navigator. The moving map display must not be used as the primary navigation instrument.

Use of MAP page during IFR flight requires an IFR approved GPS receiver and installation, operated in accordance with its applicable limitations.

The Avidyne FlightMax EX5000 Multi-Function Display Pilot's Guide, p/n 600-00121-000 revision 4, or later appropriate revision, must be available to the pilot during all flight operations.

Aircraft dispatch is prohibited when the MFD is inoperative.

2.25 TAS610 TRAFFIC ADVISORY SYSTEM (Optional Equipment)

Information shown on the display is provided to the pilot as an aid to visually acquiring traffic. Pilot's should maneuver their aircraft based only on ATC guidance or positive visual acquisition of the conflicting traffic. Maneuvers should be consistent with ATC instructions. No maneuvers should be made based only on a Traffic Advisory. ATC should be contacted for resolution of the Traffic conflict.

If the pilot is advised by ATC to disable transponder altitude reporting, the pilot should crosscheck altitudes on the PFD versus the standby altimeter. If the PFD altitude is suspect, the TAS610 Traffic Advisory System must be disabled via the circuit breaker.

The TAS610 Traffic Advisory System can only detect aircraft that are transponder equipped.

The TAS600 Series Traffic Advisory System Pilot's Operating Handbook, p/n 32-2352, Rev 6, or subsequent, should be referred to for operating instructions. It must be accessible to the flight crew at all times.

Federal Regulations state that "When an ATC clearance has been obtained, no pilot in command may deviate from that clearance, except in an emergency, unless he obtains an amended clearance." Traffic information provided by the Avidyne TAS does NOT relieve the pilot in command of this responsibility.

Refer to Pilot's Operating Handbook, p/n 32-2352, Rev 6, or subsequent, for other appropriate limitations.

The information presented herein is intended for use with the 9900BX TAS processor part number 70-2420-7 TAS610. The numbers and letters may increment from time to time in accordance with Technical Standard Order procedures and are minor changes.

The information presented herein is intended for use with the TAS 600 Series processor version 1.XX. Either X may increment from 0 to 9 as released and described in Software Change Notices. These constitute changes of minor nature, not operational changes.

2.25 TAS610 TRAFFIC ADVISORY SYSTEM (Optional Equipment) (continued)

The TAS System is limited in the following ways:

TAS Processor Part Number	70-2420-[XTAS610]
Display Range	12 nm
Vertical Filter of Displayed Traffic	± 3,500 feet
Maximum Operating Altitude	25,000 feet
Traffic Alert Limits	TSO-C147 specified warning times

2.27 MLB700 BROADCAST DATALINK

Weather information presented by the MLB700 Broadcast Datalink System is limited to supplemental use only and may not be used in lieu of an official weather data source.

The appropriate revision of the Avidyne MLB700 Pilot's Guide, p/n 600-00178-000 must be immediately available to the flight crew whenever this system is used to support weather avoidance decisions.

2.29 TWX670 TACTICAL WEATHER DETECTION SYSTEM (Optional Equipment)

The intended function of the TWX670 System is to assist the flight crew in assessing the location and severity of thunderstorm activity and selecting an avoidance path suitable to the flight characteristics of the aircraft. The system is to be used to avoid thunderstorms and is not to be used for thunderstorm penetration.

This system is not to be used as the sole means of severe weather avoidance and the use of this product does not relieve the pilot from responsibility for obtaining appropriate pre-flight and in-flight weather information.

The appropriate revision of the Avidyne Tactical Weather Detection System TWX670 Pilot Operating Handbook, p/n 600-00164-000 must be immediately available to the flight crew whenever weather avoidance is predicated on the use of this system.

2.31 CMAX CHART PAGE LIMITATIONS

The geographic referenced aircraft symbol must not be used for navigation.

NOTE

The aircraft symbol displayed provides supplemental aircraft situational awareness information. It is not intended as a means for navigation or flight guidance. The airplane symbol is not to be used for conducting instrument approaches or departures. Position accuracy, orientation, and related guidance must be assumed by other means or required navigation.

Operators with the optional CMax Chart Page must have back-up charts available. Do not rely upon CMax charts as your sole source of navigation information.

2.33 MID-CONTINENT ELECTRIC ATTITUDE INDICATOR LIMITATIONS

1. The emergency battery must be checked for proper operation prior to flight.
2. Should the RED TEST annunciator illuminate any time during the self test, this is an indication that the battery pack is in need of charging, or possible replacement. Flight in Instrument Meteorological Conditions (IMC) is prohibited.
3. Internal battery should be used for emergency use only.

2.35 KINDS OF OPERATION EQUIPMENT LIST

This airplane may be operated in day or night VFR, day or night IFR and known icing when the appropriate equipment is installed and operable.

The following equipment list identifies the systems and equipment upon which type certification for each kind of operation was predicated and must be installed and operable for the particular kind of operation indicated.

NOTE

The following system and equipment list does not include specific flight instruments and communication/navigation equipment required by the FAR Part 91 and 135 operating requirements.

System	Number Required	Types of Operation and Remarks (DAY, NIGHT, VFR, IFR and ICING Conditions)
1. ELECTRICAL		
Alternators	1	DAY, NIGHT, VFR, IFR
DC Voltmeter	1	DAY, NIGHT, VFR, IFR, ICING
Ammeters	2	DAY, NIGHT, VFR, IFR, ICING
ALT INOP Annunciator	2	DAY, NIGHT, VFR, IFR, ICING
LO BUS VOLT Annunciator	1	DAY, NIGHT, VFR, IFR, ICING
Propeller Heat LED Indicator	1	ICING
Stall Warning	1	DAY, NIGHT, VFR, IFR, ICING
2. EQUIPMENT/ FURNISHINGS		
Safety Restraint Each Occupant	AR	DAY, NIGHT, VFR, IFR, ICING

2.35 KINDS OF OPERATION EQUIPMENT LIST (continued)

System	Number Required	Types of Operation and Remarks (DAY, NIGHT, VFR, IFR and ICING Conditions)
3. FLIGHT CONTROLS		
Flap Position Indicator	1	DAY, NIGHT, VFR, IFR, ICING
Elevator and Rudder Trim Position Indicator	1 ea.	DAY, NIGHT, VFR, IFR, ICING
4. FUEL		
Fuel Quantity Indicating System	2	DAY, NIGHT, VFR, IFR, ICING
BOOST PUMP Annunciator	1	DAY, NIGHT, VFR, IFR, ICING
FUEL PRESS Annunciator	1	DAY, NIGHT, VFR, IFR, ICING
5. ICE PROTECTION (optional equipment)		
Pneumatic Deice System (Wing and Empennage Protection)	1	ICING
Wing Ice Detection Light	1	ICING
Electrothermal Propeller Deice Pads	1 per Blade	ICING
Heated Windshield	1	ICING

2.35 KINDS OF OPERATION EQUIPMENT LIST (continued)

System	Number Required	Types of Operation and Remarks (DAY, NIGHT, VFR, IFR and ICING Conditions)
5. ICE PROTECTION (optional equipment) (Continued)		
Heated Stall Warning Transducer	1	ICING
Heated Pitot Head	1	IFR, ICING
Alternate Static Source	1	IFR, ICING
WSHLD HEAT Annunciator	1	ICING
Vacuum Pumps	2	ICING
SURF DEICE Annunciator	1	ICING
Alternator	2	ICING
6. INSTRUMENTATION - ENGINE		
Tachometer	1	DAY, NIGHT, VFR, IFR, ICING
Oil Pressure Indicator	1	DAY, NIGHT, VFR, IFR, ICING
Oil Temperature Indicator	1	DAY, NIGHT, VFR, IFR, ICING
Manifold Pressure Indicator	1	DAY, NIGHT, VFR, IFR, ICING
Cylinder Head Temperature Indicator	1	DAY, NIGHT, VFR, IFR, ICING
Turbine Inlet Temperature Indicator	1	DAY, NIGHT, VFR, IFR, ICING

2.35 KINDS OF OPERATION EQUIPMENT LIST (continued)

System	Number Required	Types of Operation and Remarks (DAY, NIGHT, VFR, IFR and ICING Conditions)
7. INSTRUMENTATION - FLIGHT		
Airspeed Indicator	1	DAY, NIGHT, VFR, IFR, ICING
Standby Airspeed Indicator	1	IFR, ICING
Altimeter	1	DAY, NIGHT, VFR, IFR, ICING
Standby Altimeter	1	IFR, ICING
Free Air Temperature Gauge	1	DAY, NIGHT, VFR, IFR, ICING
Gyroscopic Attitude Indicator	1	IFR, ICING
Standby Gyroscopic Attitude Indicator	1	IFR, ICING
Gyroscopic Heading Indicator	1	IFR, ICING
Magnetic Compass	1	DAY, NIGHT, VFR, IFR, ICING
Slip/Skid Indicator	1	IFR, ICING
8. LANDING GEAR		
Hydraulic Pump	1	DAY, NIGHT, VFR, IFR, ICING
HYD PUMP Annunciator	1	DAY, NIGHT, VFR, IFR, ICING
Landing Gear Down Position Indicating Lights	3	DAY, NIGHT, VFR, IFR, ICING
Landing Gear Warning Horn	1	DAY, NIGHT, VFR, IFR, ICING
GEAR WARN Annunciator	1	DAY, NIGHT, VFR, IFR, ICING

2.35 KINDS OF OPERATION EQUIPMENT LIST (continued)

System	Number Required	Types of Operation and Remarks (DAY, NIGHT, VFR, IFR and ICING Conditions)
9. LIGHTS - EXTERNAL		
Position Lights		
a. Left Wing - Red and White	1 ea.	NIGHT
b. Right Wing - Green and White	1 ea.	NIGHT
Anti-Collision (Strobe) Lights	2	NIGHT
10. LIGHTS - COCKPIT		
Instrument Panel Switch Lights	AR	NIGHT
Instrument Lights	AR	NIGHT
Map Lights	2	NIGHT
11. PNEUMATIC/ VACUUM		
Vacuum Pumps (optional)	2	ICING
Gyro Suction Indicator (optional)	1	ICING

2.35 KINDS OF OPERATION EQUIPMENT LIST (continued)

System	Number Required	Types of Operation and Remarks (DAY, NIGHT, VFR, IFR and ICING Conditions)
12. MISCELLANEOUS		
Stall Warning System	1	DAY, NIGHT, VFR, IFR, ICING
STALL WARN FAIL Annunciator	1	DAY, NIGHT, VFR, IFR, ICING
Annunciator Test System	1	DAY, NIGHT, VFR, IFR, ICING

2.37 FUEL LIMITATIONS

(a) Minimum Aviation Fuel Grade.. 100LL/100
(b) Total Capacity .... 122 U.S. GAL.
(c) Unusable Fuel .... 2 U.S. GAL.
The unusable fuel for this airplane has been determined as 1.0 gallon in each wing in critical flight attitudes.
(d) Usable Fuel .... 120 U.S. GAL.
The usable fuel in this airplane has been determined as 60 gallons in each wing.
(e) Fuel Imbalance
Maximum fuel imbalance is 10 gallons.

2.39 OPERATING ALTITUDE LIMITATIONS

Flight above 25,000 feet pressure altitude is not approved. Flight up to and including 25,000 feet is approved if equipped with avionics in accordance with FAR 91 or FAR 135.

2.41 OXYGEN SYSTEM LIMITATIONS

(a) No smoking allowed when oxygen system is in use.
(b) Six occupants maximum when oxygen is required.
(c) Oxygen duration (Bottle pressure 1850 PSI):

AEROX SYSTEM DURATION (Hours)
(Based on 90% Consumption)

Altitude (feet)	User(s) 1	2	3	4	5	6
10,000	17.83	8.91	5.94	4.46	3.57	2.97
12,500	14.04	7.02	4.68	3.51	2.81	2.34
15,000	11.81	5.90	3.94	2.95	2.36	1.97
17,000	10.98	5.49	3.66	2.74	2.20	1.83
20,000	9.34	4.67	3.11	2.34	1.87	1.56
22,000	8.53	4.26	2.84	2.13	1.71	1.42
24,000	8.28	4.14	2.76	2.07	1.66	1.38
25,000	7.13	3.57	2.38	1.78	1.43	1.19

NOTE

Each individual flowmeter/regulator must be adjusted to the proper altitude in order to achieve the indicated duration.

2.43 AIR CONDITIONING SYSTEM LIMITATIONS

AIR COND switch in OFF position for takeoffs and landings.

NOTE

BLOWER LOW or BLOWER HIGH switch may be selected

2.45 ELECTRIC AUXILIARY CABIN HEATER LIMITATIONS

(a) Both alternators must be functioning.
(b) The low voltage monitor system and annunciator must be functional.
(c) The Vent/Defog Fan must be operational for heater ground operation.
(d) Maximum ambient temperature for heater operation is 20°C (68°F).

2.47 MAXIMUM SEATING CONFIGURATION

The maximum seating capacity is 6 (six) persons.

2.49 ICING INFORMATION

WARNING

Severe icing may result from environmental conditions outside of those for which the airplane is certified. Flight in freezing rain, freezing drizzle, or mixed icing conditions (supercooled liquid water and ice crystals) may result in ice build-up on protected surfaces exceeding the capability of the ice protection system, or may result in ice forming aft of the protected surfaces. This ice may not be shed using the ice protection systems, and may seriously degrade the performance and controllability of the airplane.

During flight, severe icing conditions that exceed those for which the airplane is certificated shall be determined by the following visual cues. If one or more of these visual cues exists, immediately request priority handling from Air Traffic Control to facilitate a route or an altitude change to exit the icing conditions.

Unusually extensive ice accumulation on the airframe and windshield in areas not normally observed to collect ice.

Accumulation of ice on the upper surface of the wing, aft of the protected area.

Accumulation of ice on the engine nacelles and propeller spinners farther aft than normally observed.

Since the autopilot, when installed and operating, may mask tactile cues that indicate adverse changes in handling characteristics, use of the autopilot is prohibited when any of the visual cues specified above exist, or when unusual lateral trim requirements or autopilot trim warnings are encountered while the airplane is in icing conditions.

All wing icing inspection lights must be operative prior to flight into known or forecast icing conditions at night. [NOTE: This supersedes any relief provided by the Master Minimum Equipment List (MMEL).]

See Section 9, Supplements, of this Pilot's Operating Handbook for additional information about the ice protection system.

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2.51 PLACARDS

On the pilot's side panel:

THIS AIRCRAFT MUST BE OPERATED AS A NORMAL CATEGORY AIRPLANE IN COMPLIANCE WITH THE OPERATING LIMITATIONS STATED IN THE FORM OF PLACARDS, MARKINGS AND MANUALS.
NO ACROBATIC MANEUVERS, INCLUDING SPINS, APPROVED.
THIS AIRCRAFT APPROVED FOR V.F.R., I.F.R., DAY AND NIGHT ICING FLIGHT WHEN EQUIPPED IN ACCORDANCE WITH THE AIRPLANE FLIGHT MANUAL.

WARNING
AIR CONDITIONER MUST BE OFF TO INSURE NORMAL TAKEOFF CLIMB PERFORMANCE.

WARNING
TURN OFF STROBE LIGHTS WHEN IN CLOSE PROXIMITY TO GROUND OR DURING FLIGHT THROUGH CLOUD, FOG OR HAZE.

Above the PFD:

NO ACROBATIC MANEUVERS, INCLUDING SPINS, APPROVED.

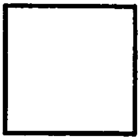
Above the PFD:

V_A 133 KIAS @ 4340 LBS

V_{LE} 195 KIAS MAX SEE AFM

2.51 PLACARDS (continued)

Above the PFD:



ELEV. TRIM
PUSH ON/OFF

Above the stall warning test button, lower pilot's instrument panel:

STALL
TEST

2.51 PLACARDS (continued)

On the parking brake handle:

PARK
BRAKE
PULL

Around the landing gear handle:

LANDING
GEAR

▲
UP
126 KIAS

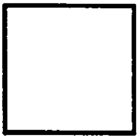
165 KIAS
DN
▼

Above the emergency gear extension handle:

EMERGENCY GEAR EXTENSION
PULL TO RELEASE. SEE A.F.M.
BEFORE RE-ENGAGEMENT

2.51 PLACARDS (continued)

Above the PFD:



ELEV. TRIM
PUSH ON/OFF

Above the stall warning test button, lower pilot's instrument panel:

STALL
TEST

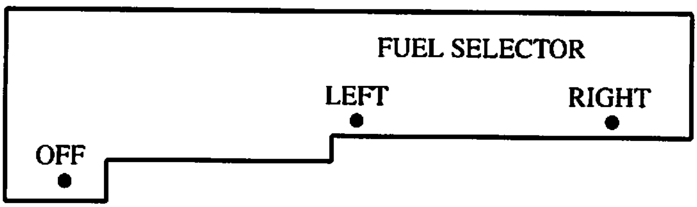
2.51 PLACARDS (continued)

Near the magnetic compass:

<u>STANDBY COMPASS</u>

FOR THE CORRECT READING CHECK:
WINDSHIELD HT SWITCH OFF
PROP DE-ICE SWITCH OFF
COOLING SYSTEM OFF
COCKPIT AND CABIN HEATING OFF

Near the fuel selector:



On the pilot's side panel directly below the window:

<u>ALTERNATE STATIC SOURCE</u>
(LOCATED PILOT'S SIDE BELOW PANEL)
UP - ALTERNATE
DOWN - PRIMARY

2.51 PLACARDS (continued)

On the instrument panel, near the oxygen system control:

OXYGEN
PULL ON

In full view of the pilot and below the right center window:

NO SMOKING

Near the defrost control:

DEFROST
PULL ON

Near the cabin temperature control:

CABIN TEMP
PULL HOT

2.51 PLACARDS (continued)

On the inside of the forward baggage door:

MAXIMUM BAGGAGE THIS COMPARTMENT 100 LBS.

On the aft baggage closeout:

MAXIMUM BAGGAGE THIS COMPARTMENT 100 LBS.

On the aft close out panel, if required:

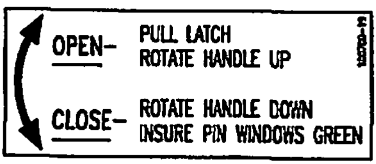
Rear Passenger / Baggage Areas
MAXIMUM ALLOWABLE WEIGHT
MAXIMUM ALLOWABLE COMBINED WEIGHT IN AFT SEATS IS
____________________POUNDS

LOAD IN ACCORDANCE WITH
WEIGHT AND BALANCE DATA

Over the emergency exit handle:

EMERGENCY EXIT
REMOVE GLASS
PULL DOOR IN - LIFT UP

On the upper door inner latch:

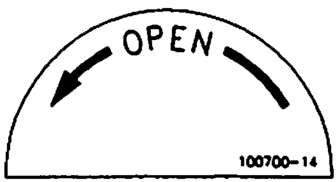


2.51 PLACARDS (continued)

On the left and right side of the upper cabin door bottom edge:

CAUTION
DO NOT ATTEMPT
TO CLOSE DOOR
WITH HANDLE IN
LATCHED POSITION

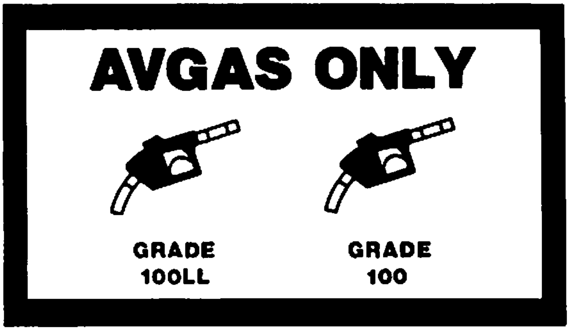
On the main cabin door handle:



On the upper edge of the cabin lower door:

OPEN ⟷ CLOSE INSURE PIN WINDOWS GREEN

Adjacent to the fuel tank filler caps:



2.51 PLACARDS (continued)

Inside of oxygen filler door on left side of tail cone:

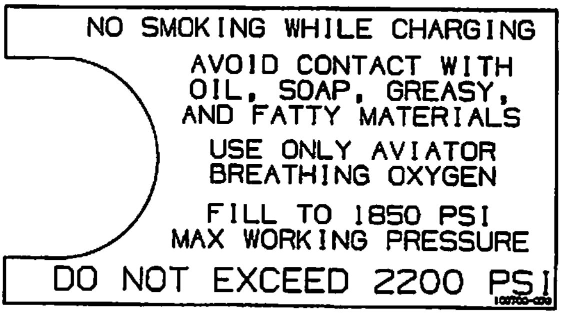


TABLE OF CONTENTS

SECTION 3

EMERGENCY PROCEDURES

TABLE OF CONTENTS (continued)

SECTION 3

EMERGENCY PROCEDURES

TABLE OF CONTENTS (continued)

SECTION 3

EMERGENCY PROCEDURES

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SECTION 3

EMERGENCY PROCEDURES

3.1 GENERAL

This section provides the recommended procedures for handling various emergency or critical situations. All emergency procedures required by the FAA as well as those necessary for operation of the airplane, as determined by the operating and design features of the airplane, are presented.

Emergency procedures associated with optional systems and equipment which require handbook supplements are presented in Section 9, Supplements.

Pilots must familiarize themselves with the procedures in this section and must be prepared to take the appropriate action should an emergency situation arise. The procedures are offered as a course of action for handling the particular situation or condition described. They are not a substitute for sound judgement and common sense.

KNOW YOUR AIRCRAFT AND BE THOROUGHLY FAMILIAR WITH IMPORTANT EMERGENCY PROCEDURES

Most basic emergency procedures are a normal part of pilot training. The information presented in this section is not intended to replace this training. This information is intended to provide a source of reference for the procedures which are applicable to this airplane. The pilot should review standard emergency procedures periodically to remain proficient in them.

3.1 GENERAL (continued)

Warning Systems

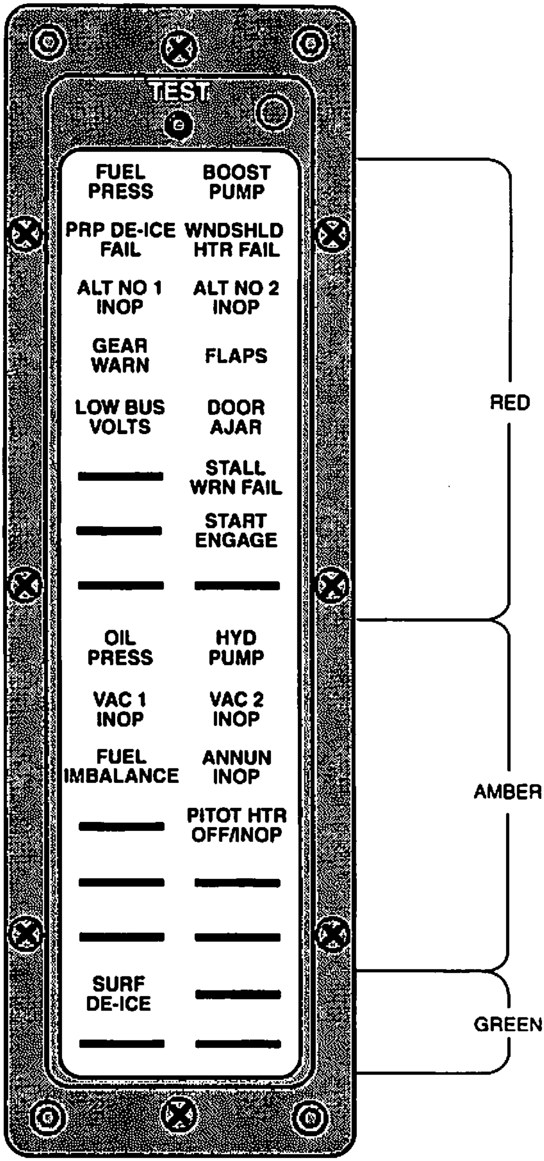
The PA-46R-350T is equipped with a comprehensive annunciator panel located on the instrument panel between the Primary Flight Display and the Multi-Function Display (see Figure 3-1).

Red Warning Annunciators are those annunciators which require immediate corrective action.

Amber Caution Annunciators are those annunciators which advise of the possible need for future corrective action.

Green Advisory Annunciators are those annunciators which indicate a system is selected and is functioning.

Warning and caution annunciators will remain illuminated as long as the initiating condition exists, while advisory annunciations remain illuminated as long as a particular system is selected.



Annunciator Panel (shown with de-ice option)
Figure 3-1

3.1 GENERAL (continued)

Annunciator Descriptions

FUEL PRESS - Illuminates if fuel pressure is below approximately 10 psig.

BOOST PUMP - Illuminates if the fuel boost pump in the tank being used fails to generate sufficient pressure. Also illuminates briefly when switching tanks.

PRP DEICE FAIL - Illuminates if a fault develops in the prop heat system or current is under 16.0 amps.

WNDSHLD HTR FAIL - Illuminates if the windshield temperature exceeds 170°F or the windshield temperature sensor has failed.

ALT NO 1 INOP - Illuminates if Alternator No. 1 fails or is selected OFF.

ALT NO 2 INOP - Illuminates if Alternator No. 2 fails or is selected OFF.

GEAR WARN - The red GEAR WARN annunciator and gear warning horn will operate simultaneously under the following conditions:

- In flight when the throttle is reduced to the point at which manifold pressure is approximately 14 inches of mercury or below and the landing gear are not in the DOWN position.
- In flight when the flaps are extended more than 10° and the landing gear are not in the DOWN position.
- On the ground when the landing gear selector is in the UP position. The landing gear squat switch activates to prevent operation of the retract side of the hydraulic pump on the ground.

FLAPS - Illuminates if there is a wing flap system failure due to an overcurrent condition in the flap motor/actuator circuit.

LOW BUS VOLTS - Illuminates if the main bus voltage is less than 25 Vdc.

DOOR AJAR - Illuminates if the cabin door is not properly closed and latched.

STALL WRN FAIL - Illuminates if the lift computer and/or the lift transducer fails.

START ENGAGE - Illuminates if the starter contactor is closed and power is being applied to the starter.

OIL PRESS - Illuminates if engine oil pressure is below 25 psig.

3.1 GENERAL (continued)

Annunciator Descriptions (continued)

HYD PUMP - Illuminates when the landing gear hydraulic pump is operating.

VAC 1 INOP - Illuminates if Vacuum No. 1 is below approximately 2 in.Hg.

VAC 2 INOP - Illuminates if Vacuum No. 2 is below approximately 2 in.Hg.

FUEL IMBALANCE - Illuminates if a fuel quantity imbalance has reached 10 gallons.

ANNUN INOP - Illuminates if there is a failure of the annunciator system.

PITOT HTR OFF/INOP - Illuminates if the pitot heat has failed or is selected OFF.

SURF DE-ICE - Illuminates when the de-ice boots inflate. (When the SURF DE-ICE switch is selected ON, the de-ice boot pressure reaches 10 psig and the pneumatic de-ice system cycles in sequence: tail, lower wing, upper wing.)

3.1 GENERAL (continued)

Aural Warnings

Aural warnings are provided to warn:

- When an engine limitation is exceeded (2 chimes per second).
- When approaching a stall (steady tone).
- Autopilot disconnect (warble tone).
- In flight when the throttle is reduced to the point at which manifold pressure is approximately 14 inches of mercury or below and the landing gear are not in the DOWN position (steady tone).
- In flight when the flaps are extended more than 10° and the landing gear are not in the DOWN position (steady tone).
- On the ground when the landing gear selector is in the UP position (steady tone).

3.1 GENERAL (continued)

Overriding Considerations

In all emergencies, the overriding consideration must be to:

- **Maintain Airplane Control.**
- Analyze the situation.
- Take proper action.

Terminology

Many emergencies require some urgency in landing the aircraft. The degree of urgency varies with the emergency; therefore the terms "land as soon as possible" and "land as soon as practical" are employed. These terms are defined as follows:

Land as soon as possible - A landing should be accomplished at the nearest suitable airfield considering the severity of the emergency, weather conditions, field facilities, and ambient lighting.

Land as soon as practical - Emergency conditions are less urgent, and although the mission is to be terminated, the emergency is such that an immediate landing at the nearest suitable airfield may not be necessary.

3.3 AIRSPEEDS FOR EMERGENCY OPERATIONS

STALL SPEEDS

4340 lbs (Gear UP, Flaps 0°) .... 69 KIAS

4340 lbs (Gear DOWN, Flaps 36°) .... 58 KIAS

DESIGN MANEUVERING SPEED .... 133 KIAS at 4340 lbs.
108 KIAS at 2900 lbs.

BEST GLIDE

4340 lbs .... 90 KIAS

3.4 EMERGENCY PROCEDURES CHECKLIST

3.4a ENGINE FIRE DURING START (3.7)

Starter (crank engine) .... PUSH
Mixture .... IDLE CUT-OFF
Throttle .... OPEN
Fuel Selector .... OFF
Emergency (EMERG) Fuel Pump .... CHECK OFF
Abandon if fire continues

3.4b TURBOCHARGER FAILURE (3.8)

CAUTION

If a turbocharger failure is the result of loose, disconnected or burned through exhaust system components, a potentially serious fire hazard exists as well as the risk of carbon monoxide migration into the passenger compartment of the aircraft. If a failure within the exhaust system is suspected in flight, immediately reduce power to idle (or as low a power setting as possible) and LAND AS SOON AS POSSIBLE. If a suspected exhaust system failure occurs prior to takeoff, DO NOT FLY THE AIRCRAFT.

NOTE

A turbocharger malfunction may result in an overly rich fuel mixture, which could result in a partial power loss and/or a rough running engine. In worst-case conditions a complete loss of engine power may result.

COMPLETE LOSS OF ENGINE POWER:

If a suspected turbocharger or turbocharger control system failure results in a complete loss of engine power, the following procedure is recommended:

Mixture .... IDLE CUTOFF
Throttle .... CRUISE
Propeller Control .... TAKEOFF
Mixture .... ADVANCE SLOWLY until engine restarts and adjust for smooth engine operation

Reduce power and land as soon as possible.

3.4b TURBOCHARGER FAILURE (3.8) (continued)

PARTIAL LOSS OF ENGINE POWER

If the turbocharger wastegate fails in the OPEN position, a partial loss of engine power may result. The following procedure is recommended if a suspected turbocharger or turbocharger wastegate control failure results in a partial loss of engine power.

Throttle ....AS REQUIRED
Propeller Control ....AS REQUIRED
Mixture ....AS REQUIRED
Continue Flight ....LAND AS SOON AS POSSIBLE

ENGINE POWER OVERBOOST

If the turbocharger wastegate control fails in the CLOSED position, an engine power overboost condition may occur. The following procedure is recommended for an overboost condition:

Throttle ....REDUCE as necessary to keep manifold pressure within limits

NOTE

Expect manifold pressure response to throttle movements to be sensitive.

Propeller...AS REQUIRED
Mixture ....AS REQUIRED
Continue Flight ....LAND AS SOON AS POSSIBLE

3.4c ENGINE POWER LOSS DURING TAKEOFF (3.9)

If sufficient runway remains for a normal landing, leave gear down and land straight ahead.

If area ahead is rough, or if it is necessary to clear obstructions:
Landing Gear Selector .... UP
Mixture .... IDLE CUT-OFF
Emergency (EMERG) Fuel Pump .... OFF
Fuel Selector .... OFF

If sufficient altitude has been gained to attempt a restart:
Maintain Safe Airspeed
Emergency (EMERG) Fuel Pump .... Check ON
Fuel Selector .... SWITCH to tank containing fuel
Mixture .... FULL RICH
Induction Air .... ALTERNATE

CAUTION

If normal engine operation and fuel flow are not reestablished, the emergency (EMERG) fuel pump should be turned OFF. The lack of a fuel flow indication could indicate a leak in the fuel system. If fuel system leak is verified, switch fuel selector to OFF.

If power is not regained:

Prepare for power off landing (refer to paragraph 3.4e).

3.4d ENGINE POWER LOSS IN FLIGHT (3.11)

Trim for 90 KIAS (Power off glide speed)
Emergency (EMERG) Fuel Pump ....ON
Fuel selector..SWITCH to tank containing fuel
Mixture ....RICH
Induction Air..ALTERNATE
Engine Gauges..CHECK for indication of cause of power loss

If power is restored:
Induction Air ....PRIMARY (Remain in ALTERNATE if induction ice is suspected)
Emergency (EMERG) Fuel Pump (except in case of engine driven pump failure)..OFF
Mixture ....AS REQUIRED
Land as soon as practical and investigate cause of power loss.

CAUTION

If normal engine operation and fuel flow are not reestablished, the emergency (EMERG) fuel pump should be turned OFF. The lack of a fuel flow indication could indicate a leak in the fuel system. If fuel system leak is verified, switch fuel selector to OFF.

If power is not restored:
Prepare for power off landing (refer to paragraph 3.4e).

3.4e POWER OFF LANDING (3.13)

Propeller Control ....FULL DECREASE

Best gliding angle 90 KIAS.

Locate suitable field.
Establish spiral pattern.
1000 ft. above field at downwind position for normal landing approach. When field can easily be reached slow to 77 KIAS for shortest landing.

Touchdowns should normally be made at lowest possible airspeed with flaps fully extended.

3.4e POWER OFF LANDING (3.13) (continued)

When committed to landing:

Landing Gear Selector .... AS REQUIRED
Throttle .... CLOSED
Mixture .... IDLE CUT-OFF
Flaps .... AS REQUIRED
Fuel Selector .... OFF
ALTR Switches .... OFF
Magneto Switches .... OFF
Emergency (EMERG) Fuel Pump .... OFF
Seat Belt and Harness .... TIGHT
Seats .... adjusted and locked in position

3.4f FIRE IN FLIGHT (3.15)

In the event of smoke or fire, prepare to land the aircraft without delay while completing fire suppression and/or smoke evacuation procedures. If it cannot be visually verified that the fire has been completely extinguished, whether the smoke has cleared or not, land immediately at the nearest suitable airfield or landing site.

WARNING

Use oxygen ONLY if flames and heat are not present.

Source of Fire .... CHECK

Electrical Fire (smoke in cabin):

Battery Master Switch .... OFF

CAUTION

The STBY PWR annunciator will rapidly flash for approximately one minute when aircraft electrical power is lost. STBY PWR must be selected, otherwise the gyro will auto shutdown after approximately one minute.

3.4f FIRE IN FLIGHT (3.15) (continued)

NOTE

Activation of the Ground Clearance switch can be used to maintain communications on Comm 1.

ALTR Switches .... OFF
Transition to Standby Instruments.
Standby (STBY) Power Button .... SELECT
Cabin Heat .... PUSH OFF
Land as soon as possible.

Engine fire:

Throttle .... CLOSED
Mixture .... IDLE CUT-OFF
Fuel Selector .... OFF
Magneto Switches .... OFF
Emergency (EMERG) Fuel Pump .... CHECK OFF
Auxiliary Cabin Heat Switch .... OFF
Vent/De-fog Fan .... OFF
Cabin Heat .... PUSH OFF
Defrost .... PUSH OFF
Proceed with power off landing procedure (paragraph 3.4e).

3.4g LOSS OF OIL PRESSURE (3.17)

Land as soon as possible and investigate cause. Prepare for power off landing.

3.4h LOSS OF FUEL FLOW (3.19)

CAUTION

Turn emergency (EMERG) fuel pump OFF if fuel flow and power is not immediately restored. The lack of fuel flow indication could indicate a leak in the fuel system. If fuel system leak is verified, switch fuel selector to OFF.

Emergency (EMERG) Fuel Pump ....ON
Fuel Selector..CHECK on tank containing usable fuel

If power restored:
Emergency (EMERG) Fuel Pump (except in case of engine driven pump failure) ....OFF
Mixture ....AS REQUIRED

If power not restored:
Emergency (EMERG) Fuel Pump..OFF
Fuel Selector ....OFF
Proceed with power off landing procedure (paragraph 3.4e).

3.4i ENGINE DRIVEN FUEL PUMP FAILURE (FUEL PRESS light illuminated - annunciator panel) (3.21)

Fuel Selector ....CHECK on tank containing usable fuel
Throttle ....RETARD
Emergency (EMERG) Fuel Pump ....ON
Throttle ....RESET AS REQUIRED
Mixture ....RESET AS REQUIRED

CAUTION

If normal engine operation and fuel flow are not reestablished the emergency (EMERG) fuel pump should be turned OFF. The lack of a fuel flow indication could indicate a leak in the fuel system. If system leak is verified, switch fuel selector to OFF.

If power is not restored, proceed with power off landing procedure (paragraph 3.4e).

3.4j HIGH OIL TEMPERATURE (3.23)

Power...REDUCE
Mixture..ENRICH, if practical
Airspeed ....INCREASE, if practical

If condition is not corrected:

Land at nearest airport and investigate the problem. Prepare for power off landing (paragraph 3.4e).

3.4k TURBINE INLET TEMPERATURE (TIT) INDICATION/SENSOR FAILURE (3.24)

If failure occurs during takeoff, climb, or landing:

Mixture..Full Rich

If failure occurs prior to setting cruise power:

Power..Set Power per POH Section 5 Power Setting Table
Mixture ....Lean to Approx. POH Section 5 Power Setting Table Fuel Flow +4 GPH. Monitor CHT and Oil Temp.

CAUTION

Aircraft POH range and endurance data presented in Section 5 will no longer be applicable. Less range/endurance will result due to higher fuel flow/fuel consumption.

If failure occurs after setting cruise power and mixture:

Power..Note/Maintain Power Setting
Mixture...Increase indicated Fuel Flow +1 GPH. Monitor CHT and Oil Temp.

CAUTION

Aircraft POH range and endurance data presented in Section 5 will no longer be applicable. Less range/endurance will result due to higher fuel flow/fuel consumption.

If failure occurs prior to or during descent:

Power ....Set for 25 in. MAP @ 2400 RPM
Mixture...Full Rich

CAUTION

Aircraft POH Time, Fuel and Distance to Descend data in Section 5 will no longer be applicable due to the different mixture settings.

3.4l HIGH CYLINDER HEAD TEMPERATURE (3.25)

If indicated cylinder head temperature reaches 480°F:

Power ....REDUCE
Mixture ....ENRICH, if practical
Airspeed ....INCREASE, if practical

If condition is not corrected:

Land at nearest appropriate airport and investigate problem.

3.4m ELECTRICAL FAILURES (3.27)

NOTE

Anytime total tie bus voltage is below 25 Vdc, the LOW BUS VOLTS annunciator will illuminate.

Single alternator Failure (Zero amps or ALT NO 1 INOP or ALT NO 2 INOP light illuminated - annunciator panel).

Verify failure ....CHECK AMP INDICATION
Electrical Load (if LOW BUS VOLTS
annunciator illuminated) ....REDUCE until total load is
less than 75 amps & LOW BUS
VOLTS annunciator extinguished
Failed ALTR Switch ....OFF
Failed ALTR Circuit Breaker ....CHECK and RESET as required
Failed ALTR Switch (after OFF at least one second) ....ON

If power not restored:

Failed ALTR Switch ....OFF
Amp Indication ....Monitor and maintain
BELOW 75 AMPS

While one alternator will supply sufficient current for minimum required avionics and cockpit lighting, use of deicing equipment (if installed), particularly windshield or propeller heat, may be limited. **Immediate action should be taken to avoid or exit icing conditions.** Under no circumstances may the total electrical load exceed 75 amps. The supplemental electric cabin heater, cabin recirculation blowers, and position, strobe, and landing lights should not be used unless absolutely necessary.

3.4m ELECTRICAL FAILURES (3.27) (continued)

Dual Alternator Failure (Zero amps both ammeters or ALT NO 1 INOP and ALT NO 2 INOP lights illuminated - annunciator panel).

NOTE

Anytime total tie bus voltage is below 25 Vdc, the LOW BUS VOLTS annunciator will illuminate.

Electrical Load ....REDUCE TO MINIMUM required for safe flight
ALTR NO. 1 and NO. 2 ....Switches OFF
ALTERNATOR Circuit Breakers....................CHECK and RESET as required
ALTR NO. 1 Switch (after OFF at least one second) ....ON
ALTR NO. 2 Switch (after OFF at least one second) ....ON

If only one alternator resets:

Operating ALTR Switch ....ON
Failed ALTR Switch ....OFF
Electrical Load ....MAINTAIN LESS THAN 75 AMPS
Ammeter ....MONITOR

If neither alternator resets:

Both ALTR Switches ....OFF

Continue flight with reduced electrical load on battery power only.

NOTE

LOW BUS VOLTS annunciator will be illuminated.

Land as soon as practical. Anticipate complete electrical failure. Duration of battery power available will be dependent on electrical load and battery condition prior to failure.

NOTE

If the battery is depleted, the landing gear must be lowered using the emergency extension procedure. The gear position lights will be inoperative. The flaps will also be inoperative and a flaps up landing will be required.

NOTE

In the event of complete electrical failure, the internal standby attitude battery will provide power to the standby attitude indicator. Ensure the standby power button is selected when the STBY PWR annunciator flashes rapidly. See Complete Electrical Failure checklist.

3.4m ELECTRICAL FAILURES (3.27) (continued)

Complete Electrical Failure

Standby (STBY) Power Button ....SELECT

CAUTION

The STBY PWR annunciator will rapidly flash for approximately one minute when aircraft electrical power is lost. STBY PWR must be selected, otherwise the gyro will shutdown automatically after approximately one minute.

Maintain attitude control using standby instruments.

Standby Attitude Gyro ....VERIFY ON and
flag is pulled on gyro

Battery Switch...OFF

Ground Clearance Switch ....ON

NOTE

Turning ON the Ground Clearance Switch may activate the No. 1 Com/Nav and Audio Panel depending on the nature of the complete electrical failure.

Land as soon as possible.

NOTE

With a complete electrical failure, emergency landing gear extension and landing without flaps will be required. Refer to Emergency Landing Gear Extension (paragraph 3.4p).

Auxiliary Cabin Heater Circuit Failure (Heater Continues to Operate With AUXILIARY CABIN HT and VENT/DE-FOG switches OFF):

VENT DEFOG Circuit Breaker..PULL

If the heater still operates, land as soon as practical.

3.4n AVIONICS SYSTEMS FAILURES (3.28)

Failure of Primary Flight Display (PFD)

Indication: PFD Display goes blank.

Standby Attitude Gyro .... VERIFY ON and flag is pulled on gyro

Maintain attitude control using standby gyro and establish the aircraft in straight and level unaccelerated flight.

If time and conditions permit:

PFD Brightness Control (BRT/DIM) .... Run to full bright
PFD Circuit Breaker .... PULL
(Located on the circuit breaker panel, row 1, column J)

NOTE

To realign the PFD, the PFD circuit breaker must be pulled before it can be reset. The PFD circuit breaker should be reset within 20 seconds.

NOTE

If electing to reset the PFD per this procedure, pulling the PFD circuit breaker and resetting it within 20 seconds will initiate a Warmstart Condition. This should restore the PFD in approximately 10 seconds. If the Warmstart fails after two consecutive attempts, or if the PFD circuit breaker is left out for longer than 20 seconds, the PFD will enter a full alignment mode which may take longer than 3 minutes to restore the PFD. See FlightMax Entegra PFD Pilot's Guide for additional information concerning "Starting the EXP5000".

PFD Circuit Breaker .... RESET

3.4n AVIONICS SYSTEMS FAILURES (3.28) (continued)

Failure of Primary Flight Display (PFD) (continued)

If PFD Screen cannot be reinstated:

On aircraft equipped with the optional second Nav Indicator:
Mechanical Nav Indicator ....Utilize for primary navigation (VLOC only)
Engine Instruments..Refer to Engine page of MFD

NOTE

The Mechanical Nav Indicator receives nav information directly from the No. 1 nav/com/GPS. Only VLOC information is available.

Maintain attitude, airspeed and heading control using standby instruments, magnetic compass and other directional indications (such as MFD, MAP/NAV page).

CAUTION

High current loads in the vicinity of the magnetic compass can influence its accuracy. Depending on the flight conditions, the pilot must reduce these loads as much as possible to insure accuracy. Tests have shown that air conditioner, windshield heat and pitot heat contribute to significant heading errors of the magnetic compass. These items (if installed) should be turned OFF prior to comparing magnetic compass headings.

Land as soon as practical.

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3.4n AVIONICS SYSTEMS FAILURES (3.28) (continued)

Invalid Air Data

Indication: Airspeed, Altimeter, and Vertical Speed Data Replaced with Red X's.

Maintain aircraft attitude, airspeed and altitude by referring to the standby instruments.

CAUTION

Pulling and resetting the PFD circuit breaker will cause the PFD to enter a realignment mode. This will result in the temporary loss of all PFD information, including attitude, airspeed and altitude. Ensure that positive control can be maintained by reference to the standby instruments prior to pulling the PFD circuit breaker. See FlightMax Entegra PFD Pilot's Guide for additional information concerning "Warmstart Conditions".

NOTE

If electing to reset the PFD per this procedure, pulling the PFD circuit breaker and resetting it within 20 seconds will initiate a Warmstart Condition. This should restore the PFD in approximately 10 seconds. If the Warmstart fails after two consecutive attempts, or if the PFD circuit breaker is left out for longer than 20 seconds, the PFD will enter a full alignment mode which may take longer than 3 minutes to restore the PFD. See FlightMax Entegra PFD Pilot's Guide for additional information concerning "Starting the EXP5000".

If time and conditions permit:

PFD Circuit Breaker .... PULL
(Located on the circuit breaker panel, row 1, column J)

NOTE

The PFD circuit breaker should be reset within 20 seconds.

PFD Circuit Breaker .... RESET

3.4n AVIONICS SYSTEMS FAILURES (3.28) (continued)

Invalid Air Data (continued)

If air data is still invalid:

NOTE

Certain failures of the PFD may cause a loss of Transponder Mode C capability and render the optional TAS610 Traffic Advisory System inoperable.

Refer to the standby instruments to maintain aircraft control.

Land as soon as practical.

Invalid Heading Data

Indication: Heading Bug and Heading Data Removed and Replaced with Red X's.

Refer to the magnetic compass and GPS for heading information.

CAUTION

High current loads in the vicinity of the magnetic compass can influence its accuracy. Depending on the flight conditions, the pilot must reduce these loads as much as possible to insure accuracy. Tests have shown that air conditioner, windshield heat and pitot heat contribute to significant heading errors of the magnetic compass. These items (if installed) should be turned OFF prior to comparing magnetic compass headings.

Land as soon as practical.

3.4n AVIONICS SYSTEMS FAILURES (3.28) (continued)

Crosscheck Monitor

Indication: Yellow Crosscheck Attitude Annunciator on PFD.

Establish aircraft in straight and level unaccelerated flight.

Standby Attitude Gyro .... VERIFY ON and flag is pulled on gyro

Aircraft Attitude .... Crosscheck aircraft attitude with standby attitude gyro to determine correct attitude indication

Monitor the standby attitude indicator.

3.4n AVIONICS SYSTEMS FAILURES (3.28) (continued)

Invalid Attitude and Heading Data

Indication: Attitude and Heading Data Removed and Replaced with Red X's.

Standby Attitude Gyro ....VERIFY ON and flag is pulled on gyro.

Maintain attitude control by referring to the standby instruments.

CAUTION

Pulling and resetting the PFD circuit breaker will cause the PFD to enter a realignment mode. This will result in the temporary loss of all PFD information, including attitude, airspeed and altitude. Ensure that positive control can be maintained by reference to the standby instruments prior to pulling the PFD circuit breaker. See FlightMax Entegra PFD Pilot's Guide for additional information concerning "Warmstart Conditions".

NOTE

If electing to reset the PFD per this procedure, pulling the PFD circuit breaker and resetting it within 20 seconds will initiate a Warmstart Condition. This should restore the PFD in approximately 10 seconds. If the Warmstart fails after two consecutive attempts, or if the PFD circuit breaker is left out for longer than 20 seconds, the PFD will enter a full alignment mode which may take longer than 3 minutes to restore the PFD. See FlightMax Entegra PFD Pilot's Guide for additional information concerning "Starting the EXP5000".

If time and conditions permit:

PFD Circuit Breaker ....PULL
(Located on the circuit breaker panel row 1, column J)

NOTE

The PFD circuit breaker should be reset within 20 seconds.

PFD Circuit Breaker ....RESET

3.4n AVIONICS SYSTEMS FAILURES (3.28) (continued)

Invalid Attitude and Heading Data (continued)

If attitude and heading data is still invalid:

Maintain attitude control by using standby gyro.

Maintain heading control by utilizing magnetic compass and other directional indications (such as MFD, MAP/NAV page).

CAUTION

High current loads in the vicinity of the magnetic compass can influence its accuracy. Depending on the flight conditions, the pilot must reduce these loads as much as possible to insure accuracy. Tests have shown that air conditioner, windshield heat and pitot heat contribute to significant heading errors of the magnetic compass. These items (if installed) should be turned OFF prior to comparing magnetic compass headings.

Land as soon as practical.

3.4n AVIONICS SYSTEMS FAILURES (3.28) (continued)

Failure of Air Data, Attitude and Heading Reference System (ADAHRS)

Indication: Airspeed, Vertical Speed, Altitude, Attitude and Heading, Replaced with Red X's.

Standby Attitude Gyro ....VERIFY ON and FLAG IS PULLED ON GYRO

Maintain attitude control by using standby gyro.

CAUTION

Pulling and resetting the PFD circuit breaker will cause the PFD to enter a realignment mode. This will result in the temporary loss of all PFD information, including attitude, airspeed and altitude. Ensure that positive control can be maintained by reference to the standby instruments prior to pulling the PFD circuit breaker. See FlightMax Entegra PFD Pilot's Guide for additional information concerning "Warmstart Conditions".

NOTE

If electing to reset the PFD per this procedure, pulling the PFD circuit breaker and resetting it within 20 seconds will initiate a Warmstart Condition. This should restore the PFD in approximately 10 seconds. If the Warmstart fails after two consecutive attempts, or if the PFD circuit breaker is left out for longer than 20 seconds, the PFD will enter a full alignment mode which may take longer than 3 minutes to restore the PFD. See FlightMax Entegra PFD Pilot's Guide for additional information concerning "Starting the EXP5000".

If time and conditions permit:

PFD Circuit Breaker ....PULL
(Located on the circuit breaker panel row 1, column J)

NOTE

The PFD circuit breaker should be reset within 20 seconds.

PFD Circuit Breaker ....RESET

3.4n AVIONICS SYSTEMS FAILURES (3.28) (continued)

Failure of Air Data, Attitude and Heading Reference System (ADAHRS) (continued)

If ADAHRS initialization does not occur:

On aircraft equipped with the optional second Nav Indicator:
Mechanical Nav Indicator .... Utilize for primary navigation
Engine Instruments .... Refer to Engine page of MFD

NOTE

The Mechanical Nav Indicator receives nav information directly from the No. 1 nav/com/GPS. Only VLOC information is available.

Maintain attitude, airspeed and heading control using standby instruments, magnetic compass and other directional indications (such as MFD, MAP/NAV page).

CAUTION

High current loads in the vicinity of the magnetic compass can influence its accuracy. Depending on the flight conditions, the pilot must reduce these loads as much as possible to insure accuracy. Tests have shown that air conditioner, windshield heat and pilot heat contribute to significant heading errors of the magnetic compass. These items (if installed) should be turned OFF prior to comparing magnetic compass headings.

Land as soon as practical.

3.4n AVIONICS SYSTEMS FAILURES (3.28) (continued)

Failure of Multi-Function Display (MFD)

Indication: Multi-Function Display (MFD) Goes Blank or MFD "freezes" and will not accept pilot input.

MFD Circuit Breaker..PULL and RESET
(Located on the circuit breaker panel, row 1, column K)

If MFD initialization does not occur:

Land as soon as possible.

Loss of Standby Attitude Indicator

Indication: OFF Warning Flag in View, Tumbled or Erroneous Attitude Display.

Standby Attitude Indicator..........................TEST (verify green STBY ATT IND TEST annunciator illuminated) / ON / ERECT

Establish aircraft in straight and level unaccelerated flight.

Standby Attitude Indicator.......................................Cage then uncage

If standby attitude indicator is not recovered:

Standby Attitude Indicator ....Cage

Land as soon as practical.

3.4n AVIONICS SYSTEMS FAILURES (3.28) (continued)

Failure of Flight and Navigation Displays

Indication: All Displays Blank Out.

Standby Attitude Gyro Switch ....VERIFY ON and FLAG IS PULLED ON GYRO

Maintain aircraft control with reference to the standby airspeed, altimeter, and attitude gyro indicators.

AVIONICS DIMMING Circuit Breaker ....PULL
(Located on the circuit breaker panel, row 3, column G)

NOTE

A failure of the display dimmer control can result in the two Garmin displays going blank. This is an indication of a partial failure of the dimmer control. A complete failure of this control would normally reinstate the displays to a full bright condition. However, if the displays should blank out, reinstatement of the displays to a full bright condition can be accomplished by bypassing the dimmer control (pulling the AVIONICS DIMMING Circuit Breaker).

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3.4o PROPELLER OVERSPEED (3.29)

Throttle ....RETARD
Oil Pressure ....CHECK
Propeller Control ....FULL DECREASE rpm,
then set if any
control available
Airspeed ....REDUCE
Throttle ....AS REQUIRED to remain
below 2500 rpm

Land as soon as practical and investigate cause of overspeed.

3.4p EMERGENCY LANDING GEAR EXTENSION (3.31)

If emergency gear extension is required due to electrical power failure, the gear position indicator lights will not illuminate.

Prior to emergency extension procedure:

Battery Master Switch ....CHECK ON
Circuit Breakers ....CHECK
DAY/NIGHT Dimming Switch (in daytime) ....DAY

If landing gear does not check down and locked:

Airspeed ....BELOW 90 KIAS
Hydraulic Pump Power Circuit Breaker (25 amp) ....PULL
(Located on the circuit breaker panel row 3, column L)

Landing Gear Selector ....DOWN
Emergency Gear Extend Control ....PULL
(while fishtailing airplane)

CAUTION

The Emergency Gear Extension procedure will require the pilot to pull the emergency gear extend control knob through a region of high resistance (up to 25 lbs.) in order to reach the stop and extend the landing gear.

3.4q SPIN RECOVERY (3.33)

Rudder ....FULL OPPOSITE to DIRECTION of ROTATION
Control Wheel ....FULL FORWARD while NEUTRALIZING AILERONS
Throttle ....CLOSED
Rudder (when rotation stops) ....NEUTRAL
Control Wheel ....AS REQUIRED to smoothly regain level flight attitude

3.4r ENGINE ROUGHNESS (3.35)

Mixture ....ADJUST FOR MAXIMUM SMOOTHNESS
Induction Air ....ALTERNATE
Emergency (EMERG) Fuel Pump ....ON
Fuel Selector ....SELECT ANOTHER TANK
Engine Indications ....CHECK FOR ABNORMALITIES

If abnormal engine indications are present:

Magnetos ....OPERATE ONE THEN THE OTHER

If only one magneto is good, operate to the first available airport on this magneto only, at reduced power.

Land as soon as practical.

3.4s OXYGEN SYSTEM (3.37)

NOTE

The time of useful consciousness at 25,000 feet is approximately 3 minutes.

NOTE

The pilot should monitor oxygen quantity to ensure compliance with the applicable supplemental oxygen regulations.

If hypoxic conditions are present:

Oxygen Quantity ....CHECK

Descend immediately to below 12,500 feet if quantity is low or depleted.

Oxygen Flow ....CHECK

If oxygen flow is interrupted as evidenced by the flowmeters or hypoxic indications:

(1) Install another mask unit.

(2) Install mask connection in an unused outlet, if available.

(3) If flow is not restored, immediately descend to below 12,500 feet.

In the event an emergency descent becomes necessary, refer to paragraph 3.4t below.

3.4t EMERGENCY DESCENT (3.39)

Throttle ....CLOSED
Propeller Control ....FULL INCREASE
Mixture ....AS REQUIRED
Landing Gear ....DOWN
(165 KIAS maximum)
Flaps ....UP
Emergency Descent ....To a safe altitude consistent with terrain

SMOOTH AIR

Airspeed After Landing Gear Is Fully Extended ....180-195 KIAS

ROUGH AIR

Airspeed After Landing Gear Is Fully Extended.................4340 lbs. 133 KIAS
2900 lbs. 108 KIAS

3.4u CABIN AIR CONTAMINATION/SMOKE EVACUATION (3.41)

In the event of smoke or fire, prepare to land the aircraft without delay while completing fire suppression and/or smoke evacuation procedures. If it cannot be visually verified that the fire has been completely extinguished, whether the smoke has cleared or not, land immediately at the nearest suitable airfield or landing site.

CAUTION

If fire is suspected, do not use oxygen at lower altitude where oxygen is not required.

Oxygen .... ON/Don mask if necessary
Auxiliary Cabin Heat Switch .... OFF
Vent/Defog Switch .... ON
AIR COND Switch .... OFF

If smoke persists, See Paragraph 3.4f, Fire In Flight.
Land as soon as possible.

3.4v VACUUM SYSTEM FAILURE (3.43)

Single Vacuum System Failure (Reduced suction pressure and left or right Vacuum Inoperative Annunciators illuminated.

Vacuum Indication ....CHECK (within normal operating range)
Operating Pump annuciator light ....EXTINGUSHED

Although either vacuum pump independently has sufficient capacity to operate the deice boots in a normal manner, intentional or continued operation in icing conditions is not recommended. Immediate action should be taken to avoid or exit icing conditions.

Dual Vacuum System Failure (Suction below 4.0 in. Hg, both Vacuum Inoperative Annunciators illuminated.

If both vacuum systems are inoperable, the wing and tail deicer boots will be inoperative. A precautionary landing should be considered depending on operating conditions.

3.4w INADVERTENT ICING ENCOUNTER (3.45)

WARNING

Flight into known icing conditions is prohibited unless Ice Protection System is installed and fully operational. Refer to Section 9, Supplements.

For aircraft not equipped with the optional Ice Protection System:
Induction Air ....ALTERNATE
Pitot Heat ....ON
Stall Warning Heat ....ON
Windshield Defrost ....ON
Vent/Defog Fan ....ON

Change heading and/or altitude to exit icing conditions.

3.4x HYDRAULIC SYSTEM MALFUNCTION (3.49)

HYD PUMP annunciator light illuminates continuously, or cycles on and off rapidly (more than 6 to 8 times):

HYDRAULIC PUMP POWER Circuit Breaker ....PULL
(Located on the circuit breaker panel row 3, column L)

Land as soon as practical and investigate the cause.

Prior to landing, the HYDRAULIC PUMP POWER circuit breaker must be reset in order to extend the landing gear. If pump continues to run after gear is locked down, pull the HYDRAULIC PUMP POWER circuit breaker. If gear fails to extend, refer to Emergency Landing Gear Extension (paragraph 3.4p).

3.4y FLAP SYSTEM MALFUNCTION (3.51)

FLAPS annunciator light illuminated:

NOTE

Leaving the FLAP WARN circuit breaker out for a few minutes prior to resetting may allow the flap motor to cool and become operative again. Care should be exercised to not forget to reset the circuit breaker prior to use of the flaps.

FLAP WARN circuit breaker..PULL and RESET
(Located on the circuit breaker panel row 5, column J)

VERIFY Normal Flap Operation.

If FLAPS annunciator light remains illuminated:

FLAP MOTOR Circuit Breaker..PULL
(Located on the circuit breaker panel row 5, column I)

CAUTION

Higher than normal approach and landing speeds may be required if full symmetrical flap extension is not available. Longer landing distances than shown in Section 5 will result from increased airspeed approaches.

Land as soon as practical and investigate the cause.

3.4z FUEL TANK SUBMERGED PUMP FAILURE (BOOST PUMP light illuminated - annunciator panel) (3.53)

Fuel Selector ....CHECK
Boost Pump Circuit Breakers.............................CHECK - RESET if necessary
(Located on the circuit breaker panel row 2, columns H and I)
BOOST PUMP Annunciator Light ....EXTINGUISHED

If circuit breaker does not remain closed or the annunciator remains lit:

Emergency (EMERG) Fuel Pump ....ON
Fuel Flow ....CHECK for fluctuation

Continue flight if no fuel flow fluctuations are observed. If fuel flow fluctuations are observed, descend to an altitude where the fluctuations cease and continue flight. After landing, have the inoperative boost pump repaired prior to further flight.

3.4aa STALL WARNING FAILURE (STALL WARN FAIL light illuminated - annunciator panel) (3.55)

STALL WARN Circuit Breaker ....CHECK - RESET if necessary
(Located on the circuit breaker panel row 3, column M)

If circuit breaker does not remain closed, or STALL WARN FAIL annunciator does not extinguish, the stall warning system will be inoperative for remainder of flight. After landing, have system repaired prior to further flight.

3.4bb ANNUNCIATOR LIGHT PANEL FAILURE (ANNUN INOP light illuminated - annunciator panel) (3.57)

ANNUN Circuit Breaker ....CHECK - RESET if necessary
(Located on the circuit breaker panel row 1, column L)
ANNUN INOP Light ....EXTINGUISHED

If ANNUN circuit breaker not open:

Annunciator Test Switch ....PUSH

If annunciator lights illuminate, annunciator panel is functioning properly. ANNUN INOP will remain lit.

If ANNUN circuit breaker does not remain closed, or annunciator lights fail to illuminate when tested, annunciator lights will be inoperative for remainder of flight.

System should be repaired prior to further flight.

3.4cc EMERGENCY EXIT (3.59)

Exit (second window from front
on right side)....................LOCATE
Plexiglas Cover....................REMOVE
Handle....................PULL
Emergency Exit Window....................PULL IN

WARNING

The emergency exit must not be blocked under any loading conditions.

3.5 AMPLIFIED EMERGENCY PROCEDURES (GENERAL)

The following paragraphs are presented to supply additional information for the purpose of providing the pilot with a more complete understanding of the recommended course of action and probable cause of an emergency situation.

3.7 ENGINE FIRE DURING START (3.4a)

Engine fires during start are usually the result of overpriming. The first attempt to extinguish the fire is to try to start the engine and draw the excess fuel back into the induction system.

If a fire is present before the engine has started, continue to crank the engine, move the mixture control to idle cut-off and open the throttle. This is an attempt to draw the fire back into the engine.

If the engine has started, continue operating until residual fuel is consumed, to try to pull the fire into the engine.

In either case (above), if fire continues more than a few seconds, the fire should be extinguished by the best available external means.

Turn OFF the emergency fuel pump. The fuel selector valve should be OFF and the mixture at idle cut-off if an external fire extinguishing method is to be used.

If fire continues, abandon the aircraft.

3.8 TURBOCHARGER FAILURE (3.4b)

CAUTION

If a turbocharger failure is the result of loose, disconnected or burned through exhaust system components, a potentially serious fire hazard exists as well as the risk of carbon monoxide migration into the passenger compartment of the aircraft. If a failure within the exhaust system is suspected in flight, immediately reduce power to idle (or as low a power setting as possible) and LAND AS SOON AS POSSIBLE. If a suspected exhaust system failure occurs prior to takeoff, DO NOT FLY THE AIRCRAFT.

NOTE

A turbocharger malfunction may result in an overly rich fuel mixture, which could result in a partial power loss and/or a rough running engine. In worst-case conditions a complete loss of engine power may result.

3.8 TURBOCHARGER FAILURE (3.4b) (continued)

COMPLETE LOSS OF ENGINE POWER

If a suspected turbocharger or turbocharger control system failure results in a complete loss of engine power, the following procedure is recommended. Retard the mixture control to the IDLE CUTOFF position. Reset the throttle to cruise power position and the propeller control to the full forward position. Slowly advance the mixture until the engine restarts and adjust for smooth engine operation. Reduce the power to the minimum required for smooth engine operation and land as soon as possible.

PARTIAL LOSS OF ENGINE POWER

If the turbocharger wastegate fails in the OPEN position, a partial loss of engine power may result. The following procedure is recommended if a suspected turbocharger or turbocharger wastegate control failure results in a partial loss of engine power.

The throttle, propeller and mixture controls can be set as required for flight. Monitor all engine gauges and land as soon as possible to have the cause of the power loss investigated.

ENGINE POWER OVERBOOST

If the turbocharger wastegate control fails in the CLOSED position, an engine power overboost condition may occur.

If an overboost condition occurs, REDUCE the throttle as necessary to keep the manifold pressure within limits.

NOTE

Expect manifold pressure response to throttle movements to be sensitive.

Set the propeller and mixture controls as necessary and land as soon as possible.

3.9 ENGINE POWER LOSS DURING TAKEOFF (3.4c)

The proper action to be taken if loss of power occurs during takeoff will depend on the circumstances of the particular situation.

If sufficient runway remains to complete a normal landing, leave the landing gear down and land straight ahead.

If the area ahead is rough, or if it is necessary to clear obstructions, move the landing gear selector switch to the UP position and prepare for a gear up landing. If time permits, move mixture control to idle cut-off, turn OFF the emergency (EMERG) fuel pump, and move the fuel selector to OFF.

If sufficient altitude has been gained to attempt a restart, maintain a safe airspeed, turn the emergency (EMERG) fuel pump ON, and switch the fuel selector to another tank containing fuel. Ensure the mixture is full RICH and move the induction air lever to the ALTERNATE position.

CAUTION

If normal engine operation and fuel flow are not reestablished, the emergency (EMERG) fuel pump should be turned OFF. The lack of a fuel flow indication could indicate a leak in the fuel system. If fuel system leak is verified, switch fuel selector to OFF.

If engine failure was caused by fuel exhaustion, power will not be regained after switching fuel tanks until the empty fuel lines are filled. This may require up to ten seconds.

If power is not regained, proceed with Power Off Landing procedure (refer to paragraph 3.4e).

3.11 ENGINE POWER LOSS IN FLIGHT (3.4d)

Complete engine power loss is usually caused by fuel flow interruption and power will be restored shortly after fuel flow is restored. The first step is to prepare for a power off landing (refer to paragraph 3.4e). An airspeed of 90 KIAS (the power off glide speed) should be maintained.

If altitude permits, turn the emergency (EMERG) fuel pump ON and switch the fuel selector to another tank containing fuel. Reset the mixture control to RICH and move the induction air lever to ALTERNATE. Check the engine gauges for an indication of the cause of the power loss. If no fuel flow is indicated, check the fuel selector position to be sure it is on a tank containing fuel.

If power is restored, move the induction air back to the PRIMARY position (unless induction ice is suspected). Turn OFF the emergency (EMERG) fuel pump (except in case of engine driven fuel pump failure) and adjust the mixture control as necessary. Land as soon as practical and investigate cause of power loss.

CAUTION

If normal engine operation and fuel flow are not reestablished, the emergency (EMERG) fuel pump should be turned OFF. The lack of a fuel flow indication could indicate a leak in the fuel system. If fuel system leak is verified, switch fuel selector to OFF.

If the preceding steps do not restore power, prepare for a power off landing.

If the previous procedure has not restored power and additional time permits, secure one magneto at a time, then back to both ON. Move the throttle and mixture control levers to different settings. This may restore power if the problem is too rich or too lean a mixture or if there is a partial fuel system restriction. Water in the fuel could take some time to be used up, and allowing the engine to windmill may restore power. If power loss is due to water, fuel flow indications will be normal.

If engine failure was caused by fuel exhaustion, power will not be restored after switching fuel tanks until the empty fuel lines are filled. This may require up to ten seconds.

If power is not regained, proceed with the Power Off Landing procedure (refer to paragraph 3.4e).

3.13 POWER OFF LANDING (3.4e)

If loss of power occurs at altitude, trim the aircraft for best gliding angle, (90 KIAS) and look for a suitable field. If measures taken to restore power are not effective, and if time permits, check your charts or avionics system for airports in the immediate vicinity; it may be possible to land at one if you have sufficient altitude. At best gliding angle, with no wind, with the engine windmilling and the propeller control in full DECREASE rpm, the aircraft will travel approximately 2 miles for each thousand feet of altitude. If possible, notify the FAA or any other authority by radio of your difficulty and intentions. If another pilot or passenger is aboard, let them help as appropriate.

When you have located a suitable field, establish a spiral pattern around this field. Attempt to be at 1000 feet above the field at the downwind position, to make a normal landing approach. Excess altitude may be lost by widening your pattern, using flaps or slipping, or a combination of these. When the field can easily be reached, slow to 77 KIAS with flaps down for the shortest landing.

Whether to attempt a landing with gear up or down depends on many factors. If the field chosen is obviously smooth and firm, and long enough to bring the plane to a stop, the gear should be down. If there are stumps or rocks or other large obstacles in the field, the gear in the down position will better protect the occupants of the aircraft. If however, the field is suspected to be excessively soft or short, or when landing in water of any depth, a wheels-up landing will normally be safer and do less damage to the airplane. Whether the landing gear is up or down, touchdowns should normally be made at the lowest possible airspeed with flaps fully extended.

When committed to landing, verify the landing gear selector position as required by field conditions. Close the throttle, move the mixture to idle cut-off. Set the flaps to the desired flap setting (normally full down), and move the fuel selector valve to OFF. Turn the alternator switches, magneto switches, and emergency fuel pump switch OFF. The seat belts and shoulder harness should be tightened and checked for security. The seats should be adjusted and locked in position.

3.15 FIRE IN FLIGHT (3.4f)

The presence of fire is noted through smoke, smell, and heat in the cabin. It is essential that the source of the fire be promptly identified through instrument readings, character of smoke, or other indications since the action to be taken differs somewhat in each case.

Check for the source of the fire first.

If an electrical fire is indicated (smoke in cockpit), turn off the battery master and alternator switches, transition to the standby instruments and immediately select STBY PWR on the standby attitude indicator. The cabin heat should also be turned OFF.

CAUTION

The STBY PWR annunciator will rapidly flash for approximately one minute when aircraft electrical power is lost. STBY PWR must be selected, otherwise the gyro will auto shutdown after approximately one minute.

NOTE

Activation of the Ground Clearance switch can be used to maintain communications on Comm 1.

An emergency descent should be executed to a safe altitude consistent with terrain and a landing made as soon as possible.

If an engine fire is present, close the throttle, move the mixture control to idle cut-off and place the fuel selector in the OFF position. Turn the magneto switches OFF and check that the emergency (EMERG) fuel pump is OFF. In all cases, auxiliary cabin heat, the vent/de-fog fan, cabin heat, defrost, and the temperature control should be OFF. If the terrain permits, a landing should be made immediately (refer to Power Off Landing procedure paragraph 3.4e).

3.17 LOSS OF OIL PRESSURE (3.4g)

Loss of oil pressure may be either partial or complete. A partial loss of oil pressure usually indicates a malfunction in the oil pressure regulating system, and a landing should be made as soon as possible to investigate the cause and prevent engine damage.

A complete loss of oil pressure indication may signify oil exhaustion or may be the result of a faulty indication. In either case, proceed toward the nearest airport and be prepared for a forced landing. If the problem is not a pressure indication malfunction, the engine may stop suddenly. Maintain altitude until such time as a power off landing can be accomplished. Do not change power settings unnecessarily, as this may hasten complete power loss.

Depending on the circumstances, it may be advisable to make an off airport landing while power is still available, particularly if other indications of actual oil pressure loss, such as sudden increases in temperatures, or oil smoke, are apparent, and an airport is not close.

If engine stoppage occurs, proceed with Power Off Landing procedure (refer to paragraph 3.4e).

3.19 LOSS OF FUEL FLOW (3.4h)

CAUTION

Turn emergency (EMERG) fuel pump OFF if fuel flow and power is not immediately restored. The lack of a fuel flow indication could indicate a leak in the fuel system. If fuel system leak is verified, switch fuel selector OFF.

The most probable cause of loss of fuel flow is either fuel depletion in the fuel tank selected or failure of the engine driven fuel pump. If loss of fuel flow occurs, turn the emergency (EMERG) fuel pump ON and check that the fuel selector is on a tank containing usable fuel.

If power is restored, turn OFF the emergency (EMERG) fuel pump (except in the case of an engine driven fuel pump failure). Adjust the mixture control as necessary.

If power is not restored, turn the emergency (EMERG) fuel pump and the fuel selector OFF, and proceed with Power Off Landing procedure (refer to paragraph 3.4e).

3.21 ENGINE DRIVEN FUEL PUMP FAILURE (FUEL PRESS light illuminated - annunciator panel) (3.4i)

If an engine driven fuel pump failure is indicated, check that the fuel selector is on a tank containing usable fuel, retard the throttle and turn the emergency (EMERG) fuel pump ON. The throttle and mixture should then be reset as required. A landing should be made at the nearest appropriate airport as soon as possible and the cause of the failure investigated.

CAUTION

If normal engine operation and fuel flow are not reestablished, the emergency (EMERG) fuel pump should be turned OFF. The lack of a fuel flow indication could indicate a leak in the fuel system. If fuel system leak is verified, switch fuel selector to OFF.

3.23 HIGH OIL TEMPERATURE (3.4j)

An abnormally high oil temperature indication may be caused by a low oil level, an obstruction in the oil cooler, damaged or improper baffle seals, a faulty display, or other causes. Reduce power and/or enrich the mixture, and increase airspeed if practical. If condition is not corrected, land as soon as practical at an appropriate airport and have the cause investigated.

A steady rapid rise in oil temperature is a sign of trouble. Land at the nearest airport and have a mechanic investigate the problem. Watch the oil pressure display for an accompanying loss of pressure.

3.24 TURBINE INLET TEMP (TIT) INDICATOR/SENSOR FAILURE (3.4k)

In the event the Turbine Inlet Temperature (TIT) indicator or sensor fails during flight, continued flight is possible using conservative mixture/TIT settings.

If TIT failure occurs during takeoff, climb, descent, or landing, maintain a full rich mixture to assure adequate fuel flow for engine cooling. During cruise climb operations, a fuel flow of 32 gph may be used. If TIT failure occurs prior to setting cruise power, set power per the POH Section 5 power setting table and then lean to the approximate POH power setting table fuel flow +4 GPH. This fuel flow will maintain adequate engine cooling and a TIT value below TIT limits. Monitor CHT and Oil Temperature for normal operation.

CAUTION

Aircraft POH range and endurance data presented in Section 5 will no longer be applicable. Less range/endurance will result due to higher fuel flow/fuel consumption.

If TIT failure occurs after setting cruise power and mixture per the POH Section 5 power setting table, maintain the power setting and increase indicated fuel flow by + 1 GPH. This fuel flow will maintain adequate engine cooling and TIT value below TIT limits. Monitor CHT and Oil Temperature for normal operation.

CAUTION

Aircraft POH range and endurance data presented in Section 5 will no longer be applicable. Less range/endurance will result due to higher fuel flow/fuel consumption.

If TIT failure occurs prior to or during descent, set power to obtain 25 in. MAP at 2400 RPM and set mixture to full rich.

CAUTION

Aircraft POH Time, Fuel and Distance to Descend data in Section 5 will no longer be applicable due to the different mixture settings.

The TIT indicating system should be repaired as soon as practical.

3.25 HIGH CYLINDER HEAD TEMPERATURE (3.4l)

Excessive cylinder head temperature may parallel excessive oil temperature. In either case, reduce power and/or enrich the mixture, and increase airspeed if practical. If the problem persists, land as soon as practical at the nearest appropriate airport and have the cause investigated.

3.27 ELECTRICAL FAILURES (3.4m)

SINGLE ALTERNATOR FAILURE (Zero amps or ALT NO 1 INOP or ALT NO 2 INOP light illuminated - annunciator panel)

NOTE

Anytime total tie bus voltage is below 25 Vdc, the LOW BUS VOLTS annunciator will illuminate.

Loss of either alternator is indicated by a zero reading on the appropriate ammeter indication and the illumination of the associated annunciator (ALT NO 1 INOP or ALT NO 2 INOP).

If the LOW BUS VOLTS annunciator is illuminated, first reduce the electrical load to less than 75 amps, which should extinguish the LOW BUS VOLTS annunciator, and prevent overloading the operating alternator.

Next, turn the failed alternator (ALTR NO. 1 or ALTR NO. 2) switch OFF for at least one second. Check the inoperative alternator (ALTERNATOR 1 or ALTERNATOR 2) circuit breaker and reset as required.

If the trouble was caused by a momentary overvoltage condition, the alternator control unit can now be reset by turning the failed alternator switch ON.

If the affected alternator's ammeter continues to read zero, and the annunciator remains lit, turn the failed alternator's switch OFF. Continue flight and monitor the operating alternator's ammeter to ensure the electrical load does not exceed 75 amps. The annunciator of the failed alternator will remain lit.

While one alternator will supply sufficient current for minimum required avionics and cockpit lighting, use of deicing equipment, particularly windshield or propeller heat, may be limited. Immediate action should be taken to avoid or exit icing conditions. Under no circumstances may the total electrical load exceed 75 amps. The electric cabin heater, cabin recirculation blowers, and position, strobe, and landing lights should not be used unless absolutely necessary.

3.27 ELECTRICAL FAILURES (3.4m) (continued)

DUAL ALTERNATOR FAILURE (Zero amps both ammeter indications or ALT NO 1 INOP and ALT NO 2 INOP light illuminated - annunciator panel)

NOTE

Anytime total tie bus voltage is below 25 Vdc, the LOW BUS VOLTS annunciator will illuminate.

In the event that both alternators indicate failure simultaneously, reduce electrical load to minimum required for safe flight by turning OFF switches and pulling circuit breakers for all nonessential electrical equipment. Maintain only that equipment required to provide heading, attitude, and altitude information, plus one navigation radio and one communications radio for emergency use only.

Attempt to reestablish alternator power on each alternator individually by first turning OFF both alternators for at least one second, resetting any tripped alternator (ALTERNATOR) control circuit breakers, and then turning each alternator ON, one at a time. Leave the good alternator switch ON and turn the bad alternator switch, if any, OFF.

If only one alternator can be restored, reinstate electrical load as desired to a maximum of 75 amps. Land as soon as practical for proper repairs.

If neither alternator can be restored to operation, continue flight with reduced electrical load on battery power only.

NOTE

LOW BUS VOLTS annunciator will be illuminated.

Land as soon as safely practical, as battery power duration is dependent upon the condition of the battery at time of failure.

NOTE

If the battery is depleted, the landing gear must be lowered using the emergency extension procedure. The gear position lights will be inoperative. The flaps will also be inoperative and a flaps up landing will be required.

NOTE

In the event of complete electrical failure, the internal standby attitude battery will provide power to the standby attitude indicator. Ensure the standby power button is selected when the STBY PWR annunciator flashes rapidly. See Complete Electrical Failure checklist.

3.27 ELECTRICAL FAILURES (3.4m) (continued)

COMPLETE ELECTRICAL FAILURE

Should a complete electrical failure occur, select the standby power button.

CAUTION

The STBY PWR annunciator will rapidly flash for approximately one minute when aircraft electrical power is lost. STBY PWR must be selected, otherwise the gyro will shutdown automatically after approximately one minute.

Maintain attitude control by using the standby instruments.

Verify the standby attitude gyro is ON and the flag is pulled. Turn the battery switch OFF and turn the ground clearance switch ON.

NOTE

Turning ON the Ground Clearance Switch may activate the No. 1 Com/Nav and Audio Panel depending on the nature of the complete electrical failure.

Land as soon as possible.

NOTE

With a complete electrical failure, emergency landing gear extension and landing without flaps will be required. Refer to Emergency Landing Gear Extension (paragraph 3.4p).

AUXILIARY CABIN HEATER CONTROL CIRCUIT FAILURE (Heater Continues to Operate With AUXILIARY CABIN HT and VENT/DE-FOG Switches OFF)

Pull the VENT DEFOG circuit breaker. If the heater still continues to operate, land as soon as practical.

3.28 AVIONICS SYSTEMS FAILURES (3.4n)

FAILURE OF PRIMARY FLIGHT DISPLAY (PFD)

Should the primary flight display (PFD) go blank, verify the standby attitude gyro switch is ON and the flag is pulled on the gyro, maintain attitude control using the standby gyro and establish the aircraft in straight and level unaccelerated flight.

If time and conditions permit, turn the PFD brightness control to full bright and pull and reset the PFD circuit breaker.

NOTE

To realign the PFD, the PFD circuit breaker must be pulled before it can be reset. The PFD circuit breaker should be reset within 20 seconds.

NOTE

If electing to reset the PFD per this procedure, pulling the PFD circuit breaker and resetting it within 20 seconds will initiate a Warmstart Condition. This should restore the PFD in approximately 10 seconds. If the Warmstart fails after two consecutive attempts, or if the PFD circuit breaker is left out for longer than 20 seconds, the PFD will enter a full alignment mode which may take longer than 3 minutes to restore the PFD. See FlightMax Entegra PFD Pilot's Guide for additional information concerning "Starting the EXP5000".

If the PFD screen cannot be reinstated and the aircraft is equipped with the optional second Nav Indicator, use the mechanical nav indicator for primary navigation and refer to the Engine Page on the MFD for engine instruments.

NOTE

The mechanical nav indicator receives nav information directly from the No. 1 nav/com/GPS. Only VLOC information is available.

3.28 AVIONICS SYSTEMS FAILURES (3.4n) (continued)

FAILURE OF PRIMARY FLIGHT DISPLAY (PFD) (continued)

Maintain attitude, airspeed and heading control using the standby instruments, magnetic compass and other directional indications such as the MAP/NAV page on the MFD.

CAUTION

High current loads in the vicinity of the magnetic compass can influence its accuracy. Depending on the flight conditions, the pilot must reduce these loads as much as possible to insure accuracy. Tests have shown that air conditioner, windshield heat and pitot heat contribute to significant heading errors of the magnetic compass. These items (if installed) should be turned OFF prior to comparing magnetic compass headings.

Land as soon as practical.

3.28 AVIONICS SYSTEMS FAILURES (3.4n) (continued)

INVALID AIR DATA

Should the airspeed, altimeter, and vertical speed data be replaced with red X's, refer to the standby instruments for aircraft attitude, airspeed and altimeter data.

CAUTION

Pulling and resetting the PFD circuit breaker will cause the PFD to enter a realignment mode. This will result in the temporary loss of all PFD information, including attitude, airspeed and altitude. Ensure that positive control can be maintained by reference to the standby instruments prior to pulling the PFD circuit breaker. See FlightMax Entegra PFD Pilot's Guide for additional information concerning "Warmstart Conditions".

NOTE

If electing to reset the PFD per this procedure, pulling the PFD circuit breaker and resetting it within 20 seconds will initiate a Warmstart Condition. This should restore the PFD in approximately 10 seconds. If the Warmstart fails after two consecutive attempts, or if the PFD circuit breaker is left out for longer than 20 seconds, the PFD will enter a full alignment mode which may take longer than 3 minutes to restore the PFD. See FlightMax Entegra PFD Pilot's Guide for additional information concerning "Starting the EXP5000".

3.28 AVIONICS SYSTEMS FAILURES (3.4n) (continued)

INVALID AIR DATA (continued)

If time and conditions permit, pull and reset the PFD circuit breaker.

NOTE

The PFD circuit breaker should be reset within 20 seconds.

If air data is still invalid, refer to the standby instruments to maintain aircraft control.

NOTE

Certain failures of the PFD may cause a loss of Transponder Mode C capability and render the optional TAS610 Traffic Advisory System inoperable.

Land as soon as practical.

INVALID HEADING DATA

Should the heading bug and heading data be replaced with red X's, refer to the magnetic compass and GPS for heading data.

CAUTION

High current loads in the vicinity of the magnetic compass can influence its accuracy. Depending on the flight conditions, the pilot must reduce these loads as much as possible to insure accuracy. Tests have shown that air conditioner, windshield heat and pitot heat contribute to significant heading errors of the magnetic compass. These items (if installed) should be turned OFF prior to comparing magnetic compass headings.

Land as soon as practical.

3.28 AVIONICS SYSTEMS FAILURES (3.4n) (continued)

CROSSCHECK MONITOR

Should the PFD display a yellow crosscheck attitude annunciator, establish the aircraft in straight and level unaccelerated flight.

Verify the standby attitude gyro is ON and the flag is pulled.

Crosscheck the aircraft attitude with the standby attitude gyro to determine the correct attitude indication.

Land as soon as practical.

INVALID ATTITUDE AND HEADING DATA

Should the attitude and heading data be replaced with red X's, verify the standby attitude gyro switch is ON and the flag is pulled on the gyro and refer to the standby attitude gyro for attitude control.

CAUTION

Pulling and resetting the PFD circuit breaker will cause the PFD to enter a realignment mode. This will result in the temporary loss of all PFD information, including attitude, airspeed and altitude. Ensure that positive control can be maintained by reference to the standby instruments prior to pulling the PFD circuit breaker. See FlightMax Entegra PFD Pilot's Guide for additional information concerning "Warmstart Conditions".

NOTE

If electing to reset the PFD per this procedure, pulling the PFD circuit breaker and resetting it within 20 seconds will initiate a Warmstart Condition. This should restore the PFD in approximately 10 seconds. If the Warmstart fails after two consecutive attempts, or if the PFD circuit breaker is left out for longer than 20 seconds, the PFD will enter a full alignment mode which may take longer than 3 minutes to restore the PFD. See FlightMax Entegra PFD Pilot's Guide for additional information concerning "Starting the EXP5000".

If time and conditions permit, pull and reset the PFD circuit breaker.

NOTE

The PFD circuit breaker should be reset within 20 seconds.

3.28 AVIONICS SYSTEMS FAILURES (3.4n) (continued)

INVALID ATTITUDE AND HEADING DATA (continued)

If attitude and heading data is still invalid, use the standby gyro to maintain attitude control and maintain heading control by using the magnetic compass and other directional indications such as the MAP/NAV page on the MFD.

CAUTION

High current loads in the vicinity of the magnetic compass can influence its accuracy. Depending on the flight conditions, the pilot must reduce these loads as much as possible to insure accuracy. Tests have shown that air conditioner, windshield heat and pitot heat contribute to significant heading errors of the magnetic compass. These items (if installed) should be turned OFF prior to comparing magnetic compass headings.

Land as soon as practical.

3.28 AVIONICS SYSTEMS FAILURES (3.4n) (continued)

FAILURE OF AIR DATA, ATTITUDE AND HEADING REFERENCE SYSTEM (ADAHRS)

Should the airspeed, vertical speed, altitude, attitude and heading data be replaced with red X's, verify the standby attitude gyro switch is ON and the flag is pulled on the gyro and refer to the standby instruments for attitude control.

CAUTION

Pulling and resetting the PFD circuit breaker will cause the PFD to enter a realignment mode. This will result in the temporary loss of all PFD information, including attitude, airspeed and altitude. Ensure that positive control can be maintained by reference to the standby instruments prior to pulling the PFD circuit breaker. See FlightMax Entegra PFD Pilot's Guide for additional information concerning "Warmstart Conditions".

NOTE

If electing to reset the PFD per this procedure, pulling the PFD circuit breaker and resetting it within 20 seconds will initiate a Warmstart Condition. This should restore the PFD in approximately 10 seconds. If the Warmstart fails after two consecutive attempts, or if the PFD circuit breaker is left out for longer than 20 seconds, the PFD will enter a full alignment mode which may take longer than 3 minutes to restore the PFD. See FlightMax Entegra PFD Pilot's Guide for additional information concerning "Starting the EXP5000".

If time and conditions permit, pull and reset the PFD circuit breaker.

NOTE

The PFD circuit breaker should be reset within 20 seconds.

3.28 AVIONICS SYSTEMS FAILURES (3.4n) (continued)

FAILURE OF AIR DATA, ATTITUDE AND HEADING REFERENCE SYSTEM (ADAHRS) (continued)

If ADAHRS initialization does not occur and the aircraft is equipped with the optional second Nav Indicator, use the mechanical nav indicator for primary navigation and refer to the Engine Page on the MFD for engine instruments.

NOTE

The mechanical nav indicator receives nav information directly from the No. 1 nav/com/GPS. Only VLOC information is available.

Maintain attitude, airspeed and heading control using the standby instruments, magnetic compass and other directional indications such as the MAP/NAV page on the MFD.

CAUTION

High current loads in the vicinity of the magnetic compass can influence its accuracy. Depending on the flight conditions, the pilot must reduce these loads as much as possible to insure accuracy. Tests have shown that air conditioner, windshield heat and pitot heat contribute to significant heading errors of the magnetic compass. These items (if installed) should be turned OFF prior to comparing magnetic compass headings.

Land as soon as practical.

3.28 AVIONICS SYSTEMS FAILURES (3.4n) (continued)

FAILURE OF MULTI-FUNCTION DISPLAY (MFD)

Should the Multi-Function Display (MFD) go blank or "freeze" and not accept pilot input, pull and reset the MFD circuit breaker.

If initialization of the MFD does not occur, land as soon as possible.

LOSS OF STANDBY ATTITUDE INDICATOR

Should the OFF Warning Flag display, exit IMC as soon as possible and maintain VFR conditions for the remainder of the flight.

If the standby attitude tumbles or shows erroneous attitude information, establish the aircraft in straight and level unaccelerated flight, then pull the "Pull to Cage" knob to erect the gyro, and then uncage. If the standby attitude indicator does not recover, exit IMC as soon as possible and maintain VFR conditions for the remainder of the flight.

FAILURE OF FLIGHT AND NAVIGATION DISPLAYS

Should all displays go blank, verify the standby attitude gyro switch is ON and the flag is pulled on the gyro, maintain aircraft in straight and unaccelerated flight by referring to the standby airspeed, altimeter, and attitude gyro indicators.

Pull the AVIONICS DIMMING Circuit Breaker.

NOTE

A failure of the display dimmer control can result in the two Garmin displays going blank. This is an indication of a partial failure of the dimmer control. A complete failure of this control would normally reinstate the displays to a full bright condition. However, if the displays should blank out, reinstatement of the displays to a full bright condition can be accomplished by bypassing the dimmer control (pulling the AVIONICS DIMMING Circuit Breaker).

3.29 PROPELLER OVERSPEED (3.4o)

Propeller overspeed is caused by a malfunction in the propeller governor or low oil pressure which allows the propeller blades to rotate to full low pitch.

If propeller overspeed should occur, retard the throttle and check the oil pressure. The propeller control should be moved to full DECREASE rpm and then reset if any control is available. Airspeed should be reduced and throttle used to maintain below 2500 RPM. Land as soon as practical and investigate cause of overspeed.

3.31 EMERGENCY LANDING GEAR EXTENSION (3.4p)

If all electrical power has been lost, the landing gear must be extended using the following procedures. The gear position indicator lights will not illuminate.

Prior to proceeding with an emergency gear extension, check to ensure that the battery master switch (BATT MASTR) is ON and that the circuit breakers have not popped. If it is daytime, the Day/Night dimmer switch should be in the DAY position.

If the landing gear does not check down and locked, reduce the airspeed to below 90 KIAS, pull out the HYDRAULIC PUMP POWER circuit breaker, place the landing gear selector in the DOWN position, pull the emergency gear extend control OUT and fishtail the airplane. Verify the landing gear position lights indicate down and locked.

CAUTION

The Emergency Gear Extension procedure will require the pilot to pull the emergency gear extend control knob through a region of high resistance (up to 25 lbs.) in order to reach the stop and extend the landing gear.

3.33 SPIN RECOVERY (3.4q)

Intentional spins are prohibited in this airplane. If a spin is inadvertently entered, immediately apply full rudder opposite to the direction of rotation. Move the control wheel full forward while neutralizing the ailerons. CLOSE the throttle. When the rotation stops, neutralize the rudder and relax forward pressure on the control wheel as required to smoothly regain a level flight attitude.

3.35 ENGINE ROUGHNESS (3.4r)

Engine roughness may be caused by dirt in the injector nozzles, induction filter icing, ignition problems, or other causes.

First adjust the mixture for maximum smoothness. The engine will run rough if the mixture is too rich or too lean.

Move the induction air to ALTERNATE and turn the emergency (EMERG) fuel pump ON.

Switch the fuel selector to another tank to determine if fuel contamination is the problem.

Check the engine displays for abnormal readings. If any readings are abnormal proceed accordingly.

The magneto switches should then be turned OFF individually and then turned back ON. If operation is satisfactory on only one magneto, proceed on the good magneto at reduced power to a landing at the first available airport.

If roughness persists, prepare for a precautionary landing at pilot's discretion.

3.37 OXYGEN SYSTEM (3.4s)

NOTE

The time of useful consciousness at 25,000 feet is approximately 3 to 5 minutes.

NOTE

The pilot should monitor oxygen quantity to ensure compliance with the applicable supplemental oxygen regulations.

Should hypoxic symptoms or indications be evident, check oxygen quantity. **Descend immediately to below 12,500 feet if quantity is low or depleted.** If there is an interruption of oxygen flow as evidenced by the flow indicators, immediately install another mask unit or install the mask connection in an unused outlet, if available.

If oxygen flow is not restored, immediately descend to below 12,500 feet. Refer to Emergency Descent checklist, paragraph 3.4t.

3.39 EMERGENCY DESCENT (3.4t)

In the event an emergency descent becomes necessary, retard the throttle to idle and move the propeller control to the FULL INCREASE position. The mixture should be reset as required to ensure the engine will continue operating. Lower the landing gear (165 KIAS maximum), raise the flaps to the full up position and immediately initiate a descent. If in smooth air, descend at 180 to 195 KIAS maximum. If extremely rough air is encountered, the airspeed should be limited according to the maneuvering speed versus Gross Weight Table:

4340 lb = 133 KIAS
2900 lb = 108 KIAS

Use straight line variation between points.

After reaching a safe altitude, advance the throttle and adjust mixture and propeller controls for power as required.

3.41 CABIN AIR CONTAMINATION/SMOKE EVACUATION (3.4u)

CAUTION

If fire is suspected, do not use oxygen at lower altitude where oxygen is not required.

Strong fumes or smoke in the cabin may indicate a fire. In any event, the primary concern is to establish maximum airflow through the cabin in order to vent the fumes or smoke. To accomplish this, turn OFF the auxiliary cabin heater, turn ON the vent/defog blower and turn OFF the cabin air recirculation blower. Turn OFF the air conditioner. This procedure will provide the maximum flow of outside ram air through the cabin. If necessary turn on and don oxygen masks. If the fumes or smoke persist the problem may be a fire (see paragraph 3.4f, Fire In Flight).

3.43 VACUUM SYSTEM FAILURE (3.4v)

A failure of either vacuum pump is indicated by reduced suction pressure and the illumination of a vacuum failure annunciator, VAC 1 INOP or VAC 2 INOP.

In the event one vacuum pump fails, check that the vacuum display still indicates within the normal operating range, and that the operating pump's vacuum failure annunciator is extinguished.

Although either vacuum pump independently has sufficient capacity to operate the deice boots in a normal manner, intentional or continued operation in icing conditions is not recommended. Immediate action should be taken to avoid or exit icing conditions.

Failure of both vacuum pumps is indicated by the vacuum display reading less than 4.0 inches of mercury and illumination of both annunciators.

If both vacuum systems are inoperable, the wing and tail deicer boots will be inoperative. A precautionary landing should be considered depending on operating conditions.

3.45 INADVERTENT ICING ENCOUNTER (3.4w)

WARNING

Flight into known icing conditions is prohibited unless Ice Protection System is installed and fully operational. Refer to Section 9, Supplements.

For aircraft not equipped with the optional Ice Protection System:

If icing conditions are inadvertently encountered, select ALTERNATE induction air and adjust manifold pressure as required. Turn the pitot and stall warning heat ON. Pull ON the windshield defrost and turn the windshield vent/defog fan ON to keep the windshield as clear as possible. Change aircraft heading and/or altitude to exit icing conditions as soon as possible.

3.49 HYDRAULIC SYSTEM MALFUNCTION (3.4x)

A hydraulic system malfunction, which causes the hydraulic pump to either run continuously (more than 15-20 seconds), or cycle on and off rapidly (more than 6-8 times), may be detected by the illumination of the HYD PUMP amber annunciator light. Pull the HYDRAULIC PUMP POWER circuit breaker to stop operation. The pump is not designed for continuous duty and will fail if left running. Land as soon as practical and investigate the cause. Prior to landing, the HYDRAULIC PUMP POWER circuit breaker must be reset in order to extend the landing gear. If the pump continues to run after the gear is locked down, again pull the HYDRAULIC PUMP POWER circuit breaker. If the gear fails to extend, refer to Emergency Landing Gear Extension (paragraph 3.4p).

3.51 FLAP SYSTEM MALFUNCTION (3.4y)

NOTE

Leaving the FLAP WARN circuit breaker out for a few minutes prior to resetting may allow the flap motor to cool and become operative again. Care should be exercised to not forget to reset the circuit breaker prior to use of the flaps.

Illumination of the FLAPS annunciator would normally be the result of an overcurrent condition in the flap motor/actuator circuit. If an overcurrent fault occurs the flap protection circuit will sense the malfunction and automatically remove power from the flap motor/actuator and flap operation will stop. Pulling and resetting the FLAP WARN circuit breaker will restore flap power to normal operation.

After resetting, normal operation of the flaps should be verified.

CAUTION

Higher than normal approach and landing speeds may be required if full symmetrical flap extension is not available. Longer landing distances than shown in Section 5 will result from increased airspeed approaches.

If normal flap operation is not regained, or the FLAPS annunciator remains illuminated, pull the FLAP MOTOR circuit breaker and land as soon as practical to ascertain the cause of the problem. The flaps will remain in the same position as when the malfunction occurred.

3.53 FUEL TANK SUBMERGED PUMP FAILURE (BOOST PUMP light illuminated - annunciator panel) (3.4z)

Illumination of the BOOST PUMP annunciator light indicates the selected fuel tank's submerged fuel boost pump has failed. Immediately check that the fuel selector is in the proper position and check the appropriate FUEL PUMPS (L BOOST or R BOOST) circuit breaker; reset if necessary. Check that the BOOST PUMP annunciator is extinguished.

If the FUEL PUMPS circuit breaker does not remain closed, or the BOOST PUMP annunciator remains lit, turn ON the emergency (EMERG) fuel pump and check for fluctuations in the fuel flow indication. Continue flight if no fuel flow fluctuations are observed. If fuel flow fluctuations are observed, descend to an altitude where the fluctuations cease and continue flight. After landing, have the inoperative boost pump repaired prior to further flight.

3.55 STALL WARNING FAILURE (STALL WRN FAIL light illuminated - annunciator panel) (3.4aa)

Illumination of the STALL WRN FAIL annunciator light means the lift computer has failed. Check, and if necessary, reset the STALL WARN circuit breaker. If the breaker does not remain closed, or if the STALL WRN FAIL annunciator light does not extinguish, the stall warning system will be inoperative for the remainder of the flight. After landing, have the system repaired before further flight.

3.57 ANNUNCIATOR LIGHT PANEL FAILURE (ANNUN INOP light illuminated - annunciator panel) (3.4bb)

Should the ANNUN INOP light illuminate, check the ANNUN circuit breaker. Reset, if necessary, and the ANNUN INOP light should extinguish.

If the ANNUN circuit breaker is not open, the annunciator fail relay switch is faulty. Push the annunciator test switch; if all lights illuminate, the annunciator panel is functioning properly. The ANNUN INOP light will remain lit.

Should the ANNUN circuit breaker fail to remain closed, or the annunciators fail to illuminate when tested, the annunciator lights will be inoperative for the remainder of the flight. Also, the landing gear position lights cannot be tested nor dimmed. The system should be repaired prior to further flight.

3.59 EMERGENCY EXIT (3.4cc)

The second window aft of the windshield on the right side of the fuselage is an emergency exit.

To use the emergency exit, remove the plexiglas cover over the handle, pull the handle, and pull in on the exit window.

TABLE OF CONTENTS

SECTION 4

NORMAL PROCEDURES

TABLE OF CONTENTS (continued)

SECTION 4

NORMAL PROCEDURES

TABLE OF CONTENTS (continued)

SECTION 4

NORMAL PROCEDURES

TABLE OF CONTENTS (continued)

SECTION 4

NORMAL PROCEDURES

SECTION 4

NORMAL PROCEDURES

4.1 GENERAL

This section provides the normal operating procedures for the PA-46R-350T. All of the normal operating procedures required by the FAA are presented as well as those procedures which have been determined as necessary for the operation of the airplane, as determined by the operating and designed features of the airplane, are presented.

Normal operating procedures associated with optional systems and equipment which require handbook supplements are presented in Section 9, Supplements.

These procedures are provided to supply information on procedures which are not the same for all airplanes and as a source of reference and review. Pilots should familiarize themselves with these procedures to become proficient in the normal operation of the airplane.

This section also contains Icing Information. A series of guide lines are presented to help recognize, operate in (if properly equipped), and exit from an inadvertant encounter with severe icing.

This section is divided into two parts. The first part is a short form checklist supplying an action - reaction sequence for normal procedures with little emphasis on the operation of the systems. Numbers in parentheses after each checklist section indicate the paragraph where the corresponding amplified procedure can be found.

The second part of this section contains the amplified normal procedures which provide detailed information and explanations of the procedures and how to perform them. This portion of the section is not intended for use as an inflight reference due to the lengthy explanation. The short form checklists should be used on the ground and in flight. Numbers in parentheses after each paragraph title indicate where the corresponding checklist can be found.

4.1 GENERAL (continued)

CAUTION

Pilots who fly at high altitude must be aware of the physiological problems associated with prolonged flight at such altitudes. Dehydration and the onset of hypoxia may occur in the passengers and crew.

Passenger comfort may be increased by an occasional intake of fluids. Prolonged high altitude flights require warm clothing and monitoring of the cabin temperature and the physical state of the crew and passengers.

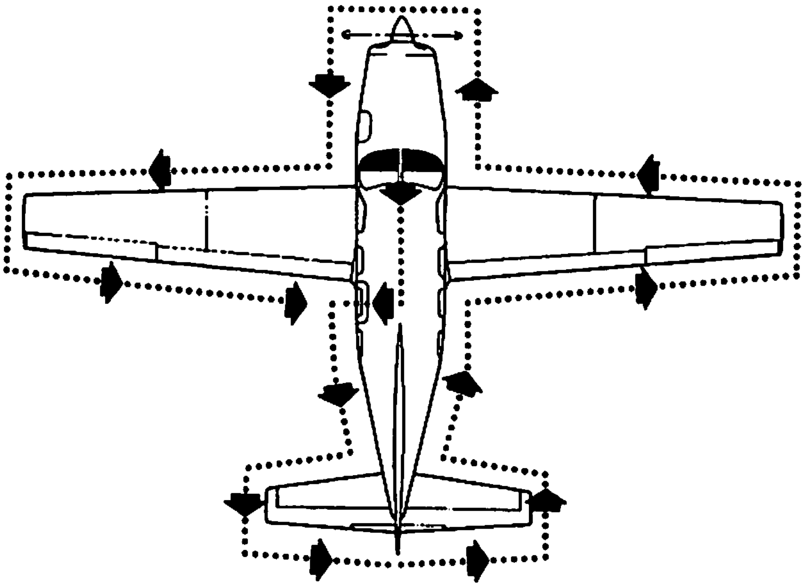
4.3 AIRSPEEDS FOR SAFE OPERATIONS

The following airspeeds are those which are significant to the safe operation of the airplane. These figures are for standard airplanes flown at gross weight under standard conditions at sea level.

Performance for a specific airplane may vary from published figures depending upon the equipment installed, the condition of the engine, airplane and equipment, atmospheric conditions and piloting technique.

(a) Best Rate of Climb Speed .... 110 KIAS
(b) Best Angle of Climb Speed .... 81 KIAS
(c) Turbulent Air Operating Speed (See Subsection 2.3) .... 133 KIAS
(d) Landing Final Approach Speed (Full Flaps) .... 77 KIAS
(e) Maximum Demonstrated Crosswind Velocity .... 17 KTS
(f) Maximum Flaps Extended Speed
    10° .... 165 KIAS
    20° .... 130 KIAS
    Full Flaps (36°) .... 116 KIAS
(g) Maximum Airspeed for Autopilot Operation .... 180 KIAS

4.5 NORMAL PROCEDURES CHECKLIST



WALK-AROUND
Figure 4-1

4.5a Preflight Checklists (4.9)

COCKPIT (4.9a)

Oxygen System	CHECK MASKS and HOSES
Control Wheel	RELEASE RESTRAINTS
Parking Brake	SET
Gear Handle	DOWN
All Switches	OFF
Magneto Switches	OFF
Radio Master Switch	OFF
Mixture	IDLE CUT-OFF
Battery Master Switch	ON
Landing Gear Indicator Lights	THREE GREEN
Annunciator Panel	CHECK
Switch Panel	CHECK

4.5a Preflight Checklists (4.9) (continued)

COCKPIT (4.9a) (continued)

FUEL PRESS Annunciator ....ON

CAUTION

See fuel imbalance limitations, Section 2.37.

Oxygen Supply Indicator ....CHECK QUANTITY
Oxygen System ....TURN ON/
CHECK FLOWMETER ON ALL MASKS
Stall Warning System ....TEST
Flaps ....EXTEND
Interior Lighting ....ON and CHECK
Pitot Heat ....ON
Stall Warning Heat Switch ....ON
Exterior Light Switches ....ON

CAUTION

Care should be taken when an operational check of the heated pitot head and heated lift detector is being performed. The units become very hot. Ground operation should be limited to three minutes to avoid damaging the heating elements.

Pitot Head ....CHECK WARM
Stall Warning Vane ....CHECK WARM
Exterior Lights ....CHECK OPERATION
Exterior Light Switches ....OFF
Pitot Heat ....OFF
Stall Warning Heat ....OFF
Battery Master Switch ....OFF
Primary Flight Controls ....PROPER OPERATION
Trim ....NEUTRAL
Static System ....DRAIN
Alternate Static System ....CHECK NORMAL POSITION
Emergency Exit ....CHECK
Windows ....CHECK CLEAN
Required Papers ....CHECK ON BOARD
Baggage ....STOW PROPERLY - SECURE
Empty Seats ....SEAT BELTS SNUGLY FASTENED

4.5a Preflight Checklist (4.9) (continued)

EMPENNAGE (4.9b)

Antennas .... CHECK
Surface Condition .... CLEAR OF ICE, FROST, SNOW
Left Static Port .... CLEAR
Alternate Static Port .... CLEAR
(Located on bottom of aft fuselage)
Oxygen Gauge Pressure .... CHECK
Oxygen Access Door .... CLOSE/SECURE
Elevator .... CHECK
Elevator Trim Tab .... CHECK
Rudder .... CHECK
Static Wicks .... CHECK
Tie Down .... REMOVE
Right Static Port .... CLEAR

RIGHT WING (4.9c)

Surface Condition .... CLEAR OF ICE, FROST, SNOW
Flap and Hinges .... CHECK
Aileron and Hinges .... CHECK
Static Wicks .... CHECK
Wing Tip and Lights .... CHECK
OAT Probe .... CHECK
Fuel Tank Vent .... CLEAR
Fuel Tank .... CHECK SUPPLY VISUALLY
- SECURE CAP
De-ice Boot (if installed) .... CHECK
Stall Strips (2 per wing) .... CHECK
Tie Down and Chock .... REMOVE
Main Gear Strut .... PROPER INFLATION
(3.44 +/- 0.25 in.)
Tire .... CHECK
Brake Block and Disc .... CHECK

CAUTION

When draining any amount of fuel, care should be taken to ensure that no fire hazard exists before starting engine.

Fuel Tank Sump .... DRAIN and CHECK for
water, sediment and proper fuel

4.5a Preflight Checklist (4.9) (continued)

NOSE SECTION (4.9d)

General Condition .... CHECK
Fuel Filter Sump .... DRAIN and CHECK for water, sediment and proper fuel
Cowling .... SECURE
Windshield .... CLEAN
Propeller and Spinner .... CHECK
Air Inlets .... CLEAR
Landing Light .... CHECK
Chock .... REMOVE
Nose Gear Strut .... PROPER INFLATION (1.65 ± 0.25 in.)
Nose Wheel Tire .... CHECK
Engine Baffle Seal .... CHECK
Oil... .... CHECK QUANTITY
Oil Filler/Dipstick Cap .... PROPERLY SEATED and SECURE
Cowl Oil Door .... CLOSED
Tow Bar .... STOW properly- SECURE
Baggage Door .... CLOSE and SECURE

4.5a Preflight Checklist (4.9) (continued)

LEFT WING (4.9e)

Surface Condition ....CLEAR of ICE, FROST, SNOW

CAUTION

When draining any amount of fuel, care should be taken to ensure that no fire hazard exists before starting engine.

Fuel Tank Sump ....DRAIN and CHECK
for water, sediment
Main Gear Strut ....INFLATION (3.44 +/- 0.25 INCH
Tire ....CHECK
Brake Block and Disc ....CHECK
Tie Down and Chock ....REMOVE
Pitot Head ....CHECK FOR OBSTRUCTIONS
Fuel Tank ....CHECK SUPPLY VISUALLY
- SECURE CAP
Fuel Tank Vent ....CLEAR
De-ice Boot (if installed)..CHECK
Stall Strips (2 per wing) ....CHECK
Wing Tip and Light ....CHECK
Aileron and Hinges ....CHECK
Flap and Hinges...CHECK
Static Wicks ....CHECK

4.5b Before Starting Engine Checklist (4.11)

BEFORE STARTING ENGINE (4.11)

Passengers .... BOARD/BRIEF on Oxygen System Operation
Door .... CLOSE and LATCH

WARNING

Do not initiate any flight if all four door pin indicators are not green and/or the DOOR AJAR annunciator is illuminated.

Door Pins .... ALL INDICATORS GREEN
Seats .... ADJUSTED and LOCKED IN POSITION
Seat Belts and Harnesses .... FASTEN/ADJUST
Parking Brake .... SET
Propeller Control .... FULL INCREASE
Fuel Selector .... DESIRED TANK
All Electrical Switches .... OFF
Day/Night Switch .... VERIFY PROPER SETTING
Circuit Breakers .... CHECK IN
Alternators .... ON
Induction Air Control .... CHECK then PRIMARY
Battery Switch .... ON
Primary Flight Display (PFD) .... VERIFY CORRECT AIRCRAFT MODEL SOFTWARE
Annunciator Panel Lights .... TEST
Alternate Static System .... CHECK PRIMARY POSITION
Pitot and Static Drains .... DRAIN
Initial Usable Fuel .... SET
Fuel Gauges .... CHECK QUANTITY & BALANCE

4.5c Engine Start Checklist (4.13)

ENGINE START - GENERAL (4.13a)

CAUTION

Do not attempt flight if there is no indication of alternator output.

CAUTION

The START ENGAGE annunciator will illuminate during engine cranking. If the annunciator remains lit after the engine is running, stop the engine and determine the cause.

CAUTION

If a positive oil pressure is not indicated within 30 seconds following an engine start, stop the engine and determine the trouble. In cold weather it will take a few seconds longer to get a positive oil pressure indication.

NOTE

Starter cranking periods should be limited to 10 seconds with two minutes for cool-down between cranking attempts. Repeat no more than 5 times. If start is not achieved by the fifth attempt, let the starter cool for 30 minutes before trying again.

4.5c Engine Start Checklist (4.13) (continued)

NORMAL START - COLD ENGINE (4.13b)

Throttle .... 1/2 INCH OPEN
Battery Master Switch .... ON
Emergency (EMERG) Fuel Pump .... OFF
Mixture .... RICH - then IDLE CUT-OFF

NOTE

The amount of prime depends on engine temperature. Familiarity and practice will enable the operator to estimate the amount of prime required.

Magneto Switches .... ON
Prop Area .... CLEAR
Starter .... ENGAGE
Mixture (when engine fires) .... ADVANCE
Throttle .... ADJUST
Oil Pressure .... CHECK
Alternators .... CHECK AMMETER
Gyro Suction .... CHECK

NORMAL START - HOT ENGINE (4.13c)

Throttle .... 1/2 INCH OPEN
Battery Master Switch .... ON
Emergency (EMERG) Fuel Pump .... OFF
Mixture .... IDLE CUT-OFF
Magneto Switches .... ON
Prop Area .... CLEAR
Starter .... ENGAGE
Mixture (when engine fires) .... ADVANCE
Throttle .... ADJUST
Oil Pressure .... CHECK
Alternators .... CHECK AMMETER
Gyro Suction .... CHECK

4.5c Engine Start Checklist (4.13) (continued)

ENGINE START WHEN FLOODED (4.13d)

Throttle .... OPEN FULL
Battery Master Switch .... ON
Emergency (EMERG) Fuel Pump .... OFF
Mixture .... IDLE CUT-OFF
Magneto Switches .... ON
Prop Area .... CLEAR
Starter .... ENGAGE
Mixture (when engine fires) .... ADVANCE
Throttle .... RETARD
Oil Pressure .... CHECK
Alternators .... CHECK AMMETER
Gyro Suction .... CHECK

4.5c Engine Start Checklist (4.13) (continued)

ENGINE START WITH EXTERNAL POWER SOURCE (4.13e)

Battery Master Switch .... OFF
Alternators .... OFF
All Electrical Equipment .... OFF
External Power Plug (28Vdc) .... INSERT in receptacle

NOTE

For all normal operations using an external power source, the battery master switch should be OFF, but it is possible to use the ship's battery in parallel by turning the battery master switch ON. This will give longer cranking capabilities, but will not increase amperage.

CAUTION

Care should be exercised because if the ship's battery has been depleted, the external power supply can be reduced to the level of the ship's battery. This can be tested by turning the battery master switch ON momentarily while the starter is engaged. If cranking speed increases, the ship's battery is at a higher level than the external power supply.

Throttle .... ½ INCH OPEN
Emergency (EMERG) Fuel Pump .... OFF
Mixture .... IDLE CUT-OFF
Magneto Switches .... ON
Prop Area .... CLEAR
Starter .... ENGAGE
Mixture (when engine fires) .... ADVANCE
Throttle .... LOWEST POSSIBLE RPM
Battery Master Switch .... ON
External Power Plug .... DISCONNECT from receptacle
Baggage Door .... CLOSED and SECURE
Voltmeter .... CHECK
Alternators .... ON
Ammeters .... CHECK
Throttle .... ADVANCE to 1000 RPM
Oil Pressure .... CHECK
Gyro Suction .... CHECK

4.5d Before Taxiing Checklist (4.15)

BEFORE TAXIING (4.15)

CAUTION

Do not operate engine above 1200 RPM with cabin doors open.

Throttle...1000 to 1200 RPM
Radio Master Switch...ON
Autopilot Master Switch ....SELECT ON / Verify Self Test Completed
Standby Attitude Gyro...ON/ERECT
Standby Attitude Gyro Preflight Test...............PERFORM AS FOLLOWS:

1. Press and hold the STBY PWR button.
2. Verify that after several seconds the amber LED has started to flash. This indicates that the unit has latched into the Battery Test Mode. At this time the STBY PWR button can be released.
3. Verify that a green annunciator is illuminated under the word TEST.
4. Visually monitor the test lights until the amber LED stops flashing, signaling the end of the test.

NOTE

A green annunciator throughout the test indicates the standby battery is sufficiently charged and should be able to function under normal operation. The presence of a red annunciator at any time during the test is an indication the standby battery is in need of charging, or possibly replacement.

NOTE

The Standby Attitude Indicator will operate for approximately 30 minutes with the internal battery, depending on battery condition at the time of power failure.

Altimeter/Standby Altimeter...SET
ADAHRS..VERIFY INITIALIZED
Environmental System..AS DESIRED
Auxiliary Cabin (Supplemental Electric) Heater ....AS DESIRED

4.5e Taxiing Checklist (4.17)

TAXIING (4.17)

CAUTION

Non-pilot personnel should not attempt to taxi the airplane until they have been instructed in taxiing procedures and technique by a qualified person authorized by the owner.

CAUTION

Do not operate the engine at high rpm when taxiing over ground containing loose stones, gravel, or any loose material that may cause damage to the propeller blades.

CAUTION

During taxi, if the LOW BUS VOLTS annunciator comes on, increase engine RPM, if possible, to retain adequate battery charging.

Taxi Area..CLEAR
Parking Brake ....RELEASED
Propeller Control ....FULL INCREASE
Throttle ....APPLY SLOWLY
Brakes ....CHECK
Steering...CHECK
Flight Instruments ....CHECK

4.5f Ground Check Checklist (4.19)

GROUND CHECK (4.19)

CAUTION

Alternate air is unfiltered. Use of alternate air during ground or flight operations, when dust or other contaminants are present, may result in engine damage from particle ingestion.

Parking Brake .... SET
Propeller Control .... FULL INCREASE
Mixture .... FULL RICH
Throttle .... 2000 RPM
Magnetos .... max. drop 175 RPM
- max. diff. 50 RPM
Gyro Suction .... CHECK (within normal operating range)

NOTE

Refer to paragraph 4.53, Icing Information, prior to any flight operations. (Takeoff, cruise, landing, etc.) If flight into icing conditions (in visible moisture below +5°C) is anticipated, conduct a preflight check of the ice protection systems per Section 9, Supplements.

Ice protection equipment (if installed) .... CHECK AS REQUIRED
Voltmeter .... CHECK
Ammeters .... CHECK
Oil Temperature .... CHECK
Oil Pressure .... CHECK
Propeller Control .... EXERCISE - then FULL INCREASE
Fuel Flow .... CHECK
Throttle .... RETARD
Annunciator Panel .... TEST
Environmental Control Panel .... TEST
MFD Aux Page .... VERIFY ALL SYSTEMS ARE VALID/ OPERATING NORMALLY
MFD Engine Page .... SELECT

4.5g Before Takeoff Checklist (4.21)

BEFORE TAKEOFF (4.21)

NOTE

Refer to Section 9, Supplements, for Flight Into Known Icing (FIKI), if installed, prior to any flight operations (takeoff, cruise, landing, etc.) in icing conditions.

Battery Master Switch .... ON
Emergency (EMERG) Fuel Pump .... ON
Magneto Switches .... ON
Alternators .... ON - CHECK INDICATIONS
Fuel Selector .... PROPER TANK
Induction Air .... PRIMARY
Seat Backs .... ERECT
Seats .... ADJUSTED& LOCKED IN POSITION
Armrests .... STOWED
Belts/Harness .... FASTENED/ADJUSTED
Mixture .... FULL RICH
Propeller Control .... FULL INCREASE
Windshield Heat (if installed) .... AS REQUIRED
Stall Warning Heat (if installed) .... AS DESIRED
Pitot Heat .... AS REQUIRED
Taxi/Rec Lights .... AS REQUIRED
Landing Light .... AS REQUIRED
Navigation Lights .... AS DESIRED
Strobe Lights .... ON
Flight Instruments .... CHECK (Primary and Standby)
Annunciator Lights .... CONSIDER ANY LIGHTS ILLUMINATED
Engine Instruments .... CHECK
Radios/Avionics .... AS REQUIRED
Flaps .... SET (0° to 20°)
Elevator and Rudder Trim .... SET
Flight Controls .... FREE & PROPER TRAVEL

4.5h Takeoff Checklist (4.23)

NOTE

Demonstrated crosswind component is 17 knots.

NOTE

Takeoffs are normally made with full throttle. However, under some off standard conditions, the manifold pressure indication can exceed its indicated limit at full throttle. Limit manifold pressure to 42 in. Hg maximum.

NOTE

During landing gear operation, it is normal for the HYD PUMP annunciator light to illuminate until full system pressure is restored.

NORMAL TECHNIQUE (4.23a)

Flaps....................0° to 10°
Brakes....................APPLY
Trim....................SET
Power....................SET TO MAXIMUM
Brakes....................RELEASE
Liftoff....................80-85 KIAS
Climb Speed....................90-95 KIAS
After liftoff, positive rate of climb and no usable runway:
Flaps....................RETRACT
Landing Gear....................UP

0° FLAP TAKEOFF PERFORMANCE (4.23b)

Flaps....................0°
Brakes....................APPLY
Trim....................SET
Power....................SET TO MAXIMUM
Brakes....................RELEASE
Liftoff....................78 KIAS
Obstacle Clearance Speed....................91 KIAS
After liftoff, positive rate of climb and immediate obstacles cleared:
Landing Gear....................UP

4.5h Takeoff Checklist (4.23) (continued)

SHORT FIELD TAKEOFF PERFORMANCE (4.23c)

NOTE

Gear warning will sound when the landing gear is retracted with the flaps extended more than 10°.

Flaps .... 20°
Brakes .... APPLY
Trim .... SET
Power .... SET TO MAXIMUM
Brakes .... RELEASE
Liftoff .... 69 KIAS
Obstacle Clearance Speed .... 80 KIAS

After liftoff, positive rate of climb and obstacle clearance:

Flaps .... RETRACT as speed builds thru 90 KIAS
Landing Gear .... UP

4.5i Climb Checklist (4.25)

MAXIMUM CONTINUOUS POWER CLIMB (4.25a)

Mixture .... FULL RICH
Propeller Speed .... 2500 RPM
Manifold Pressure .... MAXIMUM CONTINUOUS POWER
Best Angle of Climb (short duration only) .... 81 KIAS
Best Rate of Climb .... 110 KIAS
Emergency (EMERG) Fuel Pump .... OFF at safe altitude
Landing Light .... OFF
Taxi/Rec Lights .... AS REQUIRED

4.5i Climb Checklist (4.25) (continued)

CRUISE CLIMB (4.25b)

Manifold Pressure .... 35 IN. HG
Propeller Speed .... 2500 RPM
Mixture .... 32 GPH
Climb Speed .... 125 KIAS
Emergency (EMERG) Fuel Pump .... OFF at safe altitude
Landing Light .... OFF
Taxi/Rec Lights .... AS REQUIRED
Oxygen System .... AS REQUIRED

1. Adjust oxygen mask.
2. Turn on system.
3. Adjust flowmeter/regulators for planned cruise altitude.
4. Monitor flowmeters and quantity.

NOTE

Do not use oxygen system below 200 psi to prevent contamination and/or moisture from entering depleted cylinder-regulator assembly. If cylinder has been depleted, it must be removed and refurbished in accordance with the manufacturer's recommended procedures.

4.5j Cruise Checklist (4.27)

CRUISE (4.27)

WARNING

Operation above 25,000 feet is not approved.

CAUTION

To maintain lateral balance, alternate between right and left fuel tanks. See paragraphs 2.37 and 7.19.

NOTE

Reference Section 5 power setting table and performance charts.

Cruise Power .... SET per power table
Mixture (Refer to paragraph 4.27) .... ADJUST

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4.5k Descent Checklist (4.29)

NORMAL DESCENT (4.29a)

Windshield Defrost....AS REQUIRED
Windshield Heat (if installed)....AS REQUIRED
Ice Protection Equipment (if installed)....AS REQUIRED
Altimeter/Standby Altimeter....SET
Power....25 in. Hg. @ 2400 rpm
Mixture....CRUISE SETTING
Airspeed....165 KIAS

REDUCED POWER DESCENT (4.29b)

Windshield Defrost....AS REQUIRED
Windshield Heat (if installed)....AS REQUIRED
Ice Protection Equipment (if installed)....AS REQUIRED
Altimeter/Standby Altimeter....CHECK
Throttle....AT or ABOVE 20 IN. HG.
Mixture....MAINTAIN 1350°F TIT
Propeller Speed....CRUISE SETTING

NOTE

Aircraft POH Time, Fuel and Distance to Descend data presented in Section 5 will no longer be applicable if the REDUCED POWER DESCENT procedure is used.

4.5m Before Landing Checklist (4.31)

APPROACH CHECK (4.31a)

Altimeter/Standby Altimeter....................SET
Seat Backs....................ERECT
Seats....................ADJUSTED & LOCKED IN POSITION
Belts/Harness....................FASTEN/ADJUST
Emergency (EMERG) Fuel Pump....................ON
Fuel Selector....................PROPER TANK
Mixture....................RICH
Propeller Control....................SET
Gear....................DOWN (below 165 KIAS)

NOTE

During landing gear operation it is normal for the HYD PUMP annunciator light to illuminate until full system pressure is restored.

Flaps....................SET (10° @ 165 KIAS max.)
Rudder Trim....................SET TO NEUTRAL
Air Conditioner (if installed)....................OFF

LANDING CHECK (4.31b)

Landing Gear....................3 GREEN LIGHTS
Brakes....................CHECK

WARNING

After pumping several times, if one or both toe brakes are inoperative, DO NOT attempt landing on a short field.

Flaps....................SET (36° @ 116 KIAS)
Autopilot....................DISENGAGE

4.5n Landing (4.33)

NOTE

In crosswind conditions, the nosewheel may not be aligned with the runway as the wheel touches down because of opposite rudder input. To prevent swerving in the direction the nosewheel is offset, the rudder must be promptly centered just as the nosewheel touches down.

NORMAL TECHNIQUE (4.33a)

Flaps .... UP to FULL DOWN
Airspeed .... 80 - 85 KIAS (flaps down)
95 KIAS (flaps up)
Throttle .... AS REQUIRED
After touchdown:
Brakes .... AS REQUIRED

SHORT FIELD TECHNIQUE (4.33b)

Flaps .... FULL DOWN
Airspeed .... 78 KIAS
Throttle .... AS REQUIRED
Over obstacle:
Throttle .... REDUCE TO IDLE
After touchdown:
Brakes .... MAXIMUM

4.5o Go-around Checklist (4.35)

GO-AROUND (4.35)

Mixture .... FULL RICH
Propeller Control .... FULL INCREASE
Throttle .... FULL POWER
Control Wheel .... BACK PRESSURE to
ROTATE to CLIMB ATTITUDE
Airspeed .... 80 KIAS
Flaps .... RETRACT SLOWLY
Gear .... UP
Trim .... AS REQUIRED

4.5p After Landing Checklist (4.37)

AFTER LANDING (4.37)

Induction Air Control .... PRIMARY
Flaps .... RETRACT
Air Conditioner .... AS DESIRED
Emergency (EMERG) Fuel Pump .... OFF
Ice Protection Equipment (if installed) .... OFF
Transponder .... AS REQUIRED
Strobe Lights .... FIN STROBE
Landing/Taxi Lights .... AS REQUIRED

4.5q Stopping Engine Checklist (4.39)

STOPPING ENGINE (4.39)

Radios and Electrical Equipment .... OFF
External Lights .... OFF
Air Conditioner .... OFF
Propeller Control .... FULL INCREASE
Throttle .... CLOSED until a decided decrease in CHT
Throttle .... 1000 RPM for approx. 30 seconds
Mixture .... IDLE CUT-OFF
Magnetos .... OFF
Alternators .... OFF
Battery Master Switch .... OFF
Standby Attitude Indicator .... OFF

NOTE

No pilot action is required to turn OFF the standby attitude indicator. Verify that after the yellow light stops flashing the OFF flag appears on the instrument.

4.5r Mooring Checklist (4.41)

MOORING (4.41)

Parking Brake ....SET
Control Wheel ....SECURED with belts
Flaps...FULL UP
Wheel Chocks ....IN PLACE
Tie Downs...SECURE

4.7 AMPLIFIED NORMAL PROCEDURES (GENERAL)

The following paragraphs are provided to supply detailed information and the explanation of the normal procedures for operation of the airplane.

4.9 PREFLIGHT CHECK (4.5a)

The airplane should be given a thorough preflight and walk-around check. The preflight should include a check of the airplane's operational status, computation of weight and C.G. limits, takeoff and landing distance, and in-flight performance. A weather briefing should be obtained for the intended flight path, and any other factors relating to a safe flight should be checked before takeoff.

4.9a Cockpit (4.5a)

If oxygen use is anticipated for the flight, check all oxygen masks and hoses for integrity.

Release the seat belts securing the control wheel.

Set the parking brake by first depressing and holding the toe brake pedals and then pull the parking brake knob.

Check that the landing gear selector is in the DOWN position. Ensure that all electrical switches and the magneto switches are OFF. Turn OFF the radio master switch. The mixture should be in idle cut-off. Turn the battery master switch ON.

Verify that the three green landing gear indicator lights are illuminated, check the annunciator panel and switch panel illuminate, and the FUEL PRESS annunciator is ON.

CAUTION

See fuel imbalance limitations, Section 2.37.

Press the stall warning test switch and note that the stall warning horn sounds.

Extend the flaps for the walk-around inspection.

Check operation of the interior lighting, then turn OFF interior lighting.

4.9 PREFLIGHT CHECK (4.5a) (continued)

4.9a Cockpit (4.5a) (continued)

CAUTION

Care should be taken when an operational check of the heated pitot head and heated lift detector is being performed. The units become very hot. Ground operation should be limited to three minutes to avoid damaging the heating elements.

Turn ON the pitot heat, stall warning heat, and the exterior light switches. Verify that the pitot head and stall warning vane become warm, and check operation of the exterior lights.

Turn OFF the exterior light switches, pitot heat, and stall warning heat.

Turn OFF the battery master switch.

Check the primary flight controls for proper operation and set the elevator and rudder trim to neutral. Open the static system drain to remove any moisture that has accumulated in the lines. Verify that the alternate static system valve is in the normal position. Check that the emergency exit is in place and securely latched. Check the windows for cleanliness. Verify that the required papers are on board and that all baggage is stowed and secured properly. All seat belts on seats not occupied should be fastened and pulled secure.

4.9b Empennage (4.5a)

Begin the walk-around at the left side of the aft fuselage. Check the condition of any antennas located on the fuselage. All surfaces of the empennage must be clear of ice, frost, snow or other extraneous substances. Fairings and access covers should be attached properly. Ensure that the primary static system port on the left side of the aft fuselage and the alternate static port on the underside of the aft fuselage are clear of obstructions. Check oxygen gauge pressure on oxygen cylinder then close and verify that the oxygen access door is secured. The elevator and rudder should be operational and free from damage or interference of any type. Check the condition of the elevator trim tab and ensure that all hinges and push rods are sound and operational. Elevator and rudder static wicks should be firmly attached and in good condition. If the tail has been tied down, remove the tiedown rope. Ensure that the primary static port on the right side of the fuselage is clear of obstructions.

4.9 PREFLIGHT CHECK (4.5a) (continued)

4.9c Right Wing (4.5a)

Check that the wing surface and control surfaces are clear of ice, frost, snow or other extraneous substances. Check the flap, aileron and hinges for damage and operational interference. Static wicks should be firmly attached and in good condition. Check the wing tip and lights for damage. Check the OAT probe for security and damage.

The fuel tank vent should be clear of obstructions. Open the fuel cap and visually check the fuel color. The quantity should match the fuel quantity that is displayed on the MFD. Replace cap securely.

Check the condition of the deice boot, if installed, for any nicks, tears or delamination, and verify that the stall strips are securely attached.

Remove the tiedown and chock.

Next, complete a check of the landing gear. Check the gear strut for proper inflation. There should be 3.44 +/- 0.25 inches of strut exposure under a normal static load. Check for hydraulic leaks. Check the tire for cuts, wear, and proper inflation. Make a visual check of the brake block and disc.

CAUTION

When draining any amount of fuel, care should be taken to ensure that no fire hazard exists before starting engine.

Drain the fuel tank sump through the quick drain located on the lower surface of the wing just inboard of the gear well, making sure that enough fuel has been drained to ensure that all water and sediment is removed. The fuel system should be drained daily prior to the first flight and after each refueling.

4.9 PREFLIGHT CHECK (4.5a) (continued)

4.9d Nose Section (4.5a)

Check the general condition of the nose section; look for oil or fluid leakage and that the cowling is secure. Drain the fuel filter sump located on the lower fuselage aft of the cowling. Check the cowling for security. Check the windshield and clean if necessary. The propeller and spinner should be checked for detrimental nicks, cracks, or other defects. The air inlets should be clear of obstructions. The landing light should be clean and intact.

Remove the chock and check the nose gear strut for proper inflation. There should be 1.65 +/- 0.25 inches of strut exposure under a normal static load. Check the tire for cuts, wear, and proper inflation. Check the engine baffle seals. Check the oil level; maximum endurance flights should begin with 12 quarts of oil. Make sure that the oil filler/dipstick cap has been properly seated and secured, and that the cowl oil door is closed. Ensure that the tow bar is secured in the nose baggage area.

Close and secure the nose baggage door.

4.9 PREFLIGHT CHECK (4.5a) (continued)

4.9e Left Wing (4.5a)

Check that the wing surface and control surfaces are clear of ice, frost, snow or other extraneous substances.

CAUTION

When draining any amount of fuel, care should be taken to ensure that no fire hazard exists before starting engine.

Drain the fuel tank sump through the quick drain located on the lower surface of the wing just inboard of the gear well, making sure that enough fuel has been drained to ensure that all water and sediment is removed. The fuel system should be drained daily prior to the first flight and after each refueling.

Complete a check of the landing gear. Check the gear strut for proper inflation. There should be 3.44 +/- 0.25 inches of strut exposure under a normal static load. Check for hydraulic leaks. Check the tire for cuts, wear, and proper inflation. Make a visual check of the brake block and disc.

Remove the tiedown and chock.

If installed, remove the cover from the pitot head and verify that the pitot head is clear of obstructions.

Open the fuel cap and visually check the fuel color. The quantity should match the fuel quantity that is displayed on the MFD. Replace cap securely. The fuel tank vent should be clear of obstructions.

Check the condition of the deice boot, if installed, for any nicks, tears or delamination, and verify that the stall strips are securely attached. Check the wing tip and lights for damage. Check the flap, aileron and hinges for damage and operational interference. Static wicks should be firmly attached and in good condition.

4.11 BEFORE STARTING ENGINE (4.5b)

When all passengers are on board, the pilot should brief the passengers on the operation of the oxygen system (briefing should include oxygen mask donning, flowmeter adjustment, and connection to the oxygen bottle regulator). The pilot should check that the cabin door is properly closed and latched and visually check that all four door pin indicators are green.

WARNING

Do not initiate any flight if all four door pin indicators are not green and/or the DOOR AJAR annunciator is illuminated.

Seats should be adjusted and locked in position. Seat belts on empty seats should be snugly fastened. All passengers should fasten their seat belts and shoulder harnesses. A pull test of the inertia reel locking restraint feature should be performed.

Verify the parking brake is set and the area around the airplane is clear of personnel and equipment.

Move the propeller control to full INCREASE and set the fuel selector to the desired tank. Turn OFF all electrical switches. Verify the DAY/NIGHT selector switch is properly set and check circuit breaker panel to verify circuit breakers are in. Turn the alternator switches ON.

Check the induction air control for freedom of movement by moving lever to ALTERNATE and back to PRIMARY.

Turn the battery master switch ON.

Verify that the PFD displays the correct aircraft model in the center of the display.

Verify that all annunciators on the annunciator panel illuminate by selecting TEST on the annunciator panel.

Verify that the alternate static system valve is in the normal (PRIMARY) position. Drain the pitot and static systems using the three drain valves located on the left cockpit lower side panel next to the pilot seat.

Set the fuel totalizer for the current fuel load. Verify the fuel imbalance falls within the maximum allowed per Section 2.37.

4.13 ENGINE START (4.5c)

4.13a Engine Start - General (4.5c)

CAUTION

Do not attempt flight if there is no indication of alternator output.

CAUTION

The START ENGAGE annunciator will illuminate during engine cranking. If the annunciator remains lit after the engine is running, stop the engine and determine the cause.

CAUTION

If a positive oil pressure is not indicated within 30 seconds following an engine start, stop the engine and determine the trouble. In cold weather it will take a few seconds longer to get a positive oil pressure indication.

NOTE

Starter cranking periods should be limited to 10 seconds with two minutes for cool-down between cranking attempts. Repeat no more than 5 times. If start is not achieved by the fifth attempt, let the starter cool for 30 minutes before trying again.

4.13 ENGINE START (4.5c) (continued)

4.13b Normal Start - Cold Engine (4.5c)

Open the throttle lever approximately 1/2 inch. Turn the battery master switch ON, and check that the emergency (EMERG) fuel pump is OFF. Move the mixture control to full RICH for approximately four seconds then to idle cut-off. The engine is now primed.

NOTE

The amount of prime depends on engine temperature. Familiarity and practice will enable the operator to estimate the amount of prime required.

Turn both magneto switches ON. Verify the area around the propeller is clear and engage the starter. When the engine fires advance the mixture control to full RICH. Move the throttle to the desired setting and check the oil pressure for a positive indication. Confirm that the alternators are on by checking the ammeters for output. Check the gyro suction display for a positive indication.

4.13c Normal Start - Hot Engine (4.5c)

Open the throttle 1/2 inch. Turn the battery master switch ON and check that the emergency (EMERG) fuel pump is OFF. Verify the mixture control is at idle cut-off. Turn both magneto switches ON. Verify the area around the propeller is clear and engage the starter. When the engine fires, slowly advance the mixture control. Move the throttle to the desired setting and check for a positive indication of oil pressure. Confirm that the alternators are on by checking the ammeters for output. Check the gyro suction display for a positive indication.

4.13d Engine Start When Flooded (4.5c)

The throttle lever should be full open. Turn the battery master switch ON and check that the emergency (EMERG) fuel pump is OFF. Verify the mixture control is at idle cut-off. Turn both magneto switches ON. Verify the area around the propeller is clear and engage the starter. When the engine fires, advance the mixture control, retard the throttle, and check for a positive indication of oil pressure. Confirm that the alternators are on by checking the ammeters for output. Check the gyro suction display for a positive indication.

4.13e Engine Start With External Power Source (4.5c)

Turn the battery master and alternator switches OFF, and turn all electrical equipment OFF.

Plug the 28Vdc auxiliary power unit into the socket located inside the forward baggage door. If using an external battery, connect the RED lead of the jumper cable to the POSITIVE (+) terminal of an external 24-volt battery and the BLACK lead to the NEGATIVE (-) terminal. Insert the plug of the jumper cable into the socket located inside the forward baggage door. Note that, after the plug is inserted, the airplane's electrical system is ON.

NOTE

For all normal operations using an external power source, the battery master switch should be OFF, but it is possible to use the ship's battery in parallel by turning the battery master switch ON. This will give longer cranking capabilities, but will not increase amperage.

CAUTION

Care should be exercised because if the ship's battery has been depleted, the external power supply can be reduced to the level of the ship's battery. This can be tested by turning the battery master switch ON momentarily while the starter is engaged. If cranking speed increases, the ship's battery is at a higher level than the external power supply.

Open the throttle lever approximately 1/2 inch. Check that the emergency (EMERG) fuel pump is OFF. Verify the mixture control is at idle cut-off. Turn both magneto switches ON. Verify the area around the propeller is clear and engage the starter. When the engine fires, slowly advance the mixture control. Move the throttle to the lowest possible RPM to reduce sparking.

Turn the battery master switch ON, check the system voltage then disconnect the external power source from the aircraft and secure the baggage door. Turn the alternator switches ON and check for an indication of alternator output. When the engine is firing evenly, advance the throttle to 1000 rpm and check for a positive indication of oil pressure. Check gyro suction display for a positive indication.

4.15 BEFORE TAXIING (4.5d)

CAUTION

Do not operate engine above 1200 RPM with cabin doors open.

Warm up the engine at 1000 to 1200 rpm. Avoid prolonged idling at low rpm, as this practice may result in fouled spark plugs. Turn the radio master switch ON. Select the autopilot master switch ON and verify the autopilot completes a self test. Observe the standby attitude gyro and verify the flag is pulled and the gyro is erect. Perform the standby attitude gyro preflight test per paragraph 4.5d. Set the altimeter on the PFD and the standby altimeter. Verify the ADAHRS has completed a successful alignment.

Set environmental system as desired. Set the auxiliary cabin electric heater as desired (refer to paragraph 4.49).

4.17 TAXIING (4.5e)

CAUTION

Non-pilot personnel should not attempt to taxi the airplane until they have been instructed in taxiing procedures and technique by a qualified person authorized by the owner.

CAUTION

Do not operate the engine at high rpm when taxiing over ground containing loose stones, gravel, or any loose material that may cause damage to the propeller blades.

CAUTION

During taxi, if the low voltage annunciator comes on, increase engine RPM, if possible, to retain adequate battery charging.

Determine that the propeller back blast and taxi areas are clear. Avoid holes and ruts when taxiing over uneven ground.

Release the parking brake by first depressing and holding the toe brake pedals and then pushing in on the parking brake knob. Taxi with the propeller control set to full INCREASE. Power should be applied slowly to start the taxi roll. Taxi a few feet forward and apply the brakes to determine their effectiveness. While taxiing, make slight turns to ascertain the effectiveness of the steering and to check the flight instruments.

4.19 GROUND CHECK (4.5f)

WARNING

Refer to paragraph 4.53, Icing Information, prior to any flight operations. (Takeoff, cruise, landing, etc.)

CAUTION

Alternate air is unfiltered. Use of alternate air during ground or flight operations when dust or other contaminants are present may result in damage from particle ingestion.

NOTE

If flight into icing conditions (in visible moisture below +5°C) is anticipated, conduct a preflight check of the ice protection systems, if installed, per Section 9, Supplements.

Set the parking brake. The magnetos should be checked at 2000 rpm with the mixture set to full RICH and the propeller control set at full INCREASE. Drop off on either magneto should not exceed 175 rpm and the difference between the magnetos should not exceed 50 rpm. Operation on one magneto should not exceed 10 seconds.

While at 2000 rpm, check that vacuum reading on the MFD shows within normal operating range.

Conduct a preflight check of the ice protection systems (if installed) for proper operation.

Check the voltmeter and ammeters for proper voltage and alternator outputs. Check oil temperature and oil pressure for normal readings. The oil temperature may remain low for some time if the engine is being run for the first time of the day.

The propeller control should be moved through its complete range to check for proper operation and then placed in full INCREASE rpm for takeoff. Do not allow a drop of more than 500 rpm during this check. In cold weather, the propeller control should be cycled from high to low rpm at least three times before takeoff to make sure that warm engine oil has circulated in the propeller system.

Check the reading on the PFD or MFD for proper indication of fuel flow, then retard the throttle.

Check the annunciator panel lights with the TEST button and check operation of the environmental/deice control panel with the TEST button.

On the MFD Aux page verify that all systems are valid and operating normally, then select the MFD Engine page.

4.21 BEFORE TAKEOFF (4.5g)

NOTE

Refer to Section 9, Supplements, for Flight Into Known Icing (FIKI), if installed, prior to any flight operations (takeoff, cruise, landing, etc.) in icing conditions.

Ensure the battery master switch is ON. Check the emergency (EMERG) fuel pump is ON. Verify the magneto switches are ON. Turn ON the alternators and check for proper indications. Check the fuel selector to make sure it is set to the proper tank. Verify that the induction air control is in the PRIMARY position.

Seats should be adjusted and locked in position. All seat backs should be erect, all seat belts and harnesses should be fastened and adjusted, and armrests stowed.

The mixture control should be set to full RICH and propeller control should be set to full INCREASE.

Turn pitot heat, stall warning heat, windshield heat (if installed), and propeller heat (if installed) ON if necessary. The taxi/recognition lights, landing light, navigation and strobe lights should be utilized as required.

Check and set all of the primary and standby flight instruments as required. Consider any annunciator lights that are illuminated and take appropriate action as necessary. Check engine indications to verify normal operating range.

Check that the radios and avionics are set and functioning as required.

Set the flaps 0° to 20°, as required, and set the elevator and rudder trim, as required. Ensure proper flight control movement and response.

4.23 TAKEOFF (see charts in Section 5) (4.5h)

NOTE

Demonstrated crosswind component is 17 knots.

NOTE

Takeoffs are normally made with full throttle. However, under some off standard conditions, the manifold pressure indication can exceed its indicated limit at full throttle. Limit manifold pressure to 42 in. Hg maximum.

NOTE

During landing gear operation, it is normal for the HYD PUMP annunciator light to illuminate until full system pressure is restored.

Takeoffs are normally made with flaps 0° to 10°. For short field takeoffs or takeoffs affected by soft runway conditions or obstacles, total distance can be reduced appreciably by lowering the flaps to 20°.

4.23a Normal Technique (4.5h)

When the available runway length is well in excess of that required and obstacle clearance is no factor, the normal takeoff technique may be used. The flaps should be in the 0° to 10° position and the pitch trim set slightly aft of neutral. Align the airplane with the runway, apply full power, and accelerate to 80-85 KIAS.

Apply back pressure to the control wheel to lift off at 80-85 KIAS, then control pitch attitude as required to attain the desired climb speed of 90-95 KIAS. Retract the flaps. Retract the landing gear when a straight-ahead landing on the runway is no longer possible.

4.23 TAKEOFF (see charts in Section 5) (4.5h) (continued)

4.23b 0° Flaps Takeoff Performance (4.5h)

Set the flaps to 0° and set the trim for takeoff. Set maximum power before brake release and accelerate the airplane to 78 KIAS for liftoff. After liftoff, adjust the airplane attitude as required to achieve the obstacle clearance speed of 91 KIAS passing through 50 feet of altitude. Once immediate obstacles are cleared, retract the landing gear and establish the desired enroute climb configuration and speed.

4.23c Short Field Takeoff Performance (4.5h)

NOTE

Gear warning will sound when the landing gear is retracted with the flaps extended more than 10°.

For departure from short runways or runways with adjacent obstructions, a short field takeoff technique with flaps set at 20° should be used. Set trim for takeoff. Maximum power is established before brake release and the airplane is accelerated to 69 KIAS for liftoff. After liftoff, control the airplane attitude to accelerate to 80 KIAS passing through the 50-foot obstacle height. Once clear of the obstacle, retract the landing gear and accelerate through 90 KIAS while retracting the flaps. Then establish the desired enroute climb configuration and speed.

4.25 CLIMB (4.5i)

4.25a Maximum Continuous Power Climb (4.5i)

The best rate of climb at gross weight and maximum continuous power will be obtained at 110 KIAS. The best angle of climb may be obtained at 81 KIAS. The recommended procedure for climb is to use maximum continuous power with the propeller at full INCREASE and the mixture full RICH. Under some off standard conditions, the manifold pressure indication will exceed its indicated limits at full throttle. Adjust power to remain within limits. The emergency (EMERG) fuel pump should be OFF when reaching a safe altitude. Turn OFF the landing light and use the recognition lights as required.

4.25b Cruise Climb (4.5i)

For reduced enroute fuel consumption in climb and improved forward visibility attain a speed of 125 KIAS, with the manifold pressure to 35 in. Hg, use 2500 rpm, and lean the mixture to produce a fuel flow of 32 gph. The emergency (EMERG) fuel pump should be OFF when reaching a safe altitude. Turn OFF the landing light and use the recognition lights as required.

If oxygen is required, adjust the oxygen mask, turn on the oxygen system and monitor flowmeters and quantity.

NOTE

Do not use oxygen system below 200 psi to prevent contamination and/or moisture from entering depleted cylinder-regulator assembly. If cylinder has been depleted, it must be removed and refurbished in accordance with the manufacturer's recommended procedures.

4.27 CRUISE (4.5j)

WARNING

Operation above 25,000 feet is not approved.

CAUTION

To maintain lateral balance, alternate between right and left fuel tanks. See paragraphs 2.37 and 7.19.

NOTE

Reference Section 5 power setting table and performance charts.

The cruising speed is determined by many factors, including power setting, altitude, temperature, loading, and equipment installed on the airplane. When leveling off at cruise altitude, the pilot may reduce to a cruise power setting in accordance with the Power Setting Table in Section 5 of this manual. The higher RPM setting for the desired power should be used when operating above 20,000 feet. Proper leaning during cruise is essential for smooth engine operation and optimum fuel economy. This is especially important during power reductions, such as level off, to prevent rough engine operation. For cruise, mixture should be leaned to peak TIT. Always use the TIT indication for leaning.

NOTE

Do not exceed 1750°F TIT.

The maximum permissible cylinder head temperature for all operations is 500°F. To obtain maximum service life of engine components, cylinder head temperature should not exceed 435°F during cruise operation. Adjust cylinder head temperatures by reducing power, adjusting the mixture, or any combination of these methods.

Following level-off for cruise, the airplane should be trimmed for level flight.

During flight, keep account of time and fuel used in connection with power settings to determine how the fuel flow and fuel quantity systems are operating.

4.27 CRUISE (4.5j) (continued)

The emergency (EMERG) fuel pump should always be turned ON before switching tanks, and should be left on for a short period thereafter. To preclude making a hasty selection, and to provide continuity of flow, the selector should be changed to another tank before fuel is exhausted from the tank in use.

NOTE

The BOOST PUMP annunciator will momentarily illuminate when switching fuel tanks.

During cruise, use the following procedure to maintain lateral balance, and stay within the fuel imbalance limitations of 2.37:

(a) When starting with a symmetrical fuel load, use the left tank first until 10 gallons are burned, then alternate tanks at approximately one hour intervals.

(b) When starting with an unsymmetrical fuel load, care must be taken not to allow the fuel imbalance to exceed 10 gallons.

The emergency (EMERG) fuel pump should normally be OFF so that any malfunction of the engine driven fuel pump is immediately apparent. Loss of fuel pressure to the fuel injector is indicated by the illumination of the FUEL PRESS annunciator. If signs of fuel starvation should occur at any time during flight, fuel exhaustion should be suspected, at which time the fuel selector should be immediately positioned to the fullest tank and the emergency (EMERG) fuel pump switched to the ON position. If excessive fuel vapor is suspected, usually indicated by fluctuating fuel flow, turn the emergency (EMERG) fuel pump ON until the fuel flow indications are smooth.

The pilot should monitor weather conditions while flying, and be alert for meteorological conditions which might lead to icing. **Even aircraft equipped with a complete deicing option are not approved for flight in heavy icing, heavy snow, freezing rain or freezing drizzle. (See Section 9.)** Immediate steps shall be taken to exit any area where such icing conditions are inadvertently encountered. Saturated air accelerating through the induction system filter can form ice although ambient temperatures are above freezing. If induction system icing is suspected, place the induction air control in the ALTERNATE position. Alternate air should also be selected before entering clouds. Manifold pressure may decrease significantly when alternate air is selected depending on altitude, power setting, and other factors. This loss of manifold pressure can exceed 8 inches of Hg. when selecting alternate air at cruise power settings during icing conditions. If ice is forming on the filter, manifold pressure could continue to deteriorate after selecting alternate air. When manifold pressure stabilizes, attempt to regain cruise power with throttle and or RPM adjustments. The primary filter may retain ice after leaving icing conditions, making the selection of PRIMARY induction air impractical until ice melts or sublimates.

4.27 CRUISE (4.5j) (continued)

There are no mechanical uplocks in the landing gear system. In the event of a hydraulic system malfunction, check valves should prevent the gear from extending. However, some hydraulic system malfunctions may cause the gear to free-fall to the gear down position. The true airspeed with gear down is approximately 70% of the gear retracted airspeed for any given power setting. Allowances for the reduction in airspeed and range should be made when planning extended flight between remote airfields or flight over water.

4.29 DESCENT (4.5k)

4.29a Normal Descent (4.5k)

Use windshield defrost and heat, if installed, and other ice protection equipment, if installed, as required. Set the altimeter and standby altimeter.

The recommended procedure for descent is to leave the engine controls at the cruise settings and increase the airspeed to give the desired rate of descent. Monitor the manifold pressure and adjust to maintain 25 in. Hg. Set the propeller to 2400 rpm and leave the mixture leaned to the cruise setting. This will prevent rapid engine cooling which may damage the engine.

4.29b Reduced Power Descent (4.5k)

Should additional rate of descent be required, power can be reduced to 20 in. Hg. At reduced power maintain at least 1350°F TIT in order to keep engine temperatures from cooling too rapidly. If descending with the gear retracted does not provide the desired rate of descent the gear may be extended at speeds up to 165 KIAS and the aircraft operated at speeds up to 195 KIAS with the gear extended and the autopilot OFF. This procedure will significantly increase rate of descent.

4.31 BEFORE LANDING (4.5m)

4.31a Approach Check (4.5m)

Set the altimeter and standby altimeter.

Seats should be adjusted and locked in position. All seat backs should be erect, all seat belts and harnesses should be fastened and adjusted, and armrests stowed.

The emergency (EMERG) fuel pump should be ON.

The fuel selector should be on the fullest tank. The mixture should be RICH and propeller control should be set. When 165 KIAS or less is attained, lower the landing gear and set the flaps to 10°.

NOTE

During landing gear operation, it is normal for the HYD PUMP annunciator light to illuminate until full system pressure is restored.

Set the rudder trim to neutral in preparation for landing. The air conditioner (if installed) should be OFF to ensure maximum rate of climb in the event of a go-around.

4.31b Landing Check (4.5m)

Verify that all three landing gear indicator lights are green. Pump the toe brakes to ensure that the system is capable of uniform braking during the landing rollout.

WARNING

After pumping several times, if one or both toe brakes are inoperative, DO NOT attempt landing on a short field.

When 116 KIAS or less is attained, lower the flaps to 36°.

Disengage the autopilot.

4.33 LANDING (4.5n)

NOTE

In crosswind conditions, the nosewheel may not be aligned with the runway as the wheel touches down because of opposite rudder input. To prevent swerving in the direction the nosewheel is offset, the rudder must be promptly centered just as the nosewheel touches down.

4.33a Normal Technique (4.5n)

Landings may be made with any flap setting, although normally, full flaps are used. The aircraft should be flown down the final approach course at 80 - 85 KIAS with full flaps extended (95 KIAS with flaps retracted), and power as required to maintain the desired approach angle. When descending through 50 feet, reduce power to idle. Make normal landing, with braking as required, during ground roll.

4.33b Short Field Technique (4.5n)

For landings on short runways, or runways with obstructions near the threshold along final approach, a short field landing technique with full flaps should be used in accordance with the Landing Ground Roll Distance or the Landing Distance Over 50 FT Obstacle charts in Section 5. The airplane should be flown down the final approach at 78 KIAS with flaps fully extended, with power set to produce a normal 3° descent (approximately 400 ft/min) angle. As the obstacle is cleared, reduce the power to idle and adjust airplane attitude to maintain 78 KIAS to the flare point. After touchdown, apply maximum braking.

4.35 GO-AROUND (4.5o)

Go-Around (4.5o)

To initiate a go-around from a landing approach, the mixture should be set to full RICH, the propeller control should be at full INCREASE, and the throttle should be advanced to full power while the pitch attitude is increased to obtain the balked landing climb speed of 80 KIAS. When a positive climb is established, slowly retract the flaps and retract the landing gear. Allow the airplane to accelerate to the best angle of climb speed (81 KIAS) for obstacle clearance or to the best rate of climb speed (110 KIAS) if obstacles are not a factor. Reset the elevator trim as required.

4.37 AFTER LANDING (4.5p)

After Landing (4.5p)

When clear of the active runway, move the induction air control to PRIMARY, retract the flaps, and use the air conditioner as desired. Turn OFF the emergency (EMERG) fuel pump. If ice protection equipment was used during the flight, turn OFF. Select transponder mode as required. Turn ON the fin strobe light and use the landing/taxi lights as required.

4.39 STOPPING ENGINE (4.5q)

Stopping Engine (4.5q)

Prior to shutdown, all radio and electrical equipment and external lights should be turned OFF.

The air conditioner should be turned OFF, the propeller control set in the full INCREASE position, and the throttle should be CLOSED until there is a decided decrease in CHT. Increase throttle to 1000 rpm. Maintain 1000 rpm for approximately 30 seconds to ensure adequate scavenging of turbocharger oil system. Stop the engine by pulling the mixture control back to idle cut-off. After the engine stops, both magneto switches, both alternator switches, the battery master switch, and the standby attitude indicator must be turned OFF.

4.41 MOORING (4.5r)

Mooring (4.5r)

If necessary, the airplane should be moved on the ground with the aid of the nose wheel tow bar.

The parking brake should be set and the aileron and elevator controls should be secured by looping the safety belt through the control wheel and pulling it snug. The flaps should be fully retracted. Wheel chocks should be positioned in place.

Tiedowns can be secured to the wing tiedown rings and to the tail skid. The rudder is held in position by its connections to the nose wheel steering and normally does not have to be secured.

4.43 STALLS

The stall characteristics of the PA-46R-350T are conventional. An approaching stall is indicated by a stall warning horn which is activated between five and ten knots above stall speed. Mild airframe buffeting and pitching may also precede the stall.

The gross weight stalling speed with power off, landing gear extended, and full flaps is 58 KIAS. With the landing gear retracted and flaps up, this speed is increased to 69 KIAS. Loss of altitude during stalls can be as great as 700 feet, depending on configuration and power.

NOTE

The stall warning system is inoperative with the battery and alternator switches OFF.

During preflight, the stall warning system should be checked by turning the battery switch on and pressing the stall warning test switch to determine if the horn is actuated.

4.45 TURBULENT AIR OPERATION

In keeping with good operating practice used in all aircraft, it is recommended that when turbulent air is encountered or expected, the airspeed be reduced to maneuvering speed to reduce the structural loads caused by gusts and to allow for inadvertent speed build-ups which may occur as a result of the turbulence or of distractions caused by the conditions. (Refer to paragraph 2.3 for maneuvering speeds.)

4.49 SUPPLEMENTAL ELECTRIC HEATER

AFTER ENGINE START

BATT MASTR Switch .... ON
Alternator Switches .... OFF
VENT DE-FOG Switch .... ON
Airflow .... CHECK
Voltmeter .... LESS than 25 Vdc (increase electrical load as necessary to lower voltage)
LOW BUS VOLTS Annunciator .... ILLUMINATED
Electrical Switches .... OFF
VENT DE-FOG Switch .... OFF
Alternator Switches .... ON

NOTE

Low voltage monitor system and LOW BUS VOLTS annunciator must be checked operational before heater operation. VENT/DEFOG BLOWER must be checked operational before heater ground operation.

HEATER OPERATION

VENT DE-FOG Switch .... ON
AUXILIARY CABIN HT Switch .... ON

For maximum heat:

AIR COND Switch .... OFF
CABIN TEMP Control. .... FULL OUT
DEFROST Control .... AS REQUIRED to CLEAR WINDSHIELD; then FULL IN

NOTE

This unit should be considered primarily as an auxiliary backup to the standard heating system. There is no external control over the heat produced by the unit.

4.51 NOISE LEVEL

The corrected noise levels of this aircraft are as follows:

Propeller Designation	14 CFR Part 36 Appendix G	ICAO Annex 16 Volume 1, Chapter 10
HC-I3YR-1E/7890B HC-I3YR-1E/7890K	81.3 dB(A) (amdt. 28)	81.3 dB(A) (3rd, amdt.7)
HC-I3Y1R-1N/N7605+2 HC-I3Y1R-1N/N7605K+2	81.0 dB(A) (amdt. 28)	81.0 dB(A) (3rd, amdt.7)

No determination has been made by the Federal Aviation Administration that the noise levels of this airplane are or should be acceptable or unacceptable for operation at, into, or out of any airport.

The above statement notwithstanding, the noise level stated above has been verified by and approved by the Federal Aviation Administration in noise level test flights conducted in accordance with 14 CFR Part 36 - Noise Standards: Aircraft Type and Airworthiness Certification. This aircraft model is in compliance with all 14 CFR Part 36 noise standards applicable to this type.

4.53 ICING INFORMATION

THE FOLLOWING WEATHER CONDITIONS MAY BE CONDUCIVE TO SEVERE IN-FLIGHT ICING

Visible rain at temperatures below 0 degrees Celsius ambient air temperature.

Droplets that splash or splatter on impact at temperature below 0 degrees Celsius ambient air temperature.

PROCEDURES FOR EXITING THE SEVERE ICING ENVIRONMENT

These procedures are applicable to all flight phases from takeoff to landing. Monitor the ambient air temperature. While severe icing may form at temperatures as cold as -18 degrees Celsius, increased vigilance is warranted at temperatures around freezing with visible moisture present. If the visual cues specified in the Limitations Section of the AFM for identifying severe icing conditions are observed, accomplish the following:

- Immediately request priority handling from Air Traffic Control to facilitate a route or an altitude change to exit the severe icing conditions in order to avoid extended exposure to flight conditions more severe than those for which the airplane has been certificated.
- Avoid abrupt and excessive maneuvering that may exacerbate control difficulties.
- Do not engage the autopilot.
- If the autopilot is engaged, hold the control wheel firmly and disengage the autopilot.
- If an unusual roll response or uncommanded roll control movement is observed, reduce the angle-of-attack.
- Do not extend flaps when holding in icing conditions. Operation with flaps extended can result in a reduced wing angle-of-attack, with the possibility of ice forming on the upper surface further aft on the wing than normal, possibly aft of the protected area.
- If the flaps are extended, do not retract them until the airframe is clear of ice.
- Report these weather conditions to Air Traffic Control.

TABLE OF CONTENTS

SECTION 5

PERFORMANCE

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SECTION 5

PERFORMANCE

5.1 GENERAL

All of the required (FAA regulations) and complementary performance information is provided by this section.

Performance information associated with those optional systems and equipment which require handbook supplements is provided by Section 9 (Supplements).

5.2 AIRCRAFT CONFIGURATION

Performance depicted in Section 5 is applicable to aircraft equipped with ice protection system and weather radar pod.

For the effect of ice protection system on performance, refer to Section 9, Supplement 3.

5.3 INTRODUCTION - PERFORMANCE AND FLIGHT PLANNING

The performance information presented in this section is based on measured Flight Test Data corrected to I.C.A.O. standard day conditions and analytically expanded for the various parameters of weight, altitude, temperature, etc.

The performance charts are unfactored and do not make any allowance for varying degrees of pilot proficiency or mechanical deterioration of the aircraft. This performance, however, can be duplicated by following the stated procedures in a properly maintained airplane.

Effects of conditions not considered on the charts must be evaluated by the pilot, such as the effect of soft or grass runway surface on takeoff and landing performance, or the effect of winds aloft on cruise and range performance. Endurance can be grossly affected by improper leaning procedures, and inflight fuel flow and quantity checks are recommended.

REMEMBER! To get chart performance, follow the chart procedures.

5.3 INTRODUCTION - PERFORMANCE AND FLIGHT PLANNING (continued)

The information provided by paragraph 5.5 (Flight Planning Example) outlines a detailed flight plan using performance charts in this section. Each chart includes its own example to show how it is used.

WARNING

Performance information derived by extrapolation beyond the limits shown on the charts should not be used for flight planning purposes.

5.5 FLIGHT PLANNING EXAMPLE

(a) Aircraft Loading

The first step in planning the flight is to calculate the airplane weight and center of gravity by utilizing the information provided by Section 6 (Weight and Balance) of this handbook.

The basic empty weight for the airplane as licensed at the factory has been entered in Figure 6-5. If any alterations to the airplane have been made affecting weight and balance, reference to the aircraft logbook and Weight and Balance Record (Figure 6-7) should be made to determine the current basic empty weight of the airplane.

Make use of the Weight and Balance Loading Form (Figure 6-11) and the C.G. Range and Weight graph (Figure 6-15) to determine the total weight of the airplane and the center of gravity position.

After proper utilization of the information provided, the following weights have been determined for consideration in the flight planning example.

The landing weight cannot be determined until the weight of the fuel to be used has been established (refer to item (g) (1).

(1) Basic Empty Weight	3156.5 lb
(2) Occupants (See Section 6.9)	800.0 lb
(3) Baggage and Cargo	80.0 lb
(4) Fuel (6 lb/gal. x 53.58 gal.)	321.5 lb
(5) Ramp Weight	4358.0 lb
(6) Start, Taxi & Run-up Fuel	-18.0 lb
(7) Takeoff Weight	4340.0 lb
(8) Landing Weight (a)(7) minus (g)(1), (4340.0 lb minus 258.5 lb)	4081.5 lb

The takeoff weight is at or below the maximum allowable weight of 4340 lbs and the weight and balance calculations have determined the C.G. position within the approved limits. The landing weight is at or below the maximum landing weight of 4123 lb.

5.5 FLIGHT PLANNING EXAMPLE (continued)

(b) Takeoff and Landing

Now that the aircraft loading has been determined, all aspects of the takeoff and landing must be considered.

All of the existing conditions at the departure and destination airport must be acquired, evaluated and maintained throughout the flight.

Apply the departure airport conditions and takeoff weight to the appropriate Takeoff Ground Roll and Takeoff Distance (Figures 5-15, 5-17, 5-19 and 5-21) to determine the length of runway necessary for the takeoff and/or obstacle clearance.

The landing distance calculations are performed in the same manner using the existing conditions at the destination airport and, when established, the landing weight.

The conditions and calculations for the example flight are listed below. The takeoff and landing distances required for the flight have fallen well below the available runway lengths.

	Departure Airport	Destination Airport
(1) Pressure Altitude	5000 ft	1000 ft
(2) Temperature	20°C	25°C
(3) Wind Component (Headwind)	10 KTS	10 KTS
(4) Runway Length Available	3400 ft	5000 ft
(5) Takeoff and Landing Distance Required	2647 ft*	1870 ft**

*reference Figure 5-21
**reference Figure 5-45

5.5 FLIGHT PLANNING EXAMPLE (continued)

NOTE

The remainder of the performance charts used in this flight plan example assume a no wind condition. The effect of winds aloft must be considered by the pilot when computing climb, cruise and descent performance.

(c) Climb

The next step in the flight plan is to determine the necessary climb segment components.

The desired cruise pressure altitude and corresponding cruise outside air temperature values are the first variables to be considered in determining the climb components from the Fuel, Time, and Distance to Climb graph (Figure 5-27). After the fuel, time, and distance for the cruise pressure altitude and outside air temperature values have been established, apply the existing conditions at the departure field to graph (Figure 5-27). Now, subtract the values obtained from the graph for the field of departure conditions from those for the cruise pressure altitude.

The remaining values are the true fuel, time, and distance components for the climb segment of the flight plan corrected for field pressure altitude and temperature.

The following values were determined from the above instructions in the flight planning example.

(1) Cruise Pressure Altitude	20000 ft
(2) Cruise OAT	-19° C
(3) Fuel to Climb (13.5 gal. minus 5.7 gal.)	7.8 gal.*
(4) Time to Climb (18.8 min. minus 4.7 min.)	14.1 min.*
(5) Distance to Climb (47.6 nautical miles minus 10.1 nautical miles)	37.5 nautical miles*

*reference Figure 5-27

5.5 FLIGHT PLANNING EXAMPLE (continued)

(d) Descent

The descent data will be determined prior to the cruise data to provide the descent distance for establishing the total cruise distance.

Utilizing the cruise pressure altitude and OAT, determine the basic fuel, time, and distance for descent (Figure 5-39). These figures must be adjusted for the field pressure altitude and temperature at the destination airport. To find the necessary adjustment values, use the existing pressure altitude and temperature conditions at the destination airport as variables to find the fuel, time, and distance values from the graph (Figure 5-39). Now, subtract the values obtained from the field conditions from the values obtained from the cruise conditions to find the true fuel, time and distance values needed for the descent segment of the flight plan.

The values obtained by proper utilization of the graphs for the descent segment of the example are shown below.

(1) Fuel to Descend (8.9 gal. minus 0.5 gal.)	8.4 gal.*
(2) Time to Descend (25.1 min. minus 1.4 min.)	23.7 min.*
(3) Distance to Descend (82.4 nautical miles minus 3.6 nautical miles)	78.8 nautical miles*

(e) Cruise

Using the total distance to be traveled during the flight, subtract the previously calculated distance to climb and distance to descend to establish the total cruise distance. Refer to the appropriate Textron Lycoming Manual and the Cruise Performance Table (refer to page 5-28) when selecting the cruise power setting. The established pressure altitude and temperature values and the selected cruise power should now be used to determine the true airspeed from the Cruise Speed Vs. Altitude graph (Figure 5-33).

*reference Figure 5-39

5.5 FLIGHT PLANNING EXAMPLE (continued)

Calculate the cruise fuel consumption for the cruise power setting from the information provided by the Textron Lycoming Manual and the Cruise Performance Table (refer to page 5-28).

The cruise time is found by dividing the cruise distance by the cruise speed and the cruise fuel is found by multiplying the cruise fuel consumption by the cruise time.

The cruise calculations established for the cruise segment of the flight planning example are as follows:

(1) Total Distance	375 nautical miles
(2) Cruise Distance (e)(1) minus (c)(5) minus (d)(3), (375 nautical miles minus 37.5 nautical miles minus 78.8 nautical miles)	258.7 nautical miles
(3) Cruise Power (lean to peak T.I.T.)	Normal cruise power
(4) Cruise Speed	195 KTS TAS*
(5) Cruise Fuel Consumption	18 gph*
(6) Cruise Time (e)(2) divided by (e)(4), (258.7 nautical miles divided by 195 KTS)	1.33 hrs 79.6 min.
(7) Cruise Fuel (e)(5) multiplied by (e)(6) (18 gph multiplied by 1.33 hrs)	23.88 gal.

*reference Figure 5-33 and Page 5-28

5.5 FLIGHT PLANNING EXAMPLE (continued)

(f) Total Flight Time

The total flight time is determined by adding the time to climb, the time to descend and the cruise time. Remember! The time values taken from the climb and descent graphs are in minutes and must be converted to hours before adding them to the cruise time.

The flight time required for the flight planning example is shown below:

(1) Total Flight Time
(c)(4) plus (d)(2) plus (e)(6),
(0.235 hrs plus 0.395 hrs plus 1.33 hrs)
(14.1 min. plus 23.7 min. plus 79.6 min.) 1.96 hrs/117.4 min.

(g) Total Fuel Required

Determine the total fuel required by adding the fuel for start, taxi, and runup (3.0 gal., calculated by allowing 5 minutes of fuel flow at takeoff power), the fuel to climb, the fuel to descend, and the cruise fuel. When the total fuel (in gallons) is determined, multiply this value by 6 lb/gal. to determine the total fuel weight used for the flight.

The total fuel calculations for the example flight plan are shown below.

(1) Total Fuel Required
Fuel for Start, Taxi, and Runup plus
(c)(3) plus (d)(1) plus (e)(7), (3 gal.
plus 7.8 gal. plus 8.4 gal. plus 23.88 gal.) 43.08 gal
(43.1 gal. multiplied by 6 lb/gal.) 258.5 lb

5.7 PERFORMANCE GRAPHS

LIST OF FIGURES

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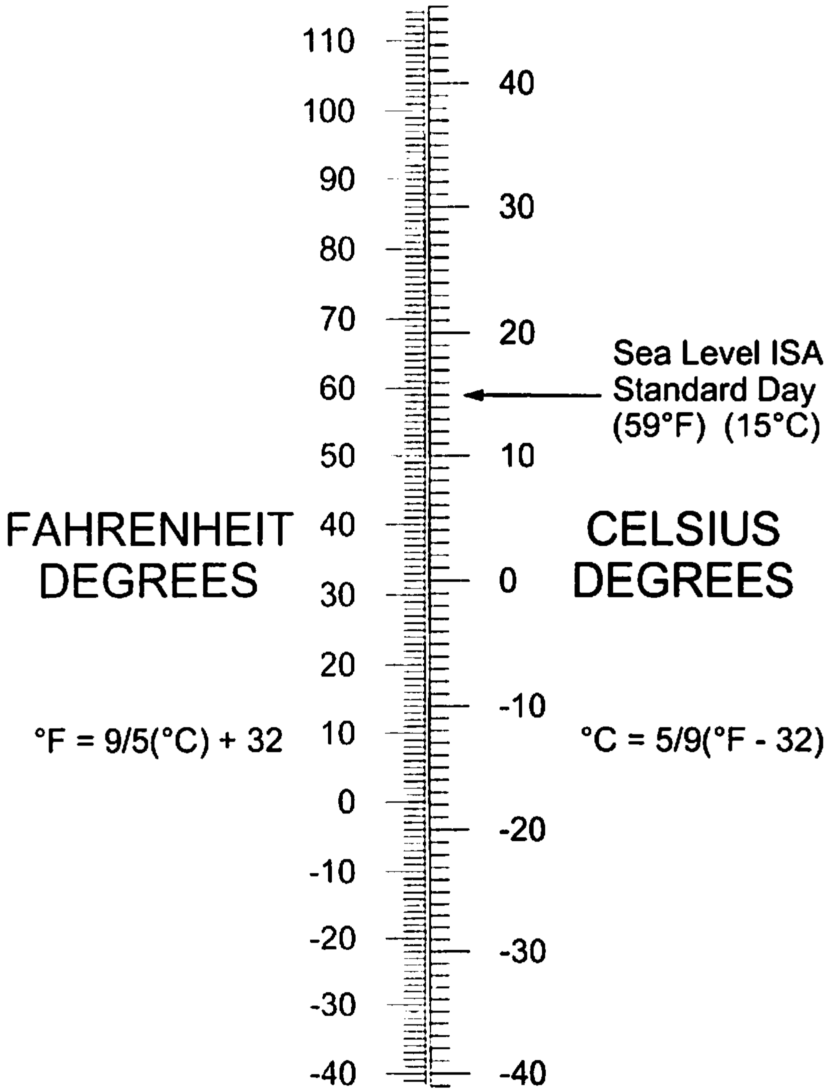
CONVERSION TABLE

MULTIPLY	BY	TO OBTAIN
Feet	0.3048	Meters
Meters	3.2808	Feet
Gallons	3.7854	Liters
Liters	0.2642	Gallons
Pounds	0.4536	Kilograms
Kilograms	2.2046	Pounds
Inches of Mercury	33.8639	Millibars
Millibars	0.02953	Inches of Mercury

Example: 50 feet = 50 x 0.3048 meters = 15.24 meters
100 liters = 100 x 0.2642 gallons = 26.42 gallons

CONVERSION TABLE
Figure 5-1



TEMPERATURE CONVERSION
Figure 5-3

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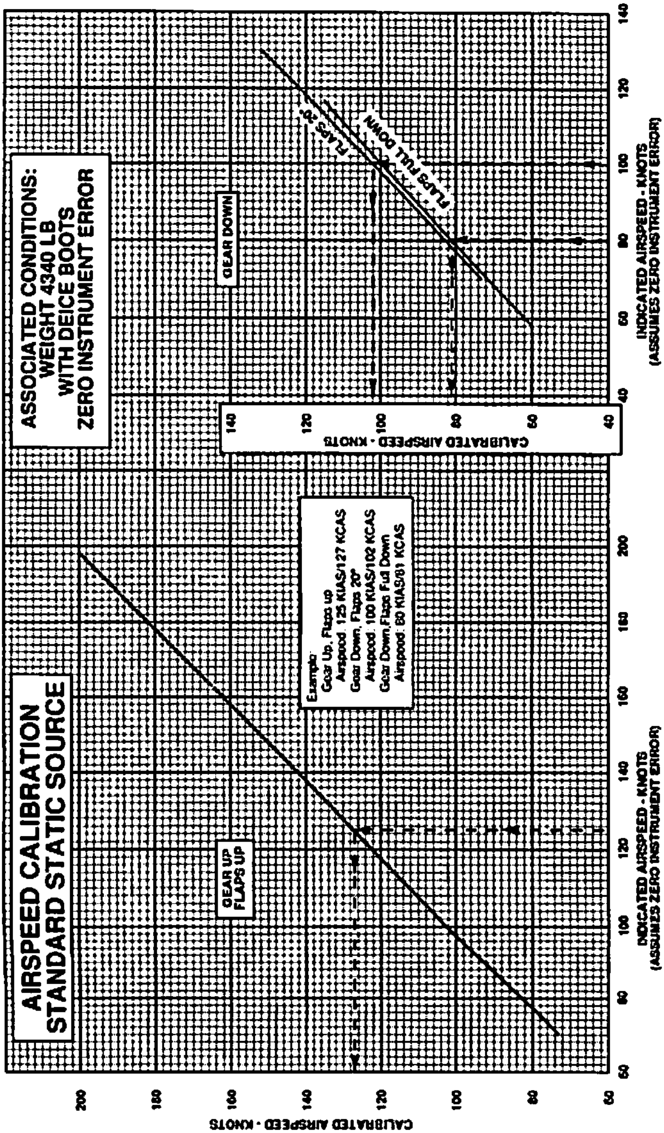
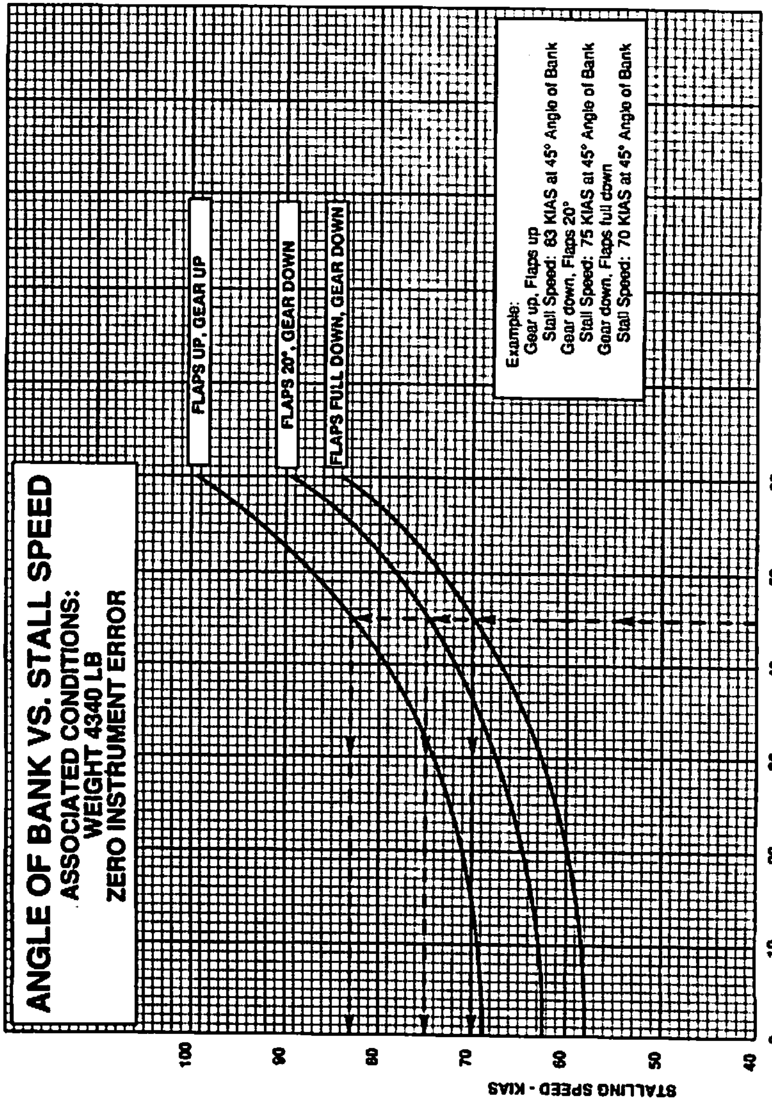
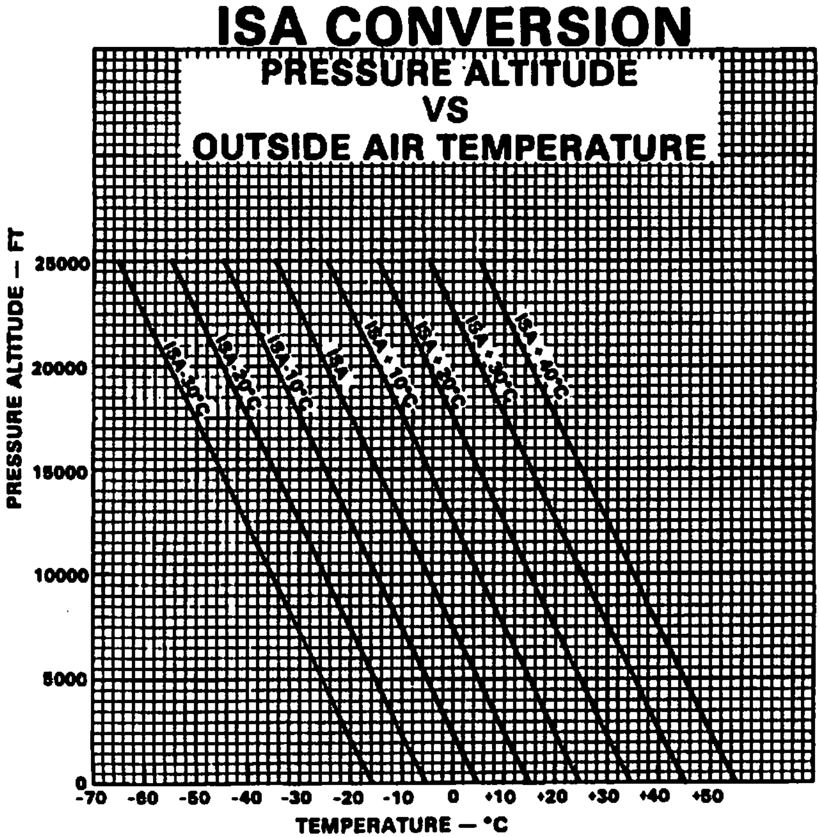


AIRSPEED CALIBRATION

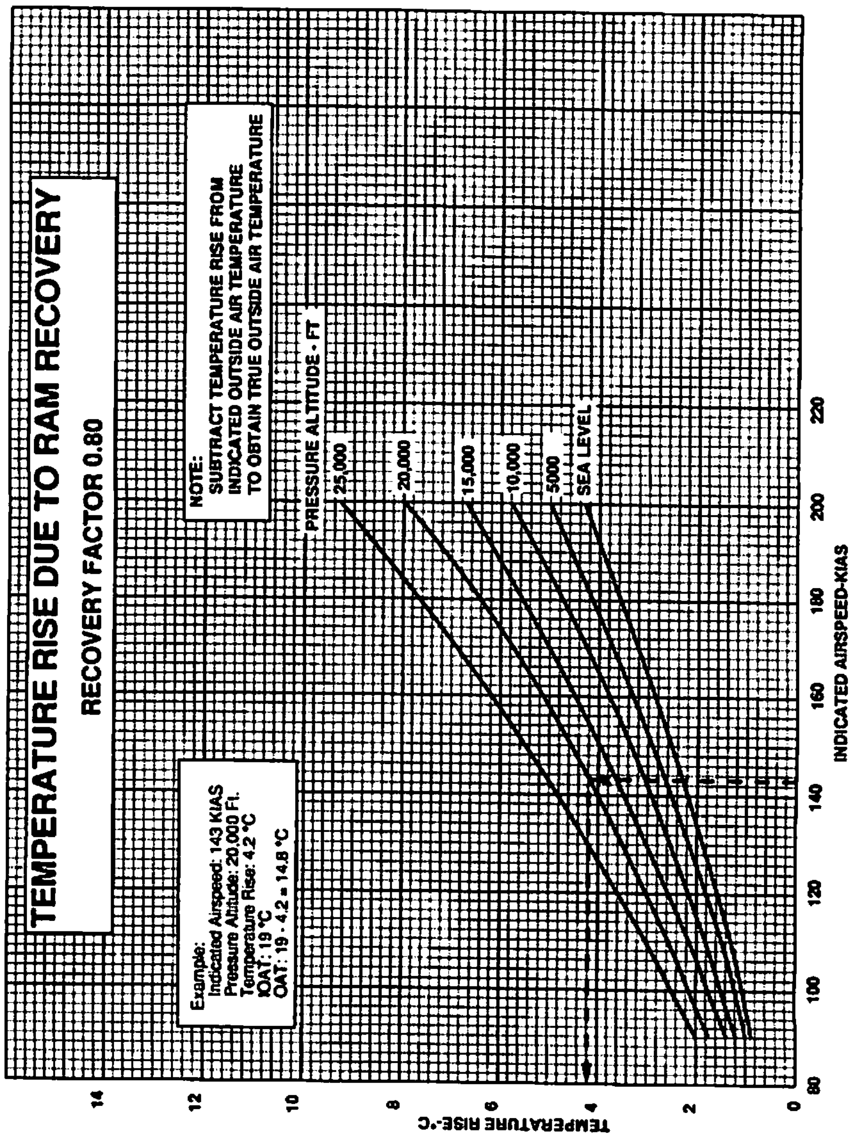
Figure 5-5



ANGLE OF BANK vs. STALL SPEED
Figure 5-7

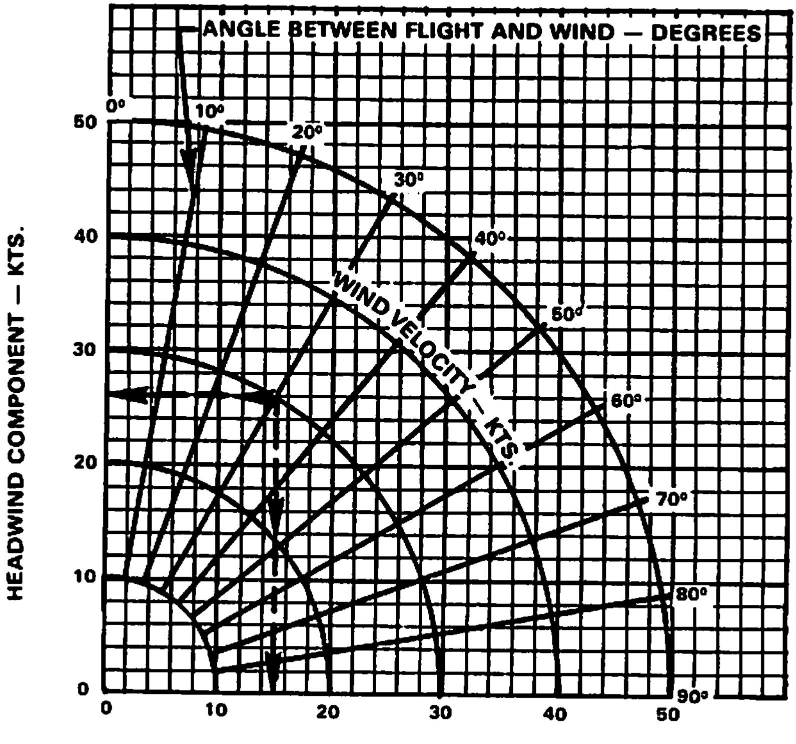


PRESSURE ALTITUDE vs. OUTSIDE AIR TEMPERATURE
Figure 5-9

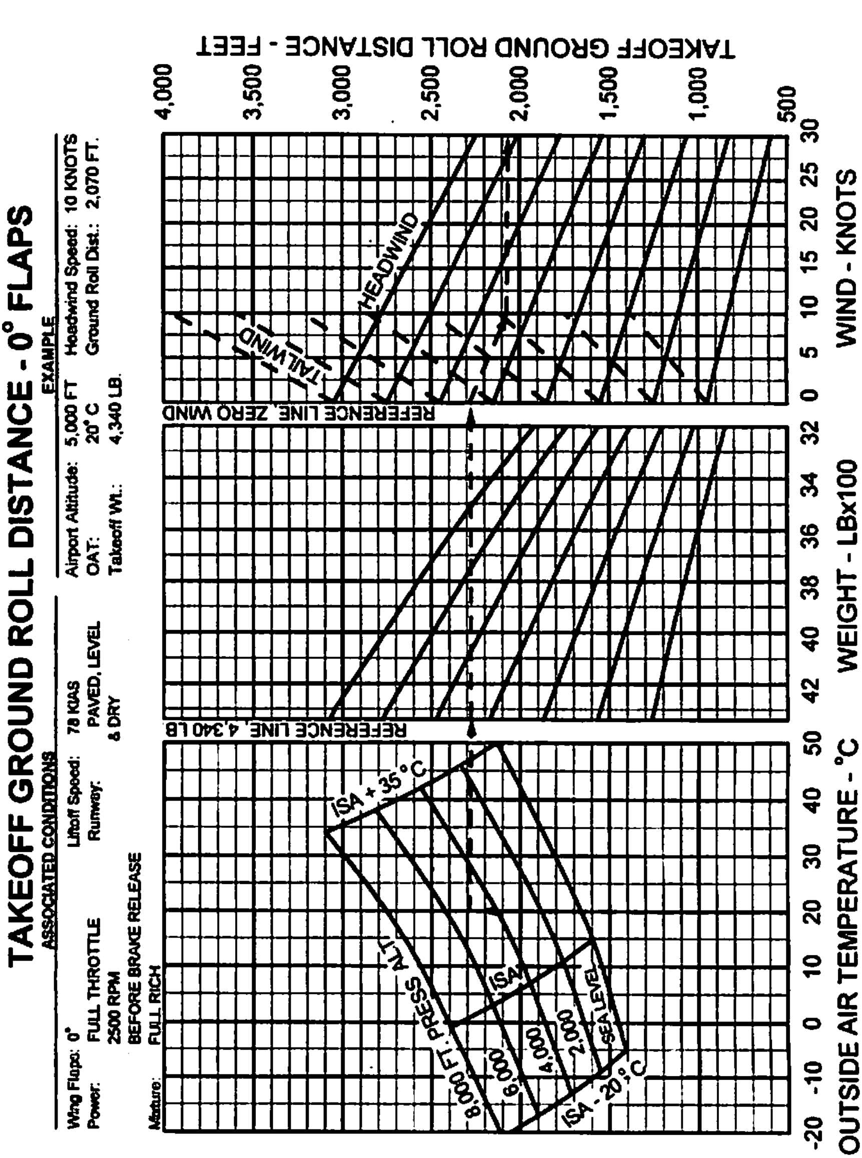


TEMPERATURE RISE DUE TO RAM RECOVERY
Figure 5-11

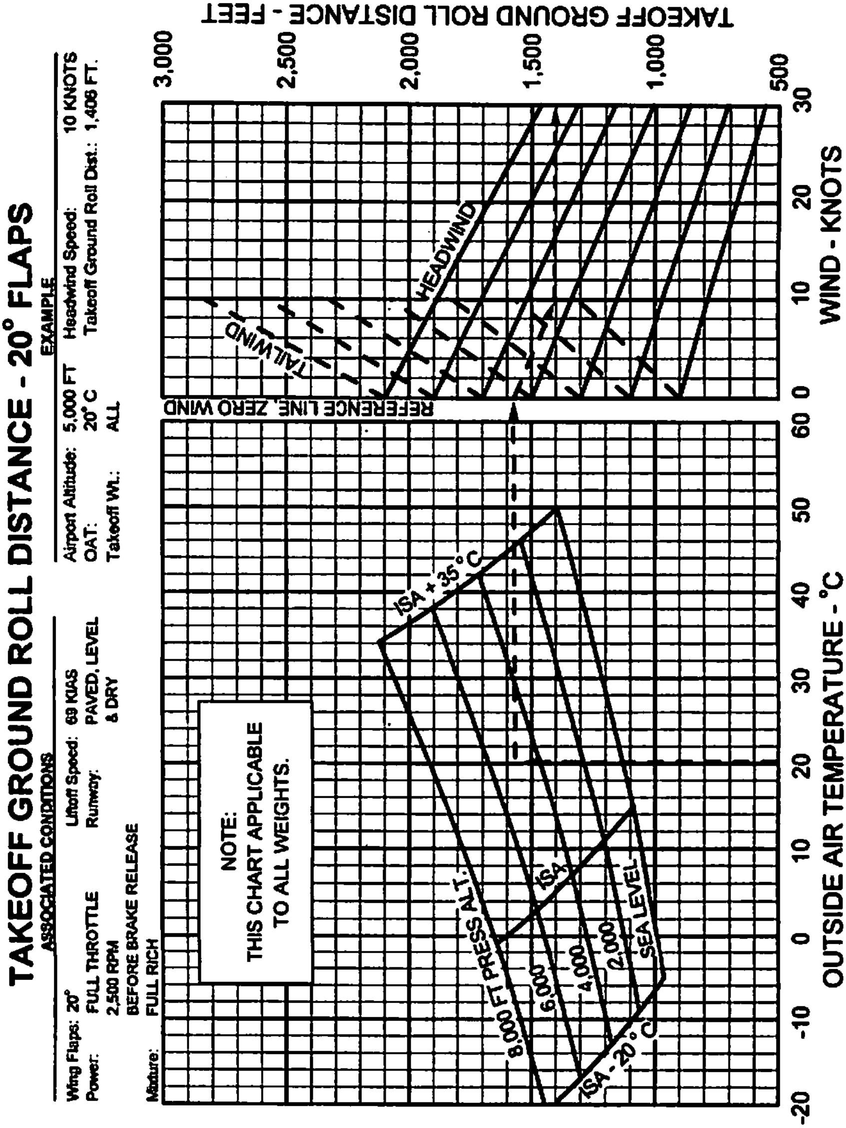
Example:
Wind velocity: 30 knots
Angle between flight path and wind: 30°
Headwind component: 26 knots
Crosswind components: 15 knots



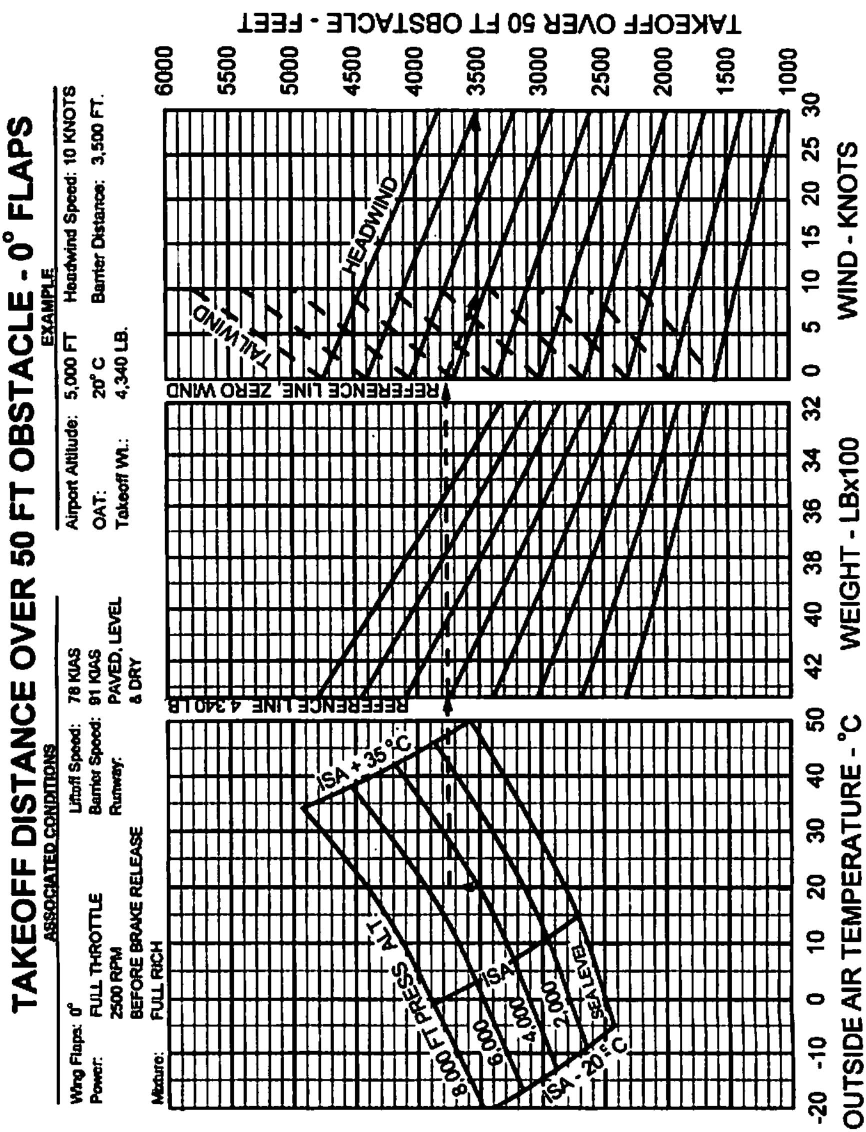
WIND COMPONENTS
Figure 5-13



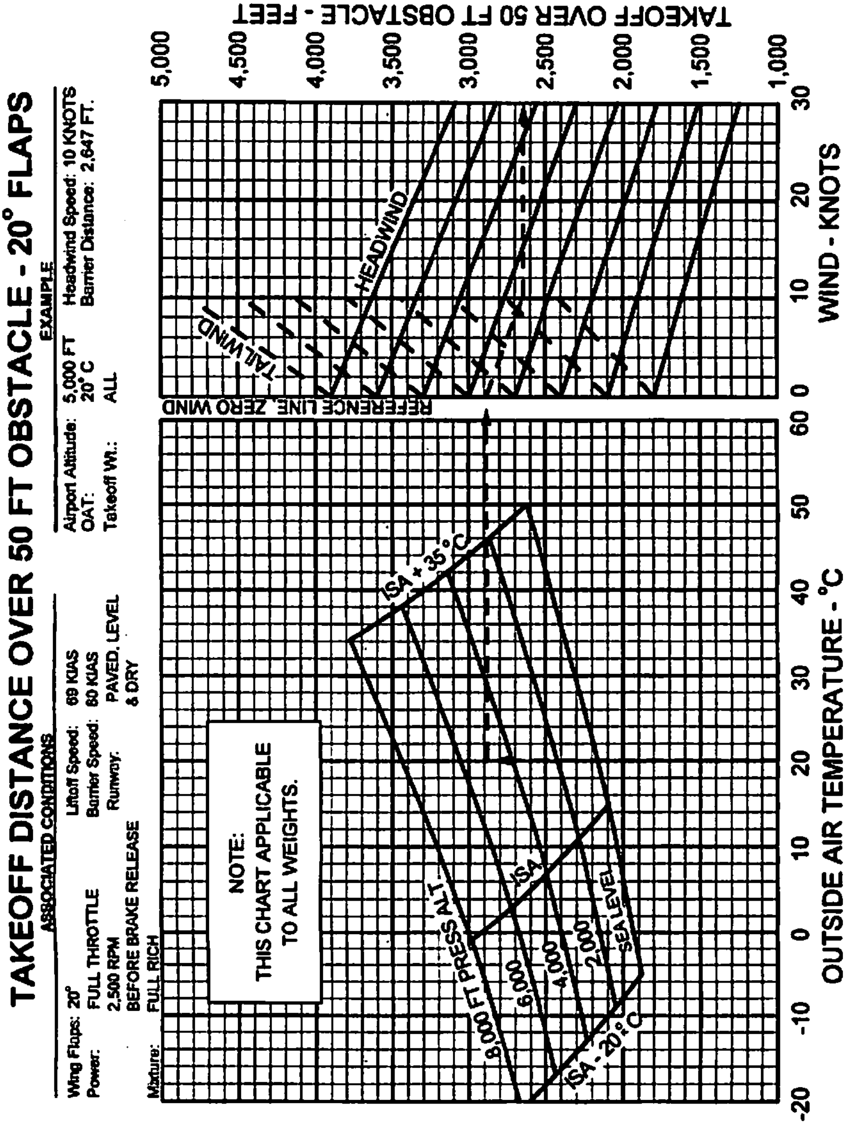
TAKEOFF GROUND ROLL, 0° FLAPS
Figure 5-15



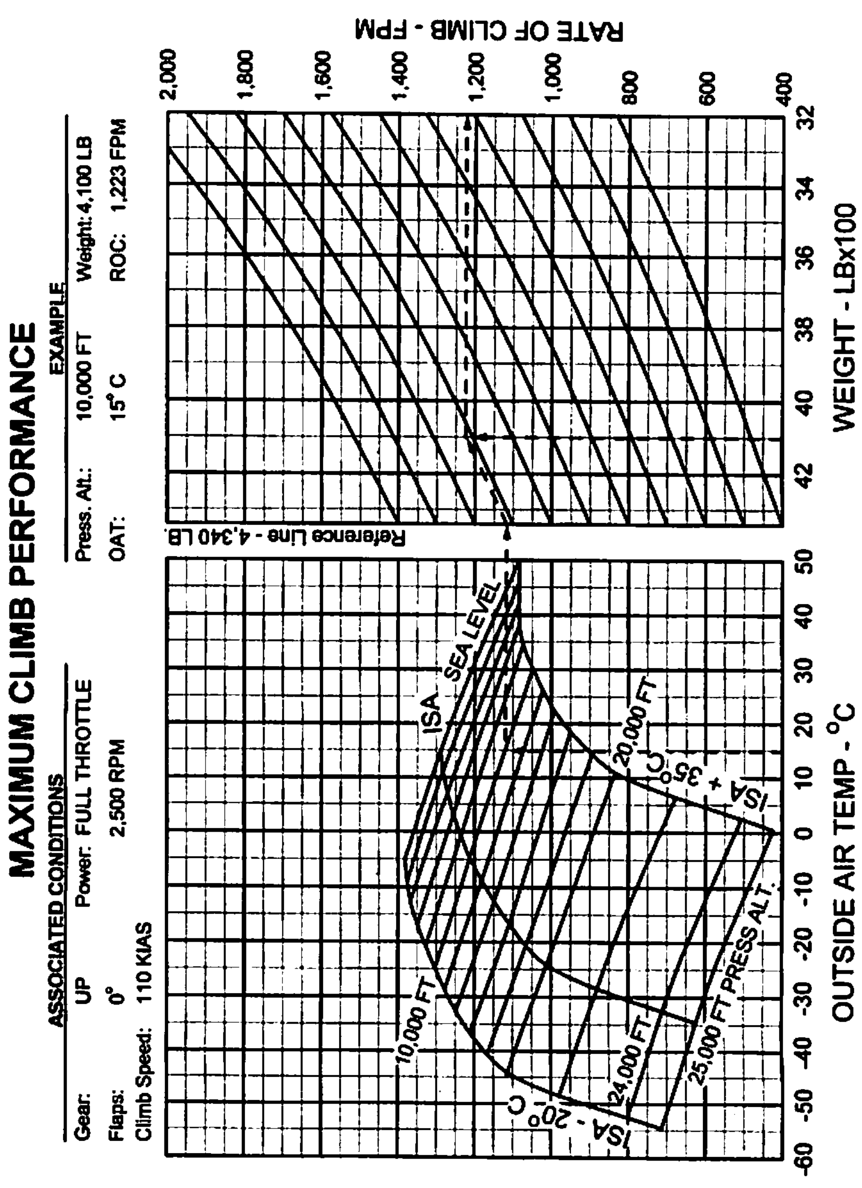
TAKEOFF GROUND ROLL, 20° FLAPS
Figure 5-17



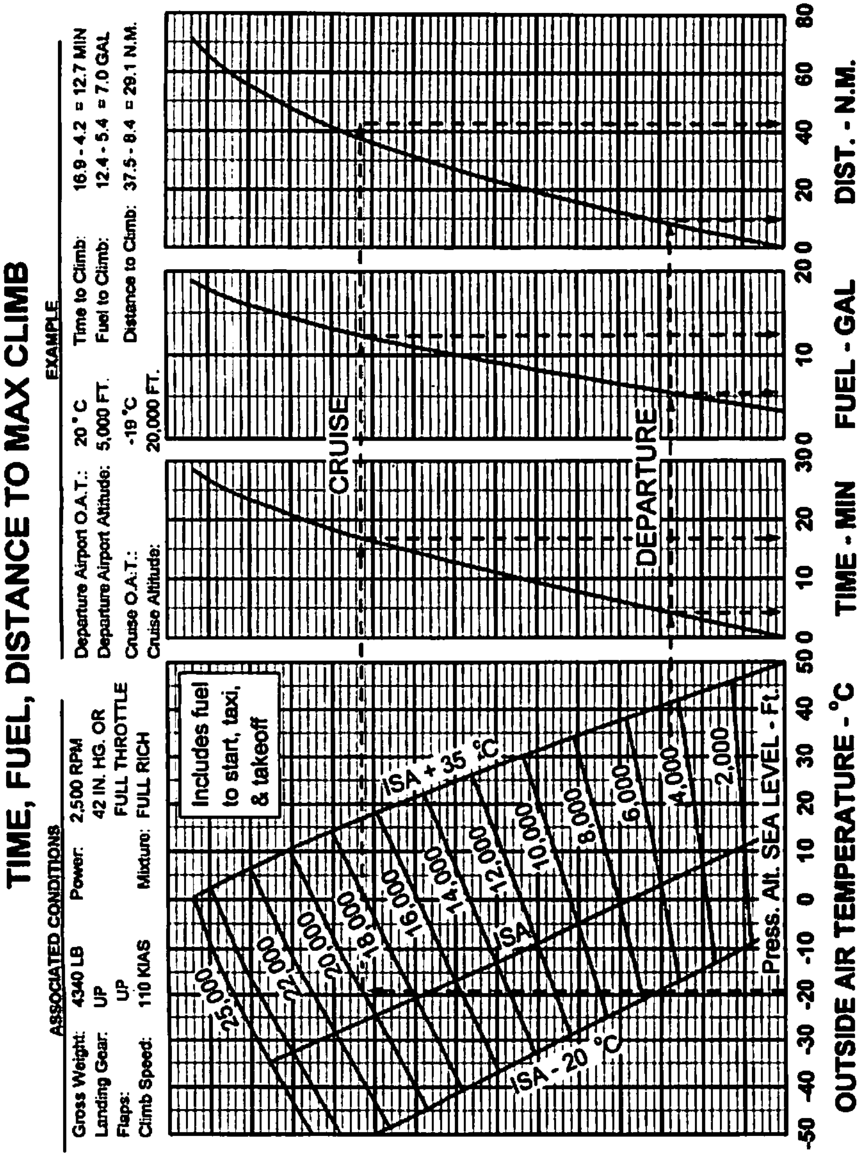
TAKEOFF DISTANCE OVER 50 FT. OBSTACLE, 0° FLAPS
Figure 5-19



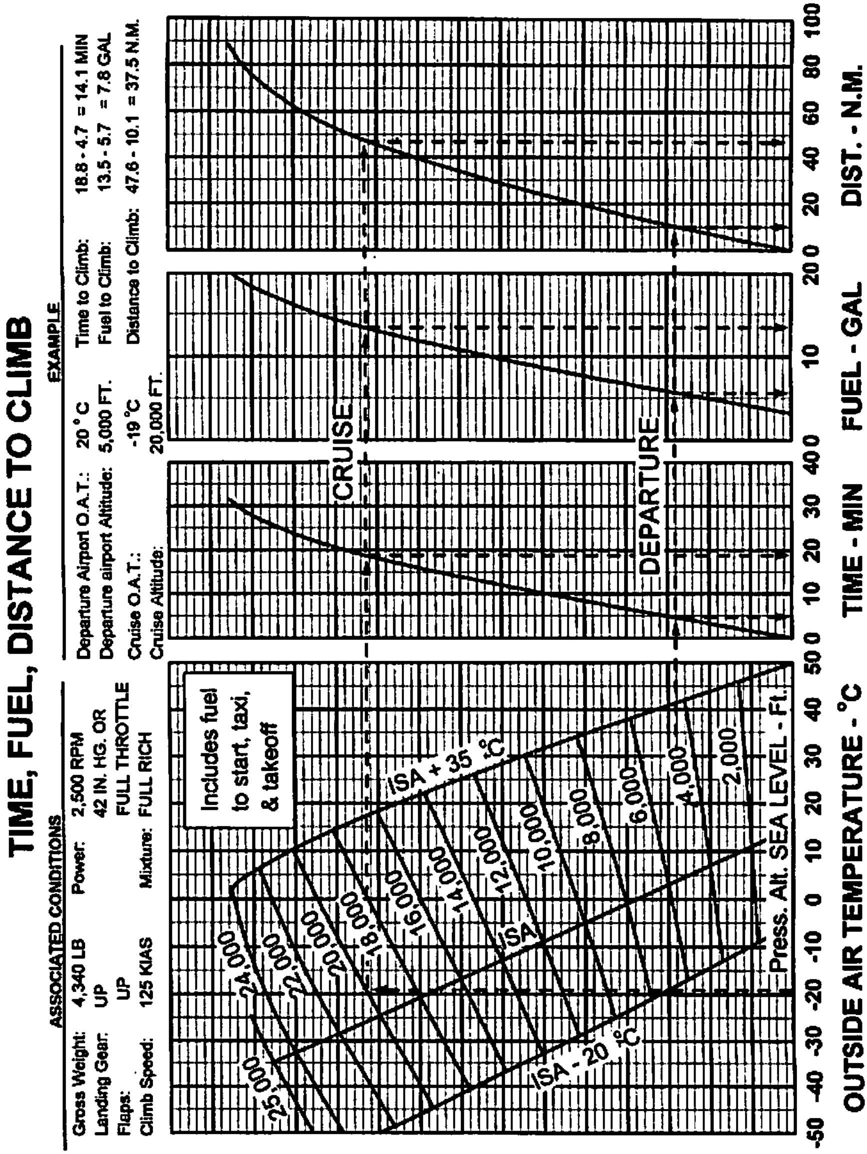
TAKEOFF DISTANCE OVER 50 FT. OBSTACLE, 20° FLAPS
Figure 5-21



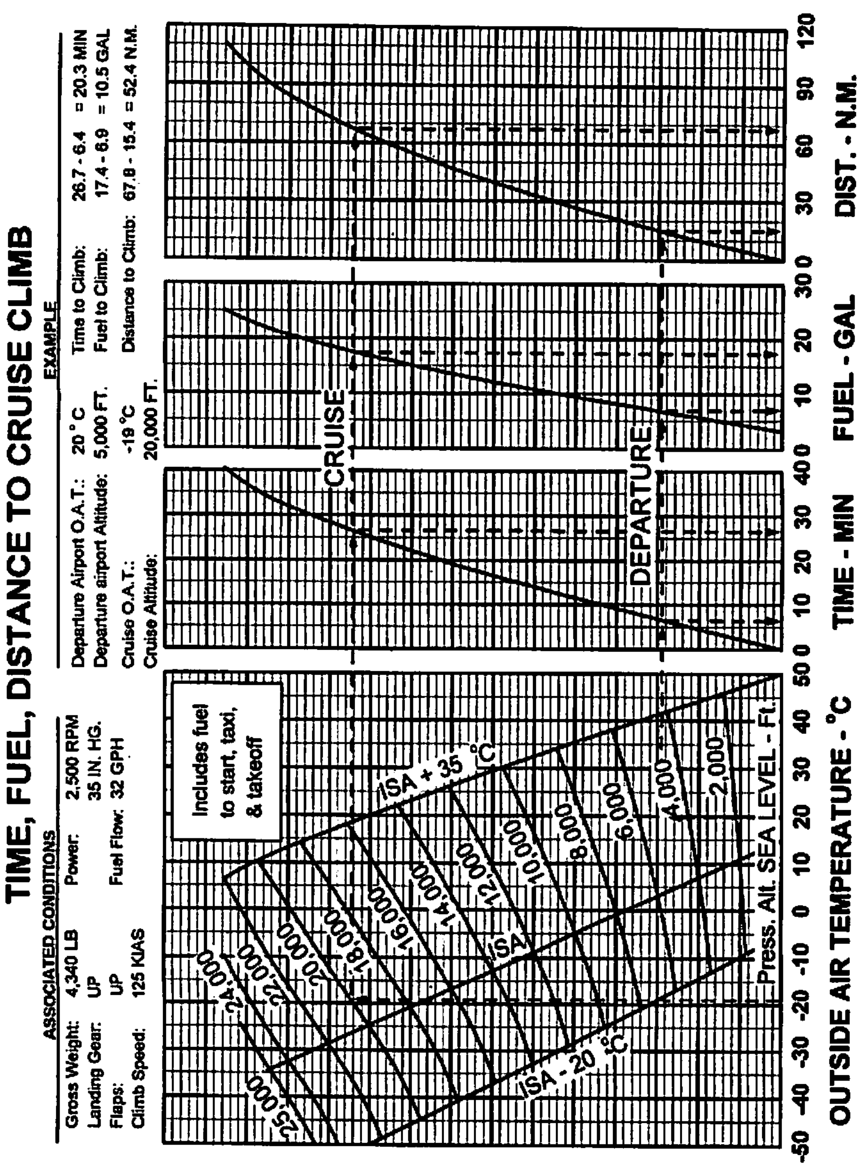
RATE OF CLIMB
Figure 5-23



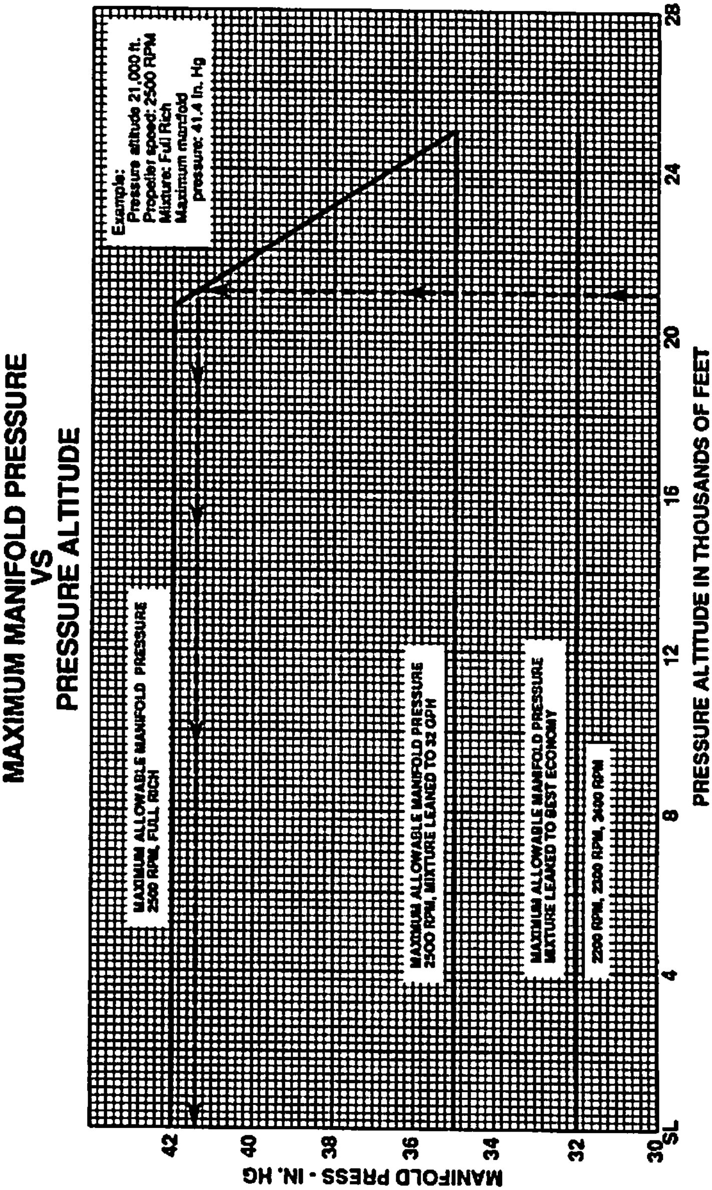
MAXIMUM CONTINUOUS POWER
TIME, FUEL, AND DISTANCE TO CLIMB (110 KIAS)
Figure 5-25



MAXIMUM CONTINUOUS POWER
TIME, FUEL, AND DISTANCE TO CLIMB (125 KIAS)
Figure 5-27



CRUISE CLIMB
TIME, FUEL, AND DISTANCE TO CLIMB
Figure 5-29



MAXIMUM MANIFOLD PRESSURE
vs. PRESSURE ALTITUDE
Figure 5-31

POWER SETTING TABLE
REFERENCE FIG. 5-33

ASSOCIATED CONDITIONS

	RPM	Man. Press.	Approx. Fuel Flow @ 20,000 ft	TIT
High Speed Cruise	2500	32" Hg	20 GPH	Lean to Peak
Normal Cruise	2500 2400	29" Hg 30" Hg	18 GPH	Lean to Peak
Economy Cruise	2400 2200	25" Hg 26" Hg	15 GPH	Lean to Peak
Long Range Cruise	2200	20" Hg	11 GPH	Lean to Peak

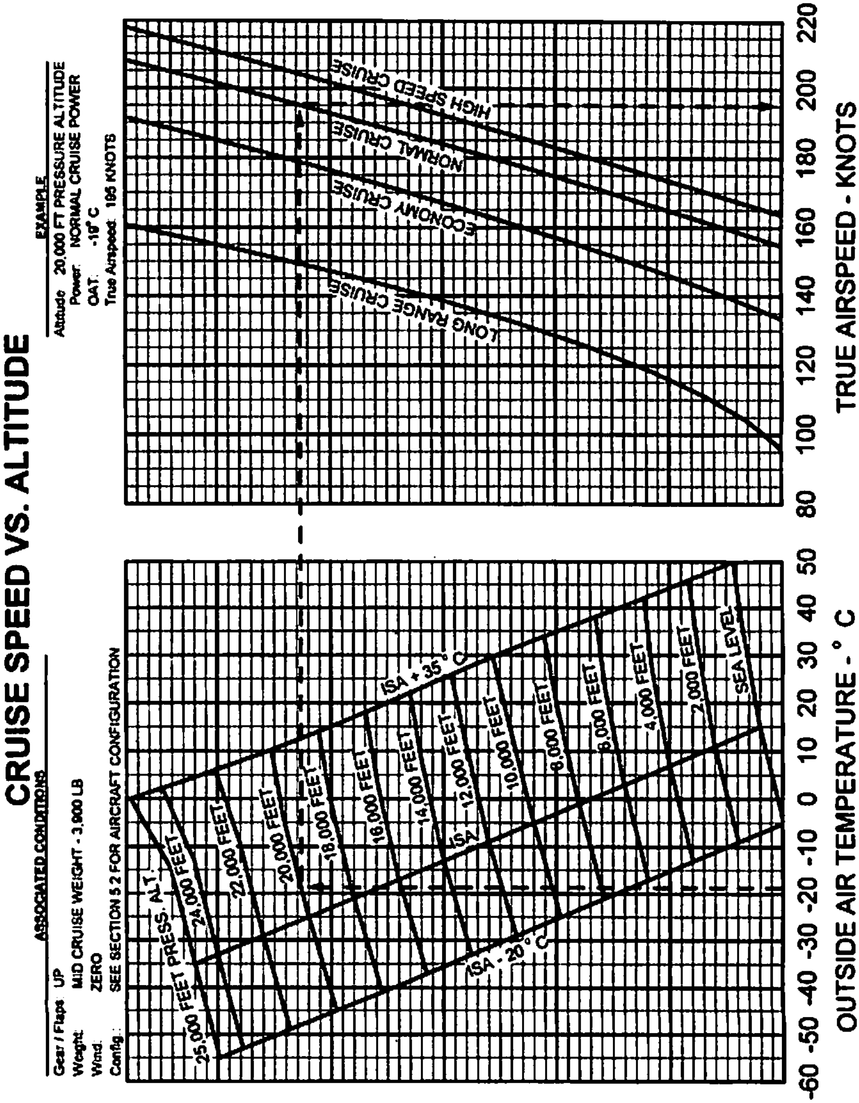
The higher rpm settings should be used at altitudes above 20,000 ft.

The cruise speeds are shown at mid-cruise weight, 3900 pounds. The speed differential for weight is 0.7 knots per 100 pounds, faster at lighter weights and slower at heavier weights.

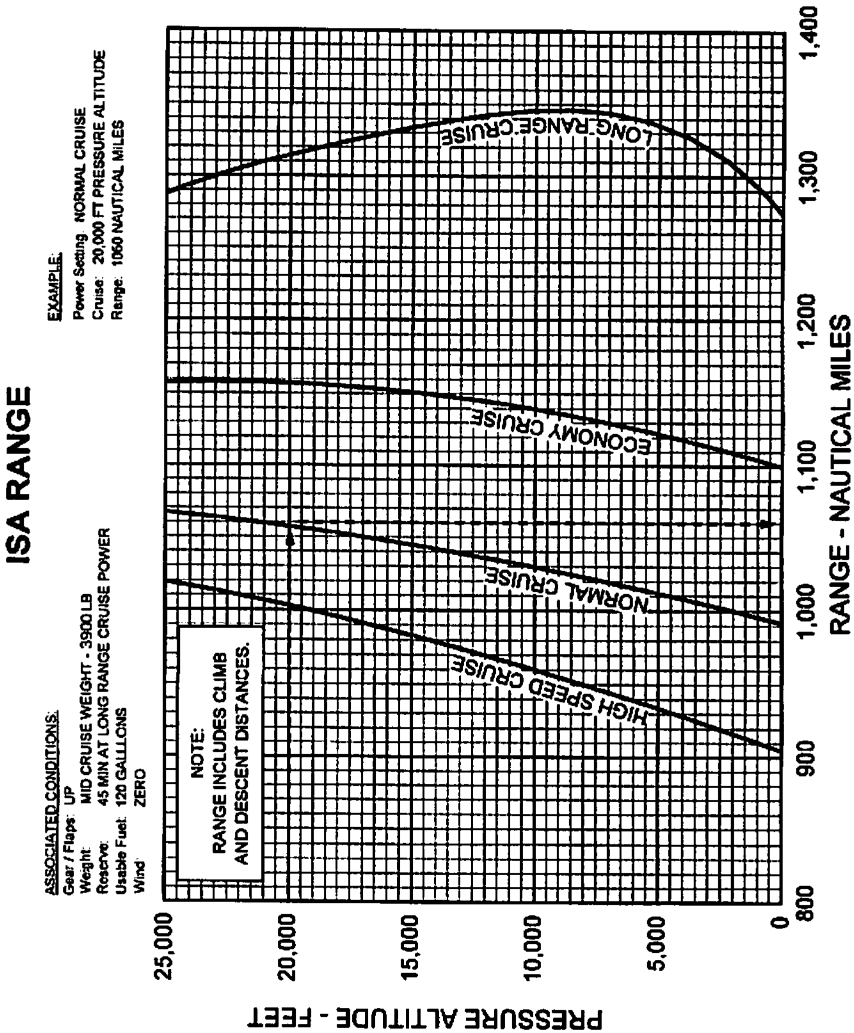
The leaning procedure is to establish peak TIT.

*Example:
Cruise altitude: 20,000 ft
Cruise OAT: -19° C
Cruise power: Normal cruise
Cruise weight: 3900 lb
Cruise fuel flow: 18 gph
Cruise speed: 195 KTAS

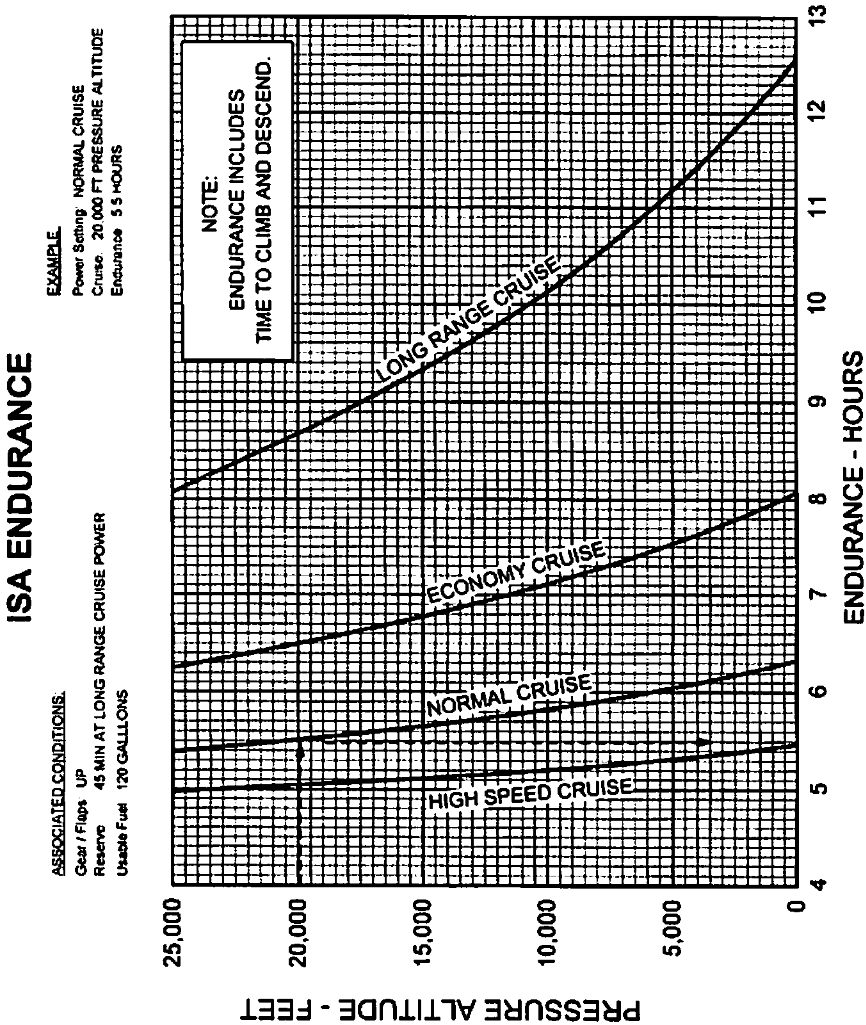
*Reference Figure 5-33



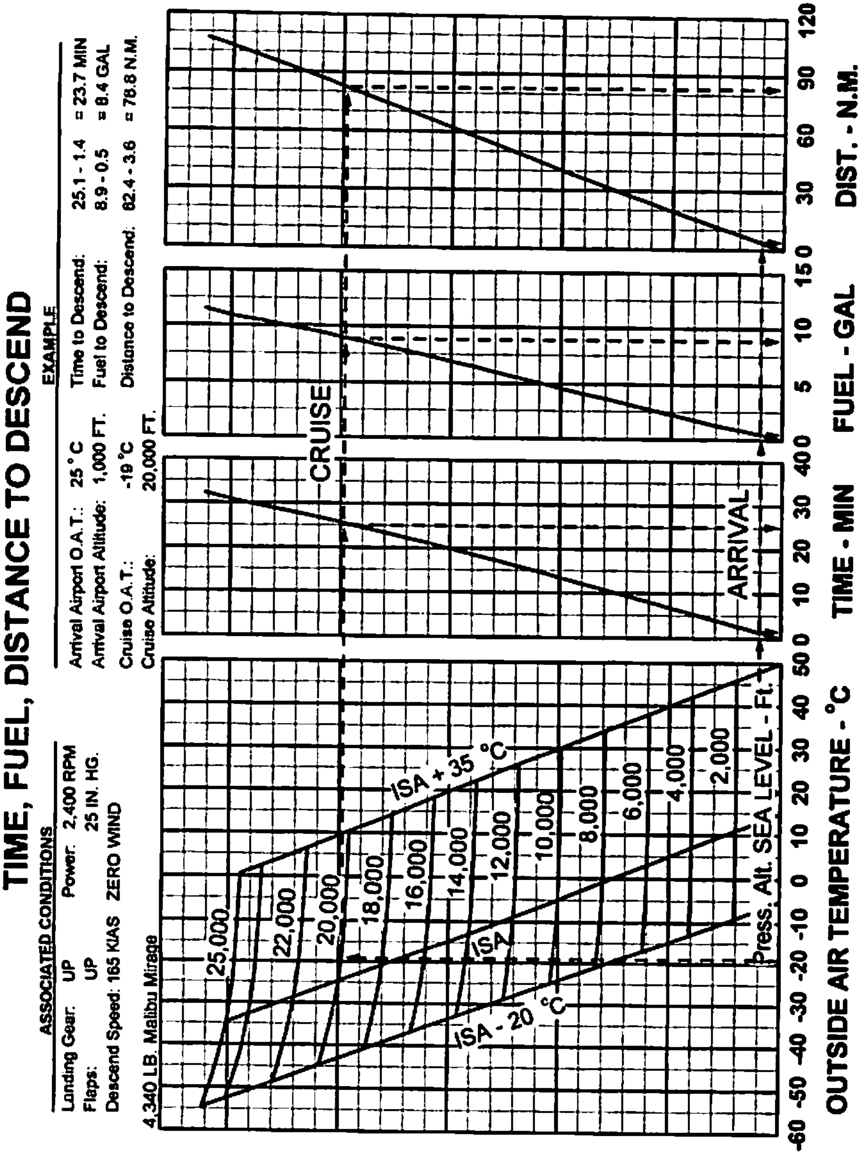
CRUISE SPEED vs. ALTITUDE
Figure 5-33



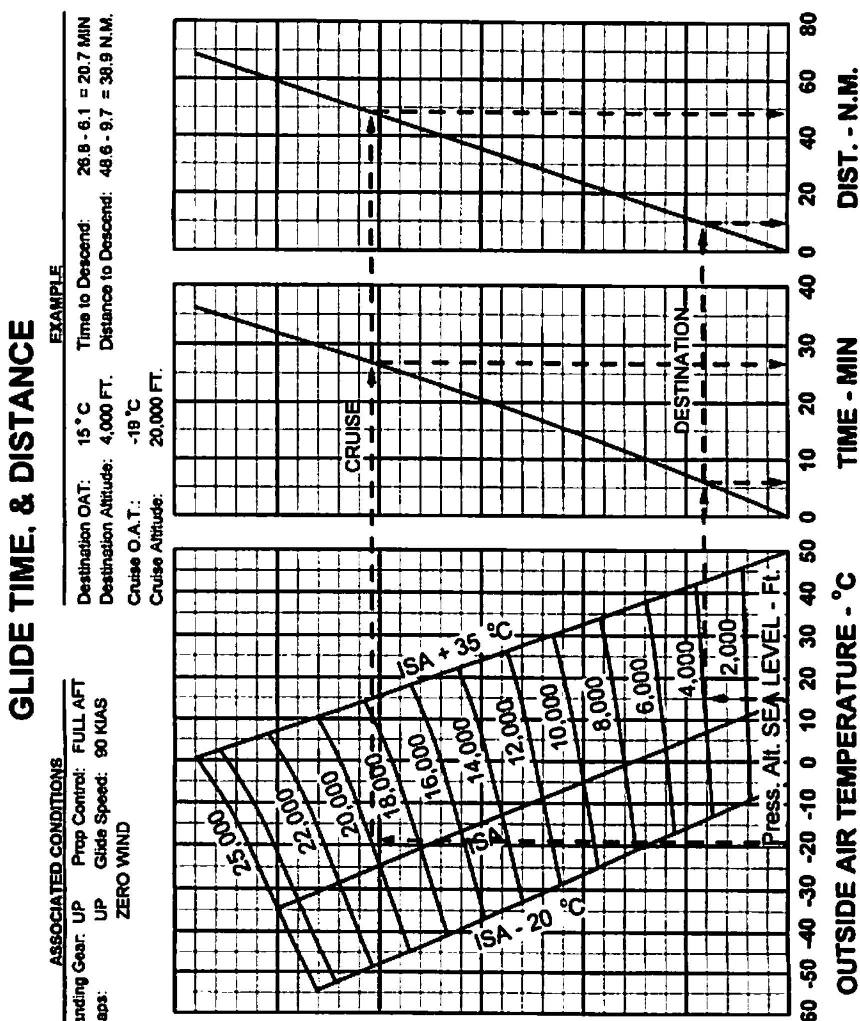
ISA RANGE
Figure 5-35



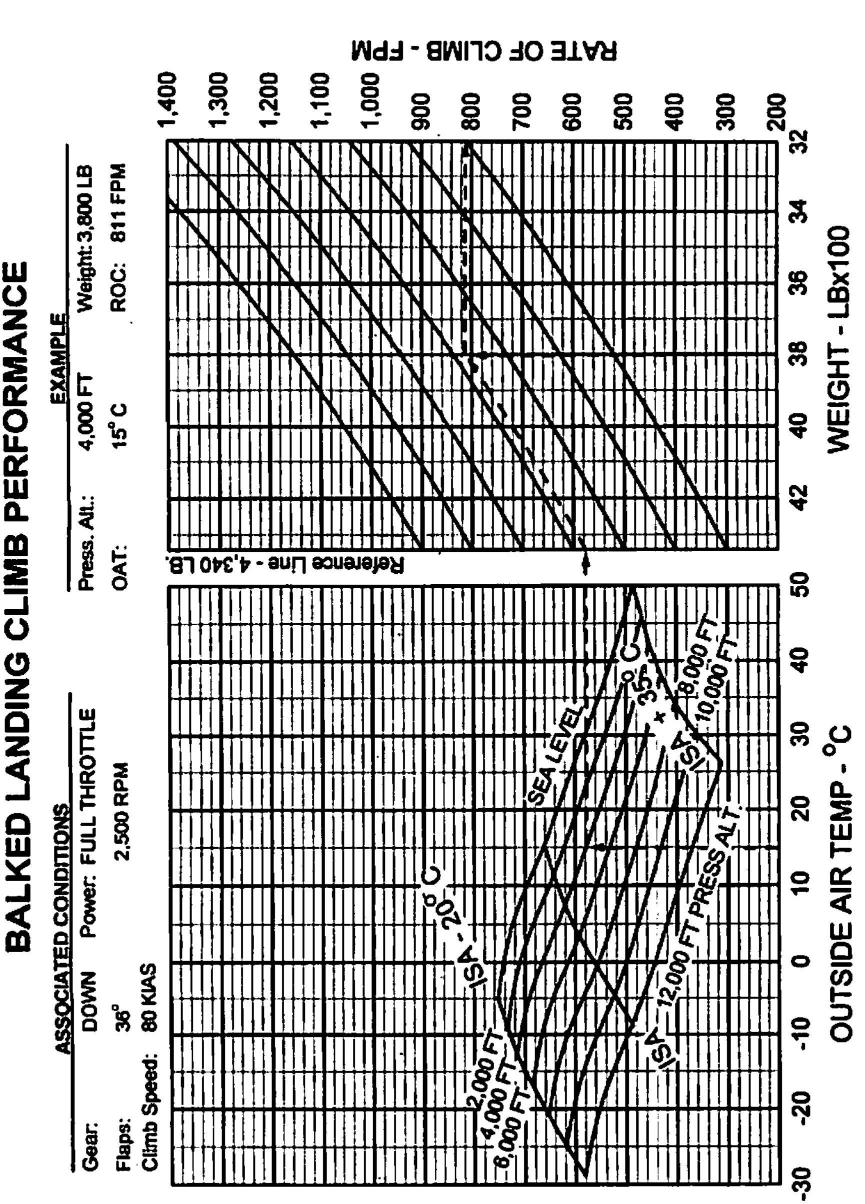
ISA ENDURANCE
Figure 5-37



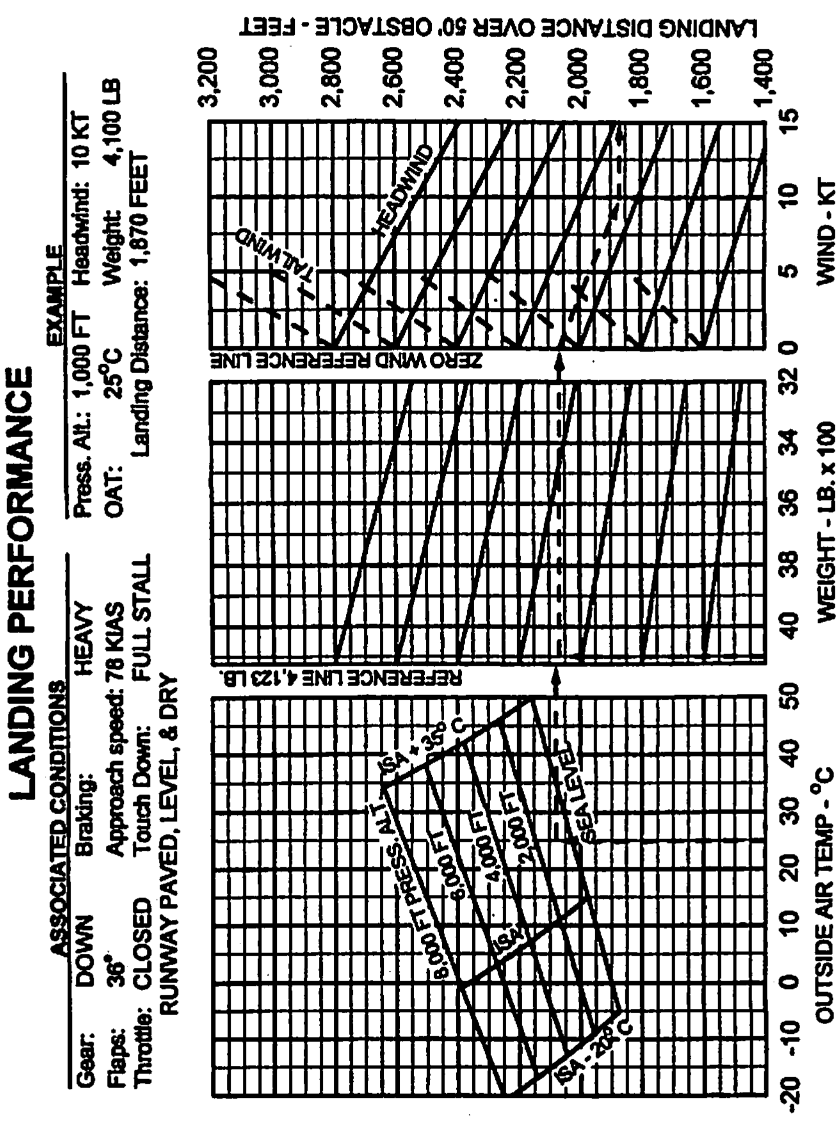
FUEL, TIME, AND DISTANCE TO DESCEND
Figure 5-39



GLIDE TIME AND DISTANCE
Figure 5-41

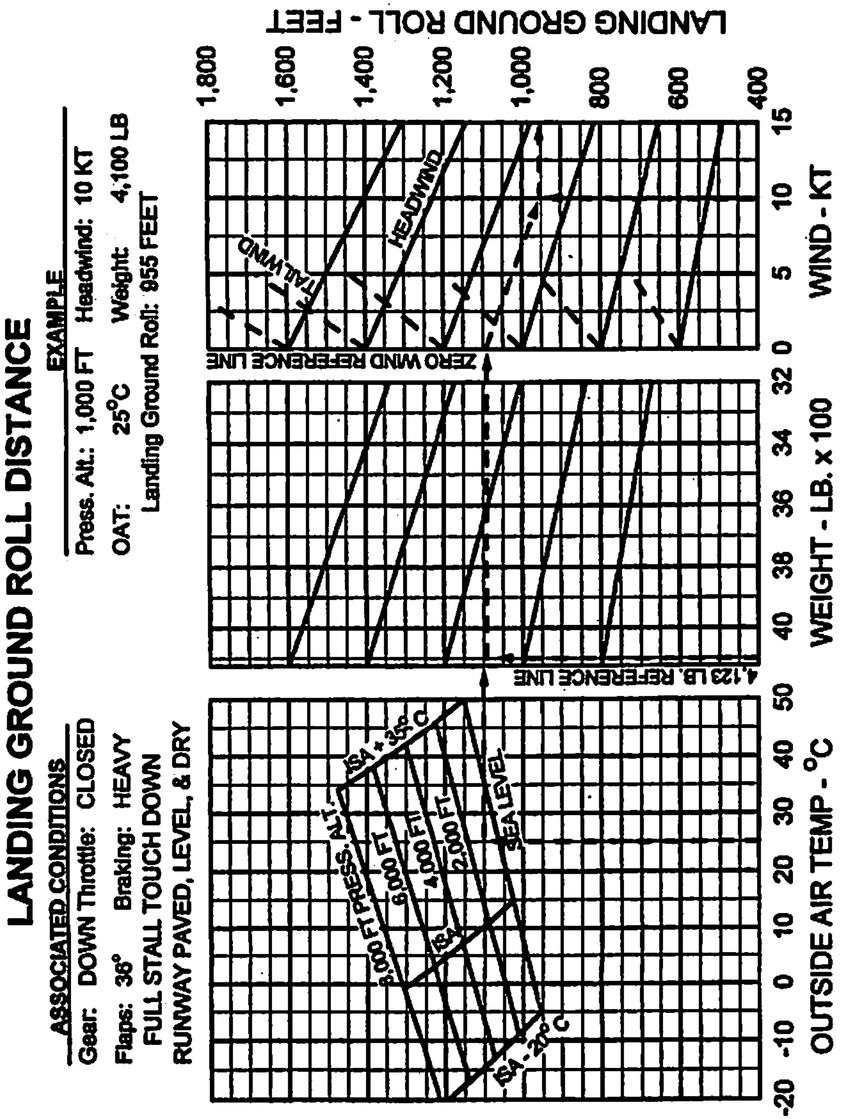


BALKED LANDING CLIMB
Figure 5-43



LANDING DISTANCE OVER 50 FT. OBSTACLE

Figure 5-45



LANDING GROUND ROLL
Figure 5-47

TABLE OF CONTENTS

SECTION 6

WEIGHT AND BALANCE

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SECTION 6

WEIGHT AND BALANCE

6.1 GENERAL

In order to achieve the performance and flying characteristics which are designed into the airplane, it must be flown with the weight and center of gravity (C.G.) position within the approved operating range (envelope). Although the airplane offers flexibility of loading, it cannot be flown with the maximum number of adult passengers, full fuel tanks and maximum baggage. With the flexibility comes responsibility. The pilot must ensure that the airplane is loaded within the loading envelope before he makes a takeoff.

Misloading carries consequences for any aircraft. An overloaded airplane will not take off, climb or cruise as well as a properly loaded one. The heavier the airplane is loaded, the less climb performance it will have.

Center of gravity is a determining factor in flight characteristics. If the C.G. is too far forward in any airplane, it may be difficult to rotate for takeoff or landing. If the C.G. is too far aft, the airplane may rotate prematurely on takeoff or tend to pitch up during climb. Longitudinal stability will be reduced. This can lead to inadvertent stalls and even spins; and spin recovery becomes more difficult as the center of gravity moves aft of the approved limit.

A properly loaded airplane, however, will perform as intended. Before the airplane is licensed, a basic empty weight and C.G. location is computed (basic empty weight consists of the standard empty weight of the airplane plus the optional equipment). Using the basic empty weight and C.G. location, the pilot can determine the weight and C.G. position for the loaded airplane by computing the total weight and moment and then determining whether they are within the approved envelope.

6.1 GENERAL (continued)

The basic empty weight and C.G. location are recorded in the Weight and Balance Data Form (Figure 6-5) and the Weight and Balance Record (Figure 6-7). The current values should always be used. Whenever new equipment is added or any modification work is done, the mechanic responsible for the work is required to compute a new basic empty weight and C.G. position and to write these in the Aircraft Log Book and the Weight and Balance Record. The owner should make sure that it is done.

A weight and balance calculation is necessary in determining how much fuel or baggage can be boarded so as to keep within allowable limits. Check calculations prior to adding fuel to insure against improper loading.

The following pages are forms used in weighing an airplane in production and in computing basic empty weight, C.G. position, and useful load. Note that the useful load includes usable fuel, baggage, cargo and passengers. Following this is the method for computing takeoff weight and C.G.

6.3 AIRPLANE WEIGHING PROCEDURE

At the time of licensing, Piper provides each airplane with the basic empty weight and center of gravity location. This data is supplied by Figure 6-5.

The removal or addition of equipment or airplane modifications can affect the basic empty weight and center of gravity. The following is a weighing procedure to determine this basic empty weight and center of gravity location:

(a) Preparation

(1) Be certain that all items checked in the airplane equipment list are installed in the proper location in the airplane.

(2) Remove excessive dirt, grease, moisture, and foreign items such as rags and tools, from the airplane before weighing.

(3) Defuel airplane. Then open all fuel drains until all remaining fuel is drained. Operate engine on each tank until all undrainable fuel is used and engine stops. Then add the unusable fuel (2 gallons total, 1 gallon each wing).

6.3 AIRPLANE WEIGHING PROCEDURE (continued)

CAUTION

Whenever the fuel system is completely drained and fuel is replenished, it will be necessary to run the engine for a minimum of three minutes at 1000 rpm on each tank to ensure that no air exists in the fuel supply lines.

(4) Fill with oil to full capacity.

(5) Place pilot and copilot seats in fifth (5th) notch, aft of forward position. Put flaps in the fully retracted position and all control surfaces in the neutral position. Tow bar should be in the proper location and all entrance and baggage doors closed.

(6) Weigh the airplane inside a closed building to prevent errors in scale readings due to wind.

(b) Leveling

(1) With the airplane on scales, insert a 3.4-inch spacer on each of the main gear struts and a 3.0-inch spacer on the nose gear strut.

(2) Level airplane (refer to Figure 6-3) deflating (or inflating as required) nose wheel tire, to center bubble on level.

(c) Weighing - Airplane Basic Empty Weight

(1) With the airplane level and brakes released, record the weight shown on each scale. Deduct the tare, if any, from each reading.

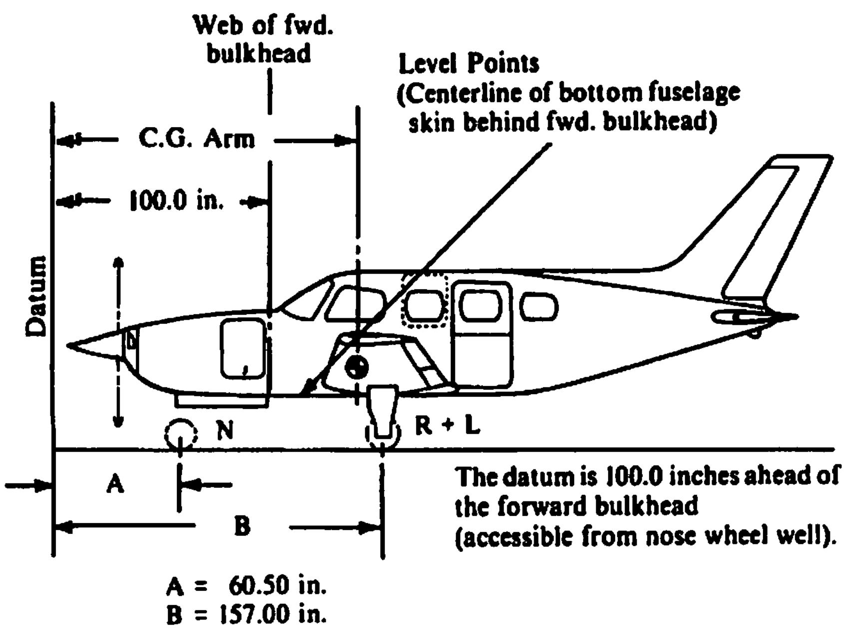
6.3 AIRPLANE WEIGHING PROCEDURE (continued)

Scale Position and Symbol		Scale Reading	Tare	Net Weight
Nose Wheel	(N)			
Right Main Wheel	(R)			
Left Main Wheel	(L)			
Basic Empty Weight, as Weighed	(T)			

WEIGHING FORM
Figure 6-1

(d) Basic Empty Weight Center of Gravity

(1) The following geometry applies to the airplane when it is level. Refer to Leveling paragraph 6.3 (b).



LEVELING DIAGRAM
Figure 6-3

6.3 AIRPLANE WEIGHING PROCEDURE (continued)

(2) The basic empty weight center of gravity (as weighed including optional equipment, full oil and unusable fuel) can be determined by the following formula:

$$\text{C.G. Arm} = \frac{N\,(A) + (R + L)\,(B)}{T} \text{ inches}$$

Where: $T = N + R + L$

6.5 WEIGHT AND BALANCE DATA AND RECORD

The Basic Empty Weight, Center of Gravity Location and Useful Load listed in Figure 6-5 are for the airplane as licensed at the factory. These figures apply only to the specific airplane serial number and registration number shown.

The basic empty weight of the airplane as licensed at the factory has been entered in the Weight and Balance Record (Figure 6-7). This form is provided to present the current status of the airplane basic empty weight and a complete history of previous modifications. Any change to the permanently installed equipment or modification which affects weight or moment must be entered in the Weight and Balance Record.

6.5 WEIGHT AND BALANCE DATA AND RECORD (continued)

MODEL PA-46R-350T

Airplane Serial Number ____________________

Registration Number____________________

Date____________________

AIRPLANE BASIC EMPTY WEIGHT

Item	Weight (Lbs)	x C.G. Arm (Inches Aft of Datum)	= Moment (In-Lbs)
Standard Empty Weight* Actual Computed			
Optional Equipment			
Basic Empty Weight			

*The standard empty weight includes full oil capacity and 2.0 gallons of unusable fuel.

AIRPLANE USEFUL LOAD - NORMAL CATEGORY OPERATION

(Ramp Weight) - (Basic Empty Weight) = Useful Load

(4358 lbs) - (lbs) =   lbs.

THIS BASIC EMPTY WEIGHT, C.G. AND USEFUL LOAD ARE FOR THE AIRPLANE AS LICENSED AT THE FACTORY. REFER TO APPROPRIATE AIRCRAFT RECORD WHEN ALTERATIONS HAVE BEEN MADE.

WEIGHT AND BALANCE DATA FORM
Figure 6-5

PA-46R-350T		Serial Number		Registration Number					Page Number	
Date	Item No.	Description of Article or Modification	Added (+) Removed (-)	Weight Change					Running Basic Empty Weight	
				Wt. (Lb.)	Arm (In.)	Moment /100			Wt. (Lb.)	Moment /100
		As licensed								

WEIGHT AND BALANCE RECORD
Figure 6-7

PA-46R-350T		Serial Number		Registration Number			Page Number	
Date	Item No.	Description of Article or Modification	Added (+) Removed (-)	Weight Change			Running Basic Empty Weight	
				Wt. (Lb.)	Arm (In.)	Moment /100	Wt. (Lb.)	Moment /100

WEIGHT AND BALANCE RECORD
Figure 6-7 (continued)

6.7 GENERAL LOADING RECOMMENDATIONS

For all airplane configurations, it is the responsibility of the pilot in command to make sure that the airplane always remains within the allowable weight vs. center of gravity while in flight.

The following general loading recommendation is intended only as a guide. The charts, graphs, and instructions should be checked to assure that the airplane is within the allowable weight vs. center of gravity envelope.

(a) Pilot Only
Load rear baggage compartment first. Investigation is required to determine the amount of forward baggage and fuel.

(b) 2 Occupants - Pilot and Passenger in Front
Load rear baggage compartment first. Fuel load may be limited by forward envelope.

(c) 3 Occupants - 2 in front, 1 in rear
Fuel and baggage in nose may be limited by forward envelope.

(d) 4 Occupants - 2 in front, 2 in rear
Investigation is required to determine optimum fuel and baggage load.

(e) 5 Occupants - 2 in front, 1 in middle, 2 in rear
Investigation is required to determine optimum fuel and baggage load. (Note: Placard if installed.)

(f) 6 Occupants - 2 in front, 2 in middle, 2 in rear
With six occupants, aft passengers weight, fuel and baggage may be limited by envelope. Investigation is required to determine optimum fuel and baggage load. (Note: Placard if installed.)

NOTE

With takeoff loadings falling near the aft limit, it is important to check anticipated landing loadings since fuel burn could result in a final loading outside of the approved envelope.

NOTE

For all airplane configurations, it is the responsibility of the pilot in command to make sure that the airplane always remains within the allowable weight vs. center of gravity envelope while in flight.

Always load the fuel equally between the right and left tanks.

6.9 WEIGHT AND BALANCE DETERMINATION FOR FLIGHT

(a) Add the weight of all items to be loaded, except fuel, to the basic empty weight to determine zero fuel weight.

(b) Use the Loading Graph (Figure 6-13) to determine the moment of all items to be carried in the airplane.

(c) Add the moment of all items to be loaded to the basic empty weight moment.

(d) Divide the total moment by the total weight to determine the zero fuel weight C.G. location.

(e) By using the figures of item (a) and item (d) (above), locate a point on the C.G. range and weight graph (Figure 6-15). If the point falls within the C.G. envelope, the loading meets the weight and balance requirements.

(f) Add the weight of the fuel to be loaded to the total weight calculated for item (a) to determine ramp weight.

(g) Use the loading graph (Figure 6-13) to determine the moment of the fuel to be loaded and add to the total moment determined for item (c).

(h) Subtract the weight and moment of the fuel allowance for engine start, taxi, and runup.

(i) Divide the total moment by the total weight to determine takeoff C.G.

(j) Locate the takeoff weight center of gravity on the C.G. Range and Weight Graph (Figure 6-15). If the point falls within the C.G. envelope, the loading meets the weight and balance requirements.

(k) Subtract the Estimated Fuel Burnoff from the Takeoff Weight to determine the Landing Weight C.G.

(l) Locate the landing weight center of gravity on the C.G. Range and Weight Graph (Figure 6-15). If the point falls within the C.G. envelope, the loading meets the weight and balance requirements.

6.9 WEIGHT AND BALANCE DETERMINATION FOR FLIGHT (continued)

	Weight (Lb)	Arm Aft of Datum (Inches)	Moment (In.-Lb)
Basic Empty Weight	3156.5	135.33	427169
Pilot and Front Passenger	320	135.50	43360
Passengers (Center Seats)	340	177.00	60180
Passengers (Rear Seats)	140	218.75	30625
Baggage (Forward) (100 Lb Limit)	0	88.60	0
Baggage (Aft) (100 Lb Limit)	80	248.23	19858
Zero Fuel Weight (4123 Lb Max.)	4036.5	143.98	581193
Fuel (120 Gal./720 Lb Max. Usable)	321.5	150.31	48328
Ramp Weight (4358 Lb Max.)	4358	144.45	629520
Fuel Allowance for Engine Start, Taxi, & Runup (3 Gal./18 Lb Max.)	-18	150.31	-2706
Takeoff Weight (4340 Lb Max.)	4340	144.43	626815

The center of gravity (C.G.) for the takeoff weight of this sample loading problem is at 144.43 inches aft of the datum line. Locate this point (144.43) on the C.G. range and weight graph (Figure 6-15). Since this point falls within the weight - C.G. envelope, this loading meets the weight and balance requirements.

Takeoff Weight	4340	144.43	626815
Minus Estimated Fuel Burn-off (climb & cruise) @ 6.0 Lb/Gal.	-258.50	150.31	-38855
Landing Weight	4081.50	144.05	587960

Locate the center of gravity of the landing weight on the C.G. range and weight graph (Figure 6-15). Since this point falls within the weight - C.G. envelope, the loading is acceptable for landing.

IT IS THE SOLE RESPONSIBILITY OF THE PILOT IN COMMAND TO ENSURE THAT THE AIRPLANE IS LOADED PROPERLY AT ALL TIMES.

SAMPLE LOADING PROBLEM
(NORMAL CATEGORY)
Figure 6-9

6.9 WEIGHT AND BALANCE DETERMINATION FOR FLIGHT (continued)

	Weight (Lb)	Arm Aft of Datum (Inches)	Moment (In.-Lb)
Basic Empty Weight			
Pilot and Front Passenger		135.50	
Passengers (Center Seats)		177.00	
Passengers (Rear Seats)		218.75	
Baggage (Forward) (100 Lb Limit)		88.60	
Baggage (Aft) (100 Lb Limit)		248.23	
Zero Fuel Weight (4123 Lb Max.)			
Fuel (120 Gal./720 Lb Max. Usable)		150.31	
Ramp Weight (4358 Lb Max.)			
Fuel Allowance for Engine Start, Taxi, & Runup (3 Gal./18 Lb Max.)	-18	150.31	-2706
Takeoff Weight (4340 Lb Max.)			

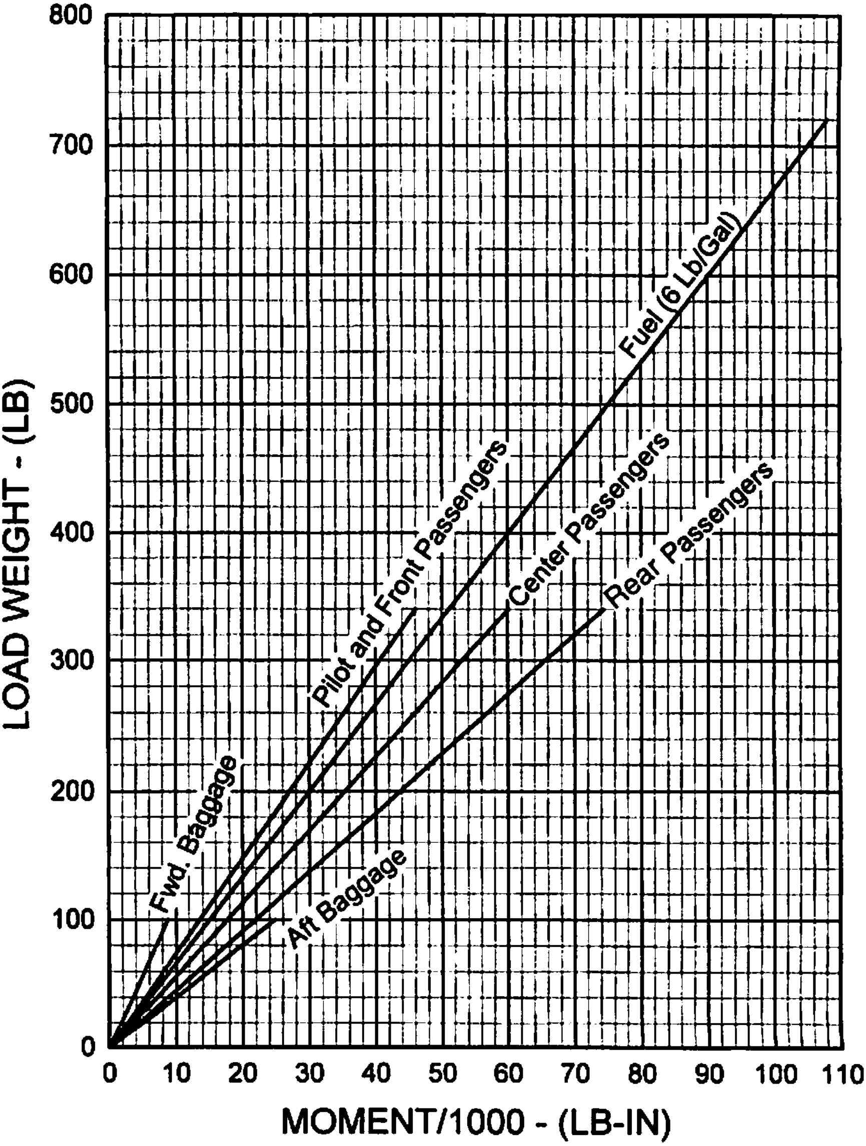
Locate the center of gravity (C.G.) of the takeoff weight on the C.G. range and weight graph (Figure 6-15). If this point falls within the weight - C.G. envelope, the loading is acceptable for takeoff.

Takeoff Weight			
Minus Estimated Fuel Burn-off (climb & cruise) @ 6.0 Lb/Gal.		150.31	
Landing Weight			

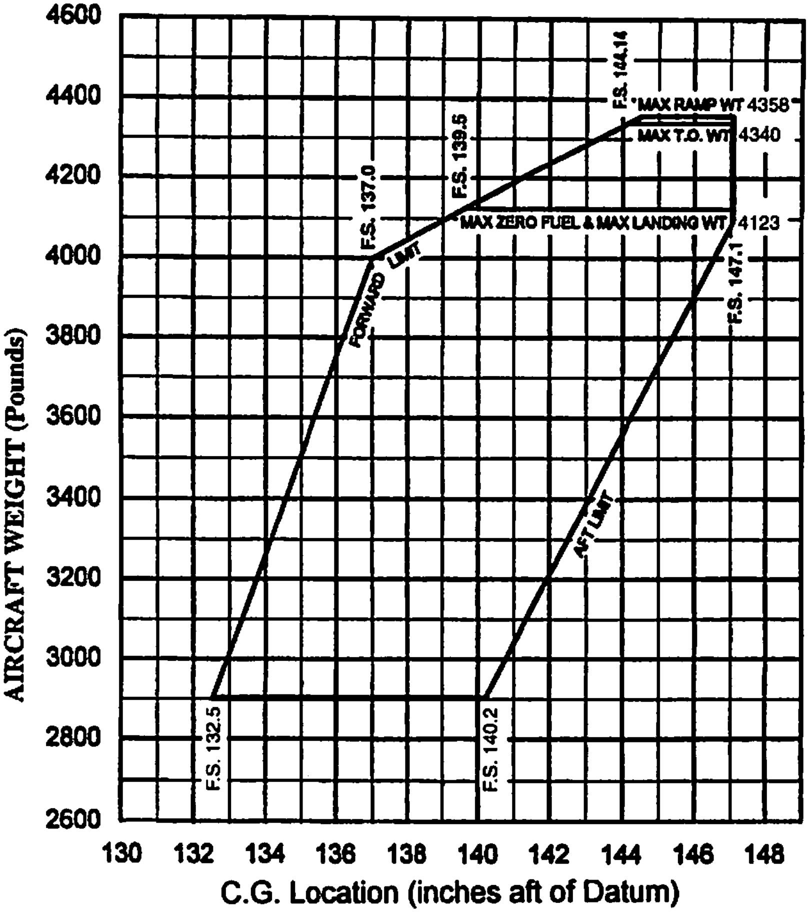
Locate the center of gravity of the landing weight on the C.G. range and weight graph (Figure 6-15). If this point falls within the weight - C.G. envelope, the loading is acceptable for landing.

IT IS THE SOLE RESPONSIBILITY OF THE PILOT IN COMMAND TO ENSURE THAT THE AIRPLANE IS LOADED PROPERLY AT ALL TIMES.

WEIGHT AND BALANCE LOADING FORM
(NORMAL CATEGORY)
Figure 6-11



LOADING GRAPH
Figure 6-13



C.G. RANGE AND WEIGHT GRAPH
Figure 6-15

TABLE OF CONTENTS

SECTION 7

DESCRIPTION AND OPERATION OF THE AIRPLANE AND ITS SYSTEMS

TABLE OF CONTENTS (continued)

SECTION 7

DESCRIPTION AND OPERATION OF THE AIRPLANE AND ITS SYSTEMS

SECTION 7

DESCRIPTION AND OPERATION OF THE AIRPLANE AND ITS SYSTEMS

7.1 THE AIRPLANE

The PA-46R-350T is a single engine, all metal, retractable landing gear, low wing, turbocharged airplane. It has seating for six occupants and two separate luggage compartments.

7.3 THE AIRFRAME

The primary airframe is of aluminum alloy construction, with a steel combination engine mount - nose gear support structure. The nose cowl is also made of aluminum. The rear section of the dorsal fairing is fiberglass.

The fuselage is an all metal, semi-monocoque structure with flush riveted skin. The skin has internally bonded doublers and is butt jointed at all seams not in the airflow direction. There are three basic fuselage sections: the forward baggage section, the cabin section, and the tail cone section.

The seating arrangement includes two crew seats and four passenger seats. The forward passenger seats face aft, and all passenger seats have adjustable backs with built-in headrests. An inside baggage area is provided aft of the rear passenger seats.

Cabin access is through the main cabin door, located on the left side, aft of the wing. The main door is a horizontally split door with retractable steps in the lower half. The upper half is held open by a gas spring. A plug type, inward releasing, emergency egress door is located on the right side adjacent to the aft facing seat.

Windows include a two-piece windshield, pilot and copilot windows, and three passenger windows on each side.

The forward baggage compartment has a locking door on the left side, forward of the wing.

7.3 THE AIRFRAME (continued)

The wing is in effect a three section structure. The center section built-up main spar extends through the lower fuselage and outboard of each main landing gear. This section has a forward spar and a rear spar which are pin jointed at the fuselage sides. The main landing gear retracts inward into recesses located aft of the main spar. The outboard section of each wing, to within approximately 18 inches of the tip, is a sealed integral fuel cell. Portions of the wing structure are adhesively bonded, and skins are butt jointed and flush riveted for a smooth airfoil surface.

The all-metal flaps are electrically actuated through a mechanical linkage. The flaps extend aft and down on three tracks and have four preselect positions.

The all-metal ailerons are mass balanced and operated by a cable system mounted on the aft wing spar.

Tiedown rings are installed on the bottom of each wing outboard of the main landing gear. The rings, which pivot about their forward edge, are spring loaded to retract into the lower wing surface when not in use. When retracted, a small ring protuberance extends below the wing surface. Applying a slight forward pulling force to the protrusion will extend the ring.

The empennage is of conventional fin and rudder, stabilizer and elevator design with aerodynamic and mass balanced control surfaces. Surfaces are of all-metal construction and the single-piece elevator assembly carries a center-mounted trim tab. This tab operates to combine anti-servo and trim functions.

Various access panels on the fuselage, wings and empennage are removable for service or inspection purposes.

Electrical bonding is provided to ensure good electrical continuity between components. Lightning strike protection is provided in accordance with presently accepted practices. Anti-static wicks are provided on trailing edges of ailerons, elevator and rudder to discharge static electricity that might cause avionics interference.

7.5 ENGINE AND PROPELLER

ENGINE

The PA-46R-350T is powered by a Textron Lycoming TIO-540-AE2A engine. It is a direct drive, horizontally opposed, overhead valve, fuel injected, air cooled, turbocharged-intercooled engine with variable absolute pressure controller. Maximum rated power is 350 HP at 2500 rpm and 42.0 in. Hg. manifold pressure. Accessories include a starter, two magnetos, a propeller governor, two belt-driven alternators, two gear-driven vacuum

7.5 ENGINE AND PROPELLER (continued)

pumps, a belt-driven air conditioner compressor, an oil filter, and an air/oil separator in the crankcase breather system.

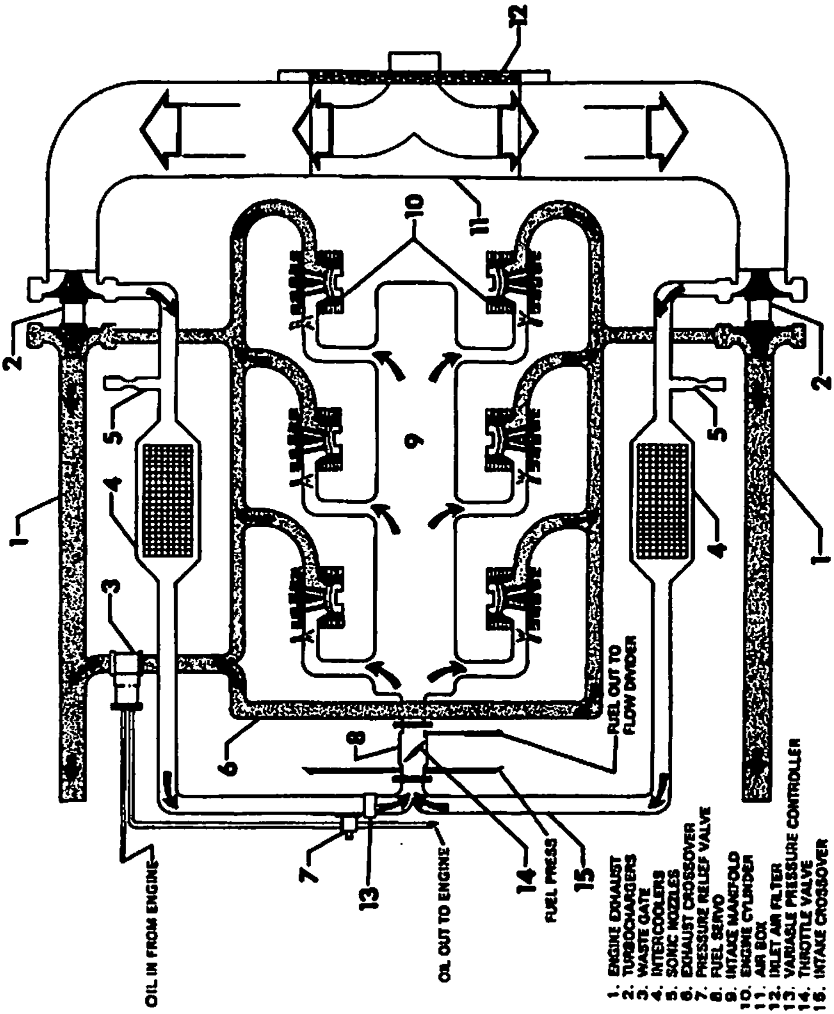
Turbocharging (Figure 7-1) is accomplished by two Garrett - A.I.D. turbo-compressors, one located on each side of the engine. Turbochargers extract energy from engine cylinder exhaust gases and use this energy to compress engine induction air. This allows the engine to maintain rated manifold pressure at altitude. When engine induction air is compressed by the turbocharger, the air temperature is increased. The elevated air temperature is reduced by air intercoolers located on each side of the engine. This aids in engine cooling and improves engine power and efficiency.

Each turbocharger extracts exhaust energy from its respective bank of cylinders to pressurize the induction air. Air flows through the induction inlet louvers into the induction air box, where it is filtered and divided for distribution to the left and right turbo compressors. At the compressor, air pressure and temperature are increased. Pressure increases air density making a greater mass of air available to the engine cylinders on each intake stroke. Air then flows through an intercooler where air temperature is reduced, further increasing the density of air available to each cylinder. Downstream the intercoolers, air flow joins at the "Y" junction of intake tubes at the lower back of the engine, then passes through the fuel injector, into the intake manifold, where it is divided to individual intake pipes flowing to each cylinder. Metered fuel is injected into the cylinder head, upstream of the intake valve. After the fuel burns in the cylinder, exhaust gases flow into the exhaust manifold and then to turbocharger turbines where exhaust energy is extracted to drive the compressor.

Turbo compressed air is throttled across the throttle butterfly valve as set by the throttle lever. A control system monitors pressure and uses engine oil pressure to automatically position the waste gate valve. The waste gate bleeds excess exhaust gas from the exhaust manifold crossover pipe and out the left exhaust stack, bypassing the turbocharger. Thus the controller automatically maintains manifold pressure.

The engine is well protected against overboost damage from excessive manifold pressure. The waste gate controller senses manifold pressure and will continually adjust turbocharger output, maintaining the manifold pressure set by the throttle. The controller automatically protects the engine from overboost damage by limiting manifold pressure to 42.0 in. Hg. In the event of a controller malfunction, there is a pressure relief valve on the induction manifold which will relieve manifold pressure and prevent an overboost.

7.5 ENGINE AND PROPELLER (continued)



TURBO-INDUCTION SYSTEM
Figure 7-1

7.5 ENGINE AND PROPELLER (continued)

When descending from altitude, care should be exercised to maintain engine power and temperatures (oil, CHT). Sudden cooling or gradual extreme cooling of engine cylinders will accelerate engine wear. Follow normal descent procedures described in Section 4.

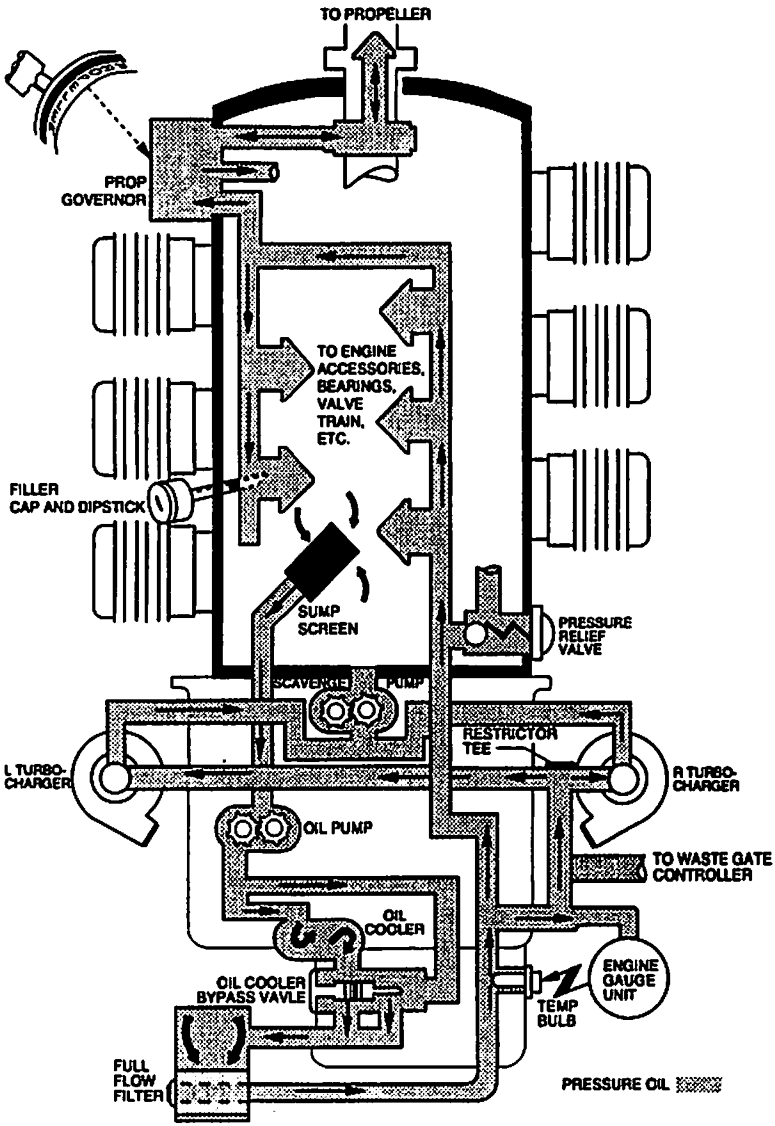
The engine is equipped with a Bendix RSA-10ED1 fuel injection system. An engine-driven fuel pump supplies fuel under pressure to the fuel injection regulator, which measures air flow and meters the correct proportion of fuel to a flow divider. The flow divider then directs the fuel to each of the individual cylinder injector nozzles. A fuel vent system provides a common reference vent pressure to the fuel pressure switch, engine-driven fuel pump and injection nozzles. The vent source is taken downstream of the turbochargers to ensure proper vent pressure during turbocharger operation.

The engine employs a full pressure, 12 quart wet sump lubrication system (Figure 7-3). Maximum endurance flights should begin with 12 quarts of oil. The sump is filled through a combination dipstick oil filler cap. Lubricating oil is drawn through the oil sump inlet screen by the engine oil pump and directly to the oil cooler and a thermostatic bypass valve. When engine oil is cold, the thermostatic bypass valve will open allowing oil to flow directly to the full flow oil filter bypassing the cooler. As the oil warms up, the bypass valve will close thereby forcing more oil to circulate through the cooler prior to entering the oil filter. From the oil filter, the oil passes through an oil pressure relief valve which regulates system oil pressure. The regulated oil is then routed to the waste gate actuator, turbochargers, and through the main oil galleries to the various engine bearings, piston oil cooling nozzles, valve mechanisms, and moving parts. Gravity returns the oil to the sump.

The turbochargers are also lubricated by the regulated oil from the engine system. Oil circulated through the turbochargers is returned to the sump by a scavenge pump attached to the hydraulic pump accessory pad. Oil from the oil pump is also supplied directly to the waste gate control system.

Oil temperature and pressure information is available from separate gauges located as part of the engine gauge stack. Engine crankcase gases are discharged to an air/oil separator behind the left rear cylinder, and then vented out the left exhaust stack.

7.5 ENGINE AND PROPELLER (continued)



ENGINE OIL SYSTEM SCHEMATIC
Figure 7-3

7.5 ENGINE AND PROPELLER (continued)

PROPELLER

The propeller is a Hartzell composite, three blade, constant speed unit with an 80-inch diameter. Constant propeller rotational speed (rpm) is maintained by a balance of air load and engine rotational forces. The Hartzell propeller governor, mounted on the left front of the engine, pressurizes and regulates the flow of engine oil to a piston in the propeller dome. The piston is linked by a sliding rod and fork arrangement to propeller blades. Governor oil pressure against the piston works to increase propeller blade pitch, thus decreasing propeller and engine rpm. Centrifugal twisting moments on the propeller blades work to decrease propeller blade pitch and increase rpm. Simple control of the interaction of these and other forces to maintain a constant rpm is provided by the propeller control lever in the cockpit.

The propeller control lever, linked by cable to the propeller governor, determines a wide range of in-flight rpm. Governor range is more limited during ground operation. Pushing the lever forward selects increased or higher rpm. Pulling the lever aft selects decreased or lower rpm. When in flight the rpm should not fluctuate significantly from that set, regardless of throttle setting.

The propeller may be operated within the full range of rpm indicated by the tachometer, up to the red radial line. In cruise, always use the power setting charts provided. Avoid exceeding maximum rpm and excessive engine stress by moving propeller and throttle levers in smooth deliberate motions. On cold days during run-up, exercise the propeller several times to flow warm oil into the propeller hub. This assures propeller governing for takeoff.

7.6 AIR INDUCTION SYSTEM

CAUTION

Alternate air is unfiltered. Use of alternate air during ground or flight operations when dust or other contaminants are present may result in engine damage from particle ingestion.

The engine air induction system receives ram air through forward facing ram air louvers located on the lower cowl below the propeller. Air enters these louvers and flows through a removable air filter mounted adjacent to the louvers. The filter removes dust and other foreign matter from the induction air. However, in the event the ram air louvers or the filter should become obstructed by ice or other causes, the pilot must manually select alternate air to provide air to the engine. This alternate air control is located on the center console just below engine control quadrant. When the induction air lever is up, or on primary air, the engine is operating on filtered air drawn through the forward facing ram air louvers. When the lever is down, or on alternate air, the engine is operating on unfiltered air, drawn through the aft facing louvers immediately aft of the ram air louvers. Since the alternate air bypasses the air filter, alternate air should never be used during ground operations, except for checking its operation.

Application of alternate air will result in a loss of manifold pressure when operating with a combination of high altitude and low RPM where the turbocharger wastegate is closed. Loss of manifold pressure of up to 8 inches Hg can result at maximum continious power, with a possible greater reduction resulting at cruise power settings. Some of this manifold pressure loss may be recovered with throttle and / or RPM adjustment.

7.7 ENGINE CONTROLS

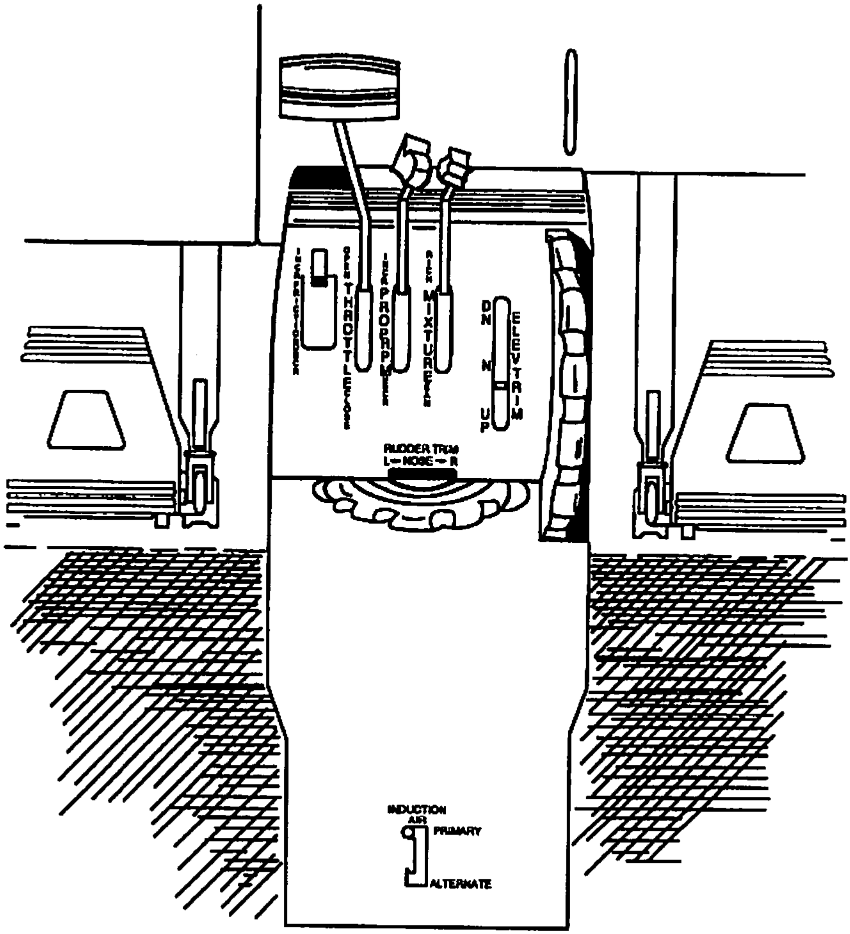
The engine is controlled by throttle, propeller and mixture control levers, located on the control quadrant on the lower central instrument panel (Figure 7-5). The controls utilize teflon-lined control cables to reduce friction and binding. The throttle lever is used to control engine power by simultaneously moving the butterfly valve in the fuel-air control unit and the variable absolute pressure controller, thus adjusting manifold pressure. The throttle lever incorporates a gear-up warning horn switch, which is activated when manifold pressure is reduced to below approximately 14 inches of mercury. If the landing gear is not locked down, the horn will sound until the gear is down and locked, or until the power setting is increased. This is a safety feature to warn the pilot of an inadvertent gear-up landing. All throttle operations should be made with a smooth, deliberate movement to prevent unnecessary engine wear or damage and to allow time for the turbocharger speed to stabilize.

The friction adjustment lever, located on the far left of the control quadrant, may be adjusted to increase or decrease the friction holding the throttle, propeller and mixture controls.

The propeller control lever is used to adjust engine speed (rpm) at the propeller governor. Propeller speed controls power availability, which is increased by increasing rpm when the lever is moved forward. The lever is moved aft to reduce rpm. Propeller operations should be smooth and deliberate to avoid unnecessary wear.

The mixture control lever is used to adjust the fuel-to-air ratio at the fuel-air control unit. Full forward is rich mixture. Normal engine shutdown is accomplished by placing the mixture in the full aft position.

7.7 ENGINE CONTROLS (continued)



CONTROL PEDESTAL
Figure 7-5

7.8 AVIDYNE FLIGHTMAX ENTEGRA PRIMARY FLIGHT / MULTI-FUNCTION DISPLAYS

Due to the design of the Avidyne FlightMax Entegra Avionics System utilized on the PA-46R-350T, the various avionics systems are very integrated.

This section provides a general description of the Avidyne FlightMax Entegra Series 700-00006-0XX (appropriate revision) PFD, its operation, and aircraft systems interfaces. For a detailed description of PFD operation, refer to the Avidyne FlightMax Entegra Series Primary Flight Display Pilot's Guide, p/n 600-00104-002 revision 4, or later appropriate revision.

7.8a PFD SYSTEMS DESCRIPTION

The Entegra PFD start-up is automatic once power is applied. The display presents the Initialization Display immediately after power is applied. Power-on default is 75% brightness. Typical alignment times are 3 minutes.

Attitude Direction Indicator (ADI)

Air Data

The airspeed tape on the left of the PFD begins indicating at 20 Knots Indicated Airspeed (IAS) and is color coded in accordance with the model POH airspeeds for V_{SO}, V_{FE}, V_S, and V_{NE}. An altitude tape is provided on the right of the PFD which also displays a symbol for the Altitude Preselect (Altitude Bug). The Vertical Speed Indicator (VSI) is displayed to the right of the altitude tape. For vertical speed rates greater than the PFD displayed VSI scale, the indicator needle will peg just outside the scale and a digital readout of actual VSI up to 4000 FPM is then displayed. An additional data block is provided for display of Outside Air Temperature (OAT), True Airspeed (TAS), and Ground Speed (GS). Controls for selecting bug and barometric correction values are along the right side of the PFD. A wind indicator is also provided beneath the altitude tape.

Attitude Data

Attitude is depicted on the PFD using a combination of an aircraft reference symbol ("flying-delta") against a background of labeled pitch ladders for pitch and a bank angle pointer in the form of an arced scale along the top of the PFD for bank. A skid/slip indicator is attached to the bottom edge of the bank angle pointer.

7.8a PFD SYSTEMS DESCRIPTION (continued)

Horizontal Situation Indicator (HSI) (continued)

Heading Data

Magnetic heading is represented in a boxed digital form at the top of the compass rose. Heading rate (Rate of Turn Indicator) takes the form of a blue arcing arrow that begins behind the magnetic heading indicator and moves left or right accordingly. Graduations are provided on the rate of turn indicator scale to indicate ½ and full standard rate turns. A heading bug is also provided on the compass rose.

Navigation Data

Navigation data on the PFD takes several forms. A Course Deviation Indicator (CDI) is always provided on the HSI and a bearing pointer can be optionally selected for display on the HSI by the pilot. Controls for selecting the source of navigation data, selecting the display format of the navigation data, and for selecting the type of compass rose and moving map to be displayed are along the left side of the PFD. The active flight plan contained in the GPS Nav/Comm unit selected as the primary navigation source (Nav) can be optionally selected for display on the HSI as well as the desired range of the optionally selectable moving map display. If a localizer or ILS frequency is tuned and captured in the GPS Nav/Comm selected as the Nav source, a Vertical Deviation Indicator (VDI) and Horizontal Deviation Indicator (HDI) are automatically displayed on the ADI.

NOTE

In the event glide slope or localizer signals are lost, the HDI and/or VDI will be displayed as red X's to indicate loss of signal. The red X'd indicator will only be removed if the signal is regained. In this case, the PFD Nav source will set to GPS, or if the GPS Nav/Comm is retuned, to another frequency. Appropriate action must be taken by the pilot if on an approach.

7.8a PFD SYSTEMS DESCRIPTION (continued)

Autopilot Integration

The Entegra PFD is fully integrated with the S-TEC System 55X Autopilot. Reference bugs for Heading, Altitude, and Vertical Speed are provided on the PFD to control the autopilot and aid pilot situational awareness. These bugs are displayed with solid or hollow symbology depending on the autopilot status. If the autopilot is engaged in that mode, the bug is solid to indicate the autopilot is coupled to that bug. A hollow bug indicates the autopilot is not engaged in that mode.

Autopilot mode annunciations are shown along the top of the PFD.

Flight director command bars on the PFD attitude indicator can be enabled by the pilot. When the flight director is enabled and the autopilot is engaged in both lateral and vertical modes, the flight director displays the goals of the autopilot.

A lateral autopilot mode must be engaged on the S-TEC System 55X Autopilot before a vertical mode can be engaged.

The flight director command bars will only be displayed on the PFD when enabled by the pilot and when both lateral and vertical autopilot modes are engaged.

The following autopilot modes are supported by the PFD:

1. HDG (Heading, using the heading bug)
2. NAV (Nav, using the course pointer and course deviation indicator)
3. GPSS (GPS Steering, using GPS course guidance)
4. APR (Approach, using the HDI and VDI, including automatic glide slope capture)
5. REV (Reverse sensing HDI approach)

CAUTION

A potentially confusing situation may develop if either VLOC1 or VLOC2 is selected on the PFD while GPSS mode is engaged on the autopilot. If either VLOC is selected (NAV source) on the PFD, the CDI will display course deviation to the radio navigation source dialed into the corresponding VLOC radio, but the autopilot will track the active GPS flight plan. As a result, the course deviation on the PFD CDI may not agree with the course being flown by the autopilot. This confusing situation may be avoided by selecting NAV mode on the autopilot when VLOC1 or VLOC2 is selected as the PFD NAV source.

NOTE

When HDG mode is engaged, rotation of the heading bug greater than 180° will result in a reversal of turn direction.

7.8a PFD SYSTEMS DESCRIPTION (continued)

Engine Instruments

Manifold Pressure -

Displays current engine manifold pressure in inches of mercury. A numeric display below the torque analog indicator displays the torque value to the nearest tenth of an inch. If the manifold pressure enters the warning (red) area, the analog indicator and the numeric readout will be displayed in the corresponding color.

Fuel Flow -

Displays the current engine fuel flow as a numeric display, to the nearest 1 pound per hour (or 1 kilogram per hour if metric units are selected).

RPM -

Displays current engine speed in revolutions per minute. A numeric display below the RPM analog indicator displays RPM value to the nearest 10 RPM's. If the RPM enters the warning (red) area, the analog indicator and the numeric readout will be displayed in the corresponding color.

Oil Pressure -

As the engine comes online, displays the oil pressure in PSI. This data block supports engine start and is removed when the oil pressure is out of the warning (red) range.

7.8b MFD SYSTEMS DESCRIPTION

NOTE

For a detailed description of the MFD, refer to the Avidyne FlightMax EX5000 Series Pilot's Guide and Reference, p/n 600-00121-000 revision 4, or later appropriate revision.

Navigation

Data associated with the moving map is found on four pages: Map, Nearest, Trip, and Info pages. The MFD contains a Jeppesen NavData database that is available for display on the Map page. In conjunction with GPS-supplied position information, an own-ship symbol is superimposed on the moving map and positioned relative to the NavData information. GPS can also supply the active flight plan for display on the moving map. Terrain data is provided by a USGS terrain database stored within the MFD and updated only on an as needed basis.

The Jeppesen Navigation Database provides data on airports, approaches, VOR's, NDB's, intersections, airspace definitions, and frequencies. North American and international databases are available. Database information can be updated via the USB port on the front face of the bezel.

The navigation data on the moving map display are based on databases that are updated periodically. Database updates are available on 28-day cycle subscriptions. Expired databases are clearly stated to the pilot via messages during system startup and on the System Setup page. The warning can only be removed by updating the data.

NOAA man-made obstruction database information provides data on man-made obstacles over 200 feet AGL. This data is only available for North America and can be updated via the USB port on the front face of the bezel.

The obstacle data on the moving map display are based on databases that are updated periodically. Database updates are available from Avidyne on 56-day cycle subscriptions. Expired databases are clearly stated to the pilot via messages during system startup and on the System Setup page. The warning can only be removed by updating the data.

7.8b MFD SYSTEMS DESCRIPTION (continued)

Navigation (continued)

Using the Jeppesen NavData data and the GPS-supplied present position, the MFD can provide the pilot with the nearest 25 airports or navaids, depending on pilot selection, within 100 nm. This information is presented on the Nearest page.

More detailed information on a particular airport is also generated from the Jeppesen NavData data and is available for pilot viewing on the Info page.

Flight plan data supplied by the GPS system provide the pilot with a tabular form of the remaining legs in the active GPS flight plan. This information is viewed on the Trip page and includes a CDI for added enroute navigation aiding.

Flight plan data is transmitted to the MFD from an external GPS navigator. Some installations do not support depictions of curved flight paths. In these cases, curved flight path segments will be depicted as straight lines. The GPS navigator and HSI are to be used during approach procedures. Reference the Avidyne FlightMax EX5000 Series Pilot's Guide, p/n 600-00121-000 revision 4, or later appropriate revision, for more information.

Datalink

Datalink information is received by the MFD based upon installation provisions and a subscription service available through Avidyne (www.myavidyne.com). Data is presented on the Map, Trip, and Nearest pages. Datalink information is provided for strategic planning purposes only. Data aging and transport considerations make it unsuitable for tactical use. Reference the Avidyne FlightMax EX5000 Series Pilot's Guide, p/n 600-00121-000 revision 4, or later appropriate revision, for more information.

Setup

The various System Setup pages allow the pilot to set user preferences for system operation. In addition to listing the software version identification information and database validity dates, the System Setup page allows access to several pages for preference selection and provides a means to initiate self-tests of the traffic and lightning sensors.

7.8b MFD SYSTEMS DESCRIPTION (continued)

Setup (continued)

Airport Settings page provides selections for displaying airport type, runway surface type and minimum runway lengths on the moving map. **Declutter Settings** page allows the pilot to select settings for defining the base map detail when changing display range. **System Time** page provides an opportunity to select system time zone and Map page menu timeout options. **DataBlock Edit** page allows the pilot to select the data to be displayed in the datablock windows on the Map page. **Datalink Setup** page allows the pilot to select parameters for the datalink system, including update rate and range of weather data request.

Engine Instruments

The Engine page provides the pilot with engine parameters depicted on simulated gauges and electrical system parameters located in dedicated regions within the MFD display. An Engine Sensor Unit interfaces with engine-mounted sensors and provides data to the MFD for display.

7.8b MFD SYSTEMS DESCRIPTION (continued)

TIS Traffic Information Service

Traffic Information Service (TIS) provides a graphic display of traffic advisory information overlaid on the MFD Map page. TIS is a ground based service providing relative location of all ATCRBS Mode A and Mode C transponder equipped aircraft within a specified service volume. Aircraft without an operating transponder are invisible to TIS.

If an aircraft has a transponder, but does not have altitude reporting, the TIS will depict it without the altitude information tag. If the depicted traffic is reporting altitude and is climbing or descending at a rate of at least 500 feet per minute, a trend arrow is displayed near the traffic symbol indicating that the aircraft is climbing or descending. If the intruder is not reporting altitude, the traffic symbol appears without an altitude tag or trend arrow. Traffic ground track is indicated by a "target track vector", a short line displayed in 45 degree increments.

The symbology displayed is as follows:

(1) Other Aircraft - An open cyan diamond indicates that an intruder's relative aircraft is greater than +/- 3000 feet, or its distance is beyond 7 nm range. It is not considered a threat.

(2) Proximity Intruder Traffic - A filled cyan diamond indicates that the intruder aircraft is within +/- 1200 feet, and within 7 nm range, but is still not considered a threat.

(3) Traffic Alert (TA) - A symbol changed to a filled amber circle indicates that the intruder aircraft is considered to be potentially hazardous. The condition which causes a traffic alert is defined on a course that will intercept a 0.5 nm radius and a relative altitude of +/- 500 feet within 34 seconds.

When a hazardous intruder aircraft is detected an annunciator will be displayed on the MFD with relative bearing, range and relative altitude along with the advisory voice message "TRAFFIC, TRAFFIC" heard through the audio system.

7.8b MFD SYSTEMS DESCRIPTION (continued)

TAS610 Traffic Advisory System (Optional Equipment)

The TAS610 Traffic Advisory System is designed to identify the altitude, range and bearing of nearby transponder-equipped aircraft. Aircraft equipped with non-Mode C transponders can provide range and bearing information only, while aircraft without operating transponders remain undetected. Traffic advisories are available on the MFD Map page via the Traffic softkey (ABOVE, BELOW, UNLIMITD, NORMAL, GROUND). The Traffic Advisory System is always on and can not be fully turned off by the pilot without deactivating the system via the circuit breaker. During ground operations (Ground Mode) the traffic system will only display traffic that is in the air and all advisory tones are muted. This mode is evidenced by the word GROUND appearing in the Traffic softkey window. Once the host aircraft is airborne and climbs above 400 feet, the traffic advisory tones are restored.

There are three advisory levels in the TAS610 Traffic Advisory System:

1. Traffic Advisories (TA) – audible/visual advisory if the current track of the intruder could result in a near miss or collision.
2. Proximate Advisories (PA) – visual advisory when the displayed traffic is within the flight crew-defined display parameters.
3. Other Traffic (OT) – traffic advisories that are neither TA's nor PA's.

CAUTION

Degraded traffic advisory system performance can be expected when intruder aircraft transponders are operating in mode A. This is particularly true when a mode A intruder is approaching from below and behind the host aircraft. In this case, target position may be inaccurate and traffic alerts may not be issued.

Reference the appropriate revision of the Avidyne Pilot's Operating Handbook for the TAS600 Series Traffic Advisory System, p/n 32-2352 Rev 6, or subsequent, for more information.

7.8b MFD SYSTEMS DESCRIPTION (continued)

MLB700 Broadcast Datalink

The MLB700 Broadcast Datalink is designed to provide reception of weather and other data products that will assist the flight crew in assessing meteorological conditions that may pose a threat to the aircraft. Graphical weather is available on the MFD Map page via the Wx Ovly softkey (NEXRAD and NEXRAD+) and the Lightning softkey (DATALINK). Textual weather is available on the MFD Map page via the Wx Rprts softkey (METAR, SIGMET and AIRMET). A valid subscription through MyAvidyne.com is required to receive the WSI InFlight™ datalink graphical and textual weather. MLB700 Broadcast Datalink information is provided for strategic planning purposes only, whereby data aging and transport considerations make it unsuitable for tactical use. Reference the appropriate revision of the Avidyne MLB700 Pilot's Guide, p/n 600-00178-000, for more information.

The MLB700 is also designed to send Sirius Satellite Radio programming to the aircraft audio panel and then to the headphones of the passengers in the four rear seats of the aircraft. The audio panel must be set to "CREW" in order for the passengers to receive the audio signal. All controls for the Sirius Satellite Radio are contained within the RC70 Wireless Remote Control. Reference the appropriate revision of the Avidyne MLB700 Pilot's Guide, p/n 600-00178-000, for more information.

TWX670 Tactical Weather Detection System (Optional Equipment)

The TWX670 Tactical Weather Detection System is designed to detect the electrical discharges associated with thunderstorms to permit the flight crew to evaluate and avoid nearby thunderstorm activity. Electrical discharge "strikes" are available on the MFD Map page via the Lightning softkey (STRK). The electrical discharges will be depicted as yellow "X's" overlaid on the Map page and will remain displayed for approximately 3 minutes. Since the TWX670 is stabilized in range and bearing, the discharges reposition on the MFD display with respect to aircraft movement. Reference the appropriate revision of the Avidyne Pilot Operating Handbook for the Tactical Weather Detection System TWX670, p/n 600-00164-000, for more information.

7.8b MFD SYSTEMS DESCRIPTION (continued)

NOTE

The presence of electrical noise may initiate a "Noise Present Warning" message on the MFD. During landing gear cycling, this message is considered normal operation.

Engine Page

Engine instruments are of the round readout design except for fuel flow which is digital readout only.

The FUEL FLOW indication displays fuel flow in gallons per hour. Readings are accurate at stabilized power settings.

The FUEL QUANTITY indicator is calibrated in gallons of fuel and accurately displays, as vertical tapes, fuel remaining in the left and right tanks.

For additional description of the engine page features refer to the Avidyne FlightMax EX5000 Multi-Function Display Pilot's Guide, p/n 600-00121-000 revision 4, or later appropriate revision.

7.8c ADAHRS FAILURE

Failure of the ADAHRS will be apparent when the air data parameters are replaced with red X's and a red (ATTITUDE FAIL) "Refer to Backup Gauges" annunciator is displayed in the top center of the PFD.

7.9 STANDBY INSTRUMENTS

The standby instrument group, located to the left of the PFD, includes an airspeed indicator, an electric attitude indicator, and a barometric altimeter. The standby airspeed and altimeter are plumbed to the pitot static system, and are of the traditional mechanical design. The standby electric attitude indicator is powered by a self-contained standby power source and includes a test feature.

Mid-Continent 4300-4XX Series Standby Attitude Indicator

The standby attitude indicator provides backup display of aircraft attitude. It is located in the middle of the standby instrument group where it can be viewed easily by the pilot. It is powered by a self-contained standby power source so that it will remain powered for approximately 30 minutes after loss of the aircraft electrical system. In the event of a loss or interruption of the aircraft electrical power, the amber standby power light will start flashing, warning that the indicator has lost its main DC power source. Selecting the STBY PWR button located on the face of the instrument will power the indicator by means of the self-contained power source.

The emergency battery must be checked for proper operation prior to flight. Should the RED TEST annunciator illuminate any time during the self-test, this is an indication that the battery pack is in need of charging, or possible replacement. Flight in Instrument Meteorological Conditions (IMC) is prohibited.

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7.11 HYDRAULIC SYSTEM

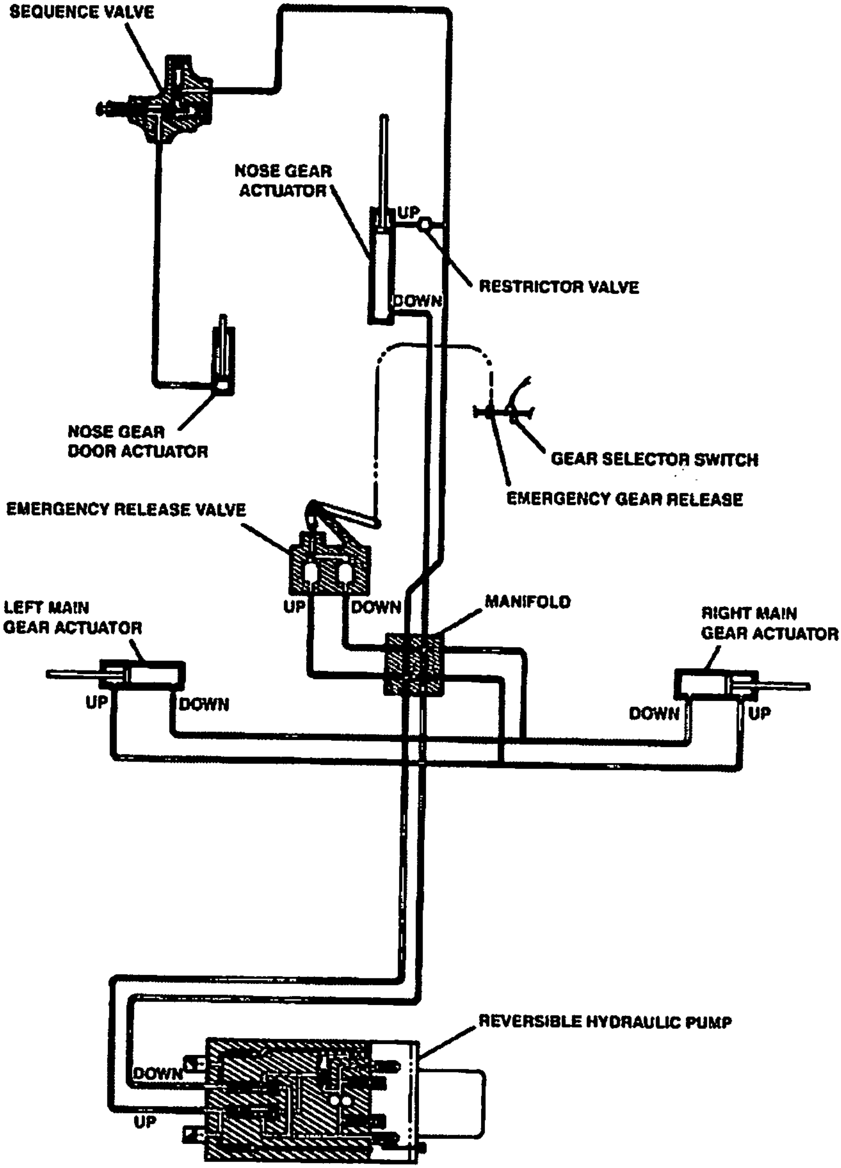
The hydraulic system (refer to Figure 7-9) provides the power to retract and extend the landing gear.

The electric motor driven hydraulic pump assembly is located aft of the rear baggage compartment and is accessible through the baggage compartment aft closeout panel. The pump assembly has an integral reservoir with filler plug, sight gauge and vent. The pump assembly incorporates pressure switches, bypass relief valves, and thermal relief valves in both the UP and DOWN sides. A shuttle valve is also incorporated to allow for unequal volumes of hydraulic fluid displaced during UP and DOWN gear actuation. Normal system operating pressure is controlled by the pressure switches. Maximum system operating pressure is limited by the bypass relief valves, and maximum system holding or trapped pressure is limited by the thermal relief valves.

The motor which drives the hydraulic pump is reversible and runs in one direction to supply gear UP pressure and in the opposite direction to supply gear DOWN pressure. The direction in which the pump runs is controlled electrically by the position of the gear selector switch on the instrument panel.

Other major components of the hydraulic system are the three gear actuators and the emergency gear extension valve. Operation of these components is covered in the landing gear section.

7.11 HYDRAULIC SYSTEM (continued)



HYDRAULIC SYSTEM
Figure 7-9

7.13 LANDING GEAR

The aircraft is equipped with hydraulically operated, fully retractable, tricycle landing gear.

Locking-type actuators are used for main and nose gears. The actuator assembly provides mechanical gear-down locking at the fully extended position and is hydraulically unlocked. The actuator also acts as the gear brace in the extended position.

The main gear retracts inboard into the wing root area. A mechanically linked door covers the strut assembly.

Hydraulic pressure for gear operation is furnished by an electrically driven hydraulic pump (refer to Figures 7-9 and 7-13). Gear operation is initiated by a two position selector with a wheel shaped knob located to the left of the engine control quadrant (Figure 7-11). Three green lights, which are individually activated as each gear mechanically locks into the DOWN position are located above the landing gear selector.

NOTE

Day/night dimmer switch must be in the DAY position to obtain full intensity of the gear position indicator lights during daytime flying. When aircraft is operated at night, the switch should be in the NIGHT position to dim the gear lights.

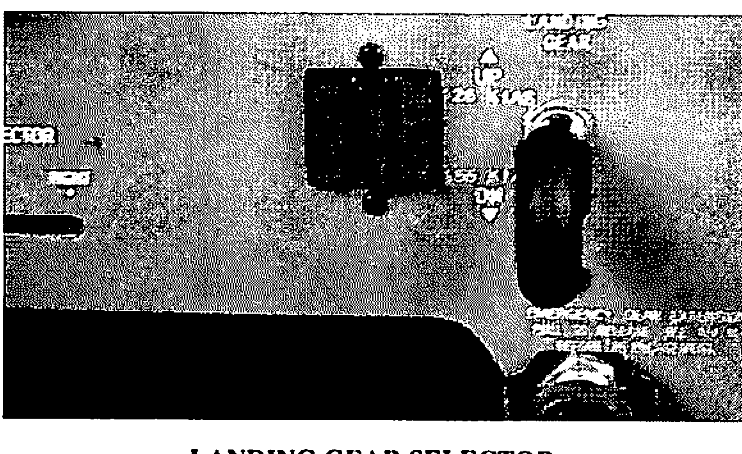
The landing gear selector knob must be pulled outward to release it from a detent in the DOWN position prior to moving it to the UP position. In addition, there is a squat switch on the left main gear which prevents operation of the gear UP electrical circuit when the aircraft weight is on the gear. If the landing gear selector is placed in the UP position with the aircraft weight on the gear, the gear warning horn will sound, and the red GEAR WARN annunciator will illuminate.

The landing gear is held in the UP position by hydraulic pressure which is trapped in the system UP lines by a check valve in the pump assembly. When normal pump operation is stopped by the pressure switch, a check valve in the pump assembly closes to trap fluid pressure in the UP side of the system. Emergency gear extension is accomplished by a manually actuated valve which relieves the pressure in the UP side and bypasses fluid to the DOWN side of the system. The additional fluid required for DOWN operation comes directly from the reservoir.

7.13 LANDING GEAR (continued)

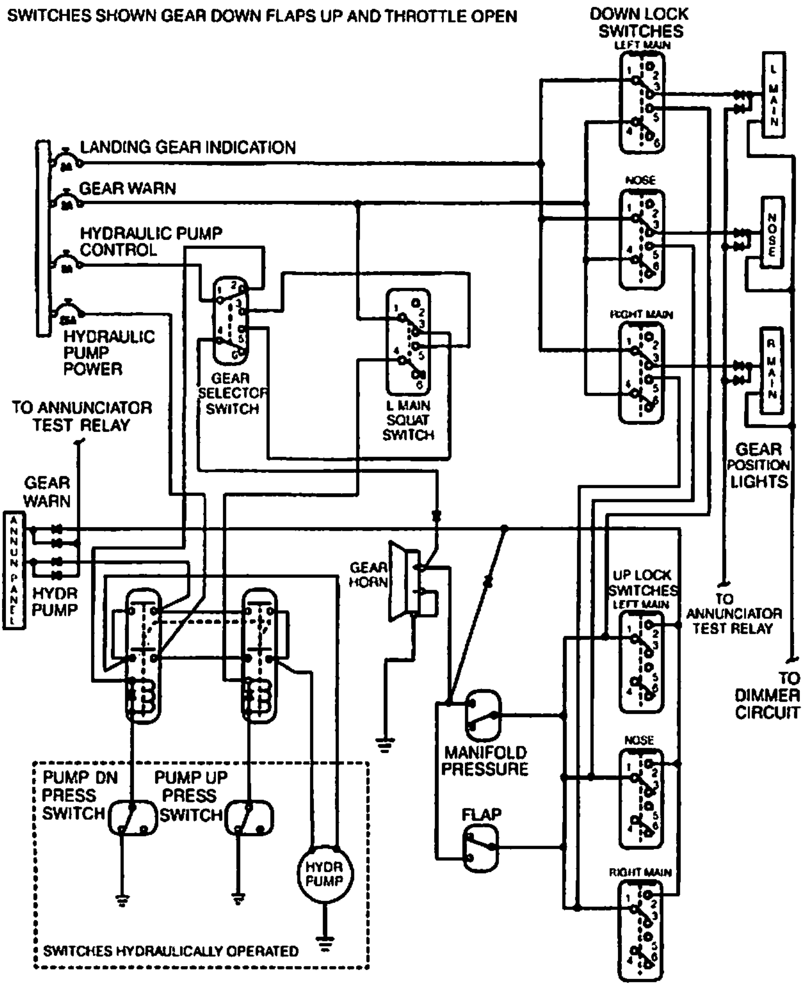
The landing gear is held in the DOWN position by spring loaded mechanical locking mechanisms built into each of the three actuating cylinders. The individual gear safe light switches are also mechanically operated when each mechanism is in the LOCKED position. With the hydraulic pump and system operating normally, hydraulic pressure is also trapped in the DOWN side of the system. This DOWN pressure is not required to mechanically lock the cylinders and is not available if the hydraulic pump is inoperative.

The EMERGENCY GEAR extension system allows the landing gear to free fall, with spring assist on the nose gear, into the extended position where the mechanical locks engage. Approximately 25 pounds of force is required to pull the EMERGENCY GEAR extension control. If a gear system malfunction has been indicated and the EMERGENCY GEAR extension system used, it is recommended that the EMERGENCY GEAR extension control and the HYD PUMP circuit breaker be left in the pulled position until the aircraft is safely on jacks. See the Service Manual for proper landing gear system check-out procedures. If the aircraft is being used for training purposes or a pilot check-out flight the EMERGENCY GEAR extension control and HYD PUMP circuit breaker must be reset in order for hydraulic pressure to be generated in the UP side of the system and the gear retracted.



LANDING GEAR SELECTOR
Figure 7-11

7.13 LANDING GEAR (continued)



LANDING GEAR ELECTRICAL DIAGRAM
Figure 7-13

7.13 LANDING GEAR (continued)

CAUTION

When flying in extreme cold where the aircraft has been cold soaked for hours, the gear may not indicate down and locked for 10 to 15 seconds while aircraft temperatures are stabilizing.

The annunciator panel contains two lights pertaining to landing gear operation. A red GEAR WARN annunciator is activated whenever all three gears are not fully down and locked, or not fully up with the gear doors closed. This annunciator comes on during normal gear operation to indicate that the gear is in transit. If it does not go out within approximately 10 seconds during normal gear operation or illuminates steadily during flight with the landing gear selector in the UP position, a system malfunction is indicated. There is also an amber HYD PUMP annunciator which indicates that the hydraulic pump motor is being supplied with electrical power. The annunciator is illuminated during normal landing gear operation for approximately the same duration as the GEAR WARN annunciator. If the light remains on or begins cycling intermittently after gear operation, a system malfunction is indicated.

The red GEAR WARN annunciator and gear warning horn will operate simultaneously under the following conditions:

(a) In flight when the throttle is reduced to the point at which manifold pressure is approximately 14 inches of mercury or below and the landing gear are not in the DOWN position.

(b) In flight when the flaps are extended more than 10° and the landing gear are not in the DOWN position.

(c) On the ground when the landing gear selector is in the UP position. The landing gear squat switch activates to prevent operation of the retract side of the hydraulic pump on the ground.

7.15 BRAKE SYSTEM

The brake system is designed to meet all normal braking needs. Two single-disc, double puck brake assemblies, one on each main gear, are actuated by toe brake pedals mounted on both the pilot's and copilot's rudder pedals. A brake system reservoir, independent of the hydraulic system reservoir, is located behind the aft access panel in the forward baggage compartment. Brake fluid should be maintained at the level marked on the reservoir. For further information see BRAKE SERVICE in Section 8 of this handbook.

The parking brake knob is located just below the left control column. To set the parking brake, first depress and hold the toe brake pedals and then pull the parking brake knob. To release the parking brake, first depress and hold the toe brake pedals and then push in on the parking brake knob.

7.17 FLIGHT CONTROL SYSTEM

The primary flight controls are conventional and are operated by dual control wheels and rudder pedals. The control wheel operates the ailerons and elevator. The rudder pedals actuate the rudder and nose wheel steering. The toe brakes, which are an integral part of the pedals, operate the wheel brakes. The ailerons and rudder are interconnected through a spring system, which is activated only when controls are out of harmony. In normal coordinated flight, the system is inactive. All flight control systems are operated by closed circuit cable systems.

Secondary control is by elevator and rudder trim. The controls are located on the pedestal (Figure 7-5). Aileron trim is provided by a fixed, ground-adjustable tab. The elevator trim control wheel is located on the right side of the pedestal. The wheel is rotated forward for nose-down trim and aft for nose-up trim. The rudder trim wheel is located on the aft face of the pedestal. The wheel is rotated to the right (counterclockwise) for nose right and left (clockwise) for nose left. Trim indications for the individual systems are located on the pedestal.

The wing flaps are electrically controlled by a selector lever mounted on the instrument panel immediately to the right of the control pedestal. The flap position indicator is located to the left of the selector lever. The flaps may be set to four positions; up (0°), 10°, 20°, and full down (36°). Each position is detented on the flap selector panel. The flaps will automatically move to the selected position, which can be confirmed by referring to the position indicator. The flaps may be extended to 10 at airspeeds below 165 KIAS, 20° below 130 KIAS, and 36° flap extension is limited to airspeeds below 116 KIAS. When extending the flap with the landing gear retracted, prior to the flap reaching the 20° position, the landing gear warning horn will sound, and the GEAR WARN annunciator will illuminate. A FLAPS annunciator light is provided as part of the annunciator panel located in the upper center section of the instrument panel. If the annunciator light illuminates, it is indicative of a system malfunction in which case the flap protection circuit automatically removes power from the electric flap motor. Resetting of the FLAP WARN circuit breaker will restore normal operating power to the flap motor. If, after resetting, and operation of the flaps, the annunciator illuminates again then a system malfunction is indicated and the flap motor circuit breaker should be pulled.

7.19 FUEL SYSTEM

Fuel is stored in two main integral wing tanks (see Figure 7-15), located outboard of the mid-wing splice. Fuel quantity held by each wing tank is 60 usable gallons with one gallon of unusable fuel, for a total of 122 gallons. The minimum fuel grade is 100 or 100LL aviation grade. Each tank gravity feeds fuel through finger screens into three lines leading to collector/sump tanks located at the root of each wing, just aft of the main spar. During preflight the collector/sump tank and one of the three lines can be inspected in each main wheel well. Collector/sump tanks vent back to the main tanks by a fourth line located forward of the main spar. The main tanks vent to the atmosphere by non-icing vents installed in the most outboard forward access panels of each wing tank. Reverse fuel flow from collector tanks to main tanks is prevented by 2 flapper check valves installed in each collector tank. Collector tank sumps are the lowest points in the fuel system, and each has a drain valve for draining collector and main tanks.

WARNING

Avoid prolonged uncoordinated flight to prevent uncovering of fuel tank outlets and subsequent fuel starvation.

Each tank separately vents air in and fumes out to equalize pressure with ambient conditions. This is accomplished through combination valves in non-icing fuel tank vents located at the most outboard, forward tank access panels.

CAUTION

Do not insert objects into the wing vent as damage to the combination valve could result in fuel leakage.

CAUTION

A plugged vent could result in fuel starvation. If a restricted vent is suspected, select the opposite tank immediately. Monitor the suspect wing and land as soon as possible.

NOTE

When opening the fuel tank filler cap, a rush of air will normally be heard and felt. This is caused by the large volume of vapor space in the wing tank, which is under a slight pressure differential. This pressure is the minimum required to open the combination valve in the vent and does not represent a hazard.

7.19 FUEL SYSTEM (continued)

CAUTION

For proper mid range accuracy, fuel quantity readings should be taken when the aircraft is in coordinated level flight at zero degrees bank angle. (Pitch, roll and yaw.) Failure to observe fuel quantity in this manner will result in erroneous readings due to wing cross section, low dihedral angle and fuel tank geometry.

If readings are taken in configurations other than coordinated level flight at zero degrees bank angle, there may be periods during flight when the accuracy of the fuel quantity gauging system will appear to be incorrect by seeming to present an unchanging quantity in spite of fuel being consumed from the tank.

Fuel quantity is indicated on the multi-function display (MFD). Each tank has two sensor sending units. Gauges are electrical and will operate when the battery switch is ON. Fuel tanks can be visually confirmed full if fuel level is up to the filler neck.

NOTE

Removal of the fuel filler cap from a wing tank that is sitting low or from an overfilled tank caused by thermal expansion could result in fuel spillage.

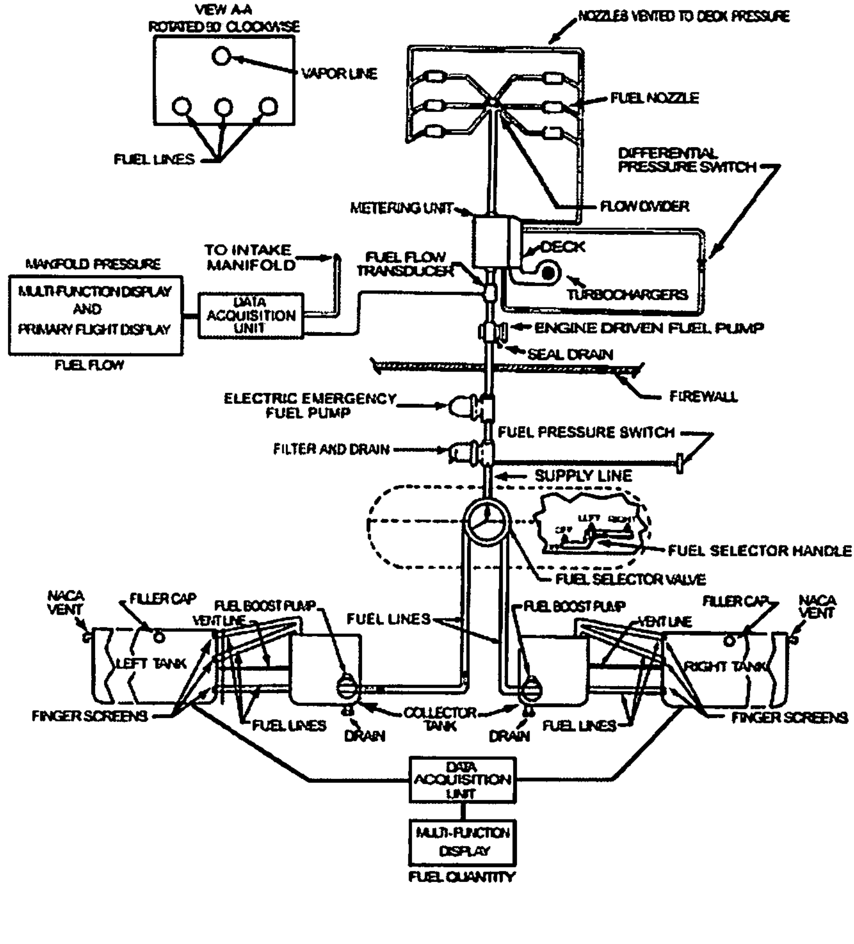
Quantity indication should be monitored at regular intervals during flight. Fuel tank selection should be alternated accordingly to maintain fuel and wing balance. See fuel imbalance limitations, Section 2, paragraph 2.37(e).

NOTE

Airplane should be fueled symmetrically in a wings level condition. At times, this will require alternate filling of left and right tanks until the full condition is reached.

Each collector/sump tank has a submerged, electrically operated, centrifugal fuel boost pump to suppress fuel vaporization in the fuel lines between the fuel tanks and the engine fuel pump. When the battery master switch is ON, the appropriate boost pump is turned on when the fuel selector is set to the LEFT or RIGHT position. Thus, the boost pump of the selected fuel tank operates continuously during engine start, and normal engine operations on the ground or in flight. Neither pump will operate if the fuel selector is set to OFF, or positioned between the LEFT and RIGHT detents.

7.19 FUEL SYSTEM (continued)



FUEL SYSTEM SCHEMATIC
Figure 7-15

7.19 FUEL SYSTEM (continued)

Should the fuel boost pump in the fuel tank being used fail to produce sufficient pressure, the BOOST PUMP light on the annunciator panel will illuminate. In this event, confirm that the fuel selector is properly seated in the detent for the selected tank. If the selector is properly seated, and the annunciator remains lit, select the opposite tank. Since there may be difficulty in obtaining the fuel from the tank with the malfunctioning boost pump, a precautionary landing at the nearest suitable airport should be considered to identify and correct the problem.

Should the engine driven fuel pump fail to produce sufficient pressure to sustain engine performance, the FUEL PRESS light on the annunciator panel will illuminate. Immediately select the emergency fuel pump ON. The FUEL PRESS annunciator will extinguish when adequate fuel pressure is restored. The emergency fuel pump should also be turned ON during takeoff and landing.

Fuel leaving the left or right collector/sump tank flows to a selector valve which is located on the right fuselage side behind the copilot's seat in a non-pressurized compartment. All fuel lines passing through the pressurized cabin are metal tubes surrounded by plastic cushion and encased by a second metal tube. This second tube is sealed from the cabin environment to preclude fuel from entering the cabin area or pressurized cabin air from entering fuel lines in the event of a leak.

The selector valve is cable controlled by a thumbsized handle located to the right of the parking brake handle. The detented selections are OFF, LEFT, RIGHT. LEFT or RIGHT positions direct fuel flow to the engine from the tank selected. To select OFF the fuel selector must be moved to the left tank position, moved down against spring pressure, then moved to the far left, or OFF position.

Fuel flows from the fuel selector forward to the fuel filter located below the baggage floor on the right side. The filter drain is a nylon tube located on the right side of the aircraft, forward of the wing. To drain fuel simply push in the nylon tube. If contaminants clog the filter, an internal relief valve will allow fuel to bypass the filter. This will allow unfiltered fuel to reach the engine and could contaminate the fuel distribution system in the engine.

NOTE

Regular servicing of the filter and examination of fuel samples for contamination is required.

Fuel flows from the filter, forward through the emergency fuel pump and firewall, into the engine compartment, to the engine-driven pump.

7.19 FUEL SYSTEM (continued)

When beginning flight operations with an equal amount of fuel in each tank, start, taxi, takeoff, and climb on the left tank. When beginning operations with unequal amounts of fuel in each tank, care must be taken not to exceed the fuel imbalance limitations specified in Section 2, paragraph 2.37(e).

After established in the cruise configuration, the mixture should be leaned. See Section 4 for proper leaning procedure. To maintain lateral balance, it is suggested that alternate tanks be selected in 20 gallon (approximately 60 minute) increments, thus requiring minimal aileron force to keep the wings level. In any case, the fuel imbalance limitations in Section 2 must not be exceeded. The pilot must monitor the fuel quantity indications and switch tanks as required. Fuel cannot be used from both tanks at the same time.

7.21 ELECTRICAL SYSTEM

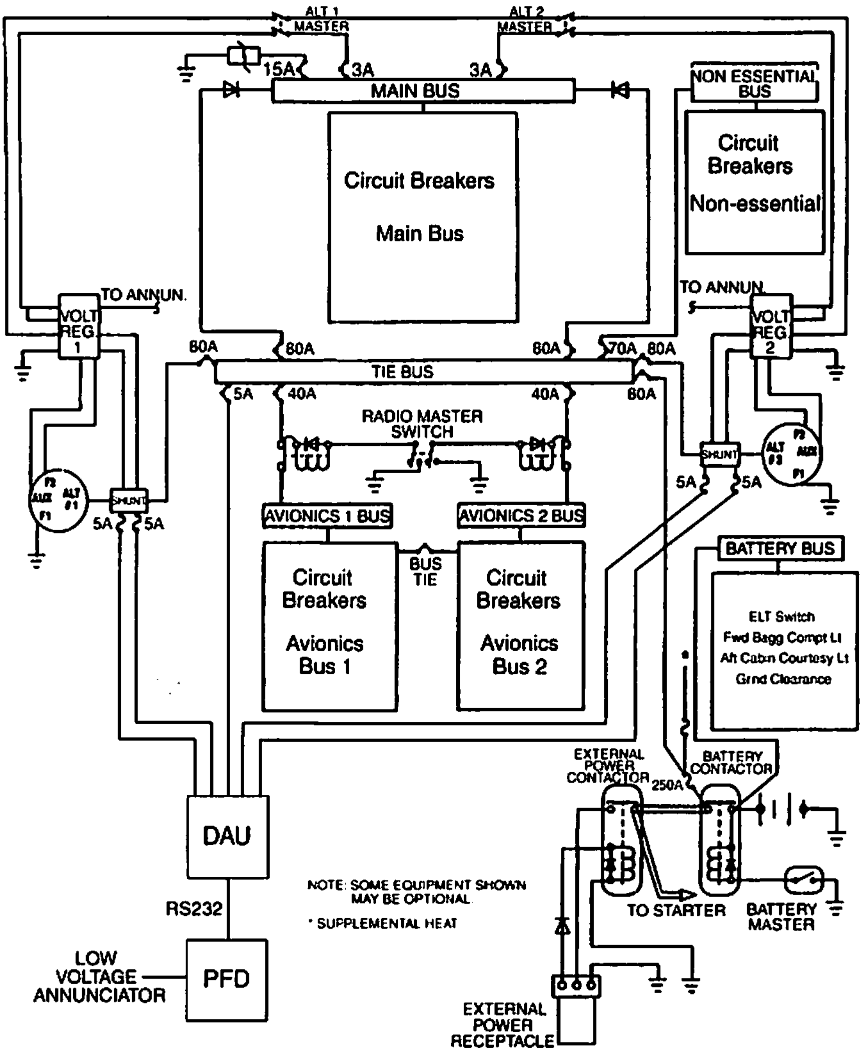
Power for the 28 Vdc, negative ground, dual fed split bus electrical system (Figure 7-17) is supplied by two belt driven, parallel connected, 28 Vdc 75 ampere self exciting alternators mounted on the forward section of the engine. When both alternators are operating and turned ON, a maximum continuous output of 150 amps is available. A 24 Vdc, 16 ampere hour lead acid battery, located beneath the left floor panel of the forward baggage compartment, provides power for engine starting. The battery also serves as a source of emergency electrical power in the event both alternators fail.

Electrical switches are located in one of two switch panels:

(a) All powerplant, avionics, and exterior light switches are located in an overhead switch panel (Figure 7-19).
(b) A switch panel located to the right of the MFD contains all de-ice/anti-ice (if installed) and environmental control related switches (Figure 7-23).

A battery bus, located in the battery compartment, provides a continuous source of power for the ELT switch, ground clearance, forward baggage compartment light, and aft cabin courtesy light. Because the battery bus is connected directly to the battery, power is available for these functions even when the Battery Master switch is OFF. Fuses located on the battery bus are used to protect these circuits.

7.21 ELECTRICAL SYSTEM (continued)



ELECTRICAL POWER DISTRIBUTION SYSTEM
Figure 7-17

7.21 ELECTRICAL SYSTEM (continued)

When the Battery Master switch, located on the overhead switch panel, is turned ON, the battery solenoid contactor closes, enabling current to flow from the battery to both the starter solenoid contactor and the tie bus located on the lower right section of the pilot's instrument panel (Figure 7-23). Should the airplane's battery be depleted, a receptacle located inside the forward baggage compartment door permits using an external 24 Vdc power supply for engine start. With the Battery Master switch OFF, connecting an appropriate external power source completes a circuit that closes the external power solenoid contactor, permitting current to flow from the external source direct to the starter contactor and the tie bus. Whether using the airplane's battery, or external power, tie bus overcurrent protection is provided by the 80 amp tie bus BATTERY circuit breaker and a 250 amp in line current limiter fuse.

A low bus voltage annunciator light will illuminate when the system voltage drops back below 25 ± 0.3Vdc.

NOTE

When utilizing just the airplane's battery, or just a 24 volt external power source, the LOW BUS VOLTAGE annunciator will be illuminated. Check the voltmeter for correct voltage.

Each alternator system is provided an independent ON-OFF switch, located on the main switch panel, and a solid state voltage regulator that automatically regulates alternator field current. When selected ON, the positive output of each alternator is fed through individual shunts to the tie bus. Overcurrent protection is provided by the 80 amp tie bus ALTR 1 and ALTR 2 circuit breakers. Should an overvoltage condition occur in either alternator, its voltage regulator will shut off the field winding voltage of that alternator; thus overvoltage relays are not required. Output from either alternator can be shut off manually by turning that alternator's switch OFF. When either alternator fails, or is selected OFF, the appropriate ALTERNATOR INOP annunciator light will illuminate.

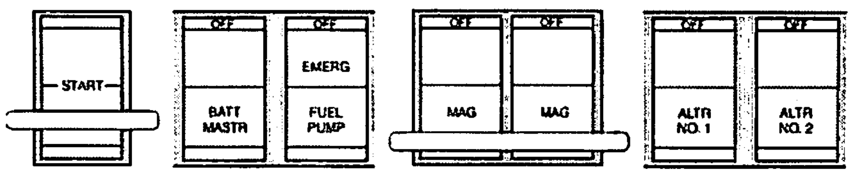
A main bus and a nonessential bus (Figure 7-21), with associated circuit breakers, are located on the lower right side of the instrument panel. Two avionics buses, with associated circuit breakers (Figure 7-21), are also located on the lower right side of the instrument panel. The two avionics buses are interconnected through the avionics bus 25 amp BUS TIE circuit breaker.

Current is fed from the tie bus to the main bus by two conductors. In line diodes prevent reverse current flow to the tie bus. Two tie bus 80 amp MAIN BUS circuit breakers (Figure 7-21) protect the main bus from an overload.

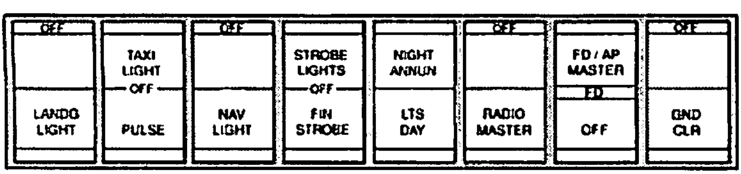
7.21 ELECTRICAL SYSTEM (continued)

Current from the tie bus is fed to each avionics bus through independent solenoid contactors. When the Radio Master switch is selected ON, both solenoid contactors close, permitting current flow to both avionics buses. Avionics bus overload protection is provided by the 40 amp tie bus AVIONICS NO. 1 and AVIONICS NO. 2 circuit breakers (Figure 7-21). Should the need arise, either avionics bus can be isolated by pulling out the avionics bus BUS TIE circuit breaker and the appropriate tie bus avionics circuit breaker.

The nonessential bus is also fed from the tie bus. Overload Protection is provided by the tie bus 70 amp NON-ESSEN circuit breaker (Figure 7-21).



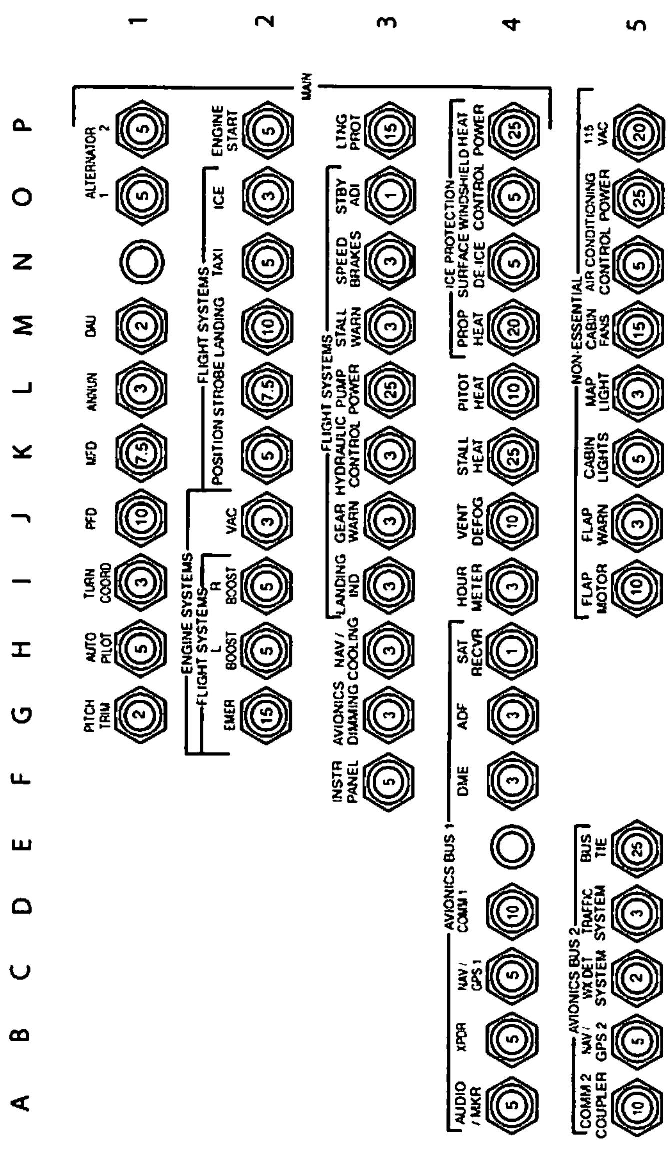
LEFT



RIGHT

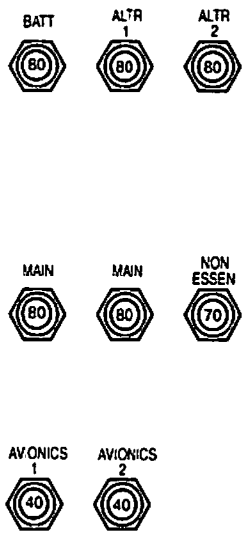
OVERHEAD SWITCH PANEL
Figure 7-19

7.21 ELECTRICAL SYSTEM (continued)



CIRCUIT BREAKER PANEL
(shown with options installed)
Figure 7-21

7.21 ELECTRICAL SYSTEM (continued)



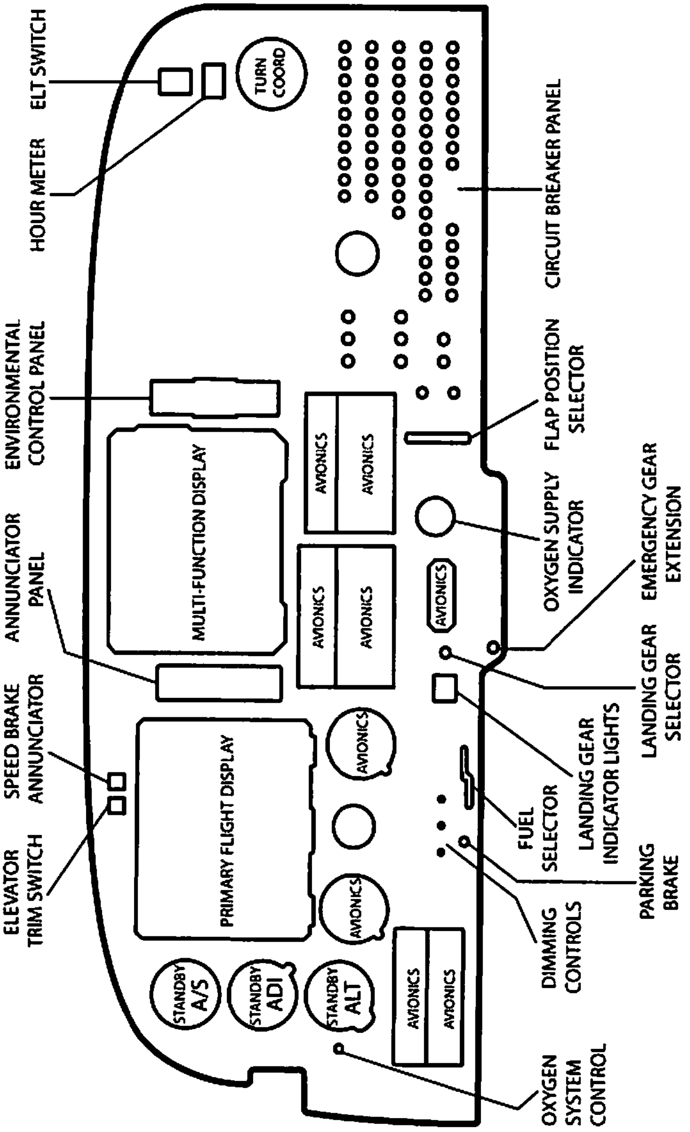
CIRCUIT BREAKER PANEL
(tie bus circuit breakers)
Figure 7-21 (continued)

7.23 INSTRUMENT PANEL

The instrument panel is designed to accommodate the flight instruments and the required power plant instruments.

See Figure 7-23.

7.23 INSTRUMENT PANEL (continued)



INSTRUMENT PANEL (Typical)
Figure 7-23

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7.25 PITOT STATIC SYSTEM (Refer to Figure 7-25)

Pitot pressure for the airspeed indicators is sensed by a heated pitot head installed on the bottom of the left wing and is carried through lines within the wing and fuselage to the ADAHRS unit on the PFD. Static pressure for the ADAHRS unit and standby altimeter and airspeed indicators is sensed by static source ports on each side of the rear fuselage forward of the elevator.

An alternate static source control valve is located below the instrument panel to the left of the pilot. For normal operation, the lever remains down. To select alternate static source, place the lever in the up position. When the alternate static source is selected, the airspeed, altimeter and vertical speed indicator are vented to an alternate static port on the bottom aft fuselage. During alternate static source operation, these instruments may give slightly different readings. The pilot can determine the effects of the alternate static source on instrument readings by switching from standard to alternate sources at different airspeeds. Corrections for each operating mode are shown in Section 5, Performance.

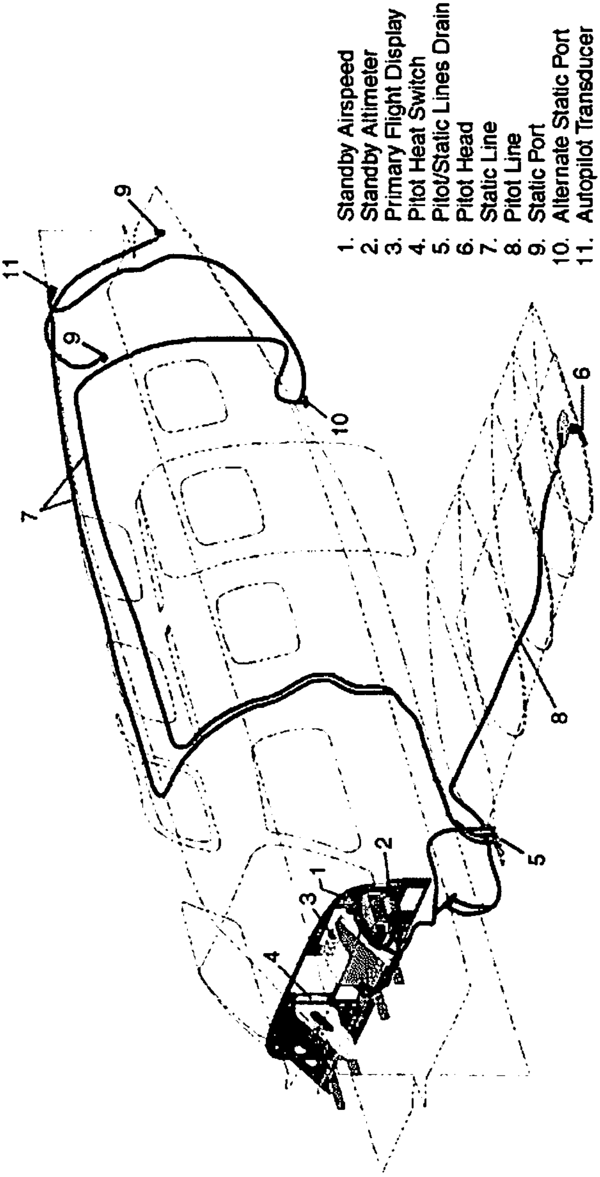
If one or more of the pitot static instruments malfunction, the system should be checked for dirt, leaks or moisture.

The holes in the sensors for pitot and static pressure must be fully open and free from blockage. Blocked sensor holes will give erratic or zero readings on the instruments.

Both the pitot and static can be drained through three separate drain valves located on the left lower side panel next to the pilot's seat. The forward two drain valves are the static drains and the aft drain valve is the pitot drain.

The heated pitot head, which alleviates problems with icing and heavy rain, is standard equipment. The switch for pitot heat is located on the environmental control panel. Static source ports have been demonstrated to be non-icing; however, in the event that icing does occur, selecting the alternate static source will alleviate the problem.

7.25 PITOT STATIC SYSTEM (continued)



PITOT STATIC SYSTEM
Figure 7-25

7.27 ENVIRONMENTAL SYSTEM (Refer to Figure 7-27)

The environmental system consists of:

(a) The ventilating air system.
(b) A supplemental electric cabin heater.
(c) An air conditioning system.
(d) The cabin air distribution system.

Switches to control and regulate the various systems are located on the switch panel to the right of the MFD.

Cabin ventilation is provided by ambient ram air and cabin heat is provided by ambient ram air routed through an exhaust shroud heat exchanger. Desired cabin comfort is maintained by using the cabin temp push-pull knob to manually adjust a flapper-type control valve located forward of the firewall. The position of this valve will allow ambient air, or hot air, or a mixture of both to enter the cabin air distribution system. Air is then routed into the cabin through the lower left and right side panel ducts.

An electric vane-axial ventilation/defog blower, located in the left cabin air inlet duct below the forward baggage compartment floor, is used to produce an air flow to the windshield defogger, and to supplement the inflow of ventilating air during ground operations. The blower is activated by selecting the VENT/DEFOG switch ON. Incoming ventilating air can be heated by mixing it with hot air from the exhaust shroud.

7.27 ENVIRONMENTAL SYSTEM (Refer to Figure 7-27) (continued)

The supplemental electric heater consists of a resistance type heat element, a dual hermetically sealed bimetallic type overtemperature protection, a power relay, and a 35 amp in line current limiter fuse. Its function is to provide additional heat for maintaining desired cabin comfort during ground or flight operations under temperature conditions when fully heated muff air or ventilating air is inadequate. When an external power source is used, the supplemental heater can also be used to preheat the cabin prior to engine start. See Section 2 for limitations on use of the supplemental heater.

The supplemental heater heat element is installed forward of the bulkhead in the left bleed air duct immediately downstream of the ventilation/defog blower. Because the ventilation/defog blower must be operating whenever supplemental heat is used, both the VENT/DEFOG and AUX CBN HEAT switches must be ON to supply power to the heating element.

Both the heater control circuit and the vent/defog fan circuit utilize the 10 amp VENT DEFOG circuit breaker located on the main circuit breaker panel. Heater element power is supplied from the battery master solenoid through the 35 amp heater fuse and the heater power relay. The 35 amp heater fuse is not accessible to the pilot. The electrical load imposed by the heater and the vent/defog fan is 40.35 amps. Operation is limited to airplanes with both alternators functioning.

Cabin air conditioning is provided by a vapor cycle system. The freon compressor is belt driven by the engine. Condenser cooling airflow is provided by a continuous duty motor driven fan. Cabin air is recirculated across the evaporators to provide cool air at each seat outlet.

The condenser and its cooling air fan are located in the tailcone immediately aft of the rear pressure bulkhead. Cooling air from outside the tailcone is drawn into the cooling air duct through a flush opening in the skin, routed across the condenser coil, and discharged overboard through the tailcone exit opening.

Two recirculation blowers and evaporator assemblies are located aft of each rear seat below the rear baggage compartment floor. The recirculation blowers draw air into each evaporator coil through grills in the floor structure behind the rear seats and discharges it into the upper left and right cabin side panel ducts. Adjustable eyeball outlets are located at each seat in the airplane.

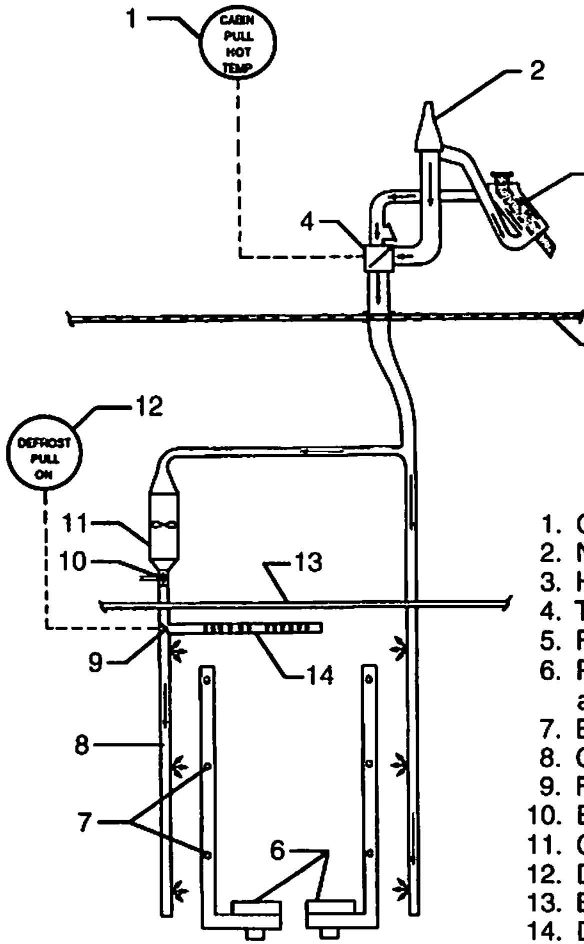
7.27 ENVIRONMENTAL SYSTEM (Refer to Figure 7-27) (continued)

The AIR COND and BLOWER HI & LO switches, located as part of the environmental switch panel, are used to control the air conditioning system.

When the AIR COND switch is selected ON, the compressor belt drive is electrically clutched, the condenser blower motor relay is closed, and both recirculation blowers are activated. The recirculation blowers can be operated independently of the air conditioner by selecting the BLOWER HI or LO on. In either situation, the BLOWER switches are used only to select a HI or LO recirculation blower motor speed. When selecting between BLOWER HI and BLOWER LO the switch currently "on" should be deselected to "off" before selecting the other "on". Overcurrent protection is provided by the 15 amp CABIN FANS, 5 amp AIR CONDITIONER CONTROL, and 25 amp AIR CONDITIONER POWER circuit breakers in the nonessential bus section of the circuit breaker panel.

The freon portion of the system incorporates a receiver dryer, a sight gauge, suction and discharge service valves, and 265 psi high pressure and 40 psi low pressure switches. Should the compressor discharge pressure increases above 265 psi, or decrease below 40 psi, the applicable pressure switch will open, disengaging the freon compressor clutch.

7.27 ENVIRONMENTAL SYSTEM (Refer to Figure 7-27) (continued)



1. Cabin Temp Control
2. NACA flush inlet
3. Heat Muff
4. Temp Control Valve
5. Firewall
6. Recirculation Blowers and Evaporators
7. Eyeballs (6)
8. Conditioned Air
9. Flow Restrictor
10. Electric Duct Heater
11. Ground Blower
12. Defrost Control
13. Bulkhead
14. Defroster

ENVIRONMENTAL SYSTEM
Figure 7-27

7.29 OXYGEN SYSTEM

CAUTION

Positively **NO SMOKING** while oxygen is being used by anyone in the aircraft.

The fixed oxygen system provides supplementary oxygen for the crew and passengers during high altitude flights (above 10,000 feet). The major components of the Aerox oxygen system are a 50 cubic foot oxygen cylinder, an oxygen supply gauge, an ON-OFF flow control knob, a pressure regulator, six plug-in receptacles and six oxygen masks with individual flowmeter/regulators.

The oxygen cylinder is mounted on the aft equipment shelf behind the aft closeout panel. When fully charged, the cylinder contains oxygen at a pressure of 1850 psi at 70°F. The oxygen supply gauge is mounted in the instrument panel. The oxygen flow control knob, labeled Oxygen/Pull-On is also mounted in the instrument panel. The pressure regulator is mounted directly on the oxygen cylinder. Once the oxygen flow control knob is on, each of the oxygen plug-in receptacles operates as an automatic on-off valve. The oxygen cylinder can be recharged through the O_2 fill port on the left side of the fuselage.

If high altitude flight is anticipated, it should be determined that the oxygen supply is adequate for the proposed flight and that the passengers are briefed. When oxygen is required, the control knob should be pulled to the ON position, allowing oxygen to flow from the cylinder through the system. Connecting the constant flow mask fitting to a receptacle and turning it 90 degrees clockwise, automatically releases oxygen to the mask through the on-off valve feature of the receptacle.

Each mask assembly oxygen line incorporates a flowmeter/regulator. The black ball in the flowmeter serves as a visual indication that oxygen is flowing and of the amount of oxygen being delivered. The flowmeter/regulator should be set by holding it vertically and turning the black knob to adjust the flow until the black indicator ball reaches the planned cruising altitude on the standard mask scale. Do not use the smaller scale for oxygen conserving equipment. The occupant can then don the mask and breathe normally for a sufficient supply of oxygen. If the actual cruising altitude changes or if the flowmeter ball drops below the actual cruising altitude, the regulator must be adjusted to ensure adequate flow of oxygen. If the flowmeter ball cannot be adjusted to the proper altitude, descend immediately to a safe altitude.

7.29 OXYGEN SYSTEM (continued)

When not in use, masks may be stowed in the removable pouches between the front and center seats. Always remove fittings from the oxygen receptacles and stow masks when they are not in use. If the control knob is pulled on and the fitting is in the receptacle, oxygen will flow through the mask continuously. Masks may be damaged if they are not properly stowed.

To stop the flow of oxygen through the system, the control knob should be pushed to the OFF position. Verify that the cylinder valve has closed completely and the flow of oxygen has stopped, by observing the indicator ball on a flowmeter. To bleed down low pressure lines, it is recommended that the mask assembly be left connected to the outlet for at least three minutes after the control knob is turned off.

To preclude the possibility of fire by spontaneous combustion, oil, grease, paint, hydraulic fluid, and other flammable material should be kept away from oxygen equipment.

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7.31 VACUUM SYSTEM (optional) (Refer to Figure 7-29)

The vacuum system is installed only when the optional Ice Protection System is installed.

Vacuum for the system is provided by two continuously operating engine driven dry air vacuum pumps; one rotating clockwise and one rotating counterclockwise. Either pump can independently support the system. Also included are two regulators, a low vacuum switch, and an inlet air filter.

The two vacuum regulators are mounted on the forward pressure bulkhead in the forward baggage compartment

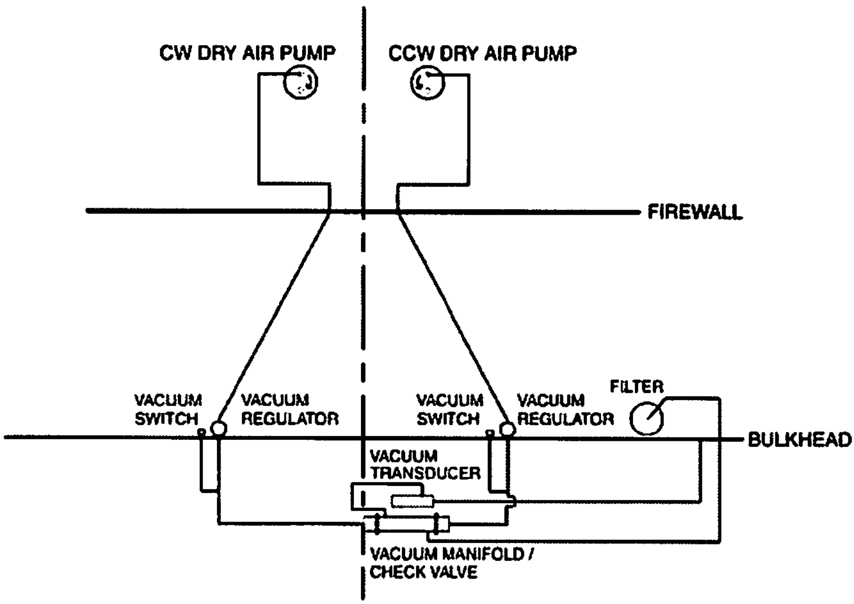
A vacuum indication on the MFD and two vacuum failure annunciators provide information to the pilot regarding the operation of both pumps. When both pumps are operating, neither annunciator is illuminated. The No. 1 vacuum failure annunciator will illuminate should the clockwise rotating pump fail, while the No. 2 vacuum failure annunciator will illuminate should the counterclockwise rotating pump fail.

Any decrease in system vacuum may indicate a dirty filter, dirty screens, sticking vacuum regulator, or a leak in the system.

Upon completion of the flight, all system abnormalities or malfunctions should be checked by a mechanic, and necessary repairs made.

Operators of airplanes equipped with wing and tail deicers should refer to Section 9, Supplements, for additional information concerning the vacuum system.

7.31 VACUUM SYSTEM (continued)



VACUUM SYSTEM
Figure 7-29

7.33 CABIN FEATURES

The front seats are adjustable fore and aft and vertically. Pivoting armrests are provided on the inboard side of each seat.

Shoulder harnesses with inertia reels are standard equipment for all seats. The inertia reel should be checked by tugging sharply on the strap. The reel will lock in place under this test and prevent the strap from extending. Under normal movement the strap will extend and retract as required.

The shoulder harness is routed over the shoulder adjacent to the windows and attached to the lap belt buckle.

Shoulder harnesses shall be worn during takeoff, landing and during an emergency situation.

Standard cabin features include map pockets, cup holders, sun visors, stowage drawers under the aft facing seats and a baggage restraint net behind the rear seats.

Two combination instrument panel flood/map lights are provided forward, and four passenger reading lights are provided aft. A cabin entrance flood light is located above the door.

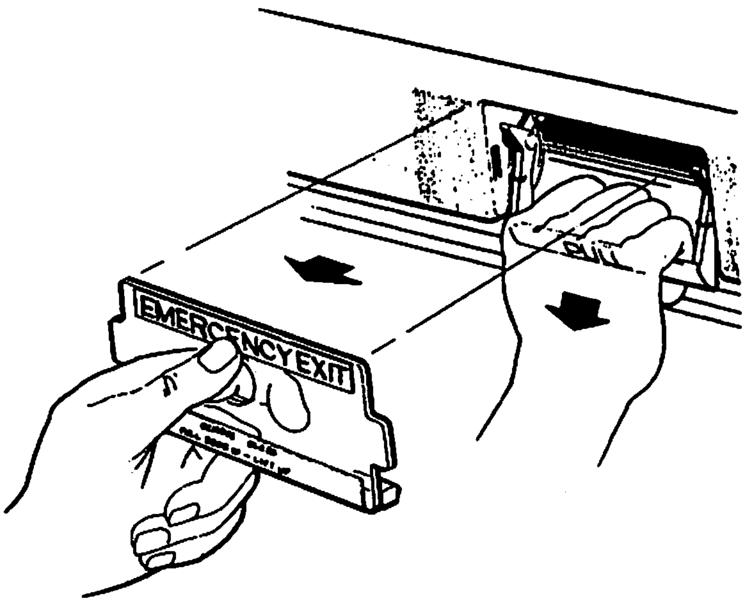
The four passenger seats with folding armrests and headrests are positioned in a club seating arrangement. The center seats face aft. The seat backs recline by pushing a button mounted in the outboard armrest.

An optional conference table located between the right passenger seats is available. The table is extended by pulling in on the upper edge of the leaf and then upward. The leaf is then rotated down into position and unfolded. Reverse this procedure for stowage.

A portable fire extinguisher is located on the floor just aft of the spar carry-thru and behind the copilot's seat. It is secured by a quick-release bracket.

The emergency exit is located on the right side of the fuselage, adjacent to the aft facing seat. Instructions for opening the emergency exit are placarded on the cover over the handle. To open, remove the cover and pull the handle. The window releases inward. (See Figure 7-31.)

7.33 CABIN FEATURES (continued)



EMERGENCY EXIT
Figure 7-31

7.35 BAGGAGE AREA

The airplane has two separate baggage areas each with a 100-pound capacity. A 13-cubic-foot forward baggage compartment, located just aft of the firewall, is accessible through a 19 x 23 inch door on the left side of the fuselage. An aft baggage compartment, which is accessible from inside the cabin, is located behind the back seats.

A forward baggage door annunciation system senses the baggage door latch position. If the baggage door is not closed and latched, the DOOR AJAR annunciator light will illuminate on the annunciator panel.

NOTE

It is the pilot's responsibility to be sure when the baggage is loaded that the airplane's C.G. falls within the allowable C.G. range (refer to Section 6, Weight and Balance).

7.37 FINISH

All exterior surfaces are primed and finished with polyurethane. To keep the finish attractive looking, polyurethane touch-up paint is available from Piper Factory Authorized Service Centers.

7.39 STALL WARNING

An approaching stall is indicated by a stall warning horn sounding a continuous tone, as opposed to the landing gear horn's beeping tone. Mild airframe buffeting may also precede a stall.

The stall warning is activated by a lift transducer installed in the leading edge of the left wing. An onboard computer will distinguish between power on, power off, and flap position conditions during normal stalls, causing the horn to sound five to ten knots above the stall speed.

A graph showing stall speeds at various angles of bank is contained in Section 5.

7.41 EMERGENCY LOCATOR TRANSMITTER

The Emergency Locator Transmitter (ELT) meets the requirements of FAR 91.52. It operates on self-contained batteries and is located in the aft fuselage section. It is accessible through a cover on the bottom right side.

A battery replacement date is marked on the transmitter. To comply with FAA regulations, the battery must be replaced on or before this date. The battery must also be replaced if the transmitter has been used in an emergency situation, if the accumulated test time exceeds one hour, or if the unit has been inadvertently activated for an undetermined time period.

NOTE

If for any reason a test transmission is necessary, the test transmission should be conducted only in the first five minutes of any hour and limited to three audio sweeps. If a test must be made at any other time, the test should be coordinated with the nearest FAA tower or flight service station.

ARTEX ELT OPERATION

On the ELT unit itself is a two position switch placarded ON and OFF. The OFF position is selected when the transmitter is installed at the factory and the switch should remain in that position whenever the unit is installed in the airplane.

A pilots remote switch, placarded ON and ARM is located on the copilots instrument panel to allow the transmitter to be armed or turned on from inside the cabin. The switch is normally in ARM position. Moving the switch to ON will activate the transmitter. A warning light located above the remote switch will alert you when ever the ELT is activated.

Should the ELT be activated inadvertently it can be reset by either positioning the remote switch to the ON then immediately relocating it to the ARM position, or by setting the switch on the ELT to ON and then back to OFF.

In the event the transmitter is activated by an impact, it can be turned off by moving the ELT switch OFF. Normal operation can then be restored by resetting the switch to ARM. It may also be turned off and reset by positioning the remote switch to the ON and then immediately to the ARM position.

7.41 EMERGENCY LOCATOR TRANSMITTER (continued)

ARTEX ELT OPERATION (continued)

The transmitter can be activated manually at any time by placing either the remote switch or the ELT switch to the ON position.

NOTE

Three sweeps of the emergency tone and an illuminated warning light indicates a normally functioning unit. The warning light must illuminate during the first 3 second test period. If it does not illuminate, a problem is indicated such as a "G" switch failure.

The ELT should be checked during postflight to make certain the unit has not been activated. Check by selecting 121.50 MHz on an operating receiver. If a downward sweeping audio tone is heard the ELT may have been activated. Set the remote switch to ON. If there is no change in the volume of the signal, your airplane's ELT is probably transmitting. Setting the remote switch back to OFF will automatically reset the ELT and should stop the signal being received on 121.50 MHz.

7.43 EXTERNAL POWER

The external power receptacle allows the airplane engine to be started from an external power source without the necessity of gaining access to the airplane battery. The cable from the external power source can be attached to a receptacle, located on the aft side of the forward baggage compartment. Instructions on a placard located on the cover of the receptacle should be followed when starting with external power. For instructions on the use of starting with external power, refer to Engine Start With External Power Source in Section 4.

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TABLE OF CONTENTS

SECTION 8

AIRPLANE HANDLING, SERVICING, AND MAINTENANCE

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SECTION 8

AIRPLANE HANDLING, SERVICING, AND MAINTENANCE

8.1 GENERAL

This section provides guidelines relating to the handling, servicing, and maintenance of the PA-46R-350T. For complete maintenance instructions, refer to the PA-46R-350T Maintenance Manual.

WARNING

Inspection, maintenance and parts requirements for all non-PIPER approved STC installations are not included in this handbook. When a non-PIPER approved STC installation is incorporated on the airplane, those portions of the airplane affected by the installation must be inspected in accordance with the inspection program published by the owner of the STC. Since non-PIPER approved STC installations may change systems interface, operating characteristics and component loads or stresses on adjacent structures, PIPER provided inspection criteria may not be valid for airplanes with non-PIPER approved STC installations.

WARNING

Modifications must be approved in writing by PIPER prior to installation. Any and all other installations, whatsoever, of any kind will void this warranty in it's entirety.

8.1 GENERAL (continued)

WARNING

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

Genuine PIPER parts are produced and inspected under rigorous procedures to insure airworthiness and suitability for use in PIPER airplane applications. Parts purchased from sources other than PIPER, even though 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.

Additionally, reworked or salvaged parts or those parts obtained from non-PIPER approved sources, may have service histories which are unknown or cannot be authenticated, may have been subjected to unacceptable stresses or temperatures or may have other hidden damage not discernible through routine visual or nondestructive testing. This may render the part, component or structural assembly, even though originally manufactured by PIPER, unsuitable and unsafe for airplane use.

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

8.1 GENERAL (continued)

Every owner should stay in close contact with an authorized Piper Service Center or Piper's Customer Services Department to obtain the latest information pertaining to their airplane, and to avail themselves of Piper's support systems.

Piper takes a continuing interest in having owners get the most efficient use from their airplane and keeping it in the best mechanical condition. Consequently, Piper, from time to time, issues service releases including Service Bulletins, Service Letters, Service Spares Letters, and others relating to the airplane.

Piper Service Bulletins are of special importance and Piper considers compliance mandatory. These are available on the Piper.com website. Depending on the nature of the release, material and labor allowances may apply. This information is provided to all authorized Piper Service Centers.

Service Letters deal with product improvements and servicing techniques pertaining to the airplane. These are available on the Piper.com website. Owners should give careful attention to Service Letter information.

Service Spares Letters offer improved parts, kits, and optional equipment which were not available originally, and which may be of interest to the owner.

Maintenance manuals, parts catalogs, and revisions to both, are available from Piper Service Centers or Piper's Customer Services Department.

Any correspondence regarding the airplane should include the airplane model and serial number to ensure proper response.

8.3 AIRPLANE INSPECTION PERIODS

WARNING

All inspection intervals, replacement time limits, overhaul time limits, the method of inspection, life limits, cycle limits, etc., recommended by PIPER are solely based on the use of new, remanufactured or overhauled PIPER approved parts. If parts are designed, manufactured, remanufactured, overhauled and/or approved by entities other than PIPER, then the data in PIPER'S maintenance/service manuals and parts catalogs are no longer applicable and the purchaser is warned not to rely on such data for non-PIPER parts. All inspection intervals, replacement time limits, overhaul time limits, the method of inspection, life limits, cycle limits, etc., for such non-PIPER parts must be obtained from the manufacturer and/or seller of such non-PIPER parts.

Piper has developed inspection items and required inspection intervals for the PA-46R-350T (see PA-46R-350T Maintenance and Inspection Manuals). The PA-46R-350T Inspection Manual contains appropriate forms, and all inspection procedures should be complied with by a properly trained, knowledgeable, and qualified mechanic at an authorized Piper Service Center or a reputable repair shop. Piper cannot accept responsibility for the continued airworthiness of any aircraft not maintained to these standards, and/or not brought into compliance with applicable Service Bulletins issued by Piper, instructions issued by the engine, propeller, or accessory manufacturers, or Airworthiness Directives issued by the FAA.

A programmed Inspection, approved by the Federal Aviation Administration (FAA), is also available to the owner. This involves routine and detailed inspections to allow maximum utilization of the airplane. Maintenance inspection costs are reduced, and the maximum standard of continued airworthiness is maintained. Complete details are available from Piper.

In addition, but in conjunction with the above, the FAA requires periodic inspections on all aircraft to keep the Airworthiness Certificate in effect. The owner is responsible for assuring compliance with these inspection requirements and for maintaining proper documentation in logbooks and/or maintenance records.

8.3 AIRPLANE INSPECTION PERIODS (continued)

A spectrographic analysis of the engine oil is available from several sources. This inspection, if performed properly, provides a good check of the internal condition of the engine. To be accurate, induction air filters must be cleaned or changed regularly, and oil samples must be taken and sent in at regular intervals.

8.5 PREVENTIVE MAINTENANCE

The holder of a pilot certificate issued under Federal Aviation Regulations (FAR) Part 61 may perform certain preventive maintenance as defined in the FARs. This maintenance may be performed only on an aircraft which the pilot owns and operates, and which is not used in air carrier or air taxi/commercial operations service.

All other aircraft maintenance must be accomplished by a person or facility appropriately certificated by the Federal Aviation Administration (FAA) to perform that work.

Anytime maintenance is accomplished, an entry must be made in the appropriate aircraft maintenance records. The entry shall include:

(a) The date the work was accomplished.
(b) Description of the work.
(c) Number of hours on the aircraft.
(d) The certificate number of pilot performing the work.
(e) Signature of the individual doing the work.

8.7 AIRPLANE ALTERATIONS

If the owner desires to have his aircraft modified, he must obtain FAA approval for the alteration. Major alterations accomplished in accordance with advisory Circular 43.13-2, when performed by an A & P mechanic, may be approved by the local FAA office. Major alterations to the basic airframe or systems not covered by AC 43.13-2 require a Supplemental Type Certificate.

8.7 AIRPLANE ALTERATIONS (continued)

The owner or pilot is required to ascertain that the following aircraft papers are in order and in the aircraft.

(a) To be displayed in the aircraft at all times:
   (1) Aircraft Airworthiness Certificate Form FAA-8100-2.
   (2) Aircraft Registration Certificate Form FAA-8050-3.
   (3) Aircraft Radio Station License if transmitters are installed.

(b) To be carried in the aircraft at all times:
   (1) Pilot's Operating Handbook.
   (2) Weight and Balance data plus a copy of the latest Repair and Alteration Form FAA-337, if applicable.
   (3) Aircraft equipment list.

Although the aircraft and engine logbooks are not required to be in the aircraft, they should be made available upon request. Logbooks should be complete and up to date. Good records will reduce maintenance cost by giving the mechanic information about what has or has not been accomplished.

8.9 GROUND HANDLING

(a) Towing

The airplane may be moved on the ground by the use of the nose wheel steering bar that is stowed in the forward baggage compartment or by power equipment that will not damage or excessively strain the nose gear steering assembly.

CAUTION

When towing with power equipment, do not turn the nose gear beyond its steering limit in either direction, as this will result in damage to the nose gear and steering mechanism.

CAUTION

Do not tow the airplane when the controls are secured.

In the event towing lines are necessary, ropes should be attached to both main gear struts as high up on the tubes as possible. Lines should be long enough to clear the nose and/or tail by not less than fifteen feet, and a qualified person should ride in the pilot's seat to maintain control by use of the brakes.

8.9 GROUND HANDLING (continued)

(b) Taxiing

CAUTION

Do not operate engine above 1200 rpm with cabin doors open.

Before attempting to taxi the airplane, ground personnel should be instructed and approved by a qualified person authorized by the owner. Engine starting and shut-down procedures as well as taxi techniques should be covered. When it is ascertained that the propeller back blast and taxi areas are clear, power should be applied to start the taxi roll, and the following checks should be performed:

(1) Taxi a few feet forward and apply the brakes to determine their effectiveness.
(2) Taxi with the propeller set in low pitch, high rpm setting.
(3) While taxiing, make slight turns to ascertain the effectiveness of the steering.
(4) Observe wing clearance when taxiing near buildings or other stationary objects. If possible, station an observer outside the airplane.
(5) When taxiing over uneven ground, avoid holes and ruts.
(6) Do not operate the engine at high rpm when running up or taxiing over ground containing loose stones, gravel, or any loose material that may cause damage to the propeller blades.

(c) Parking

When parking the airplane, be sure that it is sufficiently protected from adverse weather conditions and that it presents no danger to other aircraft. When parking the airplane for any length of time or overnight, it is suggested that it be moored securely.

(1) To park the airplane, head it into the wind if possible.
(2) The parking brake knob is located just below the left control column. To set the parking brake, first depress and hold the toe brakes and then pull out on the parking brake knob. To release the parking brake, first depress the brake pedals and then push in on the parking brake knob.

8.9 GROUND HANDLING (continued)

CAUTION

Care should be taken when setting brakes that are overheated or during cold weather when accumulated moisture may freeze a brake.

(3) Aileron and elevator controls should be secured with the front seat belt and chocks used to properly block the wheels.

(d) Mooring

The airplane should be moored for immovability, security and protection. The following procedures should be used for the proper mooring of the airplane:

(1) Head the airplane into the wind if possible.
(2) Retract the flaps.
(3) Immobilize the ailerons and elevator by looping the seat belt through the control wheel and pulling it snug.
(4) Block the wheels.
(5) Secure tiedown ropes to wing and tail tiedown rings at approximately 45 degree angles to the ground. When using rope of non-synthetic material, leave sufficient slack to avoid damage to the airplane should the ropes contract.

CAUTION

Use bowline knots, square knots or locked slip knots. Do not use plain slip knots.

NOTE

Additional preparations for high winds include using tiedown ropes from the nose landing gear and securing the rudder.

8.9 GROUND HANDLING (continued)

(6) Install a pitot head cover if available. Be sure to remove the pitot head cover before flight.
(7) Cabin and baggage door should be locked when the airplane is unattended.

8.11 ENGINE INDUCTION AIR FILTER

(a) Removing Induction Air Filter

(1) Remove louvered induction air panel assembly at nose of aircraft by removing screws.
(2) Remove screws around perimeter of filter on induction air inlet to withdraw inlet and filter.

(b) Cleaning Induction Air Filter

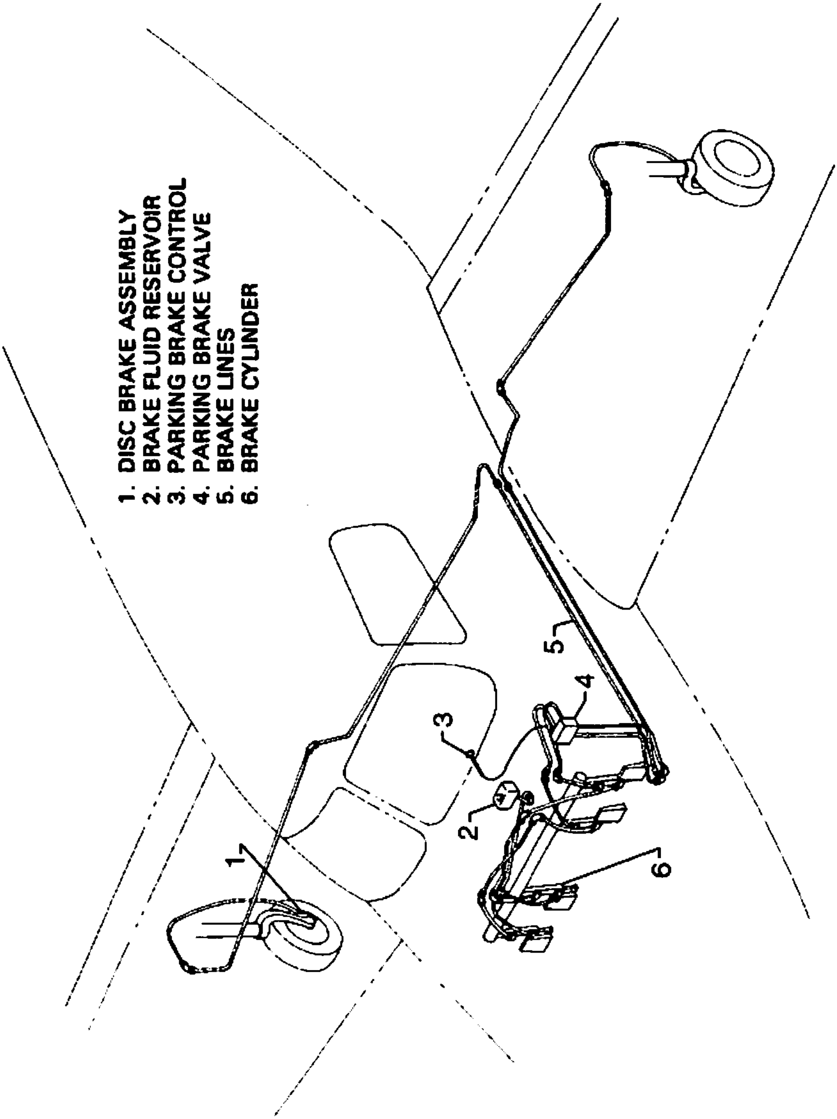
The induction air filter must be cleaned at least once every 50 hours, and more often, even daily, when operating in dusty conditions. Extra filters are inexpensive, and a spare should be kept on hand for use as a rapid replacement.

To clean the filter:
(1) Tap filter gently to remove dirt particles. Do not use compressed air or cleaning solvents.
(2) Inspect filter. If paper element is torn or ruptured or gasket is damaged, the filter should be replaced. The usable life of the filter should be restricted to one year or 500 hours, whichever comes first.
(3) After cleaning check all components for dirt and damage. Wipe the filter and inlet clean. Do not oil the filter.

(c) Installation of Induction Air Filter

Replace filter, inlet and screws. Reinstall induction air panel assembly.

8.13 BRAKE SERVICE



BRAKE SYSTEM
Figure 8-1

8.13 BRAKE SERVICE (continued)

The brake system is filled with MIL-H-5606 (petroleum base) hydraulic fluid. The fluid level should be checked periodically or at every 100 hour inspection and replenished when necessary. The brake fluid reservoir is located behind the aft access panel in the forward baggage compartment. If the entire system must be refilled, fill with fluid under pressure from the brake end of the system. This will eliminate air from the system.

No adjustment of the brake clearances is necessary. If, after extended service, brake blocks become excessively worn they should be replaced with new segments.

8.15 HYDRAULIC SYSTEM SERVICE

The hydraulic system reservoir is an integral part of the electric hydraulic pump assembly. It is located aft of the aft cabin baggage compartment and is accessible through the baggage compartment aft closeout panel. Fill the reservoir with MIL-H-5606 hydraulic fluid. The fluid level should be checked periodically or every 100 hour inspection and replenished when necessary. With the landing gear down and the system up to pressure, fill to the FULL line on the sight gauge.

8.17 LANDING GEAR SERVICE

The main landing gear uses Cleveland Aircraft Products 6.00 x 6 wheels with 6.00 x 6, eight-ply rating tires and tubes. The nose wheel uses a McCauley or a Cleveland Aircraft Products 5.00 x 5 wheel with a 5.00 x 5 six-ply rating, type III tire and tube. (Refer to paragraph 8.25.)

Wheels are removed by taking off the hub cap, cotter pin, axle nut, and bolts holding the brake segment in place. Mark tire and wheel for reinstallation; then dismount by deflating the tire, removing the through-bolts from the wheel and separating the wheel halves.

Landing gear oleos should be serviced according to the instructions on the units. The main oleos should be extended under normal static load until 3.44 +/- 0.25 inches of oleo piston tube is exposed, and the nose gear should show 1.65 +/- 0.25 inches. To add air to the oleo struts, attach a strut pump to the valve assembly near the top of the oleo strut housing and pump the oleo to the desired position. To add oil, jack the aircraft, release the air pressure in the strut, remove the valve core and add oil through this opening with the strut extended. After the strut is full, compress it slowly and fully to allow excess air and oil to escape. With the strut still compressed reinsert the valve core and pump up the strut as above.

8.17 LANDING GEAR SERVICE (continued)

In jacking the aircraft for landing gear or other service, two hydraulic jacks and a tail stand should be used. At least 400 pounds of ballast should be placed on the base of the tail stand before the airplane is jacked up. The hydraulic jacks should be placed under the jack points on the bottom of the wing and the airplane jacked up until the tail skid is at the right height to attach the tail stand. After the tail stand is attached and the ballast added, jacking may be continued until the airplane is at the height desired.

The steering rods from the rudder pedals to the transverse bellcrank in the nose wheel tunnel are factory adjusted and should be readjusted only in accordance with the applicable rigging specification. Nose wheel alignment is accomplished by adjusting the rod end(s) on the steering bungee assembly in such a way that the nose wheel is in line with the fore and aft axis of the plane when the rudder pedals are centered. Alignment of the nose wheel can be checked by pushing the airplane back and forth with the rudder two degrees to the right to determine that the plane follows a straight line. The turning arc of the nose wheel is 30° +/- 1° in either direction and is limited by stops at the trunnion forging or the forward steering contact arm mounted on the engine mount.

NOTE

The rudder is set to 2° right with the rudder pedals neutralized and the nose wheel centered.

8.19 PROPELLER SERVICE

The spinner and backing plate should be cleaned and inspected for cracks frequently. Before each flight the propeller should be inspected for nicks, scratches, and corrosion. Significant damage must be repaired by a qualified mechanic prior to flight. Nicks or scratches cause an area of increased stress which can lead to serious cracks or the loss of a propeller tip. The back face of the blades should be painted when necessary with flat black paint to retard glare.

8.21 OIL REQUIREMENTS

The oil capacity of the Textron Lycoming TI0-540-AE2A engine is 12 quarts with an inflight minimum quantity of approximately 2.75 quarts. Maximum endurance flights should begin with 12 quarts of oil. For all shorter flights, it is recommended that oil be added if the quantity falls to 10 quarts. It is recommended that engine oil be drained and renewed every 50 hours, or sooner under unfavorable conditions. Full flow cartridge type oil filters should be replaced each 50 hours of operation. The following grades are required for temperatures:

Average Ambient Temperature	MIL-L-6082B SAE Grade	MIL-L-22851 Ashless Dispersant SAE Grades
All Temperatures	**MINERAL OIL NOT APPROVED**	15W-50 or 20W-50
Above 80°F		60
Above 60°F		40 or 50
30°F to 90°F		40
0°F to 70°F		30, 40 or 20W-40
Below 10°F		30 or 20W-30

When operating temperatures overlap indicated ranges, use the lighter grade oil.

NOTE

Refer to the latest issued of Lycoming Service Instruction 1014 (Lubricating Oil Recommendations) for further information.

8.23 FUEL SYSTEM

(a) Servicing Fuel System

At every 100 hour inspection or after an extended downtime, the fuel filter strainer must be cleaned. The fuel filter strainer is located below the floor on the lower right side of the forward baggage compartment.

(b) Fuel Requirements (AVGAS ONLY)

The minimum aviation grade fuel is 100. Since the use of lower grades can cause serious engine damage in a short period of time, the engine warranty is invalidated by the use of lower octanes.

Whenever 100 or 100LL grade fuel is not available, commercial grade 100/130 should be used. (See Fuel Grade Comparison Chart.) Refer to the latest issue of Lycoming Service Instruction No. 1070 (Textron Lycoming Specified Fuels).

A summary of the current grades as well as the previous fuel designation is shown in the following chart:

FUEL GRADE COMPARISON CHART

Previous Commercial Fuel Grades (ASTM-D910)			Current Commercial Fuel Grades (ASTM-D910-75)			Current Military Fuel Grades (MIL-G-5572E) Amendment No. 3		
Grade	Color	Max. TEL ml/U.S. Gal.	Grade	Color	Max. TEL ml/U.S. Gal.	Grade	Color	Max. TEL ml/U.S. Gal.
80/87	red	0.5	80	red	0.5	80/87	red	0.5
91/98	blue	2.0	*100LL	blue	2.0	none	none	none
100/130	green	3.0	100	green	**3.0	100/130	green	**3.0
115/145	purple	4.6	none	none	none	115/145	purple	4.6

* -Grade 100LL fuel in some overseas countries is currently colored green and designated as "100L."

** -Commercial fuel grade 100 and grade 100/130 (both of which are colored green) having TEL content of up to 4 ml/U.S. gallon are approved for use in all engines certificated for use with grade 100/130 fuel.

8.23 FUEL SYSTEM (continued)

The operation of the aircraft is approved with an anti-icing additive in the fuel. When an anti-icing additive is used it must meet the specification MIL-I-27686, must be uniformly blended with the fuel while refueling, must not exceed .15% by volume of the refueled quantity, and to ensure its effectiveness should be blended at not less than .10% by volume. One and one half liquid ounces per ten gallons of fuel would fall within this range. A blender supplied by the additive manufacturer should be used. Except for the information contained in this section, the manufacturer's mixing or blending instructions should be carefully followed.

CAUTIONS

Assure that the additive is directed into the flowing fuel stream. The additive flow should start after and stop before the fuel flow. Do not permit the concentrated additive to come in contact with the aircraft painted surfaces or the interior surfaces of the fuel tanks.

Some fuels have anti-icing additives pre-blended in the fuel at the refinery, so no further blending should be performed.

Fuel additive can not be used as a substitute for preflight draining of the fuel system drains.

(c) Filling Fuel Tanks

WARNINGS

Do not operate any avionics or electrical equipment on the airplane during refueling. Do not allow open flame or smoking in the vicinity of the airplane while refueling.

During all refueling operations, fire fighting equipment must be available. Two ground wires from different points on the airplane to separate approved grounding stakes shall be used.

8.23 FUEL SYSTEM (continued)

Observe all safety precautions required when handling gasoline. Fill the fuel tanks through the filler located on the forward slope of the wing. Each wing holds a maximum of 60 U.S. gallons. When using less than the standard 120 gallon capacity, fuel should be distributed equally between each side.

NOTE

Aircraft should be refueled in a wing level condition. At times this will require alternate filling of left and right tanks until the full condition is reached.

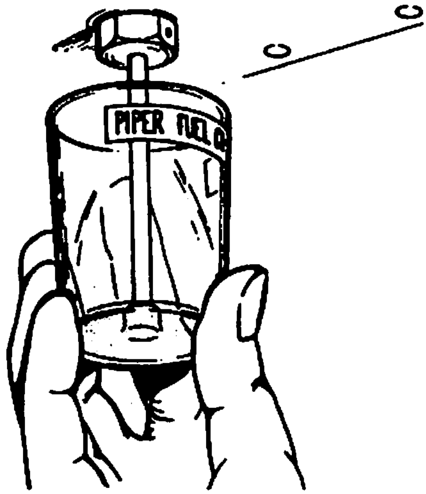
(d) Draining Fuel Strainer, Sumps and Lines

The fuel tank sumps and filter should be drained before the first flight of the day and after refueling. Set fuel selector on left or right tank before draining. The fuel collector/sump tanks, located at the root of each wing, are the lowest points in the system. Each tank drain is accessible through a hole in the bottom wing skin adjacent to the wheel well. The fuel filter drain is located on the right hand side of the fuselage several feet forward of the wing. Sumps and filter should be drained until sufficient fuel has flowed to ensure the removal of any contaminants. When draining sumps, use the end on sampler cup to push in valve, catching fuel in the cup. (Refer to Figure 8-3.) To drain filter, hold sampler cup under nylon tube and push in tube. Always inspect fuel for contaminants, water and fuel grade (color). Assure that valves have sealed after draining.

NOTE

Sump drains will lock open if valve is pushed in and turned. Continue turning to release lock.

8.23 FUEL SYSTEM (continued)



FUEL TANK DRAIN
Figure 8-3

(e) Emptying Fuel System

Drain the bulk of fuel at sump tanks. Set fuel selector on left or right tank. Push in sump drain valves and twist turn to lock open. Remaining fuel may be drained through the filter drain. Close sump drain valves before refueling.

CAUTION

Whenever the fuel system is completely drained and fuel is replenished it will be necessary to run the engine for a minimum of three minutes at 1000 rpm on each tank to insure that no air exists in the fuel supply lines.

8.25 TIRE INFLATION

For maximum service, keep tires inflated to the proper pressure: 50 psi for the nose tire and 55 psi for the main tires. All wheels and tires are balanced before original installation, and the relationship of tire, tube, and wheel should be maintained upon reinstallation. Unbalanced wheels can cause extreme vibration in the landing gear; therefore, in the installation of new components, it may be necessary to rebalance the wheels with the tires mounted. When checking tire pressure, examine the tires for wear, cuts, bruises, and slippage.

8.27 BATTERY SERVICE

Access to the 24-volt battery is gained by opening the forward baggage door and removing the left floor of the forward baggage compartment. The battery should be checked for proper fluid level. DO NOT fill the battery above the baffle plates. DO NOT fill the battery with acid - use water only. A hydrometer check will determine the percent of charge in the battery.

Inspect overflow sump for presence of battery fluid. Fluid in the sump is not a normal condition and indicates either a battery or charging system problem. If fluid is present, the electrical system must be serviced to eliminate cause and the neutralizer media in the sump jar replaced.

If the battery is not up to charge, recharge starting at a 3 amp rate and finishing with a 1.5 amp rate. Quick charges are not recommended.

8.29 OXYGEN SYSTEM

CAUTION

Positively NO SMOKING while oxygen is being used by anyone in the aircraft.

CAUTION

To preclude the possibility of fire by spontaneous combustion, oil, grease, paint, hydraulic fluid, and other flammable material should be kept away from oxygen equipment.

The oxygen system should be serviced per the PA-46R-350T Maintenance Manual, Chapter 35.

8.33 LUBRICATION

For lubricating instructions, a chart showing lubrication points and types of lubricants to be used, and lubrication methods, refer to the PA-46R-350T Maintenance Manual.

8.35 CLEANING

(a) Cleaning Engine Compartment

(1) Place a large pan under the engine to catch waste.

(2) With the engine cowling removed, spray or brush the engine with solvent or a mixture of solvent and degreaser. In order to remove especially heavy dirt and grease deposits, it may be necessary to brush areas that were sprayed.

CAUTION

Do not spray solvent into the alternators, vacuum pumps, starter, or air intakes.

(3) Allow the solvent to remain on the engine from five to ten minutes. Then rinse the engine clean with additional solvent and allow it to dry.

CAUTION

Do not operate the engine until excess solvent has evaporated or otherwise been removed.

(4) Lubricate the controls, bearing surfaces, etc., in accordance with the Lubrication Chart in the PA-46R-350T Maintenance Manual.

(5) Assure that all engine exhaust deposits and stains are removed frequently from bottom of aircraft around exhaust outlets. *Accumulation of exhaust deposits left even over short periods of time will cause corrosion.*

8.35 CLEANING (continued)

(b) Cleaning Landing Gear

Before cleaning the landing gear, place a plastic cover or similar material over the wheel and brake assembly.

CAUTION

Do not brush the micro switches.

(1) Place a pan under the gear to catch waste.
(2) Spray or brush the gear area with solvent or a mixture of solvent and degreaser, as desired. Where heavy grease and dirt deposits have collected, it may be necessary to brush areas that were sprayed, in order to clean them.
(3) Allow the solvent to remain on the gear from five to ten minutes. Then rinse the gear with additional solvent and allow to dry.
(4) Remove the cover from the wheel and remove the catch pan.
(5) Lubricate the gear in accordance with the Lubrication Chart.

(c) Cleaning Exterior Surfaces

The airplane should be washed with a mild soap and water. Harsh abrasives or alkaline soaps or detergents could make scratches on painted or plastic surfaces or could cause corrosion of metal. Cover areas where cleaning solutions could cause damage. To wash the airplane, use the following procedure:

CAUTION

Do not direct any stream of water or cleaning solutions at the openings in the pitot head, static ports, alternate static ports or fuselage belly drains.

(1) Flush away loose dirt with water.
(2) Apply cleaning solution with a soft cloth, a sponge or a soft bristle brush.
(3) To remove exhaust stains, allow the solution to remain on the surface longer.
(4) To remove stubborn oil and grease, use a cloth dampened with naphtha.
(5) Rinse all surfaces thoroughly.
(6) Any good automative wax may be used to preserve painted surfaces. Soft cleaning cloths or a chamois should be used to prevent scratches when cleaning or polishing. A heavier coating of wax on the leading surfaces will reduce the abrasion problems in these areas.

8.35 CLEANING (continued)

(d) Cleaning Windshield and Windows

CAUTION

Use only mild soap and water when cleaning the heated windshield. Use of ANY other cleaning agent or material may cause distortion or damage to windshield coatings.

(1) Remove dirt, mud and other loose particles from exterior surfaces with clean water.
(2) Wash with mild soap and warm water or with aircraft plastic cleaner. Use a soft cloth or sponge in a straight back and forth motion. Do not rub harshly.
(3) Remove oil and grease with a cloth moistened with kerosene.

CAUTION

Do not use gasoline, alcohol, benzene, carbon tetrachloride, thinner, acetone, or window cleaning sprays.

(4) After cleaning plastic surfaces, apply a thin coat of hard polishing wax. Rub lightly with a soft cloth. Do not use a circular motion.
(5) A minor scratch or mar in plastic can be removed by rubbing out the scratch with jeweler's rouge. Smooth both sides and apply wax.

(e) Cleaning Headliner, Side Panels and Seats

(1) For normal soiling and smudges, simply use the dry cleaning pad provided. This pad contains an exclusive grit- free powder with unusual power to absorb dirt.

Squeeze and twist the pad so the powder sifts through the meshes and adheres to the cloth. Then rub the soiled part in any direction, as hard as necessary to clean.

Even though the pad eventually becomes soiled, this soil will not transfer back to the headliner.

8.35 CLEANING (continued)

(2) For simple stains (e.g. coffee, cola) clean headliner with a sponge and a common household suds detergent (e.g. Tide). Dirty grease stains should be first spot cleaned with a lighter fluid containing Naphtha to remove the solvent soluble matter. Any stain residue should then be shampooed with a household upholstery cleaner (e.g. Carbona upholstery and rug shampoo).

With proper care, your headliner will provide years of excellent appearance and durability.

CAUTION

Solvent cleaners require adequate ventilation.

(3) Leather should be cleaned with saddle soap or a mild hand soap and water.

(f) Cleaning Carpets

To clean carpets, first remove loose dirt with a whisk broom or vacuum. For soiled spots and stubborn stains use a nonflammable dry cleaning fluid. Floor carpets may be cleaned like any household carpet.

(g) Cleaning Oxygen Equipment

(1) Clean the mask assemblies with a suitable oil-free disinfectant.
(2) Wipe dirt and foreign particles from the unit with a clean, dry, lint-free cloth.

(h) Cleaning Surface Deicing Equipment (if installed)

The deicers should be cleaned when the aircraft is washed using a mild soap and water solution.

In cold weather, wash the boots with the airplane inside a warm hangar if possible. If the cleaning is to be done outdoors, heat the soap and water solution before taking it out to the airplane. If difficulty is encountered with the water freezing on boots, direct a blast of warm air along the region being cleaned using a portable ground heater.

8.35 CLEANING (continued)

Petroleum products are injurious to rubber and their use as cleaning agents should be avoided. Limited use of Mineral Spirits or non-leaded (NOT LOW LEAD) gasoline is not harmful in cleaning the deicers, if the cloth is dampened (not dripping) with solvent, and a dry cloth is used to wipe the deicer before the solvent has time to soak into the rubber.

With the deicer boots properly cleaned, a coating of Agemaster No. 1 should be applied. This treatment helps protect the neoprene deice boots from ozone attack, aging and weathering.

Icex may be applied to all of the boots if icing conditions are anticipated. Any boots treated with Agemaster should be allowed to dry before application of Icex. For specific instructions refer to the PA-46R-350T Maintenance Manual.

8.36 CLEANING AND MAINTENANCE OF RELIEF TUBE SYSTEM

When the aircraft is equipped with a relief tube system, the corrosive effects of urine or other liquids poured through the system are extreme and require much attention to the cleanliness of this system both inside and outside of the aircraft. From the interior standpoint, the funnel tube assembly, rubber hose and surrounding sheet metal should be cleaned at termination of flight when the system has been used. Likewise, attention to the exterior of the aircraft is equally as important and must be cleaned as described below.

The corrosive affects of urine on painted and unpainted surfaces cannot be overemphasized. Corrosion may appear in surrounding areas if allowed to go uncleaned for one day!

(a) Interior

After each use of the relief tube, the area surrounding the relief tube should be examined for spillage and cleaned according to the cleaning procedures listed in paragraphs 8.35(e) and (f) above. Clean area inside the box and access door, funnel and tube using mild soap and water. After cleaning, assure that no soapy residue remains by flushing with clean water. Dry system thoroughly.

CAUTION

Should spillage extending into the fuselage be evident, maintenance actions must occur which include removing panels to access the floor structure to neutralize urine spillage in the aircraft structure.

Prepare to flush the relief tube assembly by placing a container underneath the relief tube outlet. Flush tube by pouring a solution of baking soda (10%) and water through the tube, flushing out the entire system. Flush again with at least 1/2 gallon of clear water. (Shop air, at low pressure, may be blown through the relief tube system to dry the system.)

8.36 CLEANING AND MAINTENANCE OF RELIEF TUBE SYSTEM (continued)

(b) Exterior

Exterior bottom painted surfaces of the aircraft must be cleaned from the firewall to the tip of the tail including the bottom of the tail surfaces, at termination of each flight when the relief tube system has been used. Cleaning should occur in accordance with paragraph 8.35(c) with the following exception: After completion of washing, a solution of baking soda (10%) and water should be applied to the entire area and allowed to remain for a few minutes. The area then must be thoroughly rinsed with clean water. The area should be thoroughly dried and observed for paint chips and corrosion, with touch up as necessary.

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TABLE OF CONTENTS

SECTION 9

SUPPLEMENTS

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SECTION 9

SUPPLEMENTS

9.1 GENERAL

This section provides information in the form of supplements which are necessary for efficient operation of the airplane when it is equipped with one or more of the various optional systems and equipment not approved with the standard airplane.

All of the supplements provided in this section are FAA Approved and consecutively numbered as a permanent part of this handbook. The information contained in each supplement applies only when the related equipment is installed in the airplane.

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PILOT'S OPERATING HANDBOOK
AND
FAA APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 1
FOR
PA-46R-350T MATRIX AIRCRAFT
FLIGHT INTO KNOWN ICING (FIKI)

This supplement must be attached to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when operating the Piper PA-46R-350T Matrix airplane into known icing conditions. The information contained in this document supplements or supersedes the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual only in those areas listed herein. For limitations, procedures, performance and loading information not contained in this supplement, consult the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

FAA APPROVED: ____________
ALBERT J. MILL
DOA-510620-CE
PIPER AIRCRAFT, INC.
VERO BEACH, FLORIDA

DATE OF APPROVAL: October 25, 2007

SECTION 1 - GENERAL

This supplement provides information necessary for the operation of the Piper Malibu Matrix aircraft for flight into known icing conditions.

Icing conditions can exist when:

- The outside air temperature (OAT) is 10°C or colder, and visible moisture in any form such as clouds, fog or mist, rain, snow, sleet and ice crystals are present.
- During ground operations when operating on contaminated ramps, taxiways or runways where surface snow, ice, standing water or slush are present.
- There are visible signs of ice accretion on the aircraft.

The Matrix ice protection system was designed and tested for operation in light to moderate meteorological conditions defined in FAR 25, Appendix C, for continuous maximum and intermittent maximum icing conditions. The ice protection system was not designed or tested for flight in freezing rain, freezing drizzle or supercooled liquid water and ice crystals, or conditions defined as severe. Flight in these conditions is prohibited and must be avoided.

The ice protection system was not designed to remove ice, snow or frost accumulations from a parked airplane. Ice, snow or frost must be completely removed during preflight to ensure a safe takeoff and subsequent flight. Procedures for ice, snow or frost removal, such as a heated hangar and/or approved deicing fluids, must be used to ensure that **ALL** ice, snow, or frost is **COMPLETELY** removed from the wings, tail, control surfaces, windshield, propeller, engine intakes, fuel vents and pitot-static ports, prior to flight.

Some icing conditions not defined in FAR Part 25, Appendix C have the potential of producing hazardous ice accumulations, which may exceed the capabilities of the airplane's ice protection equipment. (See Visual Cues for Supercooled Large Droplet (SLD) Conditions.)

Flight into icing conditions which are outside the FAR defined conditions is prohibited, and pilots are advised to be prepared to divert the flight promptly, by changing course or altitude, if hazardous ice accumulations occur.

SECTION 1 - GENERAL (continued)

VISUAL CUES FOR SUPERCOOLED LARGE DROPLETS (SLD) CONDITIONS

Should supercooled large droplets (SLD) be present, most aircraft with unpowered controls and pneumatic boots should request a route or altitude change to exit the conditions.

The cues listed as follows are indicative of SLD conditions:

- Ice may become visible on the upper or lower surface of the wing, aft of the active part of the deicing boots. Pilots should look for irregular or jagged lines of ice or for pieces of ice shedding off the airplane. During night operations, adequate illumination should be used to observe all areas.
- The aft limit of ice accumulation on a propeller spinner that is not heated will reveal ice extending beyond normal limits.
- Unheated portions of side windows may begin to accumulate granular dispersed ice crystals or a translucent or opaque coating over the entire window. This icing may be accompanied by other ice patterns on the windows, such as ridges. These patterns may occur from within a few seconds to half a minute after exposure to SLD conditions.
- Ice coverage may become unusually extensive, with visible ice fingers or feathers on parts of the airframe that normally would not be covered by ice.
- The aircraft's performance may degrade. Pilots should remain vigilant when icing conditions are present, and any alteration of the aircraft's performance should be monitored closely as a sign of icing on the airplane.

SECTION 1 - GENERAL (continued)

ICING DEFINITIONS

Residual Ice - Ice that remains attached to the de-ice boot at the conclusion of that boot inflation cycle.

Intercycle Ice - The quantity of ice that accumulates on the wing horizontal stabilizer and vertical tail de-ice boots between de-ice boot cycles.

Failure Ice - The quantity of ice accumulated on the wing horizontal stabilizer and vertical tail de-ice boots if the pneumatic surface de-ice system fails.

Light Icing - The rate of accumulation may create a problem if flight is prolonged in this environment. Occasional use of de-icing/anti-icing equipment removes/prevents accumulation.

Moderate Icing - The rate of accumulation is such that even short encounters become potentially hazardous and use of de-icing/anti-icing equipment or flight diversion is necessary.

Severe Icing - The rate of accumulation is such that de-icing/anti-icing equipment fails to reduce or control the hazard. Immediate flight diversion is necessary.

Rime Ice - A rough, milky, opaque ice formed by the instantaneous freezing of small, supercooled water droplets.

Mixed Ice - Simultaneous appearance of rime and clear ice or an ice formation that has the characteristics of both rime and clear ice.

Clear Ice - A glossy, clear, or translucent ice formed by the relatively slow freezing of large supercooled water droplets. The terms "clear" and "glaze" have been used for essentially the same type of ice accretion, although some reserve "clear" for thinner accretions which lack horns and conform to the airfoil.

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SECTION 2 - LIMITATIONS

REQUIRED EQUIPMENT

The Piper Malibu Matrix airplane is approved for flight into light to moderate icing conditions as defined by FAR Part 25, Appendix C, only if the following required ice protection systems and equipment are installed and functioning properly.

1. Surface De-ice System
2. Propeller Anti-ice System
3. Windshield Heat Anti-ice System
4. Pitot Heat Anti-ice System
5. Stall Heat Anti-ice System
6. Wing Inspection Light
7. Dual Alternators
8. Dual Vacuum Pumps
9. Alternate Static Source

NOTE

Both alternators must be installed and functioning properly for flight into known icing conditions.

SECTION 2 - LIMITATIONS (continued)

ENVIRONMENTAL CONDITIONS

Inadvertent operation in freezing rain, freezing drizzle, or conditions defined as severe may be detected by heavy ice accumulation on the airframe and windshield, ice accumulation in areas not normally observed to collect ice, or when ice forms on the upper surface of the wing, aft of the surface de-ice boot. If these conditions are encountered, the pilot should take immediate action to exit these conditions by changing altitude or course.

Takeoff is prohibited with the following forms of contamination:

With frost adhering to the following areas:

1. Wing leading edge
2. Wing upper surface
3. Windshield

With ice, snow or slush adhering to the following areas:

1. Wing leading edge and upper wing surface
2. Flight control surfaces
3. Top of fuselage
4. Windshield
5. All static ports
6. Upper surface of engine cowling forward of windshield

A visual and tactile (hand on surface) check of the wing leading edge and wing upper surface must be performed to ensure the wing is free from frost, ice, snow, or slush when the outside air temperature is less than 10°C (50°F) or if it cannot be determined, wing fuel temperature is above 0°C (32°F) and

1. there is visible moisture present (rain, drizzle, sleet, snow, fog, etc.); or
2. water is present on the wing upper surface; or
3. the difference between the dew point and the outside temperature is 3°C (5°F) or less; or
4. the atmospheric conditions have been conducive to frost formation.

SECTION 2 - LIMITATIONS (continued)

MINIMUM SPEED IN ICING CONDITIONS

Minimum speed during flight in icing conditions with the flaps up is 130 KIAS.

FLAP SETTINGS FOR OPERATION IN ICING CONDITIONS

Flaps must be up when operating in icing conditions.

WINDSHIELD HEAT

Ground operation with windshield heat selected to **WSHLD HIGH** is limited to 20 seconds duration.

MAGNETIC COMPASS

Accuracy of the magnetic compass is unreliable with windshield heat, air conditioner and blower fan on.

SECTION 2 - LIMITATIONS (continued)

AUTOPILOT

Autopilot operation during icing conditions may mask cues that indicate adverse changes in aircraft handling characteristics. Autopilot operation is prohibited if any of the following conditions in icing flight are experienced:

- Severe icing conditions (reference Section 1, General)
- Unusual aileron roll forces noted
- Elevator bridging is encountered
- Frequent autopilot trim annunciations during straight and level flight

NOTE

The autopilot must be disconnected periodically to evaluate the above mentioned conditions.

CAUTION

During flight in icing conditions, ice will form on the unprotected leading edge of the elevator, and possibly form a bridge of ice, or ice cap, between the stabilizer and the elevator. This condition may be detected and verified by visual observation, by increased elevator pitch control forces, or frequent autopilot trim annunciations during straight and level flight. If ice bridging is detected or suspected, disconnect the autopilot and pulse the aircraft elevator pitch control to dislodge the ice bridge. Elapsed time between conducting elevator checks will vary, depending upon the amount and type of ice accretion. Usually 8 to 10 minutes between elevator pulsing cycles is considered sufficient.

SECTION 2 - LIMITATIONS (continued)

SURFACE DE-ICE SYSTEM

Operation of the surface de-ice system is prohibited in temperatures below -40°C. Such operation may result in damage to the surface de-ice boots.

PLACARDS

On the pilot's left side panel:

THIS AIRCRAFT MUST BE OPERATED AS A NORMAL CATEGORY AIRPLANE
IN COMPLIANCE WITH THE OPERATING LIMITATIONS STATED IN THE
FORM OF PLACARDS, MARKINGS AND MANUALS.
NO ACROBATIC MANEUVERS, INCLUDING SPINS, APPROVED.
THIS AIRCRAFT APPROVED FOR V.F.R., I.F.R., DAY AND
NIGHT ICING FLIGHT WHEN EQUIPPED IN ACCORDANCE
WITH THE AIRPLANE FLIGHT MANUAL.
WARNING
AIR CONDITIONER MUST BE OFF TO INSURE NORMAL
TAKEOFF CLIMB PERFORMANCE.
WARNING
TURN OFF STROBE LIGHTS WHEN IN CLOSE PROXIMITY
TO GROUND OR DURING FLIGHT THROUGH CLOUD, FOG
OR HAZE.

In full view of the pilot if all required equipment is not installed and operative:

WARNING
THIS AIRCRAFT IS NOT APPROVED FOR
FLIGHT IN ICING CONDITIONS

SECTION 3 - EMERGENCY PROCEDURES

WARNING

The malfunction of any required deice equipment requires immediate action to exit icing conditions. Depending on the severity of the icing encounter, failure to take immediate positive action can lead to performance losses severe enough to make level flight impossible. Therefore, upon verification of a system malfunction or failure, climb or descend out of icing conditions if this provides the shortest route. If exit must be made in level flight, consider the use of maximum power and exit by the most direct route. The effect of the additional fuel burned at higher power settings on aircraft range must be considered and an alternate airport chosen if necessary.

ALTERNATOR FAILURE IN ICING CONDITIONS (ALT NO 1 INOP or ALT NO 2 INOP annunciator light illuminated)

NOTE

Anytime total tie bus voltage is below 25 Vdc, the LOW BUS VOLTS annunciator will illuminate.

Verify failure...CHECK AMMETER INDICATION
Electrical load (if Low Bus Voltage
annunciator illuminated)..Reduce until load is less
than 75 amps & LOW BUS
VOLTS annunciator extinguished.
Failed ALTR switch..OFF
Failed ALTR circuit breaker...CHECK and RESET
as required
Failed ALTR switch (after OFF at
least one second)..ON

If power not restored:
Failed ALTR switch..OFF
Ammeter indication ....Monitor and maintain
below 75 amps

While one alternator will supply sufficient current for minimum required avionics and cockpit lighting, use of deicing equipment, particularly windshield or propeller heat, may be limited. Immediate action should be taken to avoid or exit icing conditions. Under no circumstances may the total electrical load exceed 75 amps. The electric cabin heater, cabin recirculation blowers, and position, strobe, and landing lights should not be used unless absolutely necessary.

SECTION 3 - EMERGENCY PROCEDURES (continued)

SINGLE VACUUM PUMP FAILURE IN ICING CONDITIONS (Reduced vacuum pressure and left or right vacuum inoperative annunciator illuminate)

Vacuum Indication ....Check (within normal operating range)
Operative Pump vacuum inoperative annunciator ....extinguished

Although either vacuum pump has sufficient capacity to operate the deice boots and flight instruments in a normal manner, immediate action should be taken to exit icing conditions.

PROPELLER HEAT SYSTEM MALFUNCTION

Excessive vibration may be an indication that the propeller heat is not functioning properly.

Propeller control ....exercise
Propeller heat annunciator ....check for proper indications:
(a) ON for approx. 90 seconds
(b) OFF (flashing)
for approx. 90 seconds

Illumination of the prop heat deice fail annunciator is an indication that the propeller blades may not be deicing properly.

PROP HEAT switch ....OFF if failure is indicated

NOTE

A flashing PROP HEAT selector switch LED is an indication that the 90 second off cycle is activated.

WARNING

It is imperative that the PROP HEAT switch be turned OFF if vibration persists. This can be a symptom of uneven blade deicing which can lead to propeller unbalance and engine failure.

Immediate action should be taken to exit icing conditions and avoid further icing conditions.

SECTION 3 - EMERGENCY PROCEDURES (continued)

ICE PROTECTION SYSTEM ANNUNCIATORS

Pitot Heat Failure

Indication: Amber "PITOT HTR OFF/INOP" annunciator illuminated.

Pitot Heat Switch..CHECK ON
Pitot Heat Circuit Breaker...CHECK IN
(Located on the circuit breaker panel, row 4, column L.)

Failure of the Pitot Heat could cause erroneous indications of pilot's airspeed and standby airspeed.

Exit and avoid icing conditions.

Surface De-ice Failure

Indication: Green "SURF DE-ICE" annunciator remains illuminated for more than 30 seconds.

Surface De-ice Circuit Breaker ....PULL
(Located on the circuit breaker panel, row 4, column N.)

Exit and avoid icing conditions.

Stall Warning Fail

Indication: Red "STALL WRN FAIL" annunciator illuminated.

Stall Heat Circuit Breaker...CHECK IN
(Located on the circuit breaker panel, row 4, column K.)

Avoid low airspeeds and monitor approach speeds closely.

CAUTION

The landing gear warning system may not sound an aural warning alarm with airframe icing when the landing gear is not down and locked.

Windshield Anti-Ice Heat Failure

Indication: Red "WNDSHLD HTR FAIL" annunciator remains illuminated.

Select WSHLD HIGH or WSHLD LOW switch to OFF.

Exit and avoid icing conditions.

SECTION 4 - NORMAL PROCEDURES

The Piper PA-46R-350T is approved for flight into known icing conditions when equipped with the complete Piper Ice Protection System. Operating in icing conditions of Continuous Maximum and Intermittent Maximum as defined in FAR 25, Appendix C has been substantiated; however, there is no correlation between these conditions and forecasts of reported "Light, Moderate and Severe" conditions. **Flight into severe icing is not approved.**

Icing conditions can exist in any clouds when the temperature is below freezing; therefore it is necessary to closely monitor outside air temperature when flying in clouds or precipitation. Clouds which are dark and have sharply defined edges usually have high water content and should be avoided whenever possible. **Freezing rain and freezing drizzle must always be avoided.**

Pneumatic boots must be cleaned regularly for proper operation in icing. The exterior surfaces of the aircraft should be checked prior to flight. **Do not attempt flight with frost, ice or snow adhering to the exterior surfaces of the aircraft or landing gear.**

Prior to dispatch into forecast icing conditions all ice protection equipment must be functionally checked for proper operation.

PREFLIGHT

CAUTION

To avoid possible windshield distortion during ground operations, or during testing, do not select windshield heat to WSHLD HIGH for more than 20 seconds.

(a) A check of the heated propeller should be performed by pressing PROP HEAT button on switch panel. The green lamp in the PROP HEAT button will start to flash rapidly for 30 seconds indicating the heater is in the "on" cycle.

After 30 seconds, the flash rate is reduced, indicating the heater is in the "off" cycle. The green lamp will continue to flash at the slower flash rate as long as the aircraft is on the ground or until the pilot de-selects "prop heat" on the switch panel.

CAUTION

Care should be taken when an operational check of the heated pitot head and heated lift detector is being performed. The units become very hot.

SECTION 4 - NORMAL PROCEDURES (continued)

PREFLIGHT (continued)

(b) A check of the heated pitot head and lift detector should be performed by turning the S. WARN HEAT and PITOT HEAT switches ON and touching the units.

(c) The surface boots should be checked prior to flight for damage and cleanliness. If necessary, damage should be repaired and boots cleaned prior to flight. An operational check of the boot system should be performed during engine run-up at 2000 RPM as follows:

(1) Actuate the momentary SURF DE-ICE switch - the boots will inflate through three phases: empennage, lower wing and upper wing with a duration of approximately six seconds per phase. The surface boot system then remains off until the switch is activated again. A green SURF DE-ICE annunciator light will remain on for approximately eighteen seconds.

(2) Visually check to insure that the boots have fully deflated to indicate proper operation of the vacuum portion of the pneumatic boot pump system.

(d) An operational check of the heated windshield may be done only if the ambient temperature of the windshield is *less* than 115°F (46°C), and the engine is running. To accomplish the check, turn one alternator OFF. Then, while observing the operating alternator's ammeter, press WSHLD LOW to ON, a load increase of approximately 13 amps will be seen on aircraft ammeter. Press WSHLD HIGH to ON, a load increase of 10 additional amps indicates normal operation. Press WSHLD HIGH and WSHLD LOW switches to the OFF position.

(e) Check the operation of both alternators by observing that both ammeters indicate an output.

(f) During engine run-up, check that both vacuum pumps are operating by observing that both the left and right vacuum inop. annunciators are extinguished.

IN FLIGHT

Icing conditions of any kind should be avoided whenever possible, since any minor malfunction which may occur is potentially more serious in icing conditions. Continuous attention of the pilot is required to monitor the rate of ice build-up in order to effect the boot cycle at the optimum time. Boots should be cycled when ice has built to between 1/4 and 1/2 inch thickness on the leading edge to assure proper ice removal. Repeated boot cycles at less than 1/4 inch can cause a cavity to form under the ice and prevent removal; boot cycles at thicknesses greater than 1/2 inch may also fail to remove ice.

SECTION 4 - NORMAL PROCEDURES (continued)

IN FLIGHT (continued)

Before entering probable icing conditions use the following procedures:

(a) INDUCTION AIR ....ALTERNATE
(b) PITOT HEAT switch ....ON
(c) S. WARN HEAT switch ....ON
(d) WSHLD LOW switch ....ON (WSHLD HI in actual ice)
(e) PROP HEAT switch ....ON
(f) DEFROST knob ....OUT
(g) VENT DE-FOG switch ....ON, if additional defrost is desired
(h) SURF DE-ICE switch ....activate after 1/4 to 1/2 inch accumulation
(i) Relieve propeller unbalance (if required) by exercising propeller control briefly. Repeat as required.
(j) Maintain a minimum of 130 KIAS in icing conditions with and without the autopilot engaged.
(k) Periodically disconnect the autopilot to check for any out-of-trim or unusual control force conditions.

WARNING

Minimum airspeed in icing conditions with and without autopilot engaged is 130 KIAS.

WARNING

Disconnect the autopilot periodically to check for evidence of ice accreting in control surface gaps or frozen actuators.

WARNING

Autopilot will NOT maintain airspeed if ice accretes on the airplane. MONITOR AIRSPEED closely.

WARNING

Do not cycle surface boots with less than 1/4 inch of ice accumulation. Operation of boots with less than 1/4 inch of ice accumulation can result in failure to remove ice. Do not hold the momentary SURF DE-ICE switch on.

WARNING

Elevator movement should be periodically checked prior to the first surface boot inflation in order to prevent an ice cap from forming between the elevator and stabilizer.

SECTION 4 - NORMAL PROCEDURES (continued)

IN FLIGHT (continued)

CAUTION

Operation of the pneumatic deice system is not recommended in temperatures below -40°C. Such operation may result in damage to the deicer boots.

NOTE

For accurate magnetic compass readings. turn the WSHLD LOW and HIGH, PROP HEAT and PITOT HEAT switches OFF momentarily.

Both alternator ammeter indications should be monitored whenever the deice equipment is in use. An excessive indication shows an excessive electrical load, which may cause a battery discharging condition that could eventually lead to battery depletion. Nonessential electrical equipment should be turned off to correct or prevent this condition.

NOTE

Anytime total tie bus voltage is below 25 Vdc, the LOW BUS VOLTS annunciator will illuminate.

When ice has accumulated on the unprotected surfaces of the airplane, aerodynamic buffet commences 5 to 19 knots before the stall. A substantial margin of airspeed should be maintained above the normal stall speed, since the stall speed will increase in prolonged icing encounters. For the same reason, stall warning devices are not accurate and should not be relied upon.

During approach, the flaps must be left in the full up position. Approach speeds should be increased by 15 knots. Allow for increased landing distance due to the higher approach speeds.

CAUTION

If cruise airspeed drops below 130 knots in icing conditions, increase power to maintain 130 knots. If maximum continuous power is required to maintain 130 knots, immediate action should be taken to exit icing conditions.

NOTE

There may be a degradation of communication and navigation equipment due to ice accumulation on antennas.

SECTION 5 - PERFORMANCE

Climb speed should be increased to 130 knots when icing conditions are encountered during climb.

Cruise speeds are reduced approximately 5 knots when the surface boots are installed.

CAUTION

Ice accumulation on the unprotected surfaces can result in significant performance loss. During cruise, loss of airspeed can be as much as 30 knots or more.

CAUTION

If cruise airspeed drops below 130 knots in icing conditions increase power to maintain 130 knots. If maximum continuous power is required to maintain 130 knots immediate action should be taken to exit icing conditions.

NOTE

When icing conditions are encountered, loss of cruise airspeed and increased fuel flow resulting from higher than normal power settings to maintain altitude will reduce the aircraft range significantly. The use of an alternate airport should be considered if fuel quantity appears marginal.

NOTE

For additional general information on inflight icing refer to FAA Advisory Circular 91-51, Airplane Deice and Anti-ice Systems.

SECTION 6 - WEIGHT AND BALANCE

Factory installed optional equipment is included in the licensed weight and balance data in Section 6 of the Airplane Flight Manual.

SECTION 7 - DESCRIPTION AND OPERATION OF THE ICE PROTECTION SYSTEM AND EQUIPMENT

For flight into known icing conditions (FIKI), a complete ice protection system is required on the PA-46R-350T.

The complete ice protection system consists of the following components: Pneumatic wing and empennage boots, wing ice detection light, electrothermal propeller deice pads, electrically heated windshield, heated lift detector, heated pitot head, two operating alternators, two operating vacuum pumps and the alternate static source. Alternator controls are located on the left overhead switch panel Controls for the ice protection components are located on the environmental control panel to the right of the MFD (Figure 1-1).

A single component or a combination of components may be installed. However, the warning placard specified in Section 2 of this supplement is required when the complete system is not installed. Such a placard is also required if any component is inoperative.

The aircraft is designed to allow operation in the meteorological conditions of the FAR 25 envelopes for continuous maximum and intermittent maximum icing. **The airplane is not designed to operate for an indefinite period of time in every icing condition encountered in nature.** Activation of the ice protection system prior to entering icing conditions and attempting to minimize the length of the icing encounter will contribute significantly to the ice flying capabilities of the airplane.

WING AND EMPENNAGE BOOTS

Pneumatic deice boots are installed on the leading edges of the wing, the vertical stabilizer and the horizontal stabilizer. During normal operation, when the surface deice system is turned off, the engine driven vacuum pumps applies a constant suction to the boots to provide smooth, streamlined leading edges. The boots are inflated by a momentary ON type SURF DE-ICE switch (Figure 1-1) located on the environmental control panel. Actuation of the SURF DE-ICE switch activates two pressure regulator valves (one for each vacuum pump) which energizes three (tail, lower wing & upper wing) deice flow valves for approximately six seconds.

SECTION 7 - DESCRIPTION AND OPERATION OF THE ICE PROTECTION SYSTEM AND EQUIPMENT (cont.)

WING AND EMPENNAGE BOOTS (continued)

The boot solenoid valves are activated and air pressure is released to the boots, sequentially inflating the surface deicers. A SURF DE-ICE indicator light, located on the annunciator panel illuminates when the boots inflate. When the cycle is complete, the deicer solenoid valves permit automatic overboard exhaustion of pressurized air. Suction is then reapplied to the boots.

Circuit protection for the surface deice system is provided by a SURF DE-ICE circuit breaker located in the ICE PROTECTION section of the main circuit breaker panel.

WING ICE DETECTION LIGHT

Wing icing conditions may be detected during night flight by use of an ice detection light installed on the left side of the forward fuselage. The light is controlled by an ICE LIGHT switch (Figure 1-1) located on the environmental control panel. Circuit protection is provided by an ICE circuit breaker located on the main circuit breaker panel.

ELECTRIC PROPELLER DEICE

Electrothermal propeller deice pads are bonded to a portion of the leading edges of the propeller blades. The system is controlled by an ON-OFF type PROP HEAT switch (Figure 1-1) located on the environmental control panel. Power for the propeller deicers is supplied by the aircraft electrical system through a PROP HEAT circuit breaker in the ICE PROTECTION section of the main circuit breaker panel. When the PROP HEAT switch is actuated, power is applied to a timer which monitors the current through the propeller deice system.

Power from the timer is cycled to brush assemblies which distribute power to slip rings. The current is then supplied from the slip rings directly to the electrothermal propeller deice pads.

The Hartzell propeller is deiced in a cycle which applies power to the deice pads for approximately 90 seconds and then shuts off for approximately 90 seconds. Once begun, cycling will proceed in the above sequence and will continue until the system is turned off. The PROP HEAT switch green LED should indicate green during the portion of the cycle when power is being applied and flashes during the off cycle.

The propeller designations are: HC-I3YR-1E/7890K,
HC-I3Y1R-1N/N7605K+2

The heat provided by the deice pads reduces the adhesion between the ice and the propeller so that centrifugal force and the blast of the airstream cause the ice to be thrown off the propeller blades in small pieces.

SECTION 7 - DESCRIPTION AND OPERATION OF THE ICE PROTECTION SYSTEM AND EQUIPMENT (cont.)

ELECTRICALLY HEATED WINDSHIELD

The electrically heated left windshield is heated by current from the aircraft electrical system. It is controlled by WSHLD HIGH and WSHLD LOW switches located on the environmental control panel. Circuit protection is provided by the windshield CONTROL and POWER circuit breakers in the ICE PROTECTION section of the main circuit breaker panel.

CAUTION

To avoid possible windshield distortion during ground operations, or during testing, do not turn the WSHLD HIGH switch to ON for more than 20 seconds.

Windshield heat is an anti-ice device, which must be activated prior to entering suspected icing. Sudden penetration into icing conditions, with the heat OFF, will greatly reduce its effectiveness to prevent or eliminate windshield ice. Windshield heat can also be used to prevent windshield fog.

An overtemperature sensor is included as an integral part of the heated windshield. A system failure causing an overtemperature condition will illuminate the WNDSHLD HTR FAIL light located in the annunciator panel. In this eventuality the heated windshield should immediately be selected OFF.

HEATED LIFT DETECTOR

A heated lift detector is installed on the left wing. It is controlled by a S. WARN HEAT switch located on the environmental control panel and is protected by a STALL HEAT circuit breaker located on the main circuit breaker panel. The lift detector has an in-line resistor activated by the main gear squat switch which limits the ground electrical load to approximately 33 percent of the inflight load. This allows the lift detector to be ground checked and activated prior to flight without damaging the unit.

CAUTION

Care should be taken when an operational check of the heated lift detector is being performed on the ground. The unit becomes very hot.

SECTION 7 - DESCRIPTION AND OPERATION OF THE ICE PROTECTION SYSTEM AND EQUIPMENT (cont.)

HEATED PITOT HEAD

A heated AN type head is installed under the the wing. It is controlled by an ON-OFF type PITOT HEAT switch located on the environmental control panel and is protected by a PITOT HEAT circuit breaker located on the main circuit breaker panel.

CAUTION

Care should be taken when an operational check of the heated pitot head is being performed on the ground. The unit becomes very hot.

DUAL ALTERNATORS

Dual 28 volt, 75 amp alternators are installed as standard equipment. Both alternators must be operational for flight in icing conditions. They are controlled by ON-OFF type switches labeled ALTR NO 1 and ALTR NO 2 located in the overhead switch panel (Figure 1-2). Circuit protection is provided by similarly labeled circuit breakers located on the TIE BUS circuit breaker panel. During normal operation both alternators must be turned ON. The system is designed so that the alternators will share the total load equally. If either ALTR switch is turned OFF the appropriate annunciator light (ALT NO 1 INOP or ALT NO 2 INOP) will illuminate and remain lit.

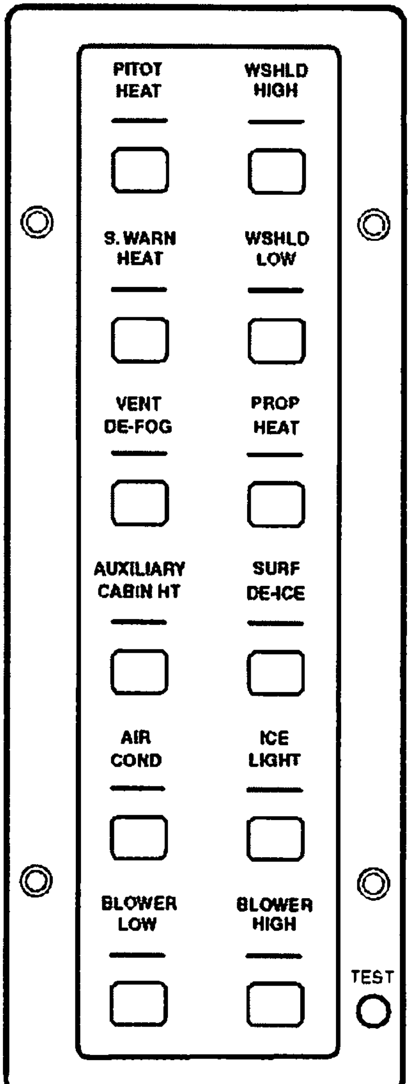
DUAL VACUUM PUMPS

Dual engine driven vacuum pumps are installed as standard equipment. Both pumps operate continuously when the engine is running. While either pump independently is capable of operating the surface deice system, intentional or continued operations in icing conditions with only one operating vacuum pump is not recommended.

ALTERNATE STATIC SOURCE

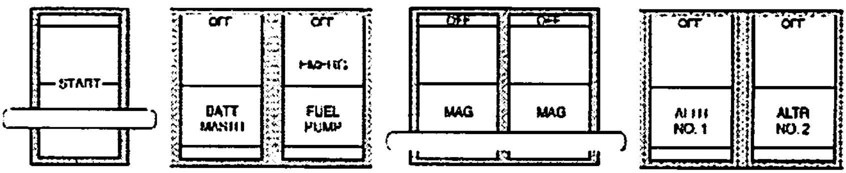
An alternate static source control valve is located below the instrument panel to the left of the pilot. For normal operation, the lever remains down. To select alternate static source, place the lever in the up position. When the alternate static source is selected, the pilot's airspeed, altimeter, vertical speed indicator, and standby airspeed and altimeter are vented to the alternate static pad on the bottom aft fuselage. During alternate static source operation, these instruments may give slightly different readings. The pilot can determine the effects of the alternate sources at different airspeeds. Static source pads have been demonstrated to be non-icing; however, in the event icing does occur, selecting the alternate static source will alleviate the problem.

SECTION 7 - DESCRIPTION AND OPERATION OF THE ICE PROTECTION SYSTEM AND EQUIPMENT (cont.)



ENVIRONMENTAL CONTROL PANEL
Figure 1-1

SECTION 7 - DESCRIPTION AND OPERATION OF THE ICE PROTECTION SYSTEM AND EQUIPMENT (cont.)



OVERHEAD SWITCH PANEL - PILOT SIDE
Figure 1-2

PILOT'S OPERATING HANDBOOK
AND
FAA APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 2
FOR
GARMIN GNS 430W VHF COMMUNICATION TRANSCEIVER/VOR/ILS RECEIVER/GPS RECEIVER

This supplement must be attached to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the Garmin GNS 430W VHF Communication Transceiver/VOR/ILS Receiver/Global Positioning System is installed per the Equipment List. The information contained herein supplements or supersedes the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual only in those areas listed herein. For limitations, procedures and performance information not contained in this supplement, consult the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

FAA APPROVED: ______________
ALBERT J. MILL
DOA-510620-CE
PIPER AIRCRAFT, INC.
VERO BEACH, FLORIDA

DATE OF APPROVAL: October 25, 2007

SECTION 1 - GENERAL

The GNS430W System is a fully integrated, panel mounted instrument, which contains a VHF Communications Transceiver, a VOR/ILS receiver, and a WAAS - Enabled Global Positioning System (GPS) Navigation computer. The system consists of a GPS antenna, GPS/WAAS receiver, VHF VOR/LOC/GS antenna, VOR/ILS receiver, VHF COMM antenna and a VHF Communications transceiver. The primary function of the VHF Communication portion of the equipment is to facilitate communication with Air Traffic Control. The primary function of the VOR/ILS Receiver portion of the equipment is to receive and demodulate VOR, Localizer, and Glide Slope signals. The primary function of the GPS/WAAS portion of the system is to acquire signals from the GPS system satellites, recover orbital data, make range and Doppler measurements, and process this information in real-time to obtain the user's position, velocity, and time.

Provided the GARMIN GNS 430W's GPS/WAAS receiver is receiving adequate usable signals, it has been demonstrated capable of and has been shown to meet the accuracy specifications for:

- GPS/WAAS TSO-C146a Class 3 Operation: The Garmin GNS430W uses GPS and WAAS (within the coverage of a Space-Based Augmentation System complying with ICAO Annex 10) for enroute, terminal area, non-precision approach operations (including "GPS" and "RNAV" approaches) and approach procedures with vertical guidance (including "LNAV/VNAV" and "LPV").

GPS navigation is accomplished using the WGS-84 (NAD-83) coordinate reference datum. GPS navigation data is based upon use of only the Global Positioning System (GPS) operated by the United States of America.

SECTION 1 - GENERAL (continued)

Class II Oceanic, Remote, and other operations

The Garmin 430W has been found to comply with the requirements for GPS primary means of Class II navigation in oceanic and remote airspace when used in conjunction with Garmin Prediction Program part number 006-A0154-03. Oceanic operations are supported when the GNS430W unit annunciates OCN. This provides an alarm limit of four nmi and a mask angle of five degrees. The GNS430W unit also has the ability to predict RAIM availability at any waypoint in the database if WAAS corrections are expected to be absent or disabled. This does not constitute an operational approval for Oceanic or Remote area operations. Additional equipment installations or operational approvals may be required.

- Oceanic navigation requires an additional approved long range oceanic and/or remote area navigation system with independent display, sensors, antenna, and power source.
- Redundant VHF Com and VHF Nav systems may be required for other than US 14 CFR Part 91 operations. Check foreign regulation requirements as applicable.
- Operations approval *may* be granted for the use of the GNS430W unit RAIM prediction function in lieu of the Prediction Program for operators requiring this capability. Refer to your appropriate civil aviation authorities for these authorizations.

SECTION 2 - LIMITATIONS

Pilot's Guide

The Garmin 400W Series Pilot's Guide, part number and revision listed below (or later revisions), must be immediately available for the flight crew whenever navigation is predicated on the use of the 400W Series unit.

- 400W Series Pilot's Guide & Reference P/N 190-00356-00 Rev. B

This AFM supplement does not grant approval for IFR operations to aircraft limited to VFR operations. Additional aircraft systems may be required for IFR operational approval.

System Software

The system must utilize the Main and GPS software versions listed below (or later FAA approved versions for this installation). The software versions are displayed on the self-test page immediately after turn-on, for approximately 5 seconds, or they can be accessed in the AUX pages.

Subsequent software versions may support different functions. Check the 400W Series Pilot's Guide for further information.

Table 1 - Approved Software Versions

Software Item	Approved Software Version (or later FAA approved versions)	
	SW version	As displayed on unit
Main SW Version	3.0	3.0
GPS SW Version	3.0	3.0

Navigation Data Base

The 400W Series unit database cards listed in the following table (or later FAA approved versions for this installation) must be installed.

- IFR enroute and terminal navigation is prohibited unless the pilot verifies the currency of the database or verifies each selected waypoint for accuracy by reference to current approved data.

SECTION 2 - LIMITATIONS (continued)

Navigation Data Base (continued)

- GPS instrument approaches using the GNS430W are prohibited, unless the GNS430W's approach data is verified by the pilot or crew to be current. Instrument approaches must be accomplished in accordance with an approved instrument approach procedure that is loaded from the GNS430W's database.

- Installations with dual 430W units will only crossfill between those units when they contain the same database cycle. Updating of each database must be accomplished on the ground prior to flight.

Table 2 - Approved Navigation Database Cards

Part Number	Description
010-10546-00	Data Card, WAAS, IFR, World Wide
010-10546-01	Data Card, WAAS, IFR, Americas
010-10546-02	Data Card, WAAS, IFR, International

SECTION 2 - LIMITATIONS (continued)

Terrain Data Base

The GNS430W supports Terrain and requires a Terrain database card to be installed in order for the feature to operate. The table below lists compatible database cards for the GNS430W. Each of the database cards contains the following data:

- The Terrain Database has an area of coverage from North 75° Latitude to South 60° Latitude in all longitudes.
- The Airport Terrain Database has an area of coverage that includes the United States, Canada, Mexico, Latin America, and South America.
- The Obstacle Database has an area of coverage that includes the United States, and is updated as frequently as every 56 days.

NOTE

The area of coverage may be modified as additional terrain data sources become available.

Table 3 - Approved Terrain Database Cards

Part Number	Description
010-10201-20	Data Card, TAWS / Terrain, 128MB
010-10201-21	Data Card, TAWS / Terrain, 256MB

Navigation

No navigation is authorized north of 89° (degrees) north latitude or south of 89° (degrees) south latitude.

SECTION 2 - LIMITATIONS (continued)

Approaches

- During GPS approaches, the pilot must verify the 400W Series unit is operating in the approach mode. (LNAV, LNAV+V, L/VNAV, or LPV.)
- When conducting approaches referenced to true North, the heading selection on the AUX pages must be adjusted to TRUE.
- Accomplishment of an ILS, LOC, LOC-BC, LDA, SDF, MLS, VOR approach, or any other type of approach not approved for GPS overlay, is not authorized with GPS navigation guidance.
- Use of the GNS430W VOR/LOC/GS receiver to fly approaches not approved for GPS requires VOR/LOC/GS navigation data to be present on the external indicator (i.e. proper CDI source selection).

Autopilot Coupling

IFR installations of the GNS430W allows the operator to fly all phases of flight based on the navigation information presented to the pilot.

Terrain Display

Terrain refers to the display of terrain information. Pilots are NOT authorized to deviate from their current ATC clearance to comply with terrain/obstacle alerts. Terrain unit alerts are advisory only and are not equivalent to warnings provided by a Terrain Awareness and Warning System (TAWS). Navigation must not be predicated upon the use of the terrain display.

The terrain display is intended to serve as a situational awareness tool only. By itself, it may not provide either the accuracy or the fidelity on which to base decisions and plan maneuvers to avoid terrain or obstacles.

VNAV

VNAV information may be utilized for advisory information only. Use of VNAV information for instrument Approach Procedures does not guarantee Step-Down Fix altitude protection, or arrival at minimums in a normal position to land.

SECTION 3 - EMERGENCY PROCEDURES

Emergency Procedures

No change.

Abnormal Procedures

- If the Garmin GNS430W GPS navigation information is not available, or is invalid, utilize other remaining operational navigation equipment installed in the airplane as appropriate. If the 430W loses GPS position and reverts to Dead Reckoning mode (indicated by the annunciation of "DR" in the lower left of the display), the moving map will continue to be displayed. Aircraft position will be based upon the last valid GPS position and estimated by Dead Reckoning methods. Changes in airspeed or winds aloft can affect the estimated position substantially. Dead Reckoning is only available in Enroute mode; Terminal and Approach modes do not support DR.
- If a "Loss of Integrity" (INTEG) message is displayed during:
    - Enroute/Terminal: continue to navigate using GPS equipment and periodically cross-check the GPS guidance to other approved means of navigation.
    - GPS Approach: GPS approaches are not authorized under INTEG - Execute missed approach or revert to alternate navigation.
- During a GPS LPV precision approach or GPS LNAV/VNAV approach, the 430W will downgrade the approach if the Horizontal or Vertical alarm limits are exceeded. This will cause the vertical guidance to flag as unavailable. The procedure may be continued using the LNAV only minimums.
- During any GPS approach in which precision and non-precision alarm limits are exceeded, the 430W will flag the lateral guidance and generate a system message "ABORT APPROACH loss of navigation". Immediately upon viewing the message the unit will revert to Terminal alarm limits. If the position integrity is within these limits, lateral guidance will be restored and the GPS may be used to execute the missed approach, otherwise alternate means of navigation should be utilized.

SECTION 4 - NORMAL PROCEDURES

Refer to the 400W Series unit Pilot's Guide defined in Section 2 - Limitations of this supplement for normal operating procedures. This includes all GPS operations, VHF COM and NAV, and Multi-Function Display infonnation.

Although intuitive and user friendly, the GNS430W requires a reasonable degree of familiarity to prevent operations without becoming too engrossed at the expense of basic instrument flying in IMC and basic see-and-avoid in VMC. Pilot workload will be higher for pilots with limited familiarity in using the unit in an IFR environment, particularly without the autopilot engaged. Garmin provides excellent training tools with the Pilot's Guide and PC based simulator. Pilots should take full advantage of these training tools to enhance system familiarization. Use of an autopilot is strongly encouraged when using the GNS430W in IMC conditions.

Approaches with Vertical Guidance

The GNS430W supports three types of GPS approaches with vertical guidance: LPV approaches, LNAV/VNAV (annunciated as L/VNAV) approaches, and LNAV approaches with advisory vertical guidance (annunciated as LNAV+V). For LNAV approaches with advisory vertical guidance, the 400W Series will annunciate LNAV+V indicating vertical guidance is available. LNAV minimums will be controlling in this case.

NOTE

If flying an LPV or LNAV/VNAV approach, be prepared to fly the LNAV only approach prior to reaching the final approach fix (FAF). If the GPS integrity is not within vertical approach limits, the system will flag the vertical guidance. This may be annunciated by a downgrade to LNAV message.

For additional information on approaches with vertical guidance, refer to the 400W Series unit Pilot's Guide.

SECTION 4 - NORMAL PROCEDURES (continued)

Autopilot Operation

The Garmin 400W Series may be coupled to the STEC 55X Autopilot when operating as prescribed in the LIMITATIONS section of this supplement. For lateral guidance, the STEC 55X Autopilot may utilize GPSS or GPS Roll Steering in lieu of the analog deviation information. For autopilot operational instructions, refer to the FAA approved Flight Manual or Flight Manual Supplement for the autopilot.

Coupling the Autopilot during Approaches

The Garmin GNS430W supports analog and digital (GPSS) control interfaces to the STEC 55X Autopilot. The STEC 55X may use digital GPS roll steering commands (GPSS) during GPS enroute, terminal, and LNAV approach operations only. When switching between GPS and VLOC, the pilot should be aware that the autopilot will need to be re-engaged in GPSS or NAV/APR, depending on the CDI nav source last selected or the type of approach desired.

Autopilot coupling to GPS vertical guidance requires that the autopilot be engaged in an analog APR mode identical to coupling to an ILS. To capture the vertical guidance, the pilot may engage the autopilot in APR mode at any time when the GPS Glide Slope (VDI) becomes valid (displayed without a FLAG).

SECTION 4 - NORMAL PROCEDURES (continued)

WFDE Prediction Program

The Garmin WAAS Fault Detection and Exclusion (WFDE) Prediction Program is required for Remote/Oceanic operations.

The Prediction Program should be used in conjunction with the Garmin 400W/500W Simulator. After entering the intended route of flight in the Simulator flight plan, the pilot selects the FDE Prediction Program under the Options menu of the Simulator program.

For detailed information, refer to the WFDE Prediction Program instructions (190-00643-01). The availability of FDE is only required for Oceanic or Remote operations.

SECTION 5 - PERFORMANCE

No change.

SECTION 6 - WEIGHT AND BALANCE

No change.

SECTION 7 - DESCRIPTION AND OPERATION

See Garmin 400W Series unit Pilot's Guide for a complete description of the 400W Series unit.

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PILOT'S OPERATING HANDBOOK
AND
FAA APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 3
FOR
GARMIN GMA 340 AUDIO PANEL

This supplement must be attached to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the Garmin GMA 340 is installed per the Equipment List. The information contained herein supplements or supersedes the information in the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual only in those areas listed herein. For limitations, procedures, and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

FAA APPROVED:

ALBERT J. MILL
DOA-510620-CE
PIPER AIRCRAFT, INC.
VERO BEACH, FLORIDA

DATE OF APPROVAL: October 25, 2007

SECTION 1 - GENERAL

This supplement supplies information necessary for the operation of the airplane when the Garmin GMA 340 audio panel is installed in accordance with FAA approved Piper data.

SECTION 2 - LIMITATIONS

No change.

SECTION 3 - EMERGENCY PROCEDURES

No change.

SECTION 4 - NORMAL PROCEDURES

AUDIO CONTROL SYSTEM OPERATION:

- Select the desired transmitter audio selector button (COM1, COM2, OR COM3) and verify that the buttons LED is illuminated.
- INTERCOM VOL Control (ICS) - Adjust to desired listening level.
- INTERCOM VOX (voice) Sensitivity Control - ROTATE CONTROL knob clockwise to the middle range and then adjust as required for desired voice activation or hot mic intercom.
- If desired, select the speaker function button. Selecting this button allows radio transmissions to be received over the cabin speaker.

NOTE

Audio level is controlled by the selected NAV radio volume control.

MARKER BEACON RECEIVER OPERATION:

- TEST Button - PRESS to verify all marker lights are operational.
- SENS Button - SELECT HI for airway flying for LO for ILS/LOC approaches.

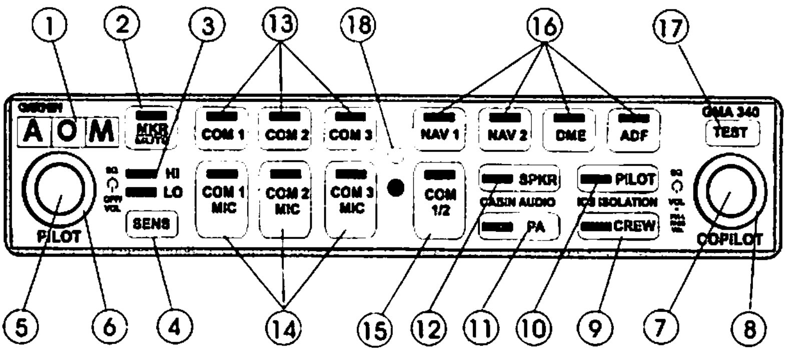
SECTION 5 - PERFORMANCE

No change.

SECTION 6 - WEIGHT AND BALANCE

Factory installed optional equipment is included in the licensed weight and balance data in section 6 of the Airplane Flight Manual.

SECTION 7 - DESCRIPTION AND OPERATION



1. Marker Beacon Lamps
2. Marker Beacon Receiver Audio Select/Mute Button
3. Marker Beacon Receiver Sensitivity Selection Indicator LED
4. Marker Beacon Receiver Sensitivity Selection Button
5. Unit On/Off, Pilot Intercom System (ICS) Volume
6. Pilot ICS Voice Activated (VOX) Intercom Squelch Level
7. Copilot and Passenger ICS Volume Control (Pull out for Passenger Volume)
8. Copilot/Passenger VOX Intercom Squelch Level
9. Crew Isolation Intercom Mode Button
10. Pilot Isolation Intercom Mode Button
11. Passenger Address (PA) Function Button
12. Speaker Function Button
13. Transceiver Audio Selector Buttons (COM1, COM2, COM3)
14. Transmitter (Audio/Mic) Selection Buttons
15. Split COM Button
16. Aircraft Radio Audio Selection Buttons (NAV1, NAV2, DME, ADF)
17. Annunciator Test Button
18. Photocell - Automatic Annunciator Dimming

SECTION 7 - DESCRIPTION AND OPERATION (continued)

ON/OFF, Pilot Intercom System (ICS) Volume Control

The GMA 340 is powered OFF when the left small knob (5) is rotated fully CCW into the detent. To turn the unit ON, rotate the knob clockwise past the click. The knob then functions as the pilot ICS volume control. A fail safe circuit connects the pilot's headset and microphone directly to COM1 in case power is interrupted or the unit is turned OFF.

Transceivers

Selection of either COM1, COM2, or COM3 for both MIC and audio source is accomplished by pressing either COM1, MIC, COM2 MIC, COM3 MIC (14). The activeCOM audio is always heard on the headphones.

Additionally, each audio source can be selected independently by pressing COM1, COM2, or COM3 (13). When selected this way, they remain active as audio sources regardless of which transceiver has been selected for microphone use.

When a microphone is keyed, the active transceiver's MIC button LED blinks approximately one per second to indicate that the radio is transmitting.

NOTE

Audio level is controlled by the selected COM radio volume controls.

SECTION 7 - DESCRIPTION AND OPERATION (continued)

Split COM

Pressing the COM 1/2 button (15) activates the split COM function. When this mode is active, COM1 is dedicated solely to the pilot for MIC/Audio while COM2 is dedicated to the copilot for MIC/Audio. The pilot and copilot can simultaneously transmit in this mode over separate radios. Both pilots can still listen to COM3, NAV1, NAV2, DME, ADF, and MRK as selected. The split COM mode is cancelled by pressing the COM 1/2 button a second time.

When in the split COM mode the copilot may make PA announcements while the pilot continues using COM1 independently. When the PA button is pressed after the split com mode is activated the copilot's mic is output over the cabin speaker when keyed. A second press of the PA button returns the copilot to normal split COM operation.

NOTE

> It is possible that radio interference may occur in the split COM mode when the frequencies of the two communications radios are close together (normally less than one MHz). The extent of the interference is a function of the specific frequencies selected, transmitted power, antenna spacing, etc. No guarantee is made to the performance of the split COM feature on small aircraft.

Aircraft Radios and Navigation

Pressing NAV1, NAV2, DME, ADF (16) or MRK (2) selects each audio source. A second button press deselects the audio.

Speaker Output

Pressing the SPKR button (12) selects the aircraft radios over the cabin speaker. The speaker output is muted when a COM microphone is keyed.

PA Function

The PA mode is activated by pressing the PA button (11). Then, when either the pilot's or copilot's microphone is keyed, the corresponding mic audio is heard over the cabin speaker. If the SKR button is also active, then any selected speaker audio is muted while the microphone is keyed. The SPKR button does not have to be previously active in order to use the PA function.

SECTION 7 - DESCRIPTION AND OPERATION (continued)

Intercom System (ICS)

Intercom volume and squelch (VOX) are adjusted using the following front panel knobs:

- **Left Small Knob** - Unit ON/OFF power control and pilot's ICS volume. Full CCW detent position is OFF.
- **Left Large Knob** - Pilot ICS mic VOX squelch level. CW rotation increases the amount of mic audio (VOX level) required to break squelch. Full CCW is the "HOT MIC" position (no squelch).
- **Right Small Knob** - IN position: Copilot ICS volume. OUT position: Passenger ICS volume.
- **Right Large Knob** - Copilot and passenger mic VOX squelch level. CW rotation increases the amount of mic audio (VOX level) required to break squelch. Full CCW is the "HOT MIC" position.
- **PILOT Mode** - This mode isolates the pilot from everyone else and dedicates the aircraft radios to the pilot exclusively. The copilot and passengers share communications between themselves but cannot communicate with the pilot or hear the aircraft radios.
- **CREW Mode** - This mode places the pilot and copilot on a common ICS communication channel with the aircraft radios. The passengers are on their own intercom channel and can communicate with each other, but cannot communicate with the crew or hear the aircraft radios.

Marker Beacon Receiver

The GMA 340's marker beacon receiver controls are located on the left side of the front panel (1 - 4). The SENS button selects either high or low sensitivity as indicated by the HI or LO LED being lit. Low sensitivity is used on ILS approaches while high sensitivity allows operation over airway markers or to get an earlier indication of nearing the outer marker during an approach.

The marker audio is initially selected by pressing the MKR/Mute button (2). If no beacon signal is received, then a second button press will deselect the marker audio. This operation is similar to selecting any other audio source on the GMA 340. However, if the second button press occurs while a marker beacon signal is received, then the marker audio is muted but not deselected. The buttons LED will remain lit to indicate that the source is still selected. When the current marker signal is no longer received, the audio is automatically un-muted. While in the muted state, pressing the MKR/Mute button deselects the marker audio. The button's LED will extinguish to indicate that the marker audio is no longer selected.

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PILOT'S OPERATING HANDBOOK
AND
FAA APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 5
FOR
BENDIX/KING KR-87 DIGITAL ADF
WITH KI-227 INDICATOR

This supplement must be attached to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the Bendix/King KR-87 Digital ADF with the KI-227 Indicator is installed per the Equipment List. The information contained herein supplements or supersedes the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual only in those areas listed herein. For limitations, procedures and performance information not contained in this supplement, consult the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

FAA APPROVED: ______________

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VERO BEACH, FLORIDA

DATE OF APPROVAL: October 25, 2007

SECTION 1 - GENERAL

The Bendix/King Digital ADF is a panel mounted, digitally tuned, automatic direction finder. It is designed to provide continuous 1 kHz digital tuning in the frequency range of 200 kHz to 1799 kHz and eliminates the need for mechanical band switching. The system is comprised of a receiver, a built-in electronic timer, a bearing indicator and a KA-44B combined loop and sense antenna.

The Bendix/King Digital ADF can be used for position plotting and homing procedures, and for aural reception of amplitude modulated (AM) signals.

The "flip-flop" frequency display allows switching between pre-selected "STANDBY" and "ACTIVE" frequencies by pressing the frequency transfer button. Both preselected frequencies are stored in a non-volatile memory circuit (no battery power required) and displayed in self-dimming gas discharge numerics. The active frequency is continuously displayed in the left window, while the right window will display either the standby frequency or the selected readout from the built-in timer.

The built-in electronic timer has two separate and independent timing functions: (1) An automatic flight timer that starts whenever the unit is turned on. This timer functions up to 59 hours and 59 minutes. (2) An elapsed timer which will count up or down for up to 59 minutes and 59 seconds. When a preset time interval has been programmed and the countdown reaches :00, the display will flash for 15 seconds. Since both the flight timer and elapsed timer operate independently, it is possible to monitor either one without disrupting the other. The pushbutton controls and the bearing indicator are internally lighted.

SECTION 2 - LIMITATIONS

No change.

SECTION 3 - EMERGENCY PROCEDURES

No change.

SECTION 4 - NORMAL PROCEDURES

To Operate as an Automatic Direction Finder:

1. OFF/VOL Control - ON.
2. Frequency Selector Knobs - SELECT desired frequency in the standby frequency display.
3. FRQ Button - PRESS to move the desired frequency from the standby to the active position.
4. ADF SPEAKER/PHONE - Selector Switch (on audio control panel) - SELECT as desired.
5. OFF/VOL Control - SET to desired volume level.
6. ADF Button - SELECT ADF mode and note relative bearing on indicator.

ADF Test (Pre-flight or In-flight):

1. ADF Button - SELECT ANT mode and note pointer moves to 90° position.
2. ADF Button - SELECT ADF mode and note the pointer moves without hesitation to the station bearing. Excessive pointer sluggishness, wavering or reversals indicate a signal that is too weak or a system malfuction.

SECTION 4 - NORMAL PROCEDURES (continued)

NOTE

The Standby Frequency which is in memory while Flight Time or Elapsed Time modes are being displayed may be called back by pressing the FRQ button, then transferred to active use by pressing the FRQ button again.

To Operate Elapsed Time Timer-Count Down Mode:

1. OFF/VOL Control - ON.
2. FLT/ELT Mode Button - PRESS (once or twice) until ET is annunciated.
3. SET/RST Button - PRESS until the ET annunciation begins to flash.
4. FREQUENCY SELECTOR KNOBS - SET desired time in the elapsed time display. The small knob is pulled out to tune the 1's. The small knob is pushed in to tune the 10's. The outer knob tunes minutes up to 59 minutes.

NOTE

Selector knobs remain in the time set mode for 15 seconds after the last entry or until the SET/RST, FLT/ET, or FRQ button is pressed.

5. SET/RST Button - PRESS to start countdown. When the timer reaches 0, it will start to count up as display flashes for 15 seconds.

NOTE

While FLT or ET are displayed, the active frequency on the left side of the window may be changed, by using the frequency selector knobs, without any effect on the stored standby frequency or the other modes.

SECTION 4 - NORMAL PROCEDURES (continued)

ADF Operation NOTES:

Erroneous ADF Bearing Due to Radio Frequency Phenomena:

In the U.S., the FCC, which assigns AM radio frequencies, occasionally will assign the same frequency to more than one station in an area. Certain conditions, such as Night Effect, may cause signals from such stations to overlap. This should be taken into consideration when using AM broadcast station for navigation.

Sunspots and atmospheric phenomena may occasionally distort reception so that signals from two stations on the same frequency will overlap. For this reason, it is always wise to make positive identification of the station being tuned, by switching the function selector to ANT and listening for station call letters.

Electrical Storms:

In the vicinity of electrical storms, an ADF indicator pointer tends to swing from the station tuned toward the center of the storm.

Night Effect:

This is a disturbance particularly strong just after sunset and just after dawn. An ADF indicator pointer may swing erratically at these times. If possible, tune to the most powerful station at the lowest frequency. If this is not possible, take the average of pointer oscillations to determine relative station bearing.

Mountain Effect:

Radio waves reflecting from the surface of mountains may cause the pointer to fluctuate or show an erroneous bearing. This should be taken into account when taking bearings over mountainous terrain.

Coastal Refraction:

Radio waves may be refracted when passing from land to sea or when moving parallel to the coastline. This also should be taken into account.

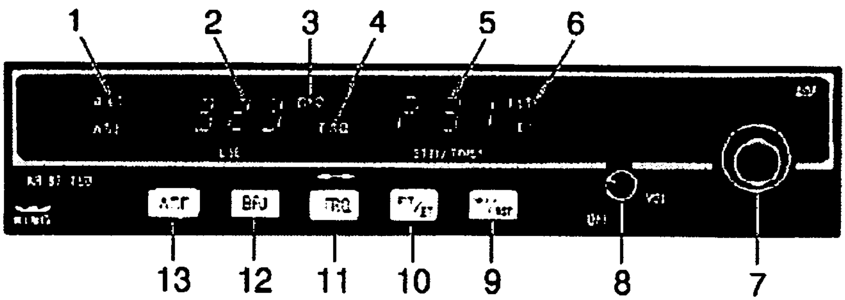
SECTION 5 - PERFORMANCE

No change.

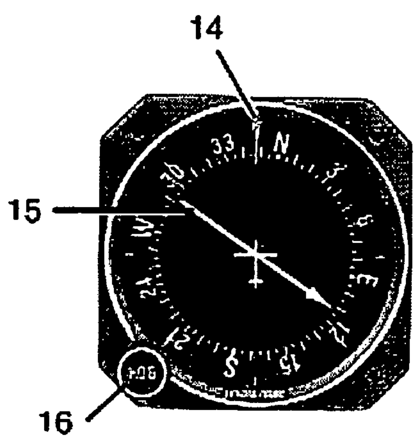
SECTION 6 - WEIGHT AND BALANCE

Factory installed optional equipment is included in the licensed weight and balance data in Section 6 of the Pilot's Operating Handbook and Airplane Flight Manual.

SECTION 7 - DESCRIPTION AND OPERATION



KR-87 Digital ADF



KI-227 Indicator

King Digital ADF Operating Controls and Indicators
Figure 5-1

SECTION 7 - DESCRIPTION AND OPERATION (continued)

Legend - Figure 5-1

1. Mode Annunciation - Antenna (ANT) is selected by the "out" position of the ADF button. This mode improves the aural reception and is usually used for station identification. The bearing pointer is deactivated and will park in the 90° relative position. Automatic Direction Finder (ADF) mode is selected by the depressed position of the ADF button. This mode activates the bearing pointer. The bearing pointer will point in the direction of the station relative to the aircraft heading.
2. Active Frequency Display - The frequency to which the ADF is tuned is displayed here. The active ADF frequency can be changed directly when either of the timer functions are selected.
3. Beat Frequency Oscillator (BFO) - The BFO mode, activated and annunciated when the "BFO" button is depressed, permits the carrier wave and associated morse code identifier broadcast on the carrier wave to be heard.

   NOTE

   CW signals (Morse Code) are unmodulated and no audio will be heard without use of BFO. This type of signal is not used in the United States air navigation. It is used in some foreign countries and marine beacons.

4. Standby Frequency Annunciation (FRQ) - When FRQ is displayed, the STANDBY frequency is displayed in the right hand display. The STANDBY frequency is selected using the frequency select knobs. The selected STANDBY frequency is put into the ACTIVE frequency window by pressing the frequency transfer button.
5. Standby Frequency Display - Either the standby frequency, the flight timer, or the elapsed time is displayed in this position. The flight timer and elapsed timer are displayed replacing the standby frequency which goes into "blind" memory to be called back at any time by depressing the FRQ button. Flight time or elapsed time are displayed and annunciated alternatively by depressing the FLT/ET button.

SECTION 7 - DESCRIPTION AND OPERATION (continued)

Legend - Figure 5-1 (continued)

6. Timer Mode Annunciation - Either the elapsed time (ET) or flight time (FLT) mode is annunciated here.
7. Frequency Selector Knobs - Selects the standby frequency when FRQ is displayed and directly selects the active frequency whenever either of the timer functions is selected. The frequency selector knobs may be rotated either clockwise or counterclockwise. The small knob is pulled out to tune the 1's. The small knob is pushed in to tune the 10's. The outer knob tunes the 100's with rollover into the 1000's. These knobs are also used to set the desired time when the elapsed timer is used in the countdown mode.
8. Off/Volume Control (OFF/VOL) - Controls primary power and audio output level. Clockwise rotation from OFF position applies primary power to receiver; further clockwise rotation increases audio level. Audio muting causes the audio output to be muted unless the receiver is locked on a valid station.
9. Set/Reset Button (SET/RST) - The set/reset button, when pressed, resets the elapsed timer whether it is being displayed or not.
10. Flight Time/Elapsed Time Mode Selector Button (FLT/ET) - The Flight Timer/Elapsed Time mode selector button, when pressed, alternatively selects either Flight Timer mode or Elapsed Timer mode.
11. Frequency Transfer Button (FRQ) - The FRQ transfer button, when pressed, exchanges the active and standby frequencies. The new frequency becomes active and the former active frequency goes into standby.
12. BFO Button - The BFO button selects the BFO mode when in the depressed position (see Note under item 3).
13. ADF Button - The ADF button selects either the ANT mode or the ADF mode. The ANT mode is selected with the ADF button in the out position. The ADF mode is selected with the ADF button in the depressed position.
14. Index (Rotatable Card) - Indicates relative, magnetic, or true heading of aircraft, as selected by the HDG control.

SECTION 7 - DESCRIPTION AND OPERATION (continued)

Legend - Figure 5-1 (continued)

15. Pointer - Indicates station bearing in degrees of azimuth, relative to the nose of the aircraft. When heading control is adjusted, indicates relative, magnetic, or true bearing of radio signal.
16. Heading Card Control (HDG) - Rotates card to set in relative, magnetic, or true bearing information.

PILOT'S OPERATING HANDBOOK
AND
FAA APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 6
FOR
BENDIX/KING KN-63 DME

This supplement must be attached to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the Bendix/King KN-63 DME is installed per the Equipment List. The information contained herein supplements or supersedes the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual only in those areas listed herein. For limitations, procedures and performance information not contained in this supplement, consult the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

FAA APPROVED: [signature]
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VERO BEACH, FLORIDA

DATE OF APPROVAL: October 25, 2007

SECTION 1 - GENERAL

The Bendix/King KN-63 DME supplies continuous slant range distance information from a fixed ground station to an aircraft in flight.

The equipment consists of a KDI-572 Panel Display which contains all the operating controls and displays, and a remotely mounted KN-63 Receiver-Transmitter. The KDI-572 Panel Display digitally displays distances in nautical miles, ground speed in knots, and time to station in minutes. All displays are in self-dimming gas discharge numerics.

SECTION 2 - LIMITATIONS

No change.

SECTION 3 - EMERGENCY PROCEDURES

No change.

SECTION 4 - NORMAL PROCEDURES

DME Operation

1. DME Mode Selector Switch - SET to N1 or N2.
2. NAV 1 and NAV 2 VHF Navigation Receivers - ON; SET FREQUENCY selector switches to VOR/DME station frequencies, as required.

   NOTE

   When the VOR frequency is selected, the appropriate DME frequency is automatically channeled.

3. DME SPEAKER/PHONE selector buttons (on audio control panel) - SET to desired mode.

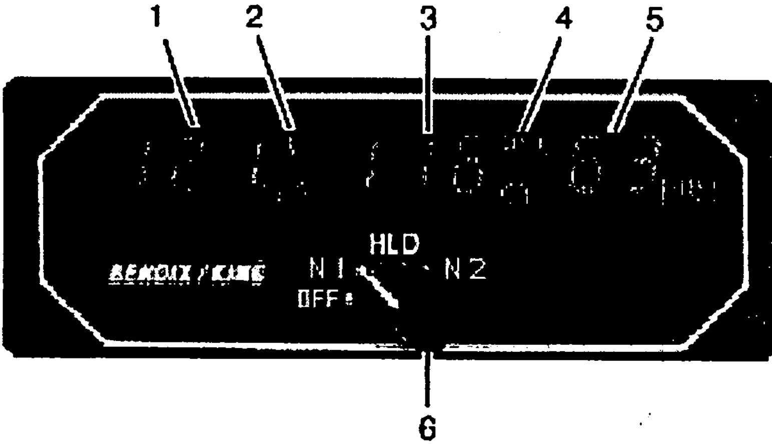
SECTION 5 - PERFORMANCE

No change.

SECTION 6 - WEIGHT AND BALANCE

Factory installed optional equipment is included in the licensed weight and balance data in Section 6 of the Pilot's Operating Handbook and Airplane Flight Manual.

SECTION 7 - DESCRIPTION AND OPERATION



Bendix/King KN-63 DME
Figure 6-1

Legend - Figure 6-1

1. DISTANCE DISPLAY (NM) - DME distance to VORTAC/WAYPOINT displayed in .1 nautical mile increments up to 99.9 NM, then in increments of one nautical mile to 389 NM.
2. DME MODE ANNUNCIATOR - Displays the DME operating mode; NAV 1 (1); NAV 2 (2); NAV 1 HOLD (H1); NAV 2 HOLD (H2); of the mode selector switch (6).
3. GROUND SPEED DISPLAY (KT) - Displays ground speed in knots to or from VORTAC/WAYPOINT up to 999 knots (aircraft must be flying directly to or from the VORTAC/WAYPOINT for true ground speed indication).
4. RNAV ANNUNCIATOR (RNV) - Indicates RNV when displayed data is in relation to the RNAV waypoint. If the wrong DME mode is selected during RNAV operation, the RNAV annunciator will flash.
5. TIME-TO-STATION DISPLAY (MIN) - Displays time-to-station (VORTAC/WAYPOINT) in minutes up to 99 minutes (aircraft must be flying directly to or from the Vortac/Waypoint for true time-to-station indication).

SECTION 7 - DESCRIPTION AND OPERATION (continued)

Legend - Figure 6-1 (continued)

6. DME MODE SELECTOR SWITCH (OFF, N1, HLD, N2) - Applies power to the DME and selects DME operating mode as follows:

   OFF: Turns DME power off.

   NAV 1
   (N1): Selects DME operation with No. 1 VHF navigation set; enables channel selection by NAV 1 frequency selector controls.

   HOLD
   (HLD): Selects DME memory circuit; DME remains channeled to station to which it was last channeled when HOLD was selected and will continue to display information relative to this channel. Allows both the NAV 1 and NAV 2 navigation receivers to be set to new operational frequencies without affecting the previously selected DME operation.

   NOTE

   In the HOLD mode there is no annunciation of the VOR/DME station frequency. However, an annunciator labeled "H1" or "H2" illuminates on the DME display to flag the pilot that the DME is in the HOLD mode.

   NAV 2
   (N2): Selects DME operation with No. 2 VHF navigation set; enables channel selection by NAV 2 frequency selector switches. Brightness of the labels for this switch is controlled by the RADIO light dimming rheostat.

PILOT'S OPERATING HANDBOOK
AND
FAA APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 7
FOR
S-TEC SYSTEM 55/55X TWO AXIS
AUTOMATIC FLIGHT GUIDANCE SYSTEM
WITH TRIM MONITOR

This Supplement must be attached to the applicable Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the S-TEC System 55/55X Autopilot Model ST-854 is installed. The information contained herein supplements or supersedes the information in the basic Pilot's Operating Handbook and FAA approved Airplane Flight Manual only in those areas listed herein. For limitations, procedures and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook and FAA approved Airplane Flight Manual.

FAA APPROVED: ______

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DATE OF APPROVAL: January 9, 2008

SECTION 1

GENERAL

This manual is to acquaint the pilot with the features and functions of the System 55/55X Two Axis Autopilot and to provide operating instructions for the system. The aircraft must be operated within the limitations herein provided when the autopilot is in use.

SECTION 2

OPERATING LIMITATIONS

1. Autopilot operation prohibited above 180 KIAS.
2. Flap extension or retraction limited to 20° down during autopilot operations.
3. Autopilot coupled missed approach or go-around maneuver not authorized.
4. Autopilot operation prohibited during take-off and landing.
5. Category I operations only.
6. Autopilot use prohibited below 200' AGL during coupled approach operations.
7. S-TEC System 55 Pilot's Operating Handbook, P/N 8747, dated 10-16-00 or later revision, or S-TEC System 55X Pilot's Operating Handbook, P/N 87109, dated 11-08-00 or later revision, must be carried in the aircraft and be available to the pilot while in flight, as appropriate for your aircraft.

SECTION 3

EMERGENCY OPERATING PROCEDURES

In the event of an autopilot malfunction, or anytime the autopilot is not perfoming as expected or commanded, do not attempt to identify the system problem. Immediately regain control of the aircraft by overpowering the autopilot as necessary and then immediately disconnect the autopilot. Do not re-engage the autopilot until the problem has been identified and corrected.

1. The autopilot may be disconnected by:
   a. Depressing the "AP Disconnect" Switch on the left horn of the pilot's control wheel.
   b. Placing the "AP Master Switch" in the "OFF" position.
   c. Momentarily interrupting aircraft electrical power at the battery master switch.
   d. Pulling the autopilot circuit breaker (Located Row 1, Column H).

2. Trim
   a. In the event of a trim failure, manually control aircraft and DEPRESS AND HOLD "Trim Intenupt/AP Disconnect Switch" on control wheel.
   b. Place trim master switch in "OFF" position, pull Pitch Trim circuit breaker (Located Row 1, Column G), release interrupt switch.
   c. Retrim aircraft. Leave trim system OFF until corrected.

EMERGENCY OPERATING PROCEDURES (continued)

3. Altitude loss during a malfunction and recovery:

   a. The following altitude losses and bank angles were recorded after a malfunction with a 3 second recovery delay:

Configuration	Bank Angle/Altitude Loss
Climb	60°/-220 ft.
Cruise	60°/-400 ft.
Descent	55°/-450 ft.

   b. The following altitude losses and bank angles were recorded after a malfunction with a 1 second recovery delay.

Configuration	Bank Angle/Altitude Loss
Maneuvering	15°/-80 ft.
Approach (Coupled or Uncoupled)	20°/-80 ft.

CAUTION

If failure of the Avidyne PFD occurs, autopilot will remain engaged and go into approximately one-half standard rate right turn. DISCONNECT AUTOPILOT and hand fly aircraft.

SECTION 4

NORMAL OPERATING PROCEDURES

For detailed normal operating procedures, including system description, pre-flight and inflight procedures refer to S-TEC System 55 Pilot's Operating Handbook, P/N 8747, dated 10-16-00 or later revision, or S-TEC System 55X Pilot's Operating Handbook, PIN 87109, dated 11-08-00 or later revision, as appropriate for your aircraft.

NOTE

In order to use the GPSS function of the 55X autopilot, the GPS navigator GPS/VLOC CDI selector switch must be in the GPS position. GPSS operation will be inhibited with the switch in the VLOC position.

NOTE

For smoother altitude captures, thus enhancing passenger comfort, engage altitude hold mode at rates of climb of 1,000 FPM or less.

CONTROL WHEEL SWITCHES

The left grip of the pilot's control wheel will normally contain the following autopilot switches:

- Manual Electric Trim
- Trim Interrup/A/P Disconnect Switch
- Control Wheel Steering (CWS)

If the optional co-pilot switch arrangement is installed, the same three switches with the same functions will be installed in the right grip of the co- pilot's control wheel.

ELECTRIC TRIM SYSTEM

The S-TEC Electric Trim System is designed to accept any single failure, either mechanical or electical, without uncontrolled operation resulting during operations in the Manual Electric Trim Mode. During autotrim mode the system is designed to limit the effect of any failure causing trim operation. In order to assure proper operation of these safeguards, it is necessary to conduct a simple pre-flight test of the system. Following is a brief description and a preflight test procedure for the trim system.

TRIM SYSTEM WITH TRIM MONITOR

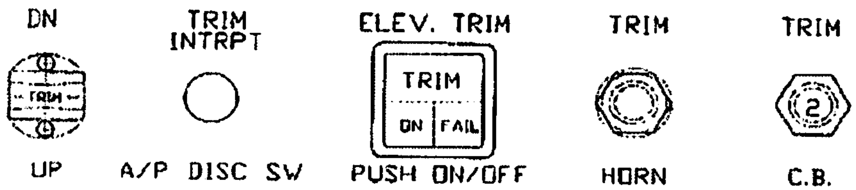

Figure 7-1

SYSTEM DESCRIPTION

The trim monitor system consists of the components pictured in Figure 7-1 and is designed to alert the pilot of a trim failure or trim in motion.

The system is activated by pushing the trim master switch on. A green On light, a yellow Trim light and a red Fail light will illuminate in the switch and the trim audio horn will activate for one second, as a test. A trim fault will cause the Trim and Fail lights to illuminate along with continuous horn operation. The pilot should press and hold the red Trim Interrupt button and conduct the emergency procedures listed in Section 3 of this supplement.

PRE-FLIGHT TRIM CHECK (With Trim Monitor)

MANUAL ELECTRIC TRIM -Test Prior To Each Flight

1. Check trim circuit breaker -IN
2. Trim master switch -Push ON -confirm green light ON after completion of test cycle.
3. A/P master switch -ON
4. Operate trim switch (both knob sections) -NOSE DN. Check that trim moves nose down and yellow trim light in trim master switch flashes while trim is in motion. The trim "in motion" indicator in the autopilot programmer should flash "TRIM" also. Conduct the same test in the NOSE UP direction.
5. With trim operating up or down depress the red control wheel interrupt switch for three seconds minimum. Confirm that trim action stops while switch is pressed. This action should also trigger the trim monitor horn with "Trim" steady and "Fail" flashing in the trim master switch. Recycle the trim master switch to delete the horn.
6. Overpower check -With trim operating electrically, grasp the manual trim wheel and overpower the electric trim to stop trim motion.
7. Operate each half of the trim switch separately -Trim should not operate unless both switch knob segments are moved together.

AUTOTRIM

1. Position elevator control halfway aft from full forward.
2. Engage HDG and ALT modes of autopilot.
3. Grasp control and slowly apply forward pressure (nose down). After approximately 3 seconds automatic trim should run NOSE UP. The yellow trim indicator in trim master switch should flash simultaneously with the trim indicator in the A/P programmer.
4. Conduct the same test by slowly applying aft pressure on the elevator control, confirming that autotrim runs NOSE DOWN and trim indicators flash while trim is in motion.
5. Move manual trim switch up or down - Autopilot should disconnect and trim should operate in the commanded direction. (Trim switch will disconnect A/P only when a pitch mode is engaged.)
6. Reengage autopilot HDG and ALT modes -Press trim interrupt/AP disconnect switch - Autopilot should disconnect.
7. Retrim aircraft for take-off -Check all controls for freedoin of motion and determine that autopilot and trim have disconnected.
8. If either the manual electric or autotrim fails any portion of the above check procedure, push the Trim Master Switch "OFF" and do not attempt to use the trim system until the fault is corrected. With the Trim Master Switch "OFF" the autopilot trim indicators will return to operation. If the electric trim system suffers a power failure in flight the system will automatically revert to the trim indicator lights located in the autopilot annunciator panel. If this occurs push the Trim Master Switch "OFF" and trim manually, using the indicators until the fault can be located and corrected.

GLIDE SLOPE FLIGHT PROCEDURE

Approach the GS intercept point (usually the O.M.) with the flaps set to approach deflection of 0-20° (as desired) at 100-120 KIAS (See Limitations Section) and with the aircraft stabilized in altitude hold mode. At the glide slope intercept, lower the landing gear and adjust power for desired descent speed. For best tracking results make power adjustments in small, smooth increments to maintain desired airspeed. At the missed approach point or the decision height, disconnect the autopilot for landing or for the go-around maneuver. (See Limitations Section.) If a missed approach is required, the autopilot may be reengaged after the aircraft has been reconfigured for and established in a stabilized climb.

SECTION 5

PERFORMANCE

The text of this Section not affected by installation of this equipment.

SECTION 6

WEIGHT AND BALANCE

The text of this Section not affected by installation of this equipment.

SECTION 7

DESCRIPTION AND OPERATION OF THE AIRPLANE AND ITS SYSTEMS

The text of this Section not affected by installation of this equipment.

SECTION 8

AIRPLANE HANDLING, SERVICING AND MAINTENANCE

The text of this Section not affected by installation of this equipment

SECTION 9

SUPPLEMENTS

Refer to contents of this supplement for operation for System 55/55X Automatic Flight Control System.

SECTION 10

OPERATING TIPS

The text of this Section not affected by installation of this equipnlent.

PILOT'S OPERATING HANDBOOK
AND
FAA APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 8
FOR
PRECISE FLIGHT SPEEDBRAKE 2000 SYSTEM

The FAA approved operational supplement for the Precise Flight SpeedBrake 2000 System, installed in accordance with STC SA00520SE, is required for operation of this system. Precise Flight will be responsible to supply and revise the operational supplement. It is permitted to include the Precise Flight supplement in this location of the Pilot's Operating Handbook unless otherwise stated by Precise Flight. The information contained in the Precise Flight supplement may supersede or supplement the information in the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual with respect to the operation of the Precise Flight SpeedBrake 2000 System. For limitations, procedures and performance information not contained in the Precise Flight supplement, consult the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

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PILOT'S OPERATING HANDBOOK AND FAA APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 9 FOR PROPELLER HEAT

This supplement must be attached to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the following equipment is installed per the appropriate Piper Drawing:

Prop Heat - Dwg. No. 101124-002.

The information contained herein supplements or supersedes the information in the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual only in those areas listed herein. For limitations, procedures and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

FAA APPROVED: ____________________

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DATE OF APPROVAL: February 10, 2009

SECTION 1 - GENERAL

This supplement supplies information necessary for the operation of the airplane when the propeller heat option is installed in accordance with FAA Approved Piper data.

SECTION 2 - LIMITATIONS

This aircraft is not approved for flight in icing conditions.

PLACARDS

In full view of the pilot if all required equipment is not installed and operative:

WARNING
THIS AIRCRAFT IS NOT APPROVED FOR
FLIGHT IN ICING CONDITIONS

SECTION 3 - EMERGENCY PROCEDURES

PROPELLER HEAT SYSTEM MALFUNCTION

Excessive vibration may be an indication that the propeller heat is not functioning properly.

Propeller control .... exercise
Propeller heat annunciator .... check for proper indications:
(a) ON for approx. 90 seconds (switch LED steady)
(b) OFF for approx. 90 seconds (switch LED flashing)

Illumination of the prop heat deice fail (PRP DE-ICE FAIL) annunciator is an indication that the propeller blades may not be deicing properly.

PROP HEAT switch .... OFF if failure is indicated

NOTE

A flashing PROP HEAT selector switch LED is an indication that the 90 second off cycle is activated.

WARNING

It is imperative that the PROP HEAT switch be turned OFF if vibration persists. This can be a symptom of uneven blade deicing which can lead to propeller unbalance and engine failure.

Immediate action should be taken to exit icing conditions and avoid further icing conditions.

SECTION 4 - NORMAL PROCEDURES

A check of the heated propeller should be performed by pressing PROP HEAT button on environmental control panel. The green lamp in the PROP HEAT button will start to flash rapidly for 30 seconds, indicating the heater is in the "on" cycle.

IN FLIGHT

If inadvertent icing is encountered:

(a) INDUCTION AIR	ALTERNATE
(b) PITOT HEAT switch	ON
(c) S. WRN HEAT switch	ON
(d) PROP HEAT switch	ON
(e) DEFROST knob	OUT
(f) VENT/DEFOG BLWR switch	ON, if additional defrost is desired

(g) Relieve propeller unbalance (if required) by exercising propeller control briefly. Repeat as required.

Exit icing conditions immediately.

NOTE

For accurate magnetic compass readings, turn the PROP HEAT and PITOT heat switches off momentarily.

SECTION 5 - PERFORMANCE

No change.

SECTION 6 - WEIGHT AND BALANCE

Factory installed optional equipment is included in the licensed weight and balance data in Section 6 of the Pilot's Operating Handbook.

SECTION 7 - DESCRIPTION AND OPERATION OF PROPELLER HEAT

The presence of propeller deicing equipment does not imply the capability to fly into forecast or known icing. The equipment is provided to enlarge the options available to the pilot as he takes appropriate action to avoid icing that is inadvertently encountered.

Controls for the propeller heat are located in the environmental control panel. (Figure 9-1).

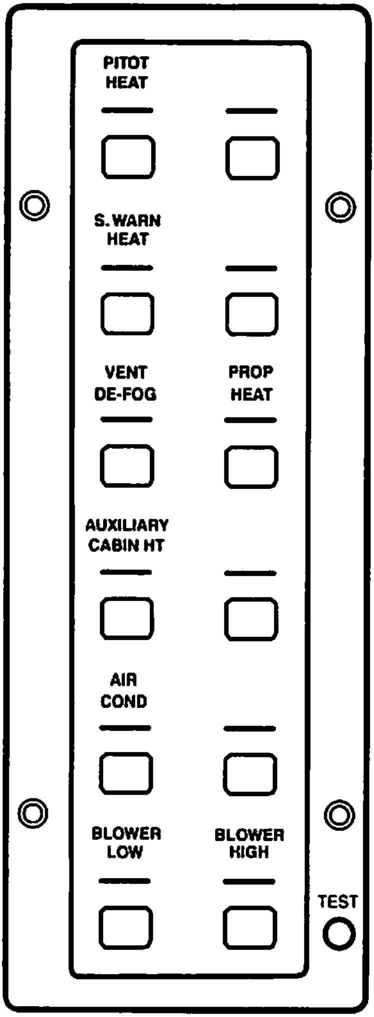

Figure 9-1
Environmental Control Panel

PROPELLER HEAT

Electrothermal propeller heat pads are bonded to a portion of the leading edges of the propeller blades. The system is controlled by an ON-OFF type PROP HEAT switch (Figure 9-1), situated in the environmental control panel. Power for the propeller heat is supplied by the aircraft electrical system through a PROP HEAT circuit breaker on the main circuit breaker panel. When the PROP HEAT switch is actuated, power is applied to a timer which monitors the current through the propeller heat system.

Power from the timer is cycled to brush assemblies which distribute power to slip rings. The current is then supplied from the slip rings directly to the electrothermal propeller heat pads.

The Hartzell propeller is heated in a cycle which applies power to the heat pads for approximately 90 seconds and then shuts off for approximately 90 seconds. Once begun, cycling will proceed in the above sequence and will continue until the system is turned off. The steady illumination of the PROP HEAT switch green LED indicates the portion of the cycle when power is being applied to the heat pads. A flashing annunciator indicates the 90 second cycle in which power has been removed from the heat pads.

A ground test of the prop heat can be accomplished by depressing the prop heat switch to "on" prior to takeoff. During this ground test when heat is being applied to the propeller the green LED in the prop heat switch will flash rapidly for approximately 30 seconds, indicating the heater is in the "on" cycle. After approximately 30 seconds, the flash rate is reduced, indicating the prop heat is in the "off" cycle. The green LED will continue to flash at the slower rate as long as the aircraft is on the ground "on" until the pilot de-selects the prop heat switch.

The propeller designations are: HC-I3YR-1E/7890K,
HC-I3Y1R-1N/N7605K+2

The heat provided by the deice pads reduces the adhesion between the ice and the propeller so that centrifugal force and the blast of the airstream cause the ice to be thrown off the propeller blades in small pieces.

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TABLE OF CONTENTS

SECTION 10

OPERATING TIPS

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SECTION 10

OPERATING TIPS

10.1 GENERAL

This section provides operating tips of particular value in the operation of the PA-46R-350T.

10.3 OPERATING TIPS

(a) Learn to trim for takeoff so that only a very light back pressure on the control wheel is required to lift the airplane off the ground

(b) The best speed for takeoff is 80 to 85 KIAS under normal conditions. Trying to pull the airplane off the ground at too low an airspeed decreases the controllability of the airplane in the event of engine failure.

(c) 10° of flaps may be lowered at airspeeds up to 165 KIAS and full flaps up to 116 KIAS, but to reduce flap operating loads, it is desirable to have the airplane at a slower speed before extending the flaps.

(d) Before attempting to reset any circuit breaker, allow a two to five minute cooling off period.

(e) Before starting the engine, check that all radio switches, light switches and the pitot heat switch are in the off position so as not to create an overloaded condition when the starter is engaged.

(f) Anti-collision lights should not be operating when flying through cloud, fog or haze, since reflected light can produce spatial disorientation. Strobe lights should not be used in close proximity to the ground, such as during taxiing, takeoff or landing.

10.3 OPERATING TIPS (continued)

(g) In an effort to avoid accidents, pilots should obtain and study the safety related information made available in FAA publications, such as regulations, advisory circulars, Aviation News, AIM and safety aids.

(h) Prolonged slips or skids which result in excess of 2000 feet of altitude loss or other radical or extreme maneuvers which could cause uncovering of the fuel outlet must be avoided as fuel flow interruption may occur when the tank being used is not full.

(i) Pilots who fly above 10,000 feet should be aware of the need for special physiological training. Appropriate training is available for a small fee at approximately twenty-three Air Force Bases throughout the United States. The training is free at the NASA Center in Houston and at the FAA Aeronautical Center in Oklahoma.

Forms to be completed (Physiological Training Application and Agreement) for application for the training course may be obtained by writing to the following address:

Chief of Physiological Training, AAC-143
FAA Aeronautical Center
P.O. Box 25082
Oklahoma City, Oklahoma 73125

It is recommended that all pilots who plan to fly above 10,000 feet take this training before flying this high and then take refresher training every two or three years.