Piper

M350

Information Manual

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Issued: April 10, 2015

APPLICABILITY

Application of this handbook is limited to the specific Piper PA-46-350P 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 thru viii, 1-i, 1-ii, 1-1 thru 1-16, 2-i, 2-ii, 2-1 thru 2-34, 3-i thru 3-iv, 3-1 thru 3-68, 4-i, 4ii, 4-1 thru 4-34, 5-i, 5-ii, 5-1 thru 5-36, 6-i, 6-ii, 6-1 thru 6-18, 7-i, 7-ii, 7-1 thru 7-84, 8-i, 8-ii, 8-1 thru 8-26, 9-i, 9-ii, 9-1 thru 9-66, and 10-i, 10-ii, 10-1 thru 10-2.

LOG OF REVISIONS

Current Revisions to the PA-46-350P Pilot's Operating Handbook, REPORT: VB-2561 issued April 10, 2015.

Revision Number and Code	Revised Pages	Description of Revisions	FAA Approved Signature and Date
Rev. 1 (PR150817)	v	Added Rev. 1 to L of R.	
	2-29	Revised Para. 2.51.	
	2-33	Revised Para. 2.51.	
	2-34	Revised Para. 2.51.	
	7-30a	Added page. Added text from page 7-31.	
	7-30b	Added page.	
	7-31	Relocated text to page 7-30a.	Eric A. Wright August 17, 2015
Rev. 2 (PR160523)	ii	Updated copyright.	
	v	Added Rev. 2 to L of R.	
	1-13	Revised Para. 1.23.	
	1-14	Added text from page 1-13.	
	2-15	Revised Para. 2.27.	
	2-30	Revised Para. 2.51 and added placard.	
	3-34	Revised Para. 3.31.	
	3-35	Revised Para. 3.31.	
	4-15	Revised Para. 4.5d.	
	4-22	Revised Para. 4.5j.	
	4-23	Revised Para. 4.5j.	
	4-28	Revised Para. 4.5q.	
	7-46	Revised Para. 7.15.	
	7-47	Revised Para. 7.15.	Eric A. Wright May 23, 2016
Rev. 3 (PR160708)	v	Added Rev. 3 to L of R.	
	2-25	Revised Para. 2.49 and added Warning.	Eric A. Wright July 8, 2016
	4-33	Revised Para. 4.19.	

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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.

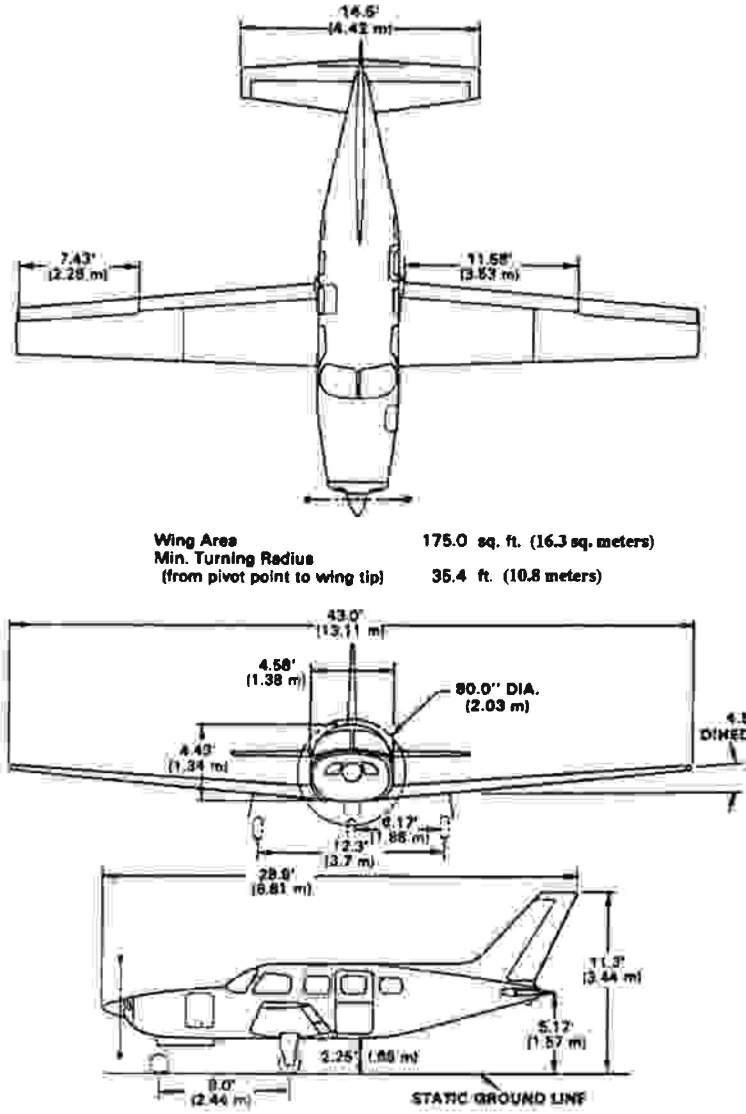
This handbook is not designed as a substitute for adequate and competent flight instruction, knowledge of current Airworthiness Directives, applicable Federal Aviation Regulations or Advisory Circulars. It is not intended to be a guide for basic flight instruction or a training manual and should not 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 (Standard)

(a) Number of Propellers	1
(b) Propeller Manufacturer	Hartzell
(c) Blade Models	N7605K + 2 N7605CK + 2
(d) Number of Blades	3
(e) Hub Model	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 GARMIN GNSS (GPS/SBAS) NAVIGATION SYSTEM EQUIPMENT APPROVALS

The Garmin GNSS navigation system is a GPS system with a Satellite Based Augmentation System (SBAS) comprised of two TSO-C145c Class 3 approved Garmin GIA 63Ws, two TSO-C146c Class 3 approved Garmin GDU 1040 Display Units, Garmin-approved GPS/SBAS antennas (GA 35), and GPS software version 5.0 or later approved version. The Garmin GNSS navigation system in this aircraft is installed in accordance with AC 20-138C.

The Garmin GNSS navigation system as installed in this aircraft complies with the requirements of AC 20-138C and has airworthiness approval for navigation using GPS and SBAS (within the coverage of a Satellite Based Augmentation System complying with ICAO Annex 10) for IFR en route, terminal area, and non-precision approach operations (including those approaches titled “GPS”, “or GPS”, and “RNAV (GPS)” approaches). The Garmin GNSS navigation system is approved for approach procedures with vertical guidance including “LPV” and “LNAV/VNAV” and without vertical guidance including “LP” and “LNAV” within the U.S. National Airspace System.

The Garmin GNSS navigation system complies with the equipment requirements of AC 90-105 and meets the equipment performance and functional requirements to conduct RNP terminal departure and arrival procedures and RNP approach procedures without RF (radius to fix) legs. Part 91 subpart K and 135 operators require operational approval from the FAA.

The Garmin GNSS navigation system complies with the equipment requirements of AC 90-100A for RNAV 2 and RNAV 1 operations. In accordance with AC 90-100A, Part 91 operators (except subpart K) following the aircraft and training guidance in AC 90-100A are authorized to fly RNAV 2 and RNAV 1 procedures. Part 91 subpart K and 135 operators require operational approval from the FAA.

The Garmin GNSS navigation system has been found to comply with the requirements for GPS Class II oceanic and remote navigation (RNP-10) without time limitations in accordance with AC 20-138C and FAA Order 8400.12C. The Garmin GNSS navigation system can be used without reliance on other long range navigation systems. This does not constitute an operational approval.

1.21 GARMIN GNSS (GPS/SBAS) NAVIGATION SYSTEM EQUIPMENT APPROVALS (Continued)

The Garmin GNSS navigation system has been found to comply with the navigation requirements for GPS Class II oceanic and remote navigation (RNP-4) in accordance with AC 20-138C and FAA Order 8400.33. The Garmin GNSS navigation system can be used without reliance on other long-range navigation systems. Additional equipment may be required to obtain operational approval to utilize RNP-4 performance. This does not constitute an operational approval.

Garmin International holds an FAA Type 2 Letter of Acceptance (LOA) in accordance with AC 20-153A for database integrity, quality, and database management practices for the Navigation database. Flight crews and operators can view the LOA status at FlyGarmin.com then select "Type 2 LOA Status".

Navigation information is referenced to WGS-84 reference system.

1.23 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.''
TAS	True Airspeed is the airspeed of an airplane relative to undisturbed air which is the CAS corrected for altitude, temperature and compressibility.
V_{FE}	Maximum Flap Extended Speed is the highest speed permissible with wing flaps in a prescribed extended position.
V_{LE}	Maximum Landing Gear Extended Speed is the maximum speed at which an aircraft can be safely flown with the landing gear extended.

1.23 SYMBOLS, ABBREVIATIONS AND TERMINOLOGY (continued)

V_{LO}	Maximum Landing Gear Operating Speed is the maximum speed at which the landing gear can be safely extended or retracted.
V_{NE}	Never Exceed Speed is the speed limit 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_O	Maximum Operating Maneuvering Speed is the maximum speed at which application of full available aerodynamic control will not overstress the airplane.

NOTE

V_O is defined in accordance with FAR 23 Amendment 45

V_S	Stalling Speed or the minimum steady flight speed at which the airplane is controllable.
V_{S1}	Speed or the minimum steady flight speed obtained in a specific configuration.
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.

1.23 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.

1.23 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

CHT	Cylinder Head Temperature.
MAP	Manifold Pressure.
TIT Gauge	Turbine Inlet Temperature.

1.23 SYMBOLS, ABBREVIATIONS AND TERMINOLOGY (continued)

(e) Avionics System Abbreviations/Terminology

1	Refers to pilot's side (AHRS1, ADC1, GPS1)
2	Refers to co-pilot's side (AHRS2, ADC2, GPS2)
ADC	Air Data Computer
AFCS	Automatic Flight Control System
AHRS	Attitude and Heading Reference System
CAS	Crew Alerting System
EBD	Evolution Backup Display (Aspen standby instrument)
EIS	Engine Indication System
FDE	Fault Detection and Exclusion
FOB	Fuel On Board
GCU	Garmin MFD/PFD Control Unit
GDL	Garmin Datalink
GDU	Garmin Display Unit
GEA	Garmin Engine/Airframe Processing Unit
GFC	Garmin Flight Control System
GIA	Garmin Integrated Avionics Unit
GMA	Garmin Audio Panel
GMC	Garmin AFCS Mode Controller
GMU	Garmin Magnetometer Unit
GPS	Global Positioning System
GSA	Garmin AFCS Servo Actuator
GSM	Garmin Servo Mount
GTP	Garmin Temperature Probe (OAT)
GTX	Garmin Transponder
GWX	Garmin Weather Radar
MFD	Multi-Function Display
PFD	Primary Flight Display
PFT	Preflight Test

1.23 SYMBOLS, ABBREVIATIONS AND TERMINOLOGY (continued)

(e) Avionics System Abbreviations/Terminology (continued)

SBAS	Satellite-Based Augmentation System
TAWS	Terrain Awareness and Warning System
WAAS	Wide Area Augmentation System

(f) Airplane Performance and Flight Planning Terminology

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.
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.
MEA	Minimum Enroute IFR Altitude.
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.

(g) Weight and Balance Terminology

A.O.D.	Aft of Datum.
Arm	The horizontal distance from the reference datum to the center of gravity (C.G.) of an item.

1.23 SYMBOLS, ABBREVIATIONS AND TERMINOLOGY (continued)

(g) Weight and Balance Terminology (continued)

Center of Gravity (C.G.)	The point at which an airplane would balance if suspended. The C.G.'s 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.
Datum	An imaginary vertical plane from which all horizontal distances are measured for balance purposes.
Basic Empty Weight	Standard empty weight plus optional equipment.
Maximum Landing Weight	Maximum weight approved for touchdown when landing.
Maximum Ramp Weight	Maximum weight approved for ground maneuver. (It includes the weight of fuel for start, taxi and run up.)
Maximum Takeoff Weight	Maximum Weight approved for the start of the takeoff run.
Maximum Zero Fuel Weight	Maximum weight exclusive of usable fuel.
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.)
Payload	Weight of occupants, cargo and baggage.

1.23 SYMBOLS, ABBREVIATIONS AND TERMINOLOGY (continued)

(g) Weight and Balance Terminology (continued)

Standard Empty Weight	Weight of a standard airplane including unusable fuel, full operating fluids and full oil.
Station	A location along the airplane fuselage usually given in terms of distance from the reference datum.
Unusable Fuel	Fuel remaining after a runout test has been completed in accordance with governmental regulations.
Usable Fuel	Fuel available for flight planning.
Useful Load	Difference between takeoff weight, or ramp weight if applicable, and basic empty weight

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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
Maximum Operating Maneuvering Speed - (V_O) Do not make full or abrupt control movements- above this speed. Interpolation between weights is acceptable for weights between those shown. Minimum flying weight is 3400 lb.	SEE TABLE	

WEIGHT (lb.)	KIAS	KCAS
4340	133	135
4200	131	133
4000	128	130
3800	125	127
3600	121	123
3400	118	120
3200	114	116

2.3 AIRSPEED LIMITATIONS (continued)

Speed	KIAS	KCAS
Maximum Speed for Pneumatic Boot Inflation.	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

Garmin PFD	KIAS
Red 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 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
	(6) Minimum Manifold Pressure (IN. HG.)	
	Above 23,000 feet	23
	(7) Minimum Propeller Speed (RPM)	
	Above 23,000 feet	2400
(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 (3 Blade)	HC-I3Y1R-1N/N7605K+2 HC-I3Y1R-1N/N7605CK+2
(j)	Propeller Diameter (inches)	
	3 Blade	80
(k)	Blade Angle Limits	
	Low Pitch Stop (3 Blade) Min./Max.	13.8°/14.2°
	High Pitch Stop (3 Blade) Min./Max.	37°/39°

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 Operating Range)	100° to 245°F
Red Line (Maximum)	245°F
(d) Oil Pressure	
Green Arc (Below 1200 RPM)	25 PSI to 95 PSI
Green Arc (Normal Operating Range)	55 PSI to 95 PSI
Amber Arc (Caution Range) (Above 1200 RPM)	25 PSI to 55 PSI
Amber Arc (Caution Range)	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 480°F
Amber Arc (Caution Range)	480°F to 500°F
Red Line (Maximum)	500°F
(h) Vacuum Pressure	
Green Range (Normal Operating Range)	4.0 to 6.0 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
4340	144.1	147.1
4123	139.6	147.1
4000	137.0	146.5
2450	130.7	137.6
2400	130.7	137.3

NOTES

Straight line variation between points given.

The datum used is 100.0 inches ahead of the forward pressure 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

2.21 FLIGHT CREW LIMITS

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

2.23 GARMIN G1000 AVIONICS SYSTEM LIMITATIONS

(a) Cockpit Reference Guide & Pilot's Guide

The latest appropriate revision of the Garmin G1000 Cockpit Reference Guide P/N 190-01888-00 must be immediately available to the flight crew.

Garmin also provides a detailed G1000 Pilot's Guide P/N 190-01889-00. The Pilot's Guide is not required to be on board the aircraft, but the latest appropriate revision should be used to obtain a more in depth description of all the functions and capabilities of the G1000 avionics system.

(b) System Software Requirements

The Garmin G1000 must utilize the following or later FAA approved software versions:

Component	Identification	Software Version
PFD	Primary Flight Display	15.00
MFD	Multifunction Flight Display	15.00
GMA	Audio Panel	3.08
AHRS	Attitude and Heading Reference System	3.04
ADC	Air Data Computer	3.10
GIA	Integrated Avionics Unit	7.70
GEA	Engine Airframe Interface Unit	2.07
GPS	Global Positioning System	5.0
GMU	Magnetometer Unit	2.05
GSA	Servo Actuator	3.30

The database version is displayed on the MFD power-up page immediately after system power-up and must be acknowledged. The remaining system software versions can be verified on the AUX group sub-page 5, "AUX SYSTEM STATUS".

2.23 GARMIN G1000 AVIONICS SYSTEM LIMITATIONS (Continued)

(c) Database

Navigation Database

GPS/SBAS based IFR enroute, oceanic and terminal navigation predicated upon the Garmin G1000 GPS Receiver is prohibited unless the pilot uses a valid, compatible, and current Navigation database or verifies each selected waypoint for accuracy by reference to current data.

Instrument approach navigation predicated upon the Garmin G1000 GPS Receiver must be accomplished in accordance with approved instrument approach procedures that are retrieved from the G1000 Navigation database. The G1000 Navigation database must incorporate the current update cycle and the approach must be retrievable by its procedure name.

TAWS / TERRAIN Database

- 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.

NOTE

The area of coverage may be modified as additional terrain data sources become available.

2.23 GARMIN G1000 AVIONICS SYSTEM LIMITATIONS (Continued)

(d) Flight Planning

In areas where GPS WAAS SBAS coverage is not available, the pilot must verify RAIM availability. Within the United States, RAIM availability can be determined using the Garmin WFDE Prediction program, or the FAA's enroute and terminal RAIM prediction website: www.raimprediction.net, or by contacting a Flight Service Station. Within Europe, RAIM availability can be determined using the Garmin WFDE Prediction program or Europe's AUGER GPS RAIM Prediction Tool at http://augur.ecacnav.com/augur/app/home. For other areas, use the Garmin WFDE Prediction program. The route planning and WFDE Prediction program may be downloaded from the Garmin website on the internet. For information on using the WFDE Prediction Program, refer to Garmin WASS FDE Prediction Program, part number 190-00643, 'WFDE Prediction Program Instructions'.

For operations within the U.S. Nation Airspace System on RNP and RNAV procedures when GPS WAAS SBAS signals are not available, the availability of GPS RAIM shall be confirmed for the intended route of flight. In the event of a predicted continuous loss of RAIM of more than five minutes for any part of the intended route of flight, the flight should be delayed, canceled, or re-routed on a track where RAIM requirements can be met.

For operations within European B-RNAV/RNAV-5 and P-RNAV airspace, if more than one satellite is scheduled to be out of service, then the availability of GPS RAIM shall be confirmed for the intended flight (route and time). In the event of a predicted continuous loss of RAIM of more than five minutes for any part of the intended flight, the flight should be delayed, canceled, or rerouted on a track where RAIM requirements can be met.

For flight planning purposes, operations where the route requires Class II navigation the aircraft's operator or flight crew must use the Garmin WFDE Prediction program to demonstrate that there are no outages on the specified route that would prevent the Garmin GNSS navigation system from providing GPS Class II navigation in oceanic and remote areas of operation that requires (RNP-10 or RNP-4) capability. If the Garmin WFDE Prediction program indicates fault exclusion (FDE) is unavailable for more than 34 minutes in accordance with FAA Order 8400.12C for RNP-10 requirements, or 25 minutes in accordance with FAA Order 8400.33 for RNP-4 requirements, then the operation must be rescheduled when FDE is available.

2.23 GARMIN G1000 AVIONICS SYSTEM LIMITATIONS (Continued)

(d) Flight Planning (continued)

Both Garmin GPS navigation receivers must be operating and providing GPS navigation guidance to their respective PFD for operations requiring RNP-4 performance.

North Atlantic (NAT) Minimum Navigational Performance Specifications (MNPS) Airspace operations per AC 91-49 and AC 120-33 require both GPS/SBAS receivers to be operating and receiving usable signals except for routes requiring only one Long Range Navigation sensor. Each display computes an independent navigation solution based on the on-side GPS sensor. However, either display will automatically revert to the cross-side sensor if the on-side sensor fails or if the cross-side sensor is determined to be more accurate. On G1000 installations a "BOTH ON GPS1" or "BOTH ON GPS2" message does not necessarily mean that one GPS has failed. Refer to the MFD AUX-GPS STATUS page to determine the state of the unused GPS.

When RAIM is required for GPS integrity (GPS WAAS SBAS not available) during instrument meteorological conditions (IMC), other non-GPS navigation equipment appropriate to the operation, must be available.

When using GPS WAAS at an alternate airport, flight planning must be based on the minimums associated with the RNAV (GPS) LNAV, circling, or GPS or conventional approach procedure with "or GPS" in the title. Upon arrival at the alternate, if the WAAS navigation equipment indicates LNAV/VNAV or LPV service is available, then the associated vertical guidance and minimums may be used.

When not using GPS WAAS, filing a GPS-based instrument approach at either the destination or alternate airport is acceptable, but not at both locations. The GPS receiver must have fault detection and exclusion (FDE) capability and the pilot must perform a preflight RAIM prediction at the airport where the RNAV (GPS) approach will be flown. For the alternate airport, flight planning must be based on the minimums associated with the LNAV or circling approach.

2.23 GARMIN G1000 AVIONICS SYSTEM LIMITATIONS (Continued)

(e) Enroute

RNP and RNAV routes including Standard Instrument Departures (SIDs) and Obstacle Departure Procedures (ODPs) and Standard Terminal Arrival (STAR) must be loaded into the flight plan from the current database in their entirety, rather than loading route waypoints from the database into the flight plan individually. Whenever possible, RNAV “Q” and RNAV “T” routes should be extracted from the database in their entirety, rather than loading RNAV route waypoints from the database into the flight plan individually. Selecting and inserting individual named fixes from the database is permitted, provided all fixes along the published route to be flown are inserted. Manual entry of waypoints using latitude/longitude or place/bearing is prohibited.

Navigation information is referenced to WGS-84 reference system, and should only be used where the Aeronautical Information Publication (including electronic data and aeronautical charts) conform to WGS-84 or equivalent.

(f) Approaches

“GPS”, “or GPS”, and “RNAV (GPS)” instrument approaches using the Garmin navigation systems are prohibited unless the flight crew verifies and uses the current Navigation database. GPS based instrument approaches must be flown in accordance with an approved instrument approach procedure that is loaded from the Navigation database.

Not all published Instrument Approach Procedures (IAP) are in the Navigation database. Flight crew planning on flying an RNAV instrument approach must ensure that the Navigation database contains the planned RNAV Instrument Approach Procedure and that approach procedure must be loaded from the Navigation database into the FMS flight plan by its name.

(1) Vertical Guidance
Advisory vertical guidance deviation information is only an aid to help pilots comply with altitude restrictions. When using advisory vertical guidance, the pilot must use the primary barometric altimeter to ensure compliance with all altitude restrictions, particularly during instrument approach operations.

2.23 GARMIN G1000 AVIONICS SYSTEM LIMITATIONS (Continued)

(f) Approaches (continued)

(1) Vertical Guidance (continued)

When GPS WAAS SBAS corrections are unavailable or if operating outside of GPS WAAS SBAS coverage, instrument approaches utilizing the GPS receiver will be conducted in the approach mode and Fault Detection and Exclusion mode. Loss of Integrity annunciations must not be displayed at the Final Approach Fix. Vertical guidance from GPS will not be available if GPS WAAS SBAS corrections are unavailable or if operating outside of GPS WAAS SBAS coverage. When outside or on the fringe of the SBAS coverage area, it may be desirable, although not recommended, to disable SBAS.

IFR non-precision approach with vertical guidance approval using the GPS/SBAS sensor is limited to published approaches within the U.S. Airspace System. Approaches to airports in other airspace are not approved unless authorized by the appropriate governing authority.

(2) GPS Approaches

See Section 1, paragraph 1.21. for approved GPS operations/approaches.

(3) Non GPS Approaches

The navigation equipment required to perform instrument approach procedures is indicated by the title of the procedure and notes on the IAP chart. Use of the Garmin GPS/SBAS receivers to provide navigation guidance during the final approach segment of an ILS, LOC, LOC-BC, LDA, SDF, MLS or any other type of approach not approved for "or GPS" navigation is prohibited. When using the Garmin VOR/LOC/GS receivers to fly the final approach segment, VOR/LOC/GS navigation data must be selected and presented on the CDI of the pilot flying.

2.23 GARMIN G1000 AVIONICS SYSTEM LIMITATIONS (Continued)

(g) Attitude and Heading Reference System (AHRS)

(1) AHRS Operational Area

Operation in the following regions is not authorized due to unsuitability of the magnetic fields near the Earth's poles:

- North of 72° North latitude at all longitudes
- South of 70° South latitude at all longitudes
- North of 65° North latitude between longitude 75° W and 120° W. (Northern Canada)
- North of 70° North latitude between longitude 70° W and 128° W. (Northern Canada)
- North of 70° North latitude between longitude 85° E and 114° E. (Northern Russia)
- South of 55° South latitude between longitude 120° E and 165° E. (Region south of Australia and New Zealand)

Loss of the G1000 heading and attitude may occur near the poles, but this will not affect the GPS track. See Section 2.27 for Standby Attitude Indicator Limitations.

NOTE

Only one GPS needs to be available for IFR operations.

(h) Terrain and Obstacle Display

The G1000 terrain and obstacle information appears on the MFD display as red and yellow tiles or towers, and is depicted for advisory information only. Aircraft maneuvers and navigation must not be predicted upon the use of the terrain display.

Obstacles 200 feet and higher are included in the obstacle database. It is very important to note that not all obstacles are necessarily charted and therefore may not be contained in the obstacle database. Coverage of the obstacle database includes the United States and Europe.

2.23 GARMIN G1000 AVIONICS SYSTEM LIMITATIONS (Continued)

(i) Datalink Weather Display

Datalink weather is provided by optional XM or Iriduim weather services. The weather information display on the MFD is limited to supplemental use only and may not be used in lieu of an official weather data source.

WARNING

Do not use data-linked weather as the sole means for negotiating a path through a thunderstorm area (tactical maneuvering). Avoid any thunderstorm identified as severe or giving an intense radar echo by at least 20 miles. This is especially true under the anvil of a large cumulonimbus.

(j) Traffic Display

Traffic shown on the display may or may not have traffic alerting available. The display of traffic is an aid to visual acquisition and may not be utilized for aircraft maneuvering.

(k) Synthetic Vision System (SVS)

Use of the Synthetic Vision System display elements alone for aircraft control without reference to the G1000 primary flight instruments or the aircraft standby instrument is prohibited.

Use of the Synthetic Vision system alone for navigation, or obstacle/ terrain avoidance is prohibited.

(l) ChartView, FliteCharts, and SafeTaxi®

The G1000 Integrated Avionics System as installed in this aircraft supports approval of AC 120-76B Hardware Class 3, Software Type B Electronic Flight Bag (EFB) electronic aeronautical chart applications when using current FliteChart or ChartView data.

For operations under 14 CFR Part 91, it is suggested that a secondary or back up source of aeronautical information necessary for the flight be available to the pilot in the aircraft. The secondary or backup information may be either traditional paper-based material or displayed electronically. If the source of aeronautical information is in electronic format, operators must determine non-interference with the G1000 system and existing aircraft systems for all flight phases.

2.23 GARMIN G1000 AVIONICS SYSTEM LIMITATIONS (Continued)

(l) ChartView, FliteCharts, and SafeTaxi® (Cont.)

Do not use SafeTaxi®, Chartview, or FliteCharts functions as the basis for ground maneuvering. SafeTaxi®, Chartview, and FliteCharts functions have not been qualified to be used as an Airport Moving Map Display (AMMD). They are intended to improve pilot situational awareness during ground operations and should only be used by the flight crew to orient themselves on the airport surface.

(m) Approach Operation Limitations

1. All TAWS caution and warning aural alerts must be followed immediately upon receipt. Pilots are authorized to deviate from their current ATC clearance to the extent necessary to comply with terrain/obstacle warnings from the TAWS per FAR 91.223.
2. When operating single pilot - BARO SYNCH must be ON. When operating two pilot - BARO SYNCH must be OFF.

2.25 GFC 700 AUTOMATIC FLIGHT CONTROL SYSTEM (AFCS)

1. The autopilot and yaw damper must be disengaged during takeoff and landing.
2. Autopilot and yaw damper minimum engagement heights:
   a.) 400 feet AGL during takeoff and subsequent climb operations.
   b.) 1000 feet AGL during cruise and descent operations.
   c.) 200 feet AGL during approach operations.
3. Autopilot minimum approved operating speed:
   a.) On approach - 90 KIAS
   b.) Other than approach - 78 KIAS
4. Autopilot and yaw damper maximum approved operating speed - 183 KIAS
5. Maximum autopilot engagement limits:
   a). With Enhanced AFCS Features (optional)
      Pitch UP: 50°
      Pitch DOWN: 50°
      Roll: +/-75°

   b.) Without Enhanced AFCS Features
      Pitch UP: 25°
      Pitch DOWN: 20°
      Roll: +/-45°
6. Autopilot approved for Category 1 precision approaches and non-precision approaches only.
7. A pilot with the seat belt fastened must occupy the left pilot's seat during all autopilot operations.

2.27 ASPEN STANDBY INSTRUMENT LIMITATIONS

1. The Aspen Evolution Backup Display (EBD) Pilot's Guide P/N 091-00027-001 Revision A, or later appropriate revision, must be immediately available to the flight crew.
2. The unit's internal battery must checked for proper charge prior to operations in IFR conditions. If the charge level is less than 80%, flight in IFR conditions is prohibited.
3. Use of the EBD for IFR operations within 750 nautical miles of the magnetic North or South Pole is NOT AUTHORIZED.

NOTE

See Section 2.33 Kinds of Operation Equipment List for approved Types of Operations when the EBD has an invalid or failed function.

2.33 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 operating requirements.

System	Number Required	Types of Operation and Remarks (DAY, NIGHT, VFR, IFR and ICING Conditions)
1. GARMIN G1000 SYSTEM EQUIPMENT		
GDU 1040 Primary Flight Display	0 (1) 2	DAY, NIGHT, VFR IFR, ICING
GDU 1240A Multi-function Display	1 (2)	IFR, ICING
GCU 476 MFD/PFD Control Unit (Keypad)	1	IFR, ICING
GIA 63W Integrated Avionics Unit	2	DAY, NIGHT, VFR, IFR, ICING
GPS	1	DAY, NIGHT, VFR, IFR, ICING
GEA 71 Engine Airframe Interface	1	DAY, NIGHT, VFR, IFR, ICING
GRS 77 Attitude and Heading Reference System (AHRS)	1 2	DAY, NIGHT, VFR IFR, ICING
GDC 74A Air Data Computer (ADC)	1 2	DAY, NIGHT, VFR IFR, ICING

(1) The MFD must be functional to fly DAY, NIGHT, VFR with an inoperative PFD1.

(2) The MFD must be functional for ALL flight operations if PFD1 is inoperative.

2.33 KINDS OF OPERATION EQUIPMENT LIST (continued)

System	Number Required	Types of Operation and Remarks (DAY, NIGHT, VFR, IFR and ICING Conditions)
1. GARMIN G1000 SYSTEM EQUIPMENT (Continued)		
GMU 44 Magnetometer	2	DAY, NIGHT, VFR, IFR, ICING
GMA 350 Audio Panel	1	IFR, ICING
AV1 FAN FAIL AV2 FAN FAIL MFD FAN FAIL PFD2 FAN FAIL CAS Messages	4	DAY, NIGHT, IFR, VFR, ICING
2. FLIGHT INSTRUMENTATION		
Standby Attitude Indicator	1	IFR, ICING
Standby Airspeed Indicator	1	IFR, ICING
Standby Altimeter	1	IFR, ICING
Outside Air Temperature (OAT) Indicator	1	DAY, NIGHT, VFR, IFR, ICING
Clock	1	IFR, ICING
3. ELECTRICAL		
Alternators	1 2	DAY, NIGHT, VFR, IFR ICING
Ammeters	2	DAY, NIGHT, VFR, IFR, ICING

2.33 KINDS OF OPERATION EQUIPMENT LIST (continued)

System	Number Required	Types of Operation and Remarks (DAY, NIGHT, VFR, IFR and ICING Conditions)
3 ELECTRICAL (Continued)		
ALTR 1 FAIL ALTR 2 FAIL CAS Messages	2	DAY, NIGHT, VFR, IFR, ICING
VOLTS Indication	1	DAY, NIGHT, VFR, IFR, ICING
4 EQUIPMENT/ FURNISHINGS		
Safety Restraint Each Occupant	AR	DAY, NIGHT, VFR, IFR, ICING
5. FLIGHT CONTROLS		
Flap Position Indicator	1	DAY, NIGHT, VFR, IFR, ICING
Elevator Trim Position Indicator	1	DAY, NIGHT, VFR, IFR, ICING
Rudder Trim Position Indicator	1	DAY, NIGHT, VFR, IFR, ICING
6. FUEL		
Fuel Quantity Indicating System	2	DAY, NIGHT, VFR, IFR, ICING
BOOST PUMP FAIL CAS Message	1	DAY, NIGHT, VFR, IFR, ICING
FUEL PRESS LOW CAS Message	1	DAY, NIGHT, VFR, IFR, ICING

2.33 KINDS OF OPERATION EQUIPMENT LIST (continued)

System	Number Required	Types of Operation and Remarks (DAY, NIGHT, VFR, IFR and ICING Conditions)
7 ICE PROTECTION		
Pneumatic Deice System (Wing and Empennage Protection)	1	ICING
SURF DEICE ON CAS Message	1	ICING
SURF DEICE FAIL CAS Message	1	ICING
Wing Ice Detection Light	1	ICING
Electrothermal Propeller Deice Boots	1 per Blade	ICING
PROP HEAT Switch Light	1	ICING
PROP HEAT FAIL CAS Message	1	ICING
Heated Windshield	1	ICING
WDSHLD OVRTMP CAS Message	1	ICING
S. WARN HEAT Switch Light	1	ICING
Heated Pitot Head	1 (pilot) 2	DAY, NIGHT, VFR IFR, ICING
L PITOT HT FAIL CAS Message	1	DAY, NIGHT, VFR, IFR, ICING

2.33 KINDS OF OPERATION EQUIPMENT LIST (continued)

System	Number Required	Types of Operation and Remarks (DAY, NIGHT, VFR, IFR and ICING Conditions)
7. ICE PROTECTION (Continued)		
R PITOT HT FAIL CAS Message	1	IFR, ICING
Alternate Static Source	1	ICING
Vacuum Pump	2	ICING
VACUUM (1 or 2) FAIL CAS Message	1	ICING
VAC PRESS LOW	1	ICING
Alternator	2	ICING
8. 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

2.33 KINDS OF OPERATION EQUIPMENT LIST (continued)

System	Number Required	Types of Operation and Remarks (DAY, NIGHT, VFR, IFR and ICING Conditions)
9. LANDING GEAR		
Hydraulic Pump	1	DAY, NIGHT, VFR, IFR, ICING
HYDR PUMP ON CAS Message	1	DAY, NIGHT, VFR, IFR, ICING
Landing Gear Down Position Indications	3	DAY, NIGHT, VFR, IFR, ICING
CHECK GEAR Aural Alert	1	DAY, NIGHT, VFR, IFR, ICING
10. LIGHTS - EXTERNAL		
Landing Light	1	NIGHT
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	DAY, NIGHT, VFR, IFR, ICING
Taxi / Pulse Lights	2	NIGHT

2.33 KINDS OF OPERATION EQUIPMENT LIST (continued)

System	Number Required	Types of Operation and Remarks (DAY, NIGHT, VFR, IFR and ICING Conditions)
11 LIGHTS - COCKPIT		
Instrument Panel Switch Lights	AR	NIGHT
Instrument Lights	AR	NIGHT
Dome Lights	1 (pilot)	NIGHT
12. PRESSURIZATION		
Cabin Altimeter	1	DAY, NIGHT, VFR, IFR, ICING
Cabin Differential Pressure Indicator	1	DAY, NIGHT, VFR, IFR, ICING
Cabin Vertical Speed Indicator	1	DAY, NIGHT, VFR, IFR, ICING
Outflow Valve	2	DAY, NIGHT, VFR, IFR, ICING
CABIN ALT 10000 CAS Message	1	DAY, NIGHT, VFR, IFR, ICING

2.33 KINDS OF OPERATION EQUIPMENT LIST (continued)

System	Number Required	Types of Operation and Remarks (DAY, NIGHT, VFR, IFR and ICING Conditions)
13. MISCELLANEOUS SYSTEM		
Stall Warning System	1	DAY, NIGHT, VFR, IFR, ICING
STALL WARN FAIL CAS Message	1	DAY, NIGHT, VFR, IFR, ICING

2.35 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) Maximum Fuel Imbalance .... 10 U.S. GAL.

2.37 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 14 CFR Part 91.

2.39 CABIN PRESSURIZATION LIMITS

(a) Pressurized flight operation approved at maximum cabin differential pressure of 5.6 psi.
(b) Pressurized landing not approved.

2.41 AIR CONDITIONING SYSTEM LIMITATIONS

AIR COND switch in OFF position for takeoffs and landings.

NOTE

BLOWER LOW or BLOWER HIGH switch may be selected

2.43 ELECTRIC AUXILIARY CABIN HEATER LIMITATIONS

(a) Both alternators must be functioning.
(b) The VOLTS indicating system 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).

2.45 MAXIMUM SEATING CONFIGURATION

The maximum seating capacity is 6 (six) persons.

2.47 SMOKING

Smoking is not permitted in the aircraft.

2.49 OPERATION IN ICING CONDITIONS

(PIR-AD98-04-26)

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.

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).]

Operation in icing conditions is prohibited unless the airplane is equipped with optional ice protection systems. See Section 4.53 and Section 9, Supplement 2 (Section 1) for details on operation in icing conditions.

2.51 PLACARDS

On the pilot's left hand 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.

PRESSURIZED LANDING NOT APPROVED.

Near the Display Backup buttons (above each PFD):

DISPLAY
BACKUP

To the right of Pilot's control column:

PULSE
OXIMETER

2.51 PLACARDS (continued)

Above the pilot's PFD:

V_O 118 KIAS
SEE AFM

V_{LO} 165 KIAS DN
V_{LO} 126 KIAS UP
V_{LE} 195 KIAS MAX

NO ACROBATIC MANEUVERS, INCLUDING SPINS, APPROVED.

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:

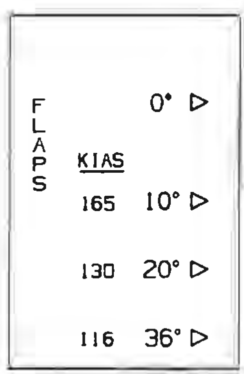
EMERGENCY GEAR
EXTENSION
PULL TO RELEASE, SEE
A.F.M. BEFORE
RE-ENGAGEMENT

2.51 PLACARDS (continued)

Left of the pilot's control column:

CABIN PRESS
PULL OFF

Near the flap selector:



Above The Pilot's PFD:

STALL TEST

2.51 PLACARDS (continued)

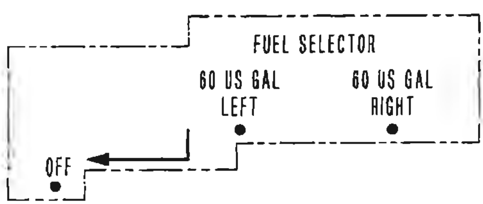
Above the copilot's PFD (if equipped with Stormscope):

STORMSCOPE NOT TO BE USED FOR
THUNDERSTORM AREA PENETRATION

Under the Pilot's Control Yoke:

DIMMING
SWITCH PANEL AVIONICS

Near the fuel selector:



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

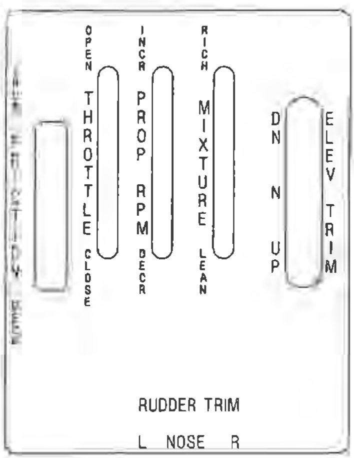
<u>ALTERNATE STATIC SOURCE</u>
(LOCATED PILOT'S SIDE BELOW PANEL)
UP - ALTERNATE
DOWN - PRIMARY

2.51 PLACARDS (continued)

On the copilot's side panel:

EMERGENCY OXYGEN
IN DRAWER UNDER SEAT
(AISLE ACCESS)
PULL MASK OUT OF DRAWER FULLY
AT FULL EXTENSION GIVE CORD A TUG
MAXIMUM DURATION ---------- 15 MINS
SEE POH
NO SMOKING WHILE IN USE

Near the elevator trim wheel:



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

NO SMOKING

OR

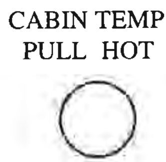
Above the cockpit overhead switch panel and on the upper cabin door:

ISSUED: APRIL 10, 2015
REVISED: MAY 23, 2016

2.51 PLACARDS (continued)

Near the defrost control:

Near the cabin temperature control:



Near the induction air control:

2.51 PLACARDS (continued)

On the inside of the forward baggage door:

MAXIMUM BAGGAGE THIS COMPARTMENT 100 LBS.

On the aft baggage closeout:

For aircraft prior to serial number 4636615:

MAXIMUM BAGGAGE THIS COMPARTMENT 100 LBS.

For aircraft serial number 4636615 and up:

On the interior of the lower cabin door (S/N 4636558 and up):

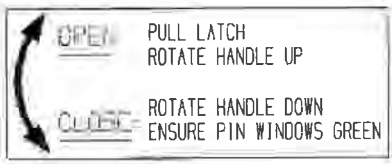
PILOTS, PASSENGERS, AND BAGGAGE AREAS
MAXIMUM ALLOWABLE COMBINED WEIGHT
POUNDS
LOAD IN ACCORDANCE WITH
APPROVED WEIGHT AND BALANCE DATA

2.51 PLACARDS (continued)

Over the emergency exit handle:

EMERGENCY EXIT
REMOVE GLASS
PULL DOOR IN - LIFT UP

On the upper door inner latch:



NOTE

Use of the word ENSURE or INSURE is acceptable.

On the lower cabin door stop (if installed), and left and right side of the upper cabin door bottom edge:

On the main cabin door handle:

2.51 PLACARDS (continued)

On the upper edge of the cabin lower door:

OPEN ⟷ CLOSE ENSURE PIN
WINDOWS GREEN

NOTE

Use of the word ENSURE or INSURE is acceptable.

Adjacent to the fuel tank filler caps:

TABLE OF CONTENTS

SECTION 3

EMERGENCY PROCEDURES

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EMERGENCY PROCEDURES

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SECTION 3

EMERGENCY PROCEDURES

3.1 GENERAL

This section provides the recommended procedures for coping with various emergency or critical situations. All of the emergency procedures required by the FAA are presented, along with those procedures that are necessary for operation of the airplane.

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

Checklists within this section are divided into two distinct parts.

1. The Emergency Procedures Checklists, depicted within boxes, describe action sequences that should be followed during critical situations.

2. When applicable, amplified procedures are provided immediately below the relevant Emergency Procedures Checklist, to enhance the pilot's understanding of the procedure.

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

Most basic emergency procedures are a normal part of pilot training. The information presented in this section is not intended to replace this training. In order to remain proficient, pilots should periodically review standard emergency procedures.

NOTE

The latest appropriate revision of the Garmin G1000 Cockpit Reference Guide for the Piper PA-46-350P (Garmin P/N 190-01888-00), and the Garmin G1000 Pilot's Guide for the Piper PA-46-350P (Garmin P/N 190-01889-00), contain detailed descriptions of the annunciator system, including all CAS messages, PFD and MFD annunciations, and aural alerts.

3.1 GENERAL (Continued)

Crew Alerting System (CAS) Messages

The following tables show the color and significance of the Warning, Caution and Advisory messages which may appear on the Garmin G1000 displays.

Warning Messages - Red

CAS Event	CAS Message	Checklist Page	Cause
CAS Warnings with Text Messages			
Alternator Failure	[redacted]	3-27 3-28 Sect. 9 Supp. 2	Alternator 1 failure, as determined by voltage regulator (discrete input).
Alternator Failure	[redacted]	3-27 3-28 Sect. 9 Supp. 2	Alternator 2 failure, as determined by voltage regulator (discrete input).
Cabin altitude is 10,000 ft or higher	[redacted]	3-46 3-58	Cabin altitude is above 10,000 feet.
Cabin door is not closed	[redacted]	3-57	Cabin door is not properly closed and latched with engine running.
Left Fuel Quantity in warning range.	[redacted]	3-23	Left fuel quantity </=5.0 Gallons while the engine is running.
Right Fuel Quantity in warning range	[redacted]	3-23	Right fuel quantity </=5.0 Gallons while the engine is running.
Fuel Pressure is Low	[redacted]	3-24	Fuel pressure is less than 10 PSIG.
Aircraft descended to 14000 or 12500 due to pilot incapacitation	[redacted]	3-46	60 seconds after an unacknowledged HYPOXIA ALERT caution, autopilot will descend to either 14000 or 12500 feet
Left and Right Pitot Heat failure	[redacted]	3-63 Sect. 9 Supp. 2	Left and Right pitot heat failed.

3.1 GENERAL (Continued)

Crew Alerting System (CAS) Messages (continued)

Warning Messages - Red (Continued)

CAS Event	CAS Message	Checklist Page	Cause
CAS Warnings with Text Messages			
Landing gear are not down and locked in flight.	[redacted]	3-54	Landing gear is not down and locked when aircraft is less than 400 ft AGL with Manifold Pressure less than 14 inHg (mutable aural) or flaps greater than 12° (non-mutable aural).
Landing Gear is selected UP when on ground	[redacted]	3-54	Aircraft is on ground and gear selector is in the UP position.
Landing Gear Failure	[redacted]	3-20	Landing gear system malfunction while on the ground.
Speed Brakes are extended	[redacted]	3-18	Speedbrakes are extended during the takeoff phase of flight.
Underspeed Protection	[redacted]	3-45	Autopilot is engaged and the airspeed has fallen below a minimum threshold or stall warning has activated.
Windshield Overtemperature	[redacted]	3-63 Sect. 9 Supp. 2	Windshield temperature exceeds 170°F or the windshield temperature sensor has failed.

3.1 GENERAL (Continued)

Crew Alerting System (CAS) Messages (continued)

Warning Messages - Red (continued)

CAS Event	CAS Message	Checklist Page	Cause
CAS Warnings with EIS Indications			
Alternator Amperage	—	N/A	Left or Right alternator amperage in warning range.
Cabin Differential Pressure	—	3-58	Cabin differential pressure is equal to or greater than 5.8 psi OR greater than 5.6 psi for more than 30 seconds.
Cylinder Head Temperature	—	3-26	Cylinder head temperature high.
Turbine Inlet Temperature	—	N/A	TIT is in the warning range.
Landing Gear Failure	—	3-20	Malfunction of associated landing gear (L, N, R)
Oil Pressure	—	3-22	Engine oil pressure is in the WARNING range.
Oil Temperature	—	3-25	Oil temperature is in the warning range.
RPM	—	3-54	Engine RPM in warning range.
Manifold Pressure	—	N/A	Engine manifold pressure in warning range.
Voltage	—	N/A	Battery voltage is less than 24V.

3.1 GENERAL (Continued)

Crew Alerting System (CAS) Messages (continued)

Caution Messages - Amber

CAS Event	CAS Message	Checklist Page	Cause
CAS Cautions with Text Messages			
Cabin Pressure Controller has failed or lost ARINC communication on the ground	CPCS FAIL	3-50	The CPCS internal test has failed anytime or CPCS communications have failed while on ground.
Cabin Pressure Controller has lost ARINC communication	CPCS FAULT	3-51	CPCS communications have failed while in flight.
Landing Gear not down and locked	CHECK GEAR	3-54	Landing gear is not down and locked when aircraft is greater than 400 ft AGL with Manifold Pressure less than 14 inHg (mutable aural) or flaps greater than 12° (non-mutable aural).
Starter Motor Energized	START ENGAGED	N/A	The starter is engaged for greater than 30 seconds during engine start or anytime when the engine is running.
Fuel Imbalance	FUEL IMBALANCE	3-23	Fuel quantity imbalance greater than 10 gallons.
R Pitot Heat Failure	R PITOT HT FAIL	3-62 Sect. 9 Supp. 2	Right pitot heat has failed.
L Pitot Heat Failure	L PITOT HT FAIL	3-62 Sect. 9 Supp. 2	Left pitot heat has failed.
Carbon Monoxide level is high	CO LVL HIGH	3-60	CO is greater than or equal to 50 PPM.
Vacuum Pressure Abnormal	VAC PRESS LOW	3-61	Gauge pressure less than 2 in Hg.

3.1 GENERAL (Continued)

Crew Alerting System (CAS) Messages (continued)

Caution Messages - Amber (continued)

CAS Event	CAS Message	Checklist Page	Cause
CAS Cautions with Text Messages			
Stall Warning system failure	STALL WARN FAIL	3-68 Sect. 9 Supp. 2	The stall warning computer and/ or transducer has failed.
Fuel Boost Pump Fail	BOOST PUMP FAIL	3-67	Submerged fuel pump has failed..
Flaps Failure	FLAP FAIL	3-67	Flaps have failed.
Propeller Heat Failure	PROP HEAT FAIL	3-64 Sect. 9 Supp. 2	A fault has developed in the propeller heat system in flight
Pitot Heat selected OFF	PITOT HEAT OFF	3-63	PITOT HEAT has NOT been selected ON (no chime accompanies this CAS message).
Speedbrakes extended in flight while engine is off, being started, or during landing.	SPDBRAKES EXTD	N/A	Speedbrakes extended in flight while engine is off, being started, or during landing.
Surface De-ice System Failure	SURF DEICE FAIL	3-65 Sect. 9 Supp. 2	System selected ON, and no activity or vacuum 1 or 2 failed.
Cabin Oxygen has been activated	OXYGEN GEN ON	N/A	One or more of the passenger oxygen generators are activated while the aircraft is in flight
Hydraulic Pump is running when it should not be running.	HYDR PUMP ON	3-66	Landing gear hydraulic pump has been operating for more than 20 seconds in flight.
No pilot interaction is detected	HYPOXIA ALERT	3-46	"Are you alert?" advisory on for 60 seconds without acknowledgement
Failure of a gear component	GEAR SYS	3-20	A failure of a component of the landing gear system.

3.1 GENERAL (Continued)

Crew Alerting System (CAS) Messages (continued)

Caution Messages - Amber (continued)

CAS Event	CAS Message	Checklist Page	Cause
CAS Cautions with EIS Indications			
CHT	—	N/A	Engine CHT in caution range.
Fuel Quantity	—	N/A	Left or right fuel quantity is between 6 and 10 gallons or Total fuel quantity between 11 and 20 gallons.
Landing Gear Failure	—	3-20	Malfunction of associated landing gear (L, N, R).
Oil Pressure	—	N/A	Oil pressure in caution range.
Oil Temperature	—	N/A	Oil temperature in the caution range
Vacuum System	—	N/A	Vacuum system pressure abnormal.

3.1 GENERAL (Continued)

Crew Alerting System (CAS) Messages (continued)

Advisory Messages - White (continued)

CAS Event	CAS Message	Checklist Page	Cause
CAS Advisories with Text Messages (continued)			
Cabin door is not closed	DOOR AJAR	N/A	Cabin door not closed and engine is OFF.
Fuel imbalance exists	FUEL IMBALANCE	N/A	Fuel imbalance is greater than 10 gal while engine is OFF.
Speedbrakes are extended	SPDBRAKES EXTD	N/A	Speedbrakes extended while the airplane is on the ground or after completing the takeoff phase of flight..
Emergency fuel pump is off	EMERG FUEL OFF	N/A	Emergency fuel pump is OFF while the engine is running and fuel pressure has dropped below 10 PSI.
Emergency fuel pump is ON	EMERG FUEL ON	N/A	Emergency fuel pump is ON after completing the takeoff phase of flight.
Left fuel quantity low	L FUEL QTY LOW	N/A	Left tank fuel quantity is less than or equal to 5 gallons while the engine is off
Right fuel quantity low	R FUEL QTY LOW	N/A	Right tank fuel quantity is less than or equal to 5 gallons while the engine is off
Surface de-ice is active	SURF DEICE ON	N/A	Surface de-ice normal cycle is active
Stall heat is operating	STALL HEAT ON	N/A	Stall heat is operating and OAT is greater than or equal to 5C.
Vacuum 1 Pressure low	VACUUM 1 FAIL	3-61 Sect. 9 Supp. 2	Vacuum No. 1 pressure is less than approx. 2.0 in Hg.
Vacuum 2 Pressure low	VACUUM 2 FAIL	3-61 Sect. 9 Supp. 2	Vacuum No. 2 pressure is less than approx. 2.0 in Hg

3.1 GENERAL (Continued)

Crew Alerting System (CAS) Messages (continued)

Advisory Messages - White (continued)

CAS Event	CAS Message	Checklist Page	Cause
CAS Advisories with Text Messages (continued)			
PFD 1 Cooling fan failed	PFD1 FAN FAIL	3-53	Advisory posted 5 seconds after fan failure is sensed
PFD 2 cooling fan failed	PFD2 FAN FAIL	3-53	Advisory posted 5 seconds after fan failure is sensed
MFD cooling fan failed	MFD FAN FAIL	3-53	Advisory posted 5 seconds after fan failure is sensed
Avionics 1 forward cooling fan failed	AV1 FAN FAIL	3-53	Advisory posted 5 seconds after fan failure is sensed
Avionics 2 forward cooling fan failed.	AV2 FAN FAIL	3-53	Advisory posted 5 seconds after fan failure is sensed

3.1 GENERAL (Continued)

PFD Annunciations and Alerts

The Garmin G1000 System produces a number of PFD annunciations and alerts in addition to the Crew Alerting System (CAS). PFD annunciations and alerts are not accompanied by Master Warning or Master Caution Indications and are displayed in dedicated areas of the PFD or MFD. Various aural alerts (voice or tone) may accompany PFD annunciations and alerts and no pilot action is required to acknowledge them.

Comparator Annunciations

Comparator Window Text	Condition
ALT MISCOMP	Difference in altitude sensors is ≥ 200 feet.
IAS MISCOMP	If both airspeed sensors detect < 35 knots, this is inhibited. If either airspeed sensor detects ≥ 35 knots, and the difference in sensors is > 10 knots. If either airspeed sensor detects ≥ 80 knots, and the difference in sensors is > 7 knots.
HDG MISCOMP	Difference in heading sensors is > 6 degrees.
PIT MISCOMP	Difference in pitch sensors is > 5 degrees.
ROL MISCOMP	Difference in roll sensors is > 6 degrees.
ALT NO COMP	No data from one or both altitude sensors
IAS NO COMP	No data from one or both airspeed sensors.
HDG NO COMP	No data from one or both heading sensors.
PIT NO COMP	No data from one or both pitch sensors.
ROL NO COMP	No data from one or both roll sensors.

3.1 GENERAL (Continued)

PFD Annunciations and Alerts (continued)

Reversionary Sensor Annunciations

Reversionary Sensor Window Text	Condition
BOTH ON ADC1	Both PFD's are displaying data from the number 1 Air Data Computer.
BOTH ON ADC2	Both PFD's are displaying data from the number 2 Air Data Computer.
BOTH ON AHRS1	Both PFD's are displaying data from the number 1 Attitude and Heading Reference System.
BOTH ON AHRS2	Both PFD's are displaying data from the number 2 Attitude and Heading Reference System.
BOTH ON GPS1	Both PFD's are displaying data from the number 1 GPS Receiver.
BOTH ON GPS2	Both PFD's are displaying data from the number 2 GPS Receiver.
USING ADC1	PFD2 is displaying data from the number 1 Air Data Computer.
USING ADC2	PFD1 is displaying data from the number 2 Air Data Computer.
USING AHRS1	PFD2 is displaying data from the number 1 Attitude and Heading Reference System.
USING AHRS2	PFD1 is displaying data from the number 2 Attitude and Heading Reference System.

3.1 GENERAL (Continued)

PFD Annunciations and Alerts (continued)

Miscellaneous Annunciations

Annunciation	Checklist Page	Condition
MAXSPD	3-45	Aircraft actual or projected airspeed exceeds maximum autopilot speed (183 KIAS) if autopilot is engaged or exceeds Vne if autopilot is not engaged.
MINSPD	3-45	Airspeed is below the minimum commandable airspeed.
TRIM	N/A	Pitch trim servo is operating.

Aural Alerts

The G1000 system generates the following aural alerts:

- Master Warning - Repeating triple chime.
- Master Caution - Non-repeating double chime.
- Advisory - Non-repeating single chime.
- "Airspeed....Airspeed" voice alert when airspeed exceeds V_{NE}.
- "Stall...Stall" voice alert during stall warning.
- "AIRSPEED" voice alert when in a low airspeed condition (if optional AFCS enhanced features are installed).
- "CHECK GEAR" voice alert in flight when engine manifold pressure is less than 14 inHg and the landing gear are not down and locked.
- "CHECK GEAR" voice alert in flight when flaps are extended to 20° or 36° and the landing gear are not down and locked.
- "CHECK GEAR" voice alert when the landing gear selector is in the UP position while on the ground.
- "Engaging Autopilot" voice alert when the autopilot automatically engages in LVL mode (if optional AFCS enhanced features are installed).
- "Vertical Track" voice alert when aircraft is one minute from VNAV Top of Descent

3.1 GENERAL (Continued)

PFD Annunciations and Alerts (continued)

Aural Alerts (continued)

- "Five-hundred" voice alert when aircraft descends within 500 feet above the terrain or runway threshold.
- "Incoming Call" voice alert when optional Iridium phone senses incoming call.
- "Minimums..Minimums" voice alert when the aircraft reaches MDA/DH if set by the pilot.
- "Timer Expired" voice alert when countdown timer reaches zero.
- Autopilot disconnect tone (also used for autopilot preflight test).
- Terrain caution and warning voice alerts.
- Traffic System voice alerts.

System Messages:

The G1000 system generates several system messages. The messages activate automatically and appear in the MESSAGES window on the lower right of the PFD. The MSG softkey will flash when a new system message is present and depressing that softkey will access/hide the MESSAGES window.

Overriding Considerations

In all emergencies, the overriding consideration must be to:

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

3.1 GENERAL (continued)

PFD Annunciations and Alerts (continued)

Aural Alerts (continued)

NOTE

If after resetting a circuit breaker, it trips open again, do not attempt to reset it.

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

OPERATING MANEUVERING SPEED .... 118 KIAS at 3411 lbs.
(See table in Section 2.3)

BEST GLIDE

4340 lbs .... 90 KIAS

3.5 ENGINE FIRE DURING START

Engine Fire During Start	
START Switch (crank engine)	PUSH
MIXTURE	IDLE CUT-OFF
THROTTLE	OPEN
FUEL SELECTOR	OFF
EMERG FUEL PUMP Switch	CHECK OFF.
Abandon if fire continues	

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.

3.7 TURBOCHARGER FAILURE

Turbocharger Failure

CAUTION

[illegible] turbocharger failure is th[illegible] [illegible], disconnected or burned [illegible] system components, a [illegible]

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.

For 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 CUT-OFF
THROTTLE....................cruise setting
PROP RPM....................TAKEOFF position
MIXTURE....................ADVANCE SLOWLY until engine restarts and adjust for smooth engine operation

Reduce power and land as soon as possible.

3.7 TURBOCHARGER FAILURE (Continued)

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For 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 fails.

THROTTLE .... AS REQUIRED
PROPELLER .... AS REQUIRED
MIXTURE .... AS REQUIRED

Land as soon as possible.

For Engine Power Overboost:

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

a suspected turbocharger or turbocharger wastegate control fails.

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

NOTE

Expect manifold pressure response to throttle movements to be sensitive.

PROP RPM .... AS REQUIRED
MIXTURE .... AS REQUIRED

Land as soon as possible.

3.9 ENGINE POWER LOSS DURING TAKEOFF

Engine Power Loss During Takeoff

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
EMERG FUEL PUMP Switch....................OFF
FUEL SELECTOR....................OFF

If sufficient altitude has been gained to attempt a restart:
Maintain Safe Airspeed
EMERG FUEL PUMP Switch....................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 EMERG FUEL PUMP Switch 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 per Para. 3.13.

Speed Brakes Extended During Takeoff

Indication: Triple Aural Chime, [redacted]

If sufficient runway remains, retract speed brakes and continue takeoff. If not, retard throttle to idle, apply maximum braking.

3.11 ENGINE POWER LOSS IN FLIGHT

Engine Power Loss In Flight
Trim for 90 KIAS (Power off glide speed)
EMERG FUEL PUMP Switch .... ON
FUEL SELECTOR .... SWITCH to tank containing fuel
MIXTURE .... RICH
INDUCTION AIR .... ALTERNATE
Engine Gauges .... CHECK for power loss indication
If power is restored:
INDUCTION AIR .... PRIMARY (Remain in ALTERNATE if induction ice is suspected)
EMERG FUEL PUMP Switch (Except in case of engine driven fuel pump failure) .... OFF
MIXTURE .... AS REQUIRED
Land as soon as practical and investigate cause of power loss.
CAUTION [illegible] flow indication could indicate a leak in [illegible] system. If fuel system leak is verified, [illegible] fuel selector to OFF.
If power is not restored: **Prepare for power off landing.**

3.13 POWER OFF LANDING

Power Off Landing

PROP RPM .... 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.

When committed to landing:

LANDING GEAR Selector .... AS REQUIRED
THROTTLE .... CLOSED
MIXTURE .... IDLE CUT-OFF
FLAPS .... AS REQUIRED
FUEL SELECTOR .... OFF
ALTR NO 1 and ALTR NO 2 Switches .... OFF
MAG Switches .... OFF
EMERG FUEL PUMP Switch .... OFF
CABIN PRESS DUMP/NORM Switch .... DUMP
Seat Belt and Harness .... TIGHT
Seats .... adjusted and locked in position

Gear System Failure

Indication: Master Warning, Triple Chime, [redacted]

Landing Gear Selector .... DOWN
Resolve issue prior to flight.

Indication: Master Caution, Double Chime, GEAR SYS

LANDING GEAR Selector .... CYCLE
If issue not resolved .... Perform Emergency Landing Gear Extension Para. 3.37.

3.15 FIRE IN FLIGHT

Fire In Flight

Source Of Fire .... CHECK

WARNING

If emergency oxygen is installed, use ONLY if flames and heat are not present.

NOTE

If pressurized, the following procedure will result in an immediate loss of pressurization and the cabin altitude will rise at an uncontrolled rate.

Electrical Fire (smoke in cabin):

CABIN PRESS DUMP/NORM Switch .... DUMP
CABIN PRESS Control Knob .... PULL OFF (to unpressurize)
CABIN TEMP Knob .... PUSH (off)
ALTR NO 1 and ALTR NO 2 Switches .... OFF
EMER Switch .... ON
BATT MASTR Switch .... OFF
Standby Instrument .... VERIFY ON

CAUTION

The cabin pressure dump valve will remain open if the CABIN PRESS DUMP/NORM switch is positioned to DUMP prior to turning the aircraft electrical system OFF. This provides maximum airflow through the cabin for smoke evacuation. Do not turn the CABIN PRESS DUMP/NORM switch to NORM. The dump valve will close and cannot be reactivated unless electrical power is turned on.

Emergency descent .... ACCOMPLISH PER PARA. 3.43 TO A SAFE ALTITUDE CONSISTENT WITH TERRAIN

Land as soon as possible.
(Perform Emergency Landing Gear Extension procedure and 0° flap landing).

3.15 FIRE IN FLIGHT (continued)

↓

WARNING

If emergency oxygen is installed, use ONLY if flames and heat are not present.

Engine fire:

THROTTLE .... CLOSE
MIXTURE .... IDLE CUT-OFF
FUEL SELECTOR .... OFF
MAG Switches .... OFF
EMERG FUEL PUMP Switch .... CHECK OFF
AUXILIARY CABIN HT Switch .... OFF
VENT/DE-FOG Switch .... OFF
DEFROST Knob .... PUSH (off)
CABIN TEMP Knob .... PUSH (off)
Conduct an Emergency Descent per Para. 3.43 and Power Off Landing per Para. 3.13.

3.17 LOSS OF OIL PRESSURE

Loss Of Oil Pressure

Indication: **Master Warning Indication; Repeating aural triple chime; Red Oil Pressure indication.**

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

3.19 LOSS OF FUEL FLOW

Loss Of Fuel Flow

CAUTION

If normal engine operation and fuel flow are not restored, the EMERG fuel pump Switch should be turned OFF. 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.

EMERG FUEL PUMP Switch .... ON
FUEL SELECTOR .... CHECK on tank containing usable fuel

If power restored:

EMERG FUEL PUMP Switch (except in case of engine driven pump failure) .... OFF
MIXTURE .... AS REQUIRED

If power not restored:

EMERG FUEL PUMP Switch .... OFF
FUEL SELECTOR .... OFF
Proceed with power off landing procedure (Para. 3.13).

Fuel Imbalance / Fuel Low

Indication: **Triple Aural Chime,** [redacted] , [redacted]
Double Aural Chime, FUEL IMBALANCE

EMERG FUEL PUMP .... ON
Opposite fuel tank .... SELECT
If possible, reduce fuel flow. Set fuel selector as required to equalize tank quantities.

3.21 ENGINE DRIVEN FUEL PUMP FAILURE

Engine Driven Fuel Pump Failure

Indication: Master Warning Indication; [redacted] message; Repeating aural triple chime.

THROTTLE .... REDUCE
EMERG FUEL PUMP Switch .... ON
THROTTLE .... RESET AS REQUIRED
MIXTURE .... RESET AS REQUIRED

Land as soon as possible.

CAUTION

If normal engine operation and fuel flow are not restored the EMERG FUEL PUMP Switch 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 the FUEL SELECTOR to OFF.

If power is not restored, proceed with power off landing procedure (Para. 3.13).

3.23 HIGH OIL TEMPERATURE

High Oil Temperature
Indication: Master Warning Indication; Repeating aural triple chime; Red oil temperature indication.
THROTTLE .... REDUCE
MIXTURE .... ENRICH, if practical
Airspeed .... INCREASE, if practical
If condition is not corrected:
Land as soon as possible **and investigate the problem. Prepare for power off landing per Para. 3.13.**

3.25 TURBINE INLET TEMPERATURE (TIT) INDICATION/SENSOR FAILURE

Turbine Inlet Temperature (TIT) Indication/Sensor Failure
Indication: Red-x on TIT indication or indication does not correlate with related parameters.
If failure occurs during takeoff, initial climb, or landing:
MIXTURE .... Full RICH
During cruise climb conditions:
Power .... Set per Section 4 Cruise Climb checklist (35 In. Hg, 2500 RPM, 32 gph)
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.

3.25 TURBINE INLET TEMPERATURE (TIT) INDICATION/SENSOR FAILURE (Continued)

↓

CAUTION

Aircraft POH range and endurance data presented in S[illegible] 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

3.27 HIGH CYLINDER HEAD TEMPERATURE

High Cylinder Head Temperature

Indication: **Master Caution Indication; Double aural chime; Amber CHT indication.**

If indicated cylinder head temperature reaches 480°F (Caution range):

THROTTLE ....REDUCE
MIXTURE .... ENRICH, if practical
Airspeed ....INCREASE, if practical

If indicated cylinder head temperature reaches 500°F (Warning range):

Land as soon as possible **and investigate problem.**

3.29 ELECTRICAL FAILURES

Single Alternator Failure.

Indication: **Master Warning Indication; [redacted] or [redacted] message; Repeating aural triple chime:**

NOTE

With a single alternator failure, the VOLTS indication will turn red anytime total tie bus voltage is below 25 VDC.

Verify failure ....CHECK Amperage Indications
Electrical Load (if VOLTS indication
in red range) ....REDUCE until total load is less than 75 amps & VOLTS indication is out of red range

Failed ALTR NO 1 or 2 Switch ....OFF
Failed ALTERNATOR NO 1 or 2 Circuit Breaker .CHECK and RESET as required
(Located on the pilot's forward circuit breaker panel, row A, positions 2 and 3)
Failed ALTR NO 1 or 2 Switch (after OFF at least one second) ....ON

If power not restored:
Failed ALTR Switch ....OFF
Amperage 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.** Effort should be taken to keep the electrical load under 75 amps, however under certain circumstances the load may exceed 75 amps when large momentary loads such as landing gear are used in combination with other required equipment. The electric cabin heater, cabin recirculation blowers, and position, strobe, and landing lights should not be used unless absolutely necessary.

3.29 ELECTRICAL FAILURES (continued)

Dual Alternator Failure

Indication: **Master Warning Indication; [redacted] and [redacted] messages; Repeating aural triple chime:**

NOTE

With a dual alternator failure, the VOLTS indication will turn red anytime total tie bus voltage is below 24 VDC.

Verify failure ....Check Amperage Indications
ALTR NO 1 and 2 Switches .... OFF
ALTERNATOR NO 1 and 2 Circuit Breakers ....CHECK and RESET as required
(Located on the pilot's forward circuit breaker panel, row A, position 2 and 3)
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 NO 1 or 2 Switch ....ON
Failed ALTR NO 1 or 2 Switch .... OFF
Electrical Load ....MAINTAIN LESS THAN 75 AMPS
Amperage Indication ....MONITOR
Exit and avoid icing conditions.

If neither alternator resets:
ALTR NO 1 and ALTR NO 2 Switches .... OFF
EMER Switch..Verify OFF
BATT MASTR Switch .... Verify ON
Electrical Load ....REDUCE TO MINIMUM (per load shed procedures as shown)

3.29 ELECTRICAL FAILURES (continued)

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NOTE

To have 30-minutes of battery power remaining after failure of both alternators, the load shed procedure must be completed within 3-minutes. It is advised to start the load shedding procedure as soon as conditions permit. Items that are not shown, such as standby instrument (provided it has sufficient internal battery charge), are allowed to run continuously and still meet the 30-minute requirement. After a 3-minute load shed procedure, the remainder of the flight (for 30-minute battery life) consists of a 22-minute *CRUISE Segment* and a 5-minute *LANDING Segment*.

Load-shed procedure (for 30-minutes of battery life):
CRUISE Segment:

CAUTION

Turning off the AV BUS MASTR switch removes power from all equipment on Avionics Bus 1 and Avionics Bus 2, some of which may be desired. Care should be exercised when deactivating certain items. Any items that remain ON or are activated beyond the usages shown may reduce the battery life to less than 30-minutes.

AV BUS MASTR Switch...OFF
INVERTER Circuit Beaker...PULL
(Located on the pilot's forward circuit breaker panel, row D, position 4.
ENVIRONMENTAL/DE-ICE SWITCH PANEL Switches........All OFF

↓

3.29 ELECTRICAL FAILURES (continued)

If optional ice protection systems are installed and icing conditions are present:

R PITOT HEAT Circuit Breaker .... PULL
(Located on the pilot's aft circuit breaker panel, row A, position 4.)
PITOT HEAT Switch .... ON
SURF DE-ICE Switch .... 2-Cycles Usage
ICE LIGHT Switch .... 1-Minute Usage

PITOT HEAT Switch (if not in icing) .... VERIFY OFF
EMERG FUEL PUMP Switch .... OFF
LANDG LIGHT .... OFF
TAXI LIGHT/PULSE Lights .... OFF
NAV LIGHTS .... OFF
STROBE LIGHTS/FIN STROBE .... OFF
SWITCH/PANEL/AVIONICS Dimmers .... LOWEST USABLE SETTING
COM 1 Transmit .... 1-Minute Usage

NOTE

Operating the #1 Transponder will still allow for 30 minute battery life. Activating any other additional electrical equipment may shorten battery life to less than 30-minutes.

If additional avionics are desired (such as #1 transponder):
All copilot sidepanel circuit breakers .... PULL
AV BUS MASTR Switch .... ON
Desired equipment circuit breakers .... RESET

LANDING Segment:

NOTE

Following a dual alternator failure, complete electrical failure may occur anytime after 30 minutes. With a complete electrical failure, emergency landing gear extension and landing without flaps will be required. Refer to Complete Electrical Failure (Para. 3.29) and Emergency Landing Gear Extension (Para. 3.37).

3.29 ELECTRICAL FAILURES (continued)

If optional ice protection systems are installed and icing conditions are present:

PITOT HEAT Switch .... ON
SURF DE-ICE Switch .... 2-Cycles Usage
ICE LIGHT Switch .... 1-Minute Usage

PITOT HEAT Switch (if not in icing) .... VERIFY OFF
EMERG FUEL PUMP Switch .... 2-Minutes Usage
LANDG LIGHT .... 2-Minutes Usage
FLAPS .... AS REQUIRED
(FLAP SYSTEM MALFUNCTION, Section 3.57)
LANDING GEAR Selector .... AS REQUIRED
(EMERGENCY LANDING GEAR EXTENSION, Section 3.37)
CABIN PRESS DUMP/NORM Switch .... DUMP
COM 1 Transmit .... 1-Minute Usage

Complete Electrical Failure

Indication: **PFD's, MFD and all equipment, except standby instrument, will be unpowered.**

NOTE

After a Complete Electrical Failure, the ADC 1 and AHRS 1 will require approximately 45 seconds to realign.

Maintain attitude control using the standby instrument.
EMER Switch .... ON
BATT MASTR Switch .... OFF
ALTR NO 1 and ALTR NO 2 Switches .... OFF
AV BUS MASTR Switch .... OFF

3.29 ELECTRICAL FAILURES (continued)

↓

NOTE

Turning the EMER Switch ON will activate the #1 PFD in reversionary mode with AHRS 1 data, ADC1 data, a subset of engine parameters, #1 COMM/NAV/GPS, audio panel, and landing gear position indicators.

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 (Para. 3.37) and Flap System Malfunction (Para. 3.57).

CABIN PRESS DUMP/NORM Switch..DUMP

Supplemental Heater Control Circuit Failure

Indication: Heater Continues to Operate With AUXILIARY CABIN HT and VENT DE-FOG switches OFF.

VENT DE-FOG Circuit Breaker..PULL
(Located on the pilot's aft circuit breaker panel, row A, position 1)

If the heater continues to operate, *land as soon as practical.*

3.31 AVIONICS SYSTEM FAILURES

NOTE

The latest appropriate revision of the Garmin G1000 Cockpit Reference Guide for the Piper PA-46-350P (Garmin P/N 190-01888-00), and the Garmin G1000 Pilot's Guide for the Piper PA-46-350P (Garmin P/N 190-01889-00), contain operational information and detailed descriptions of the Garmin G1000 avionics system.

NOTE

Images on the PFD and MFD displays may appear distorted when wearing polarized sunglasses.

COM1 and COM2 Failure

Indication: **Inability to communicate/receive on COM1 and COM2.**

NOTE

If power is lost to the audio panel a fail-safe communications path becomes available between the pilot's headset/microphone and COM1.

AUDIO MKR circuit breaker ....PULL
(Located on the pilot's aft circuit breakers panel, row C, position 4)

Exit and avoid IFR and icing conditions as soon as practical.

3.31 AVIONICS SYSTEMS FAILURES (Continued)

Pilot's PFD Failure

Indication: PFD1 Display goes blank.

DISPLAY BACKUP button above pilot's PFD .... PUSH
XFR button on autopilot .... SELECT to PFD2
XPDR2 (if dual transponders installed) .... Verify ACTIVE
XPNDR1 Circuit Breaker (if dual transponders installed) .. PULL/OPEN
(Located on the co-pilot's circuit breaker panel, row A, position 2)

Exit and avoid IFR and icing conditions as soon as practical.

NOTE

If the pilot's PFD fails, the MFD and the copilot's PFD will remain in normal mode. Pushing the DISPLAY BACKUP button above pilot's PFD allows the MFD to display AHRS and ADC information but lose certain map functions such as radar. The following features will become inoperative if there is a complete loss of PFD1/ GIA1 functionality:

- Com1/Nav1
- #1 Transponder (when XPNDR1 circuit breaker pulled)
- #1 GPS
- Cabin Pressure Control System
- Traffic System

3.31 AVIONICS SYSTEM FAILURES (Continued)

MFD Failure

Indication: MFD Display goes blank.

DISPLAY BACKUP button above pilot's PFD .... PUSH
XFR button on autopilot .... SELECT to PFD1
XPDR1 (if dual transponders installed) .... Verify ACTIVE
XPNDR2 Circuit Breaker (if dual transponders installed) .. PULL/OPEN
(Located on the co-pilot's circuit breaker panel, row C, position 7)

Exit and avoid IFR and icing conditions as soon as practical.

NOTE

The pilot's PFD and co-pilot's PFD will revert to a reversionary mode display. The following features will become inoperative if there is a complete loss of MFD functionality:

- Com2/Nav2
- #2 Transponder (when XPNDR2 circuit breaker pulled)
- #2 GPS
- Stormscope
- Pulse Oximeter/CO Detector
- GDL 69 (Garmin Datalink - XM)
- Electronic Stability Protection
- Iridium
- DME indication

CoPilot's PFD Failure

Indication: PFD2 Display goes blank.

XFR button on autopilot .... SELECT to PFD1
XPDR1 Softkey .... SELECT

Exit and avoid IFR and icing conditions as soon as practical.

NOTE

If the copilot's PFD fails, the MFD and pilot's PFD will remain in normal display format. The following features will become inoperative:

- GWX (Garmin Radar)

3.31 AVIONICS SYSTEM FAILURES (Continued)

ATTITUDE AND HEADING REFERENCE SYSTEM (AHRS) FAILURES

AHRS 1 Total Failure

On Ground:

Indication: **HDG NO COMP, PIT NO COMP, ROL NO COMP white annunciations on PFD.**

System Messages (MSG Softkey)..CONSIDER
AHRS 1 Circuit Breaker ....RESET
(Located on the pilot's aft circuit breaker panel, row C, position 6)

If AHRS 1 data still invalid:

AHRS 2 SENSOR Softkey ....SELECT

Avoid flight in IFR and icing conditions.

In Flight:

Indication: **HDG NO COMP, PIT NO COMP, ROL NO COMP white annunciations and BOTH ON AHRS2 amber annunciation on PFD.**

System Messages (MSG Softkey)..CONSIDER
AHRS 1 Circuit Breaker ....RESET
(Located on the pilot's aft circuit breaker panel, row C, position 6)

If AHRS 1 data still invalid:

AHRS 2 data ....CROSSCHECK with STANDBY INSTRUMENT

Exit and avoid IFR and icing conditions as soon as practical.

NOTE

If AHRS 1 is still invalid, the autopilot will be inoperative.

NOTE

For partial AHRS failures, the system will not autorevert to the good AHRS but a red-x and amber text will appear over the affected parameter(s).

3.31 AVIONICS SYSTEM FAILURES (Continued)

ATTITUDE AND HEADING REFERENCE SYSTEM (AHRS) FAILURES (Continued)

AHRS 2 Total Failure

On Ground:

Indication: **HDG NO COMP, PIT NO COMP, ROL NO COMP white annunciations on PFD.**

System Messages (MSG Softkey)..........CONSIDER
AHRS 2 Circuit Breaker..........RESET
(Located on the copilot's circuit breaker panel, row B, position 4)

If AHRS 2 data still invalid:

AHRS 1 SENSOR softkey..........SELECT

Avoid flight in IFR and icing conditions.

In Flight:

Indication: **HDG NO COMP, PIT NO COMP, ROL NO COMP white annunciations and BOTH ON AHRS1 amber annunciation on PFD.**

System Messages (MSG Softkey)..........CONSIDER
AHRS 2 Circuit Breaker..........RESET
(Located on the copilot's circuit breaker panel, row B, position 4)

If AHRS 2 data still invalid:

AHRS 1 data..........CROSSCHECK with STANDBY INSTRUMENT

Exit and avoid IFR and icing conditions as soon as practical.

NOTE

If AHRS 2 is still invalid, the autopilot will be inoperative.

NOTE

For partial AHRS failures, the system will not autorevert to the good AHRS but a red-x and amber text will appear over the affected parameter(s).

3.31 AVIONICS SYSTEM FAILURES (Continued)

ATTITUDE AND HEADING REFERENCE SYSTEM (AHRS) FAILURES (Continued)

AHRS 1 and AHRS 2 Total Failure

Indication: (Ground and Flight): HDG NO COMP, PIT NO COMP, ROL NO COMP white annunciations and red-x's and amber text on all AHRS parameters.

Standby Instrument ....Verify NO FAILURE INDICATIONS
Attitude and Heading ....Use Standby Instrument
Course..Set using digital window
System Messages (MSG Softkey)..CONSIDER

If all AHRS data is still invalid

and time allows ....RESET both AHRS Circuit Breakers

Land as soon as practical.

NOTE

For partial AHRS failures, a red-x and amber text will appear over the affected parameter(s).

3.31 AVIONICS SYSTEM FAILURES (Continued)

AIR DATA COMPUTER (ADC) FAILURES

ADC 1 Total Failure

On Ground:

Indication: **ALT NO COMP, IAS NO COMP white annunciations on PFD.**

System Messages (MSG Softkey).......................................CONSIDER

ADC 1 Circuit Breaker ....RESET

(Located on the pilot's aft circuit breaker panel, row C, position 5)

If ADC 1 data still invalid:
ADC 2 SENSOR softkey .... SELECT

Avoid flight in IFR and icing conditions.

In Flight:

Indication: **ALT NO COMP, IAS NO COMP white annunciations and BOTH ON ADC 2 amber annunciation on PFD.**

System Messages (MSG Softkey).......................................CONSIDER
ADC 1 Circuit Breaker ....RESET
(Located on the pilot's aft circuit breaker panel, row C, position 5)

If ADC 1 data still invalid:
ADC 2 data .... CROSSCHECK with STANDBY AIRSPEED & ALTITUDE

Exit and avoid IFR and icing conditions as soon as practical.

NOTE

For partial ADC failures, the system will not autorevert to the good ADC but a red-x and amber text will appear over the affected parameter(s).

3.31 AVIONICS SYSTEM FAILURES (Continued)

AIR DATA COMPUTER (ADC) FAILURES (Continued)

ADC 2 Total Failure

On Ground:

Indication: **ALT NO COMP, IAS NO COMP white annunciations on PFD.**

System Messages (MSG Softkey) .... CONSIDER

ADC 2 Circuit Breaker .... RESET

(Located on the copilot's circuit breaker panel, row B, position 5)

If ADC 2 data still invalid:
ADC 1 SENSOR softkey .... SELECT

Avoid flight in IFR and icing conditions.

In Flight:

Indication: **ALT NO COMP, IAS NO COMP white annunciations and BOTH ON ADC 1 amber annunciation on PFD.**

System Messages (MSG Softkey) .... CONSIDER
ADC 2 Circuit Breaker .... RESET
(Located on the copilot's circuit breaker panel, row B, position 5)

If ADC 2 data still invalid:
ADC 1 data.. CROSSCHECK with STANDBY **AIRSPEED & ALTITUDE**

Exit and avoid IFR and icing conditions as soon as practical.

NOTE

For partial ADC failures, the system will not autorevert to the good ADC but a red-x and amber text will appear over the affected parameter(s).

3.31 AVIONICS SYSTEM FAILURES (Continued)

AIR DATA COMPUTER (ADC) FAILURES (Continued)

ADC 1 and ADC 2 Failure

Indication (Ground and Flight): ALT NO COMP, IAS NO COMP white annunciations and red-x's and amber text on all ADC parameters.

System Messages (MSG Softkey) .... CONSIDER
Standby Instrument .... Verify NO FAILURE INDICATIONS
Airspeed and Altitude .... use Standby Instrument

If all ADC data is still invalid
and time allows .... RESET ADC 1 and ADC 2 circuit breakers

Land as soon as practical.

NOTE

For partial ADC failures, the system will not autorevert to the good ADC but a red-x and amber text will appear over the affected parameter.

Erroneous or Loss of Engine and Fuel Displays

Indication: **Red-x over affected engine parameter or fuel display as erroneous indications.**

NOTE

Erroneous information may be identified by indications which do not agree with other system information. Erroneous indications may be determined by comparing a display with other displays and other system information.

1. Set power based on throttle lever position, engine sound and airspeed.
2. Monitor other indications to determine the health of the engine.
3. Use known power settings and power setting tables for approximate fuel flow values.

3.31 AVIONICS SYSTEM FAILURES (Continued)

4. Use other system information, such as annunciator messages, fuel totalizer quantity and flow, to safely complete the flight.

If ALL engine parameters are invalid and time allows:

GEA circuit breaker ....RESET
(Located on the pilot's aft circuit breaker panel, row C, position 1)

Erroneous or Loss of Warning/Caution CAS Messages

Indication: **Displayed information shows an abnormal or emergency situation without the associated CAS message present.**

NOTE

Loss of a CAS message may be indicated when engine or fuel displays show an abnormal or emergency situation and the CAS message is not present. An erroneous CAS message may be identified when a CAS message appears which does not agree with other displays or system information.

1. If a CAS message appears, treat it as if the condition exists.
2. If a display indicates an abnormal condition but no CAS message is present, use other system information, such as engine displays, fuel totalizer quantity and flow, to determine if the condition exists. If it cannot be determined that the condition does not exist, treat the situation as if the condition exists.

3.31 AVIONICS SYSTEM FAILURES (Continued)

Autopilot Malfunction

Indication: **Unexpected or uncommanded change in the airplane's flight path; abnormal flight control movement; unexpected or uncommanded change in Flight Director command; red PTCH, ROLL, YAW, PTRM, or AFCS annunciator; or the autopilot abnormally disconnects, flashing red 'AP' and continuous aural alert.**

WARNING

Do not press the LVL switch (if installed) if an autopilot or pitch trim malfunction is suspected.

NOTE

Electronic Stability Protection (ESP) will be inoperative following an Autopilot Failure.

Control Wheel ....GRASP FIRMLY
Attitude Indicators...CROSSCHECK
AP DISC/TRIM INTER Switch ....DEPRESS and HOLD
Pitch Trim .... RETRIM if necessary
AUTOPILOT Circuit Breaker ....PULL
(Located on the pilot's forward circuit breaker panel, row D, position 2)
Autopilot ....DO NOT RE-ENGAGE

Automatic Autopilot Disconnect

Indication: **Flashing red and white AP annunciation on PFD and aural alert**

AP DISC/TRIM INTER Switch ....DEPRESS and RELEASE
(cancels disconnect tone, and disconnects Autopilot and Yaw Damper)
Pitch Trim .... RETRIM manually if necessary

NOTE

The autopilot disconnect may be accompanied by a red boxed AFCS, PTRM, PTCH (pitch) or ROL (roll) annunciation on the PFD, indicating the axis which has failed. The autopilot cannot be re-engaged with any of these annunciations present.

NOTE

Yaw Damper disengagement is indicated by a 5 second flashing amber "YD".

3.31 AVIONICS SYSTEM FAILURES (Continued)

Electric Trim Failure

Indication: Red boxed PTRM annunciation on PFD

NOTE

Loss of the electric pitch trim servo will not cause the autopilot to disconnect. Monitor pitch attitude for unusual behavior. Be alert to possible autopilot out-of-trim conditions (see AUTOPILOT OUT OF TRIM procedure this section) and expect residual control forces upon disconnect. The autopilot will not re-engage after disconnect with failed pitch trim.

Autopilot .... DISCONNECT

Electric Pitch Trim Runaway

Indication: White TRIM annunciation on PFD followed by pitch deviation from desired flight path and red boxed PTRM annunciation.

WARNING

Do not press the LVL switch (if installed) if an autopilot or pitch trim malfunction is suspected.

NOTE

After the autopilot is disengaged, it can not be re-engaged until the electric pitch trim system regains functionality.

NOTE

Electronic Stability Protection (ESP) will be inoperative following an Autopilot Failure.

Control Wheel ....GRASP FIRMLY
Attitude Indicators ....CROSSCHECK
AP DISC/TRIM INTER Switch .... DEPRESS and HOLD
PITCH TRIM Circuit Breaker .... PULL
(Located on the pilot's forward circuit breaker panel, row D, position 1)
Pitch Trim... RETRIM MANUALLY

3.31 AVIONICS SYSTEM FAILURES (Continued)

Autopilot Overspeed Recovery

Indication: MAXSPD **annunciation above airspeed tape.**

This submode becomes active when the autopilot is attempting to prevent the aircraft from exceeding the maximum approved autopilot operating speed (183 KIAS). This may occur at indicated airspeeds well below 183 KIAS, if airspeed is increasing at a high rate. It remains active until the airspeed is reduced and the maximum approved autopilot operating speed (183 KIAS) exceedance is no longer a factor.

THROTTLE Lever .... REDUCE POWER as required
Autopilot .... DISCONNECT if required

The pilot may elect to fly the aircraft and reduce airspeed.

NOTE

Overspeed recovery mode provides a pitch up command to decelerate the airplane below the maximum approved autopilot operating speed (183 KIAS) Overspeed recovery is not active in altitude hold (ALT) mode unless Electronic Stability Protection is installed. The speed reference cannot be adjusted while in overspeed recovery mode.

Autopilot Underspeed Recovery

Indication: MINSPD **annunciation above airspeed tape, "AIRSPEED" Aural Alert,** [redacted]

WARNING

When Underspeed Protection is active, the autopilot is actively lowering the nose of the aircraft to avoid a stall. If Underspeed Protection activates on approach, consider performing a go-around.

NOTE

Underspeed Protection is active whenever the autopilot is engaged and the airspeed has fallen below a minimum threshold or stall warning has activated.

THROTTLE Lever .... INCREASE POWER as required
FLAPS Position .... CONSIDER
LANDING GEAR Position .... CONSIDER

3.31 AVIONICS SYSTEM FAILURES (Continued)

Hypoxia Alert - Automatic Descent Mode

Indication: Single Chime, ARE YOU ALERT?, [redacted]

Any button on PFD1, MFD, PFD2...PRESS

If applicable buttons not pressed in 60-seconds:

Indication: Double Chime, HYPOXIA ALERT, [redacted]

Any button on PFD1, MFD, PFD2...PRESS

If applicable buttons not pressed in 60-seconds:

Indication: Triple Chime, [redacted], EDM Annunciation on PFD, [redacted]

Alerts Message (immediately): Automatic Descent to 14,000FT in 60 seconds

Alerts Message (after 60 seconds): Aircraft Descending to 14,000FT

Autopilot will descend aircraft in current lateral mode to 14,000 feet unless disconnected by pilot.

If no pilot interruption in 4-minutes after level-off at 14,000 feet:

Indication: Triple Chime, [redacted], EDM Annunciation on PFD, [redacted]

Alerts Message: Aircraft Descending to 12,500FT

Autopilot will descend aircraft in current lateral mode to 12,500 feet unless disconnected by pilot.

Loss Of Navigation Information

Indication: Amber VOR, VAPP, GPS, BC, LOC or GS flashing on PFD

NOTE

If a navigation signal is lost while the autopilot is tracking it, the autopilot will roll the aircraft wings level and default to roll mode (ROL).

Autopilot.....................................SELECT ANOTHER LATERAL MODE
Nav Source..SELECT A VALID NAV SOURCE
Autopilot... SELECT NAV

If on an instrument approach at the time the navigation signal is lost:

Missed Approach..EXECUTE
(A second approach may be attempted using other navaids.)

3.31 AVIONICS SYSTEM FAILURES (Continued)

Autopilot Out-Of-Trim

Indication: **Amber RUD→,←RUD, ←AIL, AIL→, ↑ELE, or ↓ELE annunciation on PFD**

CAUTION

Do not attempt to overpower the autopilot in the event of a mistrim. The autopilot servos will oppose pilot input and will trim opposite the direction of pilot input (pitch axis only). This could lead to a significant out-of-trim condition. Disconnect the autopilot using the A/P DISC / TRIM INTER switch if manual control is desired

If **RUD→** or **←RUD** annunciation .... adjust rudder trim in direction of arrow
If **↑ ELE** or **↓ ELE** annunciation .... adjust pitch trim in direction of arrow

NOTE

For aileron mistrims, ensure the slip/skid indicator is centered and observe the 10 gallon maximum fuel imbalance limitation.

NOTE

Sustained elevator mistrims indicate a possible problem with the electric pitch trim system.

Control Wheel .... GRASP FIRMLY with both hands

CAUTION

Be prepared to apply a sustained control force in the direction of the annunciation arrow. For example, an arrow pointing to the right with AIL annunciation indicates that sustained right wing down control wheel force will be required upon autopilot disconnect

AP DISC/TRIM INTER Switch .... DEPRESS
Affected trim system .... RETRIM
Autopilot .... RE-ENGAGE if available

If the mistrim indication re-occurs, disconnect the autopilot for the remainder of the flight or until the offending condition is resolved.

3.31 AVIONICS SYSTEM FAILURES (Continued)

Abnormal Flight Director Mode Transitions

Indication: Flashing lateral or vertical mode annunciations on PFD

NOTE

After 10 seconds, the new mode will be annunciated in green. Upon loss of a selected mode, the system will revert to the default mode for the affected axis, either ROL or PIT.

Loss of selected vertical mode (FLC, VS, ALT, GS)

Autopilot Mode Controls............SELECT ANOTHER VERTICAL MODE

If on an instrument approach:
Autopilot..DISCONNECT (if coupled) and continue manually or execute missed approach

Loss of selected lateral mode (HDG, NAV, LOC, APP, BC)

Autopilot Mode Controls.............SELECT ANOTHER LATERAL MODE

If on an instrument approach:
Autopilot..DISCONNECT (if coupled) and continue manually or execute missed approach

Failure of the Preflight Test

Indication: Red Boxed PFT annunciation on PFD

AUTOPILOT Circuit Breaker .... PULL
(Located on the pilot's forward circuit breaker panel, row D, position 2)

NOTE

When the autopilot circuit breaker is pulled, the red PFT annunciation will be removed and the autopilot will be unavailable. Do not reset the circuit breaker unless the airplane is on the ground.

3.31 AVIONICS SYSTEM FAILURES (Continued)

Loss of Cabin Altitude Display
Indication: Cabin Altitude Display on the MFD is Red X'd
Monitor cabin differential pressure for indications of pressurization system malfunction or loss of cabin pressure.
If an emergency descent is necessary, refer to paragraph 3.43, Emergency Descent.

Loss of Cabin Altitude Display and Cabin Differential Pressure Display
Indication: Cabin Altitude Display and Cabin Differential Pressure Display on the MFD are Red X'd
Descend to an altitude below which supplemental oxygen use would not be required in the event of a loss of cabin pressure.
If an emergency descent is necessary, refer to paragraph 3.43, Emergency Descent.

3.31 AVIONICS SYSTEM FAILURES (Continued)

Cabin Pressurization System Failure

Indication: **Master Caution, Double Chime,** CPCS FAIL

On Ground:

CABIN PRESS Knob..AS DESIRED
CABIN PRESS DUMP/NORM Switch..DUMP

NOTE

When a CPCS FAIL caution CAS message occurs on the ground, both outflow valves remain open and the flight must be conducted unpressurized. The CABIN PRESS knob may be used to attain a desirable temperature in the cabin.

In Flight:

Cabin Altitude..MONITOR
Cabin Differential Pressure..MONITOR

Descend as soon as practical.

If Required:

Oxygen mask (if installed).............................. PULL Lanyard to Activate,
Don Mask,
Verify CAS OXYGEN GEN ON Illuminated

Begin Emergency Descent per Para. 3.43 to a safe altitude consistent with terrain.

Prior to landing:

CABIN PRESS DUMP/NORM Switch ....DUMP

3.31 AVIONICS SYSTEM FAILURES (Continued)

Cabin Pressurization System Fault

Indication: Master Caution, Double Chime, CPCS FAULT

Cabin Altitude .... MONITOR
Cabin Differential Pressure .... MONITOR

Prior to landing:
CABIN PRESS DUMP/NORM Switch .... DUMP

NOTE

When a CPCS FAULT caution CAS message occurs the CPCS uses its internal sensors in lieu of the Garmin G1000 system. The landing field elevation and squat switch information may not be available, so the cabin must be depressurized prior to landing.

Dual GPS Failure

Navigation .... Use alternate source of navigation **(ILS, LOC, VOR, DME)**

If no alternate navigation sources are available:

Dead Reckoning (DR) Mode - Active when the airplane is greater than 30 NM from the destination airport.

Navigation Use the airplane symbol and magenta course line on the MAP display.

3.31 AVIONICS SYSTEM FAILURES (Continued)

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WARNING

Information normally derived from GPS turns amber. Information will become more inaccurate over time. After 20 minutes, all information is removed from the display.

WARNING

TAWS is Inoperative.

NOTE

DR mode uses heading, airspeed and last known GPS position to estimate the airplanes current position.

All maps with an airplane symbol show a ghosted airplane and a "DR" label.

Traffic Information System (TIS) is not dependent on GPS information. The position of displayed traffic relative to the airplane symbol on the map is still accurate.

Loss of Integrity (LOI) mode - Active when the airplane is within 30 NM of the destination airport (as calculated from the previews GPS or DR position).

Navigation .... Fly towards known VMC. Use ATC or other information sources as possible.

NOTE

All information derived from GPS or DR is removed from the displays.

The airplane symbol is removed from all maps. The map will remain centered at the last known position.

"NO GPS POSITION" is shown in the center of the map.

TAWS and TIS are inoperative.

3.31 AVIONICS SYSTEM FAILURES (Continued)

Avionics Cooling Fan Failures	
Indication:	**Single Chime,** AV1 FAN FAIL / AV2 FAN FAIL / MFD FAN FAIL / PFD1 FAN FAIL / PFD2 FAN FAIL
On Ground:	
Do not fly until issue is resolved.	
In Flight:	
Fix issue prior to next flight.	

When any of these CAS messages illuminate, it is possible to exceed the manufacturer's specified temperature limits for the affected equipment. The PFD and MFD displays may automatically dim if excessive temperatures are detected.

3.33 PROPELLER OVERSPEED

Propeller Overspeed

Indication: Master Warning Indication;Repeating aural triple chime; Red RPM indication.

THROTTLE .... RETARD
Oil Pressure .... CHECK (green range)
PROP RPM .... FULL DECREASE RPM, then set if any control available
Airspeed .... REDUCE
THROTTLE .... AS REQUIRED to remain at or below 2500 RPM

Land as soon as practical **and investigate cause of overspeed.**

3.35 LANDING GEAR POSITION UNSAFE

Landing Gear Position Unsafe

Indication: Master Warning, CHECK GEAR Aural Alert, [redacted]

LANDING GEAR Selector .... DOWN
LANDING GEAR Indications .... 3 GREEN

Indication: Master Caution, CHECK GEAR Aural Alert, CHECK GEAR

LANDING GEAR Selector .... DOWN (if desired)
LANDING GEAR Indications .... 3 GREEN

3.37 EMERGENCY LANDING GEAR EXTENSION

Emergency Landing Gear Extension

NOTE

If emergency gear extension is required due to a complete electrical failure, refer to the Complete Electrical Failure checklist in Section 3.29.

Prior to emergency extension procedure:

BATT MASTR Switch .... CHECK ON
(OFF if operating on the EMER bus)
Circuit Breakers ....CHECK IN

If landing gear does not check down and locked:

Airspeed ....BELOW 90 KIAS
HYDRAULIC PUMP-POWER Circuit Breaker (25 amp) ....PULL
(Located on the pilot's forward circuit breaker panel, row C, position 2)
LANDING GEAR Selector... DOWN
EMERGENCY GEAR EXTENSION Control ....PULL
(while fishtailing airplane)

3.39 SPIN RECOVERY

Spin Recovery	
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

3.41 ENGINE ROUGHNESS

Engine Roughness	
MIXTURE	ADJUST FOR MAXIMUM SMOOTHNESS
INDUCTION AIR	ALTERNATE
EMERG FUEL PUMP Switch	ON
FUEL SELECTOR	SELECT ANOTHER TANK
Engine indications	CHECK
MAG Switches	CHECK single MAG Operations

If engine runs smoothly on a single magneto, continue flight on single magneto and ***land as soon as possible***

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

3.43 EMERGENCY DESCENT

Emergency Descent

NOTE

If pressurized, the following procedure will result in an immediate loss of pressurization and the cabin altitude will rise at an uncontrolled rate. Consider use of emergency oxygen if installed.

THROTTLE .... CLOSE
(23 IN. HG. MINIMUM WHILE ABOVE 23,000 FT.)
PROP RPM .... FULL INCREASE
MIXTURE .... AS REQUIRED
LANDING GEAR Selector .... DOWN
(165 KIAS maximum)
FLAPS .... UP

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
3400 lbs. 118 KIAS

Door Open While Engine Is Operating

Indication: Triple Aural Chime, [redacted]

If during takeoff, maintain aircraft control. If sufficient runway remains, land straight ahead and apply maximum braking.

During cruise, confirm door status.

If locked, continue flight and repair lock switch before next flight.

If unlocked, descend to below 12000. Consider having passenger or crew carefully lock the door.

If solo, declare an emergency and land as soon as possible.

Expect degraded handling qualities and increased power required for all phases of flight.

3.45 PRESSURIZATION SYSTEM MALFUNCTION

Overpressurization

Indication: **Master Warning Indication; Red DIFF PSI indication; message; Repeating aural triple chime or a structural failure appears imminent.**

NOTE

If pressurized, the following procedure will result in an immediate loss of pressurization and the cabin altitude will rise at an uncontrollable rate.

CABIN PRESS DUMP/NORM Switch .... DUMP
CABIN PRESS Control Knob .... PULL to unpressurize

NOTE

If emergency oxygen is installed, don masks, activate oxygen generators, verify OXYGEN GEN ON CAS annunciation, and descend.

Emergency Descent .... TO A SAFE ALTITUDE CONSISTENT WITH TERRAIN

Sudden Loss of Pressurization

Indication: **Master Warning Indication; [redacted] message (if above 10,000 ft.); Repeating aural triple chime; CABIN ALT indication increasing.**

CABIN PRESS DUMP/NORM Switch .... CHECK NORM
CABIN PRESS Control Knob .... CHECK IN

NOTE

If emergency oxygen is installed, don masks, activate oxygen generators, verify OXYGEN GEN ON CAS annunciation, and descend. See USE OF EMERGENCY OXYGEN SYSTEM in Section 9 Supplement 1, page 3 for details.

Emergency Descent .... TO A SAFE ALTITUDE CONSISTENT WITH TERRAIN

3.47 CABIN AIR CONTAMINATION/SMOKE EVACUATION (Pressurized)

Cabin Air Contamination/Smoke Evacuation (Pressurized)

NOTE

If pressurized, the following procedure will result in an immediate loss of pressurization and the cabin altitude will rise at an uncontrollable rate.

CABIN PRESS DUMP/NORM Switch .... DUMP
CABIN PRESS Control Knob .... PULL OFF (to unpressurize)
AUXILIARY CABIN HT Switch .... OFF
VENT DE-FOG Switch .... ON
AIR COND Switch .... OFF

NOTE

If emergency oxygen is installed, don masks, activate oxygen generators, verify OXYGEN GEN ON CAS annunciation, and descend.

Emergency Descent .... TO A SAFE ALTITUDE CONSISTENT WITH TERRAIN

Land as soon as practical.

NOTE

If fumes/smoke dissipate, land as soon as practical to investigate problem. If fumes/smoke persist, refer to Fire in Flight Para. 3.15.

3.47 CABIN AIR CONTAMINATION/SMOKE EVACUATION (Pressurized)

Carbon Monoxide Level High

Indication: Double Aural Chime, CO LVL HIGH

Press MFD ENGINE soft key and observe the SYSTEMS/PULSE OXIMETER section for CO PPM ≥ 50.

CO Level ....Monitor

If CO LVL is greater than 200 PPM

Oxygen mask (if installed)............................. PULL Lanyard to Activate, Don Mask, Verify OXYGEN GEN ON CAS Illuminated

Begin Emergency Descent per Para. 3.41 to a safe altitude consistent with terrain

CABIN PRESS Control Knob .... PULL OFF (to unpressurize)

CABIN PRESS DUMP/NORM Switch.. DUMP

VENT DE-FOG Switch ....ON

AIR COND Switch .... OFF

BLOWER Switches... OFF

Land as soon as possible.

NOTE

See Section 9 Supplement for Emergency Oxygen for more information.

3.49 VACUUM SYSTEM FAILURE

Single Vacuum System Failure

Indication: VACUUM 1 FAIL or VACUUM 2 FAIL message Single Chime.

Vacuum Indication ....CHECK (within normal operating range)

Operating Vacuum Pump CAS message ....................EXTINGUISHED

NOTE

Although either vacuum pump has sufficient capacity to operate the deice boots and pressurization system in a normal manner, immediate action should be taken to exit icing conditions.

Dual Vacuum System Failure

Indication: VACUUM 1 FAIL **and** VACUUM 2 FAIL **messages, Single Chime; Amber vacuum indication below 2.0 in. Hg.,** VAC PRESS LOW **message; Double aural chime.**

NOTE

If both vacuum systems are inoperable, the wing and tail deicer boots will be inoperative, and loss of cabin pressure control is possible. Immediate action should be taken to exit icing conditions. Manually dump cabin pressure before landing. A precautionary landing should be considered depending on operating conditions.

3.51 ANTI-ICE / DE-ICE SYSTEM MALFUNCTIONS

Left Pitot Heat Failure

Indication: Master Caution, Double Chime, L PITOT HT FAIL

NOTE

Failure of the L Pitot Heat could cause erroneous indications of pilot's airspeed and standby airspeed. Airspeeds on each PFD should be compared for accuracy.

L PITOT HEAT Circuit Breaker..RESET
(Located on the pilot's aft circuit breaker panel, row A, position 3)
If IAS MISCOMPARE
annunciation illuminated..SELECT GOOD ADC
***Exit and avoid IFR and icing conditions* and consider terminating flight early due to possible loss of airspeed redundancy.**

Right Pitot Heat Failure

Indication: Master Caution, Double Chime, R PITOT HT FAIL

NOTE

Failure of the R Pitot Heat could cause erroneous indications of copilot's airspeed. Airspeeds on each PFD should be compared for accuracy.

R PITOT HEAT Circuit Breaker..RESET
(Located on the pilot's aft circuit breaker panel, row A, position 4)
If IAS MISCOMPARE
annunciation illuminated..SELECT GOOD ADC
***Exit and avoid IFR and icing conditions* and consider terminating flight early due to possible loss of airspeed redundancy.**

3.51 ANTI-ICE / DE-ICE SYSTEM MALFUNCTIONS (Continued)

Total Pitot Heat Failure

Indication: Triple Aural Chime, [redacted]

NOTE

Failure of both left and right pitot heaters could cause erroneous pilot, copilot and/or standby airspeed indications. Monitor pilot and copilot airspeeds. In the event of complete loss of airspeed, maintain safe airspeed by use of throttle, engine settings and airframe sensory cues.

L PITOT HEAT Circuit Breaker....................RESET
(Located on the pilot's aft circuit breaker panel, row A, position 3)
R PITOT HEAT Circuit Breaker....................RESET
(Located on the pilot's aft circuit breaker panel, row A, position 4)
If either circuit breaker opens again, do not reset.

Exit and avoid IFR and icing conditions **and consider terminating flight early due to possible loss of airspeed redundancy.**

Pitot Heat Off

Indication: Master Caution; PITOT HEAT OFF

PITOT HEAT Switch....................Select ON

Windshield Overtemperature

Indication: Triple Aural Chime, [redacted]

WSHLD HIGH / WSHLD LOW Switch....................OFF

Immediate action should be taken to exit icing conditions.

3.51 ANTI-ICE / DE-ICE SYSTEM MALFUNCTIONS (Continued)

Propeller Heat System Malfunction

Indication: **Master Caution Indication; message; Double aural chime.** PROP HEAT FAIL

NOTE

Excessive vibration may be an indication that the propeller heat is not functioning properly.

PROP RPM Control .... exercise
PROP HEAT Switch .... check for proper LED indications:
Steady for 90 sec. - System ON
Flashing 90 sec. - System OFF
PROP HT FAIL CAS Message .... CHECK

NOTE

Illumination of the PROP HT FAIL CAS message is an indication that the propeller blades may not be deicing properly.

PROP HEAT Switch .... OFF (if failure is indicated)

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.

3.51 ANTI-ICE / DE-ICE SYSTEM MALFUNCTIONS (Continued)

Surface De-ice Failure
In Flight:
Indication: **Master Caution, Double Chime,** SURF DEICE FAIL
SURFACE DE-ICE Circuit Breaker..RESET (Located on the pilot's aft circuit breaker panel, row A, position 6)
If message remains illuminated, *Exit and Avoid icing conditions.*
On Ground:
Indication: **Master Caution, Double Chime,** SURF DEICE FAIL
Flight in icing conditions is prohibited.

3.53 INADVERTENT ICING ENCOUNTER

Inadvertent Icing Encounter

WARNING

Flight into known icing conditions is prohibited unless the optional Ice Protection System is fully operational. Refer to Section 9, Supplement 2.

INDUCTION AIR .... ALTERNATE
PITOT HEAT Switch .... ON
S WARN HEAT Switch .... ON
Windshield DEFROST Knob.. PULL ON
PROP HEAT Switch (if installed) .... ON
VENT DE-FOG Switch .... ON

Indication: Change heading and/or altitude to exit icing conditions.

3.55 HYDRAULIC SYSTEM MALFUNCTION

Hydraulic System Malfunction

Indication: Master Caution Indication; HYDR PUMP ON message; Double aural chime.

HYDRAULIC PUMP POWER Circuit Breaker .... PULL
(Located on the pilot's forward circuit breaker panel, row C, position 2)

Land as soon as practical and investigate the cause.

Prior to landing, the HYDRAULIC PUMP POWER circuit breaker (located on the pilot's forward circuit breaker panel, row C, position 2) 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 (Para. 3.37).

3.57 FLAP SYSTEM MALFUNCTION

Flap System Malfunction

Indication: **Master Caution Indication; FLAP FAIL message; Double aural chime.**

FLAP WARN circuit breaker ....RESET
VERIFY Normal Flap Operation.

(Located on pilot's forward circuit breaker panel, row C, position 8)

If FLAP FAIL message remains illuminated:

FLAP MOTOR Circuit Breaker..PULL

(Located on pilot's forward circuit breaker panel, row C, position 7)

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.

The flaps will remain in the same position as when the malfunction occurred.

***Land as soon as practical* and investigate the cause.**

3.59 FUEL TANK SUBMERGED PUMP FAILURE

Fuel Tank Submerged Pump Failure

Indication: **Master Caution Indication; BOOST PUMP FAIL message; Double aural chime.**

FUEL SELECTOR ....CHECK in detent
L BOOST Circuit Breaker ....CHECK - RESET if necessary
R BOOST Circuit Breaker ....CHECK - RESET if necessary
(Located on pilot's forward circuit breaker panel, row B, positions 2 and 3)
BOOST PUMP FAIL CAS message ...........................EXTINGUISHED

If annunciator remains lit:

EMERG FUEL PUMP Switch...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.

3.61 STALL WARNING FAILURE

Stall Warning Failure

Indication: **Master Caution Indication; STALL WARN FAIL message; Double aural chime.**

STALL WARN Circuit Breaker ....CHECK - RESET if necessary
(Located on pilot's forward circuit breaker panel, row C, position 3)

NOTE

Underspeed Protection (USP) is inoperative when Stall Warning is inoperative.

If circuit breaker does not remain closed, or STALL WARN FAIL CAS message does not extinguish, the stall warning system will be inoperative for remainder of flight.

Avoid low airspeeds and monitor approach speeds closely.

If message remains illuminated, *Exit and Avoid icing conditions.*

3.63 EMERGENCY EXIT

Emergency Exit

EMERGENCY EXIT (second window from front
on right side) ....LOCATE

NOTE

The cabin must be depressurized before attempting to open the emergency exit.

Plexiglas Cover ....REMOVE
Handle ....PULL
Emergency Exit Window .... PULL IN

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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-46-350P airplane. 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.

The checklists in this section use a simple object - action format, with little emphasis on system operation. These checklists should be used during normal ground and flight operations. When appropriate, additional information is provided immediately below the checklist, providing more detailed information related to that procedure.

In order to operate the airplane in a safe and efficient manner, pilots should familiarize themselves with the both the checklists and amplified procedures.

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

4.1 GENERAL (continued)

CAUTION

[illegible] who fly at high altitude must be aware of [illegible]

[illegible]

4.3 AIRSPEEDS FOR SAFE OPERATIONS

The following airspeeds 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 (Vy) .... 110 KIAS
(b) Best Angle of Climb Speed (Vx) .... 81 KIAS
(c) Maximum Operating Maneuvering Speed Vo .... 118 KIAS
(at 3400 LBS)
See Airspeed Limitations, Section 2.3
(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) Airspeeds for Autopilot Operation .... 78 - 183 KIAS
(h) Minimum Airspeed for Autopilot Coupled Approach .... 90 KIAS

4.5 NORMAL PROCEDURES CHECKLIST

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 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.

4.5a Preflight Checklists

COCKPIT

Control Wheel	RELEASE RESTRAINTS
PARK BRAKE	PULL ON
LANDING GEAR Selector	DOWN
All Switches	OFF
MAG Switches	OFF
AV BUS MASTR Switch	OFF
MIXTURE	IDLE CUT-OFF
BATT MASTR Switch	ON
Stby Instrument	Successful Boot-Up
Gear Position Indicators	3 Green on PFD
Fuel Gauges	CHECK Quantity and Balance

[illegible]

[illegible]

Interior Lighting	ON and CHECK
FLAPS	EXTEND
PITOT HEAT Switch	ON
S. WARN HEAT Switch	ON
Exterior Light Switches	ON

CAUTION

[illegible] taken when an operational check [illegible] pitot heads is being performed. The [illegible] very hot. Ground operation should [illegible]

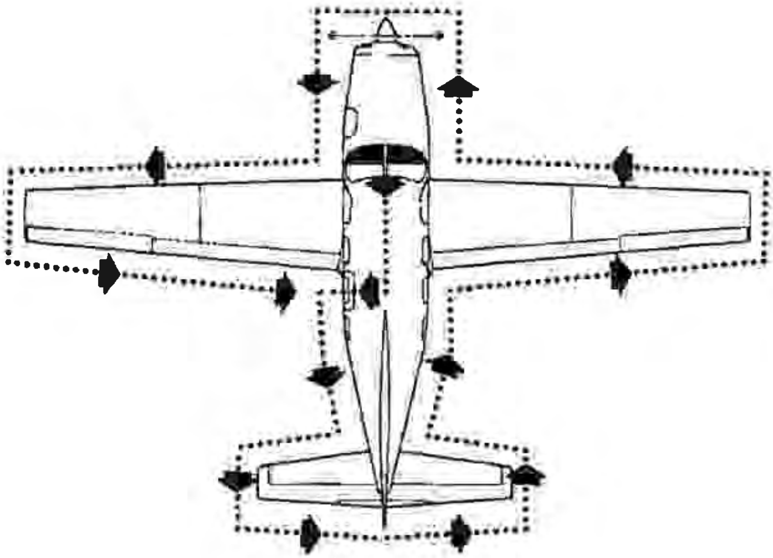
4.5a Preflight Checklists (continued)

COCKPIT (continued)

Pitot Heads .... CHECK WARM
Stall Warning Vane .... CHECK WARM
Exterior Lights .... CHECK OPERATION
Exterior Light Switches .... OFF
PITOT HEAT Switch .... OFF
S. WARN HEAT Switch .... OFF
BATT MASTR Switch .... OFF
Primary Flight Controls .... PROPER OPERATION
Elevator and Rudder Trims .... NEUTRAL
Pitot and Static Drains .... PUSH to drain
Alternate Static System .... CHECK PRIMARY POSITION
Emergency Exit .... CHECK SECURE
Windows .... CHECK CLEAN
Required Papers .... CHECK ON BOARD
Baggage .... STOW PROPERLY - SECURE
Empty Seats .... SEAT BELTS SNUGLY FASTENED

If the emergency oxygen system is installed and the OXYGEN GEN ON CAS message is illuminated, the expended canisters must be replaced if oxygen usage is desired for the flight.

4.5a Preflight Checklist (continued)



WALK-AROUND
Figure 4-1

EMPENNAGE

Antennas .... CHECK
Surface Condition .... CLEAR OF ICE, FROST, SNOW
Left Static Ports .... CLEAR
Storage Compartment Door .... CLOSE/SECURE
Alternate and Pressurization Static Ports .... CLEAR
De-ice Boot (if installed) .... CHECK
Elevator .... CHECK
Elevator Trim Tab .... CHECK
Rudder .... CHECK
Static Wicks .... CHECK
Tie Down .... REMOVE
Right Static Ports .... CLEAR

4.5a Preflight Checklist (continued)

RIGHT WING

Surface Condition .... CLEAR OF ICE, FROST, SNOW
Flap and Hinges .... CHECK
Aileron and Hinges .... CHECK
Static Wicks .... CHECK
Wing Tip and Lights .... 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
Radar Pod and Storage Door (if installed) .... CHECK/SECURE
Pitot Head .... CHECK FOR OBSTRUCTIONS
Main Gear Strut .... PROPER INFLATION (3.4 +/- 0.25 in.)
Tire .... CHECK
Brake Block and Disc .... CHECK

CAUTION

When draining any amount of fuel, car [illegible] taken to ensure that no fire hazard e[illegible]

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

NOSE SECTION

General Condition .... CHECK
Cowling .... SECURE
Fuel Filter Sump .... DRAIN and CHECK for water, sediment and proper fuel
Windshield .... CLEAN
Propeller and Spinner .... CHECK
Air Inlets .... CLEAR
Landing Light .... CHECK
Chock .... REMOVE

4.5a Preflight Checklist (continued)

NOSE SECTION (Continued)

Nose Gear Strut .... PROPER INFLATION (1.7 ± 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

LEFT WING

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

Fuel Tank Sump .... DRAIN and CHECK for water, sediment
Main Gear Strut .... INFLATION (3.4 +/- 0.25 INCH
Tire .... CHECK
Brake Block and Disc .... CHECK
Tie Down and Chock .... REMOVE
OAT Probes .... CHECK
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

BEFORE STARTING ENGINE

Passengers .... BOARD
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
PARK BRAKE .... SET
PROP RPM .... FULL INCREASE
All Electrical Switches .... OFF
Circuit Breakers .... CHECK IN
CABIN PRESS Control Knob .... PUSH (On)
CABIN PRESS DUMP/NORM Switch .... NORM
INDUCTION AIR Control .... CHECK then PRIMARY
Alternate Static System .... CHECK PRIMARY POSITION
Pitot and Static Drains .... VERIFY PUSH TO DRAIN
EMER Switch .... ON
Verify operation of the pilot's PFD, No. 1 Nav/Com, Audio Panel, and illumination of the Landing Gear Down Indicators
EMER Switch .... OFF

Proceed with appropriate Engine Start Checklist.

4.5c Engine Start Checklist

ENGINE START - GENERAL

CAUTION

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

CAUTION

If engine does not start within 10 seconds, prime and repeat starting procedure. Starter manufacturer recommends starter cranking periods be limited to 10 seconds with a 20 second rest period between cranking periods Maximum of 6 start periods allowed. If start is not achieved on sixth attempt allow starter to cool for 30 minutes before attempting additional starts.

CAUTION

The START ENGAGED CAS message will illuminate after 30 seconds of continuous engine cranking. If the CAS message illuminates 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.

4.5c Engine Start Checklist (continued)

NORMAL START - COLD ENGINE

THROTTLE .... 1/2 INCH OPEN
BATT MASTR Switch .... ON
CAS Messages .... CONSIDER ANY ILLUMINATED
PFD Annunciations .... CONSIDER ANY ILLUMINATED
ALTR NO 1 and ALTR NO 2 Switches .... ON
EMERG FUEL PUMP Switch .... OFF
FUEL SELECTOR .... DESIRED TANK
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.

STROBE LIGHTS/FIN STROBE .... FIN STROBE
MAG Switches .... ON
Prop Area .... CLEAR
START Switch .... ENGAGE
MIXTURE (when engine fires) .... ADVANCE
THROTTLE .... ADJUST
Oil Pressure .... CHECK
Alternator AMPS Indications .... CHECK NORMAL

After PFD 1 initialization is complete, consider any CAS messages and PFD annunciations that are illuminated. Move the MIXTURE control to full RICH for approximately four seconds then to LEAN (idle cut-off) position. The engine is now primed.

4.5c Engine Start Checklist (continued)

NORMAL START - HOT ENGINE

THROTTLE .... 1/2 INCH OPEN
BATT MASTR Switch .... ON
CAS Messages .... CONSIDER ANY ILLUMINATED
PFD Annunciations .... CONSIDER ANY ILLUMINATED
ALTR NO 1 and ALTR NO 2 Switches .... ON
EMERG FUEL PUMP Switch .... OFF
FUEL SELECTOR .... DESIRED TANK
MIXTURE .... IDLE CUT-OFF
STROBE LIGHTS/FIN STROBE .... FIN STROBE
MAG Switches .... ON
Prop Area .... CLEAR
START Switch .... ENGAGE
MIXTURE (when engine fires) .... ADVANCE
THROTTLE .... ADJUST
Oil Pressure .... CHECK NORMAL
Alternator AMPS Indications .... CHECK NORMAL

To start a hot engine, open the THROTTLE 1/2 inch. Do not prime.

ENGINE START WHEN FLOODED

THROTTLE .... OPEN FULL
BATT MASTR Switch .... ON
CAS Messages .... CONSIDER ANY ILLUMINATED
PFD Annunciations .... CONSIDER ANY ILLUMINATED
ALTR NO 1 and ALTR NO 2 Switches .... ON
EMERG FUEL PUMP Switch .... OFF
FUEL SELECTOR .... DESIRED TANK
MIXTURE .... IDLE CUT-OFF
STROBE LIGHTS/FIN STROBE .... FIN STROBE
MAG Switches .... ON
Prop Area .... CLEAR
START Switch .... ENGAGE
MIXTURE (when engine fires) .... ADVANCE
THROTTLE .... RETARD
Oil Pressure .... CHECK NORMAL
Alternator AMPS Indications .... CHECK NORMAL

4.5c Engine Start Checklist (continued)

ENGINE START WHEN FLOODED (Continued)

For starting a flooded engine, the THROTTLE lever should be full open. Check that the EMERG FUEL PUMP switch is OFF. Verify the MIXTURE control is at the LEAN (idle cut-off) position. When the engine fires, advance the MIXTURE control, retard the THROTTLE, and check for a positive indication of oil pressure.

ENGINE START WITH EXTERNAL POWER SOURCE

BATT MASTR Switch ....Verify OFF
ALTR NO 1 and ALTR NO 2 Switches ....Verify OFF
All Electrical Equipment.. OFF
External Power Plug .... INSERT in receptacle

NOTE

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

4.5c Engine Start Checklist (continued)

ENGINE START WITH EXTERNAL POWER SOURCE (continued)

CAUTION

Care should be exercised because if the ship's [illegible]

THROTTLE .... ½ INCH OPEN
CAS Messages .... CONSIDER ANY ILLUMINATED
PFD Annunciations .... CONSIDER ANY ILLUMINATED
EMERG FUEL PUMP Switch .... OFF
FUEL SELECTOR .... DESIRED TANK
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.

STROBE LIGHTS/FIN STROBE .... FIN STROBE
MAG Switches .... ON
Prop Area .... CLEAR
START Switch .... ENGAGE
MIXTURE (when engine fires) .... ADVANCE
THROTTLE .... LOWEST POSSIBLE RPM
BATT MASTR Switch .... ON
External Power Plug .... DISCONNECT from receptacle
Baggage Door .... CLOSED and SECURE
(DOOR AJAR warning CAS message extinguished)
THROTTLE .... ADVANCE to 1000 RPM
ALTR NO 1 and ALTR NO 2 Switches .... ON
Alternator AMPS Indications .... CHECK NORMAL
VOLTS Indication .... CHECK NORMAL
Oil Pressure .... CHECK NORMAL

ENGINE START WITH EXTERNAL POWER SOURCE (continued)

Verify the BATT MASTR and ALTR NO 1 and ALTR NO 2 switches are OFF, and turn all electrical equipment OFF. Plug the 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. EMERG FUEL PUMP switch is OFF. Move the FUEL SELECTOR to the desired tank. Move the MIXTURE control to full RICH for approximately four seconds then to LEAN (idle cut-off) position. The engine is now primed.

4.5d Before Taxiing Checklist

BEFORE TAXIING

CAUTION

[illegible]perate engine abov[illegible]
[illegible]s open.

THROTTLE...1000 to 1200 RPM
AV BUS MASTR Switch..ON
Multi-Function Display (MFD).......VERIFY DATABASE CURRENCY
MFD-Weight Planning....................ENTER WEIGHTS AS REQUIRED
Fuel Totalizer (weight)..................FOB SYNC or ENTER MANUALLY
CAS Messages............CONSIDER ANY MESSAGES ILLUMINATED
Autopilot ....Verify Preflight
Self Test (PFT) Completed and Disconnect Tone heard
TAXI and LNDG LIGHT..AS REQUIRED
NAV LIGHT...AS REQUIRED
Environmental System..AS DESIRED
AUXILIARY CABIN HT...AS DESIRED
Destination Field Elevation..SET
STALL TEST Switch ....PRESS TO TEST
TRAFFIC (if installed) ....TEST
COM/NAV Radios and Avionics and STBY Instrument......CHECK/SET

4.5d Before Taxiing Checklist (continued)

BEFORE TAXIING (continued)

WARNING

If the internal battery of the EBD standby instrument is less than 80%, IFR flight is prohibited.

NOTE

EBD brightness is automatically adjusted based on the ambient light detected by the photocell. If the EBD is too bright. use the manual BRT ADJUST mode to reduce brightness.

Standby Instrument .... VERIFY ON with no red-X's or failure annunciations and acceptable charge level

FLAPS .... RETRACT

To check the standby instrument's internal battery charge level, press the MENU key, rotate the MODE/SYNC knob to the POWER SETTINGS page, then press BATTERY line select key. BAT LEVEL IN --.-- will be displayed for a short period of time as internal battery capacity is being measured. This could take up to 10 minutes if the ambient temperature is below 0°C. Once the capacity is measured the ON BAT XX% REM annunciation will be displayed. After checking the battery charge level, the EXT PWR softkey must be pressed to reestablish power from the aircraft electrical system. Press the MENU key to return to the normal display.

WARNING

Failure to return the Standby Instrument to ship's power by selecting the EXT PWR soft key before selecting MENU, will deplete the Standby Instrument battery within 30 minutes. This will make the instrument unusable in the event of an electrical emergency.

To manually adjust the EBD brightness level, select the MENU button and then press the bottom left knob to toggle between automatic (BRT AUTO) and manual (BRT ADJUST) modes. When in manual mode, rotate bottom left knob to adjust brightness to desired level.

4.5e Taxiing Checklist

TAXIING

Taxi Area....................CLEAR
PARK BRAKE....................RELEASED
PROP RPM....................FULL INCREASE
THROTTLE....................APPLY SLOWLY
Brakes....................CHECK
Steering....................CHECK
Flight Instruments....................CHECK

CAUTION

During taxi, if the VOLTS indication decreases into the red range, increase engine RPM, if possible, to retain adequate battery charging.

4.5f Ground Check Checklist

GROUND CHECK

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.

PARK BRAKE....................Pull to SET
PROP RPM....................FULL INCREASE
THROTTLE....................2000 RPM
MAG Switches....................CHECK
max. drop 175 RPM
- max. diff. 50 RPM
VACUUM INDICATION....................CHECK (MFD Engine page)

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, Supplement 3 - Ice Protection System.

4.5f Ground Check Checklist (continued)

GROUND CHECK (continued)

Ice protection equipment (if installed)................CHECK AS REQUIRED
VOLTS Indication ....CHECK NORMAL
ALTR AMPS 1 and ALTR AMPS 2...........................CHECK NORMAL
Oil Temperature ....CHECK NORMAL
Oil Pressure ....CHECK NORMAL
PROP RPM ....EXERCISE - then FULL INCREASE
Fuel Flow ....CHECK NORMAL
THROTTLE ....RETARD to Idle (check smooth engine operation)
THROTTLE ....1000 to 1200 RPM
Environmental/De-Ice Switch Panel ....PRESS-TO-TEST

4.5g Before Takeoff Checklist

BEFORE TAKEOFF

NOTE

Refer to Section 9, Supplement 3 for PA-46-350P Aircraft Flight Into Known Icing (FIKI) (if ice protection system is installed), prior to any flight operations (takeoff, cruise, landing, etc.).

NOTE

Prolonged operation of the stall warning vane heater in temperatures greater than 5°C will reduce the operational life of the stall warning vane.

BATT MASTR Switch .... Verify ON
EMERG FUEL PUMP Switch ....ON
MAG Switches..ON
ALTR NO 1 and ALTR NO 2 Switches ....ON - CHECK AMPERAGE INDICATIONS
FUEL SELECTOR .... PROPER TANK
INDUCTION AIR Control ....PRIMARY
Seat Backs ....ERECT
Seats .... ADJUSTED& LOCKED IN POSITION
Armrests ....STOWED
Belts/Harness ....FASTENED/ADJUSTED
Pressurization System ....CHECK DESTINATION ELEVATION
MIXTURE ....FULL RICH

4.5g Before Takeoff Checklist (continued)

BEFORE TAKEOFF (continued)

PROP RPM .... FULL INCREASE
Flight Instruments .... CHECK (Primary and Standby)
CAS Messages .... CONSIDER ANY MESSAGES ILLUMINATED
Engine Instruments .... CHECK NORMAL
COM/NAV Radios and Avionics .... AS REQUIRED
Transponder .... AS REQUIRED
FLAPS .... SET (0° to 10°)
Elevator and Rudder Trim .... SET
Autopilot .... DISENGAGE
Yaw Damper .... OFF
AIR COND .... OFF
Flight Controls .... FREE & PROPER TRAVEL
Ice Protection Equipment (if installed) .... AS REQUIRED
TAXI and LANDG LIGHT Switches .... AS REQUIRED
NAV LIGHT Switch .... AS REQUIRED
STROBE LIGHTS/FIN STROBE Switch .... FIN STROBE

4.5h Takeoff Checklist

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. (See Section 7.)

NORMAL TECHNIQUE

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 and positive rate of climb:

LANDING GEAR Selector .... UP
FLAPS .... RETRACT

4.5h Takeoff Checklist (continued)

0° FLAP TAKEOFF PERFORMANCE

FLAPS .... 0°
Brakes .... APPLY
Trim .... SET
Power .... SET TO MAXIMUM
Brakes .... RELEASE
Liftoff .... 78 KIAS
Obstacle Clearance Speed .... 91 KIAS

After liftoff and positive rate of climb:

LANDING GEAR Selector .... UP

4.5i Climb Checklist

MAXIMUM CONTINUOUS POWER CLIMB

MIXTURE .... FULL RICH
PROP RPM .... 2500 RPM
Manifold Pressure .... MAXIMUM CONTINUOUS POWER

4.5i Climb Checklist (continued)

MAXIMUM CONTINUOUS POWER CLIMB (continued)

Cylinder Head Temperature (CHT) .... 500°F MAX
Turbine Inlet Temperature (TIT) .... 1750°F MAX
Oil Temperature .... 245°F MAX
Best Angle of Climb (short duration only) .... 81 KIAS
Best Rate of Climb .... 110 KIAS
Pressurization .... check proper DEST ELV
Cabin Press .... Check Cabin Alt, rate, and Press Diff
EMERG FUEL PUMP Switch .... OFF at safe altitude
LANDG LIGHT Switch .... OFF
TAXI/PULSE Lights .... AS REQUIRED

NOTE

For maximum engine life it is recommended to transition to Cruise Climb once a safe altitude is attained.

CRUISE CLIMB

Manifold Pressure .... 35 IN. HG
PROP RPM .... 2500 RPM
MIXTURE .... 32 GPH
Climb Speed .... 125 KIAS
Cylinder Head Temperature (CHT) .... CHECK 500°F MAX
435°F Recommended
Turbine Inlet Temperature (TIT) .... CHECK 1750°F MAX
1650°F Recommended or 100°F richer
than peak TIT whichever is less.
Oil Temperature .... 245°F MAX
Pressurization .... check proper DEST ELV
Cabin Press .... Check Cabin Alt, rate, and Press Diff
EMERG FUEL PUMP Switch .... OFF at safe altitude
LANDG LIGHT Switch .... OFF
TAXI/PULSE Lights .... AS REQUIRED

4.5j Cruise Checklist

CRUISE

WARNING

Operation above 25,000 feet is not approved.

CAUTION

To maintain lateral balance, alternate [illegible] right and left fuel tanks. See paragraphs [illegible] and 7.19.

Reference Section 5 power setting table and performance charts.

Cruise Power .... SET per power table
MIXTURE (Refer to para. 4.27)..ADJUST
Cylinder Head Temperature (CHT)..........................CHECK 500°F MAX
400°F Recommended
(See Section 4.27)
Turbine Inlet Temperature (TIT)............................CHECK 1750°F MAX
1650°F Recommended or 100°F richer
than peak TIT whichever is less.
(See Section 4.27)
Pressurization......................CHECK DEST ELV and press system health

NOTE

Higher operating temperatures and pressures generally increase the wear rate of critical engine parts. Aircraft engines have operating limitations, termed redlines, that represent the maximum allowable value for a given parameter. The engine is certified to perform safely at these redline conditions. However, continuous operation at redline values may shorten the service life of the engine. For example, engines continuously run at the highest possible cruise setting at maximum Turbine Inlet Temperature may require a top overhaul of cylinders before engine TBO. Operating consistently at the maximum allowable engine parameters does not promote optimum service life.

NOTE

Do not exceed 1750°F TIT. Recommended TIT is 1650°F or 100°F richer than peak TIT whichever is less.

4.5j Cruise Checklist (continued)

CRUISE (continued)

NOTE

The maximum permissible cylinder head temperature for all operations is 500°F. No matter what approved power setting is used, cylinder head temperatures should not exceed 435°F in level flight cruise. For optimum service life, cruise cylinder head temperatures should be maintained below 400°F. Adjust cylinder head temperatures by reducing power, adjusting the mixture, or any combination of these methods.

NOTE

EBD brightness is automatically adjusted based on the ambient light detected by the photocell. If the EBD is too bright, use the manual BRT ADJUST mode to reduce brightness.

NOTE

Prolonged operation of the stall warning vane heater in temperatures greater than 5°C will reduce the operational life of the stall warning vane.

The cruising speed is a result many factors including power setting, altitude, temperature, loading, and equipment installed on the airplane. Also, weather conditions should be continuously monitored, with special attention to conditions which could lead to icing.

Use windshield defrost and heat, and optional ice protection equipment 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 the cruise setting. Leave the mixture leaned to the cruise setting. This will prevent rapid engine cooling which may damage the engine. Should additional rate of descent be required, power can be reduced to 23 in. Hg. (above 23,000 ft.) and to 20 in. Hg. (at or below 23,000 ft.) while maintaining cabin pressurization. At reduced power maintain at least 1350°F TIT in order to keep engine

4.5j Cruise Checklist (continued)

CRUISE (continued)

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 less than 165 KIAS and the aircraft operated at speeds less than 195 KIAS with the gear extended. This procedure will significantly increase rate of descent.

To achieve the Time, Fuel, and Distance performance defined in Section 5, reduce the power to 25 in. Hg. and 2500 RPM and control pitch attitude to maintain 165 KIAS. Set the mixture to maintain 1350°F TIT.

To manually adjust the EBD brightness level, select the MENU button and then press the bottom left knob to toggle between automatic (BRT AUTO) and manual (BRT ADJUST) modes. When in manual mode, rotate bottom left knob to adjust brightness to desired level.

4.5k Descent Checklist

NORMAL DESCENT

Windshield DEFROST .... AS REQUIRED
Windshield Heat (if installed).. AS REQUIRED
Ice Protection Equipment (if installed)............................ AS REQUIRED
Power...CRUISE SETTING
MIXTURE...CRUISE SETTING
Airspeed .... AS REQUIRED

NOTE

Prolonged operation of the stall warning vane heater in temperatures greater than 5°C will reduce the operational life of the stall warning vane.

NOTE

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

REDUCED POWER DESCENT

Windshield Defrost .... AS REQUIRED
Windshield Heat (if installed).. AS REQUIRED
Ice Protection Equipment (if installed)............................ AS REQUIRED
THROTTLE .... AT or ABOVE 23 IN. HG. (ABOVE 23,000 FT.)
AT or ABOVE 20 IN. HG. (AT/BELOW 23,000 FT.)
MIXTURE...................................... MAINTAIN 1350°F TIT MINIMUM
PROP RPM ....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.

4.5k Descent Checklist (4.29) (continued)

POH Section 5 PERFORMANCE DESCENT

Windshield DEFROST .... AS REQUIRED
Windshield Heat (if installed).. AS REQUIRED
Ice Protection Equipment (if installed) .... AS REQUIRED
Altimeter/Standby Altimeter ....Set
THROTTLE ....25 IN. HG.
PROP RPM .... 2400 RPM
MIXTURE...MAINTAIN 1350°F TIT
Airspeed .... 165 KIAS

4.5m Before Landing Checklist

APPROACH CHECK

LANDG LIGHT Switch .... AS REQUIRED
Altimeter/Standby Altimeter ....SET
Pressurization ....CHECK proper DST ELV
Seat Backs ....ERECT
Seats .... ADJUSTED & LOCKED IN POSITION
Belts/Harness...FASTEN/ADJUST
EMERG FUEL PUMP Switch ....ON
FUEL SELECTOR .... PROPER TANK
MIXTURE...RICH
PROP RPM ....SET Full Fwd
LANDING GEAR Selector ....DOWN (below 165 KIAS)
FLAPS..SET (10° @ 165 KIAS max.)
Rudder Trim .... SET TO NEUTRAL
AIR COND Switch .... OFF

During the approach to landing, the CHECK GEAR aural alert may sound. The mutable CHECK GEAR is triggered when the gear is not down and locked and engine is below 14 in Hg manifold pressure. The nonmutable CHECK GEAR is triggered when the landing gear is not down and locked and flaps are extended beyond 12°. See Section 7 for additional details.

4.5m Before Landing Checklist (continued)

LANDING CHECK

Landing Gear Lights .... 3 GREEN
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
Yaw Damper (prior to landing) .... OFF

4.5n LANDING

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

FLAPS .... ANY SETTING
(normal is 36°)
Airspeed .... 80 - 85 KIAS (flaps down)
95 KIAS (flaps up)
THROTTLE .... AS REQUIRED
After touchdown:
Brakes .... AS REQUIRED

SHORT FIELD TECHNIQUE

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

4.5o Go-around Checklist

GO-AROUND

MIXTURE .... FULL RICH
PROP RPM .... FULL INCREASE
THROTTLE .... FULL POWER
Control Wheel .... back pressure to
ROTATE to CLIMB ATTITUDE
Airspeed .... 80 KIAS
LANDING GEAR Selector .... UP
FLAPS .... RETRACT INCREMENTALLY
Trim .... AS REQUIRED

If the aircraft is equipped with optional Underspeed Protection (USP) and an autopilot coupled go-around is desired, press the TO/GA button on the throttle handle, followed immediately by the checklist shown above. Refer to Section 7 for additional details on the autopilot coupled go-around and Underspeed Protection (USP).

4.5p After Landing Checklist

AFTER LANDING

INDUCTION AIR Control .... PRIMARY
FLAPS .... RETRACT
AIR COND .... AS DESIRED
EMERG FUEL PUMP Switch .... OFF
Ice Protection Equipment (if installed) .... OFF
WX Radar (if installed) .... STBY
Transponder .... AS REQUIRED
STROBE LIGHTS/FIN STROBE .... AS REQUIRED
LANDG/TAXI Lights .... AS REQUIRED

4.5q Stopping Engine Checklist

STOPPING ENGINE

AV BUS MASTR Switch .... OFF
External Lights (except strobe) .... OFF
AIR COND Switch .... OFF
PROP RPM .... FULL INCREASE
THROTTLE .... CLOSE until a decided decrease in CHT
THROTTLE .... 1000 RPM for approx. 30 seconds
MIXTURE .... IDLE CUT-OFF
MAG Switches .... OFF
ALTR NO 1 and ALTR NO 2 Switches .... OFF
STROBE LIGHTS/FIN STROBE .... OFF
BATT MASTR Switch .... OFF
Standby Instrument .... VERIFY SHUTDOWN

NOTE

In case the Aspen EBD standby instrument remains "ON" due to improper shutdown, the EBD switches to internal battery and depletes it. To turn off the EBD, press the "SHUT DOWN" command from Main Menu page 6 or hold the red "REV" button for 20 seconds.

4.5r Mooring Checklist

MOORING

PARK BRAKE .... SET
Control Wheel .... SECURED with belts
FLAPS .... FULL UP
Wheel Chocks .... IN PLACE
Tie Downs .... SECURE

4.7 STALLS

The stall characteristics of the M350 are conventional. An approaching stall is indicated by a stall aural alert 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.

When conducting stalls intentionally, Electronic Stability Protection may be disabled from the MFD/AUX/System Setup Page.

NOTE

The stall warning system is inoperative with the BATT MASTR, ALTR NO 1 and ALTR NO 2 switches OFF.

During preflight, the stall warning system should be checked by turning the BATT MASTR switch on and pressing the STALL TEST switch to determine if the aural alert is actuated.

4.9 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 operating maneuvering speed (Vo) 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 operating maneuvering speeds appropriate to the weight of the aircraft.)

4.11 CABIN PRESSURIZATION SYSTEM

Cabin pressurization system controls and switches are located on the lower section of the pilot's instrument panel, lower copilot's instrument panel, and overhead switch panel. (Refer to Section 7, Figures 7-19 and 7-23.)

The cabin pressurization system controls, gauges and switches are as follows:

(a) Cabin Pressure Altitude/Differential Pressure/Rate of Climb Gauge on the MFD
(b) Cabin Pressure Dump/Normal Switch
(c) Cabin Pressurization Control

Prior to starting engine, check the operation of the cabin pressurization control. Note that a firm effort is required to move the CABIN PRESS control knob out of either the outside air or the pressurized air position. If little effort is required to move the lever, be suspicious of a broken control cable. If a cable is broken, the air control valve may have failed in either the open or closed position. If failed open, pressurized flight will not be possible, but unpressurized flight will be possible. If failed closed, pressurized flight would be possible but should not be attempted, as it would not be possible to bring in fresh air should contamination occur.

WARNING

Do not land with aircraft pressurized.

To repressurize while in flight, push the CABIN PRESS control knob IN and set the CABIN PRESS DUMP/NORM switch to NORM.

4.13 SUPPLEMENTAL ELECTRIC HEATER

AFTER ENGINE START

BATT MASTR Switch .... ON
ALTR NO 1 and ALTR NO 2 Switches .... OFF
VENT DE-FOG Switch .... ON
Airflow .... CHECK
VOLTS Indication .... LESS than 24 Vdc (increase electrical load as necessary to lower voltage)
VOLTS CAS MESSAGE .... ILLUMINATED
Electrical Switches (used to increase load) .... OFF
VENT DE-FOG Switch .... OFF
ALTR NO 1 and ALTR NO 2 Switches .... ON

NOTE

The VOLTS indicating system must be checked operational before heater operation. The VENT/ DE-FOG 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. .... PULL (on)
DEFROST Control .... AS REQUIRED to CLEAR WINDSHIELD; then PUSH IN

NOTE

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

4.15 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-I3Y1R-1N/N7605K+2 HC-I3Y1R-1N/N7605CK+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.

4.19 ICING INFORMATION

(PIR-AD98-04-26.)

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

Visible rain at temperatures below 0° C ambient air temperature.

Droplets that splash or splatter on impact at temperatures below 0° C 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° C, increased vigilance is warranted at temperatures around freezing with visible moisture present. If the visual cues specified in Section 2.49 or Section 9, Supplement 2 (Section 1) of this POH for identifying severe icing conditions, including Supercooled Large Droplets (SLD) 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.

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TABLE OF CONTENTS

SECTION 5

PERFORMANCE

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SECTION 5

PERFORMANCE

5.1 GENERAL

All of the required (FAA regulations) and supplementary 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 2.

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 5-13, 5-15, 5-17 and 5-19) 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 5-19
**reference Figure 5-43

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 5-25). 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 5-25). 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 5-25

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 5-37). 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 5-37). 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 5-27) 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 versus. Altitude graph (Figure 5-31).

*reference Figure 5-37

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 5-27).

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 5-31 and Page 5-27

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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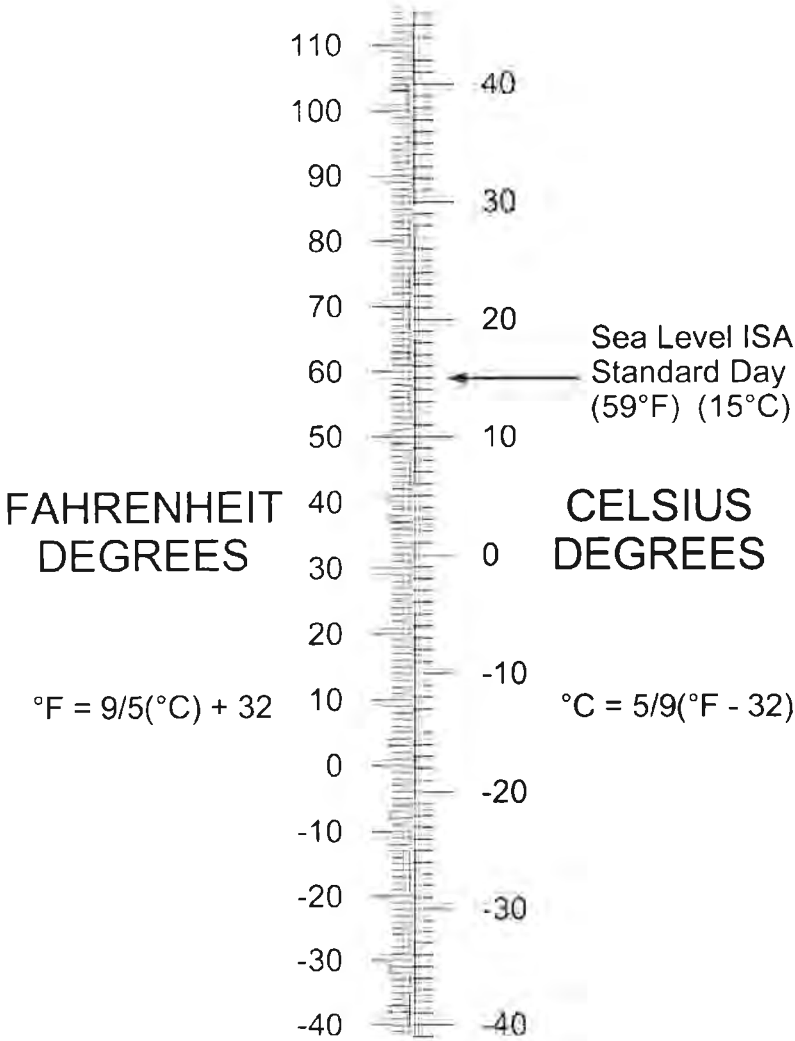
CONVERSION TABLE

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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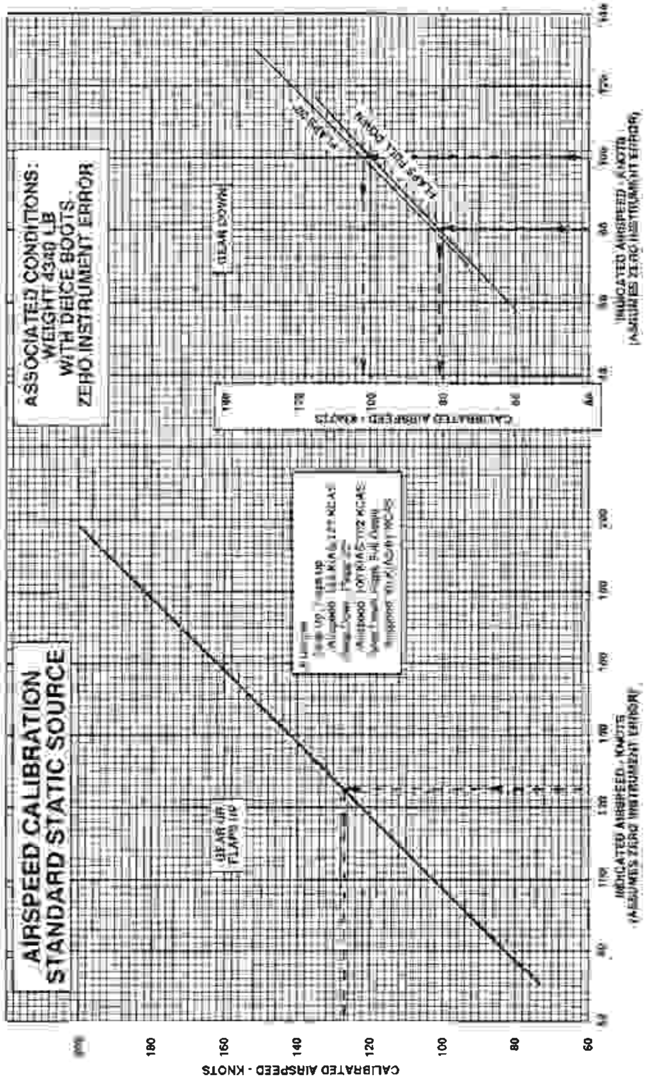
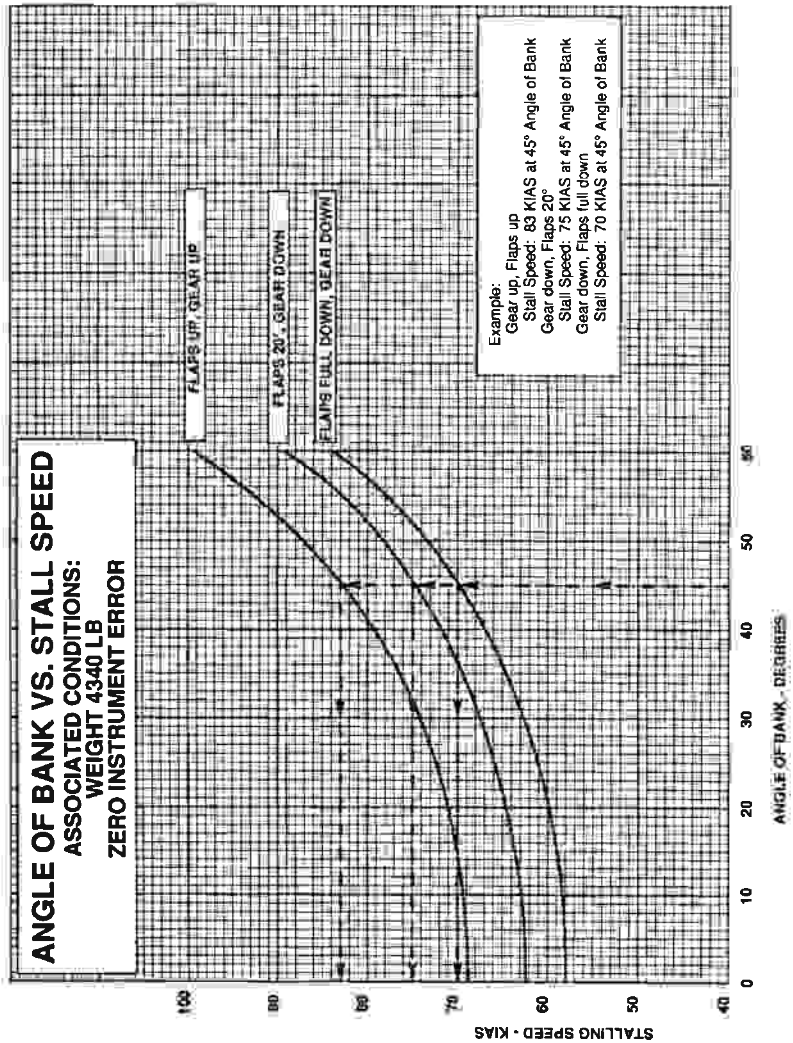
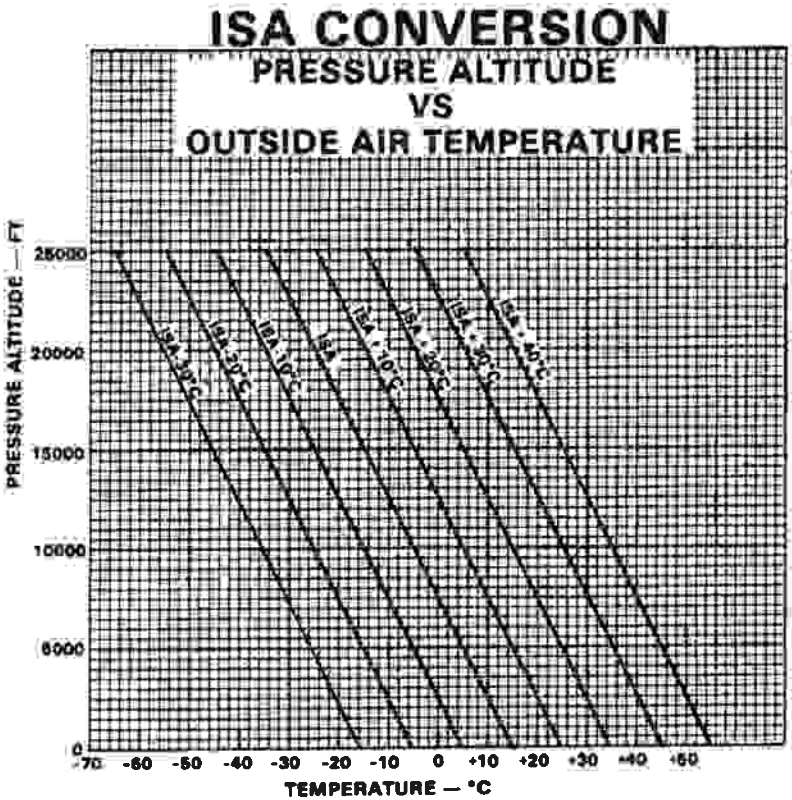


AIRSPEED CALIBRATION
Figure 5-5

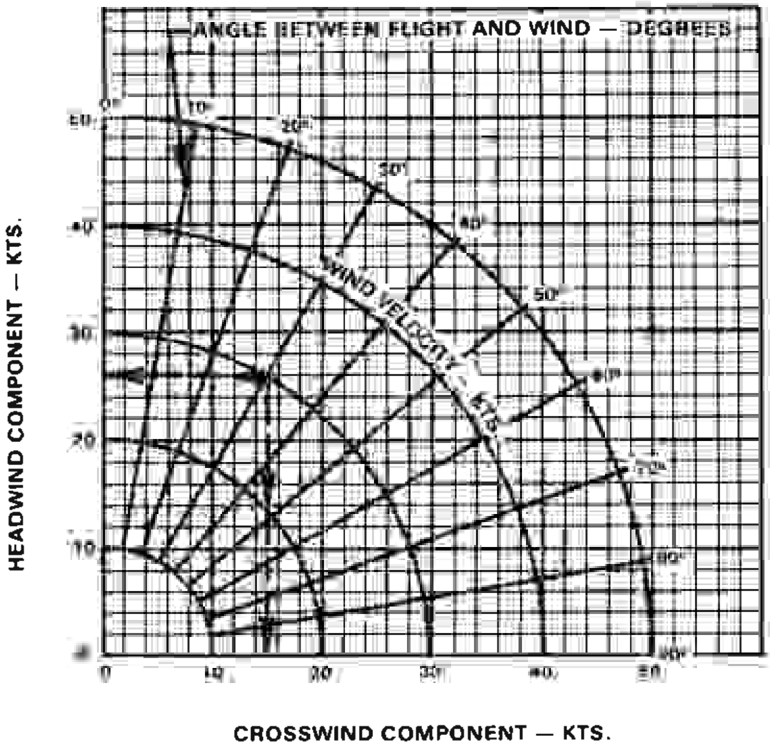


ANGLE OF BANK vs. STALL SPEED
Figure 5-7

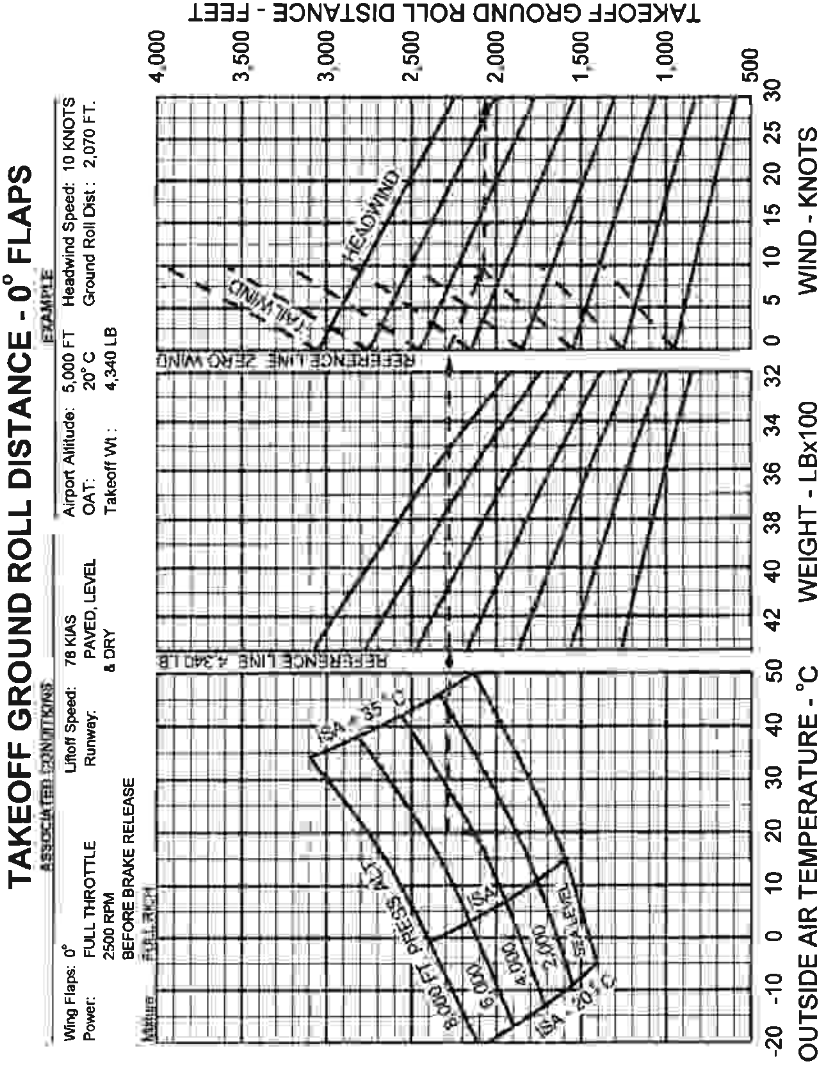


PRESSURE ALTITUDE vs. OUTSIDE AIR TEMPERATURE
Figure 5-9

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



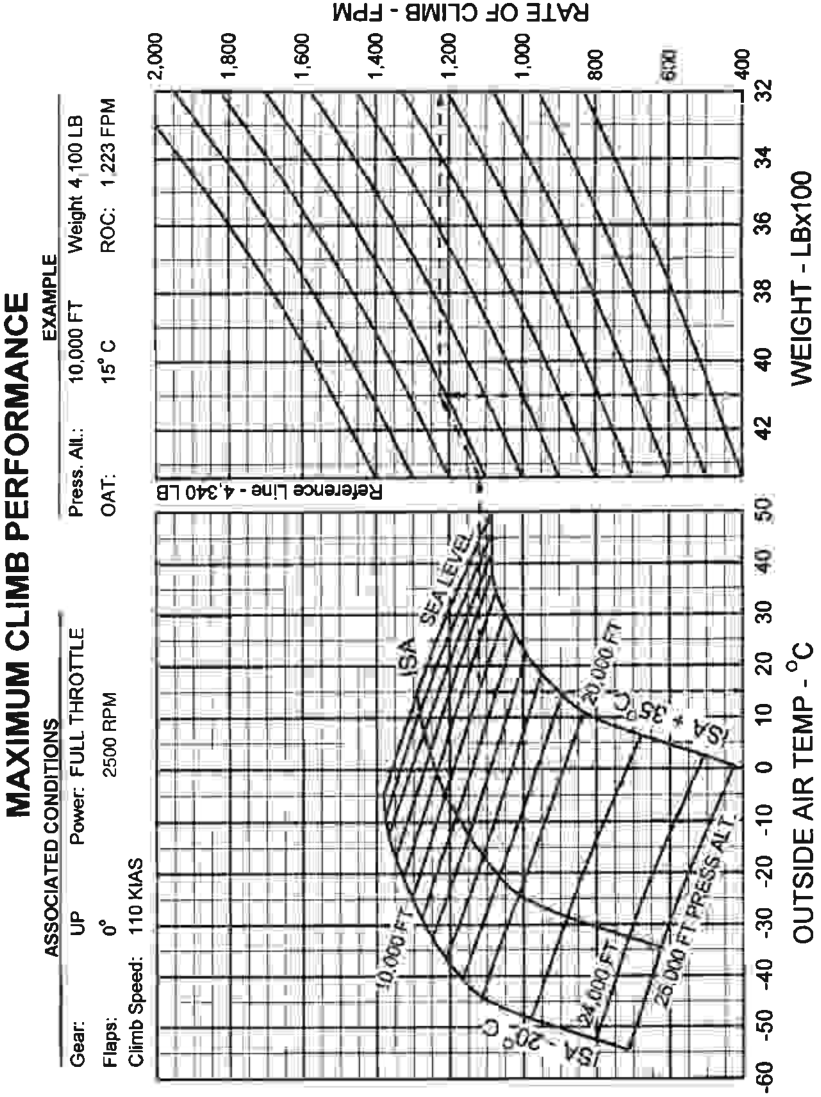
WIND COMPONENTS
Figure 5-11



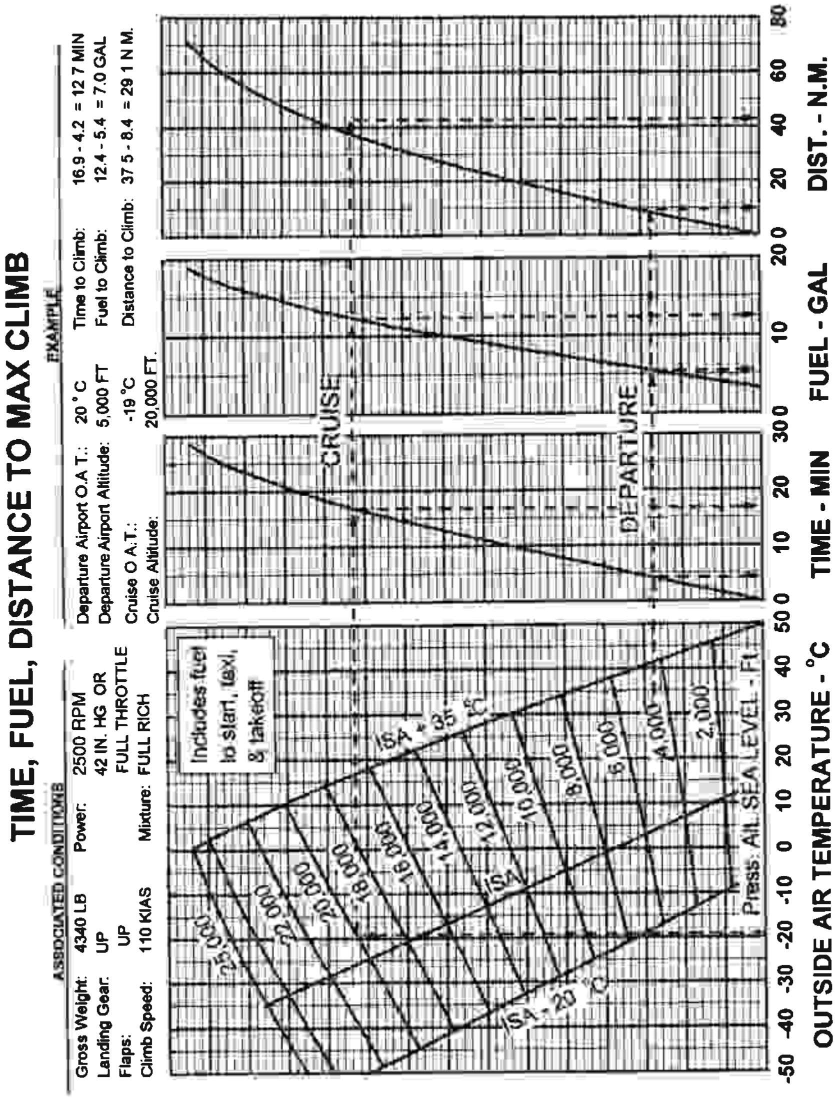
TAKEOFF GROUND ROLL, 0° FLAPS
Figure 5-13

Reserved

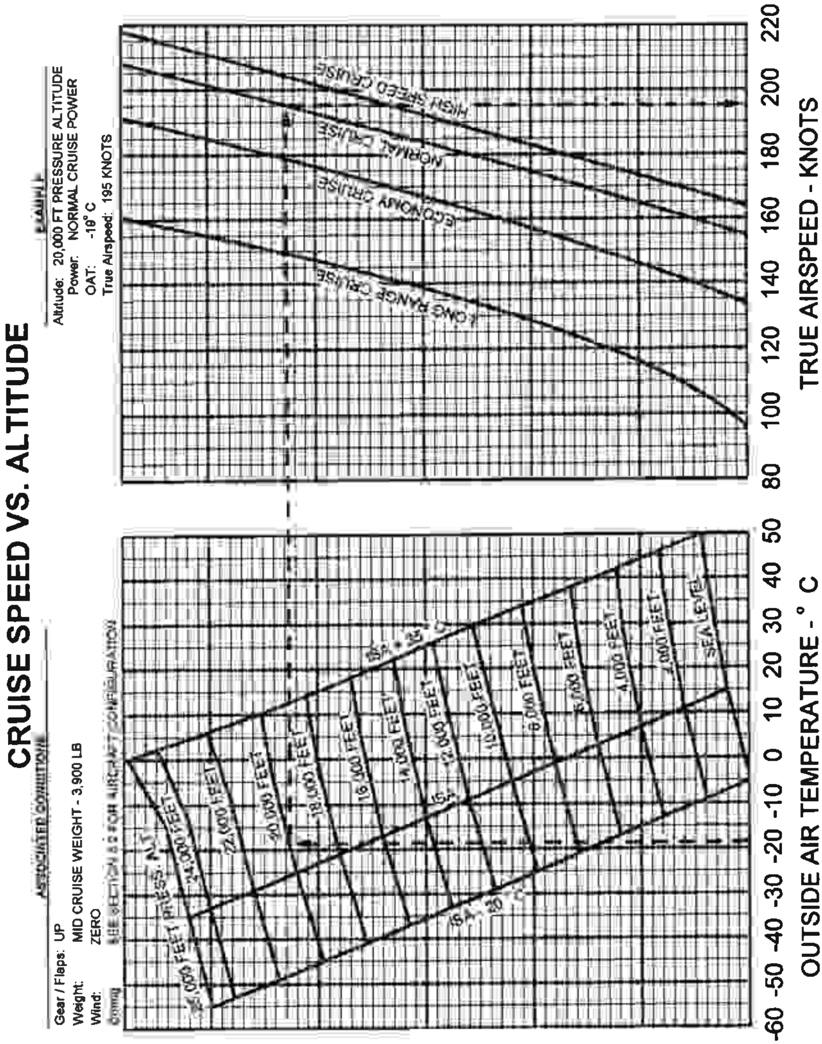
Figure 5-15



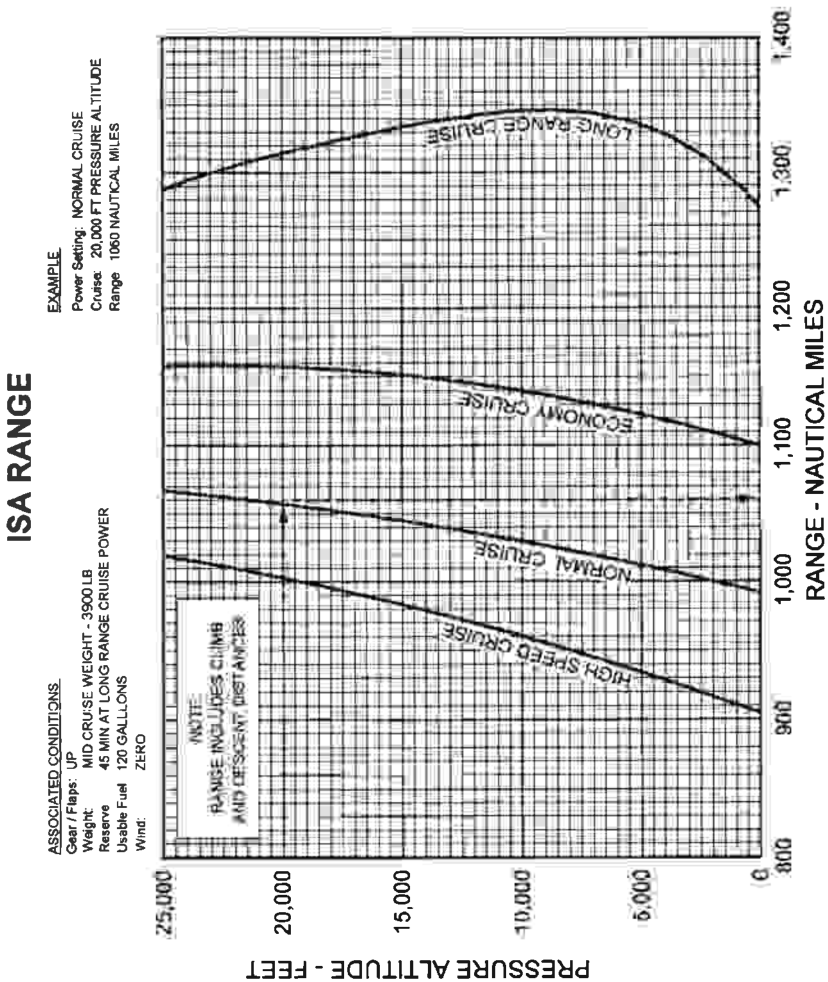
RATE OF CLIMB
Figure 5-21



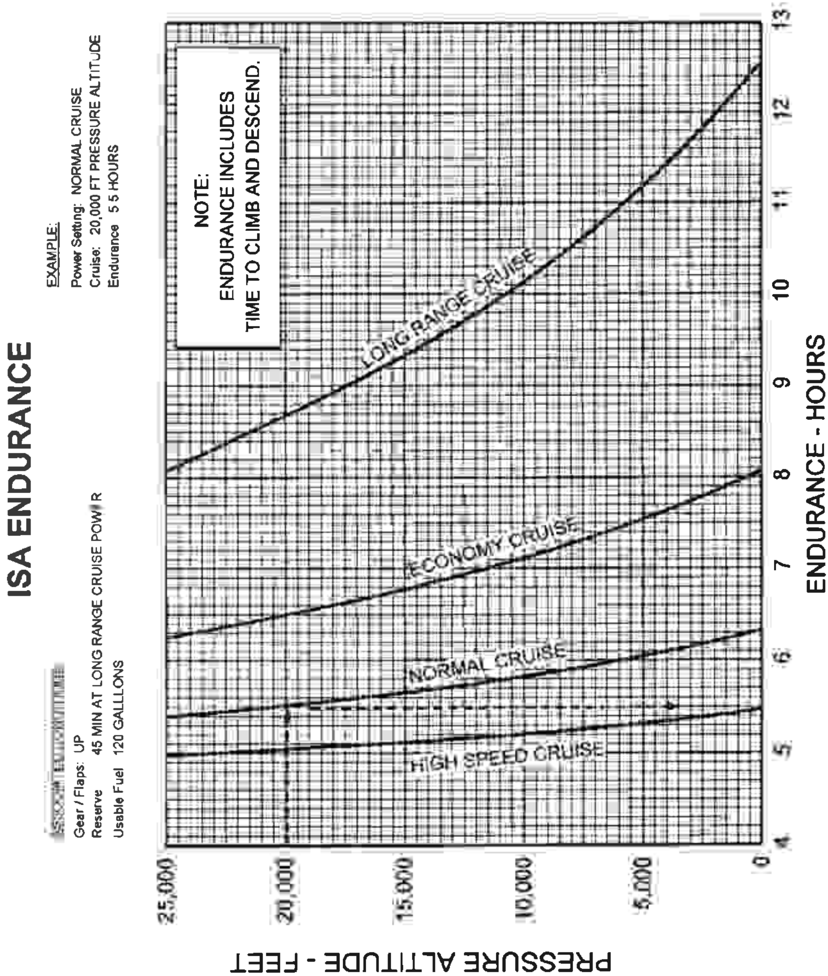
MAXIMUM CONTINUOUS POWER
TIME, FUEL, AND DISTANCE TO CLIMB (110 KIAS)
Figure 5-23



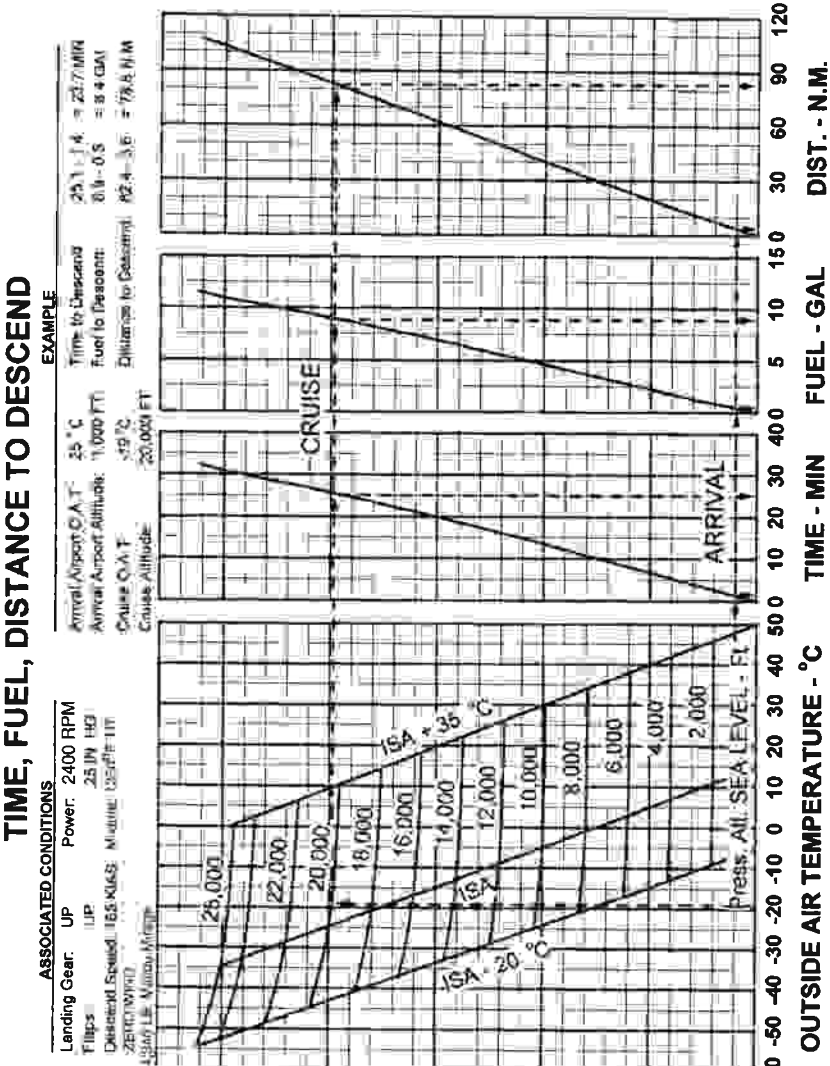
CRUISE SPEED vs. ALTITUDE
Figure 5-31



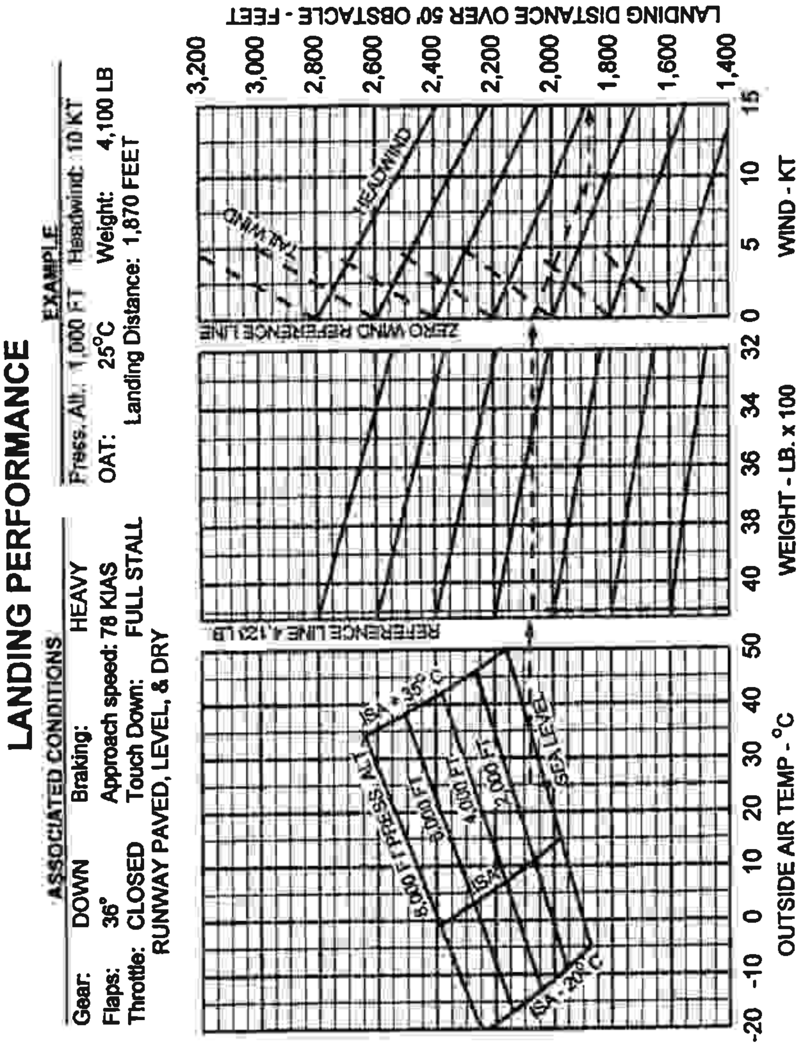
ISA RANGE
Figure 5-33



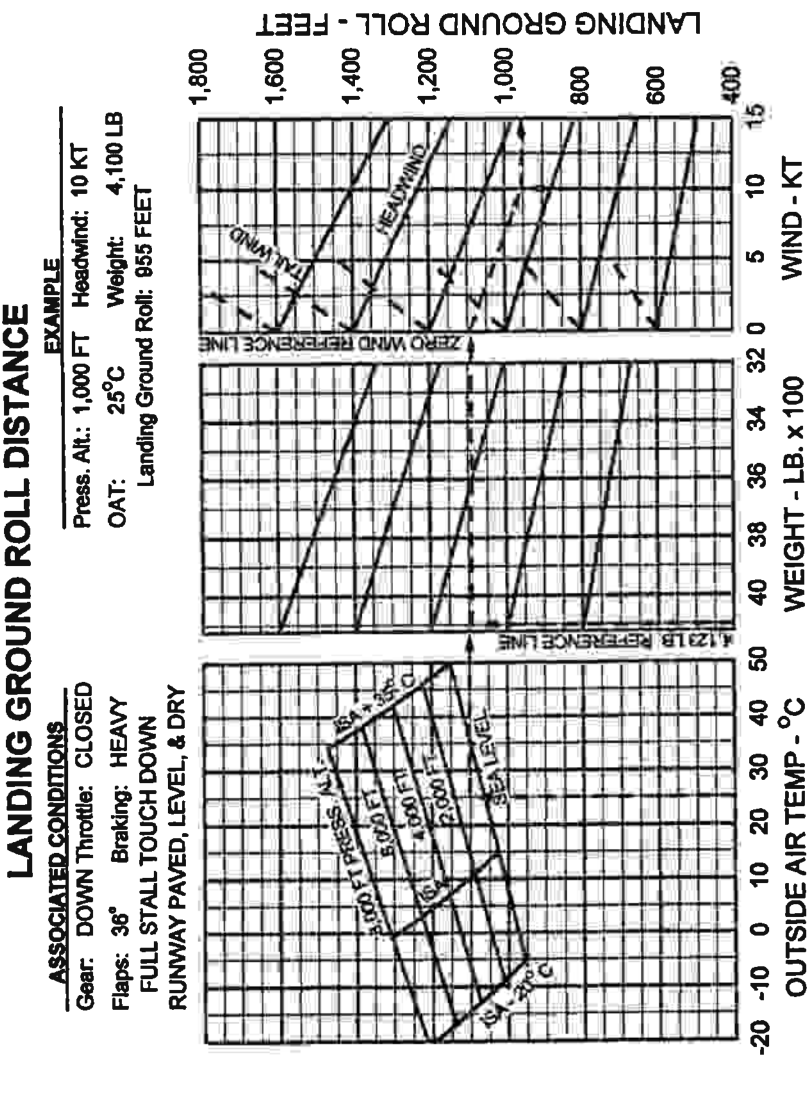
ISA ENDURANCE
Figure 5-35



FUEL, TIME, AND DISTANCE TO DESCEND
Figure 5-37



LANDING DISTANCE OVER 50 FT. OBSTACLE
Figure 5-43



LANDING GROUND ROLL
Figure 5-45

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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 takeoff is attempted.

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 seat in fifth (5th) notch and copilot seat in sixth (6th) 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.

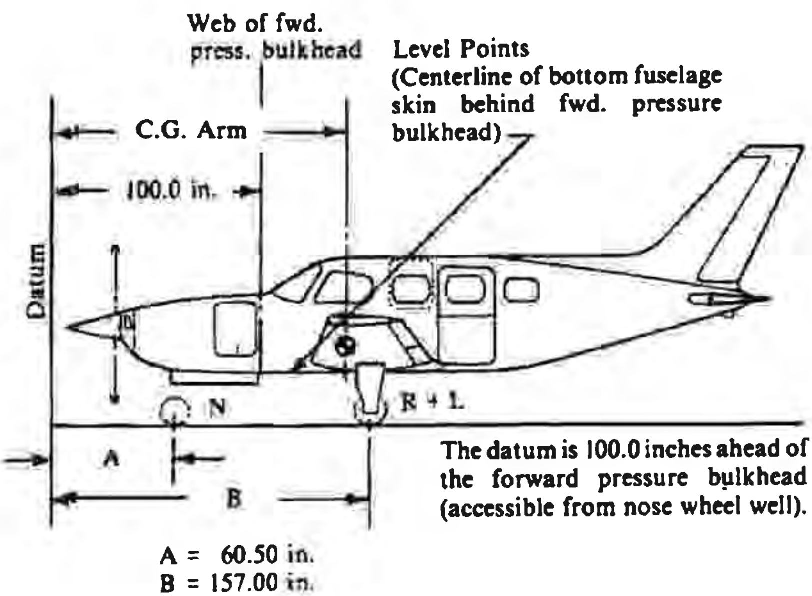
6.3 AIRPLANE WEIGHING PROCEDURE (continued)

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-46-350P

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-46-350P		Serial Number		Registration Number			Page Number	
				Weight Change			Running Basic Empty Weight	
Date	Item No.	Description of Article or Modification	Added (+) Removed (-)	Wt. (Lb.)	Arm (In.)	Moment /100	Wt. (Lb.)	Moment /100
		As licensed						

WEIGHT AND BALANCE RECORD
Figure 6-7

PA-46-350P		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 (Non Folding Seats)*	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

* Aircraft S/N 4636460, 4636463 - 4636502

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	170	135.50	23035
Front Passenger (Folding Seat)*	150	136.70	20505
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	144.03	581373
Fuel (120 Gal./720 Lb Max. Usable)	321.5	150.31	48328
Ramp Weight (4358 Lb Max.)	4358	144.49	629701
Fuel Allowance for Engine Start, Taxi, & Runup (3 Gal./18 Lb Max.)	-18	150.31	-2706
Takeoff Weight (4340 Lb Max.)	4340	144.47	626995

The center of gravity (C.G.) for the takeoff weight of this sample loading problem is at 144.47 inches aft of the datum line. Locate this point (144.47) 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	144.47	626995
Minus Estimated Fuel Burn-off (climb & cruise) @ 6.0 Lb/Gal.	-258.50	150.31	-38855
Landing Weight	4081.50	144.10	588140

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 (continued)

* Aircraft S/N 4636503 & Up

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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 (Non Folding Seats)*		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

* Aircraft S/N 4636460, 4636463 - 4636502

6.9 WEIGHT AND BALANCE DETERMINATION FOR FLIGHT (continued)

	Weight (Lb)	Arm Aft of Datum (Inches)	Moment (In.-Lb)
Basic Empty Weight			
Pilot		135.30	
Front Passenger (Folding Seat)*		136.70	
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 (continued)

* Aircraft S/N 4636503 & Up

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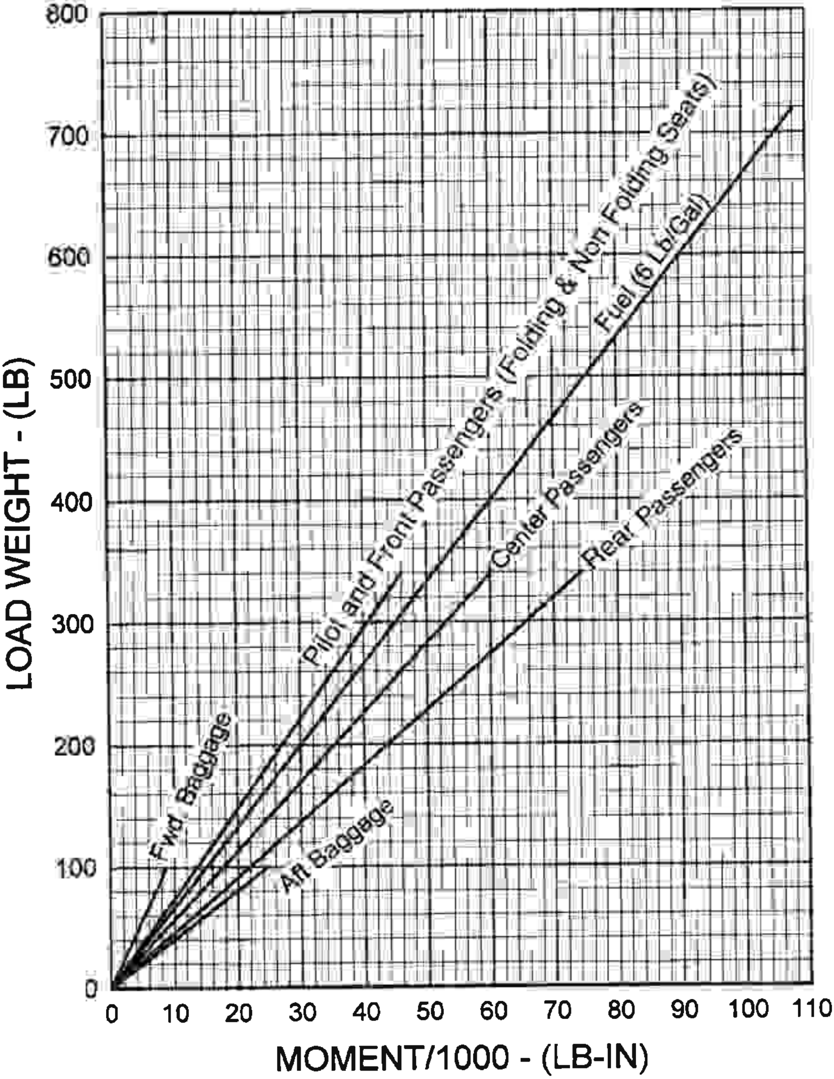
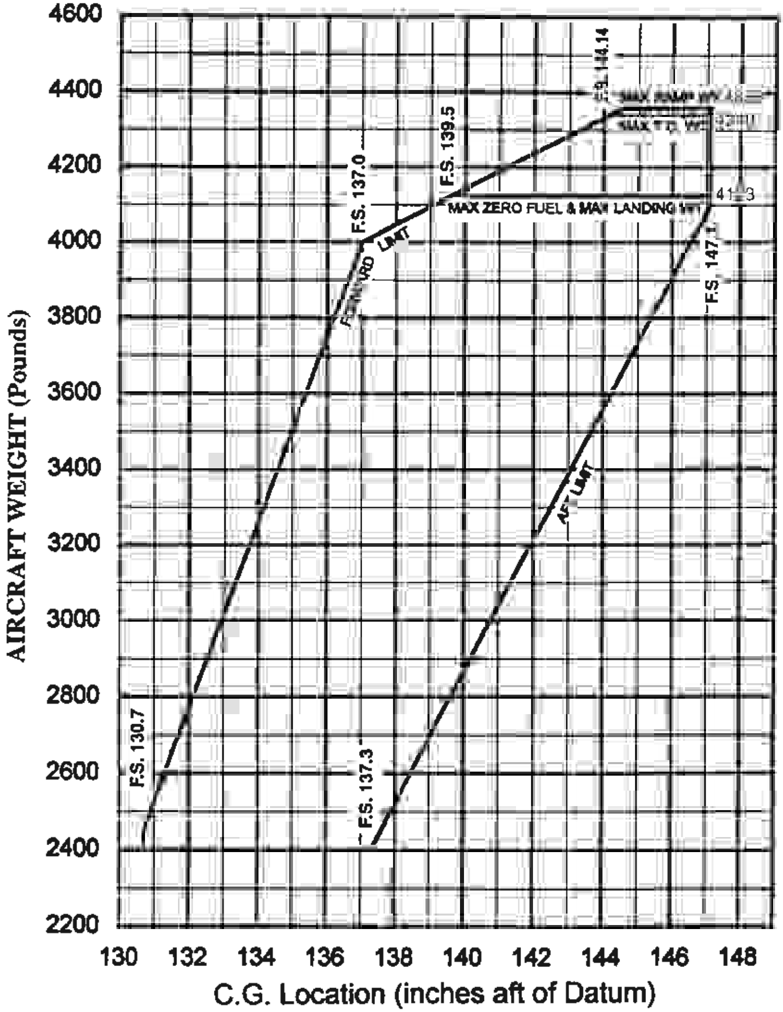


LOADING GRAPH
Figure 6-13



C.G. RANGE AND WEIGHT GRAPH
Figure 6-15

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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-46-350P is a single engine, all metal, retractable landing gear, low wing, turbocharged airplane. It has a pressurized cabin with 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 pressurized cabin section, and the tail cone section. The cabin section is sealed to maintain pressurization.

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, copilot and six passenger side windows.

The forward baggage compartment is unpressurized and has a locking door on the left side, forward of the wing.

7.3 THE AIRFRAME (continued)

The wing is 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.

Retractable tiedown rings are installed on the bottom of each wing outboard of the main landing gear. The rings 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.

Access panels on the fuselage, wings and empennage are removable for service and 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-46-350P 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 and a belt-driven air conditioner compressor.

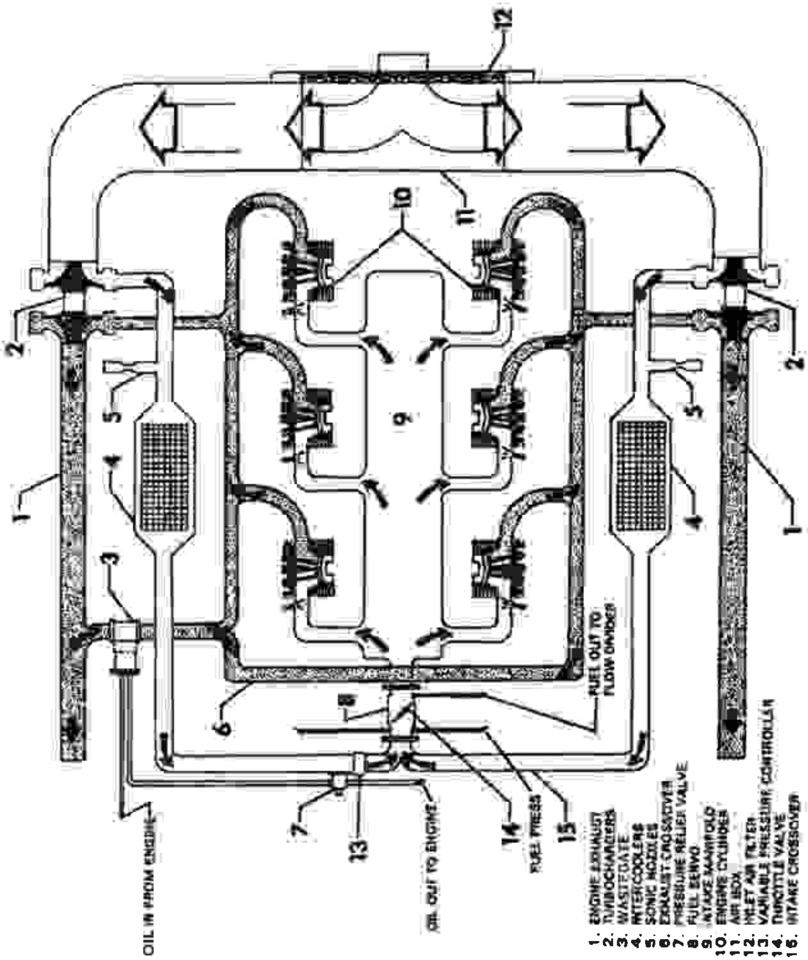
Turbocharging (Figure 7-1) is accomplished by two Garrett - A.I.D. turbo-compressors, one located on each side of the engine. Turbochargers extract energy from engine cylinder exhaust gases and use this energy to compress engine induction air. This allows the engine to maintain rated manifold pressure 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 wastegate valve. The wastegate 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 wastegate 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). Turbocharger compressors supply air for cabin pressurization and power reduction below that recommended could cause a decrease in cabin pressure. Sudden cooling or gradual extreme cooling of engine cylinders will accelerate engine wear. Follow normal descent procedures described in Section 4.

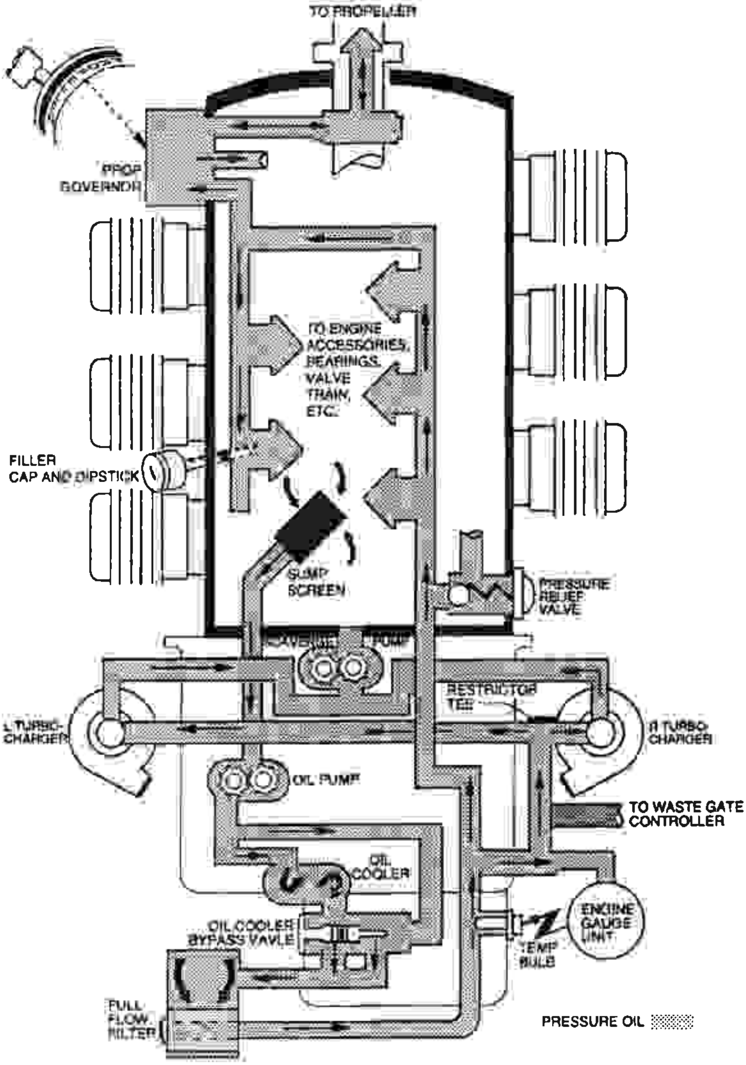
The engine is equipped with a Bendix RSA-10ED1 fuel injection system. An engine-driven fuel pump supplies fuel under pressure to the fuel injection regulator, which measures air flow and meters the correct proportion of fuel to a flow divider. The flow divider then directs the fuel to each of the individual 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 wastegate 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 wastegate 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 PROP RPM control lever in the cockpit.

The PROP RPM 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 on the MFD, 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.

7.7 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.

7.7 AIR INDUCTION SYSTEM (continued)

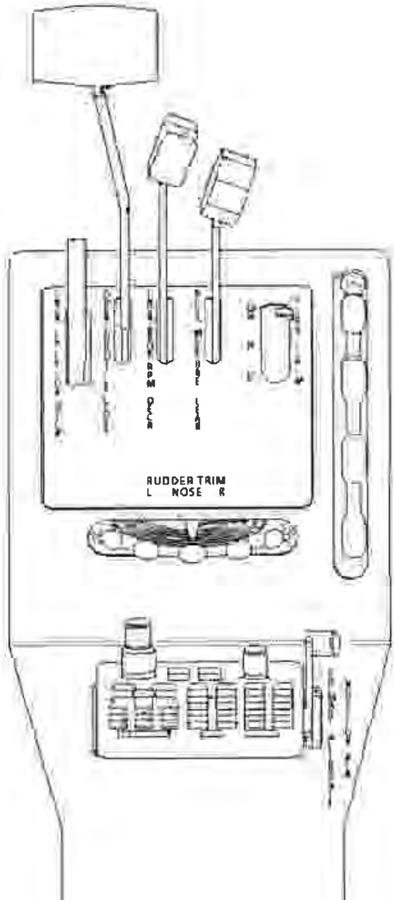
The engine air induction system receives ram air through forward facing ram air louvers located on the lower cowl below the propeller. Air enters these louvers and flows through a removable air filter mounted adjacent to the louvers. The filter removes dust and other foreign matter from the induction 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 the ALTERNATE position to provide air to the engine. This ALTERNATE AIR control is located on the center console just aft of the engine control quadrant and to the right of the keypad. When the INDUCTION AIR lever is forward, or on PRIMARY air, the engine is operating on filtered air drawn through the forward facing ram air louvers. When the lever is aft, 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 continuous 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.

7.9 ENGINE CONTROLS

The engine is controlled by THROTTLE, PROP RPM 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. A pressure switch activates the gear-up aural alert when manifold pressure is reduced to approximately 14 inches of mercury and below. If the landing gear is not locked down, the aural alert 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.

7.9 ENGINE CONTROLS (continued)



CONTROL PEDESTAL
Figure 7-5

7.9 ENGINE CONTROLS (continued)

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, PROP RPM and MIXTURE controls.

The PROP RPM 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 control in the full aft position.

7.11 GARMIN G1000 AVIONICS SYSTEM

NOTE

Refer to the Garmin G1000 Cockpit Reference Guide for the Piper PA-46-350P, Garmin p/n 190-01888-00, latest revision, and the Garmin G1000 Pilot's Guide for the Piper PA-46-350P (Garmin P/N 190-01889-00, latest revision) for complete descriptions of the G1000 system and operating procedures.

The Garmin G1000 Integrated Avionics System consists of dual Primary Flight Displays (PFD), a Multi-Function Display (MFD), an Audio Panel, dual Attitude and Heading Reference Systems (AHRS), dual Air Data Computers (ADC), and the sensors and computers to process flight and engine information for display to the pilot. The system contains dual GPS WAAS receivers, dual VOR/ILS receivers, dual VHF communications transceivers, dual transponders, and an integrated crew alerting system (CAS) to alert the pilot of status annunciations, caution annunciations and warning annunciations. The G1000 system provides system messages which alert the pilot to abnormalities associated with the G1000 system. The G1000 system also has a terrain proximity system, Traffic Information Service (TIS) and FliteCharts. Optional avionics equipment include DME, Class B TAWS, Traffic Advisory System (TAS), Stormscope, Jeppesen ChartView, weather radar, Synthetic Vision, AOPA Facilities Directory, Iridium Worldwide Weather Services, Iridium Voice Calls and SMS Text, the Garmin Datalink (GDL) for XM weather and music, and ADF provisions.

Primary Flight Display

The Primary Flight Display (PFD) typically displays airspeed, attitude, altitude, and heading information in a traditional format. Slip information is shown as a trapezoid under the bank pointer. One width of the trapezoid is equal to a one ball width slip. Rate of turn information is shown on the scale above the rotating compass card; a standard rate turn is accomplished when the turn rate trend vector stops at the second tick mark (standard rate tick mark). OAT information is presented in the lower left corner of the PFD. The measured value of OAT is adjusted for probe recovery factor and ram air effects to indicate static air temperature.

The primary function of the PFD's is to provide attitude and heading data from the Attitude and Heading Reference System, air data from the Air Data Computer, and navigation and alerting information. The PFDs may also be used for flight planning.

Primary Flight Display (continued)

The following controls are available on the PFD (clockwise from top right):

- Communications frequency volume and squelch knob
- Communications frequency set knobs
- Communications frequency transfer button
- Altimeter setting knob (BARO)
- Course knob
- Map range knob and cursor control
- FMS control buttons and knob
- PFD softkey buttons, including master warning/caution acknowledgement
- Altitude reference set knob
- Heading bug control
- Navigation frequency transfer button
- Navigation frequency set knobs
- Navigation frequency volume and Identifier knob

The primary function of the VHF Communication portion of the G1000 is to enable external radio communication. The primary function of the VOR/ILS Receiver portion of the equipment is to receive VOR, Localizer, and Glide Slope signals. The primary function of the GPS portion of the system is to acquire signals from the GPS and WAAS satellites and process this information in real-time to obtain the user's position, velocity, and time. This GPS WAAS is certified under TSO C146a and therefore is qualified as a primary navigation system. The PFD also displays all autopilot annunciations, including mode annunciations at the top, center of the display and system and preflight test status annunciations near the top of the altitude tape.

Attitude and Heading Reference System (AHRS)

The AHRS uses GPS, rate sensors, air data, and magnetic variation to provide pitch and roll attitude, sideslip and heading to the display system. The AHRS incorporates internal monitors to determine validity of its parameters. If a parameter is suspect but still within tolerance of the internal monitors, the appropriate MISCOMPARE annunciation will be posted and the pilot, considering similar parameters for comparison, must determine the suspect parameter. If the parameter is determined invalid by the internal monitors, a red-X is displayed over the invalid parameter and a NO COMPARE annunciation is posted. If the entire AHRS becomes invalid while in flight, the G1000 system will automatically select the other AHRS, as indicated by a

Primary Flight Display (continued)

Attitude and Heading Reference System (AHRS) (Continued)

BOTH ON AHRS1 or BOTH ON AHRS2 annunciation, depending on which AHRS is functioning, and post the appropriate NO COMPARE annunciations. In this situation, the autopilot will become inoperative. If the AHRS becomes valid again, the pilot must manually re-select that AHRS if desired. Selection of which AHRS should be used or is being used is made via the SENSOR softkey on the PFD. If both AHRS become invalid, a red-X and amber ATTITUDE FAIL will be displayed on the attitude indicator and a red-X and amber HDG will be displayed on the heading display. The course pointer on the HSI will indicate straight up and the course may be set using the digital window.The AHRS will align while the aircraft is in motion, but will align quicker if the wings are kept level during the alignment process.

Air Data Computer (ADC)

The ADC provides airspeed, altitude, vertical speed, and air temperature to the display system. In addition to the primary displays, this information is used by the FMS and Traffic systems.

The ADC incorporates internal monitors to determine validity of its parameters. If a parameter is suspect but still within tolerance of the internal monitors, the appropriate MISCOMPARE annunciation will be posted and the pilot, considering similar parameters for comparison, must determine the suspect parameter. If the parameter is determined invalid by the internal monitors, a red-X is displayed over the invalid parameter and a NO COMPARE annunciation is posted. If the entire ADC becomes invalid while in flight, the G1000 system will automatically select the other ADC, as indicated by a BOTH ON ADC1 or BOTH ON ADC2 annunciation, depending on which ADC is functioning, and post the appropriate NO COMPARE annunciations. If the ADC becomes valid again, the pilot must manually re-select that ADC if desired via the SENSOR softkey on the PFD. If both ADC's become invalid, a red-X and amber AIRSPEED FAIL, ALTITUDE FAIL and VERTICAL SPEED FAIL will be displayed on the appropriate display.

Primary Flight Display (continued)

Crew Alerting System (CAS) Messages

The Crew Alerting System (CAS) consists of a Master Warning and Caution softkey on the lower right side of the PFD operating in conjunction with CAS text messages. CAS text messages appear in the lower right area of the PFD during normal and reversionary mode operations. CAS messages are posted in order of priority with warnings appearing above cautions and cautions appearing above advisories. The CAS message window is capable of displaying a total of 12 CAS messages in both normal and reversionary display modes. Should the total CAS message count exceed 12, the oldest of the lowest priority messages can only be seen by scrolling through the list. Scrolling through caution and advisory CAS messages is possible via the CAS ↑ or CAS ↓ softkeys. Warning CAS messages are not scrollable. The severity of CAS messages is categorized as Warning, Caution and Advisory as follows:

Red Warning Messages

Warning messages consist of a flashing red Master WARNING softkey and a flashing (inversely red on white) CAS Warning text message located in the lower right area of the PFD. Warnings are accompanied by a continuous triple chime, which can be silenced by pressing (acknowledging) the Master WARNING softkey on the PFD. When acknowledged, the Master WARNING softkey will extinguish, the CAS Warning text message will stop flashing and will revert to normal (red on black) annunciation, and the aural chime will silence. CAS Warning text messages will persist until the initiating condition is removed. If the warning was initiated by an engine parameter, that parameter's indication will continue to flash until the condition is removed.

Primary Flight Display (continued)

Crew Alerting System (CAS) Messages (continued)

Amber Caution Messages

Caution messages consist of a flashing amber Master CAUTION softkey, and a flashing (inversely black on amber) CAS Caution text message located in the lower right area of the PFD. Cautions are accompanied by a double chime. Caution messages can be acknowledged by pressing the Master CAUTION softkey on the PFD. When acknowledged, the Master CAUTION softkey will extinguish and the CAS Caution text message will revert to a normal (amber on black) annunciation. CAS Caution text messages will persist until the initiating condition is removed.

White Advisory Messages

Advisory messages consist of a white text message located in the lower right area of the PFD. Advisory messages are accompanied by a single chime when the chime is not a nuisance. Advisory messages are not acknowledgeable. CAS Advisory Messages persist until the initiating condition is removed.

Reversionary Mode

The PFDs will automatically be displayed in a composite format (Reversionary mode) for emergency use if the MFD display fails. The DISPLAY BACKUP button on the instrument panel should also be pressed. In the composite mode, the PFD will display the engine parameters typically reserved for the MFD, but only limited map functions are available via the inset map.

Multi-Function Display

The Multi-Function Display (MFD) is the primary display for engine parameters, map information (including dedicated map pages for navigation, traffic, weather radar, stormscope, weather datalink and TAWS), waypoint information, nearest functions, charts, flight plan information, and approach procedures and the Crew Alerting System (CAS).

Multi-Function Display (continued)

Crew Alerting System (CAS) Messages (continued)

NOTE

Depending on system software version and optional systems installed, not all annunciator system (CAS and Non-CAS) messages listed in this handbook are applicable.

Reversionary Mode

Should the PFD in front of the pilot become inoperative, the MFD can be selected into reversionary mode by pressing either of the DISPLAY BACKUP buttons on the instrument panel. The MFD will then show typical PFD information, including the pilot selectable data fields, autopilot annunciations, transponder information, CAS messages and G1000 system messages. Information retained from the MFD will also be available, including engine parameters, flight planning information with DTK and DIS fields, and an inset map with all features except radar.

Multi-Function Display (continued)

Traffic Information Service (TIS)

NOTE

If the G1000 system is configured to use the optional Traffic Advisory System (TAS), TIS will not be available for use.

Traffic Information Service (TIS) provides a graphic display of traffic advisory information to the pilot. The G1000 system performs an automatic test of the TIS system upon power-up. If the TIS power-up test is passed, it will enter STANDBY mode while on the ground. If the TIS power-up test is failed, a failure annunciation will be indicated in the center of the Traffic Map page. The traffic mode of operation is indicated in the upper-left corner of the Traffic Map page. The TIS will automatically switch to OPERATING mode once the aircraft is airborne and provide a voice or tone audio output and a graphic display of traffic.

TIS uses the Mode S transponder for the traffic data link and is available only when the aircraft is within the service volume of a TIS-capable, ground based, terminal radar site. Updates are available to the pilot in 5-second intervals. Aircraft without a transponder are invisible to TIS and aircraft without altitude reporting capability are shown without altitude separation data or climb/descent indication.

Multi-Function Display (continued)

Traffic Information Service (TIS) (continued)

Traffic Map Page

The Traffic Map page, located in the Map Group on the MFD, is selectable from 2 nm to 12 nm. The G1000 system can display up to eight traffic targets within a 7.5 nm radius, from 3000 feet below to 3500 feet above the requesting aircraft. The altitude difference between the requesting aircraft and other aircraft is displayed above/below the traffic symbol in hundreds of feet. If the traffic target is above the requesting aircraft, the altitude separation text appears above the traffic symbol; if below, the altitude separation text appears below the traffic symbol. An altitude trend up/down arrow is displayed to the right of the traffic target symbol when the relative climb or descent speeds are greater than 500 ft/min in either direction. TIS also provides a vector line showing the direction in which the traffic is moving, to the nearest 45°.

Traffic is overlaid on the following pages:

* Navigation Map Page
* Traffic Map Page
* Trip Planning Page
* Nearest Pages
* Active Flight Plan Page
* PFD Inset Map

TIS Alerts

Traffic is displayed according to TCAS symbology using four different symbols:

1. Non-Threat Traffic – An open white diamond with black center that indicates traffic is beyond a 5 nm range and greater than ±1200 feet from the requesting aircraft.
2. Traffic Advisory (TA) – A solid yellow circle that indicates that traffic has met the criteria for a traffic advisory and is considered to be potentially hazardous. A yellow TRAFFIC annunciation is displayed at the top left of the attitude indicator on the PFD and an alert is heard in the cockpit, advising "Traffic".

Multi-Function Display (continued)

Traffic Information Service (TIS) (continued)

TIS Alerts (continued)

3. Traffic Advisory Off Scale - On the Traffic Map page a half TA symbol indicating a traffic advisory (TA), which is detected but is outside the range of the map will be displayed at the edge of the scale on the azimuth of the detected traffic. On the map page the off-scale traffic advisory is provided in a text box located on the lower left corner of the map.

Traffic information for which TIS is unable to determine the bearing (non-bearing traffic) is displayed in the center of the Traffic Map Page or in a banner at the lower left corner of map pages other than the Traffic Map Page on which traffic can be displayed.

TIS customization options are available to the pilot by depressing the MENU key while on the Navigation Map Page, and then selecting "Map Setup" then "Traffic" Group. TIS traffic may also be displayed on the Navigation Map page by selecting the MAP softkey and then selecting the TRAFFIC softkey.

Multi-Function Display (continued)

Traffic Advisory System (TAS) – Optional

NOTE

If the G1000 system is configured to use the optional Traffic Advisory System (TAS), TIS will not be available for use.

The optional Garmin GTS 825 is a Traffic Advisory System (TAS) which uses an on-board processor and antennas to detect and track other aircraft, and is independent of ground based terminal radar. It enhances flight crew situational awareness by displaying traffic information from transponder-equipped aircraft. The system also provides visual and aural traffic alerts including voice announcements to assist in visually acquiring traffic.

The GTS 825 provides a system test mode to verify the TAS system is operating normally. The test takes ten seconds to complete. When the system test is initiated, a test pattern of traffic symbols appears on the Traffic Map Page. If the system test passes, the system announces, "TAS System Test Passed" otherwise the system announces, "TAS System Test Failed." When the system test is complete, the traffic system enters Standby Mode.

After power-up, the GTS 825 automatically enters STANDBY Mode and no traffic depictions or alerts will be given. The GTS 825 must be in OPERATE Mode for traffic to be displayed and for TA's to be issued. The pilot can manually change the system between STANDBY mode and OPERATE mode at any time via softkeys on the Traffic Map page. If the pilot does not manually select a mode of operation, the system will automatically transition from STANDBY to OPERATE 8-seconds after becoming airborne and transition from OPERATE to STANDBY 24-seconds after landing. TAS aural alerts will be muted during all gear down operations.

Traffic Map Page

The Traffic Map page, located in the Map Group on the MFD, is selectable from 2 nm to 12 nm. The GTS 825 is capable of tracking up to 45 intruding aircraft equipped with Mode A or C transponders, and up to 30 intruding aircraft equipped with Mode S transponders. A maximum of 30 aircraft with the highest threat potential can be displayed simultaneously over a range of 2 nm to 12 nm at altitudes of 10,000 feet below to 10,000 feet above the requesting aircraft. No TAS surveillance is provided for aircraft without operating transponders. The altitude difference between the requesting aircraft and other aircraft is displayed above/below the traffic symbol in hundreds of feet. If the traffic target is above the requesting aircraft, the altitude separation text is preceded by a "+" symbol and appears above the

Multi-Function Display (continued)

Traffic Advisory System (TAS) – Optional (continued)

Traffic Map Page (Continued)

traffic symbol; if below, the altitude separation text is preceded by a "-" symbol and appears below the traffic symbol. An altitude trend up/down arrow is displayed to the right of the traffic target symbol when the relative climb or descent speeds are greater than 500 ft/min in either direction.

Traffic is overlaid on the following pages:

- Navigation Map Page
- Traffic Map Page
- Trip Planning Page
- Nearest Pages
- Active Flight Plan Page
- PFD Inset Map
- PFD Forward Looking Depiction Area (when SVS is selected ON)

TAS Alerts:

Traffic is displayed according to TCAS symbology using four different symbols.

1. Non-Threat Traffic – An open white diamond with black center that indicates traffic is beyond a 6 nm range and greater than ±1200 feet from the requesting aircraft.
2. Proximity Advisory (PA) - A solid white diamond indicating that the intruding aircraft is within ± 1,200 feet and 6 nm range, but is still not considered a TA threat.
3. Traffic Advisory (TA) – A solid yellow circle that indicates that traffic has met the criteria for a traffic advisory and is considered to be potentially hazardous. A yellow TRAFFIC annunciation is displayed at the top left of the attitude indicator on the PFD and an alert is heard in the cockpit, advising "Traffic", along with additional voice information about the bearing, relative altitude, and approximate distance from the intruder that triggered the TA. For example, the voice alert "Traffic, 11 o'clock, high, three miles" would indicate that the traffic is in front of and slightly to the left of the own aircraft, above own altitude, and approximately three nautical miles away. A TA will be displayed for a minimum of 8 seconds, even if the condition(s) that triggered the TA are no longer present.

Multi-Function Display (continued)

Traffic Advisory System (TAS) – Optional (continued)

TAS Alerts: (Continued)

4. Traffic Advisory Off Scale – On the Traffic Map page a half TA symbol indicating a traffic advisory (TA), which is detected but is outside the range of the map will be displayed at the edge of the scale on the azimuth of the detected traffic. On the map page the off-scale traffic advisory is provided in a text box located on the lower left corner of the map.

Traffic information for which TAS is unable to determine the bearing (non-bearing traffic) is displayed in the center of the Traffic Map Page or in a banner at the lower left corner of maps other than the Traffic Map Page on which traffic can be displayed.

TAS customization options are available to the pilot by depressing the MENU key while on the Navigation Map Page, and then selecting "Map Setup" then "Traffic" Group. TAS traffic may also be displayed on the Navigation Map by selecting the MAP softkey and then selecting TRAFFIC softkey.

Terrain Proximity

NOTE

If the G1000 system is configured to use the optional Terrain Awareness and Warning System (TAWS), Terrain Proximity will not be available for use.

G1000 Terrain Proximity is a terrain awareness system that increases situational awareness and aids in preventing controlled flight into terrain (CFIT). It is similar to the Terrain Awareness and Warning System (TAWS) but does not comply with TSO-C151b certification standards. Terrain Proximity does not provide warning annunciations or voice alerts but it does provide color indications on map displays when terrain and obstacles are within a certain altitude threshold from the aircraft. Although the terrain and obstacle color map displays are the same, TAWS uses a more extensive database and more sophisticated algorithms to assess aircraft distance from terrain and obstacles. The terrain and obstacles database may not contain all obstructions, so the information provided should be used as an aid to situational awareness and should never be used to navigate or maneuver around terrain.

Multi-Function Display (continued)

Terrain Proximity (continued)

GPS altitude, which is derived from satellite position and therefore may differ from baro-corrected altitude read from the altimeter, is converted to mean sea level (MSL)-based altitude (GPS-MSL altitude) and is used in conjunction with GPS position to calculate and predict the aircraft's flight path in relation to the surrounding terrain and obstacles, whose altitudes are also referenced to MSL.

System Status:

Terrain Proximity requires the following components to operate properly:

* valid 3-D GPS position
* valid terrain/obstacle database

If Terrain Proximity does not have a valid 3-D GPS position a yellow "No GPS Position" text will be displayed at the center of the Terrain Proximity Page and on the PFD inset map if terrain is selected. If there is not a valid terrain/obstacle database, the system will not display the yellow and red colors associated with the offending obstacles and terrain.

Operation of Terrain Proximity:

Terrain is displayed on the following pages:

* Navigation Map Page
* Terrain Proximity Page
* Trip Planning Page
* Flight Plan Page
* PFD Inset Map

To display terrain data on maps other than the Terrain Proximity page, select the MAP softkey (select INSET softkey for the PFD inset map) on the Navigation Map Page and then select the TERRAIN softkey. When Terrain Proximity is selected on maps other than the Terrain Proximity Page, an icon to indicate the feature is enabled for display and a legend for Terrain Proximity colors are shown.

Terrain customization options are available by pressing the MENU key while on the Navigation Map Page, and then selecting "Map Setup" then "Map" group. Options selected on the Navigation Map page will be used on other map pages (less the Terrain Proximity Page itself) that display terrain information. Additional information about obstacles can be

Multi-Function Display (continued)

Terrain Proximity (continued)

displayed by panning over the display on the map. The panning feature is enabled by depressing the RANGE knob on the keypad then pushing the knob in the desired direction until it is over the obstacle of interest. There is no inhibit function associated with Terrain Proximity, as there are no aural or visual alerts to inhibit.

Terrain Proximity Page:

The Terrain Proximity Page is specialized to show terrain and obstacle data in relation to the aircraft's current altitude, without clutter from the basemap. Aviation data (airports, VORs, and other NAVAIDs) can be displayed for reference.

Aircraft orientation on this map is always heading up unless there is no valid heading. Two views are available relative to the position of the aircraft: the 360° default display and the radar-like ARC (120°) display. Map range is adjustable with the RANGE Knob from 1 to 200 nm, as indicated by the map range rings (or arcs).

Operation of Terrain Proximity:

The Terrain Proximity Page is located in the Map Page Group on the MFD.

On all pages that display terrain data, obstacles and terrain are depicted with the following colors:

* Red - above or within 100 feet below the aircraft altitude.
* Yellow - between 100 feet and 1000 feet below the aircraft altitude.
* Black - more than 1000 feet below the aircraft altitude.

Terrain Proximity Alerts:

Terrain Proximity does not provide warning annunciations or voice alerts associated with obstacles or terrain.

Multi-Function Display (continued)

Terrain Awareness and Warning System (TAWS) – Optional

NOTE

If the G1000 system is configured to use the optional Terrain Awareness and Warning System (TAWS), Terrain Proximity will not be available for use.

The Terrain Awareness and Warning System (TAWS) is an optional feature used to increase situational awareness and aid in reducing controlled flight into terrain (CFIT). TAWS provides visual and aural cautions and warning alerts when terrain and obstacles are within a given altitude threshold from the aircraft. The displayed alerts and warnings are advisory in nature only. TAWS satisfies TSO-C151b Class B certification requirements whereas the more limited Terrain Proximity does not.

TAWS uses terrain and obstacle information supplied by government sources. Terrain information is based on terrain elevation information in a database that may contain inaccuracies. Individual obstructions may be shown if available in the database. The data undergoes verification by Garmin to confirm accuracy of the content, per TSO-C151b standards, however, the displayed information should never be understood as being all-inclusive and data may be inaccurate.

GPS altitude, which is derived from satellite position and therefore may differ from baro-corrected altitude read from the altimeter, is converted to mean sea level (MSL)-based altitude (GPS-MSL altitude) and is used in conjunction with GPS position to calculate and predict the aircraft's flight path in relation to the surrounding terrain and obstacles, whose altitudes are also referenced to MSL.

System Status:

During G1000 power-up, TAWS conducts a self-test of its aural and visual annunciations. The system test can also be manually initiated by selecting the TAWS Page then depress the MENU key, then select the "Test TAWS" option. An aural alert "TAWS System Test OK" or "TAWS System Failure" is issued at test completion, regardless of whether the test was initiated automatically or manually. TAWS System Testing is disabled when ground speed exceeds 30 knots.

TAWS requires the following to operate properly:

* A valid terrain/obstacle/airport terrain database
* A valid 3-D GPS position solution

Multi-Function Display (continued)

Terrain Awareness and Warning System (TAWS) – Optional (continued)

System Status (continued)

If a valid 3-D GPS position solution and vertical accuracy requirements are not attained or the aircraft is out of the database coverage area, a TAWS N/A annunciation will appear on the TAWS Page and the aural annunciation "TAWS Not Available" is heard. When the GPS signal is re-established and the aircraft is within the database coverage area, the aural message "TAWS Available" is heard.

Operation of TAWS:

Terrain is displayed on the following pages:

* Navigation Map Page
* TAWS Page
* Trip Planning Page
* Flight Plan Page
* PFD Inset Map

To display terrain data on maps other than the TAWS Page, select the MAP softkey (select INSET softkey for the PFD inset map) on the Navigation Map Page and then select the TERRAIN softkey. When TAWS is selected on maps other than the TAWS Page, an icon to indicate the feature is enabled for display and a legend for TAWS terrain colors is shown.

Terrain customization options are available by depressing the MENU key while on the Navigation Map Page, and then selecting "Map Setup" then "Map" group. Options selected on the Navigation Map page will be used on other map pages (less the TAWS Page itself) that display terrain information. Additional information about obstacles can be displayed by panning over the display on the map. The panning feature is enabled by depressing the RANGE knob on the keypad then pushing the knob in the desired direction until it is over the obstacle of interest.

Multi-Function Display (continued)

Terrain Awareness and Warning System (TAWS) – Optional (continued)

Operation of TAWS (continued)

To inhibit the aural and visual Premature Descent Alert (PDA) and Forward Looking Terrain Awareness (FLTA) alerts (RTC, ITI, ROC and IOI), press the INHIBIT softkey on the TAWS Page or depress the MENU key then select "Inhibit TAWS" or "Enable TAWS" depending on the current state. In either case, inhibiting and enabling TAWS alerts depends on the status of the INHIBIT softkey, as the INHIBIT softkey performs both functions. Use caution when inhibiting TAWS as the system should be enabled when appropriate. Once TAWS in inhibited a TAWS INHB alert annunciation is displayed on the MFD and PFD.

NOTE

If TAWS alerts are inhibited when the Final Approach Fix is the active waypoint during a GPS WAAS approach, a LOW ALT annunciation may appear on the PFD next to the altimeter if the current aircraft altitude is at least 164 feet below the prescribed altitude at the Final Approach Fix.

TAWS Page:

The TAWS Page is located in the Map Page Group on the MFD.

The TAWS Page is specialized to show terrain, obstacle, and potential impact point data in relation to the aircraft's current altitude, without clutter from the basemap. Aviation data (airports, VORs, and other NAVAIDs) can be displayed for reference. If an obstacle and the projected flight path of the aircraft intersect, the display automatically zooms in to the closest potential point of impact on the TAWS Page.

Aircraft orientation on this map is always heading up unless there is no valid heading. Two views are available relative to the position of the aircraft; the 360° default display and the radar-like ARC (120°) display. Map range is adjustable with the RANGE Knob from 1 to 200 nm, as indicated by the map range rings or arcs.

Alert Type	PFD/MFD Alert Annunciation	MFD Pop-Up Alert	Aural Message	Response Technique
Excessive Descent Rate Warning (EDR)	PULL-UP	PULL-UP	"Pull Up"	WARNING
Reduced Required Terrain Clearance Warning (RTC)	PULL-UP	TERRAIN - PULL-UP	"Terrain, Terrain; Pull Up, Pull Up"	WARNING
Imminent Terrain Impact Warning (ITI)	PULL-UP	TERRAIN AHEAD - PULL-UP	"Terrain Ahead, Pull Up; Terrain Ahead, Pull Up"	WARNING
Reduced Required Obstacle Clearance Warning (ROC)	PULL-UP	OBSTACLE - PULL-UP	"Obstacle, Obstacle; Pull Up, Pull Up"	WARNING
Imminent Obstacle Impact Warning (IOI)	PULL-UP	OBSTACLE AHEAD - PULL-UP	"Obstacle Ahead, Pull Up; Obstacle Ahead, Pull Up"	WARNING
Reduced Required Terrain Clearance Caution (RTC)	TERRAIN	CAUTION - TERRAIN	"Caution, Terrain; Caution, Terrain"	CAUTION
Imminent Terrain Impact Caution (ITI)	TERRAIN	TERRAIN AHEAD	"Terrain Ahead; Terrain Ahead"	CAUTION
Reduced Required Obstacle Clearance Caution (ROC)	TERRAIN	CAUTION - OBSTACLE	"Caution, Obstacle; Caution, Obstacle"	CAUTION
Imminent Obstacle Impact Caution (IOI)	TERRAIN	OBSTACLE AHEAD	"Obstacle Ahead; Obstacle Ahead"	CAUTION
Premature Descent Alert Caution (PDA)	TERRAIN	TOO LOW - TERRAIN	"Too Low, Terrain"	CAUTION
Altitude Callout "500"	None	None	"Five-Hundred"	N/A
Excessive Descent Rate Caution (EDR)	TERRAIN	SINK RATE	"Sink Rate"	CAUTION
Negative Climb Rate Caution (NCR)	TERRAIN	DON'T SINK	"Don't Sink"	CAUTION

* See associated Response Techniques checklists on pages 7-29 and 7-30.

TAWS Alert Types
Table 1

Multi-Function Display (continued)

Terrain Awareness and Warning System (TAWS) – Optional (continued)

TAWS Page (continued)

On all pages that display terrain data, the obstacles and terrain are depicted with the following colors:

* Red - above or within 100 feet below the aircraft altitude.
* Yellow - between 100 feet and 1000 feet below the aircraft altitude.
* Black - more than 1000 feet below the aircraft altitude.

TAWS Alerts:

Alerts are issued when flight conditions meet parameters that are set within TAWS software algorithms. TAWS alerts typically employ a CAUTION or a WARNING alert severity level, or both. When an alert is issued, visual annunciations are displayed on the PFD and MFD and aural alerts are simultaneously issued. The TAWS Alert Annunciation is shown at the upper left of the Altimeter tape on the PFD and below the Terrain Legend on the MFD. If the TAWS Page is not displayed at the time, a pop-up alert appears on the MFD. To acknowledge the pop-up alert:

- Press the CLR Key (returns to the currently viewed page), or
- Press the ENT Key (accesses the TAWS Page)

TAWS alerts types are shown in Table 1 on page 7-28.

<u>Response Technique - WARNING</u>:

1. Level the wings while simultaneously adding maximum power.
2. Smoothly pitch up at a rate of 2° to 3° per second towards an initial target pitch attitude of 15°.
3. Adjust pitch attitude to ensure terrain clearance, while respecting stall warning. If the flaps are extended, retract flaps to the up position.
4. Continue climb at best angle of climb speed (V_X) until terrain or obstacle clearance is assured.
   * Only vertical maneuvers are recommended unless operating in VMC or the pilot determines, after using all available information and instruments, that a turn, in addition to the vertical escape maneuver, is the safest course of action.
   * Pilots are authorized to deviate from their current air traffic control (ATC) clearance to the extent necessary to comply with a TAWS warning.

Multi-Function Display (continued)

Terrain Awareness and Warning System (TAWS) – Optional (continued)

TAWS Alerts (continued)

Response Technique - CAUTION:

1. Take positive corrective action until the alert ceases.
2. Based on analysis of all available instruments and information:
   * Stop descending or,
   * Initiate a climb and/or,
   * Turn as necessary.

Weather Radar

The Weather Radar installation consists of a Receiver/Transmitter unit in a tear-drop shaped pod mounted beneath the right wing just outboard of the wing jack point.

The Garmin GWX 68 Airborne Color Weather Radar is a four-color digital pulsed radar with 6.5 kilowatts of output power. It combines excellent range and adjustable scanning profiles with a high-definition target display. The pulse width is four microseconds (µs) on all ranges except the 2.5 nm range. At close range, the GWX 68 uses a one µs pulse width to reduce the targets from smearing together.

The Piper PA-46-350P uses a 10-inch phased array antenna that is fully stabilized to accommodate 30° of pitch and roll.

To focus radar scanning on specific areas, Sector Scanning offers pilot-adjustable horizontal scan angles of 20°, 40°, 60°, or 90°. A vertical scanning function helps to analyze storm tops, gradients, and cell buildup activity at various altitudes.

Radar features include:

* Extended Sensitivity Time Constant (STC) logic that automatically correlates distance of the return echo with intensity, so cells do not suddenly appear to get larger as they get closer.
* WATCH® (Weather Attenuated Color Highlight) helps identify possible shadowing effects of short-range cell activity, identifying areas where radar return signals are weakened or attenuated by intense precipitation (or large areas of lesser precipitation) and may not fully reflect the weather behind a storm.
* Weather Alert that looks ahead for intense cell activity in the 80-320 nm range, even if these ranges are not being monitored.

Multi-Function Display (continued)

Weather Radar (continued)

Operation of Radar:

NOTE

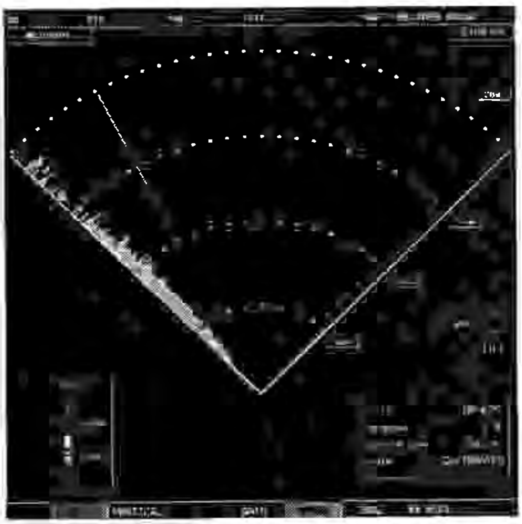
Pulling the XM circuit breaker will render the radar inoperative.

NOTE

Radar images beyond approximately 130 nm should not be relied upon.

NOTE

During radar operation, with the range settings reduced to 20 NM or less, there may be a radar image on the left side of the radar display that is a radar reflection of the propeller and or forward aircraft fuselage. This erroneous radar return can be identified by its failure to update position during aircraft heading changes. If observed, this radar return is not a valid part of the actual radar image and should be disregarded. See image below for example.



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Multi-Function Display (continued)

Weather Radar (continued)

Operation of Radar:

Weather Mode:

To activate the radar's Weather mode while on the ground, proceed to the Map Page Group on the MFD, rotate the small FMS knob to the Weather Radar Page, select the MODE softkey, and then select the STANDBY mode softkey. After the system goes through a 60-second warm-up period (countdown is displayed on the screen) the radar will enter STANDBY mode. To begin radar transmitting, select the WEATHER mode softkey. A pop-up menu will appear alerting the pilot that the radar is being activated on the ground and safety precautions should be exercised.

To activate the radar while in flight, proceed to the Map Page Group on the MFD, rotate the small FMS knob to the Weather Radar Page, select the MODE softkey, and then select the WEATHER mode softkey. After the system goes through a 60-second warm-up period (countdown is displayed on the screen) the radar will begin transmitting.

When the weather radar system is in either the Weather or Ground Map mode, the system automatically switches to Standby mode upon landing.

Ground Map Mode:

To activate the radar's Ground Map mode, proceed to the Map Page Group on the MFD, rotate the small FMS knob to the Weather Radar Page, select the MODE softkey, and then select the GROUND softkey. Select the BACK softkey, then activate the cursor by pressing the small FMS knob, rotate the large FMS knob to place the cursor in the TILT field, then turn the small FMS knob to adjust the antenna tilt angle to display ground returns at the desired distance.

When the weather radar system is in either the Weather or Ground Map mode, the system automatically switches to Standby mode upon landing.

Multi-Function Display (continued)

Weather Radar (continued)

Weather Radar Page:

Weather Display:

When evaluating various target returns on the weather radar display, the colors denote precipitation intensity and rates shown in the following table.

Weather Mode Color	Intensity	Approximate Precipitation Rate (inches/hour)
Black	< 23 dBZ	< .01
Green	23 dBZ to < 32 dBZ	.01 to 0.1
Yellow	32 dBZ to < 41 dBZ	0.1 to 0.5
[illegible]	41 dBZ to < 50 dBZ	0.5 to 2
[illegible]	50 dBZ and greater	> 2

Precipitation Intensity and Rates
Table 2

Updrafts and downdrafts in thunderstorms carry water through the cloud, therefore the more severe the drafts, the greater the number and size of the precipitation droplets. With this in mind, the following interpretations can be made from what is displayed on the weather radar.

Avoid these areas by an extra wide margin.

* In areas where the displayed target intensity is red or magenta (indicating large amounts of precipitation), the turbulence is considered severe.
* Areas that show steep color gradients (intense color changes) over thin bands or short distances suggest irregular rainfall rate and strong turbulence.
* Areas that show red or magenta are associated with hail or turbulence, as well as heavy precipitation. Vertical scanning and antenna tilt management may be necessary to identify areas of maximum intensity.

Multi-Function Display (continued)

Weather Radar (continued)

Weather Radar Page (continued)

Proper use of the weather radar is critical for detecting various types of weather phenomena (thunderstorms, squall lines, tornadoes, hail, etc.).

Ground Map Display:

When evaluating various intensities of ground target returns, the colors shown in the table below should be used.

Ground Map Mode Color	Intensity
Black	0 dB
Light Blue	> 0 dB to < 9 dB
Yellow	9 dB to < 18 dB
[illegible]	18 dB to < 27 dB
Blue	27 dB and greater

Ground Target Return Intensities
Table 3

A secondary use of the weather radar system is for the presentation of terrain. This can be a useful tool for verifying aircraft position. A picture of the ground is represented much like a topographical map that can be used as a supplement to the Navigation Map on the MFD.

Ground Map mode uses a different gain range than Weather mode. Different colors are also used to represent the intensity levels. The displayed intensity of ground target returns is defined in the table shown above. The type and orientation of the target in relation to the aircraft affects the intensity displayed. Use of the GAIN and TILT controls helps improve contrast so that specific ground targets can be recognized more easily.

Proper use of the weather radar is critical for detecting various types/features of terrain.

Multi-Function Display (continued)

Garmin Datalink (GDL) – Optional

XM Satellite Weather and XM Satellite Radio® entertainment services is provided through the optional GDL 69A, a remote-mounted data-link satellite receiver. XM Satellite Radio and XM Satellite Weather services, available by subscription, each have coded IDs unique to the installed GDL 69A. These coded ID's must be provided to XM Satellite Radio to activate service. These IDs are located on the label on the back of the Data Link Receiver and on the XM Information Page on the MFD and in the XM Satellite Radio Activation Instructions included with the unit (available at www.garmin.com, P/N 190-00355-04). Once activated, XM Satellite Radio uses the coded IDs to send an activation signal that allows the G1000 to display weather data and/or entertainment programming provided through the GDL 69A.

NOTE

Pulling the XM circuit breaker will disable the radar as well as the expected GDL69A functions (XM weather and XM radio).

XM Satellite Weather:

Received graphical weather information and associated text is displayed on the Multi Function Display (MFD) and the Primary Flight Display (PFD) Inset Map. XM satellite weather operates in the S-band frequency range and provides continuous reception capabilities at any altitude throughout North America.

The primary map for viewing XM Weather data is the Weather Data Link Page in the Map Page Group. This is the only G1000 map display capable of showing information for all available XM weather products.

Selecting the products for display on the Weather Data Link Page is made by pressing the softkey associated with that product. The label for the product is shown in capital letters in the Weather Products column in the table below. When a weather product is selected for display, the corresponding softkey label changes to gray to indicate the product is enabled. Unavailable weather products have subdued softkey labels (softkeys are disabled from selection).

Multi-Function Display (continued)

Garmin Datalink (GDL) – Optional (continued)

XM Satellite Weather (continued)

NOTE

Echo Tops and Cloud Tops are not selectable at the same time due to their color similarities.

The following pages can display various portions of XM Weather data:

* Navigation Map
* Weather Datalink Page (able to display all XM Weather data)
* Weather Information Page
* AUX - Trip Planning Page
* Nearest Pages
* Flight Plan Pages
* PFD Inset Map

When a weather product is active on the Weather Data Link Page or the Navigation Map Page, the age of the data is displayed on the screen. The age of the product is based on the time difference between when the data was assembled on the ground and the current GPS time. Weather products are refreshed at specific intervals.

If for any reason, a weather product is not refreshed within the 30, 60, or 90-minute Expiration Time intervals, the data is considered expired and is removed from the display. This ensures that the displayed data is consistent with what is currently being broadcast by XM Satellite Radio services. If more than half of the expiration time has elapsed, the color of the product age displayed changes to yellow.

Multi-Function Display (continued)

Garmin Datalink (GDL) – Optional (continued)

XM Satellite Weather (continued)

Weather Product	Symbol	Expiration Time (minutes)	Refresh Rate (minutes)
NEXRAD		30	5
Cloud Top (CLD TOP)		60	15
Echo Top (ECHO TOP)		30	7.5
XM Lightning (LTNG)		30	5
Cell Movement (CELL MOV)		30	1.25
SIGMETs/AIRMETs (SIG/AIR)		60	12
METARs		90	12
City Forecast (CITY)		90	12
Surface Analysis (SFC)		60	12
Freezing Levels (FRZ LVL)		60	12
Winds Aloft (WIND)		60	12
County Warnings (COUNTY)		60	5
Cyclone Warnings (CYCLONE)		60	12
Radar Coverage	No product image	30	5
TFRs	No product image	60	12
TAFs	No product image	60	12

Weather Product Symbols, Expiration Times and Refresh Rates
Table 4

Multi-Function Display (continued)

Garmin Datalink (GDL) – Optional (continued)

XM Satellite Weather (continued)

The table on page 7-37 shows the weather product symbols, the expiration time and the refresh rate. The refresh rate represents the interval at which XM Satellite Radio broadcasts new signals that may or may not contain new weather data. It does not represent the rate at which weather data is updated or new content is received by the Data Link Receiver. Weather data are refreshed at intervals defined and controlled by XM Satellite Radio and their data vendors.

Customizing the Weather Data Link Page is possible by selecting Weather Data Link Page from the Map Group, press the MENU key, select Weather Setup option from the Page Menu and press the ENT key. Turn the large FMS knob to scroll to a weather product of interest then rotate the small FMS knob to scroll through the options for each product (ON/OFF, range settings, etc.). Press the ENT key to select the option then press the FMS knob or the CLR key to return to the Weather Data Link Page with the changed settings.

Customizing Weather Data Link options is also available on the Navigation Map page. Proceed to the Navigation Map page, depress the MENU key, highlight the Map Setup option and press the ENT key, turn the small FMS knob to highlight the Weather group, turn the large FMS knob to highlight and move between the product selections. When an item is highlighted, turn the small FMS knob to select the option and press the ENT key. Press the FMS knob or the CLR key to return to the Navigation Map Page with the changed settings.

Multi-Function Display (continued)

Garmin Datalink (GDL) – Optional (continued)

XM Radio Entertainment:

The optional XM Radio entertainment feature of the GDL 69A Data Link Receiver is available for the pilot's and passengers' enjoyment. XM Satellite Radio offers a variety of radio programming over long distances without having to constantly search for new stations. The GDL 69A can receive the S-band, XM Satellite Radio® entertainment services at any altitude throughout the Continental U.S. Based on signals from satellites, coverage far exceeds land-based transmissions.

Entertainment audio is not available on the GDL 69 Data Link Receiver as it is on the GDL 69A Data Link Receiver.

XM Radio is never muted for the cabin passengers unless a stereo input to the stereo input jack is installed. XM Radio is automatically muted for the front seat crewmembers during the following conditions:

- Aircraft radio reception
- Push-to-talk switch activation
- Stall warning activation
- Gear warning activation
- Marker beacon audio activity
- Master caution and master warning chimes
- Audible system messages

The XM Radio Page provides information and control of the audio entertainment features of the XM Satellite Radio. To get to the XM Radio Page, proceed to the AUX Page Group on the MFD, turn the small FMS knob to the AUX-XM Information Page and select the RADIO softkey.

Keypad

Control for the MFD, and if desired, the PFD, is performed by the MFD/PFD control unit (keypad) located aft of the throttle quadrant. Alpha-numeric keys are provided for easy entry of flight plan information, waypoint information, and frequency information. A range knob is provided to select ranges on the MFD or PFD, if desired.

Audio Panel

The GMA 350 audio panel provides the traditional functions of microphone and receiver audio selection. The audio panel also includes an intercom system (ICS), a marker beacon receiver, a COM clearance recorder, a passenger address (PA) system, manual squelch control, and telephone and music inputs and controls. The MAN SQ key can be used to individually control the squelch at the pilot, copilot and passenger locations.

Push buttons keys control audio selection. When a key is selected, a triangular annunciator above the key is illuminated. Annunciator brightness is controlled by an internal photocell and key brightness is controlled by the PANEL dimmer in the overhead switch panel.

Split-com mode is available by pressing both MIC keys simultaneously. The respective COM1/MIC1 or COM2/MIC2 annunciators are illuminated indicating Split-COM operation. The pilot defaults to COM1 and the copilot defaults to COM2. Split-COM operation is canceled by pressing either of the selected MIC keys.

If the GMA 350 fails or if power is not applied to the unit, a fail-safe circuit connects the pilot's headset and microphone directly to the COM1 transceiver. The speaker will not function during fail-safe operations.

GTX 33ES (Extended Squitter) Transponder

In addition to the basic functionality of the GTX 33 transponder, the GTX 33ES transponder provides Extended Squitter Version 2 Automatic Dependent Surveillance-Broadcast (ADS-B) which meets the TSO C166b mandate for 2020. ADS-B Out information consisting of altitude, position, velocity, and heading are automatically transmitted to other aircraft and ground stations.

The combined installation of GTX 33ES and GTS 825 has the following capabilities:

ADS-B Out: transmits altitude, position, velocity, and heading to other aircraft and ground station.

ADS-B In: receives altitude, position, velocity, and heading information from aircraft and ground stations.

Traffic information will be displayed as a combination of two systems:

- ADS-B traffic information from other ADS-B equipped aircraft
- GTS 825 Traffic Advisory System (TAS)

NOTE

ADS-B traffic information will be available on the normal G1000 traffic display maps/pages. In the absence of ADS-B traffic information, the GTS 825 system will display all other transponder equipped aircraft.

ADS-B transmission defaults to enabled at each power cycle. To enable/disable the transmission of the ADS-B information, press the ADS-B TX Softkey under the PFD XPDR menu. Do not disable ADS-B transmission unless requested by ATC. If either the GTX 33 or 33ES fails, a red “x” will be displayed in the XPDR field.

GTX 33DES (Diversity Extended Squitter) Transponder - Optional

The functionality of the GTX 33DES transponder is identical to the GTX 33ES transponder. The GTX 33DES transponder is equipped with two antennas, one on the top of the fuselage and the other on the bottom, which provides additional signal coverage over that of the GTX 33ES transponder. The GTX 33DES is offered as an option for the number 1 transponder in a dual transponder installation.

7.13 GFC700 AUTOMATIC FLIGHT CONTROL SYSTEM (AFCS)

AUTOPILOT CONTROLS

Controls for selecting lateral and vertical flight director modes and for engaging/disengaging autopilot, yaw damper and flight director, are located on the GMC 710 autopilot controller located above the MFD. The SPD key on the GMC 710 is deactivated and, if pressed, will display a system message indicating that it is disabled. Additional autopilot related functions are controlled by the following:

A/P DISC / TRIM INTER Switch – Autopilot Disconnect and Trim Interrupt switch located on the control wheel. Depressing this red switch interrupts the electric pitch trim and disconnects the autopilot and yaw damper.

Electric Pitch Trim Switch – Split switch located on the control wheel. Commands nose up or nose down pitch trim when both halves of the switch are operated simultaneously.

CWS Switch – Control Wheel Steering switch located on the control wheel. While this switch is depressed, the autopilot servos are disconnected, allowing the pilot to fly the airplane manually.

TO/GA Switch – Optional Takeoff/Go-Around switch located in the left throttle lever. Depressing this switch commands the flight director to an initial takeoff or go-around pitch attitude.

LVL Switch - Optional Level mode switch located on the instrument panel above the MFD. Depressing this blue switch activates the autopilot Level Mode, which engages the autopilot and commands the airplane to wings level and zero vertical speed.

AUTOPILOT OPERATION

When the AV BUS MASTR switch is selected ON, the GFC700 automatically conducts a self-test, as indicated by a white boxed PFT on the PFD. Successful completion of this self-test is indicated by extinguishing the PFT with no AP failure indications and an autopilot "warble" tone (the same tone as autopilot disconnect). If the GFC700 preflight test is not completed successfully, a red PFT annunciation will be displayed on the PFD and the autopilot and electric pitch trim will not function.

Selected autopilot modes are displayed on the AFCS Status Box at the top of the PFD. Lateral modes are displayed on the left, autopilot status is in the middle, and vertical modes are on the right. All active modes are shown in green and armed modes are white.

7.13 GFC700 AUTOMATIC FLIGHT CONTROL SYSTEM (AFCS) (Continued)

AUTOPILOT OPERATION (Continued)

Pressing the AP key activates the autopilot and flight director in the default ROL and PIT modes. Pressing the FD key activates only the flight director in default ROL and PIT modes. Pressing any key associated with a valid lateral or vertical mode activates that mode and the default mode in the opposing axis. For example, pressing the ALT key activates the flight director in ALT hold mode with the default lateral (ROL) mode. Re-selection of any valid lateral or vertical mode toggles between the selected mode and the default mode for that axis.

If the information required to compute a flight director mode becomes invalid or unavailable, the flight director automatically reverts to the default mode for that axis. A flashing yellow mode annunciation and annunciator light indicate loss of sensor (ADC) or navigation data (VOR, LOC, GPS, VNV, WAAS) required to compute commands. If the loss occurs in the lateral axis, the system defaults to ROL mode and rolls wings level. If the loss occurs in the pitch axis, the system defaults to PIT mode and maintains the current pitch attitude. The flashing annunciation stops when the affected mode key is pressed, another mode for the axis is selected, or after 10 seconds, if no action is taken.

Autopilot Disengagement Methods:

The autopilot can be disengaged manually by the following “normal” methods which are indicated by a yellow flashing AP annunciation:

- Pressing the A/P DISC / TRIM INTER switch on the control wheel
- Activation of either half or both halves of the manual electric pitch trim switch on the control wheel
- Pressing the AP key on the MFD
- Pressing the TO/GA switch on the throttle (if optional Underspeed Protection not installed)

The autopilot can be disengaged manually by the following “abnormal” methods which are indicated by a red flashing AP annunciation:

- Pulling the AUTOPILOT or GMC circuit breaker
- Activation of the stall warning system (if optional Underspeed Protection not installed)

7.13 GFC700 AUTOMATIC FLIGHT CONTROL SYSTEM (AFCS) (Continued)

Autopilot Disengagement Methods: (continued)

The autopilot can be momentarily disengaged by pressing and holding the CWS switch on the control wheel.

The autopilot will disengage automatically under the following conditions which are indicated by a red flashing AP annunciation:

- Internal autopilot system failure
- Total AHRS failure
- Inability to compute default flight director modes

After any autopilot disengagement, the aural disconnect alert can be canceled by pressing the AP DISC/TRIM INTER switch or manual electric pitch trim switches

AUTOPILOT FEATURES

Overspeed Recovery Mode

Overspeed Recovery attempts to prevent the aircraft from exceeding the maximum approved autopilot operating speed (183 KIAS) by providing a flight director pitch up command whenever the airspeed trend vector exceeds 183 KIAS. If flying manually to flight director guidance, the pilot may follow the pitch up commands. The pitch up command will not exceed that for level flight; to decelerate more rapidly the pilot should reduce engine power. When Overspeed Recovery is active, an amber MAXSPD is displayed above the airspeed tape. Overspeed Recovery is not active in ALT mode unless Electronic Stability Protection is installed.

Takeoff Mode (optional)

Takeoff Mode allows the pilot to manually follow the flight director command bars after takeoff rotation. Takeoff Mode is activated by pressing the TO/GA switch on the throttle lever while on the ground. Whenever Takeoff Mode is active, “TO” will be displayed as the lateral and vertical modes in the AFCS status box.

7.13 GFC700 AUTOMATIC FLIGHT CONTROL SYSTEM (AFCS) (Continued)

AUTOPILOT FEATURES (Continued)

Go-Around Mode (optional)

Go-Around Mode allows the pilot to manually follow the flight director command bars during a go-around maneuver. Go-Around Mode is activated by pressing the TO/GA switch on the left throttle lever while in flight. Whenever Go-Around Mode is active, "GA" will be displayed as the lateral and vertical modes in the AFCS status box. Autopilot coupled Go-Around is available as an optional feature. During a coupled go-around the autopilot remains engaged and the pilot must add power and reduce drag according to the GO-AROUND checklist in Section 4.

Underspeed Protection (Optional)

Underspeed Protection (USP) is a flight director function that provides low speed awareness and prevents the airplane from stalling. The autopilot must be engaged for USP to function. An AIRSPEED aural alert and an amber MINSPD annunciation activates to indicate a low airspeed condition. If airspeed continues to decrease, a USP ACTIVE CAS warning is triggered and the airplane pitches down. If the flight director is in a non-altitude critical mode (VS, VNAV, PIT, LVL or FLC) the airplane pitches down to maintain airspeed above the stall warning speed. If the flight director is in an altitude critical mode (ALT, GP, GS, TO or GA) the airplane may decelerate to stall warning. After stall warning the airplane rolls wings level and pitches down to achieve and maintain a speed approximately two knots above stall warning deactivation. When USP is active, the flight director modes remain unchanged, but the pitch mode annunciation turns white and the roll mode annunciation turns white in altitude critical mode.. In all cases, the pilot should take action to exit the underspeed condition by increasing engine power and decreasing drag as appropriate.

Level Mode (Optional)

Level Mode commands the airplane to wings level and zero vertical speed. It is activated by pressing the blue switch (labeled LVL) at the top center of the instrument panel. Level Mode may be activated manually at anytime with the autopilot engaged or disengaged. Level Mode will activate automatically if Electronic Stability Protection is engaged for more than 10 seconds in any 20 second interval. Activation is indicated by green LVL and LVL for lateral and vertical modes respectively. Level mode should not be relied upon if the autopilot is operating in any failure condition.

7.13 GFC700 AUTOMATIC FLIGHT CONTROL SYSTEM (AFCS) (Continued)

AUTOPILOT FEATURES (Continued)

Electronic Stability and Protection (Optional)

Electronic Stability and Protection (ESP) provides a control force feedback to deter the pilot from operating outside a defined envelope. ESP functions only when the autopilot is operable, but is disengaged. As the aircraft approaches the defined operating limits, the autopilot servos automatically engage to nudge the aircraft back to the nominal operating envelope. The pilot can easily overpower the restoring tendency, and may interrupt ESP with the AP disconnect or CWS switches. If the pilot operates in the ESP envelope for an extended period of time, the autopilot will automatically engage in LVL mode. At any time (usually for training reasons), the ESP function may be disabled from the AUX – SYSTEM SETTINGS page on the MFD. When disabled in this manner, ESP OFF is displayed. ESP will automatically re-enable after each electrical power cycle.

Expanded Engagement Envelope (Optional)

Expanded engagement envelope allows autopilot engagement up to the pitch and roll attitudes shown in the autopilot limitations of Section 2. If the autopilot is engaged at a pitch or roll attitude within the expanded engagement envelope but beyond the maximum autopilot command limits, the airplane will be pitched or rolled to the maximum autopilot command limits.

Hypoxia Recognition and Emergency Descent Mode (Optional)

Hypoxia Recognition and Emergency descent mode (EDM) detects pilot incapacitation due to the affects of hypoxia or other physical condition. This is accomplished by monitoring pilot response to various message prompts. If the system determines that pilot is not responding, Emergency Descent Mode is activated, placing the aircraft in a descent to a lower altitude to provide an opportunity for the pilot and passengers to recover from the effects of hypoxia.

The system is operative when the autopilot is engaged and the aircraft cabin altitude exceeds 14,900 feet pressure altitude. After a period of inactivity (time is dependent on cabin altitude) the pilot is prompted for a response. If no response is detected the aircraft will initially descend to 14,000 feet and then to 12,500 feet MSL. Refer to Garmin G1000 Pilot's Guide (P/N 190-01889-00) for additional details.

7.15 STANDBY INSTRUMENT

NOTE

If electrical power is removed from the Aspen EBD standby instrument prior to completion of its self-test, the unit will remain ON and deplete its internal battery. If this occurs, turn the BATT MASTR switch ON and wait for the self-test to be completed or press the red REV button on the unit to turn it OFF.

NOTE

EBD brightness is automatically adjusted based on the ambient light detected by the photocell. If the EBD is too bright, use the manual BRT ADJUST mode to reduce brightness.

The Aspen Evolution Backup Display (EBD) is a fully digital, independent flight instrument display which provides attitude, barometric altitude, airspeed, heading, vertical speed, slip/skid and turn rate indications. The purpose of this flight instrument is to provide a reference to crosscheck the G1000 system information for system reliability and to display basic flight information during a G1000 system failure.

The EBD is located to the left of the PFD in direct view of the pilot. During normal operation, power is provided by the forward main bus. If the alternator is inoperative, the EBD will continue to operate on the forward main bus until the battery voltage is below that required by the standby instrument. The EBD will then operate on its internal battery for 30 minutes, permitting the pilot to find a suitable landing location. If this occurs the EBD will illuminate an "ON BAT" annunciation and display an estimated battery charge state.

To check the standby instrument's internal battery charge level, press the MENU key, rotate the MODE/SYNC knob to the POWER SETTINGS page, then press BATTERY line select key. BAT LEVEL IN --.-- will be displayed for a short period of time as internal battery capacity is being measured. This could take up to 10 minutes if the ambient temperature is below 0.C. Once the capacity is measured the ON BAT XX% REM annunciation will be displayed. After checking the battery charge level, the EXT PWR softkey must be pressed to re-establish power from the aircraft electrical system. Press the MENU key

7.15 STANDBY INSTRUMENT (Continued)

to return to the normal display. The unit's internal battery must be checked for proper charge prior to operations in IFR conditions. If the charge level is less than 80%, flight in IFR conditions is prohibited.

WARNING

Failure to return the Standby Instrument to ship's power by selecting the EXT PWR soft key before selecting MENU, will deplete the Standby Instrument battery within 30 minutes. This will make the instrument unusable in the event of an electrical emergency.

In flight (indicated airspeed valid and ≥30 knots):

The standby display will immediately revert to its internal battery following a complete electrical failure (loss of both alternators, primary battery, and emergency bus) providing approximately 30 additional minutes of operation. If this occurs the EBD will illuminate an "ON BAT" annunciation and display an estimated battery charge state.

On the ground (indicated airspeed invalid or <30 knots):

The standby display will power up and power down with the application or removal of external power. A "POWERING DOWN" message is presented during the power down sequence. Pressing any key on the EBD while the 5-second "POWERING DOWN" warning is displayed keeps the display operating using the internal battery. If the 5-second shutdown warning has occurred and no key on the EBD is pressed, the shutdown sequence will continue. If normal power is subsequently applied, the EBD will re-initialize in approximately 30 seconds.

When the MENU button is pressed and the Menu is active, the bottom left knob can be used to adjust the display brightness. By default, the brightness operates in AUTO mode, and is automatically adjusted based on photocell sensed ambient lighting conditions. To override the AUTO brightness setting, press the bottom left knob (when Menu is active) and rotate the knob to adjust to the desired level. Select MENU again to hide the menu and return to normal display.

7.17 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.

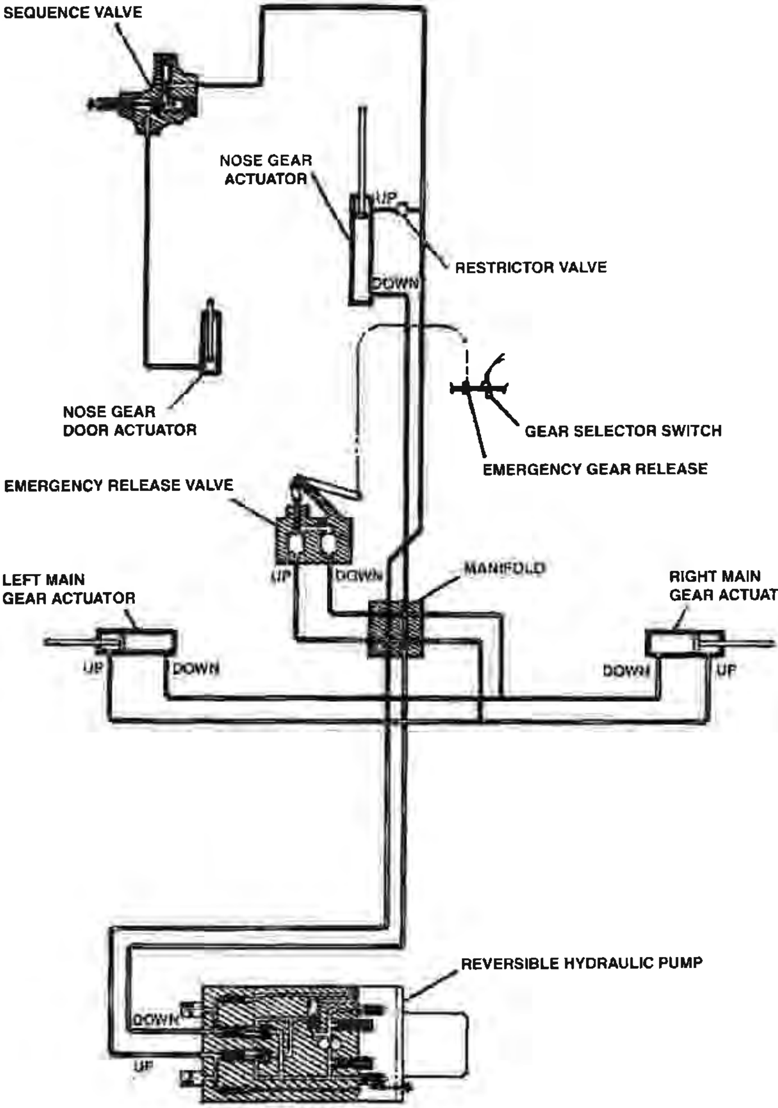
NOTE

Occasional cycling of the hydraulic pump during climb and initial cruise can occur due to variations in system pressure caused by ambient temperature changes.

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. An amber HYDR PUMP ON CAS message illuminates whenever the hydraulic pump operates for more than 1-second (on ground) or 20-seconds (in flight).

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.

7.17 HYDRAULIC SYSTEM (continued)



HYDRAULIC SYSTEM
Figure 7-9

7.19 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. Landing gear operation is controlled by a two position landing gear selector switch with a wheel shaped knob located to the left of the engine power control quadrant. The landing gear selector switch 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, a HYDR PUMP ON warning CAS message along with a CHECK GEAR aural alert and warning CAS message are immediately activated.

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.

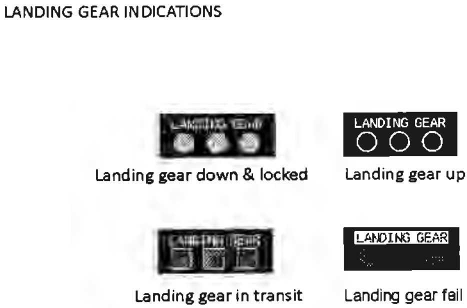
The landing gear is held in the DOWN position by spring loaded mechanical locking mechanisms built into each of the three actuating cylinders. The gear down indications are displayed when each mechanism is in the LOCKED position. With the hydraulic pump and system operating normally, hydraulic pressure 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.

7.19 LANDING GEAR (Continued)

Landing Gear Indications

Landing gear indications on the MFD can be any of the following:

- gear down: solid green circle
- gear up: hollow white circle
- gear in transit: crosshatched square
- abnormal/unknown gear position: solid red circle



LANDING GEAR INDICATIONS
Figure 7-13

CAUTION

When flying in extreme cold where the aircraft has been cold soaked for an extended period of time, the gear may not indicate down and locked for 10 to 15 seconds after normal gear extension.

The landing gear selector position is monitored. When the landing gear selector disagrees with the position of the landing gear, a GEAR SYS CAS message is displayed (warning if on the ground and caution if in flight). If the position of the landing gear are unknown by the system, the landing gear indications on the MFD become solid red circles and a Master Warning or Master Caution is activated (warning if on the ground and caution if in flight).

7.19 LANDING GEAR (Continued)

Gear Position Unsafe

Should the throttle be placed at low power settings and/or the flaps extended while the gear is retracted, a CHECK GEAR CAS message alerts the pilot that the gear is retracted.

The CHECK GEAR CAS message is activated under the following conditions:

(a) The gear is not down and locked down and the manifold pressure is below 14 inches.
(b) The landing gear selector switch is in the UP position when the airplane is on the ground.
(c) The gear is not down and locked and wing flaps are extended to the 20° or 36° positions.

The CHECK GEAR CAS message is a Caution in flight above approximately 400 feet AGL and becomes a Warning when below approximately 400 feet AGL. The CHECK GEAR caution or warning message created by low power settings can be silenced by increasing power, extending the landing gear, or by pressing the master caution or master warning softkey. The CHECK GEAR caution or warning created by flap extension can only be silenced by retracting the flaps to the 0° or 10° positions or extending the landing gear.

Emergency Extension

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. Emergency gear extension is accomplished by moving the guard across the emergency gear extension knob to the side and pulling the emergency gear extension knob aft. A manually actuated valve 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. Emergency gear extension must not be attempted at airspeeds in excess of 100 KIAS. 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 HYDRAULIC PUMP circuit breaker be left in the pulled position until the aircraft is safely on jacks. See the Maintenance 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 HYDRAULIC PUMP POWER circuit breaker must be reset in order for hydraulic pressure to be generated in the UP side of the system and the gear retracted.

7.19 LANDING GEAR (Continued)

Emergency Extension (continued)

CAUTION

When flying in extreme cold where the aircraft has been cold soaked, it may take several minutes for all three gear to indicate down and locked following an EMERGENCY EXTENSION "FREE FALL."

7.21 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 PARK 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 PARK BRAKE knob. To release the parking brake, first depress and hold the toe brake pedals and then push in on the PARK BRAKE knob.

7.23 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 "CHECK GEAR" aural alert will sound, and the GEAR WARNING annunciator will illuminate. An amber FLAP FAIL CAS message illuminates if an over current condition occurs in the flap motor/actuator system. If this occurs, 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 CAS message illuminates again then a system malfunction is indicated and the flap motor circuit breaker should be pulled.

7.25 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.

7.25 FUEL SYSTEM (continued)

Fuel quantity is indicated on the multi-function display (MFD). Each tank has two sensor sending units. 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.

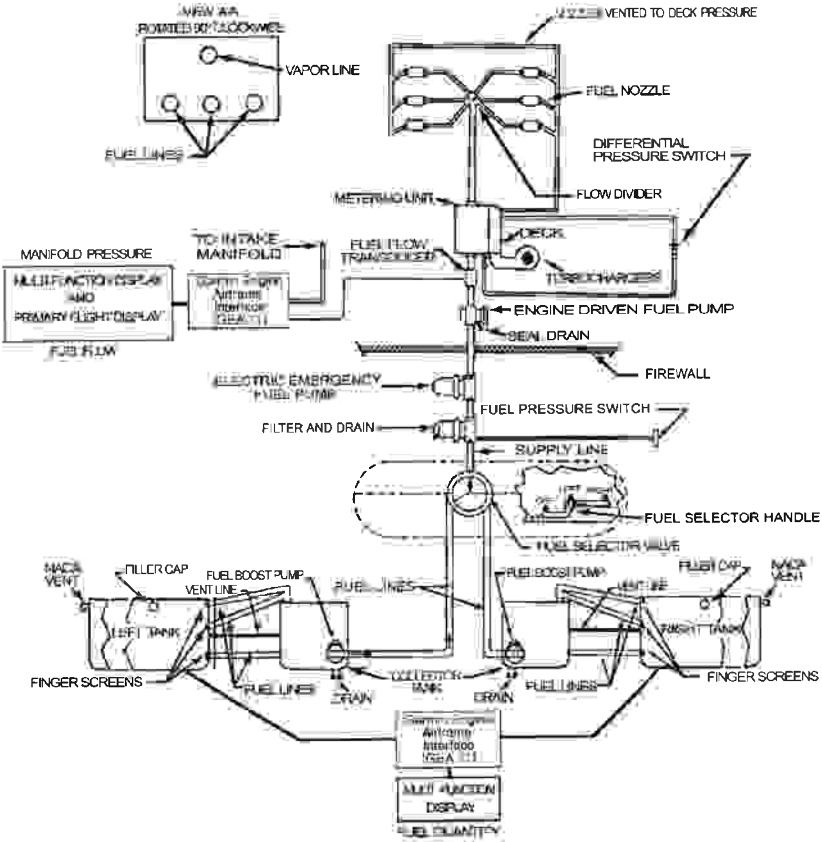
Quantity indication should be monitored at regular intervals during flight. Fuel tank selection should be alternated accordingly to maintain fuel and wing balance. See fuel imbalance limitations (2.35(e)).

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 BATT MASTR 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.

7.25 FUEL SYSTEM (continued)



FUEL SYSTEM SCHEMATIC
Figure 7-15

7.25 FUEL SYSTEM (continued)

Should the fuel boost pump in the fuel tank being used fail to produce sufficient pressure, the amber BOOST PUMP FAIL CAS message 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 CAS message remains illuminated, select the opposite tank. Check the L BOOST and R BOOST circuit breakers and reset as necessary. 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 red FUEL PRESS LOW CAS message will illuminate. Immediately select the EMERG FUEL PUMP switch ON. The FUEL PRESS LOW CAS message will extinguish when adequate fuel pressure is restored. The EMERG FUEL PUMP switch 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 thumb sized 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.

7.25 FUEL SYSTEM (continued)

Fuel flows from the filter, forward through the emergency fuel pump and firewall, into the engine compartment, to the engine-driven pump, through the fuel flow transducer, metering unit, flow divider and through each of six fuel nozzles into each cylinder.

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 paragraph 2.35(e). An amber FUEL IMBALANCE CAS message illuminates whenever the imbalance exceeds 10 gallons.

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. The fuel quantity indication turns amber and a master caution sounds whenever the fuel quantity in either tank is less than or equal to 10 gallons. The fuel quantity indication turns red, a master warning sounds and a red L FUEL QTY LOW and R FUEL QTY LOW CAS message illuminates whenever the fuel quantity in the respective tank is less than or equal to 5 gallons.

7.27 ELECTRICAL SYSTEM

Power for the 28 Vdc, negative ground, dual fed split bus electrical system is supplied by two belt driven, parallel connected, 28 Vdc 75 ampere 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 three switch panels:

(a) All powerplant and exterior light switches are located in an overhead switch panel (Figure 7-17).
(b) A switch panel located between the MFD and the copilot's PFD contains all de-ice/anti-ice and environmental control related switches (Figure 7-21).

7.27 ELECTRICAL SYSTEM (continued)

A battery bus, located in the battery compartment, provides a continuous source of power for the ELT switch, EMER switch, 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 BATT MASTR switch is OFF. Fuses located on the battery bus are used to protect these circuits.

When the BATT MASTR 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 7-21). 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 BATT MASTR 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.

NOTE

When utilizing just the airplane's battery, or just a 24 volt external power source, the VOLTS indication will be in the red range. Check the voltage indication for correct voltage readings.

Each alternator system is provided an independent ON-OFF switch (ALTR NO 1 and ALTR NO 2), 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 NO 1 and ALTR NO 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, the appropriate ALTERNATOR FAIL CAS message will illuminate. With both alternators functioning as a single alternator failure the VOLTS indication will turn red when the tie bus voltage drops below 25 VDC. With neither alternator functioning the VOLTS indication will turn red when the tie bus voltage drops below 24 VDC

7.27 ELECTRICAL SYSTEM (continued)

A main bus and a nonessential bus (Figure 7-19), with associated circuit breakers, are located on the pilot's left side panels. Two avionics buses, with associated circuit breakers (Figure 7-19), are located on the copilot's right side 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 7-19) protect the main bus from an overload.

Current from the tie bus is fed to each avionics bus through independent solenoid contactors. When the AV BUS MASTR switch is selected ON, both solenoid contactors de-energize, permitting current flow to both avionics buses. Avionics bus overload protection is provided by the 40 amp tie bus #1 AVIONICS BUS and #2 AVIONICS BUS circuit breakers (Figure 7-19). Should the need arise, either avionics bus can be isolated by pulling out the AVIONICS BUS TIE circuit breaker located on the co-pilot's circuit breaker panel row B, position 1 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 ESS BUS circuit breaker (Figure 7-19).

The emergency bus is intended to provide emergency power to systems required to land the aircraft in the event of a Complete Electrical Failure. Its use is not intended for a non-complete loss of electrical power, such as loss of both alternators. The emergency bus is activated by pressing the EMER switch on the overhead switch panel.

NOTE

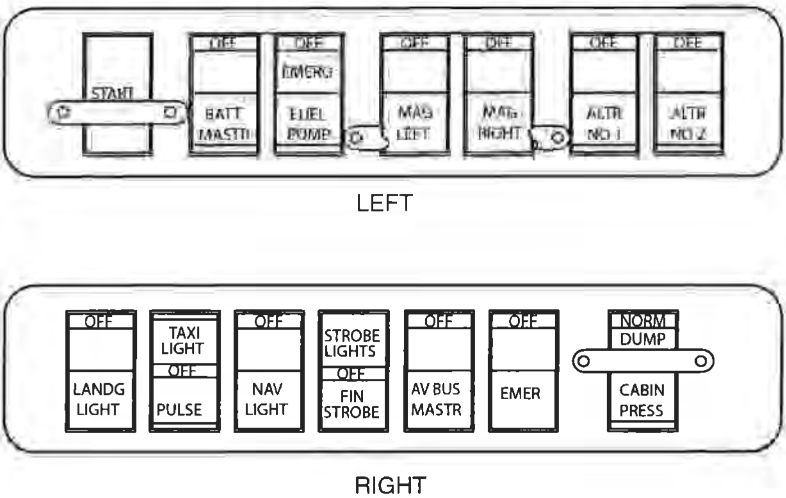
In the event of a total electrical failure and to operate exclusively on the emergency bus, the EMER switch should be turned ON and the BATT MASTR switch must be OFF.

NOTE

The displayed voltage "VOLTS" will be that of the emergency bus when the EMER switch is turned ON and the BATT MASTR, ALTR NO 1 and ALTR NO 2 are turned OFF, otherwise the displayed voltage will be that of the TIE BUS.

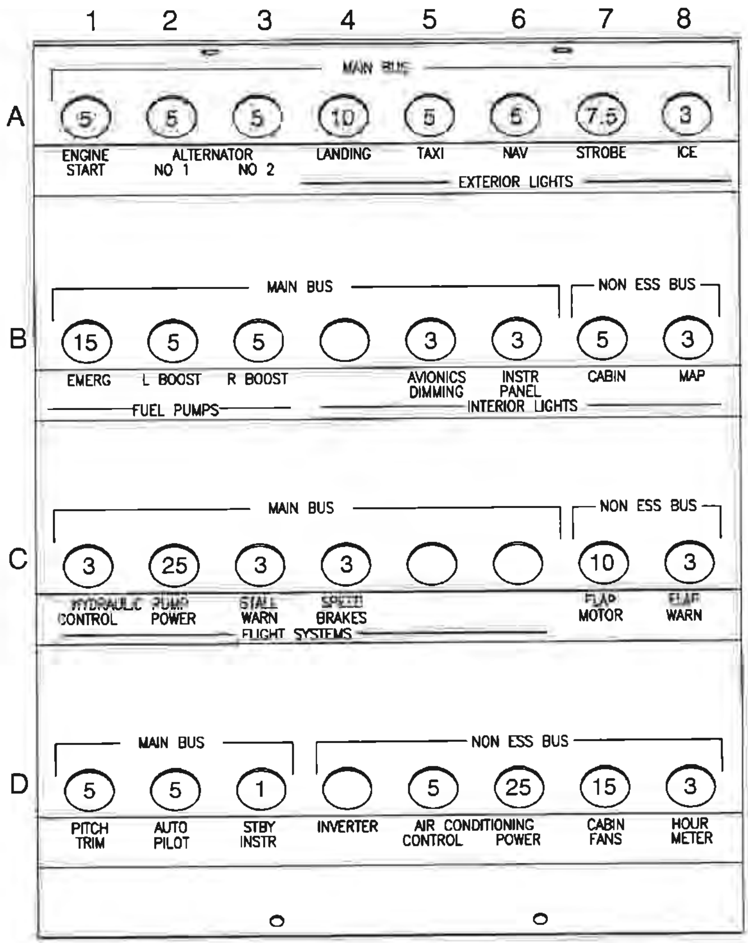
7.27 ELECTRICAL SYSTEM (continued)

The EMER bus is tied directly to the battery via a relay. The EMER bus provides power to the #1 PFD (in reversionary display mode), #1 Com/Nav/GPS, #1 AHRS, #1 ADC, the audio panel, the emergency bus voltage indication, a subset of engine parameters, landing gear position indications, the Cabin Dump system, and the standby instrument. The following parameters on PFD1 will display invalid while operating exclusively on the EMER bus: Manifold Pressure, Oil Pressure, Cabin Altitude, Cabin Differential Pressure, Vacuum, Nav2/Com2, DME, XPDR1 and XPDR2. The flaps will not function and the indication will correspond to the value present when the complete electrical failure occurred. The landing gear must be extended using the Emergency Landing Gear Extension procedure in Section 3.5p.



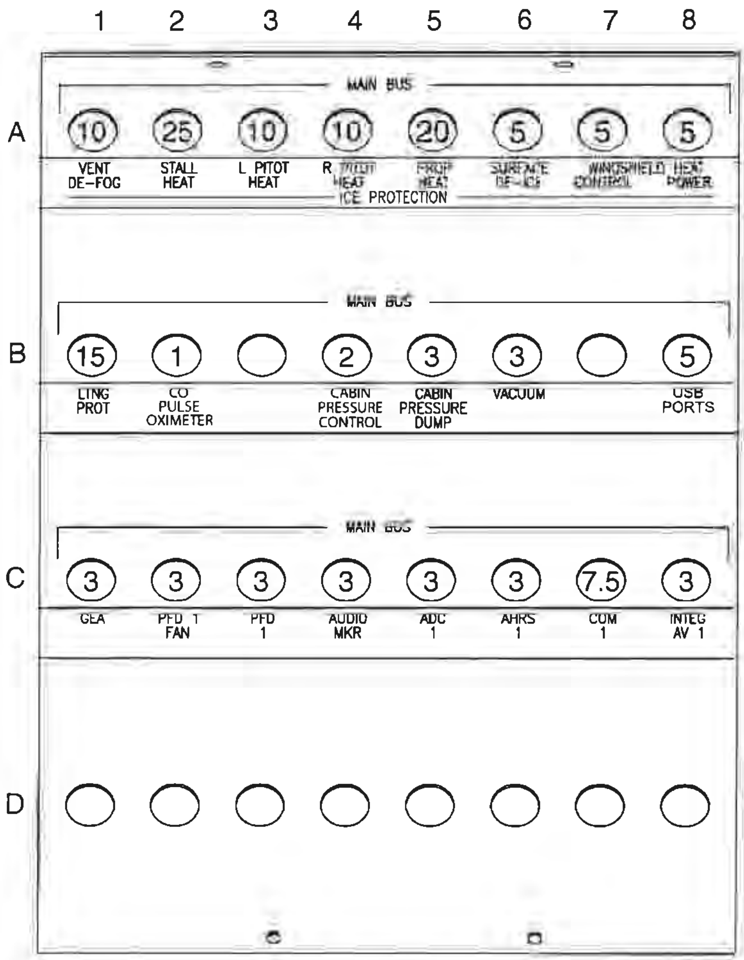
OVERHEAD SWITCH PANEL
Figure 7-17

7.27 ELECTRICAL SYSTEM (continued)



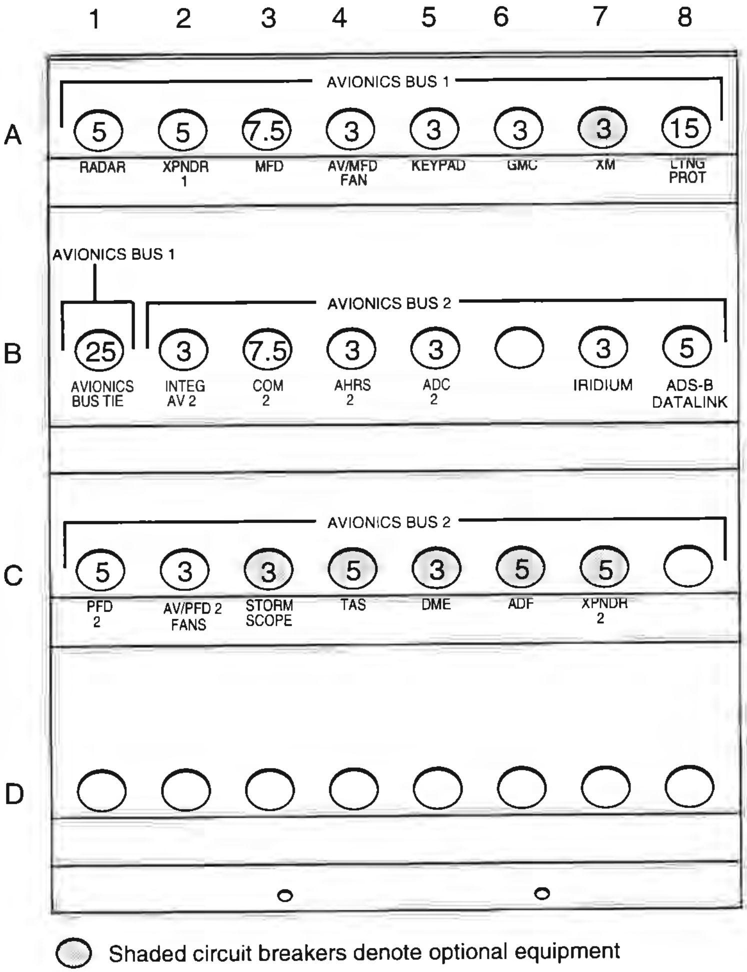
CIRCUIT BREAKER PANELS
(Pilot's Side - Forward, Typical)
Figure 7-19

7.27 ELECTRICAL SYSTEM (continued)



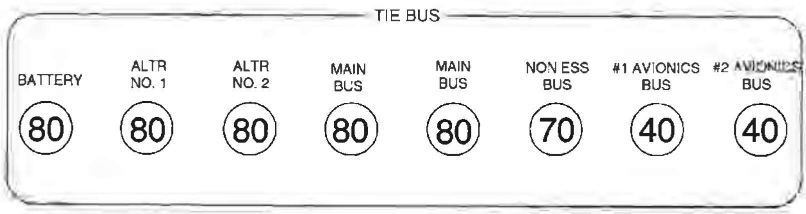
CIRCUIT BREAKER PANELS
(Pilot's Side - Aft, Typical)
Figure 7-19 (continued)

7.27 ELECTRICAL SYSTEM (continued)



CIRCUIT BREAKER PANELS
(Copilot's Side, Typical)
Figure 7-19 (continued)

7.27 ELECTRICAL SYSTEM (continued)



CIRCUIT BREAKER PANELS
(Tie Bus)
Figure 7-19 (continued)

7.29 INSTRUMENT PANEL

The instrument panel is designed to accommodate the flight instruments and the required power plant instruments.

All the high current tie bus input and feeder circuit breakers are located on the lower right section of the instrument panel.

See Figure 7-21.

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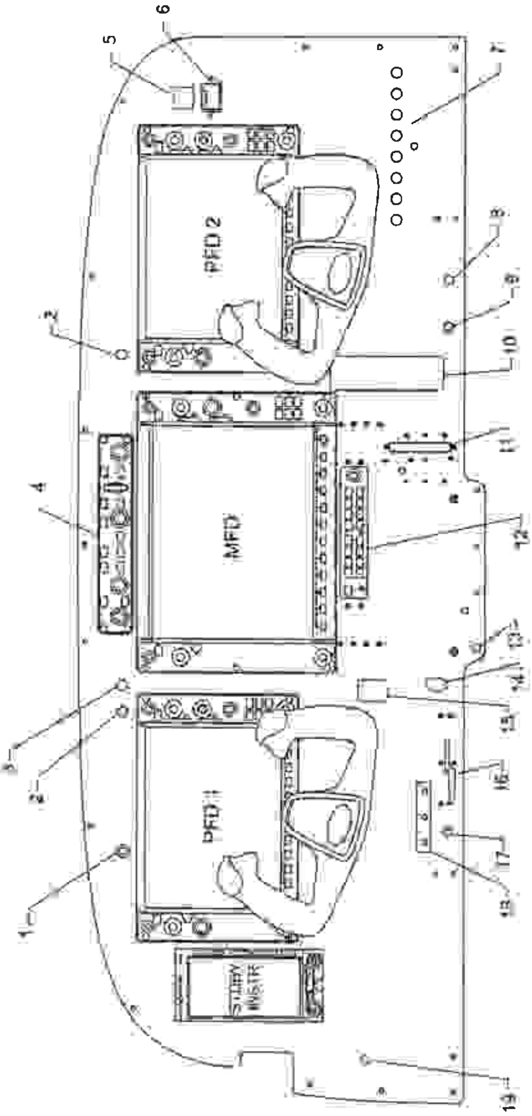
7.29 INSTRUMENT PANEL (continued)



1. Stall Test Switch
2. Display Backup Switch
3. Level Mode (LVL) Switch
4. Autopilot Controller
5. ELT Switch
6. Hour Meter
7. Tie Bus Circuit Breakers
8. Cabin Temperature Control
9. Defrost Switch
10. Environmental/De-Ice Switch Panel
11. Flap Position Selector
12. GMA350 Audio Panel
13. Emergency Gear Extension
14. Landing Gear Selector
15. Pulse Oximeter
16. Fuel Selector
17. Parking Brake
18. Lighting Dimming
19. Cabin Pressurization Control

INSTRUMENT PANEL (Typical)
Figure 7-21

7.31 PITOT STATIC SYSTEM

Pitot pressure for the airspeed indicators is sensed by heated pitot heads installed on the bottom of the left and right wings and is carried through lines within the wing and fuselage to the two Air Data Computers (ADC). Static pressure for the pilot's ADC and standby altimeter and airspeed indicators is sensed by static source ports on each side of the rear fuselage forward of the elevator. Co-located static ports are used for the co-pilot's ADC. Static pressure for the alternate static system and pressurization system are sensed by separate static ports located on the bottom of the aircraft just aft of the entry door.

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 ADC and standby altimeter and airspeed are vented to alternate static ports 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.

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 systems can be drained through separate drain valves located on both the right and left lower side panels next to the crew seats. Three drain valves exist on the pilot side. The forward two drain valves are the pilot static drains and the aft drain valve is the pilot pitot drain. Two drain valves exist on the copilot side. The forward drain valve is the copilot pitot drain, the aft drain valve is the copilot static drain.

The heated pitot heads, which alleviate problems with icing and heavy rain, are standard equipment. The switch for pitot heat is located on the environmental/de-ice switch 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.

7.33 ENVIRONMENTAL SYSTEM (Refer to Figure 7-23)

The environmental system consists of:

(a) A compressor bleed air and conditioning system.
(b) The ventilating air system.
(c) A supplemental electric cabin heater.
(d) An air conditioning system.
(e) The cabin air distribution system.
(f) The pressurization and control system.

Switches to control and regulate the various systems, except the pressurization system, are located on the environmental/de-ice switch panel to the lower right of the MFD.

Compressor bleed air from the engine turbochargers supplies air for heating the cabin during flight and ground operations and for pressurization. The bleed air is first routed through an air-to-air heat exchanger, and then into the cabin through the lower left and right cabin side panel ducts. The heat exchanger utilizes ambient ram air to cool the bleed air, or hot air from an exhaust shroud to heat the bleed air. 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 heat exchanger.

The cabin pressurization system isobaric outflow valve provides the means by which smoke and impurities are vented from the cabin.

Cabin ventilating air during ground or unpressurized low altitude flight operations is provided by the ambient ram air source to the bleed air heat exchanger. 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 DE-FOG switch ON. Incoming ventilating air can be heated by mixing it with hot air from the exhaust shroud.

NOTE

If electric supplemental heat is not used, maximum cabin heat for ground operations and unpressurized low altitude flight will be obtained with the CABIN PRESS control knob full out.

7.33 ENVIRONMENTAL SYSTEM (Refer to Figure 7-23) (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 bleed 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 pressure 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 DE-FOG and AUXILIARY CABIN HT 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 DE-FOG circuit breaker located on the pilot's aft circuit breaker panel row A, position 1. 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 approximately 40 amps. Operation is limited to airplanes with both alternators functioning.

Cabin air conditioning is provided by a vapor cycle system. The 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.

7.33 ENVIRONMENTAL SYSTEM (Refer to Figure 7-23) (continued)

The AIR COND and BLOWER HIGH & LOW switches, located as part of the environmental/de-ice switch panel, are used to control the air conditioning system.

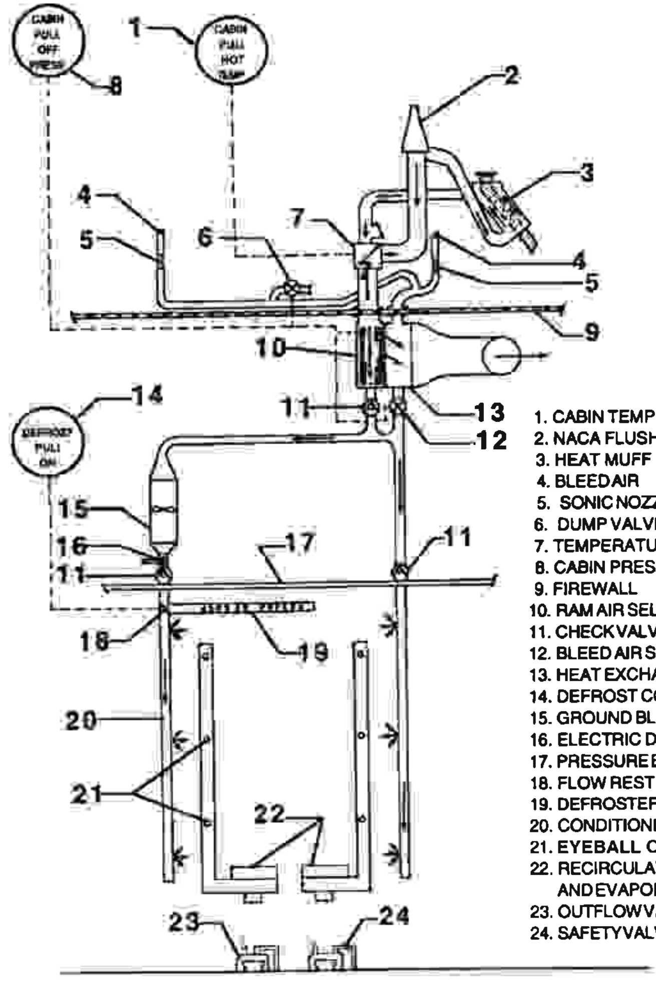
When the AIR COND switch is selected ON, the compressor belt drive is electrically clutched, the condenser blower motor relay is closed, and both recirculation blowers are activated. The recirculation blowers can be operated independently of the air conditioner by selecting the BLOWER HIGH or LOW on. In either situation, the BLOWER switches are used only to select a HIGH or LOW recirculation blower motor speed. When selecting between BLOWER HIGH and BLOWER LOW 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 pilot's forward circuit breaker panel.

The HFC 134A refrigerant 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 compressor clutch.

The cabin pressurization and control system consists of two electromechanical outflow valves, electronically operated vacuum solenoid valve, surge tank, associated interconnecting plumbing and wiring and control software. Cabin altitude, differential pressure, and rate of change are displayed on the MFD. Should cabin pressure altitude exceed 10,000 feet, the red CABIN ALT 10000 CAS message will illuminate to warn the pilot.

Refer to paragraph 7.35, BLEED AIR, CONDITIONING AND PRESSURIZATION SYSTEM, for a more complete description of the pressurization system and use of related controls and switches.

7.33 ENVIRONMENTAL SYSTEM (Refer to Figure 7-23) (continued)



1. CABIN TEMP CONTROL
2. NACA FLUSH INLET
3. HEAT MUFF
4. BLEED AIR
5. SONIC NOZZLE
6. DUMP VALVE
7. TEMPERATURE CONTROL VALVE
8. CABIN PRESSURE CONTROL
9. FIREWALL
10. RAM AIR SELECTOR VALVE
11. CHECK VALVE
12. BLEED AIR SHUTOFF VALVE
13. HEAT EXCHANGER
14. DEFROST CONTROL
15. GROUND BLOWER
16. ELECTRIC DUCT HEATER
17. PRESSURE BULKHEAD
18. FLOW RESTRICTOR
19. DEFROSTER
20. CONDITIONED AIR
21. EYEBALL OUTLETS (6)
22. RECIRCULATION BLOWERS AND EVAPORATORS
23. OUTFLOW VALVE
24. SAFETY VALVE

ENVIRONMENTAL SYSTEM
Figure 7-23

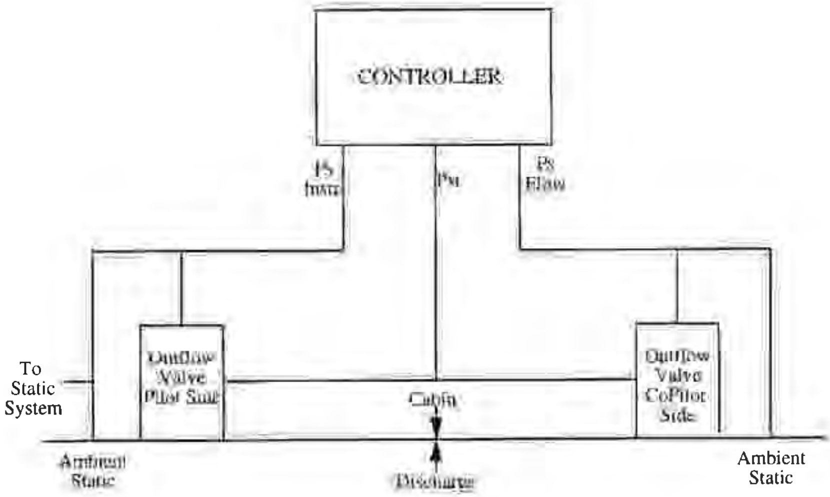
7.35 BLEED AIR, CONDITIONING AND PRESSURIZATION SYSTEM

Air for cabin pressure is obtained from the engine turbocharger induction air system through two sonic venturi tubes. Bleed air is routed through the bleed air heat exchanger for the temperature conditioning to provide the desired cabin comfort level. Ram ambient air is routed across the heat exchanger to cool the bleed air, and hot ambient air from the heat muff is routed across the heat exchanger to heat the bleed air. Mixtures of ram ambient and heated ambient air may also be selected.

Cabin air is controlled by a push-pull knob labeled CABIN PRESS located left of the control wheel on the pilot's instrument panel. Bleed air for pressurizing the cabin is provided when the control is fully in. Unpressurized ambient air is provided for ventilating the cabin when the control is fully out. This control operates three valves: the bleed air shutoff valve, the bleed air dump valve, and the ram air selector valve. When pushed fully in, the bleed air shutoff valve is open, the bleed air dump valve is closed, and the ram air selector valve is positioned to route ambient air across the bleed air heat exchanger. When the control is pulled completely out, the bleed air shutoff valve is closed, the bleed air dump valve is open, and the ram air selector valve is positioned to route ambient air into the conditioned air ducts through the check valve and into the cabin.

With the CABIN PRESS push-pull knob fully IN, the only action required by the pilot during normal operation is to input the destination airport elevation by selecting the TMR/REF softkey on either PFD and entering the destination airport elevation in the DEST ELV field. If a new destination elevation is not entered, the last value entered will be used, which could result in the airplane landing while still pressurized. Cabin pressurization system displays are incorporated into the MFD, or PFD in Reversionary Mode.

7.35 BLEED AIR, CONDITIONING AND PRESSURIZATION SYSTEM (continued)

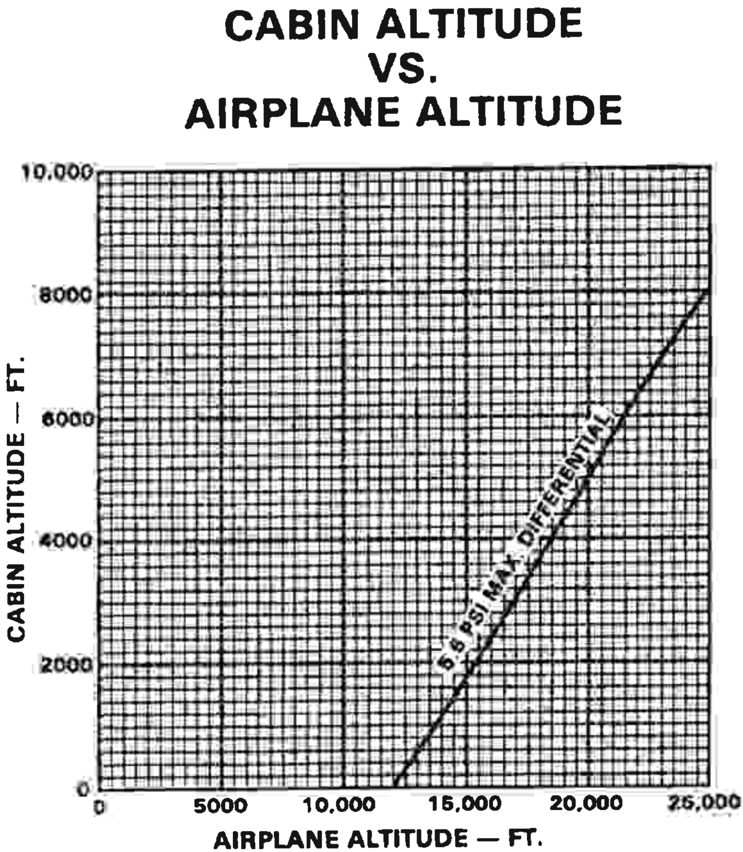


PRESSURIZATION CONTROL SCHEMATIC
Figure 7-25

A CABIN ALT 10000 warning CAS message is illuminated when the cabin altitude is above 10,000 feet. Cabin pressure is automatically regulated to 5.5 psi pressure differential. Should the CPCS controller fail, each outflow valve has a mechanical differential pressure limiter that will maintain a maximum of 5.6 psid. Should the cabin differential pressure remain above 5.6 psid for greater than 30 seconds, or if it reaches 5.8 psid, a Master Warning will be triggered, with a red DIFF PSI indication (on the MFD) and a repeating aural triple chime. The landing gear squat switch, on the left main landing gear, prevents the cabin from being pressurized while the airplane is on the ground. The CABIN PRESS DUMP/NORM switch, when set to DUMP, electrically opens a solenoid valve in the controller, which opens both outflow valves and rapidly dumps cabin pressure to ambient pressure.

For complete instructions on the operation of the cabin pressurization system, refer to Section 4, Normal Procedures.

7.35 BLEED AIR, CONDITIONING AND PRESSURIZATION SYSTEM (continued)



CABIN ALTITUDE vs. AIRPLANE ALTITUDE
Figure 7-27

7.35 BLEED AIR, CONDITIONING AND PRESSURIZATION SYSTEM (continued)

For unpressurized flight the CABIN PRESS control should be pulled fully out. Setting the CABIN PRESS DUMP/NORM switch to DUMP will provide maximum airflow through the cabin. Cabin temperature will continue to be controlled by the CABIN TEMP control.

For complete instructions on pressurization malfunctions, refer to Section 3 - Emergency Procedures.

7.37 PULSE OXIMETER

The Pulse Oximeter / Carbon Monoxide Detector is designed to detect, measure, and display cockpit carbon monoxide (CO) level. It provides a visual alert to the crew before the cockpit CO level reaches a critical level. It enables the occupants of the aircraft to monitor their physiological condition using a pulse oximeter installed in the cockpit's instrument panel. The sensor measures SPO2 (oxygen saturation percentage in blood) and heart rate.

The cockpit CO level is displayed in the PULSE OXIMETER field of the MFD's Engine Page.

The installation consists of a single pulse oximeter/carbon monoxide detector instrument operating on aircraft DC power. "CO LVL HIGH" CAS caution will be annunciated on the PFDs whenever carbon monoxide level reaches 50 parts per million (PPM) or greater. There is a one minute delay at startup to stabilize the sensor before the unit will accurately sense CO levels. The unit provides:

• CO detector from	20 - 999 PPM
• Heart Rate	40-240 BPM
• SPO2 Blood Oxygen Level	70-100%

It is good operating procedure to Check SPO2 (blood oxygen level) periodically based on cabin altitude:

When Crossing 10,000' and every 30 minutes thereafter
Crossing 12,500' and every 25 minutes thereafter
Crossing 14,000' and every 20 minutes thereafter
Crossing 18,000' and every 15 minutes thereafter
Crossing 22,000' and every 10 minutes thereafter
Crossing 25,000' and every 5 minutes thereafter

7.39 VACUUM SYSTEM

Vacuum for the deice 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 vacuum transducer, an inlet air filter, and a manifold.

The two vacuum regulators are mounted on the forward pressure bulkhead in the forward baggage compartment

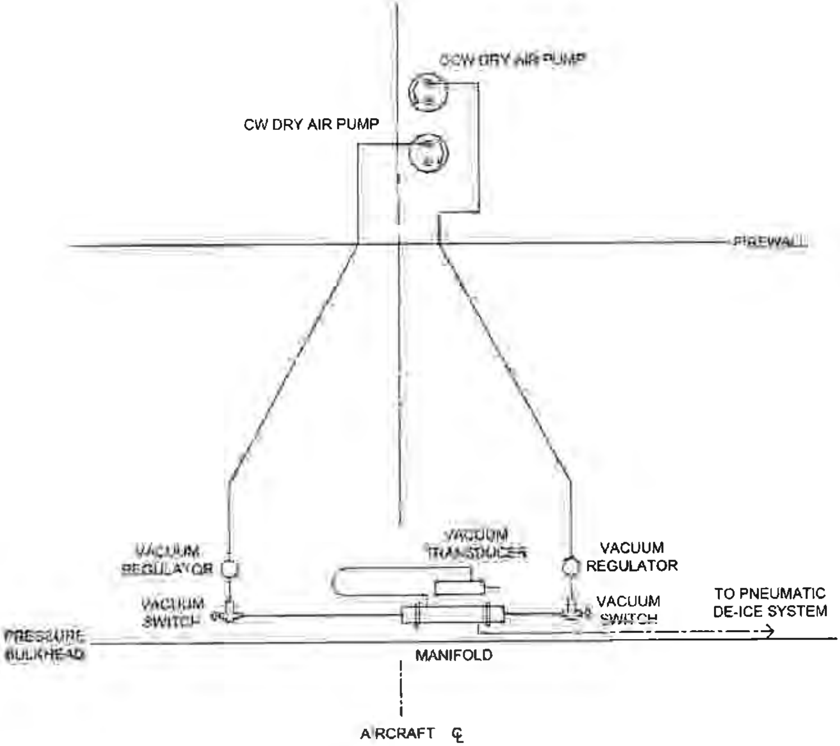
A vacuum indication on the MFD and independent advisory VACUUM 1 FAIL and VACUUM 2 FAIL CAS messages provide information to the pilot regarding the operation of both pumps. When both pumps are operating, neither CAS message is illuminated. The VACUUM 1 FAIL message will illuminate should the counterclockwise rotating (upper) pump fail, while the VACUUM 2 FAIL message will illuminate should the clockwise rotating (lower) pump fail.

Any decrease in system vacuum may indicate a dirty filter, dirty screens, sticking vacuum regulator, or a leak in the system. If both vacuum pumps fail or anytime the vacuum decreases below 2.0 in. Hg the vacuum indication turns amber and a double aural chime sounds.

Upon completion of the flight, all system abnormalities or malfunctions should be checked by a mechanic, and necessary repairs made, prior to further pressurized flight.

Operators of airplanes equipped with wing and tail deicers should refer to Section 9, Supplement 2, for additional information concerning the vacuum system.

7.39 VACUUM SYSTEM (continued)



VACUUM SYSTEM
Figure 7-29

7.41 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.

Seat belts and shoulder harnesses shall be worn during movement on the surface, takeoff, landing and during an emergency situation.

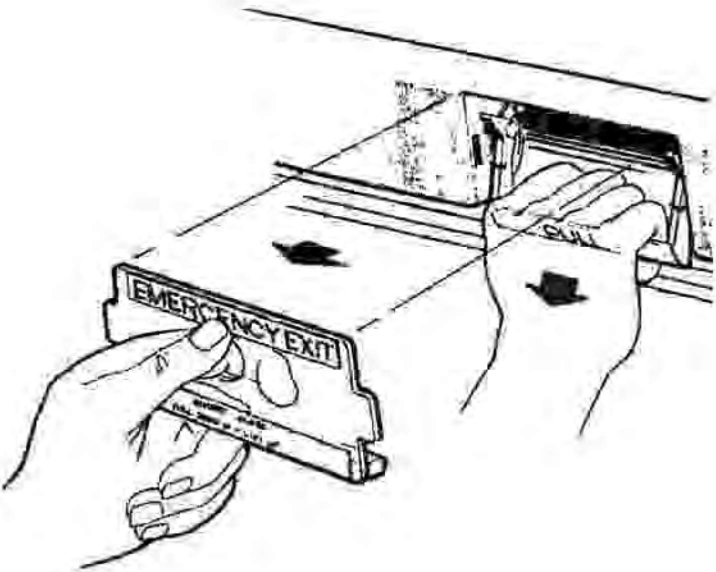
Standard cabin features include map pockets, cup holders, sun visors, and a baggage restraint net behind the rear seats.

Two combination instrument panel flood/map lights are provided forward, and four passenger reading lights are provided aft. Two cabin entrance flood lights are located above the door as well as a single light in the aft door jamb. Two additional lights are located in the aft baggage area. Each of these five lights and a light timer is activated whenever the lower cabin entrance door is opened. The lights remain on for 10-minutes then automatically shut off. A black push-button switch labeled BAGGAGE, located in the cabin just aft of the lower door, can be pressed to activate the lights for another 10-minute cycle. To preserve battery power the lower cabin door should not be left open for extended periods of time.

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.

A 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.

7.41 CABIN FEATURES (continued)



EMERGENCY EXIT
Figure 7-31

Optional passenger oxygen generators and masks are available and, if installed, are located in a drawer under the right aft facing seat.

Crew oxygen is located under the copilot's seat, readily available to either crew member. An amber OXYGEN GEN ON message illuminates when any of the three oxygen generators have been activated. The CAS message remains illuminated with the battery switch ON, until the system is serviced.

An optional fire extinguisher is available and, if installed, is located on the cabin floor behind the wing spar on the right side of the cabin.

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. The cabin must be unpressurized to open the emergency exit.

7.43 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 white DOOR AJAR message will illuminate when the engine is not running or a red CAS message when the engine is running..

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).

7.45 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.

7.47 STALL WARNING

An approaching stall is indicated by a "STALL. STALL." aural warning. 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 aural alert to sound five to ten knots above the stall speed.

Activation of the STALL TEST switch during ground operation will produce an aural STALL..STALL stall warning alert, verifying proper stall warning operation. If the autopilot were to be engaged during the stall warning test, it will disengage once the STALL WARN TEST switch is depressed. The amber STALL WARN FAIL caution message indicates that the lift computer and/or lift transducer has failed.

A graph showing stall speeds at various angles of bank is contained in Section 5.

7.49 EMERGENCY LOCATOR TRANSMITTER

The Emergency Locator Transmitter (ELT) operates on self-contained batteries and is located in the aft fuselage section. It is accessible through a cover on the bottom right side of the fuselage.

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.

The ME-406 ELT (406 MHz), if installed, is equipped with a warning buzzer. This warning buzzer, which receives power from the ELT itself, is mounted in the tailcone. Whenever the ELT is activated the buzzer "beeps" periodically. The time between pulses lengthen after a predetermined transmitter "ON" time. The objective is to hear the buzzer from outside the aircraft while the engine is not running.

7.49 EMERGENCY LOCATOR TRANSMITTER (continued)

ARTEX ELT OPERATION (continued)

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.

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.

7.51 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 Starting Engines in Section 4.

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-46-350P. For complete maintenance instructions, refer to the PA-46-350P 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.

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 Approved 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 posted on Piper's website; www.piper.com. Depending on the nature of the release, material and labor allowances may apply. This information is provided to all Approved Piper Service Centers.

Service Letters deal with product improvements and servicing techniques pertaining to the airplane. They are sent to Piper Service Centers and, are also posted on Piper's website; www.piper.com. 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.

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-46-350P (see PA-46-350P Maintenance and Inspection Manuals). The PA-46-350P Inspection Manual contains appropriate forms, and all inspection procedures should be complied with by a properly trained, knowledgeable, and qualified mechanic at an Approved 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 progressive Inspection, 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 must be documented on a Form 337 and performed via field approval or Supplemental Type Certificate.

8.9 AIRPLANE FILE

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.

(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 FAA Form -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.

8.11 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

[illegible]

CAUTION

[illegible] the airplane when the controls are [illegible]

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.

(b) Taxiing

CAUTION

[illegible] engine above 1200 RPM with [illegible]

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.

8.11 GROUND HANDLING (continued)

(5) When taxiing over uneven ground / unpaved surfaces, avoid holes, ruts, and excessive taxi speeds.
(6) Avoid excessive taxi speed during turns.
(7) 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.

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.

8.11 GROUND HANDLING (continued)

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.

(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.

8.13 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 or high industrial pollution 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 is restricted to 500 hours, or on condition, whichever comes first.

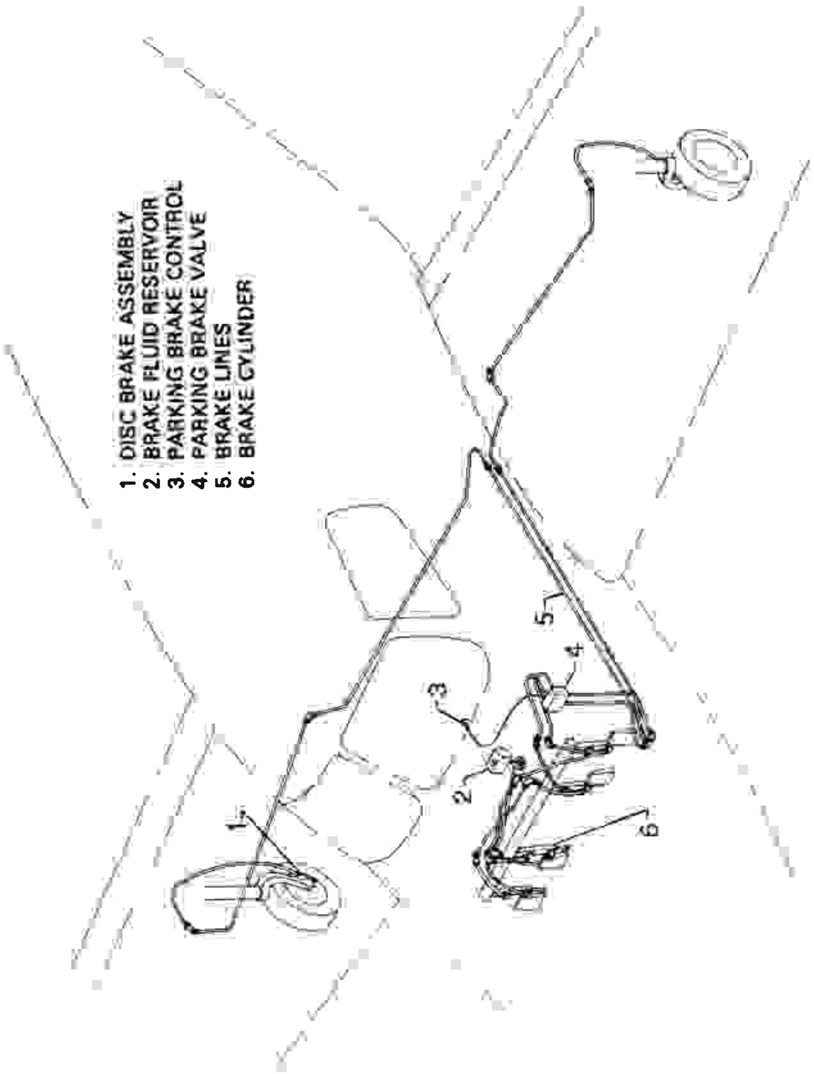
8.13 ENGINE INDUCTION AIR FILTER (Continued)

(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.

8.15 BRAKE SERVICE



BRAKE SYSTEM
Figure 8-1

8.15 BRAKE SERVICE (continued)

The brake system is filled with MIL-PRF-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 pads become excessively worn they should be replaced with new segments.

8.17 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. The fluid level should be checked periodically or every 100 hour inspection and replenished when necessary. Consult maintenance manual for instructions on hydraulic system reservoir servicing.

8.19 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 (empty weight of airplane plus full fuel and oil), until 3.4 +/- 0.25 inches of oleo piston tube is exposed, and the nose gear should show 1.7 +/- 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.

8.19 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 applying 2° of right rudder and verifying that the plane follows a straight line along the ground. 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.

8.21 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. To prevent corrosion, the surface should be cleaned and waxed periodically.

8.23 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.

8.25 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
91/96	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.

8.25 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-1-27686, 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.

8.25 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.

8.25 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.

8.27 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.

8.29 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, remove it from the aircraft, then recharge starting at a 3 amp rate and finishing with a 1.5 amp rate. Quick charges are not recommended.

8.31 EMERGENCY OXYGEN SYSTEM (OPTIONAL)

The optional emergency oxygen system must be serviced if used. The canister generators must be replaced with new units to restore the emergency system oxygen to a useable condition.

8.33 PRESSURIZATION SYSTEM

The Pressurization system goes through a Built-In Test upon power-up. If CPCS Fail or CPCS Fault the pressure controller has failed or lost communication. Refer to the PA-46-350P Maintenance Manual.

8.35 LUBRICATION

For lubricating instructions, a chart showing lubrication points and types of lubricants to be used, and lubrication methods, refer to the PA-46-350P Maintenance Manual.

8.37 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, magnetos 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-46-350P 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.*

8.37 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 automotive 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.

8.37 CLEANING (continued)

(d) Cleaning Windshield and Windows

[illegible]

[illegible]

(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 Plexiglas Polish and cleaner, conforming to Federal Specification P-P-560 or with kerosene.

[illegible]

[illegible]

(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. Deep scratches may lead to failure when pressurized.
(6) If a deep scratch or crack is found in any of the windshields or windows, do not pressurize cabin until serviced at authorized repair station.

(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.

8.37 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 PA-46-350P 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 Optional Surface Deicing Equipment

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.

8.37 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-46-350P Maintenance Manual.

8.39 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.)

8.39 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.

8.41 CLEANING GARMIN PFD AND MFD DISPLAYS

The Garmin Primary Flight Display (PFD) and Multi-Function Display (MFD) use a lens coated with a special anti-reflective coating that is very sensitive to skin oils, waxes and abrasive cleaners.

CAUTION

[illegible]

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 EMERGENCY OXYGEN SYSTEM

This supplement must be attached to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the Emergency Oxygen System 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
ERIC A. WRIGHT
ODA-510620-CE
PIPER AIRCRAFT, INC.
VERO BEACH, FLORIDA

DATE OF APPROVAL: April 10, 2015

SECTION 1 - GENERAL

This supplement supplies information necessary for the operation of the airplane when the optional Emergency Oxygen System is installed in accordance with FAA Approved Piper Data.

SECTION 2 - LIMITATIONS

The following placard is installed on the right cabin side panel, immediately forward of the copilot's air vent, and the right aft facing seat, aft of the air vent.

EMERGENCY OXYGEN

IN DRAWER UNDER SEAT PULL
MASK OUT OF DRAWER FULLY AT
FULL EXTENSION GIVE CORD A TUG
MAXIMUM DURATION = 15 MINS
SEE POH
NO SMOKING WHILE IN USE

SECTION 3 - EMERGENCY PROCEDURES

In the event that the emergency oxygen system is needed, proceed as follows:

Mask compartment(s) .... OPEN
Mask .... REMOVE and extend lanyard to full length; tug to activate generator. Unfold and don mask(s).
Flow Indicator(s) .... green area in bottom of accumulator INFLATES, indicating oxygen flow.
Cabin Altitude .... REDUCE to a safe altitude consistent with terrain before the 15 minute oxygen supply is fully depleted.

WARNING

No smoking while oxygen is in use. Remove oil and grease (including lipstick, chapstick, makeup, etc.) before using oxygen.

NOTE

Descent should be started as soon as possible in order to assure that flow rate remains adequate throughout the descent. Refer to SECTION 3 of the basic POH and FAA Approved AFM for emergency descent procedures. This system, once activated, cannot be turned off.

SECTION 4 - NORMAL PROCEDURES

Prior to each flight, turn on the master switch and check that the amber CAS message OXYGEN GEN ON is not illuminated. If the annunciator is illuminated, one or more of the oxygen generators should be replaced. In addition, check the oxygen masks and hoses for accessibility and condition.

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 OF THE EMERGENCY OXYGEN SYSTEM

The optional emergency oxygen system consists of three "two-man" chemical oxygen generators, which provide sufficient oxygen flow for six people, during a descent from 25,000 feet to 12,000 feet or below, for a 15 minute time period. Once an oxygen generator is activated, it will continue to produce oxygen until depleted; no shut-off provisions are provided. Each generator has two oxygen masks connected, either of which is capable of activating the generator. The masks are accessible from each crew/passenger seat.

The system consists of two major assemblies, the crew assembly and the passenger assembly.

The crew assembly is located under the copilot's seat and contains one two-man oxygen generator and two masks mounted on a sliding tray. The tray is accessible from the aisle between the pilot's and copilot's seats and is pulled out from under the seat to expose the two masks. Each mask is connected to the generator with a clear plastic tube and lanyard. The tube delivers oxygen to the mask when the lanyard is pulled out, releasing the firing mechanism, which activates a chemical reaction within the oxygen generator. Each generator has two over-pressure relief valves to prevent excessive pressure in the generator, in the event of a malfunction or delivery tube restriction. When activated, the generator delivers oxygen to both attached masks simultaneously.

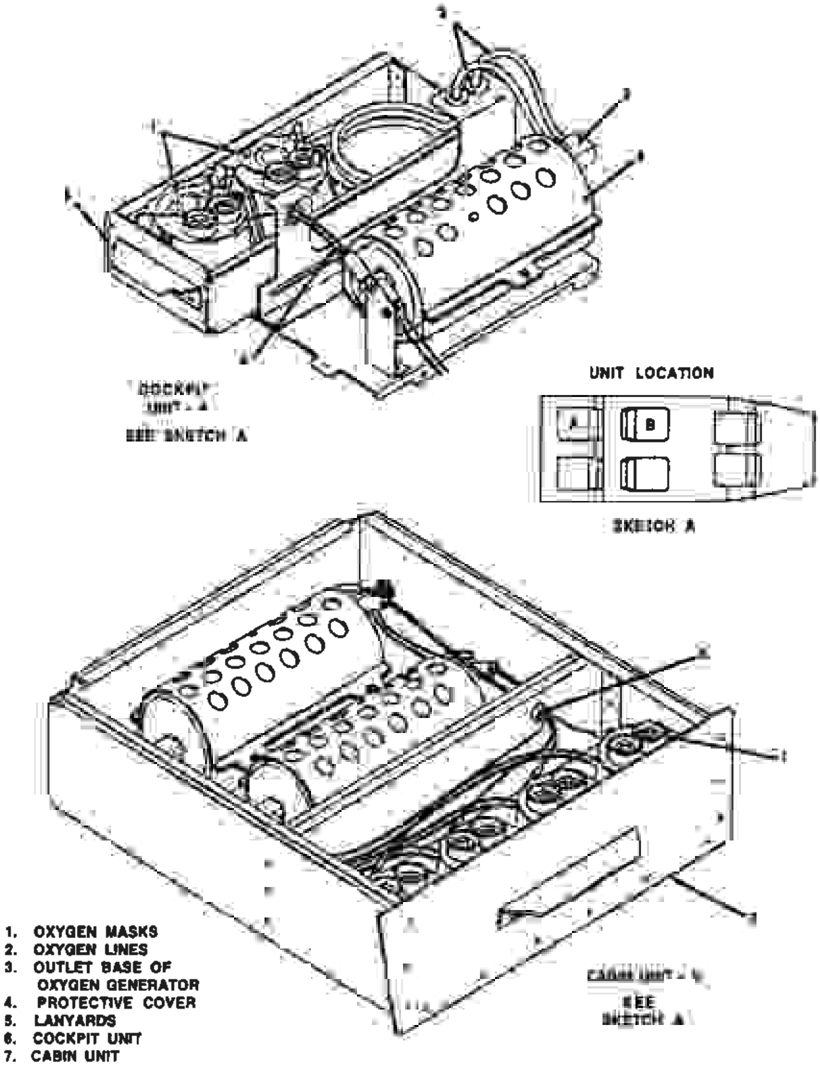
SECTION 7 - DESCRIPTION AND OPERATION OF THE EMERGENCY OXYGEN SYSTEM (continued)

The passenger assembly is located in the drawer in the right aft facing passenger seat base. The drawer is accessible from the aft side of the base, under the seat bottom and is pulled aft to expose the four masks. The two inboard masks are attached to one generator, while the two outboard masks are attached to the second generator. Either of the four masks will reach any of the four passenger seat locations. Activation of the generators is the same as the crew installation; pulling out the lanyard attached to the mask. Operation of the passenger provisions are identical to that of the crew.

Placards are provided on the side panel outboard of the copilot's seat and the right aft facing seat, stating the location and operation of the oxygen system, and that smoking is prohibited while oxygen is in use.

An amber OXYGEN GEN ON CAS message is provided to inform the crew whenever either of the three oxygen generators has been activated. The annunciator light is operated by a micro switch adjacent to each generator firing mechanism. The light will continue to be illuminated until the generator is replaced with a full one with an untripped firing mechanism.

SECTION 7 - DESCRIPTION AND OPERATION OF THE EMERGENCY OXYGEN SYSTEM (continued)



OXYGEN SYSTEM INSTALLATION
Figure 7-1

PILOT'S OPERATING HANDBOOK
AND
FAA APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 2
FOR
ICE PROTECTION SYSTEM
(APPROVED FOR FLIGHT INTO KNOWN ICING CONDITIONS)

This supplement must be attached to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when Ice Protection System 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

ERIC A. WRIGHT
ODA-510620-CE
PIPER AIRCRAFT, INC.
VERO BEACH, FLORIDA

DATE OF APPROVAL: April 10, 2015

SECTION 1 - GENERAL

This supplement provides information necessary for the operation of the Piper PA-46-350P aircraft for flight into known icing conditions.

Icing conditions can exist when:

- The outside air temperature (OAT) is 5°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 PA-46-350P 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 section titled Visual Cues for Supercooled Large Droplet (SLD) Conditions in this supplement.

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 as soon as possible.

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 accumulation of ice on the propeller spinner further aft than normally observed.
- 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.

SECTION 2 - LIMITATIONS

REQUIRED EQUIPMENT

The Piper PA-46-350P airplane is approved for flight into light to moderate icing conditions as defined by 14 CFR Part 25, Appendix C, only if the following required ice protection systems and equipment are installed and functioning properly.

(1) Pneumatic wing and empennage boots and SURF DEICE ON and SURF DEICE FAIL CAS messages.
(2) Wing ice detection light.
(3) Electrothermal propeller deice pads on the propeller blades and PROP HEAT FAIL CAS message.
(4) Electrically heated windshield and WDSHLD OVRTMP CAS message.
(5) Heated stall warning lift detector.
(6) Heated pitot heads and L/R PITOT HT FAIL CAS messages.
(7) Dual alternators.
(8) Dual vacuum pumps and VAC PRESS LOW CAS message.
(9) Alternate static source.
(10) All equipment required for night IFR flight.

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, ice, snow or slush adhering to the following areas:

1. Wing leading edge
2. Wing upper surface
3. Horizontal stabilizer
4. Control surfaces
5. Windshield
6. Propeller blades
7. Engine inlets

SECTION 2 - LIMITATIONS (continued)

ENVIRONMENTAL CONDITIONS (continued)

With frost, ice, snow or slush adhering to the following areas: (continued)

8. Top of fuselage
9. Static ports
10. Windshield
11. 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) 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.

MINIMUM SPEED IN ICING CONDITIONS

Minimum speed during flight in icing conditions with the flaps up is 130 KIAS.

FLAP SETTINGS FOR OPERATIONS IN ICING CONDITIONS

Flaps must be up when holding in icing condition, maximum flap extension with **ANY** ice accumulation on the airframe is limited to 20°.

MINIMUM APPROACH SPEED WITH FAILED SURFACE DE-ICE SYSTEM

A minimum approach speed of 105 KIAS should be used with the flaps in the 0° (fully retracted) position.

MINIMUM APPROACH SPEED WITH OPERATIONAL SURF DE-ICE SYSTEM

A minimum approach speed of 95 KIAS should be used with the flaps in the 20° position.

SECTION 2 - LIMITATIONS (continued)

ENVIRONMENTAL CONDITIONS (continued)

MINIMUM OUTSIDE AIR TEMPERATURE FOR BOOT OPERATION

Operation of the pneumatic deice system at temperatures below -40° may result in damage to the deicer boots.

WINDSHIELD HEAT CHECKS

Ambient temperature of the windshield must be less than 115°F (46° C).

The engine must be running.

WSHLD H1GH operations limited to 20 seconds during ground operations and system tests.

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).
- Elevator bridging is encountered.
- Frequent pitch trim activation during straight and level flight as indicated by trim wheel movement and illumination of the TRIM annunciation.
- Conditions developed which cause pitch, roll or yaw servo to provide a sustained force as indicated by ELE, AIL or RUD alert annunciations in the AFCS system status field on the PFD and/or pilot qualitative evaluations.

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 mistrim or trim-in-motion (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)

CAUTION

[illegible]

STALL WARNING SYSTEM

Since stall buffet and stall speeds increase with intercycle and residual ice accumulated on the boots and unprotected surfaces, the stall warning system may not be accurate and should not be relied upon.

OAT PROBES

At the worst case condition (highest derived airspeed) presented in the performance charts of this POH and with a fully iced over OAT probe, which assumes the measured total temperature equals static temperature, the maximum indicated temperature error calculated is 4°C less than actual.

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.
PRESSURIZED LANDING NOT APPROVED.

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.

NOTE

Depending on system software version and optional systems installed, not all annunciator system (CAS and Non-CAS) messages listed in this handbook are applicable.

ICE PROTECTION SYSTEM ANNUNCIATIONS

WARNING Messages - Red - Repeating Aural Triple Chime

Message	Cause
ALTR 1 FAIL	ALTR NO 1 switch is turned ON and the alternator has failed.
ALTR 2 FAIL	ALTR NO 2 switch is turned ON and the alternator has failed.
PITOT HEAT FAIL	Both pitot heats inop.
WDSHLD OVRTMP	Windshield temperature exceeds 170° F or the windshield temperature sensor has failed.

SECTION 3 - EMERGENCY PROCEDURES (continued)

ICE PROTECTION SYSTEM ANNUNCIATIONS (continued)

CAUTION Messages - Amber - Double Aural Chime

Message	Cause
L PITOT HT FAIL	Left pitot heat has failed.
R PITOT HT FAIL	Right pitot heat has failed.
PITOT HEAT OFF	Pitot heat has not been selected ON (no chime accompanies this CAS message).
PROP HEAT FAIL	A fault has developed in the prop heat system or current is under 16.0 amps.
STALL WARN FAIL	The stall warning lift computer and/or lift transducer has failed.
SURF DEICE FAIL	Surface de-ice system has failed.

ADVISORY Messages - White - Single Aural Chime

Message	Cause
SURF DEICE ON	Surface de-ice system is selected ON and power is being applied to the SURF DE-ICE timer.
VACUUM 1 FAIL	Vacuum 1 is below approximately 2.0 in.-Hg.
VACUUM 2 FAIL	Vacuum 2 is below approximately 2.0 in.-Hg.
STALL HEAT ON	Stall Heat is operating and OAT is greater than, or equal to 5°C.

SECTION 3 - EMERGENCY PROCEDURES (continued)

ICE PROTECTION SYSTEM ANNUNCIATIONS (continued)

Erroneous or Loss of Warning/Caution CAS Messages

Indication: Displayed information shows an abnormal or emergency situation without the associated CAS message present.

NOTE

Loss of a CAS message may be indicated when engine or fuel displays show an abnormal or emergency situation and the CAS message is not present. An erroneous CAS message may be identified when a CAS message appears which does not agree with other displays or system information.

1. If a CAS message appears, treat it as if the condition exists.

NOTE

See Section 3.1 of this handbook for a list of CAS Warning, Caution and Advisory messages that may be inoperative.

2. If a display indicates an abnormal condition but no CAS message is present, use other system information, such as engine displays, fuel totalizer quantity and flow, to determine if the condition exists. If it cannot be determined that the condition does not exist, treat the situation as if the condition exists.

3.29 ELECTRICAL FAILURES

Single Alternator Failure.

Indication: **Master Warning Indication; [redacted] or [redacted] message; Repeating aural triple chime:**

NOTE

With a single alternator failure, the VOLTS indication will turn red anytime total tie bus voltage is below 25 VDC.

Verify failure ....CHECK Amperage Indications
Electrical Load (if VOLTS indication
in red range) .... REDUCE until total load is less than 75 amps & VOLTS indication is out of red range

Failed ALTR NO 1 or 2 Switch .... OFF
Failed ALTERNATOR NO 1 or 2 Circuit Breaker .CHECK and RESET as required
(Located on the pilot's forward circuit breaker panel, row A, positions 2 and 3)
Failed ALTR NO 1 or 2 Switch (after OFF at least one second) ....ON

If power not restored:
Failed ALTR Switch .... OFF
Amperage 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.** Effort should be taken to keep the electrical load under 75 amps, however under certain circumstances the load may exceed 75 amps when large momentary loads such as landing gear are used in combination with other required equipment. The electric cabin heater, cabin recirculation blowers, and position, strobe, and landing lights should not be used unless absolutely necessary.

3.29 ELECTRICAL FAILURES (continued)

Dual Alternator Failure

Indication: **Master Warning Indication; [redacted] and [redacted] messages; Repeating aural triple chime:**

NOTE

With a dual alternator failure, the VOLTS indication will turn red anytime total tie bus voltage is below 24 VDC.

Verify failure .... Check Amperage Indications
ALTR NO 1 and 2 Switches .... OFF
ALTERNATOR NO 1 and 2 Circuit Breakers .... CHECK and RESET as required
(Located on the pilot's forward circuit breaker panel, row A, position 2 and 3)
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 NO 1 or 2 Switch .... ON
Failed ALTR NO 1 or 2 Switch .... OFF
Electrical Load .... MAINTAIN LESS THAN 75 AMPS
Amperage Indication .... MONITOR
Exit and avoid icing conditions.

If neither alternator resets:
ALTR NO 1 and ALTR NO 2 Switches .... OFF
EMER Switch .... Verify OFF
BATT MASTR Switch .... Verify ON
Electrical Load .... REDUCE TO MINIMUM (per load shed procedures as shown)

3.29 ELECTRICAL FAILURES (continued)

↓

NOTE

To have 30-minutes of battery power remaining after failure of both alternators, the load shed procedure must be completed within 3-minutes. It is advised to start the load shedding procedure as soon as conditions permit. Items that are not shown, such as standby instrument (provided it has sufficient internal battery charge), are allowed to run continuously and still meet the 30-minute requirement. After a 3-minute load shed procedure, the remainder of the flight (for 30-minute battery life) consists of a 22-minute *CRUISE Segment* and a 5-minute *LANDING Segment*.

Load-shed procedure (for 30-minutes of battery life):
CRUISE Segment:

CAUTION

Turning off the AV BUS MASTR switch removes power from all equipment on Avionics Bus 1 and Avionics Bus 2, some of which may be desired. Care should be exercised when deactivating certain items. Any items that remain ON or are activated beyond the usages shown may reduce the battery life to less than 30-minutes.

AV BUS MASTR Switch..OFF
INVERTER Circuit Beaker..PULL
(Located on the pilot's forward circuit breaker panel, row D, position 4.
ENVIRONMENTAL/DE-ICE SWITCH PANEL Switches........All OFF

↓

3.29 ELECTRICAL FAILURES (continued)

If optional ice protection systems are installed and icing conditions are present:

R PITOT HEAT Circuit Breaker ....PULL
(Located on the pilot's aft circuit breaker panel, row A, position 4.)
PITOT HEAT Switch. ....ON
SURF DE-ICE Switch.......................................2-Cycles Usage
ICE LIGHT Switch..1-Minute Usage

PITOT HEAT Switch (if not in icing)................................VERIFY OFF
EMERG FUEL PUMP Switch.. OFF
LANDG LIGHT .... OFF
TAXI LIGHT/PULSE Lights.. OFF
NAV LIGHTS .... OFF
STROBE LIGHTS/FIN STROBE .... OFF
SWITCH/PANEL/AVIONICS Dimmers ....LOWEST USABLE SETTING
COM 1 Transmit ....1-Minute Usage

NOTE

Operating the #1 Transponder will still allow for 30 minute battery life. Activating any other additional electrical equipment may shorten battery life to less than 30-minutes.

If additional avionics are desired (such as #1 transponder):
All copilot sidepanel circuit breakers ....PULL
AV BUS MASTR Switch ....ON
Desired equipment circuit breakers..RESET

LANDING Segment:

NOTE

Following a dual alternator failure, complete electrical failure may occur anytime after 30 minutes. With a complete electrical failure, emergency landing gear extension and landing without flaps will be required. Refer to Complete Electrical Failure (Para. 3.29) and Emergency Landing Gear Extension (Para. 3.35).

3.29 ELECTRICAL FAILURES (continued)

If optional ice protection systems are installed and icing conditions are present:

PITOT HEAT Switch..ON
SURF DE-ICE Switch.. 2-Cycles Usage
ICE LIGHT Switch .... 1-Minute Usage

PITOT HEAT Switch (if not in icing)........................VERIFY OFF
EMERG FUEL PUMP Switch..........................2-Minutes Usage
LANDG LIGHT ....2-Minutes Usage
FLAPS ....AS REQUIRED
(FLAP SYSTEM MALFUNCTION, Section 3.5y)
LANDING GEAR Selector.....................................AS REQUIRED
(EMERGENCY LANDING GEAR EXTENSION, Section 3.5p)
CABIN PRESS DUMP/NORM Switch..............................DUMP
COM 1 Transmit ....1-Minute Usage

3.47 VACUUM SYSTEM FAILURE

Single Vacuum System Failure
Indication: VACUUM 1 FAIL **or** VACUUM 2 FAIL **message.**
Vacuum Indication ....CHECK (within normal operating range)
Operating Vacuum Pump CAS message ....................EXTINGUISHED
NOTE Although either vacuum pump has sufficient capacity to operate the deice boots in a normal manner, immediate action should be taken to exit icing conditions.

Dual Vacuum System Failure
Indication: VACUUM 1 FAIL **and** VACUUM 2 FAIL **messages, Single Chime; Amber vacuum indication below 2.0 in. Hg.,** VAC PRESS LOW **message; Double aural chime.**
NOTE If both vacuum systems are inoperable, the wing and tail deicer boots will be inoperative, and loss of cabin pressure control is possible. Immediate action should be taken to exit icing conditions. Manually dump cabin pressure before landing. A precautionary landing should be considered depending on operating conditions.

SECTION 3 - EMERGENCY PROCEDURES (continued)

ICE PROTECTION SYSTEM ANNUNCIATIONS (continued)

Propeller Heat System Malfunction

Indication: **Master Caution Indication; PROP HEAT FAIL message; Double aural chime.**

NOTE

Excessive vibration may be an indication that the propeller heat is not functioning properly.

PROP RPM Control .... EXERCISE
PROP HEAT Switch .... check for proper LED indications:
Steady for 90 sec. - System ON
Flashing 90 sec. - System OFF
PROP HEAT FAIL CAS Message .... CHECK

NOTE

Illumination of the PROP HEAT FAIL CAS message is an indication that the propeller blades may not be deicing properly.

PROP HEAT Switch .... OFF (if failure is indicated)

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.

SECTION 3 - EMERGENCY PROCEDURES (continued)

ICE PROTECTION SYSTEM ANNUNCIATORS (continued)

Left Pitot Heat Failure

Indication: Master Caution, Double Chime, L PITOT HT FAIL

NOTE

Failure of the L Pitot Heat could cause erroneous indications of pilot's airspeed and standby airspeed. Airspeeds on each PFD should be compared for accuracy.

L PITOT HEAT Circuit Breaker ....RESET
(Located on the pilot's aft circuit breaker panel, row A, position 3)

If IAS MISCOMPARE
annunciation illuminated ....SELECT GOOD ADC

***Exit and avoid IFR and icing conditions* and consider terminating flight early due to possible loss of airspeed redundancy.**

Right Pitot Heat Failure

Indication: Master Caution, Double Chime, R PITOT HT FAIL

NOTE

Failure of the R Pitot Heat could cause erroneous indications of copilot's airspeed. Airspeeds on each PFD should be compared for accuracy.

R PITOT HEAT Circuit Breaker ....RESET
(Located on the pilot's aft circuit breaker panel, row A, position 4)

If IAS MISCOMPARE
annunciation illuminated ....SELECT GOOD ADC

***Exit and avoid IFR and icing conditions* and consider terminating flight early due to possible loss of airspeed redundancy.**

SECTION 3 - EMERGENCY PROCEDURES (continued)

ICE PROTECTION SYSTEM ANNUNCIATORS (continued)

Both Left and Right Pitot Heat Failure

Indication: Master Warning, Triple Chime, [redacted]

NOTE

Failure of both left and right pitot heaters could cause erroneous pilot, copilot and/or standby airspeed indications. Monitor pilot and copilot airspeeds. In the event of complete loss of airspeed, maintain safe airspeed by use of throttle, engine settings and airframe sensory cues.

L PITOT HEAT Circuit Breaker ....RESET
(Located on the pilot's aft circuit breaker panel, row A, position 3)

R PITOT HEAT Circuit Breaker ....RESET
(Located on the pilot's aft circuit breaker panel, row A, position 4)

If either circuit breaker opens again, do not reset.

Exit and avoid IFR and icing conditions **and consider terminating flight early due to possible loss of airspeed redundancy.**

Surface De-ice Failure

In Flight:

Indication: Master Warning, Triple Chime, [redacted]

SURFACE DE-ICE Circuit Breaker ....RESET
(Located on the pilot's aft circuit breaker panel, row A, position 6)

If message remains illuminated, *Exit and Avoid icing conditions*.

On Ground:

Indication: Master Caution, Double Chime, SURF DEICE FAIL

Flight in icing conditions is prohibited.

SECTION 3 - EMERGENCY PROCEDURES (continued)

ICE PROTECTION SYSTEM ANNUNCIATORS (continued)

Windshield Over Temp
Indication: Master Warning, Triple Chime, [redacted]
WSHLD HIGH / WSHLD LOW Switche .... OFF
Immediate action should be taken to exit icing conditions.

Stall Warning Fail
Indication: Master Caution, Double Chime, STALL WARN FAIL
STALL WARN Circuit Breaker ....CHECK - RESET if necessary (Located on pilot's forward circuit breaker panel, row C, position 3)
If circuit breaker does not remain closed, or STALL WARN FAIL CAS message does not extinguish, the stall warning system will be inoperative for remainder of flight.

SECTION 4 - NORMAL PROCEDURES

The Piper PA-46-350P 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 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 should be functionally checked for proper operation.

PREFLIGHT

CAUTION

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

SECTION 4 - NORMAL PROCEDURES (continued)

PREFLIGHT (continued)

Pitot Probes & Stall Warning Vane .... Verify WARM
PITOT HEAT Switch .... OFF
S. WARN HEAT Switch .... OFF
Surface De-Ice Boots .... Verify clean and no damage

ENGINE RUNUP

CAUTION

An operational check of the windshield heat system may be done only if the ambient temperature of the windshield is LESS than 115° F (46° C) and the engine is running. WSHLD HIGH should not be used for more than 20 seconds during ground operations/tests.

WSHLD LOW Switch .... ON
Verify approx. 13 amp increase
WSHLD HIGH Switch .... ON
Verify additional approx. 10 amp increase
WSHLD LOW & WSHLD HIGH Switches .... OFF
PITOT HEAT Switch .... ON
Verify increased amps,
amber PITOT HEAT OFF message extinguished,
absence of L PITOT HT FAIL or R PITOT HT FAIL messages
PITOT HEAT Switch .... OFF
PROP HEAT Switch.. ON
Verify LED flashes rapidly for 30 seconds - System is ON
Verify LED flashes slowly - System is OFF
PROP HEAT Switch... OFF
S. WARN HEAT Switch .... ON
Verify increased amps
S. WARN HEAT Switch .... OFF
PROP RPM Control .... 2000 RPM
Alternator Amps.....................CHECK Ammeters for appropriate output

SECTION 4 - NORMAL PROCEDURES (continued)

ENGINE RUNUP (continued)

Vacuum Suction....................CHECK for appropriate indication (green), Verify absence of VACUUM 1 FAIL or VACUUM 2 FAIL messages
SURF DE-ICE Switch ....ON
Verify (visually) proper boot inflation and deflation, SURF DE-ICE ON message for three boot phases (approx. 18 seconds total), absence of SURF DE-ICE FAIL and VACUUM FAIL (1 or 2) messages
Boot Inflation Cycle....................Verify COMPLETE
SURF DEICE ON ....message 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.

Before entering probable icing conditions use the following procedures:
INDUCTION AIR Lever ....ALTERNATE
PITOT HEAT Switch ....ON
S. WARN HEAT Switch ....ON
WSHLD LOW Switch ....ON (WSHLD HIGH in actual ice)
PROP HEAT Switch ....ON
DEFROST Knob ....PULL ON (out)
VENT/DE-FOG Switch ....ON, if additional defrost is desired

At first sign of ice formation anywhere on the aircraft:
SURF DE-ICE Switch ....ACTIVATE, continue to ACTIVATE as needed to minimize ice accretion.

If propeller imbalance is suspected:
PROP RPM ....EXERCISE

WARNING

Do not hold the momentary SURF DE-ICE switch on.

SECTION 4 - NORMAL PROCEDURES (continued)

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.

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

Prolonged operation of the stall warning vane heater in temperatures greater than 5°C will reduce the operational life of the stall warning vane.

Both alternator ammeters 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

With both alternators functioning the VOLTS indication will turn red anytime total tie bus voltage is below 25 VDC.

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 may not be accurate and should not be relied upon.

CAUTION

[illegible]

SECTION 4 - NORMAL PROCEDURES (continued)

CAUTION

Accumulation of ice on any surface of the airplane leads to an increase in total drag and a resulting reduction in airspeed. Aircraft airspeed, airspeed indicator markings, adverse handling characteristics, and frequent pitch trim activation (TRIM annunciation or trim wheel movement) should be monitored closely to maintain proper low airspeed awareness.

NOTE

An icing encounter can render the aircraft radar unreliable due to beam reflection off of the ice layer on the radome. Also, there may be a degradation of communication and navigation equipment due to ice accumulation on antennas.

If ice is remaining on the unprotected surfaces of the airplane at the termination of the flight, the approach and landing should be made using 20° of flaps and carrying the required amount of power to keep airspeed at 95 KIAS. If ice removal from the protected surfaces cannot be accomplished (ie. due to a failure of the surface deice system) prior to the approach, the flaps must be left in the full up position and approach speeds should not be reduced below 105 KIAS. Allow for increased landing distance due to the higher approach speeds. See Section 2 of this supplement for additional limitations.

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

[illegible]

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.

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

For additional general information on inflight icing refer to FAA Advisory Circular AC 91-51A, Effect of Icing on Aircraft Control and 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

The 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 stall warning 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 systems are located on the environmental/de-ice switch panel.

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 7-1 of this supplement), located on the environmental/de-ice switch 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 each.

The boot solenoid valves are activated and air pressure is released to the boots, sequentially inflating the surface deicers. A SURF DEICE ON CAS message is present when the boots inflate properly. If the boots do not inflate properly a SURF DEICE FAIL CAS message is displayed. When the cycle is complete, the deicer solenoid valves permit automatic overboard exhaustion of pressurized air. Suction is then reapplied to the boots.

SECTION 7 - DESCRIPTION AND OPERATION OF THE ICE PROTECTION SYSTEM AND EQUIPMENT (cont.)

WING AND EMPENNAGE BOOTS (continued)

Circuit protection for the surface deice system is provided by a SURFACE DE-ICE circuit breaker located on the pilot's aft 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 7-1) located on the environmental/de-ice switch panel. Circuit protection is provided by an ICE circuit breaker located in the EXTERIOR LIGHTS section of the pilot's forward circuit breaker panel.

ELECTROTHERMAL 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 7-1) located on the environmental/de-ice switch panel. Power for the propeller deicers is supplied by the aircraft electrical system through a PROP HEAT circuit breaker on the pilot's aft 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.

During ground operations the Hartzell propeller is deiced in a cycle which applies power to the deice pads for approximately 30 seconds and then shuts off power to the deice pads. The PROP HEAT switch green LED should flash rapidly for the 30 seconds indicating that the system is energized, then flash slowly (until turned OFF by the pilot) indicating that the system is de-energized.

During flight operations 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.

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/de-ice switch panel. Circuit protection is provided by the WINDSHIELD HEAT CONTROL and POWER circuit breakers in the ICE PROTECTION section of pilot's aft 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 of 170° F will produce a WDSHLD OVRTMP CAS message. In this eventuality the heated windshield should immediately be selected OFF.

HEATED STALL WARNING LIFT DETECTOR

A heated stall warning lift detector is installed on the left wing leading edge. It is controlled by a S. WARN HEAT switch located on the environmental/de-ice switch panel and is protected by a STALL HEAT circuit breaker located in the ICE PROTECTION section of the pilot's aft circuit breaker panel. The stall warning 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.

NOTE

Prolonged operation of the stall warning vane heater in temperatures greater than 5°C will reduce the operational life of the stall warning vane.

SECTION 7 - DESCRIPTION AND OPERATION OF THE ICE PROTECTION SYSTEM AND EQUIPMENT (cont.)

HEATED PITOT HEAD

A heated AN-type pitot head is installed under each wing. It is controlled by an ON-OFF type PITOT HEAT switch located on the environmental/ de-ice switch panel and is protected by a L PITOT HEAT and R PITOT HEAT circuit breakers located in the ICE PROTECTION section of the pilot's aft circuit breaker panel.

CAUTION

Care should be taken when an operational check of the heated pitot heads is being performed on the ground. The unit becomes very hot. Ground operation should be limited to three minutes to avoid damaging the heating elements.

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 7-2). Circuit protection is provided by similarly labeled circuit breakers located on the TIE BUS circuit breaker panel located on the instrument panel. During normal operation both alternators must be turned ON. The system is designed so that the alternators will share the total electrical load equally. If an alternator fails, the appropriate ALTR 1 FAIL or ALTR 2 FAIL Warning CAS message will appear.

DUAL VACUUM PUMPS

Dual engine-driven vacuum pumps are installed as standard equipment if Surface Deice option is installed. 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.

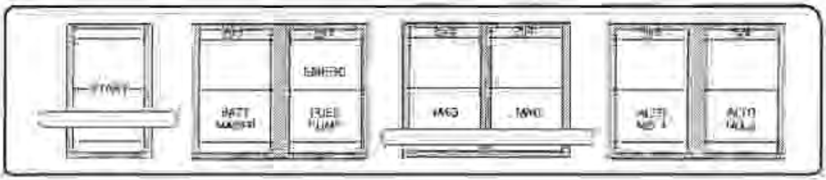
SECTION 7 - DESCRIPTION AND OPERATION OF THE ICE PROTECTION SYSTEM AND EQUIPMENT (cont.)

ENVIRONMENTAL/DE-ICE SWITCH PANEL
Figure 7-1

SECTION 7 - DESCRIPTION AND OPERATION OF THE ICE PROTECTION SYSTEM AND EQUIPMENT (cont.)

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 in the down position. To select alternate static source, place the lever in the up position. When the alternate static source is selected, the airspeed and altimeter information on ADC 1 (normally the airspeed and altimeter indications on the pilot's PFD), and the standby instrument is vented to the alternate static pad on the bottom aft fuselage. During alternate static source operation, these instruments may give slightly different readings compared to those of the primary static source. The primary 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.



LEFT

OVERHEAD SWITCH PANEL - PILOT SIDE
Figure 7-2

PILOT'S OPERATING HANDBOOK
AND
FAA APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 3
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.

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VERO BEACH, FLORIDA

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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 Garmin Primary Flight Display (PFD) which contains all the operating controls and displays, and a remotely mounted KN-63 Receiver-Transmitter. The Garmin PFD displays displays the Nav radio (1 and 2) which is receiving the DME signal, the Nav frequency and the distance to the DME station in nautical miles.

SECTION 2 - LIMITATIONS

No change.

SECTION 3 - EMERGENCY PROCEDURES

No change.

SECTION 4 - NORMAL PROCEDURES

DME Operation

1. NAV 1 and NAV 2 VHF Navigation Receivers - ON; TUNE FREQUENCY to VOR/DME or VORTAC station frequencies, as required.

   NOTE

   When the VORTAC or VOR/DME frequency is selected, the appropriate DME frequency is automatically channeled.

2. DME IDENTIFICATION - select the AUX button on audio panel (audio ID will always come through the headset and will come through the cockpit speaker if SPKR is selected on the audio panel).
3. Select PFD softkey, then DME softkey to display DME Information window.
4. Select ADF/DME softkey on PFD to display ADF/DME TUNING Window.
5. Select NAV1, NAV2 or HOLD from the DME MODE field in the from ADF/DME TUNING window.

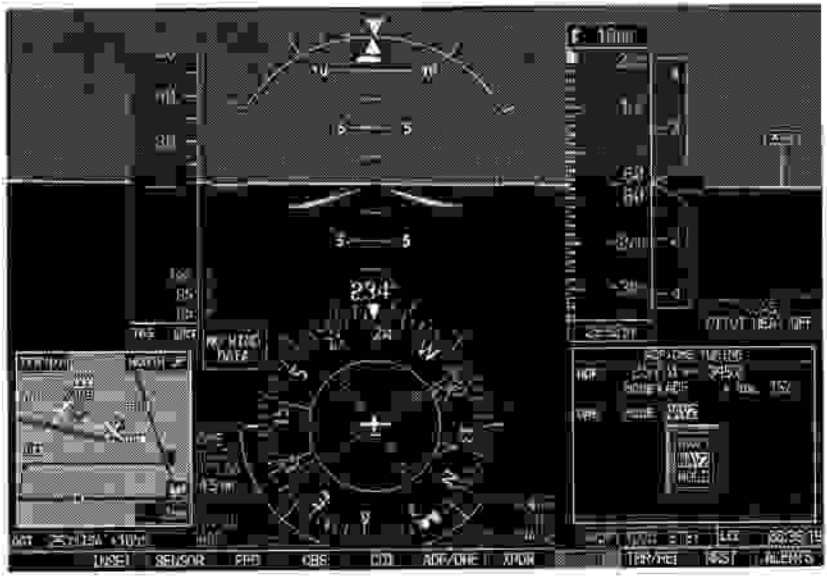
SECTION 5 - PERFORMANCE

No change.

SECTION 6 - WEIGHT AND BALANCE

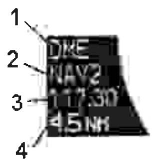
Factory installed optional equipment is included in the licensed weight and balance data in Section 6 of the Pilot's Operating Handbook and Airplane Flight Manual.

SECTION 7 - DESCRIPTION AND OPERATION



DME Display on Garmin PFD
Figure 1

Legend - Figure 1



1. DME Information Window

2. DME MODE ANNUNCIATOR
   Displays the DME operating mode; NAV 1; NAV 2; or HOLD as selected in the DME TUNING window.

3. FREQUENCY
   Displays the frequency of the VOR/DME or VORTAC selected on the associated navigation radio.

4. DISTANCE DISPLAY (NM)
   DME distance to VOR/DME or VORTAC displayed in .1 nautical mile increments up to 99.9 NM, then in increments of one nautical mile to up to 389 NM.

SECTION 7 - DESCRIPTION AND OPERATION (continued)

Legend - Figure 1 (continued)

5. DME TUNING Window (NAV1, NAV2, HOLD)
   Allows access to the DME operating mode as follows:

5

NAV 1 Selects DME operation with No. 1 VHF navigation set; enables channel selection by NAV 1 frequency selector controls.

NAV 2 Selects DME operation with No. 2 VHF navigation set; enables channel selection by NAV 2 frequency selector switches.

HOLD Selects DME memory circuit; DME remains channeled to station which 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 NAV 1 / Nav 2 radio which is being used, but the frequency tuned via that radio remains on the display. Additionally, an annunciator labeled HOLD illuminates on the DME display to flag the pilot that the DME is in the HOLD mode.

PILOT'S OPERATING HANDBOOK
AND
FAA APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 4
FOR
PRECISE FLIGHT SPEEDBRAKE 2000 SYSTEM

This supplement must be attached to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the SpeedBrake System 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.

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VERO BEACH, FLORIDA

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SECTION 1 - GENERAL

This supplement supplies information necessary for the operation of the airplane when the optional Precise Flight SpeedBrakes are installed in accordance with FAA Approved Precise Flight data.

SECTION 2 - LIMITATIONS

(a) Airspeed Limitations are the same as the basic airplane.

(b) The SpeedBrakes are not approved for deployment in icing conditions.

(c) The SpeedBrake Circuit Breaker to be indicated by placard or equivalent.

(d) Placards:
On each wing, at each SpeedBrake location, in full view.

ELECTRICALLY ACTUATED
DO NOT MANUALLY OPERATE

SECTION 3 - EMERGENCY PROCEDURES

(a) SpeedBrake OFF for a forced landing after engine failure.

(b) SpeedBrake OFF for any spin recovery.

(c) SpeedBrake OFF for ditching.

(d) SpeedBrake OFF if the elevator is disabled.

(e) SpeedBrake OFF for aircraft electrical failure.

(f) PULL SPEED BRAKES Circuit Breaker for SPDBRAKES Switch or Electrical failure.

NOTE

If use of the circuit breaker is required for SpeedBrake retraction. leave the circuit breaker in the pulled position, and have maintenance personnel inspect system per Precise Flight SpeedBrake 2000 Maintenance Manual.

SECTION 3 - EMERGENCY PROCEDURES (continued)

PRECISE FLIGHT SPEED BRAKE SYSTEM ANNUNCIATIONS

WARNING Messages - Red - Repeating Aural Triple Chime

Message	Cause
[illegible]	Speedbrakes are extended during the takeoff phase of flight.

CAUTION Messages - Amber - Aural Double Chime

Message	Cause
SPDBRAKES EXTD	Speedbrakes are extended in flight while the engine is OFF, being started or during landing.

ADVISORY Messages - White - ural Single Chime

Message	Cause
SPDBRAKES EXTD	Speedbrakes are extended while the airplane is on the ground or after completing the takeoff phase of flight.

SECTION 4 - NORMAL PROCEDURES

The SpeedBrake system should be functionally checked for proper operation prior to flight. The independent electrical clutches need to be synchronized by SpeedBrake activation before flight and/or after SpeedBrake Circuit Breaker Pull.

(a) BEFORE TAKE-OFF Place the Switch in the AFT/ON position to deploy speedbrakes. Observe that the SPDBRAKES EXTD advisory CAS message is activated and both speedbrakes are extended.

(b) Place the Switch in the FORWARD/OFF position to retract speedbrakes prior to take-off. Observe that the SPDBRAKES EXTD advisory CAS message is off and both speedbrakes are retracted.

(c) During aircraft Take-Off the speedbrake switch should be OFF and the speedbrakes retracted.

EXPEDITED DESCENTS

(a) Select 2400 RPM and approximately 25 inches Manifold Pressure.

(b) SpeedBrake switch ON to deploy SpeedBrake and maintain 165 KIAS.

(c) SpeedBrake switch OFF to retract SpeedBrake

FINAL APPROACH

(a) Fly a high base leg and final approach. Extend wing flaps as desired and place the SpeedBrake switch ON to deploy the SpeedBrakes. (The SpeedBrake switch may be operated intermittently - as required - to modulate the glide path). Maintain an 85 KIAS approach speed by establishing a moderately steep, nose-down attitude.

SECTION 4 - NORMAL PROCEDURES (continued)

LANDING

(a) Rotate the aircraft more rapidly than usual to perform a taillow touchdown.

CAUTION

If the landing rate of sink is excessive, place the SpeedBrake switch "off" to retract the SpeedBrakes and add power as required to reduce the rate of descent.

BALKED LANDING

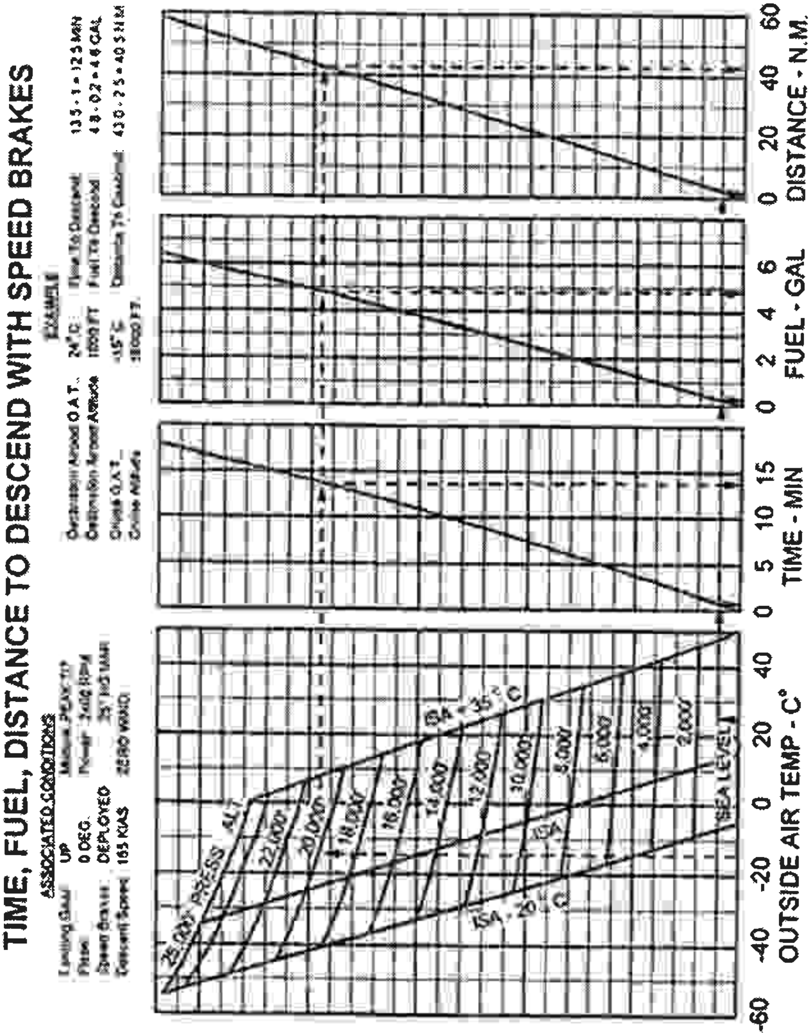
(a) Advance throttle, SpeedBrake switch OFF, retract wing flaps.

SECTION 5 - PERFORMANCE

(a) Inadvertent takeoff with SpeedBrakes Deployed expect an extended take off roll, and reduction in rate of climb until SpeedBrakes are retracted

(b) Cruise flight with SpeedBrakes deployed expect cruise speed and range to be reduced approximately the same amount as flight with landing gear extended.

(c) In the unlikely event of one SpeedBrake Cartridge deploying while the other remains retracted, a maximum of 10% of corrective aileron travel and 5 lbs. of rudder pressure are required for coordinated flight from stall through Vne.



TIME, FUEL, DISTANCE TO DESCEND
WITH SPEEDBRAKES DEPLOYED

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 THE PRECISE FLIGHT SPEEDBRAKE 2000 SYSTEM

Precise Flight SpeedBrake 2000 System is installed to provide expedited descents at low cruise power, glide path control on final approach, airspeed reduction and an aid to the prevention of excessive engine cooling in descent. The SpeedBrakes can be extended at aircraft speeds up to Vne.

WARNING

If icing is encountered with the SpeedBrakes extended, retract the SpeedBrakes immediately.

The Series 2000 SpeedBrake Option consists of wing mounted electric SpeedBrake Cartridges. Each SpeedBrake Cartridge is interconnected electronically by a central logic-switching unit and the yoke mounted SpeedBrake actuator switch. The SpeedBrake Cartridges receive electrical power from the aircraft electrical buss through a disconnect type circuit breaker.

The Crew Alerting System (CAS) provides speedbrake WARNING, CAUTIONS, and Advisory annunciations notifying the pilot of speedbrake status and abnormal conditions (see this supplements section 3 for details). The SPDBRAKES EXTD Advisory CAS message will appear after the speedbrake switch is toggled ON and both brakes are in the up position. If the speedbrake switch is toggled ON and both brakes do not extend, the SPDBRAKES EXTD Advisory CAS message will fail to appear indicating a failure of the speedbrakes. A second attempt to deploy the speedbrakes may be attempted, but if unsuccessful, the speed brake switch should be left off.

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PILOT'S OPERATING HANDBOOK
AND
FAA APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 5
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.

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PIPER AIRCRAFT, INC.
VERO BEACH, FLORIDA

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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 FAIL caution CAS message 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.

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).

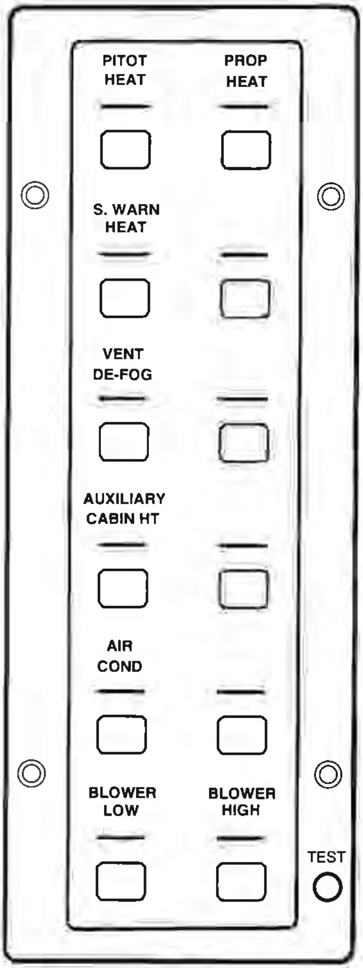

Figure 9-1
Environmental Control Panel

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 designation is: HC-I3Y1R-1N/N7605K+2
HC-I3Y1R-1N/N7605CK+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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PILOT'S OPERATING HANDBOOK
AND
FAA APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 6
FOR
BECKER ADF-3500 SYSTEM
WITH GARMIN PFD INDICATOR

This supplement must be attached to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the Becker ADF-3500 with the Garmin Primary Flight Display (PFD) 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: ______________________
ERIC A. WRIGHT
ODA-510620-CE
PIPER AIRCRAFT, INC.
VERO BEACH, FLORIDA

DATE OF APPROVAL: April 10, 2015

SECTION 1 - GENERAL

The Becker ADF-3500 System consists of a remotely mounted ADF receiver and converter located in the tailcone of the airplane, and an antenna mounted on the lower fuselage. The system operates in a frequency range of 190 kHz to 1799.5 KHz and 2182 (maritime emergency frequency). The system, including pilot interface, is fully integrated with the G1000 avionics suite.

SECTION 2 - LIMITATIONS

No change.

SECTION 3 - EMERGENCY PROCEDURES

No change.

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SECTION 4 - NORMAL PROCEDURES

To Operate as an Automatic Direction Finder:

1. Press the ADF/DME softkey on the PFD.
2. Activate the cursor and select a standby frequency in the ADF/DME TUNING window.
3. Press ENT to transfer the standby frequency to the active field.
4. Select ADF in the MODE field.
5. Adjust volume in the VOL field.
6. Press the PFD softkey on either PFD.
7. Press the BRG1 or BRG2 softkey on either PFD until "ADF" is displayed in the Bearing 1 or Bearing 2 Information Window. The selected ADF bearing will be displayed on the HSI.
8. Press the AUX key on the audio panel to listen to station identification.

ADF Test (Pre-flight or In-flight):

1. Press the ADF/DME softkey on the PFD.
2. Activate the cursor and select a standby frequency in the ADF/DME TUNING window.
3. Press ENT to transfer the standby frequency to the active field.
4. Select ANT in the MODE field and note that the bearing pointer moves towards the 90^{o} position then disappears.
5. Select ADF in the MODE field and note that the bearing pointer moves without hesitation to the station bearing. Excessive pointer sluggishness, wavering or reversals indicate a weak signal or system malfunction.

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 MODE 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 bearing 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

Becker ADF-3500 Display on PFD
Figure 1

SECTION 7 - DESCRIPTION AND OPERATION (Continued)

Antenna (ANT) Mode

This mode improves the aural reception and is usually used for station identification. The bearing pointer is deactivated and will move towards the 90° relative position and then disappear. Selection of Automatic Direction Finder (ADF) mode will then cause the bearing pointer to point in the direction of the station.

Beat Frequency Oscillator (BFO) Mode

This mode 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.

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-46-350P.

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) On takeoff, do not retract the gear prematurely. The airplane may settle and make contact with the ground because of lack of flying speed, atmospheric conditions, or rolling terrain.

(c) To reduce flap operating loads, it is desirable to have the airplane at a speed slower than the maximum allowable 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 AV BUS MASTR, 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. The pilot may consider not using the Strobe lights in close proximity to other aircraft, such as during taxiing, operations.

(g) In extreme turbulence, reduce power setting to obtain design operating maneuvering speed. (See Section 2 Limitations for correct speeds).

10.3 OPERATING TIPS (continued)

(h) 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.

(i) 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.

(j) In order to prevent propeller strikes while taxiing on rough terrain or crossing over rises, the airplane should be taxied slowly with minimum power and rises should be crossed at an acute angle. Tires and struts should be properly inflated.

(k) 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.