DUPLICATE

SENECA V

PA-34-220T (1999 KG)

SN 3449001 AND UP

PILOT'S OPERATING HANDBOOK

AND

FAA APPROVED AIRPLANE FLIGHT MANUAL

AIRPLANE SERIAL NO. 3449221

AIRPLANE REGIST. NO. OE-FMW

PA-34-220T (1999 KG)
REPORT: VB-1649 FAA APPROVED BY: Peter E. Peck

PETER E. PECK
D.O.A. NO. SO-1
THE NEW PIPER AIRCRAFT, INC.
VERO BEACH, FLORIDA

DATE OF APPROVAL:
JANUARY 23, 1997

THIS HANDBOOK 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 MUST BE CARRIED IN THE AIRPLANE AT ALL TIMES.

Piper™

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 THE NEW PIPER AIRCRAFT, INC. MUST BE PROPERLY INSERTED.

Published by
PUBLICATIONS DEPARTMENT
The New Piper Aircraft, Inc.
Issued: JANUARY 23, 1997

APPLICABILITY

Application of this handbook is limited to the specific Piper PA-34-220T model airplane designated by serial number and registration number on the face of the title page of this handbook.

WARNING

THIS HANDBOOK CANNOT BE USED FOR OPERATIONAL PURPOSES UNLESS KEPT IN A CURRENT STATUS.

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 Pilot's Operating Handbook and FAA Approved Airplane Flight Manual, with the exception of the equipment list, is kept current by revisions which are distributed to the registered 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 add, update or correct the text of the present handbook and/or to add supplemental information to cover added airplane equipment.

I. Identifying Revised Material

Each handbook page is dated at the bottom of the page showing both 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.

II. Revision Procedure

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. Discard old page.
3. Insert page numbers followed by a small letter in direct sequence with the same commonly numbered page.

ORIGINAL PAGES ISSUED

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

Title, ii through viii, 1-i, 1-ii, 1-1 through 1-12, 2-i, 2-ii, 2-1 through 2-14, 3-i through 3-iv, 3-1 through 3-40, 4-i through 4-iv, 4-1 through 4-54, 5-i, 5-ii, 5-1 through 5-36, 6-i, 6-ii, 6-1 through 6-14, 7-i, 7-ii, 7-1 through 7-68, 8-i, 8-ii, 8-1 through 8-20, 9-i, 9-ii, 9-1 through 9-64, 10-i, 10-ii, 10-1 through 10-4

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS

Current Revisions to the PA-34-220T, Seneca V Pilot's Operating Handbook, REPORT: VB-1649 issued JANUARY 23, 1997.

Revision Number and Code	Revised Pages	Description of Revisions	FAA Approved Signature and Date
Rev. 1	v	Added Rev. 1 to L of R page.	
(PR970926)	3-ii	Revised Table of Contents.	
	3-iii	Revised Table of Contents.	
	3-iv	Revised Table of Contents.	
	3-12	Added para. 3.5d.	
	3-13	Added para. 3.5d.	
	3-14 thru 3-31	Revised para's. 3.5e thru 3.5p, and relocated information.	
	3-31a	Added page and para. 3.14.	
	3-31b	Added page and para. 3.15.	
	3-32 thru 3-40	Revised para's. 3.17, 3.19, 3.21, 3.23, 3.25, 3.27, 3.29 3.31, 3.33 & 3.35, and relocated information.	
	4-i	Revised Table of Contents.	
	4-9	Revised para. 4.5c.	
	4-10	Revised para. 4.5c.	
	4-11	Revised para. 4.5c.	
	4-12	Revised para. 4.5c.	
	4-13	Revised para. 4.5e.	
	4-15	Revised para. 4.5g.	
	4-16	Revised para. 4.5h.	
	4-17	Revised para. 4.5h.	
	4-29 thru 4-35	Revised para's. 4.13 thru 4.13f.	
	4-36	Revised para. 4.17.	
	4-39	Revised para. 4.21.	
	4-41	Revised para's. 4.23a & 4.23b.	Peter E. Peck
	5-23	Revised Fig. 5-23.	
	5-31	Revised Fig. 5-39.	Sept. 26, 1997
	9-5	Revised Section 2.	Date

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revisions	FAA Approved Signature and Date
Rev. 2	vi	Added Rev. 2 to L of R page.	
(PR980422)	2-i	Revised Table of Contents.	
	2-8	Revised para. 2.29 by adding Icing Information.	
	2-9	Revised para. 2.29	
	3-2	Revised para. 3.3.	
	3-29	Revised para. 3.9i, item 4.	
	4-iii	Revised Table of Contents.	
	4-1	Revised para. 4.1.	
	4-2	Revised para. 4.3, item (b).	
	4-5	Revised para. 4.5a.	
	4-15	Revised para. 4.5g, by adding Warning.	
	4-16	Revised para. 4.5h, by adding Warning.	
	4-17	Revised para. 4.5i.	
	4-24	Revised para. 4.9c.	
	4-39	Revised para. 4.21, by adding Warning.	
	4-40	Revised para. 4.23, by adding Warning.	
	4-42	Revised para. 4.25a.	
	4-45	Revised para. 4.27.	
	4-55	Added para. 4.55, Icing Information.	
	4-56	Added Blank Page.	
	5-16	Revised Fig. 5-11.	
	5-17	Revised Fig. 5-13.	
	5-18	Revised Fig. 5-15.	
	5-20	Revised Fig. 5-17.	Peter E. Peck
	7-2	Revised para. 7.5.	Peter E. Peck
	7-43	Revised Fig. 7-35.	
	7-47	Revised Fig. 1.	April 22, 1998 Date

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revisions	FAA Approved Signature and Date
Rev. 3 (PR980819)	vii	Added page and Rev. 3.	
	viii	Added page.	
	2-8	Revised Para. 2.27.	
	3-21	Revised Para. 3.5k.	
	4-10	Revised Para. 4.5c.	
	4-11	Revised Para. 4.5c.	
	4-12	Revised Para. 4.5c.	
	4-14	Revised Para. 4.5f.	
	4-30	Revised Para's. 4.13a & b.	
	4-31	Revised Para's. 4.13c & d.	
	4-33	Revised Para. 4.13e.	
	4-38	Revised Para. 4.19.	
	4-55	Corrected typo.	
	7-31	Revised Para. 7.19.	
	9-i	Revised T of C.	
	9-18	Revised Section 3.	Peter E. Peck
	9-65 thru 9-76	Added Supplement 9 - Bendix/King KX 155A Comm/Nav System.	August 19, 1998 Date
Rev. 4 (PR991119)	vi-a	Added Rev. 4 and corrected page number in footer.	
	vi-b	Corrected page number in footer.	Christina L. Marsh
	9-14	Revised Supplement 3 by adding Section 2 Placard.	Nov. 19, 1999 Date
Rev. 5 (PR000207)	vi-a	Added Rev. 5 to L of R.	
	vi-b	Added Rev. 5 to L of R.	
	4-5	Revised Para. 4.5a.	
	4-11	Revised Para. 4.5c.	
	4-13	Revised Para. 4.5e.	
	4-18	Revised Para. 4.5k.	
	4-20	Revised Para. 4.5o.	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revisions	FAA Approved Signature and Date
Rev. 5	4-24	Revised Para. 4.9b & 4.9c.	
(PR000207)	7-37	Revised Para. 7.23.	
(continued)	9-i	Revised T of C.	
	9-22	Revised Section 4.	
	9-77 thru 9-84	Added Supplement 10 - Garmin GNS 430 Comm/Nav.	
	9-85 thru 9-86	Added Supplement 11 - S-TEC System 55 Autopilot.	Christina L. Marsh Christina L. Marsh
	10-3	Revised Para. 10.3.	Feb. 7, 2000 Date
Rev. 6	vi-b	Added Rev. 6 to L of R.	Christina L. Marsh Christina L. Marsh
(PR000522)	9-14	Revised Section 2.	May 22, 2000 Date
Rev. 7	vi-b	Added Rev. 7 to L of R.	
(PR000612)	vi-c	Added Page & Rev. 7 to L of R.	
	vi-d	Added Page.	
	2-13	Revised para. 2.31.	
	4-48	Revised para. 4.33.	
	7-25	Revised para. 7.17.	
	7-26	Revised Figure 7-21 title.	
	7-29	Revised para. 7.17.	
	9-i	Revised T of C.	
	9-ii	Revised T of C.	
	9-83	Revised Section 4.	
	9-87 thru 9-94	Added Supplement 12 - Garmin GNS 430 Comm/Nav w/ Traffic Adv. & Lightning Strike Adv. Data.	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revisions	FAA Approved Signature and Date
Rev. 7 (PR000612) continued	9-95 thru 9-102	Added Supplement 13 - Garmin GNS 530 Comm/Nav w/ Traffic Adv. & Lightning Strike Adv. Data.	
	9-103 thru 9-108	Added Supplement 14 - BF Goodrich Skywatch Traffic Advisory System Model SKY497.	
	9-109 thru 9-116	Added Supplement 15 - Avidyne 5-RR-MFC Series FlightMax Flight Situation Display w/ Software 530-0104.	
	9-117 thru 9-120	Added Supplement 16 - BF Goodrich Aerospace WX-500 Stormscope Series II Weather Mapping Sensor.	Christina L. Marsh Christina L. Marsh June 12, 2000 Date
Rev. 8 (PR010223)	vi-c	Added Rev. 8 to L of R.	
	vi-d	Added Rev. 8 to L of R.	
	4-54	Revised para. 4.53.	
	6-11	Revised Fig. 6-9.	
	9-ii	Revised T of C.	
	9-121 thru 9-130	Added pages and Supplement 17.	
	9-131 thru 9-140	Added pages and Supplement 18.	
	9-141 thru 9-142	Added pages and Supplement 19.	
	9-143 thru 9-148	Added pages and Supplement 20.	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revisions	FAA Approved Signature and Date
Rev. 8 (PR010223) continued	9-149 thru 9-154 9-155 thru 9-158	Added pages and Supplement 21. Added pages and Supplement 22.	Christina L. Marsh Feb. 23, 2001 Date
Rev. 9 (PR011101)	vi-d 9-i 9-ii 9-159 thru 9-166	Added Rev. 9 to L of R. Revised T of C. Revised T of C. Added pages and Supplement 23.	Albert J. Mill Nov. 01, 2001 Date
Rev. 10 (PR020107)	vi-d 9-ii 9-167 thru 9-176	Added Rev. 10 to L of R. Revised T of C. Added pages and Supplement 24.	Albert J. Mill Jan. 07, 2002 Date
Rev. 11 (PR020225)	vi-d 1-5 2-6 2-13 6-13	Added Rev. 11 to L of R. Revised para. 1.11 & 1.15. Revised para. 2.11. Revised para. 2.31. Revised Figure 6-13.	Albert J. Mill Feb. 25, 2002 Date
Rev. 12 (PR020531)	vi-d 6-11	Added Rev. 12 to L of R. Revised Figure 6-9.	Albert J. Mill May 31, 2002 Date

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revisions	FAA Approved Signature and Date
Rev. 13 (PR021210)	vi-e vi-f 9-i 9-177 thru 9-178	Added page and Rev. 13. Added page. Revised T of C. Added pages and Supplement 25.	Albert J. Mill Dec. 10, 2002 Date
Rev. 14 (PR030205)	vi-e 7-5 7-6 7-9 7-9a 7-9b 7-12	Added Rev. 14 to L of R. Revised para. 7.5. Revised para. 7.7. Revised fig. 7-5. Added page and fig. 7-5a. Added page. Revised para. 7.9.	Albert J. Mill Feb. 5, 2003 Date
Rev. 15 (PR030430)	iii iv vi-e vi-f 2-6 6 12 8-1 8-1a 8-1b 8-2 9-ii 9-36 9-164	Added Warning. Moved info. from page iii. Added Rev. 15 to L of R. Added Rev. 15 to L of R. Revised para. 2.11. Revised fig. 6-11. Moved info. to page 8-1b and revised para. 8.1. Added page and revised para. 8.1. Added page and moved info. from pages 8-1 and 8-2. Moved info. to page 8-1b and revised para. 8.3. Revised T of C. Revised Section 4. Revised Section 7.	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revisions	FAA Approved Signature and Date
Rev. 15 (PR030430) continued	9-179 9-180 10-i 10-1	Added pages and Supplement 26. Revised T of C. Revised subject headings.	Albert J. Mill April 30, 2003 Date
Rev. 16 (PR031110)	vi-f 3-4 3-8 3-25 3-27 4-16 4-17 9-118	Added Rev. 16 to L of R. Revised para. 3.5a. Revised para. 3.5a. Revised para. 3.9d. Revised para. 3.9h. Revised para. 4.5h. Revised para. 4.5h. Revised section 1.	Albert J. Mill Nov. 10, 2003 Date
Rev. 17 (PR040112)	vi-f 9-ii 9-181 thru 9-184	Added Rev. 17 to L of R. Revised T of C. Added pages and Supplement 27.	Albert J. Mill Jan. 12, 2004 Date
Rev. 18 (PR041213)	vi-f 4-18 4-46	Added Rev. 18 to L of R. Revised para. 4.5m. Revised para. 4.31.	Linda J. Dicken Dec. 13, 2004
Rev. 19 (PR060424)	vi-f 5-23	Added Rev. 19 to L of R. Revised Figure 5-23.	Linda J. Dicken April 24, 2006
Rev. 20 (PR070219)	vi-f 4-49	Added Rev. 20 to L of R. Revised para. 4.35.	Linda J. Dicken Feb. 19, 2007

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SECTION 1

GENERAL

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SECTION 1
GENERAL

1.1 INTRODUCTION

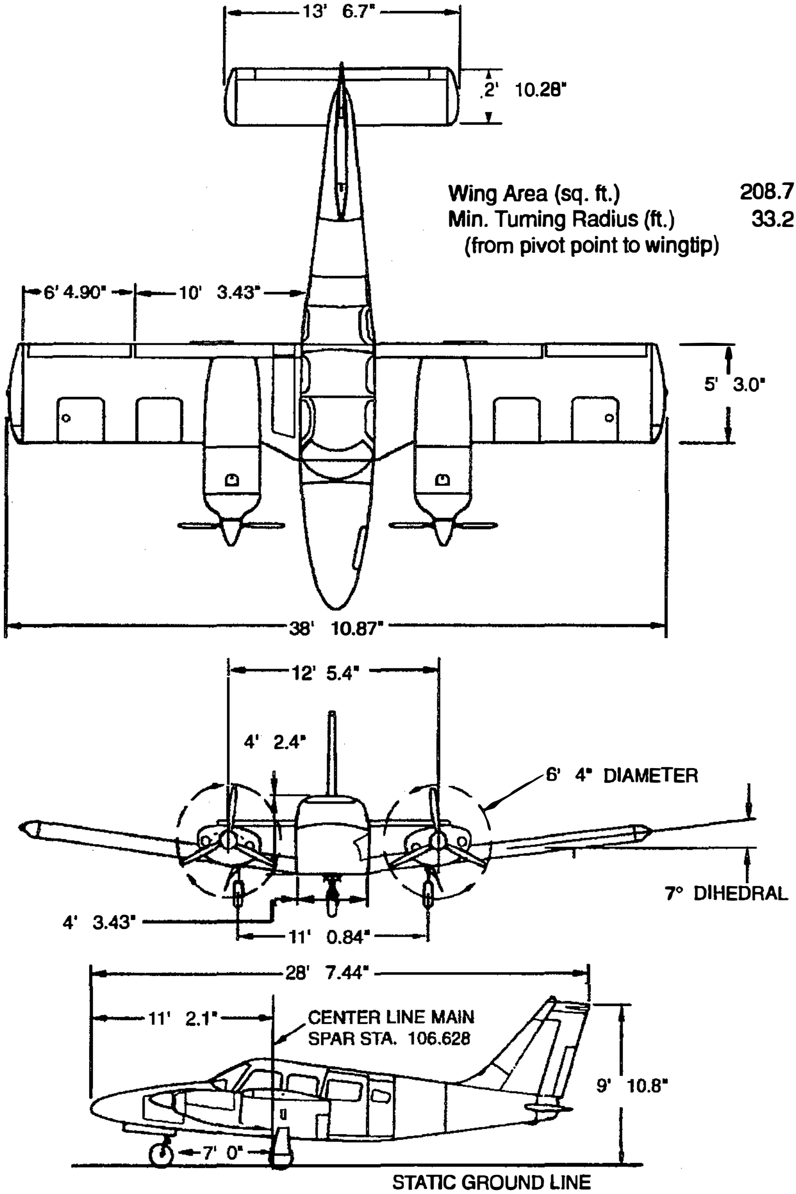
This Pilot's Operating Handbook is designed for maximum utilization as an operating guide for the pilot. It includes the material required to be furnished to the pilot by the Federal Aviation Regulations and additional information provided by the airplane manufacturer and constitutes the FAA Approved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

This handbook is not designed as a substitute for adequate and competent flight instruction, knowledge of current airworthiness directives and applicable federal air 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.

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.

Although the arrangement of this handbook is intended to increase its in-flight capabilities, it should not be used solely as an occasional operating reference. The pilot should study the entire handbook to become familiar with the limitations, performance, procedures and operational handling characteristics of the airplane before flight.

The handbook has been divided into numbered sections, each provided with a finger-tip tab divider for quick reference. The limitations and emergency procedures have been placed ahead of the normal procedures, performance and other sections to provide easier access to information that may be required in flight. The Emergency Procedures Section has been furnished with a red tab divider to present an instant reference to the section. 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.



THREE VIEW
Figure 1-1

1.3 ENGINE

(a) Number of Engines	2
b) Engine Manufacturer	Teledyne Continental
(c) Engine Model Number	
(1) Left	TSIO-360RB
(2) Right	LTSIO-360RB
	Max. Cont. Power
(d) Rated Horsepower	220 BHP
(e) Rated Speed (rpm)	2600
(f) Bore (inches)	4.438
(g) Stroke (inches)	3.875
(h) Displacement (cubic inches)	360
(i) Compression Ratio	7.5:1
(j) Engine Type	Six Cylinder, Direct Drive, Horizontally Opposed, Air Cooled

1.5 PROPELLER

STANDARD

(a) Number of Propellers	2
(b) Propeller Manufacturer	Hartzell
(c) Propeller Hub & Blade Models*	
(1) Left	BHC-J2YF-2CUF/ FC8459B-8R
(2) Right	BHC-J2YF-2CLUF/ FJC8459B-8R
(d) Number of Blades	2
(e) Propeller Diameter (in.)	
(1) Maximum	76
(2) Minimum	75
(f) Propeller Type	Constant Speed, Hydraulically Activated, Full Feathering

*The propellers have the same designation when deicing boots are installed.

OPTIONAL

(a) Number of Propellers	2
(b) Propeller Manufacturer	McCauley
(c) Propeller Hub & Blade Models*	
(1) Left	3AF32C522/82NJA-6
(2) Right	3AF32C523/L82NJA-6
(d) Number of Blades	3
(e) Propeller Diameter (in.)	
(1) Maximum	76
(2) Minimum	75
(f) Propeller Type	Constant Speed, Hydraulically Activated, Full Feathering

1.7 FUEL

AVGAS ONLY

(a) Fuel Capacity (U.S. gal.) (total)	128
(b) Usable Fuel (U.S. gal.) (total)	122
(c) Fuel	
(1) Minimum Grade	100 Green or 100LL Blue Aviation Grade
(2) Alternate Fuels	Refer to latest revision of Continental Service Bulletin Fuel and Oil Grades.

1.9 OIL

(a) Oil Capacity (U.S. qts.) (per engine)	8
(b) Oil Specification	Refer to latest revision of Continental Service Bulletin Fuel and Oil Grades.

*The propellers have the same designation when deicing boots are installed.

(c) Oil Viscosity

	Aviation Grade	S.A.E. No.
(1) Below 40°F	1065	30
(2) Above 40°F	1100	50

When operating temperatures overlap indicated ranges, use the lighter grade of oil. Multi-viscosity oils meeting Teledyne Continental Motors' Specification MHS-24A are approved.

1.11 MAXIMUM WEIGHTS

(a) Max. Ramp Weight	4430 lbs/2009 kg.
(b) Max. Takeoff Weight	4407 lbs/1999 kg.
(c) Max. Landing Weight	4407 lbs/1999 kg.
(d) Max. Zero Fuel Weight - Std.	4407 lbs/1999 kg.
(e) Max. Weights in Baggage Compartment	
(1) Forward	100 lbs/45 kg
(2) Aft	85 lbs/38 kg

1.13 STANDARD AIRPLANE WEIGHTS

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

1.15 BAGGAGE SPACE

	FORWARD	AFT
(a) Maximum Baggage	100 lbs/45 kg	85 lbs/38 kg
(b) Baggage Space (cu. ft.)	15.3	17.3
(c) Baggage Door Size (in.)	24 x 21	

1.17 SPECIFIC LOADINGS

(a) Wing Loading (lbs. per sq. ft.)	21.2
(b) Power Loading (lbs. per hp)	10.0

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1.19 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_A	Maneuvering Speed is the maximum speed at which application of full available aerodynamic control will not overstress the airplane.
KTAS	True Airspeed expressed in Knots.

1.19 SYMBOLS, ABBREVIATIONS AND TERMINOLOGY (cont)

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.
V_{LO}	Maximum Landing Gear Operating Speed is the maximum speed at which the landing gear can be safely extended or retracted.
V_{MCA}	Air Minimum Control Speed is the minimum flight speed at which the airplane is directionally controllable as determined in accordance with Federal Aviation Regulations. Airplane certification conditions include one engine becoming inoperative and windmilling; not more than a 5° bank towards the operative engine; takeoff power on operative engine; landing gear up; flaps in takeoff position; and most rearward C.G.
V_{NE}	Never Exceed Speed is the speed limit that may not be exceeded at any time.
V_{NO}	Maximum Structural Cruising Speed is the speed that should not be exceeded except in smooth air and then only with caution.
V_S	Stalling Speed or the minimum steady flight speed at which the airplane is controllable.
V_{SO}	Stalling Speed or the minimum steady flight speed at which the airplane is controllable in the landing configuration.

V_{SSE}	Intentional One Engine Inoperative Speed is a minimum speed selected by the manufacturer for intentionally rendering one engine inoperative in flight for pilot training.
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.

(b) Meteorological Terminology

ISA	International Standard Atmosphere in which: The air is a dry perfect gas; The temperature at sea level is 15° Celsius (59° Fahrenheit); The pressure at sea level is 29.92 inches Hg(1013.2mb); The temperature gradient from sea level to the altitude at which the temperature is -56.5°C (-69.7°F) is -0.00198°C (-0.003566°F) 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).

1.19 SYMBOLS, ABBREVIATIONS AND TERMINOLOGY (cont)

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.

(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

TIT Gauge	Turbine Inlet Temperature Gauge

(e) Airplane Performance and Flight Planning Terminology

Climb Gradient	The demonstrated ratio of the change in height during a portion of a climb, to the horizontal distance traversed in the same time interval.

Demonstrated Crosswind Velocity (DEMO. X-WIND)	The demonstrated crosswind velocity is the velocity of the crosswind component for which adequate control of the airplane during takeoff and landing was actually demonstrated during certification tests.
Accelerate-Stop Distance	The distance required to accelerate an airplane to a specified speed and, assuming failure of an engine at the instant that speed is attained, to bring the airplane to a stop.
Route Segment	A part of a route. Each end of that part is identified by: (1) a geographical location; or (2) a point at which a definite radio fix can be established.

(f) Weight and Balance Terminology

Reference Datum	An imaginary vertical plane from which all horizontal distances are measured for balance purposes
Station	A location along the airplane fuselage usually given in terms of distance in inches from the reference datum.
Arm	The horizontal distance from the reference datum to the center of gravity (C.G.) of an item.
Moment	The product of the weight of an item multiplied by its arm. (Moment divided by a constant is used to simplify balance calculations by reducing the number of digits.)
Center Or Gravity (C.G.)	The point at which an airplane would balance if suspended. Its distance from the reference datum is found by dividing the total moment by the total weight of the airplane.

1.19 SYMBOLS, ABBREVIATIONS AND TERMINOLOGY (cont)

C.G. Arm	The arm obtained by adding the airplane's individual moments and dividing the sum by the total weight.
C.G. Limits	The extreme center of gravity locations within which the airplane must be operated at a given weight.
Usable Fuel	Fuel available for flight planning.
Unusable Fuel	Fuel remaining after a runout test has been completed in accordance with governmental regulations.
Standard Empty Weight	Weight of a standard airplane including unusable fuel, full operating fluids and full oil.
Basic Empty Weight	Standard empty weight plus optional equipment.
Payload	Weight of occupants, cargo and baggage.
Useful Load	Difference between takeoff weight, or ramp weight if applicable, and basic empty weight.
Maximum Ramp Weight	Maximum weight approved for ground maneuver. (It includes weight of start, taxi and run up fuel.)
Maximum Takeoff Weight	Maximum weight approved for the start of the takeoff run.
Maximum Landing Weight	Maximum weight approved for the landing touchdown.
Maximum Zero Fuel Weight	Maximum weight exclusive of usable fuel.

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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 the operation of the airplane and its systems.

This airplane must be operated as a normal category airplane in compliance with the operating limitations stated in the form of placards and markings and those given in this section and handbook.

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.	204	203
Maximum Structural Cruising Speed (V_{NO}) - Do not exceed this speed except in smooth air and then only with caution.	164	165

2.3 AIRSPEED LIMITATIONS (Cont)

SPEED	KIAS	KCAS
Design Maneuvering Speed (V_A) - Do not make full or abrupt control movements above this speed.		
4407 lbs/1999 kg GW	135	137
3205 lbs.	113	115

CAUTION

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

SPEED	KIAS	KCAS
Maximum Gear Extended Speed (V_{LE}) - Do not exceed this speed with landing gear extended.	128	130
Maximum Landing Gear Operating Speed (V_{LO}) - Do not extend or retract landing gear above these speeds.		
Extension	128	130
Retraction	107	109
Maximum Flaps Extended Speed (V_{FE})- Do not exceed this speed with the flaps extended.	113	113
One Engine Inoperative Best Rate of Climb Speed. (V_{YSE})	88	91
Air Minimum Control Speed (V_{MCA}) - Lowest airspeed at which airplane is controllable with one engine operating at takeoff power and no flaps.	66	67

2.5 AIRSPEED INDICATOR MARKINGS

MARKING	KIAS
Red Radial Line (Never Exceed)	204
Yellow Arc (Caution Range - Smooth Air Only)	164 to 204
Green Arc (Normal Operating Range)	67 to 164
White Arc (Flap Down)	61 to 113
Blue Radial Line (One Engine Inoperative Best Rate of Climb Speed)	88
Red Radial Line (One Engine Inoperative Air Minimum Control Speed)	66

2.7 POWER PLANT LIMITATIONS

(a) Number of Engines	2
(b) Engine Manufacturer	Teledyne Continental
(c) Engine Model Number	
(1) Left	TSIO-360RB
(2) Right	LTSIO-360RB
(d) Engine Operating Limits	
	Max. Cont. Power
(1) Rated Horsepower (BHP)	220
(2) Max. Rotational Speed (RPM)	2600
(3) Max. Manifold Pressure (Inches of Mercury)	38
(4) Max. Cylinder Head Temperature	460°F
(5) Max. Oil Temperature	240°F
(e) Oil Pressure	
Minimum (red line)	10 PSI
Maximum (red line)	100 PSI

2.7 POWER PLANT LIMITATIONS (Cont)

(f) Fuel Grade (AVGAS ONLY)
(Min. grade) — 100 or 100LL Aviation Grade

(g) Number of Propellers — 2

(h) Propeller Manufacturer

Hartzell (Two Blade) (Standard)
Propeller Hub and Blade Models

a. Left — BHC-J2YF-2CUF/FC8459B-8R
b. Right — BHC-J2YF-2CLUF/FJC8459B-8R

NOTES
(2-blade propellers only)

Avoid continuous operation between 1900 and 2100 RPM above 32 IN. HG. manifold pressure.

Avoid continuous ground operation between 1600 and 2100 RPM in cross and tail winds.

McCauley (Three Blade) (Optional)
Propeller Hub and Blade Models

a. Left — 3AF32C522( )/( )82NJA-6
b. Right — 3AF32C523( )/( )L82NJA-6

(i) Propeller Diameter (inches)
Maximum — 76
Minimum — 75

2.7a POWER PLANT LEANING LIMITATIONS

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

2.9 POWER PLANT INSTRUMENT MARKINGS

(a) Tachometer

Green Arc (Normal Operating Range)	600 RPM to 2600 RPM
Red Line (Maximum)	2600 RPM

(b) Cylinder Head Temperature

Green Arc (Normal Range)	240°F to 460°F
Red Line (Maximum)	460°F

(c) Oil Temperature

Green Arc (Normal Operating Range)	100°F to 240°F
Red Line (Maximum)	240°F

(d) Oil Pressure

Red Line (Minimum)	10 PSI
Yellow Arc (Caution - Ground Operation Only)	10 PSI to 30 PSI and 80 PSI to 100 PSI
Green Arc (Normal Operating Range)	30 PSI to 80 PSI
Red Line (Maximum)	100 PSI

(e) Manifold Pressure

Green Arc (Normal Operating Range)	10 IN. to 38 IN. HG.
Red Line (Maximum)	38 IN. HG.

(f) Turbine Inlet Temperature

Green Arc	1200°F to 1650°F
Red Line (Maximum)	1650°F

NOTE:

A maximum temperature of 1700°F is allowed for 60 seconds, in order to determine peak T.I.T. for fuel management.

2.11 WEIGHT LIMITS

(a)	Max. Ramp Weight	4430 lbs/2009 kg
(b)	Max. Takeoff Weight	4407 lbs/1999 kg
(c)	Max. Landing Weight	4407 lbs/1999 kg
(d)	Max. Weights in Baggage Compartments	
	Forward	100 lbs/45 kg
	Aft	85 lbs/38 kg

2.13 CENTER OF GRAVITY LIMITS

Weight Pounds	Forward Limit Inches Aft of Datum	Rearward Limit Inches Aft of Datum
3400	82.0	94.6
4250	86.7	94.6
4407	88.0	94.6

NOTES:

Straight line variation between points given.

The datum used is 78.4 inches ahead of the wing leading edge at the inboard edge of the fuel tank.

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.

2.15 MANEUVER LIMITS

All intentional acrobatic maneuvers (including spins) are prohibited. Avoid abrupt maneuvers.

2.17 FLIGHT MANEUVERING 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.

2.19 TYPES OF OPERATION

The airplane is approved for the following operations when equipped in accordance with FAR 91 or FAR 135.

(a) Day V.F.R.
(b) Night V.F.R.
(c) Day I.F.R.
(d) Night I.F.R.
(e) Icing conditions when equipped per Ice Protection System Installation Supplement (refer to Section 9).

2.21 FUEL LIMITATIONS

NOTE

The unusable fuel for this airplane has been determined as 3.0 U.S. gallons in each wing in critical flight attitude.

(a) Total Capacity	128 U.S. GALS.
(b) Unusable Fuel	6 U.S. GALS.
(c) Usable Fuel	122 U.S. GALS.

2.23 HEATER LIMITATIONS

Operation of the combustion heater above 25,000 feet is not approved.

2.25 OPERATING ALTITUDE LIMITATIONS

Flight above 25,000 feet is not approved. Flight up to and including 25,000 feet is approved if equipped with oxygen in accordance with FAR 23.1441 and avionics in accordance with FAR 91 or FAR 135.

2.27 GYRO SUCTION LIMITS

The operating limits for the suction system are 4.5 to 5.2 inches of mercury for all operations as indicated by the gyro suction gauge.

-or-

The operating limits for the suction system are 4.8 to 5.2 inches of mercury for all operations as indicated by the gyro suction gauge.

2.29 ICING INFORMATION

"WARNING"

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

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

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

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

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

2.29 ICING INFORMATION (cont)

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).]

2.31 PLACARDS

In full view of the pilot:

THIS AIRPLANE 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, NIGHT & ICING FLIGHT WHEN EQUIPPED IN ACCORDANCE WITH FAR 91 OR FAR 135.

MINIMUM SINGLE ENGINE CONTROL SPEED 66 KIAS

SINGLE ENGINE STALLS NOT RECOMMENDED. CAN CAUSE 400 FT. LOSS OF ALTITUDE AND 15° PITCH ANGLE.

WARNING - TURN OFF STROBE LIGHTS WHEN TAXIING IN VICINITY OF OTHER AIRCRAFT, OR DURING FLIGHT THROUGH CLOUD, FOG OR HAZE.

On side panel to left of pilot:

CAUTION - COMPASS CALIBRATION MAY BE IN ERROR WITH ELECTRICAL EQUIPMENT OTHER THAN AVIONICS ON.

2.31 PLACARDS (Cont)

On instrument panel in full view of the pilot:

V_A 135 AT 4407 LBS.
(SEE A.F.M.)
V_{LO} 128 DN, 107 UP
V_{LE} 128 MAX.
DEMO X-WIND 17 KTS

On instrument panel near emergency gear release:

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

On instrument panel near gear selector switch:

	UP	107 KIAS MAX.
GEAR		
	DOWN	128 KIAS MAX.

In full view of the pilot (adjacent to cowl flap controls):

MAXIMUM TAKEOFF WEIGHT 4407 POUNDS
MAXIMUM LANDING WEIGHT 4407 POUNDS

On storm window:

DO NOT OPEN
ABOVE 129 KIAS

On the instrument panel in full view of the pilot (2-blade propellers only)

AVOID CONTINUOUS GROUND OPERATION 1600 - 2100 RPM IN CROSS/TAIL WIND.
AVOID CONTINUOUS OPERATIONS 1900 - 2100 RPM ABOVE 32" MANIFOLD PRESSURE.

Adjacent to upper door latch (rear door):

ENGAGE LATCH BEFORE FLIGHT

On the inside of forward baggage compartment door:

MAXIMUM BAGGAGE THIS COMPARTMENT 100 LBS. SEE THE LIMITATIONS SECTION OF THE AIRPLANE FLIGHT MANUAL.

Adjacent to front door latch :

Caution:

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

2.31 PLACARDS (Cont)

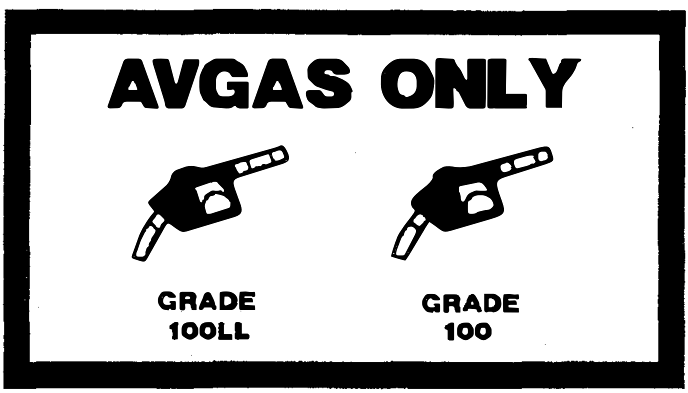
On the inside of cup dispenser door:

MAXIMUM WEIGHT 2 LBS

On the inside of both oil filter access doors:

OIL COOLER WINTERIZATION PLATE TO BE REMOVED WHEN AMBIENT TEMPERATURE EXCEEDS 50°F.

Adjacent to fuel tank filler caps:



On aft baggage closeout:

MAXIMUM BAGGAGE THIS COMPARTMENT 85 LBS.
NO HEAVY OBJECTS ON HAT SHELF.

2.31 PLACARDS (Cont)

On the executive writing table:

CAUTION

THIS TABLE MUST BE STOWED DURING TAKEOFF AND LANDING.

In full view of the pilot and passengers:

NO SMOKING

In full view of the pilot:

ARMRESTS ARE TO BE IN THE STOWED POSITION FOR TAKEOFF AND LANDING

2.31 PLACARDS (Cont)

On right hand side of entertainment console top:

MONITOR, ALL
LOOSE ITEMS,
AND CONSOLE
TOP ARE TO BE
IN THE STOWED
POSITION FOR
TAKEOFF AND
LANDING

On right hand side of entertainment console top:

MAXIMUM WEIGHT
ALLOWABLE ON
THE CONSOLE
TOP IN THE
EXTENDED
POSITION
IS 10 LBS.

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SECTION 3

EMERGENCY PROCEDURES

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EMERGENCY PROCEDURES

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 as well as those necessary for operation of the airplane, as determined by its operating and design features, are presented.

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

This section is divided into two basic parts. The first part contains the emergency procedures checklists. These checklists supply an immediate action sequence to be followed during critical situations with little emphasis on the operation of the systems. The numbers located in parentheses after each checklist heading indicate where the corresponding paragraph in the amplified procedures can be found.

The second part of the section provides amplified emergency procedures corresponding to the emergency procedures checklist items. These amplified emergency procedures contain additional information to provide the pilot with a more complete description of the procedures so they may be more easily understood. The numbers located in parentheses after each paragraph heading indicates the corresponding checklist paragraph.

Pilots must familiarize themselves with the procedures given in this section and must be prepared to take the appropriate action should an emergency situation arise. The procedures are offered as a course of action for 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. This information is intended to provide a source of reference for the procedures which are applicable to this airplane. The pilot should review standard emergency procedures periodically to remain proficient in them.

3.3 AIRSPEEDS FOR SAFE OPERATIONS

One engine inoperative air minimum control (VMCA) ....66 KIAS
One engine inoperative best rate of climb (VYSE)...........................88 KIAS
One engine inoperative best angle of climb (VXSE) ....83 KIAS
Maneuvering (VA - 4407 LBS) ....135 KIAS
Never exceed (VNE)..204 KIAS

3.5 EMERGENCY PROCEDURES CHECKLIST

3.5a Engine Inoperative Procedures (3.9)

IDENTIFYING DEAD ENGINE AND VERIFYING POWER LOSS (3.9a)

Loss of thrust.

Nose of aircraft will yaw in direction of dead engine (with coordinated controls).

Rudder pedal force will be required in the direction away from the dead engine to maintain straight flight.

ENGINE SECURING PROCEDURE (FEATHERING PROCEDURE) (3.9b)

Throttle ....CLOSE
Propeller ....FEATHER (800 RPM MIN.)
Mixture ....IDLE CUT-OFF
Cowl Flap ....CLOSE
Fuel Selector ....OFF
Airconditioner (If installed)...OFF
Alternator..OFF
Standby Fuel Pump...OFF
Magneto Switches...OFF
Prop Sync (If installed)..OFF
Electrical Load ....REDUCE
Crossfeed ....AS REQUIRED

ENGINE FAILURE DURING TAKEOFF (SPEED BELOW 85 KIAS OR GEAR DOWN) (3.9c)

If engine failure occurs during takeoff and 85 KIAS has not been attained:

Throttles ....IMMEDIATELY CLOSE
Brakes (or land and brake)...AS REQUIRED
Stop straight ahead

If insufficient runway remains for a complete stop:

Throttles ....IMMEDIATELY CLOSE
Mixtures ....IDLE CUT-OFF
Fuel Selectors ....OFF
Magneto Switches...OFF
Standby Fuel Pumps ....OFF
Battery Master Switch ....OFF
Brakes ....apply max. braking

MAINTAIN DIRECTIONAL CONTROL, MANEUVERING TO AVOID OBSTACLES IF NECESSARY.

ENGINE FAILURE DURING TAKEOFF (SPEED ABOVE 85 KIAS) (3.9d)

If sufficient runway remains for a complete stop:

Directional Control ....MAINTAIN
Throttles ....IMMEDIATELY CLOSE

LAND IF AIRBORNE AND STOP STRAIGHT AHEAD

Brakes ....AS REQUIRED

3.5a Engine Inoperative Procedures (3.9d) (Continued)

ENGINE FAILURE DURING TAKEOFF (SPEED ABOVE 85 KIAS)

If runway remaining is inadequate for stopping and the decision is made to continue:

WARNING

Negative climb performance may result from an engine failure occurring after liftoff and before the failed engine's propeller has been feathered, the gear has been retracted, the cowl flap on the failed engine is closed and a speed of 88 KIAS has been attained.

In many combinations of aircraft weight, configuration, ambient conditions and speed, negative climb performance may result. Refer to one engine inoperative climb chart for clean configuration positive climb performance.

Mixture controls ....FULL FORWARD
Propeller controls ....FULL FORWARD
Throttles ....38 in. Hg. MAP
Directional Control ....MAINTAIN
Flaps ....FULL UP
Landing Gear (in level or climbing flight) ....RETRACT
Inoperative Engine ....IDENTIFY BY CLOSING THROTTLE
Propeller (Inop. Engine) ....FEATHER
Establish Bank ....2° to 3° INTO OPERATIVE ENGINE
Climb Speed ....88 KIAS
Trim ....ADJUST TO 2° to 3° BANK TOWARD OPERATIVE ENGINE WITH APPROXIMATELY 1/2 BALL SLIP INDICATED ON THE TURN AND BANK INDICATOR
Cowl Flap (Inop. Engine) ....CLOSE

When a positive rate of climb has been established:

Engine Securing ....COMPLETE

LAND AS SOON AS PRACTICAL AT THE NEAREST SUITABLE AIRPORT.

ENGINE FAILURE DURING CLIMB (3.9e)

Airspeed .... MAINTAIN 88 KIAS

Directional Control .... MAINTAIN

Power .... MAX. CONTINUOUS

Inoperative Engine .... IDENTIFY and VERIFY

Inoperative Engine .... COMPLETE ENGINE SECURING PROCEDURE

Trim .... ADJUST TO 2° to 3° BANK TOWARD OPERATIVE ENGINE WITH APPROXIMATELY 1/2 BALL SLIP INDICATED ON THE TURN AND BANK INDICATOR

Cowl Flap (Operative Engine) .... 1/2 OPEN

LAND AS SOON AS PRACTICAL AT THE NEAREST SUITABLE AIRPORT.

3.5a Engine Inoperative Procedures (Continued)

ENGINE FAILURE DURING FLIGHT (SPEED BELOW VMCA) (3.9f)

Rudder .... APPLY AGAINST YAW (Operative Engine)

Throttles (Both Engines) .... RETARD TO STOP TURN

Pitch Attitude .... LOWER NOSE TO ACCELERATE ABOVE VMCA (66 KIAS)

Operative Engine .... INCREASE POWER AS AIRSPEED INCREASES ABOVE VMCA (66 KIAS)

If altitude permits, a restart may be attempted.

If restart fails or if altitude does not permit restart:

Inoperative Engine Propeller .... FEATHER

Trim .... ADJUST TO 2° to 3° BANK TOWARD OPERATIVE ENGINE WITH APPROXIMATELY 1/2 BALL SLIP INDICATED ON THE TURN AND BANK INDICATOR

Inoperative Engine .... Complete Engine Securing Procedure

Cowl Flap (Operative Engine) .... 1/2 OPEN

LAND AS SOON AS PRACTICAL AT THE NEAREST SUITABLE AIRPORT.

ONE ENGINE INOPERATIVE LANDING (3.9g)

Inoperative Engine ....ENGINE SECURING PROCEDURE COMPLETE

Seat Belts/Harnesses ....FASTEN/ADJUST

Fuel Selector (Operative Engine)...ON

Standby Fuel Pump (Operative Engine) ....ON

Mixture (Operative Engine) ....FULL RICH

Propeller Control (Operative Engine)..............................FULL FORWARD

Cowl Flap (Operative Engine) ....1/2 OPEN

Altitude & Airspeed...MAKE NORMAL APPROACH

When Landing is Assured:

Landing Gear ....DOWN

Flaps...AS REQUIRED

Final Approach Speed ....90 KIAS

Power..RETARD SLOWLY AND FLARE AIRPLANE

Trim ....AS POWER IS REDUCED (AIRPLANE WILL YAW IN DIRECTION OF OPERATIVE ENGINE)

3.5a Engine Inoperative Procedures (Continued)

WARNING

Under many conditions of loading and density altitude a go-around may be impossible and in any event the sudden application of power during one engine inoperative operation makes control of the airplane more difficult.

WARNING

One Engine Go-Around is not possible from the approach configuration unless sufficient altitude is available to raise flaps and landing gear in a descent.

CAUTION:

A one engine inoperative go-around should be avoided if at all possible.

ONE ENGINE INOPERATIVE GO-AROUND

Mixture ....VERIFY FULL FORWARD
Propeller ....VERIFY FULL FORWARD
Throttle ....MAX ON OPERATIVE ENGINE
Flaps ....RETRACT SLOWLY
Landing Gear ....RETRACT
Airspeed ....88 KIAS
Trim ....ADJUST TO 2° to 3° BANK TOWARD OPERATIVE ENGINE WITH APPROXIMATELY 1/2 BALL SLIP INDICATED ON THE TURN AND BANK INDICATOR
Cowl Flap (Operating Engine) ....1/2 OPEN

3.5b Air Starting Procedure (3.11)

UNFEATHERING PROCEDURE/ STARTER ASSISTED (3.11a)

Fuel Selector (Inoperative Engine) ....ON
Standby Fuel Pump ....ON
Throttle ....Open 1/2 inch
Mixture ....FULL RICH
Magneto Switches (Inoperative Engine)..ON
Prop Control (Inoperative Engine) ....MID RANGE
Starter...ENGAGE until prop windmills
Throttle...REDUCE POWER until engine is warm
Standby Fuel Pump...OFF

Alternator (after restart) ....ON
Engine Instruments ....CHECK
Airconditioner (If installed) ....(As desired) ON
Propeller...Manual Sync with operative engine
Throttle...Set as Desired
Prop Sync (If installed) ....(As desired) ON

UNFEATHERING PROCEDURE/ UNFEATHERING ACCUMULATOR ASSISTED (3.11b) *

NOTE

With the propeller unfeathering system installed, the propeller will usually windmill automatically when the propeller control is moved forward.

Fuel Selector (Inoperative Engine) .... ON
Standby Fuel Pump (Inop. Engine) .... ON
Throttle .... Open 1/4 inch
Mixture .... FULL RICH
Magneto Switches (Inoperative Engine) .... ON
Prop Control .... FULL FORWARD
Throttle .... REDUCE POWER until engine is warm
Standby Fuel Pump (Inop. Engine) .... OFF
Alternator .... ON

If engine does not start, prime as required and engage starter.

NOTE

Starter assist is required if the propeller is not windmilling freely within 5-7 seconds after the propeller control has been moved forward.

When propeller unfeathering occurs, it may be necessary to retard the prop control slightly to keep the prop from overspeeding.

* Optional Equipment with Hartzell Propeller installation.

3.5c Engine Fire (3.13)

ENGINE FIRE DURING START (3.13a)

If engine has not started:

Fuel Selector ....OFF
Mixture ....IDLE CUT-OFF
Throttle ....FULL OPEN
Starter ....CONTINUE to Crank Engine

If engine has already started and is running, continue operating to try pulling the fire into the engine.

If fire continues:

Fuel Selector ....OFF
Standby Fuel Pump...OFF
Mixture ....IDLE CUT-OFF
Throttle ....FULL OPEN
External Fire Extinguisher (If Available)..USE
Airplane ....EVACUATE

NOTES:

If fire continues, shut down both engines and evacuate.

If fire has spread to the ground, it may be possible to taxi away.

ENGINE FIRE IN FLIGHT (3.13b)

Fuel Selector (Affected Engine) ....OFF
Throttle (Affected Engine)..CLOSE
Propeller (Affected Engine) ....FEATHER
Mixture (Affected Engine) ....IDLE CUT-OFF
Heater...OFF
Defroster ....OFF
Cowl Flap ....OPEN
Affected Engine ....COMPLETE Engine Securing Procedure

If fire persists:

Airspeed...INCREASE in attempt to blow out fire

Land as soon as possible at the nearest suitable airport.

3.5d TURBOCHARGER FAILURE (3.14)

CAUTION:

If a turbocharger failure is the result of loose, disconnected or burned through exhaust system components, a potentially serious fire hazard exists. If a failure within the exhaust system is suspected in flight, shut down the engine immediately and LAND AS SOON AS POSSIBLE. If a suspected exhaust system failure occurs prior to takeoff, DO NOT FLY THE AIRCRAFT.

NOTE:

A turbocharger malfunction at altitudes above 10,000 feet MSL may result in an overly rich fuel mixture, which could result in a partial power loss and/or a rough running engine. In worst case conditions a complete loss of engine power may result.

COMPLETE LOSS OF ENGINE POWER:

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

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

Reduce power and land as soon as possible.

3.5d TURBOCHARGER FAILURE (3.14) (continued)

PARTIAL LOSS OF ENGINE POWER

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

Throttle ....AS REQUIRED
Propeller..AS REQUIRED
Mixture ....AS REQUIRED
Land as soon as possible.

ENGINE POWER OVERBOOST

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

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

NOTE

Expect manifold pressure response to throttle movements to be sensitive.

Propeller..AS REQUIRED
Mixture ....FULL RICH
Land as soon as possible.

3.5e Turbine Inlet Temperature (TIT) Indicator Failure (3.15)

If failure occurs during takeoff, climb, or landing:

Mixture .... Full Rich

If failure occurs prior to setting cruise power:

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

CAUTION

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

If failure occurs after setting cruise power and mixture:

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

CAUTION

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

If failure occurs prior to or during descent:

Power .... Set for Descent
Mixture .... Full Rich

3.5f Fuel Management During One Engine Inoperative Operation (3.17)

CRUISING (3.17a)

CROSSFEED

Fuel Selector (Operative Engine)....................CROSSFEED
Fuel Selector (Inoperative Engine)....................OFF

NOTE

Use crossfeed in level cruise flight only.

COMING OUT OF CROSSFEED (Prior to Landing)

Standby Fuel Pump (Operative Engine)....................ON
Fuel Selector (Operative Engine)....................ON
Fuel Selector (Inoperative Engine)....................OFF
Standby Fuel Pump (Inoperative Engine)....................OFF

LANDING (3.17b)

Fuel Selector (Operative Engine)....................ON
Fuel Selector (Inoperative Engine)....................OFF
Standby Fuel Pump (Operative Engine)....................ON

3.5g Engine Driven Fuel Pump Failure (3.19)

Throttle....................RETARD
Standby Fuel Pump (Affected Engine)....................ON
Throttle....................RESET (As Required)
Mixture....................RESET (As Required)

CAUTION

If normal engine operation and fuel flow is not immediately re-established, the standby fuel pump should be turned off. The lack of a fuel flow indication could indicate a leak in the fuel system, or fuel exhaustion. If system leak is verified, switch fuel selector to OFF. Proceed with engine securing procedure.

3.5h Landing Gear Unsafe Warnings (3.21)

Red gear warning annunciator light indicates when the gear is in transit.

Recycle gear if indication continues.

Red gear warning annunciator light will illuminate along with the gear warning horn should the gear not be down and locked if throttles are brought to a low setting.

3.5i Landing Gear Malfunctions (3.23)

MANUAL EXTENSION OF LANDING GEAR (3.23a)

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

Check following before extending gear manually:

Day/Night Dimming Switch (Daytime) ....DAY
Circuit Breakers..CHECK
Battery Master Switch...ON
Alternators ....CHECK

To extend, reposition guard clip downward clear of knob and proceed as follows:

Airspeed ....REDUCE (85 KIAS max.)
Gear Selector ....GEAR DOWN POSITION
Emerg. Gear Extend Knob ....PULL
Indicator Lights..3 GREEN

Leave emergency gear extension knob out.

WARNING

If the emergency gear extension knob has been pulled out to lower the gear due to a gear system malfunction, leave the control in its extended position until the airplane has been put on jacks to check the proper function of the landing gears hydraulic and electrical systems.

GEAR UP LANDING (3.23b)

Select suitable landing area.

Ground Personnel..INFORM (If possible)
Fuel ....BURN OFF (If time allowed)
Seatbelts and Harness..FASTEN/ADJUST
CHECK INERTIA REEL
Passengers..BRIEF
Normal Landing Checklist...COMPLETE
Autopilot..OFF
Battery Master (Day time)..OFF
Approach ....NORMAL

When runway is made and landing is assured:

Mixtures...IDLE CUTOFF
Prop Controls...FEATHER
Fuel Selectors ....OFF

Touch down at minimum airspeed and level attitude.

Battery Master (Night)...OFF

Evacuate when aircraft comes to a stop.

3.5j Electrical Failures (3.25)

SINGLE ALTERNATOR FAILURE

(Alternator #1 or #2 Inop. Light Illuminated - Annunciator Panel). (3.25a)

Verify Failure..CHECK AMMETER
Electrical load...REDUCE until total load is less than 85 Amps
Failed Alternator Switch..OFF
Failed Alternator Circuit Breaker..............................CHECK AND RESET
Failed Alternator Switch (After OFF at least 1 second).............................ON

If power is NOT restored:

Failed Alternator Switch..OFF
Amperage ....MONITOR and maintain below 85 Amps

While one alternator will supply sufficient current for minimum required avionics and cockpit lighting, use of deicing equipment, particularly windshield or propeller heat, may be limited. Immediate action should be taken to avoid or exit icing conditions. Under no circumstances may the total electrical load exceed 85 amps. The cabin recirculation blowers, and position, strobe and landing lights should not be used unless absolutely necessary.

3.5j Electrical Failures (3.25) (Continued)

DUAL ALTERNATOR FAILURE

(Alternator #1 and #2 Inop. Light Illuminated - Annunciator Panel). (3.25b)

CAUTION

The alternator output circuit breakers must not be opened manually when the alternators are functioning properly.

NOTE

Anytime total bus voltage is below approximately 25 Vdc, the LO BUS voltage annunciator will illuminate.

Verify Failure....................CHECK AMMETER
Electrical load....................REDUCE to minimum required for safe flight
Alternator Switches....................OFF
Alternator Circuit Breakers....................CHECK & RESET AS REQUIRED
Alternator Switches (One at a time after OFF at least 1 second)....................ON

If only one alternator resets:

Operating Alternator Switch....................ON
Failed Alternator Switch....................OFF
Electrical load....................MAINTAIN less than 85 Amps
Amperage....................MONITOR

3.5j Electrical Failures (3.25) (Continued)

DUAL ALTERNATOR FAILURE (Continued)

If neither alternator resets:

Both Alternator Switches...OFF

CONTINUE FLIGHT WITH REDUCED ELECTRICAL LOAD ON BATTERY POWER ONLY.

NOTE

LO BUS voltage annunciator will also be illuminated.

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

WARNING

Compass error may exceed 10 degrees with both alternators inoperative.

NOTE

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

3.5k Vacuum System Failures (3.27)

(Left or right Vacuum Inop. Light Illuminated - Annunciator Panel).

Gyro Suction Gauge ....CHECK (within normal operating range)

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

(Left and right Vacuum Inop. Light Illuminated - Annunciator Panel).

If both vacuum systems are inoperable, the turn coordinator and pilot's directional gyro will be the only usable gyroscopic flight instruments, wing and tail deicer boots will be inoperative. A precautionary landing should be considered depending on operating conditions

3.5m Spin Recovery (Intentional Spins Prohibited) (3.29)

NOTE

Federal Aviation Administration Regulations do not require spin demonstration of multi-engine airplanes; spin tests have not been conducted. The recovery technique presented is based on the best available information.

Throttles ....RETARD to IDLE

Rudder...FULL OPPOSITE TO DIRECTION OF SPIN

Control wheel ....FULL FORWARD if nose does not drop

Ailerons ....NEUTRAL

Rudder...NEUTRALIZE when rotation stops

Control wheel...SMOOTH BACK PRESSURE to recover from dive

3.5n Emergency Descent (3.31)

Throttles....................CLOSED
Propellers....................FULL FORWARD
Mixture....................AS REQUIRED for smooth operation
Landing gear....................EXTEND below 128 KIAS
Airspeed....................128 KIAS Max.

3.5o Combustion Heater Overheat (3.33)

Unit will automatically cut-off.

Do not attempt to restart.

3.5p Propeller Overspeed (3.35)

Throttle (Affected Engine)....................RETARD
Oil pressure (Affected Engine)....................CHECK
Prop control (Affected Engine)....................FULL DECREASE RPM (DO NOT FEATHER) THEN SET if any control available
Airspeed....................REDUCE
Throttle (Affected Engine)....................AS REQUIRED to remain below 2600 rpm

3.7 AMPLIFIED EMERGENCY PROCEDURES (GENERAL)

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

EMERGENCY PROCEDURES CHECKLIST (3.5)

3.9 Engine Inoperative Procedures (3.5a)

3.9a Identifying Dead Engine and Verifying Power Loss (3.5a)

If it is suspected that an engine has lost power, the faulty engine must be identified, and its power loss verified. Rudder pressure required to maintain directional control will be on the side of the operative engine - in short, A DEAD FOOT INDICATES A DEAD ENGINE. Engine gauges like TIT and oil pressure may be of help in identifying the dead engine.

3.9b Engine Securing Procedure (Feathering Procedure) (3.5a)

The engine securing procedure should always be accomplished in a sequential order according to the nature of the engine failure.

Begin the securing procedure by moving the throttle of the inoperative engine towards IDLE. If no changes are noted, the correct identification of the dead engine is confirmed. Move the propeller control to FEATHER (fully aft) before the propeller speed drops below 800 RPM. ***The propellers can be feathered only while the engine is rotating above 800 RPM.*** Loss of centrifugal force due to slowing rpm will actuate a stop pin that keeps the propeller from feathering each time the engine is stopped on the ground. One engine inoperative performance will decrease significantly if the propeller of the inoperative engine is not feathered.

The inoperative engine's mixture control should be moved fully aft to the IDLE CUTOFF position. Close its cowl flap to reduce drag. Move the inoperative engine's fuel selector to the off position. Turn off the airconditioner (if installed). The alternator switch, magneto switches, standby fuel pump switch and prop sync (if installed), should all be turned off. Complete the procedure by reducing the electrical load and considering the use of the fuel crossfeed if the fuel quantity dictates.

NOTE

When an engine is feathered, the OIL, VACuum INOP, and ALTernator annunciator warning lights will remain illuminated.

3.9c Engine Failure During Takeoff (Speed Below 85 KIAS or Gear Down) (3.5a)

Determination of runway length, single engine climb rate, and accelerate/stop distance will aid in determining the best course of action in the event of an engine failure during takeoff.

If engine failure occurs during the takeoff roll, the takeoff MUST be aborted. If failure occurs after liftoff but before 85 KIAS is achieved or before the gear is retracted, the takeoff should also be aborted. Immediately CLOSE the throttles, land if airborne, apply brakes as required and stop straight ahead.

If an engine failure occurs below 85 KIAS and there is not adequate runway remaining for landing, deceleration and stop, immediately retard the throttles fully aft and mixture controls to idle cut-off. Move the fuel selectors to the off position. Turn OFF the magneto switches followed by the stand by fuel pump and battery master switch while applying maximum braking.

During these procedures maintain directional control and if necessary, maneuver to avoid obstacles.

3.9d Engine Failure During Takeoff (Speed Above 85 KIAS) (3.5a)

If engine failure occurs after liftoff with the gear still down and 85 KIAS has been attained, the course of action to be taken will depend on the runway remaining and aircraft configuration. Also the pilot's decision must be based on a personal judgement, taking into consideration such factors as obstacles, the type of terrain beyond the runway, altitude and temperature, weight and loading, weather, airplane condition, and the pilot's own proficiency and capability.

If adequate runway remains, maintain heading. Close both throttles immediately, land if airborne, apply brakes as required and stop straight ahead.

3.9d Engine Failure During Takeoff (Speed Above 85 KIAS) (3.5a) (Cont)

WARNING

In many combinations of aircraft weight, configuration, ambient conditions and speed, negative climb performance may result. Refer to One Engine Inoperative Climb chart for clean configuration positive climb performance.

Negative climb performance may result from an engine failure occurring after liftoff and before the failed engine's propeller has been feathered, the gear has been retracted, the cowl flap on the failed engine is closed and a speed of 88 KIAS has been attained.

If the runway remaining is inadequate for stopping or the gear is in-transit or up, the pilot must decide whether to abort or to continue the takeoff and climb on a single engine.

If a decision is made to continue the takeoff, the airplane will tend to turn in the direction of the inoperative engine, since one engine will be inoperative and the other will be at maximum power. Rudder pressure force on the side of the operative engine will be necessary to maintain directional control.

Verify the mixture, propeller and throttle controls are fully forward while maintaining directional control. Remember, keep in mind that the One Engine Inoperative Air Minimum Control speed (VMCA) is 66 KIAS and the One Engine Inoperative Best Rate of Climb speed (VYSE) is 88 KIAS. Verify that the flaps and landing gear are up.

Once the faulty engine is identified and its power loss verified, feather its propeller. Establish a bank of 2° to 3° into the operative engine. Maintain 88 KIAS (VYSE). Trim the aircraft for 2° to 3° bank toward the operative engine with approximately 1/2 ball slip indicated on the turn and bank indicator. Close the cowl flap on the inoperative engine.

After the aircraft is trimmed, and a positive rate of climb has been established, complete the engine securing procedure.

Land as soon as practical at the nearest suitable airport.

3.9e Engine Failure During Climb (3.5a)

If engine failure occurs during climb, a minimum airspeed of 88 KIAS (V_{YSE}) should be maintained. Since one engine will be inoperative and the other will be at maximum power, the airplane will have a tendency to turn in the direction of the inoperative engine. Rudder pedal force on the side of the operative engine will be necessary to maintain directional control.

After the faulty engine has been identified and power loss has been verified, complete the Engine Securing Procedure. Continue a straight ahead climb until sufficient altitude (minimum of 1000 feet above ground elevation) is reached to execute the normal Single Engine Landing procedure at the nearest suitable airport.

For maximum climb performance in single engine flight, sideslip must be minimized by banking towards the operating engine 2° to 3°. The ball of the turn and slip indicator will be approximately 1/2 diameter out of center towards the operating engine for straight flight and should remain so displaced during any maneuvering necessary. The cowl flap on the operative engine should be set to 1/2 open.

Land as soon as practical at the nearest suitable airport.

3.9f Engine Failure During Flight (Speed Below V_{MCA})(3.5a)

Should an engine fail during flight at an airspeed below V_{MCA} (66 KIAS) apply rudder towards the operative engine to minimize the yawing motion. The throttles should be retarded to stop the yaw towards the inoperative engine. Lower the nose of the aircraft to accelerate above 66 KIAS and increase the power on the operative engine as the airspeed exceeds 66 KIAS. The airplane should be banked 5° towards the operating engine during this recovery to maximize control effectiveness.

After an airspeed of at least 88 KIAS (V_{YSE}) has been established, an engine restart attempt may be made if altitude permits. If the restart has failed, or altitude does not permit, the engine should be secured.

Move the propeller control of the inoperative engine to FEATHER and complete the engine securing procedure. Adjust the trim to a 2° to 3° bank into the operative engine with approximately 1/2 ball slip indicated on the turn and bank indicator. The cowl flap on the operative engine should be set to 1/2 open to maintain engine temperatures within allowable limits.

3.9g One Engine Inoperative Landing (3.5a)

Complete the Engine Securing Procedure. The landing gear should not be extended and the wing flaps should not be lowered until certain of making the field. Check seat belts and harnesses are properly secured. Check that the fuel selector and the standby fuel pump of the operative engine are ON and the mixture control is FULL RICH. Move the propeller control FULL FORWARD. Adjust the cowl flap control of the operating engine to the 1/2 open position to keep temperatures within limits.

Maintain a normal approach, keeping in mind that landing should be made right the first time and that a go-around should be avoided if at all possible.

When landing is assured, extend the landing gear and lower the flaps as required. Establish a final approach speed of 90 KIAS and retard the power slowly to touchdown using trim as required.

3.9h One Engine Inoperative Go-Around (3.5a)

CAUTION:

A one engine inoperative go-around should be avoided if at all possible.

WARNING:

Under some conditions of loading and density altitude a go-around may be impossible, and in any event the sudden application of power during one engine inoperative operation makes control of the airplane more difficult.

WARNING

One Engine Go-Around is not possible from the approach configuration unless sufficient altitude is available to raise flaps and landing gear in a descent.

To execute a one engine inoperative go-around, verify the mixture and propeller levers are full forward. The throttle should be advanced slowly to the maximum manifold pressure 38 in. Hg. Retract the flaps slowly. After a positive rate of climb has been established, retract the landing gear. Maintain airspeed at the one engine inoperative best rate of climb speed of 88 KIAS. Trim the aircraft for 2° to 3° bank toward the operative engine with approximately 1/2 ball slip indicated on the turn and bank indicator. Set the cowl flaps of the operating engine to the 1/2 open position.

3.9i Summary of Factors Affecting Single Engine Operations.

Significant climb performance penalties can result from landing gear, flap, or windmilling propeller drag. These penalties are approximately as listed below:

Landing gear extended/Flaps Up ....-200 ft./min.
Flaps extended 25°/Gear Down ....-300 ft./min.
Flaps extended fully/Gear Down ....- 350 ft./min.
Inoperative engine propeller windmilling
(Gear and Flaps Up) ....-200 ft./min.

WARNING

The propeller on the inoperative engine <u>must</u> be feathered, the landing gear retracted, and the wing flaps retracted for continued flight.

3.9i Summary of Factors Affecting Single Engine Operations. (Continued)

The following general facts should be used as a guide if an engine failure occurs:

1. **Discontinuing a takeoff upon engine failure is advisable under most circumstances. Continuing the takeoff, if engine failure occurs prior to reaching obstacle speed and gear retraction, is not advisable.**
2. Altitude is more valuable to safety after takeoff than is airspeed in excess of the best single-engine climb speed.
3. A windmilling propeller and extended landing gear cause a severe drag penalty and, therefore, **climb or continued level flight is improbable**, depending on weight, altitude and temperature. Prompt retraction of the landing gear, identification of the inoperative engine, and feathering of the propeller is of utmost importance if the takeoff is to be continued.
4. In no case should airspeed be allowed to fall below V_{XSE} (83 KIAS) unless touchdown is imminent even though altitude is lost, since any lesser speed will result in significantly reduced climb performance.
5. If the requirement for an immediate climb is not present, allow the airplane to accelerate to the single-engine best rate-of-climb airspeed since this speed will always provide the best chance of climb or least altitude loss in a given time.
6. To maximize controllability during recovery following an engine loss near or below V_{MC}, immediately reduce pitch attitude. The airplane should be banked approximately 5° into the operative engine and the rudder used to maintain straight flight. This will result in the ball of the turn and slip indicator being displaced 1/2 to 3/4 diameter towards the operating engine.
7. To maximize climb performance after airplane is under control of the pilot and failed engine is secured, the airplane should be trimmed in a 2° to 3° bank towards the operating engine with the rudder used as needed for straight flight. This will result in approximately 1/2 ball displacement towards the operating engine. This ball displacement should be maintained during any necessary maneuvering to maintain best possible climb margins.

3.11 AIR STARTING PROCEDURE (3.5b)

3.11a Unfeathering Procedure/ Starter Assisted

Move the fuel selector for the inoperative engine to the ON position and check to make sure the standby fuel pump for that engine is on. Open the throttle 1/2 inch and the mixture should be set FULL RICH. Turn ON the magneto switches and position the propeller control mid range.

Engage the starter until the propeller windmills freely. If the engine does not start, prime as necessary. After restart, turn OFF the standby fuel pump, set the throttle at reduced power until the engine is warm and turn the alternator switch ON. Once the engine is warm the throttle and prop controls can be set as necessary for cruise.

3.11b Unfeathering Procedure/ Unfeathering Accumulator Assisted *

Move the fuel selector for the inoperative engine to the ON position and check to make sure the standby fuel pump for that engine is on. Open the throttle 1/4 inch and the mixture to FULL RICH. Turn ON the magneto switches and push the propeller control full forward.

If the propeller does not windmill freely within 5 - 7 seconds after the propeller control has been moved full forward, prime as necessary and engage the starter for 1 - 2 seconds. After restart, turn OFF the standby fuel pump, set the throttle at reduced power until the engine is warm and turn the alternator switch ON.

NOTE

When propeller unfeathering occurs, it may be necessary to retard the prop control slightly to keep the prop from overspeeding.

* Optional Equipment with the Hartzell propeller installation.

3.13 ENGINE FIRE (3.5c)

3.13a Engine Fire During Start (3.5c)

The first attempt to extinguish the fire is to try to draw the fire back into the engine. If the engine has not started, move the fuel selector to OFF, mixture control to idle cut-off and open the throttle. Continue to crank the engine with the starter in an attempt to pull the fire into the engine.

If the engine has already started and is running, continue operating to try to pull the fire into the engine.

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

If an external fire extinguishing method is to be applied, move the fuel selector valve and auxiliary fuel pump switch to OFF, the mixture to IDLE CUT-OFF and the throttle to FULL OPEN.

NOTES:

If fire has spread to the ground from excess fuel, taxi away from fire area if possible.

If fire continues, shut down both engines and evacuate.

3.13b Engine Fire In Flight (3.5c)

The possibility of an engine fire in flight is extremely remote. The procedure given below is general and pilot judgment should be the deciding factor for action in such an emergency.

If an engine fire occurs in flight, place the fuel selector of the affected engine to the OFF position and close its throttle. Feather the propeller on the affected engine. Move the mixture control to idle cut-off. Turn OFF the heater and defroster units. The cowl flap should be open. After completion of the Engine Securing Procedure (para. 3.5a) on the affected engine, and if the fire persists, increase airspeed as much as possible in an attempt to blow out the fire.

Land as soon as possible at the nearest suitable airport.

3.14 TURBOCHARGER FAILURE (3.5d)

CAUTION:

If a turbocharger failure is the result of loose, disconnected or burned through exhaust system components, a potentially serious fire hazard exists. If a failure within the exhaust system is suspected in flight, shut down the engine immediately and LAND AS SOON AS POSSIBLE. If a suspected exhaust system failure occurs prior to takeoff, DO NOT FLY THE AIRCRAFT.

NOTE:

A turbocharger malfunction at altitudes above 10,000 feet MSL may result in an overly rich fuel mixture, which could result in a partial power loss and/or a rough running engine. In worst case conditions a complete loss of engine power may result.

COMPLETE LOSS OF ENGINE POWER:

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

PARTIAL LOSS OF ENGINE POWER

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

Should a partial loss of engine power occur (i.e. wastegate fails open), the throttle, propeller and mixture controls can be set as required for flight. Monitor all engine gauges and ***land as soon as possible*** to have the cause of the power loss investigated.

3.14 TURBOCHARGER FAILURE (3.5d) (continued)

ENGINE POWER OVERBOOST

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

NOTE
Expect manifold pressure response to throttle movements to be sensitive.

Set the throttle and propeller controls as necessary to keep the manifold pressure within limits. Set the mixture control to full rich. ***Land as soon as possible*** to have the cause of the overboost condition investigated.

3.15 TURBINE INLET TEMPERATURE (TIT) INDICATOR FAILURE (3.5e)

In the event the Turbine Inlet Temperature (TIT) indicator or sensor fails during flight, continued flight is possible using conservative mixture/TIT settings. If TIT failure occurs during takeoff, climb, descent, or landing, maintain a full rich mixture to assure adequate fuel flow for engine cooling.

If TIT failure occurs prior to setting cruise power, set power per the POH Section 5 power setting table and then lean to the approximate POH power setting table fuel flow +4 GPH. This fuel flow will maintain adequate engine cooling and a TIT value below TIT limits. Monitor CHT and Oil Temperature for normal operation.

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

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

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

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

3.17 FUEL MANAGEMENT DURING ONE ENGINE INOPERATIVE OPERATION (3.5f)

A crossfeed is provided to increase range during one engine inoperative operation. Use crossfeed in level flight only.

3.17a CRUISING

CROSSFEED

Crossfeed should be employed only when it is necessary to extend range during single engine operation. Crossfeed must be off for takeoffs and landings.

To activate the crossfeed system, move the fuel selector of the operative engine to crossfeed. At this time a crossfeed annunciator in the annunciator panel will illuminate, informing you that fuel from the inoperative engine is being transferred to the operating engine. Set the fuel selector of the inoperative engine to the off position.

COMING OUT OF CROSSFEED

To return to normal operation during a single engine landing when the crossfeed system has been in use, use the following procedure. On the operative engine turn on the standby fuel pump and then position the fuel selector of the operative engine to on. Verify that the fuel selector of the inoperative engine is in the off position.

3.17b LANDING

During the landing sequence the fuel selector of the operating engine must be ON and the fuel selector of the inoperative engine OFF. The standby fuel pump of the operating engine should be ON.

3.19 ENGINE DRIVEN FUEL PUMP FAILURE (3.5g)

Loss of fuel pressure and engine power can be an indication of failure of the engine driven fuel pump.

Should a malfunction of the engine driven fuel pump occur, the standby fuel pump system can supply sufficient fuel pressure for engine power. Any combination of RPM and Manifold Pressure defined on the Power Setting Table may be used, but leaning may be required for smooth operation. Normal cruise, descent and approach procedures should be used.

CAUTION

If normal engine operation and fuel pressure are not immediately re-established, the standby fuel pump should be turned off. The lack of a fuel pressure indication could indicate a leak in the fuel system, or fuel exhaustion. If system leak is verified, switch fuel selector to off and proceed with engine securing procedure.

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3.21 LANDING GEAR UNSAFE WARNINGS (3.5h)

The red landing gear warning annunciator (GEAR WARN) will illuminate when the landing gear is in transition between the full up position and the down-and-locked position. The pilot should recycle the landing gear if continued illumination of the annunciator occurs. Additionally, the annunciator will illuminate when the gear warning horn sounds. The gear warning horn will sound at low throttle settings if the gear is not down and locked.

3.23 LANDING GEAR MALFUNCTIONS (3.5i)

3.23a Manual Extension of Landing Gear (3.5i)

Several items should be checked prior to extending the landing gear manually. Check for popped circuit breakers and ensure the battery master switch is ON. Then check the alternators. If it is daytime,the Day/Night Dimmer Switch should be in the Day position.

To execute a manual extension of the landing gear, reposition the guard clip downward clear of the extension knob and reduce power to maintain airspeed below 85 KIAS. Place the landing gear selector switch in the GEAR DOWN position and pull the emergency gear extension knob. Check for 3 green indicator lights.

WARNING

If the emergency gear extension knob has been pulled out to lower the gear due to a gear system malfunction, leave the control in its extended position until the airplane has been put on jacks to check the proper function of the landing gears hydraulic and electrical systems.

3.23b Gear-Up Landing (3.5i)

If all normal and emergency gear extension procedures have failed, a gear up landing will be necessary. Select a suitable landing area. If possible, inform ground personnel of the emergency situation. If time allows, burn off excess fuel. Brief passengers and be sure that all occupants have seat belts and shoulder harnesses secured properly.

When ready to land, complete the landing checklist as for a normal landing; however the gear selector should be in the UP position. Turn OFF the autopilot and, in daylight, turn OFF the battery master. During a night landing when the battery master is left ON, the gear warning horn may sound when the throttles are retarded.

Make a normal approach and when the runway is made and landing is assured, place mixtures in IDLE CUTOFF, FEATHER the propellers, and turn OFF the fuel selectors.

Land smoothly, touching down in a level attitude. At night, turn OFF the battery master after touchdown. All occupants should evacuate as soon as the airplane has stopped.

3.25 ELECTRICAL FAILURES (3.5j)

WARNING

Compass error may exceed 10 degrees with both alternators inoperative.

NOTE

Anytime total bus voltage is below approximately 25 Vdc, the LO BUS voltage annunciator will illuminate.

NOTE

If the battery is depleted, the landing gear must be lowered using the emergency extension procedure. The green position lights will be inoperative.

3.25a Single Alternator Failure (Alternator #1 or #2 Inop. Light Illuminated - Annunciator Panel) (3.5j)

CAUTION

The alternator output circuit breakers should not be opened manually when the alternators are functioning properly.

If one ammeter shows zero output or the ALTernator annunciator light is illuminated, reduce electrical loads to a minimum, turn the inoperative alternator switch OFF and check its circuit breaker. Reset if required. After at least one second, turn the ALT switch ON.

If the alternator remains inoperative, turn the ALT switch OFF, maintain an electrical load not to exceed 85 amps on the operating alternator and exercise judgment regarding continued flight. While one alternator will supply sufficient current for minimum required avionics and cockpit lighting, use of deicing equipment, particularly windshield or propeller heat, may be limited. Immediate action should be taken to avoid or exit icing conditions. Under no circumstances may the total electrical load exceed 85 amps. The cabin recirculation blowers, and position, strobe and landing lights should not be used unless absolutely necessary.

3.25b Dual Alternator Failure (Alternator #1 and #2 Inop. Light Illuminated- Annunciator Panel) (3.5j)

CAUTION

The alternator output circuit breakers should not be opened manually when the alternators are functioning properly.

If both ammeters show zero output, reduce electrical loads to a minimum and turn both ALT switches OFF. Check both alternator circuit breakers and reset if required. After being OFF at least one second, turn ALT switches ON one at a time while observing each alternator output.

If only one alternator output can be restored, leave the operating ALTernator switch ON, turn the faulty ALTernator switch OFF, reduce electrical loads to less than 85 amps and monitor the alternator output.

If neither alternator output can be restored, turn both ALT switches OFF. Continue flight with reduced electrical load and land as soon as practical. The battery is the only remaining source of electrical power.

3.27 VACUUM SYSTEM FAILURES (3.5k)

A malfunction of either vacuum pump is indicated by the illumination of the vacuum inop annunciators.

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

Failure of both vacuum pumps is indicated by the illumination of the vacuum inop annunciators and a suction gauge reading less than 4.5 inches of mercury.

If both vacuum systems are inoperable, the turn coordinator and pilot's directional gyro will be the only usable gyroscopic flight instruments, wing and tail deicer boots will be inoperative. A precautionary landing should be considered depending on operating conditions

3.29 SPIN RECOVERY (INTENTIONAL SPINS PROHIBITED) (3.5m)

NOTE

Federal Aviation Administration Regulations do not require spin demonstration of multi-engine airplanes; therefore, spin tests have not been conducted. The recovery technique presented is based on the best available information.

Intentional spins are prohibited in this airplane. In the event a spin is encountered unintentionally, immediate recovery actions must be taken.

To recover from an unintentional spin, immediately retard the throttles to the idle position. Apply full rudder opposite the direction of the spin rotation and immediately push the control wheel full forward. Keep the ailerons neutral. Maintain the controls in these positions until spin rotation stops, then neutralize the rudder. Recovery from the resultant dive should be with smooth back pressure on the control wheel. No abrupt control movement should be used during recovery from the dive, as the positive limit maneuvering load factor may be exceeded.

3.31 EMERGENCY DESCENT (3.5n)

In the event an emergency descent becomes necessary, CLOSE the throttles and move the propeller controls full FORWARD. Adjust the mixture controls as necessary to attain smooth operation.

Extend the landing gear below 128 KIAS.

Maintain 128 KIAS Max. in descent.

3.33 COMBUSTION HEATER OVERHEAT (3.5o)

In the event of an overheat condition, the fuel, air and ignition to the heater is automatically cut off. Do not attempt to restart the heater until it has been inspected and the cause of the malfunction has been determined and corrected.

3.35 PROPELLER OVERSPEED (3.5p)

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

If propeller overspeed should occur, retard the throttle. The propeller control should be moved to full DECREASE rpm (do NOT feather) and then set if any control is available. Airspeed should be reduced and throttle used to maintain 2600 RPM.

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NORMAL PROCEDURES

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SECTION 4
NORMAL PROCEDURES

4.1 GENERAL

This section provides the normal operating procedures for the PA-34-220T, SENECA V airplane. All of the normal operating procedures required by the FAA 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, are presented.

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

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

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

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

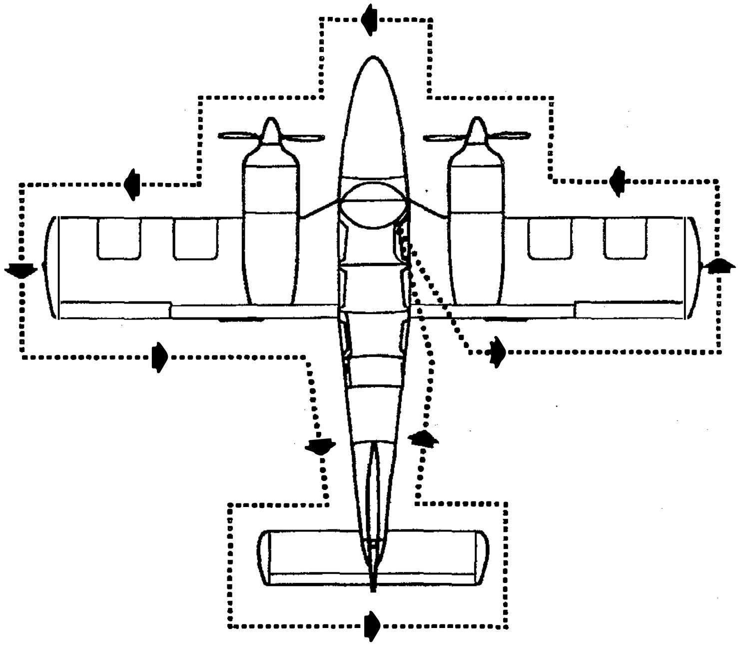
The second part of this section contains the amplified normal procedures which provide detailed information and explanations of the procedures and how to perform them. This portion of the section is not intended for use as an inflight reference due to the lengthy explanation. The short form checklists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

4.3 AIRSPEEDS FOR SAFE OPERATIONS

The following airspeeds are those which are significant to the operation of the airplane. These airspeeds 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 engines, airplane and equipment, atmospheric conditions and piloting technique.

(a)	Best Rate of Climb Speed (V_Y)	88 KIAS
(b)	Best Angle of Climb Speed (V_X)	83 KIAS
(c)	Turbulent Air Operating Speed (See Subsection 2.3)	135 KIAS
(d)	Maximum Flap Speed	113 KIAS
(e)	Landing Final Approach Speed (Flaps 40°) Short Field Effort	80 KIAS
(f)	Intentional One Engine Inoperative Speed	85 KIAS
(g)	Maximum Demonstrated Crosswind Velocity	17 KTS



WALK AROUND
Figure 4-1

4.5 NORMAL PROCEDURES CHECKLIST

4.5a Preflight Checklists (4.9)

CAUTION:

The flap position should be noted before boarding the airplane. The flaps must be placed in the up position before they will be locked and support weight on the step.

COCKPIT (4.9a)

Control Wheel	release restraints
Static System	DRAIN
Parking Brake	SET
Magneto Switches	OFF
Standby Fuel Pump Switches	OFF
Flight Controls	PROPER OPERATION
Gear Selector	DOWN

4.5a Preflight Checklists (4.9) (Continued)

COCKPIT (4.9a) (Continued)

Throttles .... IDLE
Mixture Controls .... IDLE CUT-OFF
Alternate Static Source .... NORMAL
Cowl Flaps .... OPEN
Stabilator & Rudder Trim .... NEUTRAL
Fuel Selectors .... ON
Radio Master Switch .... OFF
All Electrical Switches .... OFF
Battery Master Switch .... ON
Annunciator Panel .... PRESS TO TEST
Fuel Gauges .... CHECK QUANTITY
Landing Gear Lights .... 3 GREEN
Flaps .... EXTEND
Battery Master Switch .... OFF
Windows .... check CLEAN
Required Papers .... check ON BOARD
POH .... check ON BOARD
Baggage .... STOW PROPERLY - SECURE
Crossfeed drains .... DRAIN

RIGHT WING (4.9b)

Crossfeed Drains .... CHECK CLOSED
Surface Condition .... CLEAR of ICE, FROST & SNOW
Flap and Hinges .... CHECK
Aileron, Hinges & Freedom of Movement .... CHECK
Static Wicks .... CHECK
Wing Tip and Nav/Anti-Collision Lights .... CHECK
Fuel Filler Cap .... CHECK & SECURE
Fuel Tank Vent .... CLEAR

CAUTION:

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

RIGHT WING (4.9b) (Continued)

Wing Tank Drains (2) .... DRAIN
Tie Down .... REMOVE
Fuel Filter Drain .... DRAIN
Engine Oil & Cap .... CHECK & SECURE
Propeller & Spinner .... CHECK
Air Inlets .... CLEAR
Cowl Flap Area .... CHECK
Main Gear Strut .... PROPER INFLATION (3.2 ± .50 in.)
Main Wheel Tire .... CHECK
Brake, Block & Disc .... CHECK
Chock .... REMOVE

NOSE SECTION (4.9c)

General Condition .... CHECK
Windshield .... CLEAN
Landing Lights .... CHECK
Tow bar .... REMOVED AND STOWED
Chock .... REMOVE
Nose Gear Strut .... PROPER INFLATION (1.2 ± .25 in)
Nose Wheel Tire .... CHECK
Forward baggage door (key removable in locked position only) .... SECURE AND LOCKED

4.5a Preflight Checklists (4.9) (Continued)

LEFT WING (4.9d)

Surface Condition ....CLEAR of ICE, FROST & SNOW
Main Gear Strut..PROPER INFLATION (3 1/2 in.)
Main Wheel Tire..CHECK
Brake, Block & Disc ....CHECK
Chock ....REMOVE
Cowl Flap Area...CHECK Engine Oil & Cap
CHECK & SECURE
Propeller & Spinner..CHECK
Air Inlets ....CLEAR
Fuel Filter Drain ....DRAIN
Stall Warning Vanes (2)...CHECK
Pitot Head ....CLEAR
Tie Down ....REMOVE

CAUTION:

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

Wing Tank Drains (2) ....DRAIN
Fuel Tank Vent ....CLEAR
Fuel Filler Cap ....CHECK & SECURE
Wing Tip and Nav/Anti-Collision Lights ....CHECK
Aileron, Hinges & Freedom of Movement...CHECK
Flap and Hinges ....CHECK
Static Wicks ....CHECK

FUSELAGE (LEFT SIDE) (4.9e)

General Condition ....CHECK
Antennas...CHECK
Fresh Air Inlet ....CLEAR
Battery Vents ....CLEAR
External Power Receptacle ....CHECK
Rear doors ....LATCHED
Left static vent ....CLEAR

EMPENNAGE (4.9f)

Surface Condition ....CLEAR of ICE, FROST & SNOW
Anti-Collision Light ....CHECK
Stabilator, Trim Tab & Freedom of Movement....................CHECK
Rudder, Trim Tab & Freedom of Movement....................CHECK
Static Wicks ....CHECK
Tie Down ....REMOVE

FUSELAGE (RIGHT SIDE) (4.9g)

General Condition ....CHECK
Fresh Air Inlet ....CLEAR
Right static vent ....CLEAR
Cabin Door ....CHECK

MISCELLANEOUS (4.9h)

Battery Master Switch ....ON
Flaps....................RETRACT
Interior Lighting (Night Flight)....................ON & CHECK

CAUTION

Care should be taken when an operational check of the heated pitot head is being performed. The unit becomes very hot. Ground operation should be limited to 3 minutes maximum to avoid damaging the heating elements.

Pitot Heat/ Lift Detect Switch ....ON
Exterior Lighting Switches....................ON & CHECK
Pitot Head ....CHECK - WARM
Lift Detect Switch....................CHECK - WARM
All Lighting Switches ....OFF
Pitot Heat/ Lift Detect Switch ....OFF
Battery Master Switch ....OFF
Passengers ....BOARD

4.5b Before Starting Engine Checklists (4.11)

BEFORE STARTING ENGINE (4.11)

Preflight Check ....COMPLETED
Flight Planning..COMPLETED
Aft Cabin Doors ....CLOSE & SECURE
Forward Cabin Door ....CLOSE & SECURE
Seats..ADJUSTED & LOCKED

CAUTION:

With the shoulder harness fastened and adjusted, a pull test of it's locking restraint feature should be performed.

Seatbelts and Harness ....FASTEN/ADJUST
CHECK INERTIA REEL
Empty Seats ....SEAT BELTS SNUGLY FASTENED
Alternators..ON

WARNING

No braking will occur if knob is pulled before brake application.

Parking Brake ....SET
Gear Selector ....GEAR DOWN
Throttles ....IDLE
Propeller Controls..FULL FORWARD
Mixture ....IDLE CUT-OFF
Friction Handle ....AS DESIRED
Alternate Air Controls ....OFF
Cowl Flaps..OPEN
Stabilator & Rudder Trim ....SET
Fuel Selectors..ON
Heater Switch ....OFF
Radio Master Switch ....OFF
Electrical Switches ....OFF
Circuit Breakers ....CHECK IN

4.5c Engine Start Checklists (4.13)

ENGINE START - GENERAL (4.13)

CAUTION:

For cold weather starting, ensure magneto and master switches are off and mixture controls are in idle cut-off before turning propeller manually.

NOTE:

When starting at ambient temperatures +20°F and below, operate first engine started with alternator ON (at max charging rate not to exceed 1500 RPM) for 5 minutes minimum before initiating start on second engine.

To prevent starter damage, limit starter cranking to 30-second periods. If the engine does not start within that time, allow a cooling period of several minutes before engaging starter again. Do not engage the starter immediately after releasing it. This practice may damage the starter mechanism.

NOTE:

If available, preheat should be considered. Rotate each propeller through three times manually during preflight inspection.

NOTE:

Do not attempt an engine start while the engine gauges are in the process of conducting the self test feature. (See Section 7, para. 7.25a.)

4.5c Engine Start Checklists (4.13) (Continued)

NORMAL START - COLD ENGINE (4.13a)

Throttles .... 1 INCH OPEN
Propeller Controls .... FULL FORWARD
Battery Master Switch .... ON
Gear Lights .... 3 GREEN
*Standby Fuel Pump .... ON
*Magneto Switches .... ON
*Mixture .... RICH - THEN IDLE CUTOFF

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

*Propeller Area .... CLEAR
*Starter .... ENGAGE
*Mixture (when engine fires) .... ADVANCE
*Throttle .... ADJUST
*Oil Pressure .... CHECK

Repeat Above Procedure (*) for Second Engine Start

Voltmeter .... CHECK (28 ± 1 VOLT)
Alternator .... CHECK AMP OUTPUT
Gyro Vacuum .... CHECK (within normal operating range)

ENGINE START - COLD WEATHER (4.13b)

Throttles .... 1/2 INCH OPEN
Propeller Controls .... FULL FORWARD
Battery Master Switch .... ON
Gear Lights .... 3 GREEN
*Standby Fuel Pump .... ON
*Magneto Switches .... ON
*Mixture .... FULL RICH
*Throttle .... IDLE (after 5 sec. of prime)
*Propeller Area .... CLEAR
*Starter .... ENGAGE
*Throttle .... ADJUST AS REQUIRED
*Oil Pressure .... CHECK

Repeat Above Procedure (*) for Second Engine Start

Voltmeter .... CHECK (28 ± 1 VOLT)
Alternator .... CHECK AMP OUTPUT
Gyro Vacuum .... CHECK (within normal operating range)

4.5c Engine Start Checklists (4.13) (Continued)

NORMAL START - HOT ENGINE (4.13c)

Throttles....................1/2 INCH OPEN
Propeller Controls....................FULL FORWARD
Mixture....................IDLE CUT-OFF
Battery Master Switch....................ON
Gear Lights....................3 GREEN
Standby Fuel Pump....................OFF

NOTE

Pump may be turned ON after successful engine start, if long periods of engine idle in high ambient temperatures are anticipated.

Magneto Switches....................ON
Propeller Area....................CLEAR
Starter....................ENGAGE
Mixture (when engine fires)....................ADVANCE
Throttle....................ADJUST
Oil Pressure....................CHECK
Voltmeter....................CHECK (28 ± 1 VOLT)
Alternator....................CHECK AMP OUTPUT
Gyro Vacuum....................CHECK (within normal operating range)

ENGINE START WHEN FLOODED (4.13d)

Throttle....................OPEN FULL
Propeller Control....................FULL FORWARD
Mixture....................IDLE CUT-OFF
Battery Master Switch....................ON
Standby Fuel Pump....................OFF

NOTE

Pump may be turned ON after successful engine start, if long periods of engine idle in high ambient temperatures are anticipated.

Magneto Switches....................ON
Propeller Area....................CLEAR
Starter....................ENGAGE
Mixture (when engine fires)....................ADVANCE SLOWLY
Throttle....................RETARD TO 1000 RPM
Oil Pressure....................CHECK
Voltmeter....................CHECK (28 ± 1 VOLT)
Alternator....................CHECK AMP OUTPUT
Gyro Vacuum....................CHECK (within normal operating range)

ENGINE START WITH EXTERNAL POWER SOURCE (4.13e)

NOTE

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

CAUTION:

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

If cranking speed increases, the ship's battery is at a higher level than the external power supply. If the battery has been depleted by excessive cranking, it must be recharged before the second engine is started. All the alternator current will go to the low battery until it receives sufficient charge, and it may not start the other engine immediately.

Battery Master Switch .... OFF
Alternator Switches .... OFF
All Electrical Equipment .... OFF
Receptacle Door .... OPEN
External Power Plug .... INSERT in RECEPTACLE

Proceed with normal start.

Throttles .... LOWEST POSSIBLE RPM
External Power Plug .... DISCONNECT from RECEPTACLE
Receptacle Door .... SECURE
Battery Master Switch .... ON
Alternator Switches .... ON
Throttles .... 1000 RPM
Oil Pressure .... CHECK
Voltmeter .... CHECK BUS VOLTAGE (28 ± 1 Volt)
Alternator Output .... CHECK, BOTH LT and RT
Gyro Vacuum .... CHECK (within normal operating range)

4.5d Before Taxiing Checklist (4.15)

WARM-UP (4.15a)

External Power Source Unit ....REMOVE (IF APPLIED)
Throttles..1000 to 1200 RPM

BEFORE TAXIING (4.15b)

Battery Master Switch ....ON
Gyros...SET
Altimeter and Clock ....CHECK & SET
Radio Master Switch ....ON
Lights ....AS REQUIRED
Heater and Defroster ....AS DESIRED
Fuel Selectors ....ON, CHECK CROSSFEED
Radios..CHECK & SET
Autopilot ....TEST & OFF
Electric Trim ....CHECK
Passenger Briefing ....COMPLETE
Parking Brake ....RELEASE

4.5e Taxiing Checklist (4.17)

TAXIING (4.17)

Taxi Area..CLEAR
Standby Fuel Pumps ....AS REQUIRED

NOTE

During extended periods of engine idle at high ambient temperatures, fuel flow to the engine can be interrupted by the formation of fuel vapor bubbles in the fuel line. This condition can be corrected by turning the standby fuel pump ON, to provide positive pressure to the engine driven pump inlet.

Throttles...APPLY SLOWLY
Brakes..CHECK
Steering..CHECK
Flight Instruments..CHECK

NOTE

During taxi, if the Low Bus Voltage annunciator illuminates, increase engine RPM (if possible) to retain adequate battery charging.

4.5f Ground Check Checklist (4.19)

GROUND CHECK (4.19)

CAUTION:

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

Parking Brake .... SET
Mixtures .... FULL RICH
Propeller Controls .... FULL FORWARD
Throttles .... 1000 RPM
Engine Instruments .... CHECK
Throttles .... 1500 RPM
Propeller Controls (Max. Drop - 300 RPM) .... FEATHER - CHECK
Throttles .... 2300 RPM
Propeller Controls (Max. Drop - 300 RPM) .... EXERCISE
Alternate Air .... CHECK ON (OBSERVE APPROX. 25 RPM DROP) THEN OFF
Throttles .... 2000 RPM
Magnetos (Max. Drop - 150 RPM:
Max. Diff. - 50 RPM) .... CHECK
Voltmeter .... CHECK BUS (28 ± 1 VOLT)
Alternator Output .... CHECK, BOTH LT and RT
Annunciator Panel Lights .... OUT
Gyro Vacuum Gauge .... CHECK AS REQUIRED (within normal operating range)

WARNING:

If flight into icing conditions (in visible moisture below +5°C) is anticipated or encountered during climb, cruise or descent, activate the aircraft ice protection system,including the pitot heat, as described in supplement no. 3 - Ice Protection System.

Ice Protection Equipment .... CHECK AS REQUIRED
Throttles .... IDLE - CHECK
Throttles .... 800 to 1000 RPM
Friction Handle .... SET

4.5g Before Takeoff Checklist (4.21)

WARNING:

Refer to paragraph 4.55, Icing Information, prior to any flight operations. (Takeoff, cruise, landing, etc.)

BEFORE TAKEOFF (4.21)

Doors....................LATCHED
Seat Backs....................ERECT
Seats....................ADJUSTED & LOCKED IN POSITION
Seat Belts, Harnesses....................FASTENED/ADJUSTED
Armrests....................STOWED
Battery Master Switch....................ON
Alternators....................ON
Standby Fuel Pumps....................ON
Flight Instruments....................CHECK
Engine Instruments....................CHECK

WARNING:

If flight into icing conditions (in visible moisture below +5°C) is anticipated or encountered during climb, cruise or descent, activate the aircraft ice protection system, including the pitot heat, as described in supplement no. 3 - Ice Protection System.

Prop Heat....................AS REQUIRED
Windshield Heat....................AS REQUIRED
Pitot/Stall Warning Heat....................AS REQUIRED
Prop Controls....................FULL FORWARD
Mixtures....................FULL FORWARD
Alternate Air....................OFF
Flaps....................SET
Airconditioner (if installed)....................OFF
Stabilator and Rudder Trims....................SET
Fuel Selectors....................ON
Flight Controls....................CHECK
Parking Brake....................RELEASE

4.5h Takeoff Checklist (4.23)

CAUTION:

Fast taxi turns immediately prior to takeoff should be avoided to prevent unporting fuel feed lines.

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 38 in. Hg. maximum.

WARNING:

Refer to paragraph 4.55, Icing Information, prior to any flight operations. (Takeoff, cruise, landing, etc.)

NORMAL (0° FLAP) PERFORMANCE TAKEOFF (4.23a)

Flaps .... UP
Stabilator and Rudder Trim .... CHECK SET
Brakes .... HOLD
Mixture .... FULL RICH
Power .... 2600 RPM, 38 in. Hg. MAN PRESS
Brakes .... RELEASE
Rotate Speed .... (Max. T.O. Wt.) 79 KIAS
Obstacle Clearance Speed .... (Max. T.O. Wt.) 79 KIAS
Gear .... UP
Climb Speed (after obstacle clearance) .... 88 KIAS

4.5h Takeoff Checklist (4.23) (Continued)

SHORT FIELD PERFORMANCE TAKEOFF (4.23b)

Flaps .... 25°
Stabilator and Rudder Trim .... CHECK SET
Brakes .... HOLD
Mixture .... FULL RICH
Power .... 2600 RPM, 38 in. Hg. MAN PRESS
Brakes .... RELEASE
Rotate Speed .... (Max. T.O. Wt.) 71 KIAS
Obstacle Clearance Speed .... (Max. T.O. Wt.) 73 KIAS
Gear .... UP
Flaps .... RETRACT SLOWLY WHILE ACCELERATING
Climb Speed (after obstacle clearance) .... 88 KIAS

4.5i Climb Checklist (4.25)

MAXIMUM PERFORMANCE CLIMB (4.25a)

Best Rate (Flaps Up) .... 88 KIAS
Best Angle (Flaps Up) .... 83 KIAS
Cowl Flaps .... FULL OPEN
Power .... Max. Continuous Power
Standby Fuel Pumps .... **OFF at a safe altitude**
(ON above 10,000 FT)

CRUISE CLIMB (4.25b)

Mixture .... FULL RICH
Power .... 2500 RPM, 32 in. Hg. MAN PRESS
Climb Speed .... 110 KIAS
Cowl Flaps .... CLOSED or As Required
1/2 OPEN
Standby Fuel Pumps .... **OFF at a safe altitude**
(ON above 10,000 FT)

4.5j Cruise Checklist (4.27)

CRUISING (4.27)

Power....................SET per Power Setting Chart
Mixture Controls....................ADJUST
Fuel Pump....................(Confirm OFF)
Cowl Flaps....................AS REQUIRED

4.5k Descent Checklist (4.29)

DESCENT (4.29)

Throttles....................AS REQUIRED
Mixture Controls....................ADJUST
Cowl Flaps....................CLOSED
Altimeter....................SET
Windshield Defrost....................AS DESIRED

4.5m Approach and Landing Checklist (4.31)

APPROACH AND LANDING (4.31)

NAV Source....................VERIFY HSI Nav Guidance is set for approach
Seat Backs....................ERECT
Seat Belts, Harnesses....................FASTEN/ADJUSTED
Armrests....................STOWED
Standby Fuel Pumps....................ON
Fuel Selectors....................ON
Cowl Flaps....................AS REQUIRED
Mixture Controls....................FULL RICH
Propeller Controls....................FULL FORWARD
Landing Gear (Below 128 KIAS)....................DOWN
Landing Gear Lights....................3 GREEN
Nacelle Mirror....................NOSE GEAR DOWN
Airconditioner (if installed)....................OFF
Autopilot....................OFF
Toe Brakes....................DEPRESS TO CHECK

4.5m Approach and Landing Checklist (4.31) (Continued)

NORMAL LANDING (4.31a)

Flaps (Below 113 KIAS) .... FULL DOWN
Airspeed .... 90 KIAS
Trim .... AS REQUIRED
Throttles .... AS REQUIRED
Touchdown .... MAIN WHEELS
Braking .... AS REQUIRED

SHORT FIELD PERFORMANCE LANDING (4.31b)

Flaps (Below 113 KIAS) .... FULL DOWN
Airspeed (At Max. Weight) .... 82 KIAS
Trim .... AS REQUIRED
Throttles .... IDLE
Touchdown .... MAIN WHEELS
Flaps .... RETRACT
Control Wheel .... BACK PRESSURE
Braking .... MAXIMUM without SKIDDING

4.5n Go-Around Checklist (4.33)

GO-AROUND (4.33)

Mixtures .... FULL RICH
Propeller Controls .... FULL FORWARD
Throttles .... FULL POWER
Control Wheel .... BACK PRESSURE TO OBTAIN POSITIVE CLIMB ATTITUDE at 85 KIAS
Flaps .... RETRACT SLOWLY
Gear .... UP
Cowl Flaps .... AS REQUIRED
Trim .... AS REQUIRED

4.5o After Landing Checklist (4.35)

AFTER LANDING (4.35)

Clear of runway.

Flaps .... RETRACT
Cowl Flaps .... FULL OPEN
Airconditioner (if installed) .... AS DESIRED
Radar (if installed) .... OFF
Standby Fuel Pumps .... AS REQUIRED

NOTE

During extended periods of engine idle at high ambient temperatures, fuel flow to the engine can be interrupted by the formation of fuel vapor bubbles in the fuel line. This condition can be corrected by turning the standby fuel pump ON, to provide positive pressure to the engine driven pump inlet.

Strobe Lights .... OFF
Landing and Taxi Lights .... AS REQUIRED

4.5p Stopping Engine Checklist (4.37)

STOPPING ENGINE (4.37)

Heater (If ON) .... FAN - 2 MIN. THEN OFF
Radio Master Switch .... OFF
Electrical Equipment .... OFF
Throttles .... IDLE
Mixtures .... IDLE CUTOFF
Magneto Switches .... OFF
Alternator Switches .... OFF
Panel Lights (At Night) .... OFF
Battery Master .... OFF

4.5q Mooring Checklist (4.39)

MOORING (4.39)

Parking Brake .... SET
Control Wheel .... SECURED with belts
Wheel Chocks .... IN PLACE
Tiedowns .... SECURE

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4.7 AMPLIFIED NORMAL PROCEDURES (GENERAL)

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

4.9 PREFLIGHT CHECK (4.5a)

The airplane should be given a thorough preflight and walk-around inspection. 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.

CAUTION

The flap position should be noted before boarding the airplane. The flaps must be placed in the UP position before they will lock and support weight on the step.

4.9a Cockpit (4.5a)

Upon entering the cockpit, release the seat belts securing the control wheel. Open the static system drain located on the side panel next to the pilot's seat to remove any moisture that has accumulated in the lines.

Set the parking brake by first depressing and holding the toe brake pedals and then pulling out the parking brake knob. Ensure that the magneto switches and the standby fuel pump switches are in the OFF position.

Check the primary flight controls for proper operation and check that the landing gear selector is in the DOWN position. The throttles should be at IDLE and the mixture controls should be in IDLE CUT-OFF. Verify that the alternate static system valve is in the normal position.

Move the cowl flap controls to the full OPEN position to facilitate inspection and ensure cooling after engine start. Set the stabilator and rudder trim to neutral so that the tabs can be checked for alignment. This check is performed prior to engine start so that you can hear any noise that might indicate binding. Ensure that both fuel selectors are ON.

4.9 PREFLIGHT CHECK (4.5a) (Continued)

4.9a Cockpit (4.5a) (Continued)

Verify the radio master switch and all electrical switches are in the OFF position. Turn battery master switch ON.

Check the annunciator lights with the PRESS-TO-TEST button located to the left of the annunciator panel. Check the fuel quantity gauges for adequate supply of fuel. Check that the three landing gear lights are illuminated and that the red gear warning light is not illuminated. Extend the flaps for the walk-around inspection. Turn OFF the battery master switch.

Check the windows for cleanliness. Check that the POH and all required papers are on board. Properly stow any baggage and secure. Before leaving the cockpit, drain the two crossfeed drains on the forward side of the spar box.

4.9b Right Wing (4.5a)

After exiting the cockpit, the first items to check during the walk-around are the fuel crossfeed line drains to ensure that the crossfeed drains are closed. These drains are located on the bottom of the fuselage just forward of the entrance step.

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

Open the fuel cap to check the cap vent, fuel quantity and color of the fuel. The vent should be free of obstructions. The quantity should match the indication that was on the fuel quantity gauges. Replace cap securely.

CAUTION:

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

Proceeding along the wing, verify that the fuel tank vent located on the underside of the wing, outboard of the nacelle, is clear of obstructions. The two fuel tank drains under the wing should be opened to drain moisture and sediment. Remove the tie down.

4.9b Right Wing (4.5a) (Continued)

Proceed forward to the engine cowling. Check its general condition; look for oil or fluid leakage and that the cowling is secure. Drain the gascolator (fuel filter) drain near the outboard bottom of the engine nacelle (refer to Section 8 for more detailed draining procedure).

Open the oil access door and check the oil quantity (six to eight quarts). Eight quarts are required for maximum range. Make sure that the dipstick has properly seated after checking. Check and ensure that the oil filler cap is securely tightened and secure the access door.

The propeller and spinner should be checked for detrimental nicks, cracks, or other defects, and the air inlets are clear of obstructions. The spinner should be secure and undamaged (check closely for cracks). Move down to the cowl flap area. The cowl flaps should be open and secure.

Next, complete a check of the landing gear. Check the main gear strut for proper inflation. There should be 3.2 ± .50 inches of strut exposure under a normal static load. Check for hydraulic leaks. Check the tire for cuts, wear, and proper inflation. Make a visual check of the brake, block and disc. Remove the chock.

4.9c Nose Section (4.5a)

Check the general condition of the nose section. The windshield should be clean, secure and free from cracks or distortion. Check the condition and security of the landing/taxi lights. If the tow bar was used, remove and stow. Next remove the chock and check the nose gear strut for leaks and proper strut inflation. There should be 1.2 ± .25 inches of strut exposure under a normal static load. Check the tire for cuts, wear, and proper inflation.

Open the forward baggage compartment and check to make sure that the baggage has been stowed properly. Close, secure and lock the baggage door. The forward baggage compartment door key can be removed in the locked position only.

4.9 PREFLIGHT CHECK (4.5a) (Continued)

4.9d Left Wing (4.5a)

The wing surface should be clear of ice, frost, snow or other extraneous substances. Check the main gear strut for proper inflation. There should be 3-1/2 inches of strut exposure under a normal static load. Check for hydraulic leaks. Check the tire for cuts, wear, and proper inflation. Make a visual check of the brake, block and disc. Remove the chock. Next, check the cowl flap area. The cowl flap should be open and secure.

Next, check the engine cowling. Check its general condition; look for oil or fluid leakage and that the cowling is secure. Open the oil access door and check the oil quantity (six to eight quarts). Eight quarts are required for maximum range. Make sure that the dipstick has properly seated after checking. Check and ensure that the oil filler cap is securely tightened and secure the access door.

The propeller and spinner should be checked for detrimental nicks, cracks, or other defects, and the air inlets are clear of obstructions. Drain the gascolator (fuel filter) drain near the outboard bottom of the engine nacelle (refer to Section 8 for more detailed draining procedure).

Proceed along the leading edge of the wing to the stall warning vanes. Check both vanes for damage and freedom of movement. A squat switch in the stall warning system does not allow the units to be activated on the ground.

Check the pitot head. If a pitot cover was installed, it must be removed before flight and the holes checked for obstructions. Remove the tie down.

CAUTION:

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

The two fuel tank drains under the wing should be opened to drain moisture and sediment. Proceeding along the wing, verify that the fuel tank vent located on the underside of the wing, outboard of the nacelle, is clear of obstructions.

Proceed to the fuel filler cap. Open the fuel cap and visually check the fuel quantity. The quantity should match the indication that was on the fuel quantity gauges. Replace cap securely.

4.9d Left Wing (4.5a) (Continued)

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

4.9e Fuselage (Left Side) (4.5a)

Check the general condition of the left side of the fuselage. All side windows should be clean and without defects. Antennas should be in place and securely attached. Check the fresh air inlet for any obstructions. Check that the two rear doors are secure and that the hinges are operational. Next check that the battery vents are clear of obstructions. Verify external power door closes and secure. Check that the static vent holes are free from obstructions.

4.9f Empennage (4.5a)

Check that the empennage surfaces are clear of ice, frost, snow or other extraneous substances. Check the anti-collision light, located at the top of the vertical fin, for damage. All surfaces of the empennage should be examined for damage and operational interference. The stabilator and rudder should be operational and free from damage or interference of any type. Check the condition of the trim tabs and ensure that all hinges and push rods are sound and operational. Stabilator and rudder static wicks should be firmly attached and in good condition.

If the tail has been tied down, remove the tie down rope.

4.9g Fuselage (Right Side) (4.5a)

Check the general condition of the right side of the fuselage. Check the dorsal fin air scoop and right static vent for obstructions. Check that the cabin door attachments are secure and that the hinges are operational.

4.9 PREFLIGHT CHECK (4.5a) (Continued)

4.9h Miscellaneous (4.5a)

Enter the cockpit, turn the battery master switch ON and retract the flaps. Check the interior lights by turning ON the necessary switches. After the interior lights are checked, turn ON the pitot/lift detectors heat switch, and the exterior light switches. Next, perform a walk-around check of the exterior lights for proper operation, and the heated pitot head and lift detectors for proper heating.

CAUTION

Care should be taken when an operational check of the heated pitot head and the heated lift detectors is being performed. Both units become very hot. Ground operation should be limited to 3 minutes maximum to avoid damaging the heating elements.

Reenter the cockpit and turn all switches OFF. At this time all passengers can be boarded.

4.11 BEFORE STARTING ENGINE (4.5b)

After preflight interior and exterior checks and flight planning have been completed and the airplane has been determined ready for flight, both the forward and aft cabin doors should be secured. All occupied seats should be adjusted and secured in position and seat belts and shoulder harnesses properly fastened. All seat belts on seats not occupied should be fastened and pulled secure.

NOTE

With the shoulder harness fastened and adjusted, a pull test of it's locking restraint feature should be performed.

4.11 BEFORE STARTING ENGINE (4.5b) (Continued)

Turn on the alternator switches.

WARNING

No braking will occur if knob is pulled prior to brake application.

Set the parking brake by first depressing and holding the toe brake pedals, then pulling out the parking brake handle. Verify that the landing gear selector is in the DOWN position.

Check that the control levers move smoothly and place the throttles at IDLE, the propeller controls to FULL INCREASE and the mixture controls at IDLE CUTOFF. Adjust the friction handle as desired.

Verify that the alternate air control for each engine is OFF and the cowl flaps are OPEN.

Verify that both stabilator and rudder trim is set to NEUTRAL and that the fuel selectors are ON.

All other electrical switches and radio master switch should be OFF to avoid an electrical overload when the starter is engaged. Check that all circuit breakers are in.

4.13 ENGINE START GENERAL (4.5c)

CAUTION:

For cold weather starting, ensure magneto and master switches are off and mixture controls are in idle cut-off before turning propeller manually.

NOTE:

When starting at ambient temperatures +20°F and below, operate first engine started with alternator ON (at max charging rate not to exceed 1500 RPM) for 5 minutes minimum before initiating start on second engine.

To prevent starter damage, limit starter cranking to 30-second periods. If the engine does not start within that time, allow a cooling period of several minutes before engaging starter again. Do not engage the starter immediately after releasing it. This practice may damage the starter mechanism.

NOTE:

If available, preheat should be considered. Rotate each propeller through three times manually during preflight inspection.

NOTE:

Do not attempt an engine start while the engine gauges are in the process of conducting the self test feature. (See Section 7, para. 7.25a.)

4.13 ENGINE START (4.5c) (Continued)

4.13a Normal Start - Cold Engine (4.5c)

Open the throttles approximately 1 inch and advance the propeller controls to FULL FORWARD. Turn the battery master switch ON and check that the three green gear position lights are illuminated. Turn on the standby fuel pump and the magneto switches. Advance the mixture control to FULL RICH for approximately 4 seconds then to IDLE CUT-OFF. The engine is now primed.

NOTE

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

Verify the propeller area is clear. Once you are sure the area is clear and the engine can safely be started, engage the starter.

When the engine fires, advance the mixture control to FULL RICH. Move the throttle to the desired setting and check the oil pressure for a positive indication. If no oil pressure is indicated within 30 seconds, shut down the engine and have it checked. In cold weather it may take somewhat longer for an oil pressure indication. After smooth engine operation, the standby fuel pump may be turned OFF.

Repeat the above procedure for the opposite engine. After both engines have been started, check bus voltage and the alternators for sufficient output and the gyro vacuum gauge for a reading within the normal operating range.

4.13b Engine Start - Cold Weather (4.5c)

Open the throttles 1/2 inch and advance the propeller controls to FULL FORWARD. Turn the battery master switch ON and check that the three green gear position lights are illuminated. Turn on the standby fuel pump and the magneto switches. Advance the mixture control to FULL RICH and after approximately 5 seconds of prime, reposition the throttle to the idle position.

Verify the propeller area is clear. Once you are sure the area is clear and the engine can safely be started, engage the starter.

When the engine fires, adjust the throttle as necessary. Check the oil pressure for a positive indication. Normally there should be an indication of oil pressure within 30 seconds. In cold weather it may take a few seconds longer. If after allowing sufficient time there is no oil pressure, shut down the engine until the cause is determined and remedied.

Repeat the above procedure for the opposite engine. After both engines have been started, check bus voltage and the alternators for sufficient output and the gyro vacuum gauge for a reading within the normal operating range.

4.13c NORMAL START - HOT ENGINE (4.5c)

Open the throttles 1/2 inch and advance the propeller controls to FULL FORWARD. Verify the mixture control is at the idle cut-off. Turn the battery master switch ON and check that the three green gear position lights are illuminated. Verify the standby fuel pump is OFF. Turn both magneto switches ON.

Verify the propeller area is clear. Once you are sure the area is clear and the engine can safely be started, engage the starter. When the engine fires, slowly advance the mixture control. Move the throttle to the desired setting and check the oil pressure for a positive indication.

Repeat the above procedure for the opposite engine. After both engines have been started, check bus voltage and the alternators for sufficient output and the gyro vacuum gauge for a reading within the normal operating range.

4.13d Engine Start When Flooded (4.5c)

If an engine is flooded (by overpriming, for example), advance the throttle and propeller controls full forward, and the mixture control to idle cut-off. Turn ON the battery master switch. The standby fuel pump should be OFF. Turn on the magneto switches and verify the propeller area is clear. Once you are sure the area is clear and the engine can safely be started, engage the starter.

Advance the mixture control only after the engine has fired, and retard the throttle control to 1000 RPM. Check the oil pressure gauge for a positive indication. If no oil pressure is indicated within 30 seconds, shut down the engine and have it checked. In cold weather it may take somewhat longer for an oil pressure indication.

Repeat the above procedure for the opposite engine. After both engines have been started, check bus voltage and the alternators for sufficient output and the gyro vacuum gauge for a reading within the normal operating range.

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

NOTE

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

CAUTION:

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

If cranking speed increases, the ship's battery is at a higher level than the external power supply. If the battery has been depleted by excessive cranking, it must be recharged before the second engine is started. All the alternator current will go to the low battery until it receives sufficient charge, and it may not start the other engine immediately.

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

A standard external power receptacle feature allows the operator to use an external power source to crank the engines without having to gain access to the airplane's battery.

Turn the battery master, alternator switches, and all electrical equipment OFF. Insert the plug of the auxiliary power unit into the receptacle located on the left aft side of the fueslage.

Proceed with the normal starting technique. After the engines have started, reduce power to the lowest possible RPM to reduce sparking.

Disconnect the external power source from the aircraft and secure the receptacle door. Turn the battery master and alternator switches ON. Advance the throttles to 1000 RPM. Check oil pressures, bus voltage and alternator outputs. DO NOT ATTEMPT FLIGHT IF THERE IS NO INDICATION OF ALTERNATOR OUTPUT. Check gyro vacuum gauge for a reading within the normal operating range.

4.13f Preheating

The use of preheat and auxiliary power (battery cart) will facilitate starting during cold weather and is recommended when the engine has been cold soaked at temperatures of 10°F and below in excess of two hours. Successful starts without these aids can be expected at temperatures below normal, provided the aircraft battery is in good condition and the ignition and fuel systems are properly maintained.

The following procedures are recommended for preheating, starting, warm-up, run-up and takeoff.

(a) Select a high volume hot air heater. Small electric heaters which are inserted into the cowling bug eye do not appreciably warm the oil and may result in superficial preheating.

4.13f Preheating (Continued)

WARNING

Superficial application of preheat to a cold-soaked engine can have disastrous results.

A minimum of preheat application may warm the engine enough to permit starting but will not de-congeal oil in the sump, lines, cooler, filter, etc. Typically, heat is applied to the upper portion of the engine for a few minutes after which the engine is started and normal operation is commenced. The operator may be given a false sense of security by indications of oil and cylinder temperatures as a result of preheat. Extremely hot air flowing over the cylinders and oil temperature thermocouples may lead one to believe the engine is quite warm; however, oil in the sump and filter are relatively remote and will not warm as rapidly as a cylinder. For example, even when heat is applied directly, oil lines are usually lagged with material which does an excellent job of insulating

Congealed oil in such lines may require considerable preheat. The engine may start and apparently run satisfactorily, but can be damaged from lack of lubrication due to congealed oil in various parts of the system. The amount of damage will vary and may not become evident for many hours. On the other hand, the engine may be severely damaged and could fail shortly following application of high power. Improper or insufficient application of preheat and the resulting oil and cylinder temperature indications may encourage the pilot to expedite his ground operation and commence a takeoff prematurely. This procedure only compounds an already bad situation.

Proper procedures require thorough application of preheat to all parts of the engine. Hot air should be applied directly to the oil sump and external oil lines as well as the cylinders, air intake and oil cooler. Excessively hot air can damage non-metallic components such as seals, hoses and drive belts, so do not attempt to hasten the preheat process.

4.13f Preheating

Before starting is attempted, turn the engine by hand or starter until it rotates freely. After starting, observe carefully for high or low oil pressure and continue the warm-up until the engine operates smoothly and all controls can be moved freely. Do not close the cowl flaps to facilitate warm-up as hot spots may develop and damage ignition wiring and other components.

(b) Hot air should be applied primarily to the oil sump and filter area. The oil drain plug door or panel may provide access to these areas. Continue to apply heat for 15 to 30 minutes and turn the propeller, by hand, through 6 or 8 revolutions at 5 or 10 minute intervals.

(c) Periodically feel the top of the engine and, when some warmth is noted, apply heat directly to the upper portion of the engine for approximately five minutes. This will provide sufficient heating of the cylinders and fuel lines to promote better vaporization for starting. If enough heater hoses are available, continue heating the sump area. Otherwise, it will suffice to transfer the source of heat from the sump to the upper part of the engine.

(d) Start engine immediately after completion of the preheating process. Since the engine will be warm, use normal starting procedure.

NOTE

Since the oil in the oil pressure gauge line may be congealed, as much as 60 seconds may elapse before oil pressure is indicated. If oil pressure is not indicated within one minute, shut the engine down and determine the cause.

(e) Operate the engine at 1000 RPM until some oil temperature is indicated. Monitor oil pressure closely during this time and be alert for a sudden increase or decrease. Retard throttles, if necessary, to maintain oil pressure below 100 psi. If oil pressure drops suddenly to less than 30 psi, shut down the engine and inspect lubrication system. If no damage or leaks are noted, preheat the engine for an additional 10 to 15 minutes before restarting.

4.15 BEFORE TAXIING (4.5d)

4.15a. Warm-Up (4.5d)

If an External Power Source Unit has been used for starting, it should be disconnected and the battery master should be turned ON.

Warm-up the engines at 1000 to 1200 RPM. Avoid prolonged idling at low RPM, as this practice may result in fouled spark plugs.

Takeoff may be made as soon as the ground check is completed, provided that the throttles may be opened fully without backfiring or skipping, and without a reduction in engine oil pressure.

Do not operate the engines 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.

4.15b. Before Taxiing (4.5d)

Verify the battery master is turned ON. Set the gyros, the altimeter and clock as required. Turn ON the radio master switch. Lights and heater/defroster may be turned on as desired. Check the operation of the fuel management controls by moving each fuel selector to crossfeed for a short time, while the other selector is in the ON position. Return the selectors to the on position. Check the radios, and set them as desired. Check the autopilot (See Section 9) and the electric trim system.

Complete the passenger briefing. Release the parking brake by first depressing and holding the toe brake pedals and then pushing in on the parking brake control.

4.17 TAXIING (4.5e)

Check to make sure the taxi area is clear. The standby fuel pumps can be turned on, as required for smooth engine performance, during taxi operations. Always apply the throttles slowly. While taxiing, apply the brakes to determine their effectiveness. Make slight turns to check steering. As much as possible, turns during taxiing should be made using rudder pedal motion and differential power (more power on the engine on the outside of the turn, less on the inside engine) rather than brakes.

During the taxi, check the flight instruments (turn indicator, directional gyro, coordination ball & compass).

NOTE

During taxi, if the Low Bus Voltage annunciator illuminates, increase engine RPM (if possible) to retain adequate battery charging.

4.19 GROUND CHECK (4.5f)

CAUTION:

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

A thorough check should be made before takeoff, using a checklist. Before advancing the throttle to check the magnetos and the propeller action, be sure that the engine oil temperature is 75°F or above. Head the airplane into the wind if possible (see crosswind limits for propellers) and set the parking brake.

Advance mixture and propeller controls forward and the throttle controls to 1000 RPM. Check engine instruments to see that they are functional and that readings are within limitations. Advance the throttles to 1500 RPM, and retard the propeller controls aft to check feathering; however, do not allow a drop of more than 300 RPM.

Advance the throttles to 2300 RPM and exercise the propeller controls to check the function of the governor. Retard control until a 200 to 300 drop in RPM is indicated. This should be done three times on the first flight of the day. The governor can be checked by retarding the propeller control until a drop of 100 RPM to 200 RPM appears, then advancing the throttle to get a slight increase in manifold pressure. The propeller speed should stay the same when the throttle is advanced, thus indicating proper function of the governor. Return the propeller controls to full forward position and move the alternate air controls to ON then OFF. Avoid prolonged ground operation with alternate air ON as the air is unfiltered.

Retard the throttles until engine speed reaches 2000 RPM. Check the magnetos on each engine by turning OFF, then ON, each of four magneto switches in turn. The normal drop on each magneto is 100 RPM and the maximum drop should not exceed 150 RPM. The maximum differential drop should not exceed 50 RPM. After checking one magneto, do not check the next until the engine speed returns to 2000 RPM. Operation of an engine on one magneto should be kept to a minimum.

4.19 GROUND CHECK (4.5f) (Continued)

CAUTION:

Ensure that the alternators are not indicating full charge prior to takeoff.

Check the bus voltage for 28 ± 1 volts. Check alternator output - alternator output readings should be about equal. All annunciator lights should be out. A reading within the nonnal operating range on the gyro vacuum gauge signifies proper operation of the gyro vacuum system.

CAUTION:

Although either vacuum pump independently has sufficient capacity to operate the flight instruments and the deice boots in a normal manner, intentional or continued operation in icing conditions is not recommended.

NOTE:

If flight into icing conditions (in visible moisture below +5°C) is anticipated, conduct a preflight check of the ice protection systems per supplement No. 3 "Ice Protection System Installation."

Retard the throttles to check idling. Set the throttles between 800 and 1000 RPM. Set the desired amount of friction on the engine control levers.

4.21 BEFORE TAKEOFF (4.5g)

WARNING:

Refer to paragraph 4.55, Icing Information, prior to any flight operations. (Takeoff, cruise, landing, etc.)

Ensure cabin doors are closed and latched properly. Check that all seat backs are erect and seats are adjusted and locked in position. Check that all seat belts and harnesses are fastened and adjusted and armrests are stowed. Ensure that the battery master, alternator and standby fuel pump switches are ON. Check and set all of the flight instruments as required and engine gauges for normal engine indication.

WARNING:

If flight into known icing conditions (in visible moisture below +5°C) is anticipated or encountered during climb, cruise or descent, activate the aircraft ice protection system, including the pitot heat, as described in supplement No. 3 "Ice Protection System".

Turn propeller heat, windshield heat, and pitot/stall warning heat on if necessary. The propeller controls should be set to full forward and the mixture controls to FULL RICH. Verify that the engine alternate air selectors are in the OFF position. If flaps are to be used for takeoff, visually confirm that they have extended. The airconditioner (if installed) must be OFF to ensure normal takeoff performance. Check and set the stabilator and rudder trims. Verify that both fuel control selectors are set to the ON position. Ensure proper flight control movement and response. Release the parking brake.

4.23 TAKEOFF (4.5h)

To achieve the takeoff performance specified in Section 5, it is necessary to set rated power (2600 RPM, 38 in. Hg.) prior to brake release.

CAUTION:

Fast taxi turns immediately prior to takeoff should be avoided to prevent any possibility of fuel line unporting which could lead to engine stoppage on takeoff.

NOTES

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 38 in. Hg.*

WARNING:

Refer to paragraph 4.55, Icing Information, prior to any flight operations. (Takeoff, cruise, landing, etc.)

Takeoff should not be attempted with ice or frost on the wings. Takeoff distances and 50-foot obstacle clearance distances are shown on charts in the Performance Section of this handbook. The performance shown on charts will be reduced by uphill gradient, tailwind component, or soft, wet, rough or grassy surface, or poor pilot technique.

Avoid fast turns onto the runway, followed by immediate takeoff, especially with a low fuel supply. Fast taxi turns immediately prior to takeoff run can cause temporary malfunction of one engine on takeoff.

As power is applied at the start of the takeoff roll, look at the engine instruments to see that the engines are operating properly and putting out normal power, and at the airspeed indicator to see that it is functioning. Apply throttle smoothly until 38 in. Hg. manifold pressure is obtained. DO NOT APPLY ADDITIONAL THROTTLE.

The flap setting for normal takeoff is 0°. In certain short field takeoff efforts when the shortest possible ground roll and the greatest clearance distance over a 50 ft. obstacle is desired, a flap setting of 25° is recommended.

4.23a Normal (0° Flap) Performance Takeoff (4.5h)

When obstacle clearance is no problem, a normal flaps up (0°) takeoff may be used. Set the flaps to the up (0°) position. Set the stabilator trim indicator in the takeoff range. Apply and hold the brakes and bring the engines to full power before release. Release the brakes, accelerate to 79 KIAS and ease back on the wheel enough to let the airplane lift off the runway. Hold 79 KIAS until the obstacle is cleared. After obstacle clearance, accelerate to the best rate of climb speed, 88 KIAS, or higher if desired, retracting the landing gear when a gear-down landing is no longer possible on the runway.

When a short field effort is required but the situation presents a wide margin on obstacle clearance, the safest short field technique to use is with the flaps up (0°). In the event of an engine failure, the airplane is in the best flight configuration to sustain altitude immediately after the gear is raised.

The distances required using this takeoff procedure are given on a chart in the Performance Section of this handbook.

4.23b Short Field Performance Takeoff (4.5h)

When the shortest possible ground roll and the greatest clearance distance over a 50-foot obstacle is desired, use a 25-degree flap setting. Set the stabilator trim indicator slightly nose up from the takeoff range. Apply and hold the brakes and bring the engines to full power before release. Release the brakes, accelerate to 71 KIAS and rotate firmly so that when passing through the 50-foot height the airspeed is approximately 73 KIAS. Retract the gear when a gear down landing is no longer possible on the runway.

4.23 TAKEOFF (4.5h) (Continued)

4.23b Short Field Performance Takeoff (4.5h) (Continued)

It should be noted that the airplane is momentarily near VMC when using the above procedure. IN THE EVENT THAT AN ENGINE FAILURE SHOULD OCCUR WHILE THE AIRPLANE IS AT THIS AIRSPEED, IT IS MANDATORY THAT THE THROTTLE ON THE OPERATING ENGINE BE RETARDED AND THE NOSE LOWERED IMMEDIATELY TO MAINTAIN CONTROL OF THE AIRPLANE. It should also be noted that when a 25-degree flap setting is used on the takeoff roll, an effort to hold the airplane on the runway too long may result in a wheel barrowing tendency. This should be avoided.

This procedure should only be used when conditions truly require this kind of performance. The pilot must be aware that he achieves this improved performance only at the expense of a reduction in his safety margins. If an engine failure were to occur near the obstacle with the gear and flaps still down, the only choice available to the pilot is to reduce the remaining power to idle and make the best possible landing straight ahead since single engine performance under these conditions is non-existent.

The distances required using this takeoff procedure are given on a chart in the Performance Section of this handbook.

4.25 CLIMB (4.5i)

NOTE:

The standby fuel pumps must be on during climbs above 10,000 feet.

4.25a Takeoff Climb (4.5i)

On climb-out after takeoff, it is recommended that the best angle of climb speed (83 KIAS) be maintained only if obstacle clearance is a consideration. The best rate of climb speed (88 KIAS) should be maintained with takeoff power on the engines until adequate terrain clearance is obtained.

4.25b Cruise Climb (4.5i)

At this point, engine power should be reduced to 2500 RPM and 32 inches Hg. manifold pressure for cruise climb. Establish a climb speed of 110 KIAS and position the cowl flaps 1/2 OPEN or as required to maintain proper engine temperatures.

4.25 CLIMB (4.5i) (Continued)

4.25b Cruise Climb (4.5i) (Continued)

This combination of reduced power and increased airspeed provides better engine cooling, less engine wear, reduced noise level and better forward visibility.

When reducing engine power the throttles should be retarded first, followed by the propeller controls. The mixture controls should remain at full rich during the climb. Cowl flaps should be set to the 1/2 open position or adjusted as required, to maintain cylinder head and oil temperatures within the normal ranges specified for the engine.

Consistent operational use of the cruise climb power settings is strongly recommended since this practice will make a substantial contribution to increased engine life, and will reduce the incidence of premature engine overhaul.

4.27 CRUISE (4.5j)

When leveling off at cruise altitude, the pilot may reduce to a cruise power setting in accordance with the Power Setting Table in this handbook.

For maximum engine service life, cylinder head temperatures should be maintained below 420°F and oil temperatures below 200°F during cruise. These temperatures can be maintained by opening the cowl flaps, reducing the power, enriching the mixture or any combination of these methods.

4.27 CRUISE (4.5j) (Continued)

WARNING

Flight in icing conditions is prohibited unless aircraft is equipped with the approved and complete Piper ice protection system (see Supplement 3, Section 9). If icing is encountered, immediate action should be taken to fly out of icing conditions. Icing is hazardous due to greatly reduced performance, loss of forward visibility, possible longitudinal control diffi-culties due to increased control sensitivity. and impaired power plant and fuel system operation.

The pilot should monitor weather conditions while flying and should be alert to conditions which might lead to icing. If induction system icing is expected, place the alternate air control in the ON position.

The ammeter readout for the electrical system should be monitored during flight, especially during night or instrument flight, so that corrective measures can be taken in case of malfunction. The procedures for dealing with electrical failures are contained in the Emergency Procedure Section of this handbook. The sooner a problem is recognized and corrective action taken, the greater is the chance of avoiding total electrical failure.

Both alternator switches should be ON for normal operation. Selecting the electrical system mode will allow review of the bus voltage, left and right alternator output, and battery charge/discharge current. Certain failures can cause the alternator output voltage to increase uncontrollably. To prevent damage, alternator control units are installed to automatically shut off the alternator(s).

The red left or right alternator inop. annunciator on the annunciator panel will illuminate to warn of the tripped condition.

Left Alt.
Inop.

Right Alt.
Inop.

Alternator outputs will vary with the electrical equipment in use and the state of charge of the battery. Alternator outputs should not exceed 85 amperes. The red low voltage annunciator will warn of bus voltage below requirements.

Low Bus
Voltage

Should the current requirement exceed 170 amps, the alternators will continue at 85 amps each, the remainder coming from the battery. Therefore, to ensure against battery discharge, it is recommended that electrical loads be adjusted to limit continuous alternator outputs to 85 amps. It is not recommended to take off into IFR operation with only one alternator operative even though electrical loads may be less than 85 amps.

Since the SENECA V has one combined fuel tank per engine, it is advisable to feed the engines symmetrically during cruise so that approximately the same amount of fuel will be left in each side for the landing. A crossfeed is provided and can be used in cruise after 30 minutes of flight to balance the fuel quantity and extend the range during single-engine operation.

During flight, keep account of time and fuel used in connection with power settings to determine how the fuel flow and fuel quantity gauging systems are operating. If the fuel flow indication is considerably higher than the fuel actually being consumed or if an asymmetric flow gauge indication is observed, a fuel nozzle may be clogged and require cleaning.

There are no mechanical uplocks in the landing gear system. In the event of a hydraulic system malfunction, the landing gear will free-fall to the gear down position.

The true airspeed with gear down is approximately 75% of the gear retracted airspeed for any given power setting. Allowances for the reduction in airspeed and range should be made when planning extended flight between remote airfields or flight over water.

For flight above 12,500 feet see FAR 91.32 requirements for oxygen and Section 9- Supplements in this handbook.

4.29 DESCENT (4.5k)

When power is reduced for descent, the mixtures should be enriched as altitude decreases. The propellers may be left at cruise setting; however if the propeller speed is reduced, it should be done after the throttles have been retarded. Cowl flaps should normally be closed and the T.I.T. should be maintained at approximately 1300°F or higher to keep the engines at the proper operating temperature. Set the altimeter. Adjust the windshield defrost as required during descent.

4.31 APPROACH AND LANDING (4.5m)

Sometime prior to the start of the approach, verify the navigation source information being provided to the HSI is set for the desired published approach.

NOTE

The HSI displays course deviation from a VOR, Localizer (LOC), or Glideslope (G/S) when NAV or VLOC is the navigation source and displays GPS track deviation when GPS is the selected navigation source.

Sometime during the approach for a landing, the throttle controls should be retarded to check the gear warning horn. Flying the airplane with the horn inoperative is not advisable. Doing so can lead to a gear up landing as it is easy to forget the landing gear, especially when approaching for a single-engine landing, or when other equipment is inoperative, or when attention is drawn to events outside the cabin.

The red GEAR WARN light on the annunciator panel will illuminate when the landing gear is in transition between the full up position and the down and locked position. Additionally, the light will illuminate when the gear warning horn sounds. The gear warning horn will sound at low throttle settings if the gear is not down and locked. The light is off when the landing gear is in either the full down and locked or full up positions.

The landing gear should be lowered at speeds below 128 KIAS and the flaps at speeds as follows:

10° - 140 KIAS maximum
25° - 120 KIAS maximum
40° - 113 KIAS maximum

Prior to entering the traffic pattern, the aircraft should be slowed to approximately 120 KIAS, and this speed should be maintained on the downwind leg. The landing check should be made on the downwind leg. The seat backs should be erect, armrests stowed, and the seat belts and shoulder harnesses should be fastened.

NOTE

A pull test of the locking restraint feature should be performed on the inertia reel type shoulder harness.

The standby fuel pumps should be ON. Both fuel selectors should be ON, and the cowl flaps should be set as required. Select landing gear DOWN and check for three green lights on the panel and look for the nose wheel in the nose wheel mirror.

Maintain a traffic pattern speed of 100 KIAS and a final approach speed of 90 KIAS. If the aircraft is lightly loaded, the final approach speed may be reduced to 79 KIAS. Set the mixture controls to full rich.

When the power is reduced on close final approach, the propeller controls should be advanced to the full forward position to provide maximum power in the event of a go-around.

The landing gear position should be checked again on final approach by checking the three green indicator lights on the instrument panel and looking at the external mirror to check that the nose gear is extended.

NOTE

The airconditioner should be OFF to ensure maximum rate of climb in the event of a go-around. Pump the toe brakes to ensure that the system is capable of uniform braking during landing rollout.

Flap position for landing will depend on runway length and surface wind. Full flaps will reduce stall speed during final approach and will permit contact with the runway at a slower speed.

Good pattern management includes a smooth, gradual reduction of power on final approach, with the power fully off before the wheels touch the runway. This gives the gear warning horn a chance to blow if the gear is not locked down. If electric trim is available, it can be used to assist a smooth back pressure during flare out.

Maximum braking after touch-down is achieved by retracting the flaps, applying back pressure to the wheel and applying pressure on the brakes. However, unless extra braking is needed or unless a strong crosswind or gusty air condition exists, it is best to wait until turning off the runway to retract the flaps. This will permit full attention to be given to the landing and landing roll, and will also prevent the pilot from accidentally reaching for the gear handle instead of the flap handle.

4.31 APPROACH AND LANDING (4.5m) (Continued)

4.31a Normal Landing (4.5m)

For a normal landing, approach with full flaps (40°) and partial power until shortly before touch-down. Hold the nose up as long as possible before and after contacting the ground with the main wheels.

If a crosswind or high wind landing is necessary, approach with higher than normal speed and with 0° to 25° of flaps. Immediately after touch-down, raise the flaps.

During a crosswind approach, hold a crab angle into the wind until ready to flare out for the landing. Then lower the wing that is into the wind, to eliminate the crab angle without drifting, and use the rudder to keep the wheels aligned with the runway. Avoid prolonged side slips with a low fuel indication.

The maximum demonstrated crosswind component for landing is 17 KTS.

4.31b Short Field Performance Landing (4.5m)

For a short field landing, approach with full flaps (40°) at 82 KIAS. Immediately after touch-down, raise the flaps, apply back pressure to the wheel and apply brakes.

4.33 GO-AROUND (4.5n)

If a go-around from a normal approach with the airplane in the landing configuration becomes necessary, apply takeoff power to both engines (not to exceed 38 in. Hg. manifold pressure). While the pitch attitude is increased to obtain the balked landing climb speed of 85 KIAS, slowly retract the flaps and retract the landing gear, when a positive climb is established, and adjust cowl flaps for adequate engine cooling.

Airspeed should then be established at the best angle of climb speed (83 KIAS) for obstacle clearance or to the best rate of climb speed (88 KIAS), if obstacles are not a factor. Reset the longitudinal trim as required.

4.35 AFTER LANDING (4.5o)

When clear of the active runway, retract the flaps and open the cowl flaps. Operate the airconditioner as desired. Turn off the radar, and operate the standby fuel pumps, as required.

NOTE

During extended periods of engine idle at high ambient temperatures, fuel flow to the engine can be interrupted by the formation of fuel vapor bubbles in the fuel line. This condition can be corrected by turning the standby fuel pump ON, to provide positive pressure to the engine driven pump inlet.

Turn off the strobe lights. Use the Landing/Taxi light as required.

4.37 STOPPING ENGINE (4.5p)

Prior to shutdown, switch the heater (if ON) to the FAN position a few minutes for cooling and then turn it OFF. Turn all radio and electrical equipment and external lights OFF.

Move the throttle controls full aft to idle and the mixture controls to idle cut-off. Turn OFF the magneto, the alternator and battery master switches. Also, at night, turn OFF the panel lights.

NOTE

The flaps must be placed in the UP position for the flap step to support weight. Passengers should be cautioned accordingly.

4.39 MOORING (4.5q)

If necessary, the airplane should be moved on the ground with the aid of the optional nose wheel tow bar, which is stowed in the forward baggage compartment.

The parking brake should be set and the ailerons and stabilator should be secured by looping the seat belt through the control wheel and pulling it snug. The rudder need not be secured under normal conditions, as its connection to the nose wheel holds it in position. The flaps are locked when in the fully retracted position.

Wheel chocks should be positioned in place. Tie-down ropes may be attached to mooring rings under each wing and to the tail skid.

4.41 STALLS

The loss of altitude during a power off stall with the gear and flaps retracted may be as much as 400 feet. The loss of altitude with the gear down and 40° of flaps may also be as much as 400 feet.

A power on stall may result in as much as 150 feet of altitude loss.

NOTE

The stall warning system is inoperative with the battery master switch OFF.

4.43 TURBULENT AIR OPERATION

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

4.45 RESERVED

4.47 VSSE - INTENTIONAL ONE ENGINE INOPERATIVE SPEED

VSSE is a speed selected by the aircraft manufacturer as a training aid for pilots in the handling of multi-engine aircraft. It is the minimum speed for intentionally rendering one engine inoperative in flight. This minimum speed provides the margin the manufacturer recommends for use when intentionally performing engine inoperative maneuvers during training in the particular airplane.

VSSE is not a limitation. However, it is recommended that, except for training, demonstrations, takeoffs, and landings, the airplane should not be flown at a speed slower than VSSE

The intentional one engine inoperative speed, VSSE, for the SENECA V is 85 KIAS.

4.49 VMCA - AIR MINIMUM CONTROL SPEED

VMCA is the minimum flight speed at which a twin-engine airplane is directionally and/or laterally controllable as determined in accordance with Federal Aviation Regulations. Airplane certification conditions include one engine becoming inoperative and windmilling; not more than a 5° bank toward the operative engine; landing gear up; flaps in takeoff position; and most rearward center of gravity.

VMCA for the SENECA V has been determined to be 66 KIAS. Under no circumstances should an attempt be made to fly at a speed below this VMCA with only one engine operating. As a safety precaution, when operating under single-engine flight conditions either in training or in emergency situations, maintain an indicated airspeed above 85 KIAS, VSSE.

The VMCA demonstration, which may be required for the FAA flight test for the multi-engine rating, approaches an uncontrolled flight condition with power reduced on one engine. The demonstration and all intentional one engine operations should not be performed at an altitude of less than 4000 feet above the ground. The recommended procedure for VMCA demonstration is to reduce the power to idle on the simulated inoperative engine at or above the intentional one engine inoperative speed, VSSE, and slow down approximately one knot per second until the FAA Required Demonstration Speed, stall buffet or warning, rudder or ailerons at full travel, or VMCA (red line on the Airspeed Indicator) is reached.

Initiate recovery during the demonstration by immediately reducing power on the operating engine and promptly lowering the nose of the airplane to accelerate to VSSE.

The most critical situation occurs where the stall speed and VMCA speed coincide. Care should be taken to avoid this flight condition, because at this point loss of directional control occurs at the same time the airplane stalls, and a spin could result.

VMCA DEMONSTRATION

(a) Landing Gear...UP
(b) Flaps...UP
(c) Airspeed...at or above 85 KIAS (VSSE)
(d) Mixture...FULL RICH
(e) Propeller Controls ....HIGH RPM
(f) Throttle (Simulated Inoperative Engine)..................................IDLE
(g) Throttle (Other Engine) ....MAX ALLOWABLE
(h) Airspeed ....Reduce approximately 1 knot per second until either STALL WARNING, FULL CONTROL TRAVEL or VMCA is obtained

CAUTION:

Use rudder to maintain directional control (heading) and ailerons to maintain 5° bank towards the operative engine (lateral attitude). At the first sign of either VMCA (airspeed indicator redline) or stall warning (which may be evidenced by: inability to maintain heading or bank attitude, aerodynamic stall buffet, or stall warning horn), immediately initiate recovery; reduce power to idle on the operative engine, and immediately lower the nose to regain VMCA and continue accelerating to VSSE.

CAUTION:

One engine inoperative stalls are not recommended.

Under no circumstances should an attempt be made to fly at a speed below VMCA with only one engine operating.

4.51 PRACTICE ONE ENGINE INOPERATIVE FLIGHT

Simulated one engine inoperative flight can be practiced without actually shutting down one engine by setting the propeller rpm of an engine to approximate zero thrust. This is accomplished at typical training altitudes with the throttle adjusted to produce the appropriate engine speed shown below and the mixture full rich, or leaned as required for smooth low power operation.

Propeller rpm for Zero Thrust

The RPM used to simulate one engine inoperative flight is approximately 2300 RPM.

4.53 NOISE LEVEL

The corrected noise level of this aircraft is 77.0 dB(A) with the two blade propeller and 73.9 dB(A) with the three blade propeller.

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 FAR 36, Noise Standards - Aircraft Type and Airworthiness Certification. This aircraft model is in compliance with all FAR 36 Appendix G noise standards applicable to this type.

The corrected noise level of this aircraft as measured per ICAO Annex 16, Chapter 10, is 78.5 dB(A) for aircraft with the standard two blade propeller and is 76.0 dB(A) for aircraft with the optional three blade propeller.

4.55 ICING INFORMATION

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

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

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

"PROCEDURES FOR EXITING THE SEVERE ICING ENVIRONMENT"

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

Immediately request priority handling from Air Traffic Control to facilitate a route or an altitude change to exit the severe icing conditions in order to avoid extended exposure to flight conditions more severe than those for which the airplane has been certificated.

Avoid abrupt and excessive maneuvering that may exacerbate control difficulties.

Do not engage the autopilot.

If the autopilot is engaged, hold the control wheel firmly and disengage the autopilot.

If an unusual roll response or uncommanded roll control movement is observed, reduce the angle-of-attack.

Do not extend flaps when holding in icing conditions. Operation with flaps extended can result in a reduced wing angle-of-attack, with the possibility of ice forming on the upper surface further aft on the wing than normal, possibly aft of the protected area.

If the flaps are extended, do not retract them until the airframe is clear of ice.

Report these weather conditions to Air Traffic Control.

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TABLE OF CONTENTS

SECTION 5

PERFORMANCE

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SECTION 5
PERFORMANCE

5.1 GENERAL

This section contains the required FAA performance information applicable to this aircraft. Additional information is provided for flight planning purposes.

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

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.

The information provided by paragraph 5.5 (Flight Planning Example) outlines a detailed flight plan using the 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 effecting 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 C.G. Range and Weight graph (Figure 6-15) to determine the total weight of the airplane and the center of gravity position.

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	3122 lbs.
(2) Occupants (2 x 170 lbs.)	340 lbs.
(3) Baggage and Cargo	27 lbs.
(4) Fuel (6 lb./gal. x 80)	480 lbs.
(5) Takeoff Weight	3969 lbs.
(6) Landing Weight (a)(5) minus (g)(1), (3969 lbs. minus 355 lbs.)	3614 lbs.

The takeoff and landing weights are below the maximums and the weight and balance calculations have determined that the C.G. position is within the approved limits.

(b) Takeoff and Landing

Apply the departure airport conditions and takeoff weight to the appropriate Takeoff Performance and Accelerate and Stop Distance graphs (Figures 5-11 thru 5-17) to determine the length of runway necessary for the takeoff and/or the barrier distance.

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 example flight have fallen well below the available runway lengths.

	Departure Airport	Destination Airport
(1) Pressure Altitude	2000 ft.	3000 ft.
(2) Temperature	21°C	22°C
(3) Wind Component	9 KTS (Headwind)	10 KTS (Headwind)
(4) Runway Length Available	7400 ft.	9000 ft.
(5) Runway Required (Normal Procedure, Std. Brakes)		
Takeoff	1620 ft.*	
Accelerate and Stop	3032**	
Landing		2240 ft.***

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.

* reference Figure 5-15
** reference Figure 5-11
*** reference Figure 5-45

(c) Climb

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 the 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	16,500 ft.
(2) Cruise OAT	-13°C
(3) Time to Climb (12.5 min. minus 1.5 min.)	11 min*
(4) Distance to Climb (22 naut. miles minus 2 naut. miles)	20 n.m.*
(5) Fuel to Climb (12 gal. minus 1 gal.)	11Gal.*

* reference Figure 5-25

(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 5-41). 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 5-41). 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 flight plan.

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

(1) Time to Descend (16 min. minus 3 min.)	13 min.*
(2) Distance to Descend (44 naut. miles minus 7 naut. miles)	37 n.m.*
(3) Fuel to Descend (6 gal. minus 1 gal.)	5 Gal*

* reference Figure 5-41

(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 Power Setting Tables when selecting the cruise power setting. The established pressure altitude and temperature values and the selected cruise power should now be utilized to determine the true airspeed from the Speed Power graph (Figure 5-31).

Calculate the cruise fuel for the cruise power setting from the information provided on Figure 5-29.

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 flow by the cruise time.

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

(1) Total Distance	394 n.m.
(2) Cruise Distance (e)(1) minus (c)(4) minus (d)(2), (394 n.m. minus 20 n.m. miles minus 37 n.m.)	337 n.m.
(3) Cruise Power	Normal Cruise
(4) Cruise Speed	187 kts.*
(5) Cruise Fuel Consumption	Approx. 24 GPH**
(6) Cruise Time (e)(2) divided by (e)(4), (337 miles divided by 187 kts)	1.8 hr.
(7) Cruise Fuel (e)(5) multiplied by (e)(6), (24 GPH multiplied by 1.8 hr.)	43.2 gal.

* reference Figure 5-31
** reference Figure 5-29

(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 following flight time is required for the flight planning example.

(1) Total Flight Time

(c)(3) plus (d)(1) plus (e)(6),	
(0.18 hrs. plus 0.22 plus 1.8 hr.)	2.2 hrs.

(g) Total Fuel Required

Determine the total fuel required by adding 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

(c)(5) plus (d)(3) plus (e)(7),	
(11 gal. plus 5 gal. plus 43.2)	59.2 gal.
(59.2 gal. multiplied by 6 lb./gal.)	355.2 lb.

5.7 PERFORMANCE GRAPHS

LIST OF FIGURES

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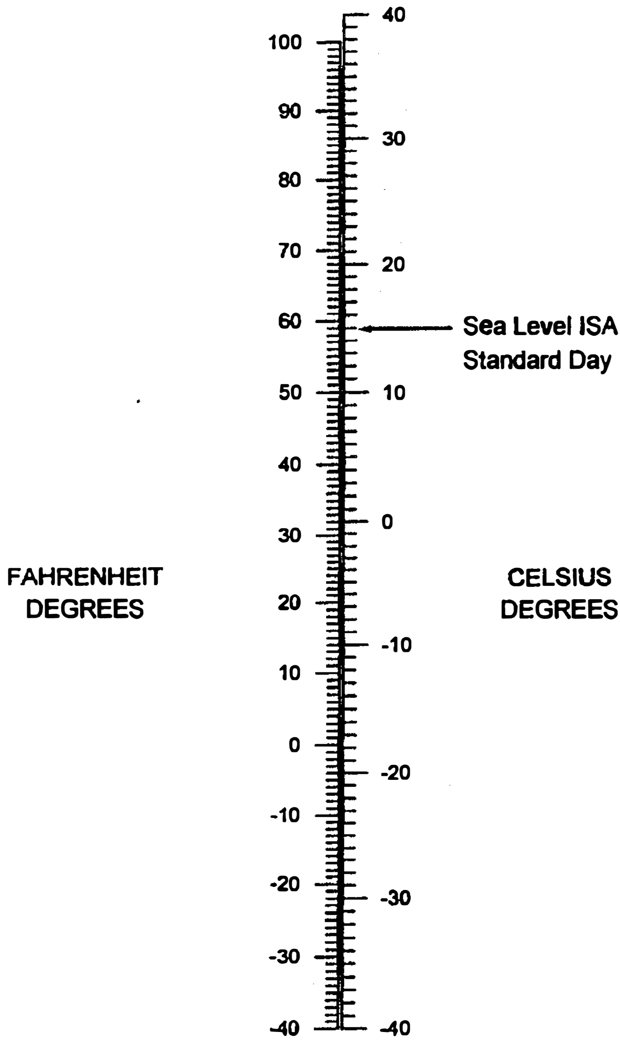
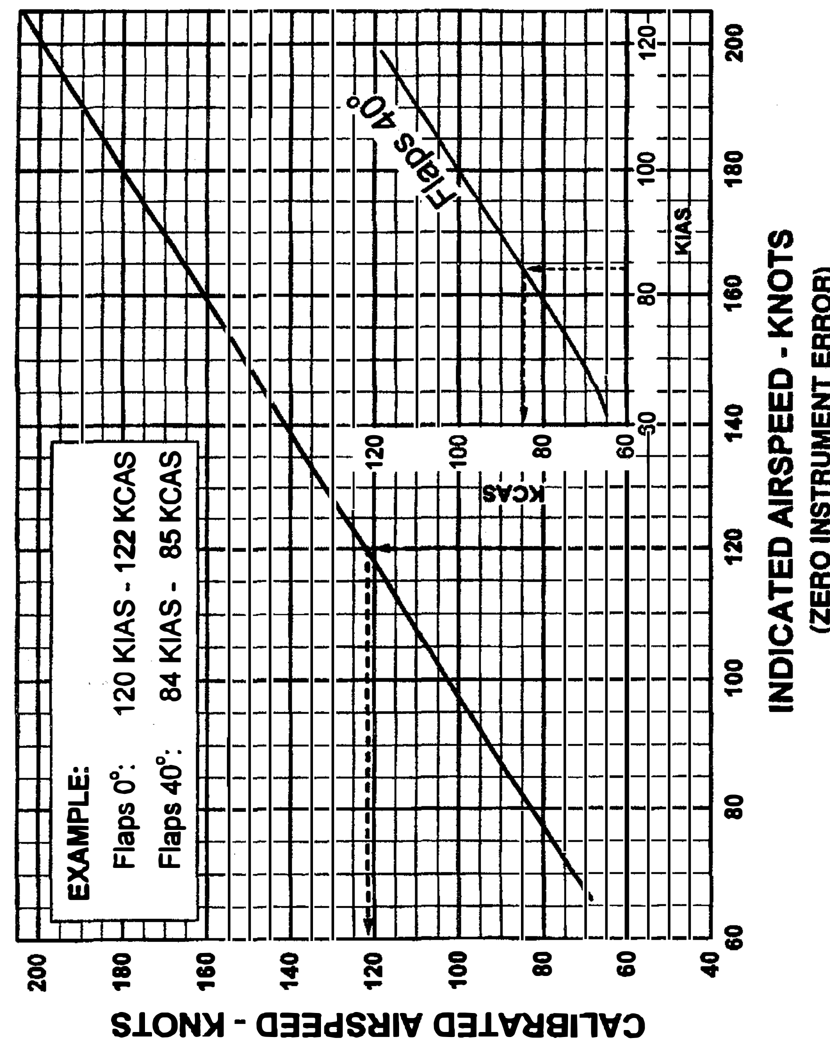
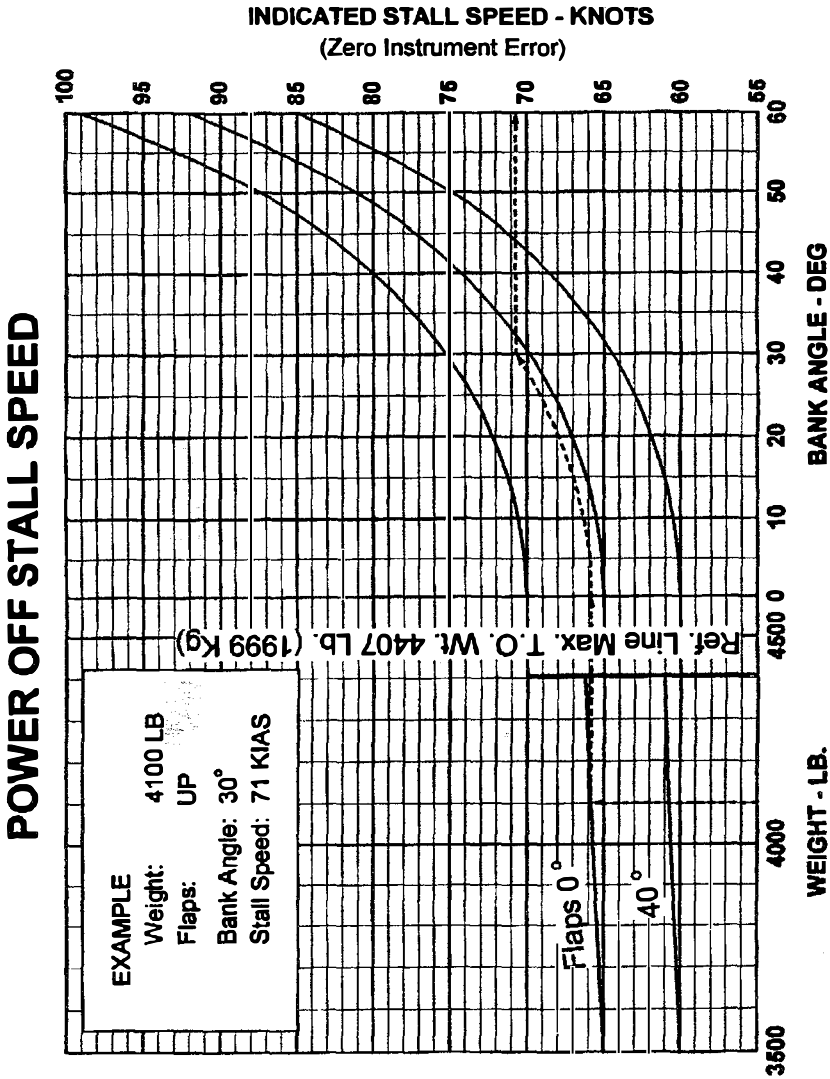


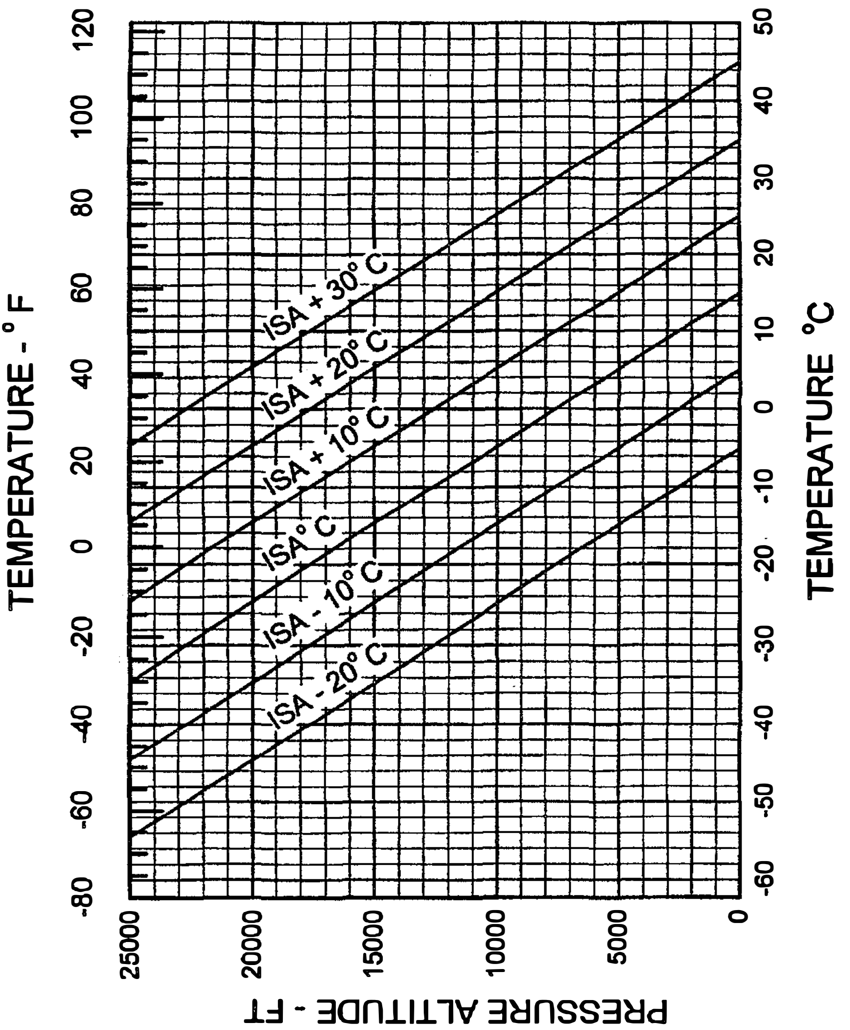
TEMPERATURE CONVERSION
Figure 5-1



AIRSPEED CALIBRATION
Figure 5-3



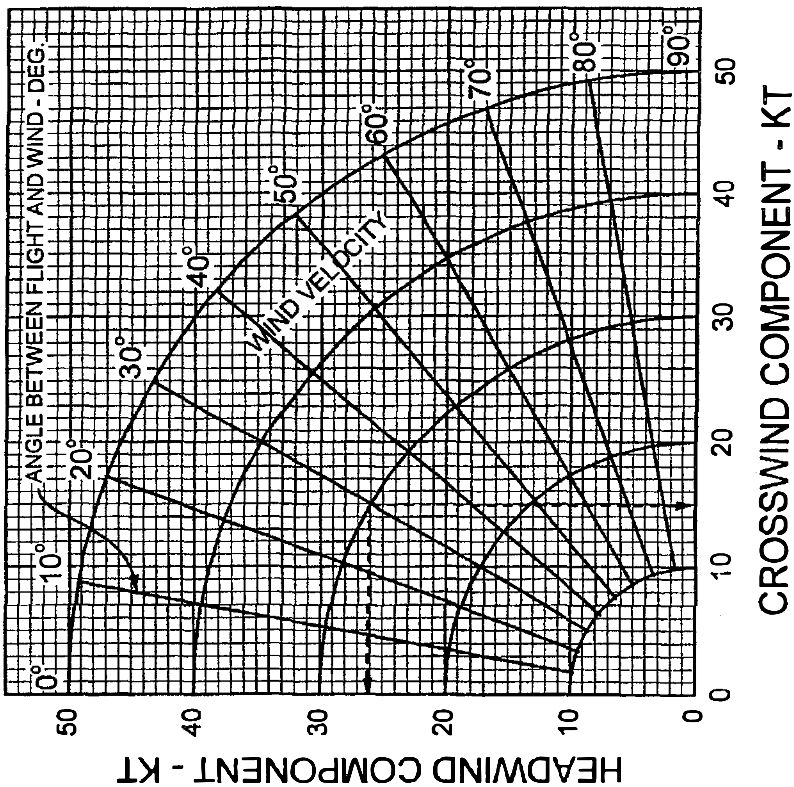
STALL SPEED VS. ANGLE OF BANK
Figure 5-5



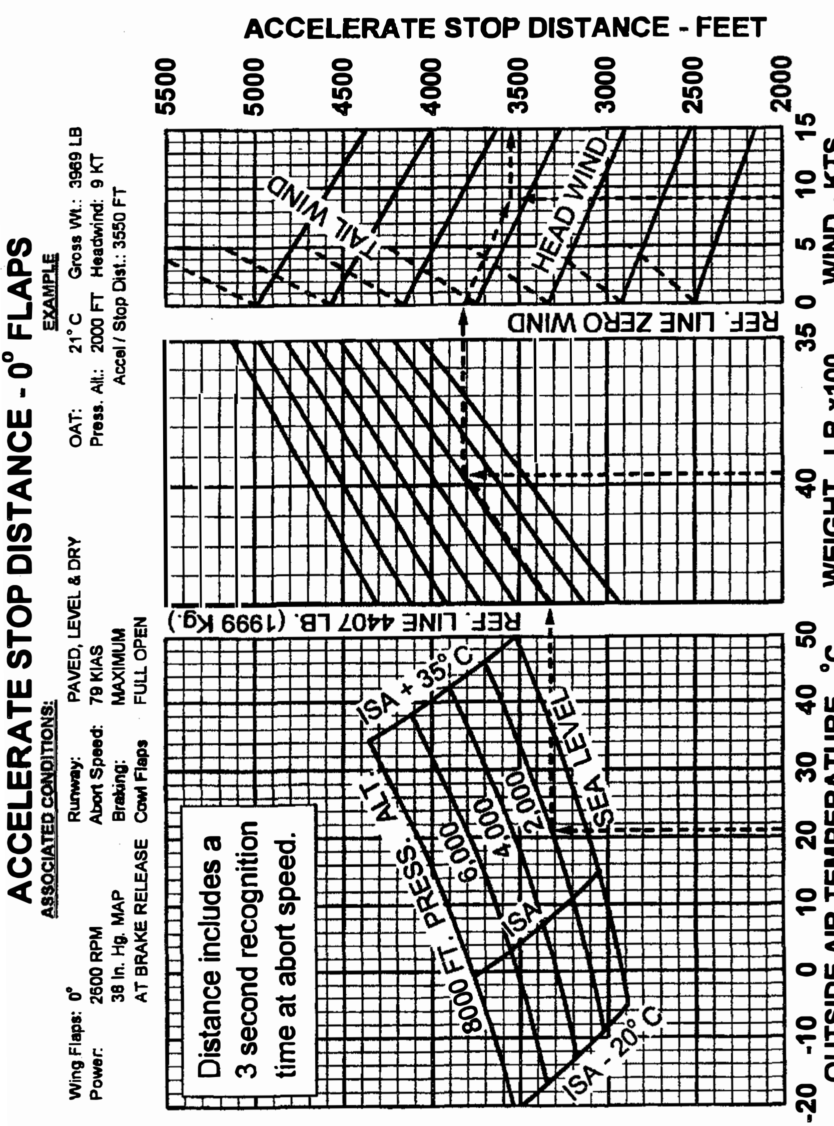
ISA CONVERSION
Figure 5-7

EXAMPLE:

Wind Velocity:	30 Kt
Angle between flight path and wind:	30°
Headwind:	26 Kt
Crosswind:	15 Kt

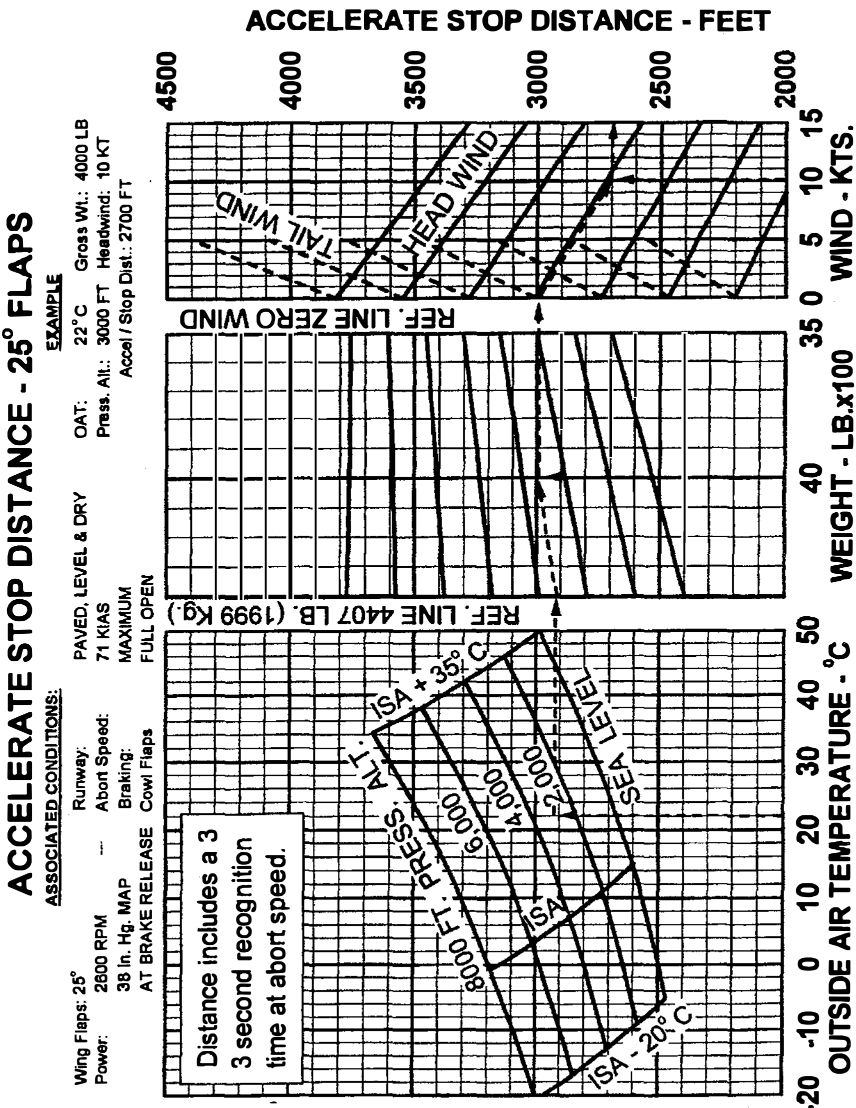


WIND COMPONENTS
Figure 5-9

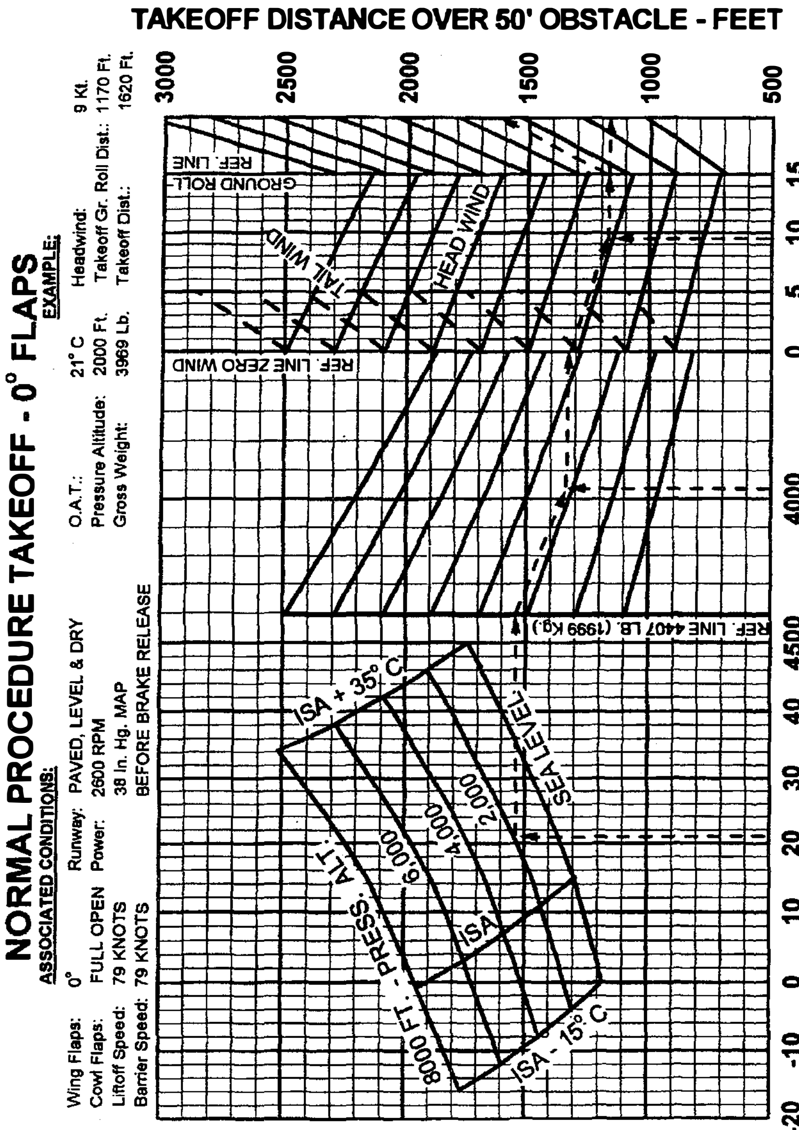


ACCELERATE AND STOP DISTANCE - 0° FLAPS

Figure 5-11



ACCELERATE AND STOP DISTANCE - 25° FLAPS
Figure 5-13



NORMAL PROCEDURE TAKEOFF - 0° FLAPS
Figure 5-15

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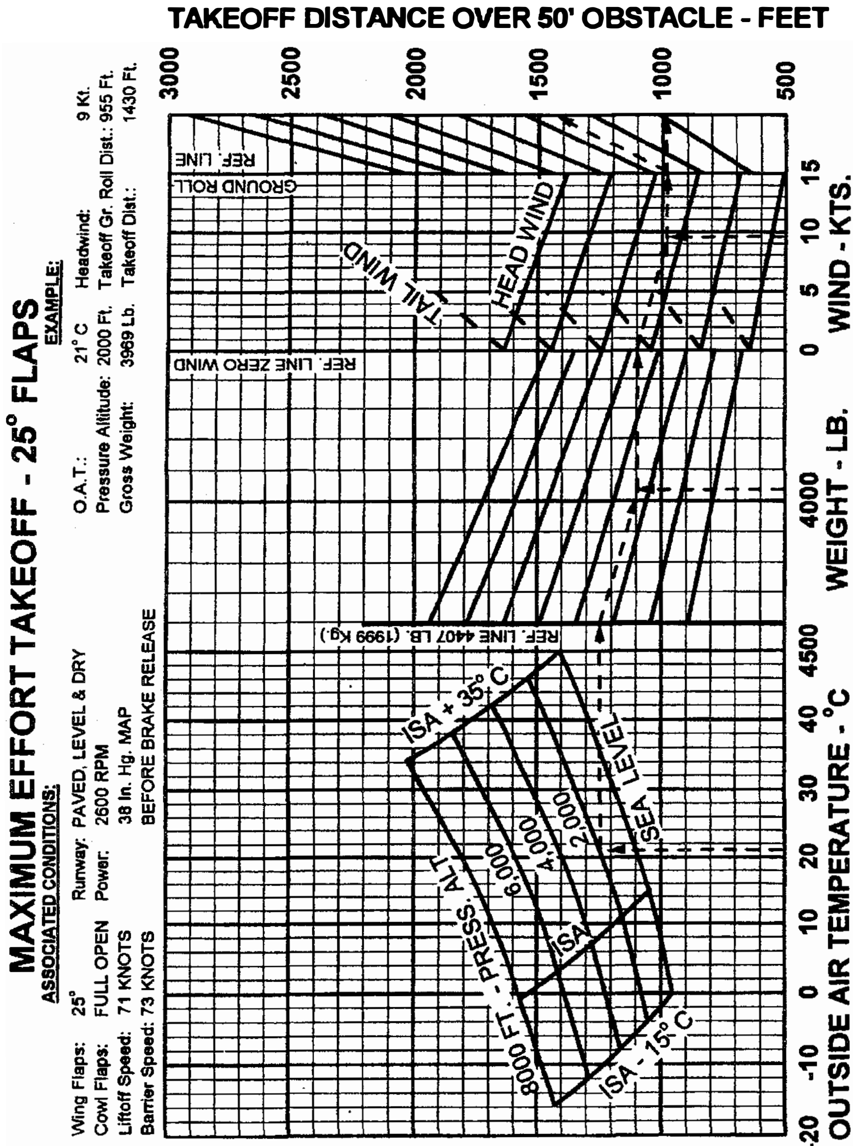
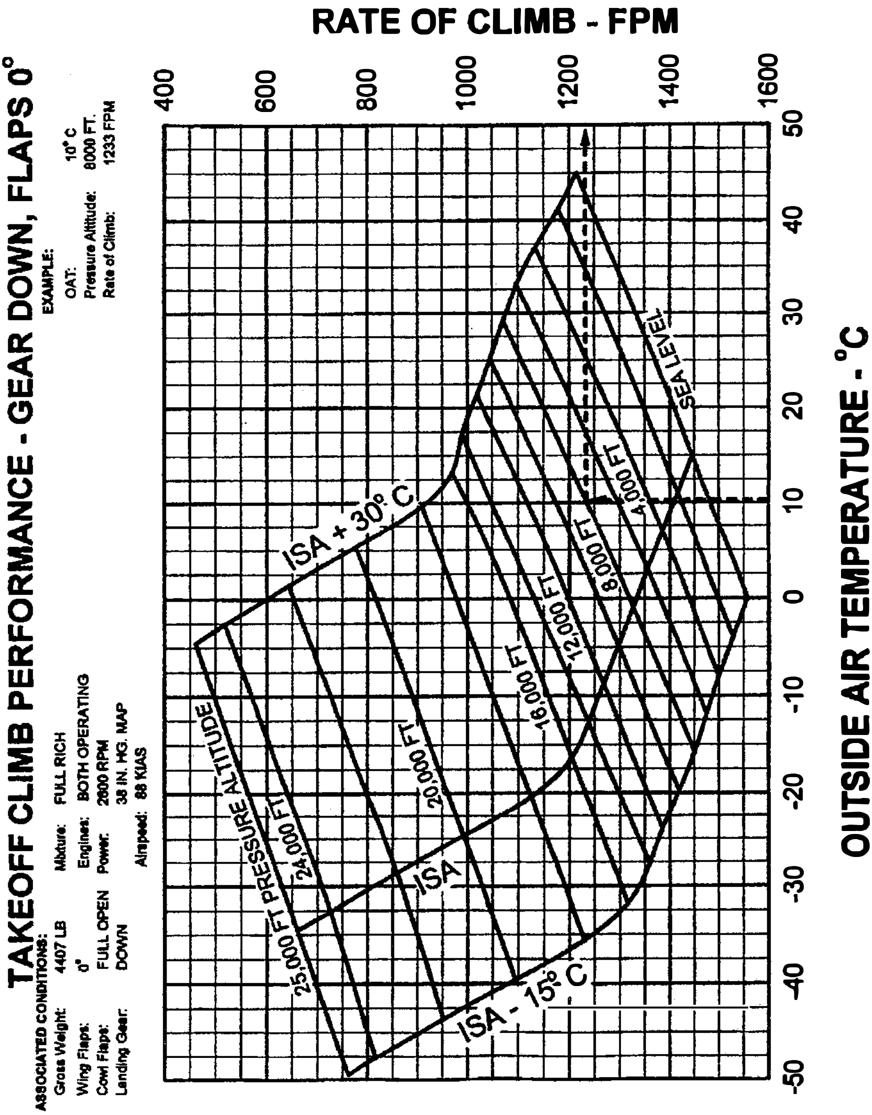
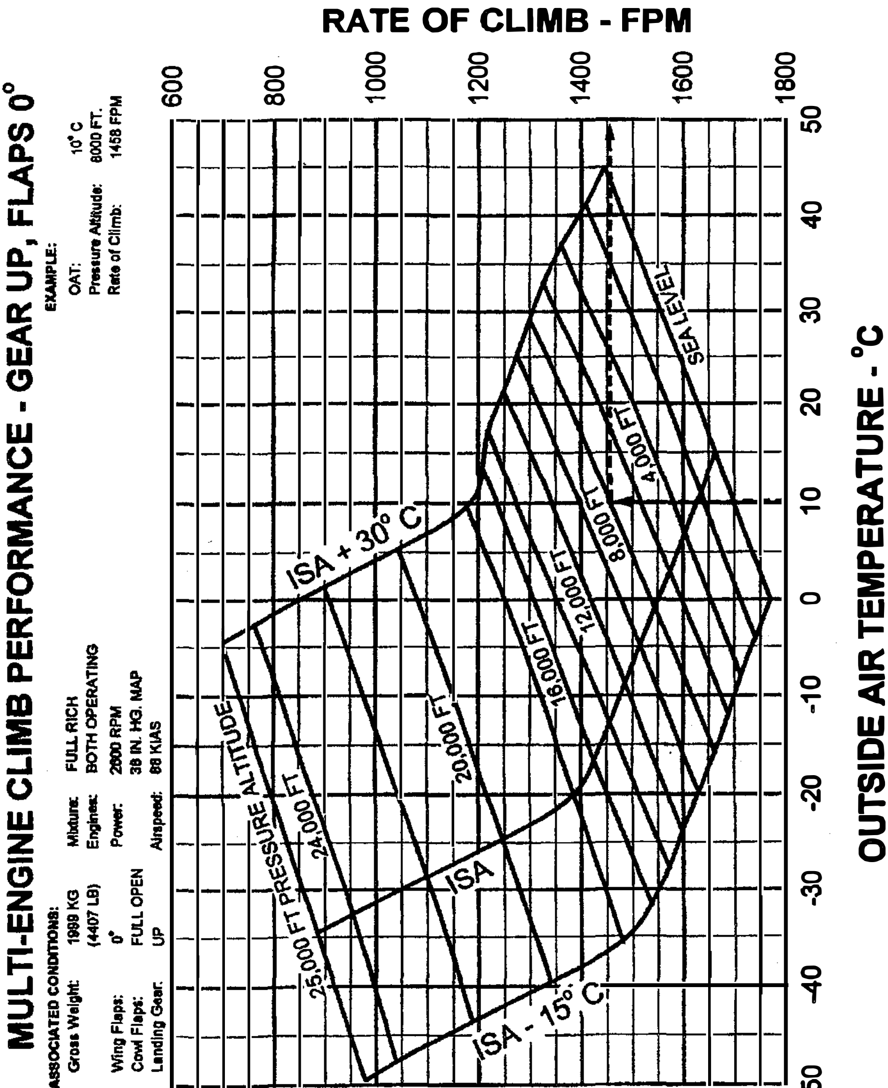


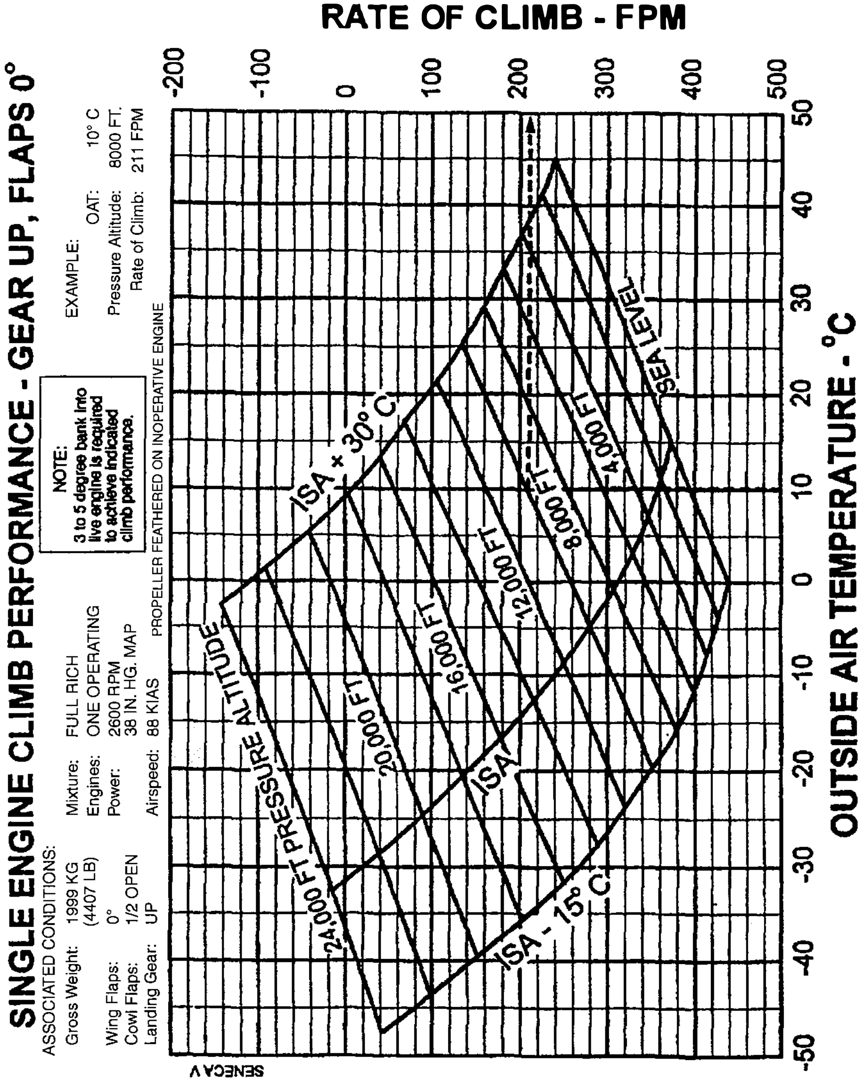
MAXIMUM EFFORT TAKEOFF - 25° FLAPS
Figure 5-17



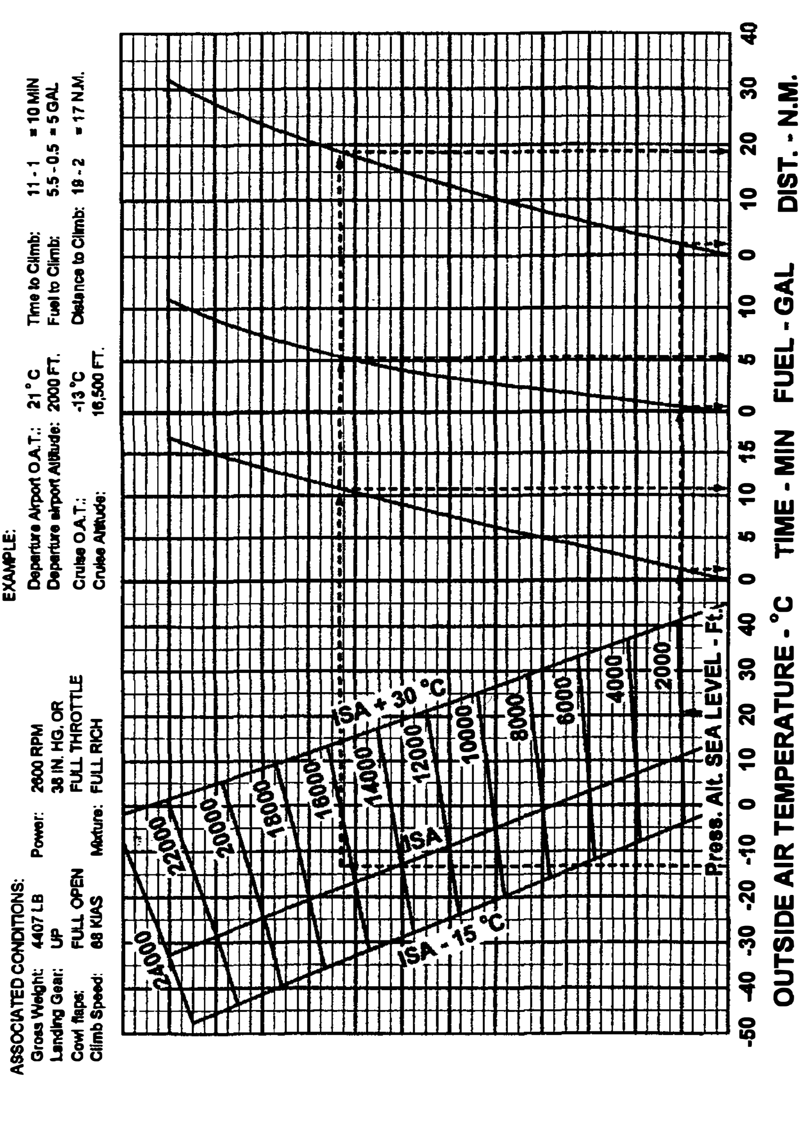
TAKEOFF CLIMB PERFORMANCE
Figure 5-19



MULTI ENGINE CLIMB PERFORMANCE GEAR RETRACTED
Figure 5-21

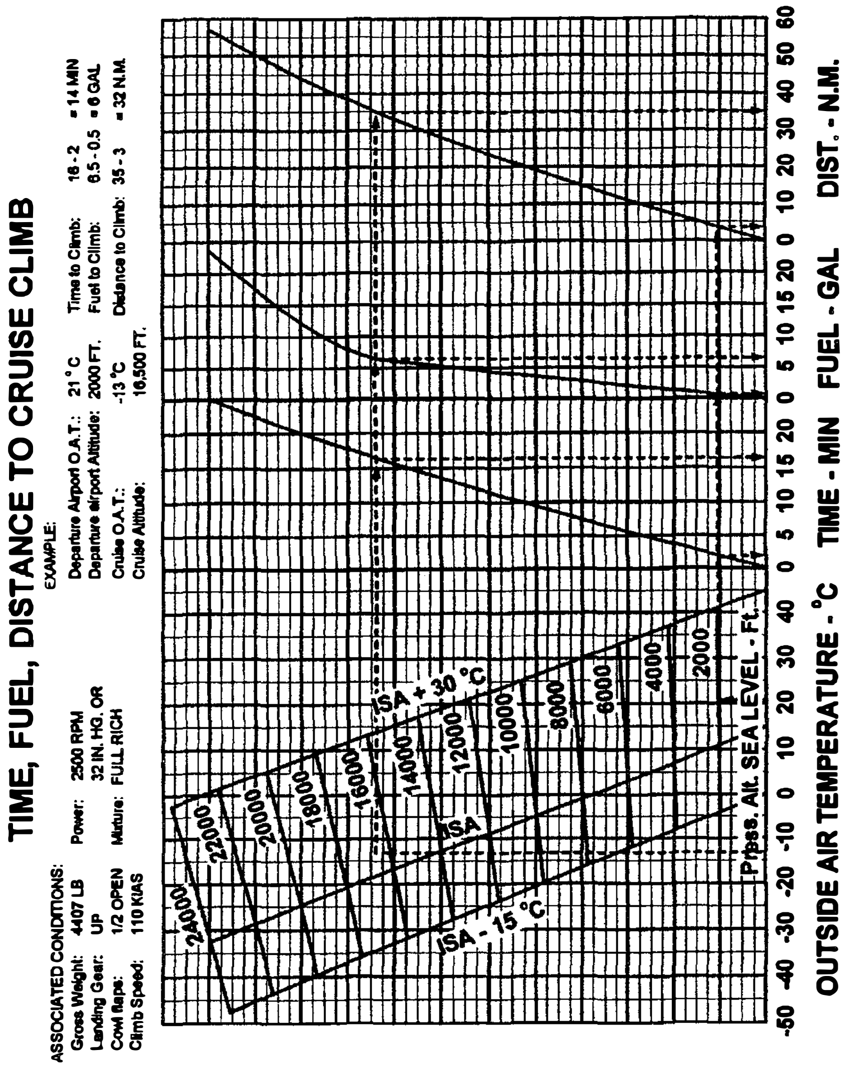


SINGLE ENGINE CLIMB PERFORMANCE GEAR RETRACTED
Figure 5-23



TIME, FUEL AND DISTANCE TO CLIMB

Figure 5-25



TIME, FUEL AND DISTANCE TO CRUISE CLIMB
Figure 5-27

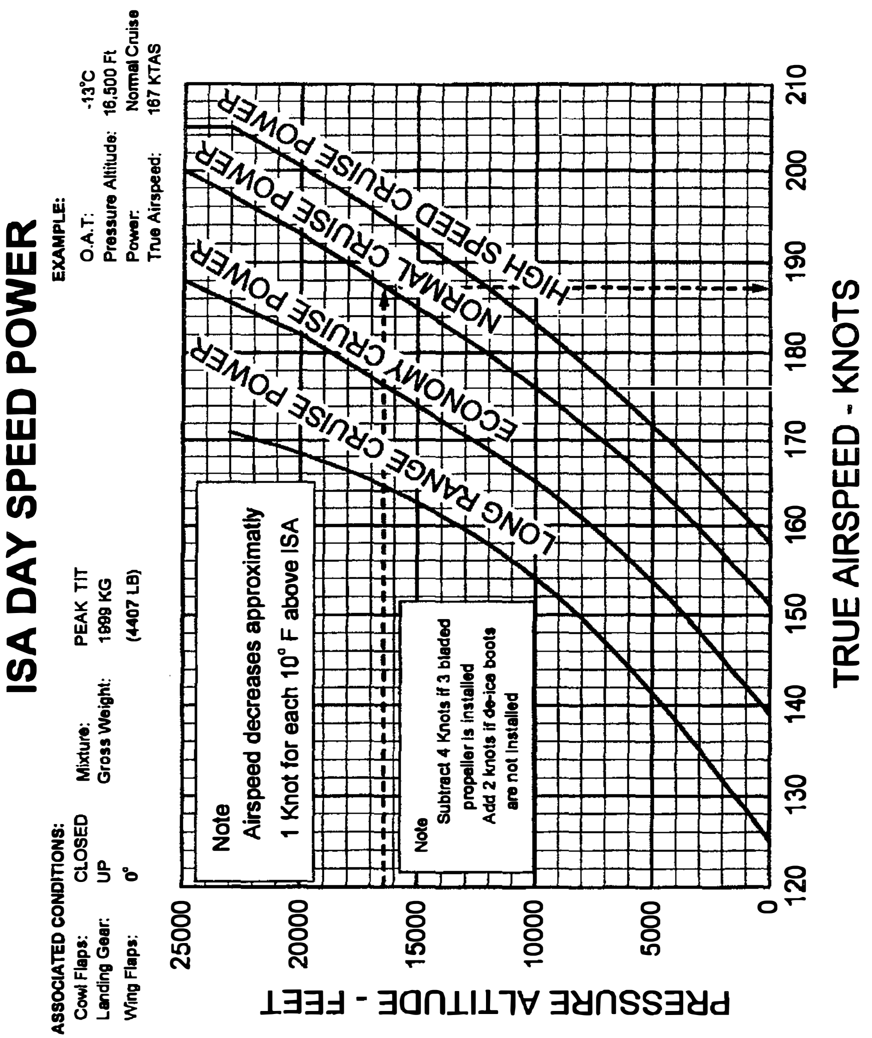
POWER SETTING TABLE

	Pressure Altitude	RPM	Manifold Pressure	Approximate Fuel Flow	Turbine Inlet Temperature
High Speed Cruise	Above 23,000 Ft.	2500	29" Hg	28 GPH	Lean to Peak *Not to Exceed 1650° F
	Below 23,000 Ft.	2500	30" Hg	28 GPH	
Normal Cruise	Above 20,000 Ft.	2500	28" Hg	24 GPH	
	Below 20,000 Ft.	2400	29" Hg		
	Below 20,000 Ft.	2300	30" Hg		
Economy Cruise	Above 20,000 Ft.	2400	26" Hg	22 GPH	
	Below 20,000 Ft.	2300	27" Hg		
	Below 20,000 Ft.	2200	28" Hg		
Long Range Cruise	Below 23,000 Ft.	2200	25" Hg	18 GPH	

*Permissable to lean to 1700° F for up to 60 sec. in order to determine peak TIT.

Note:
The fuel flows shown are approximate. Fuel flows may vary ±1 GPH depending upon altitude and outside air temperature.

POWER SETTING TABLE
Figure 5-29



SPEED POWER
Figure 5-31

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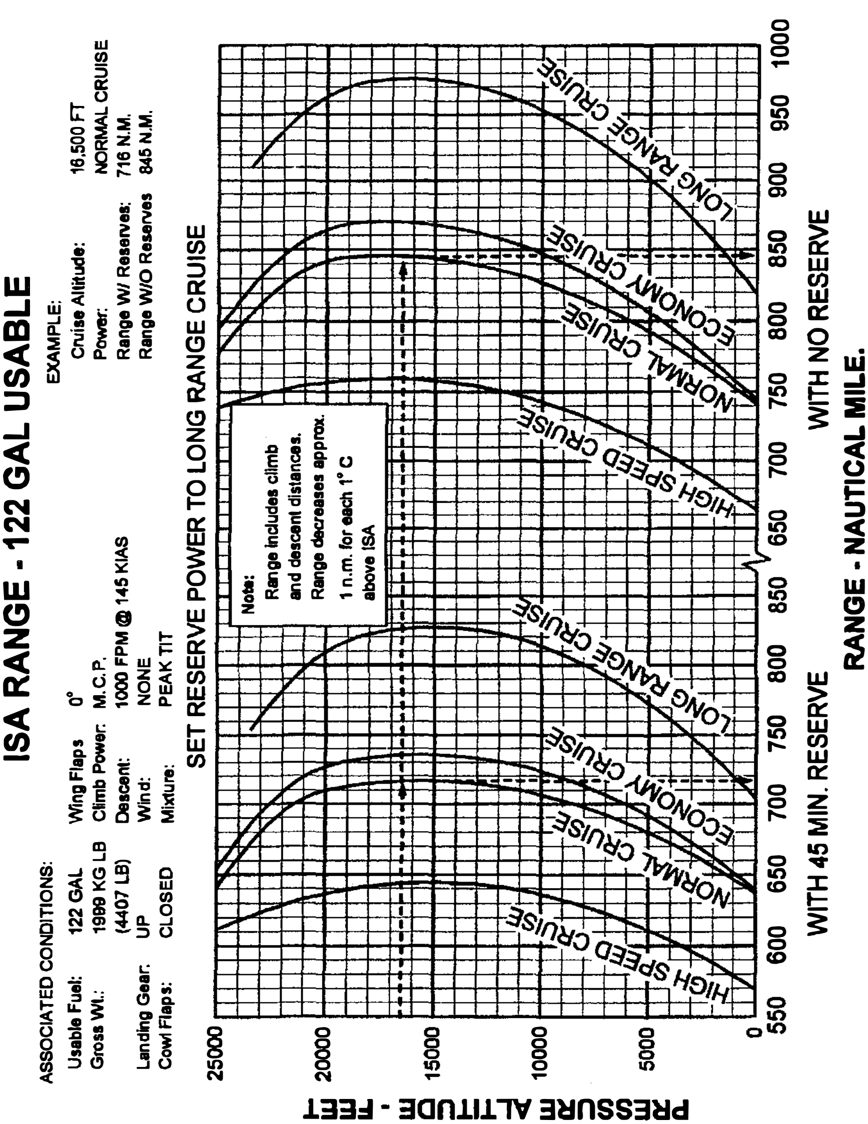

STANDARD TEMPERATURE RANGE - 122 GALLONS USABLE
Figure 5-35

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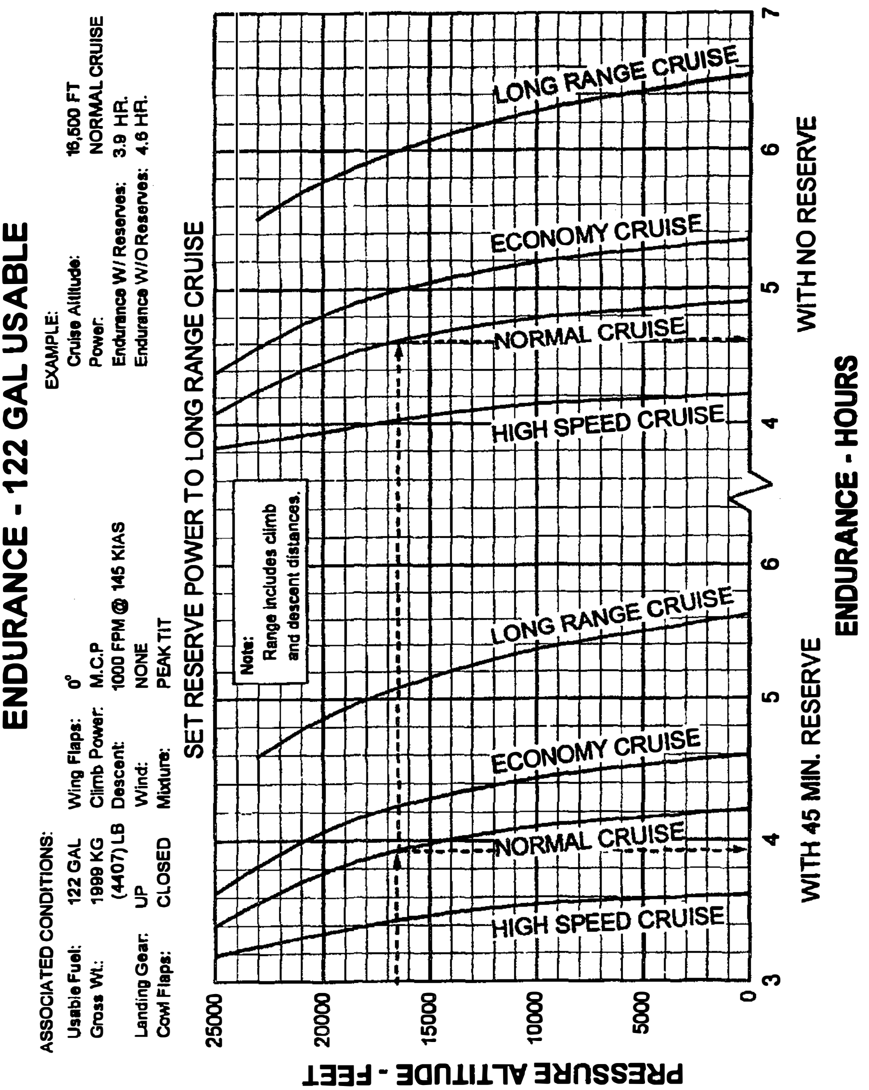
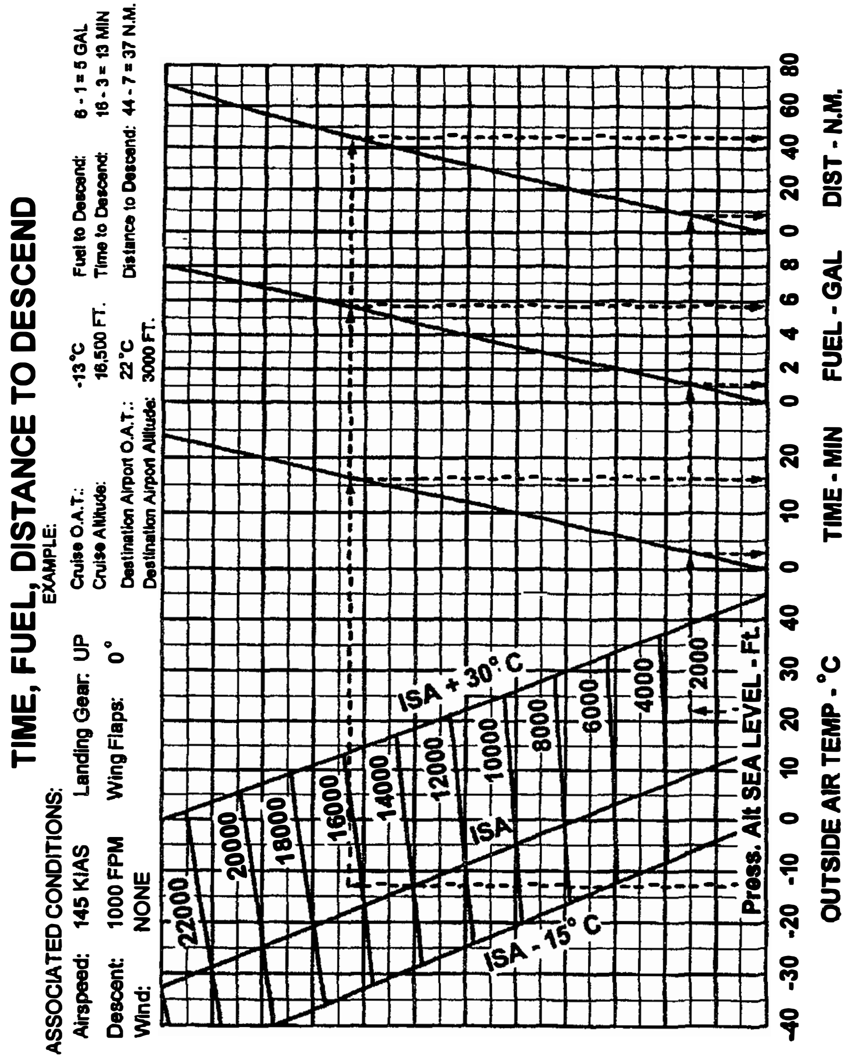
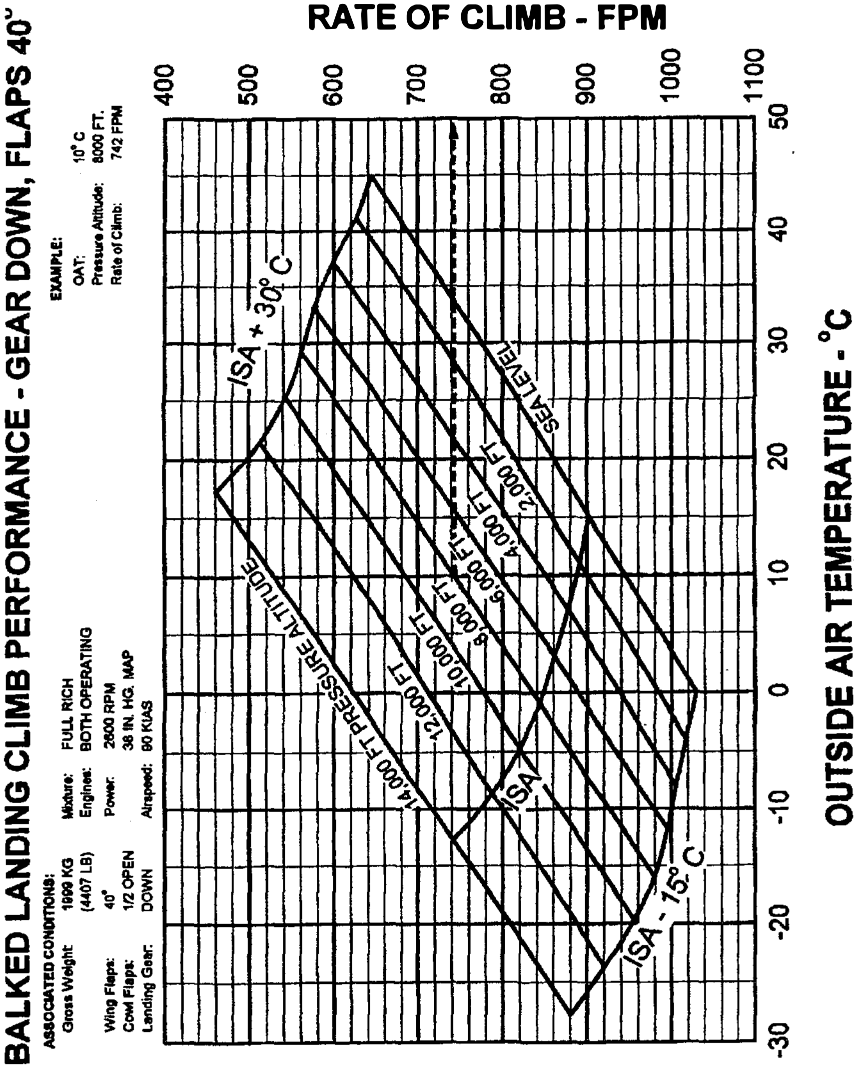


ENDURANCE - 122 GALLONS USABLE

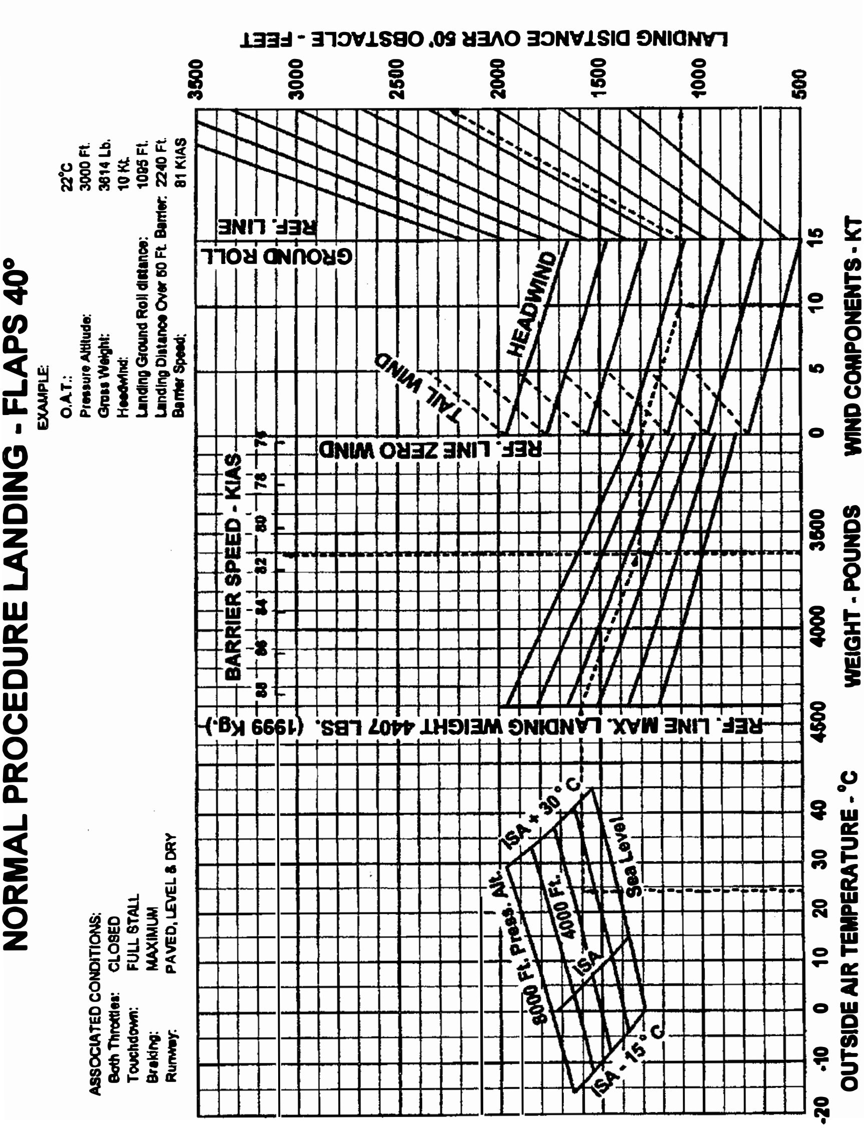
Figure 5-39



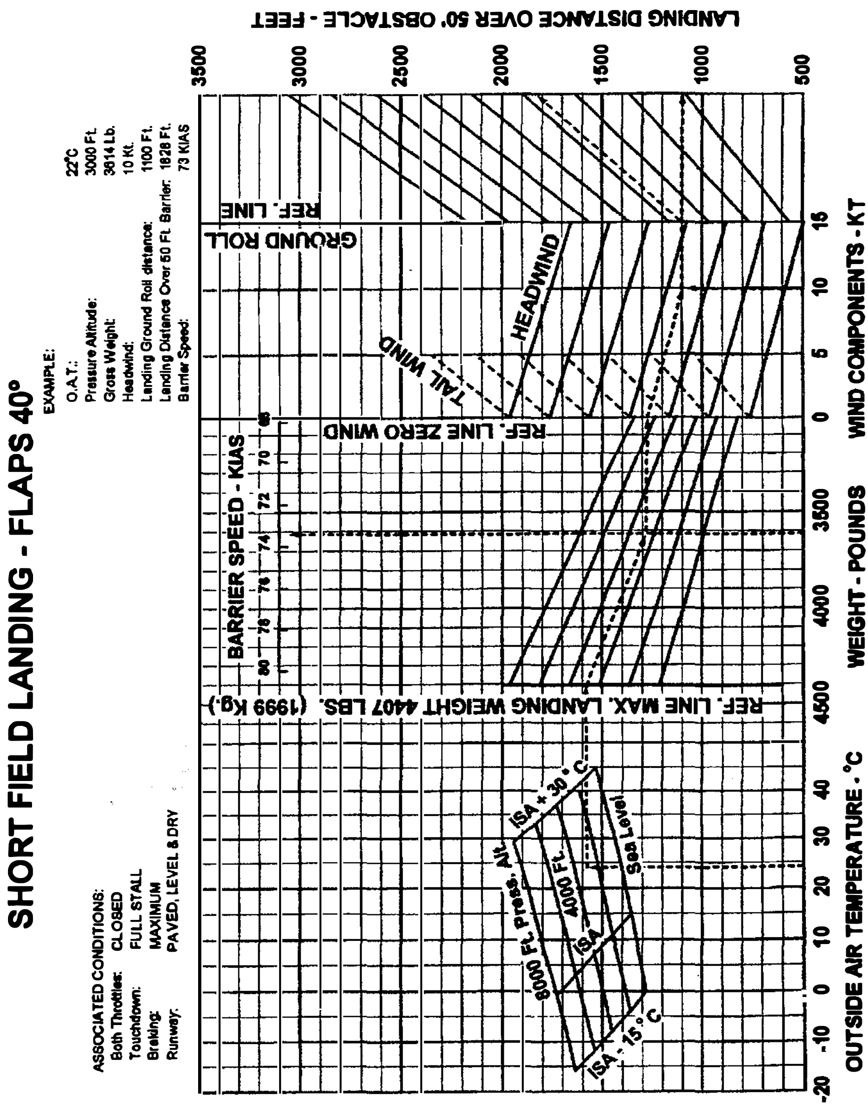
FUEL, TIME AND DISTANCE TO DESCEND
Figure 5-41



BALKED LANDING CLIMB PERFORMANCE
Figure 5-43



NORMAL PROCEDURE LANDING - 40° FLAPS
Figure 5-45



SHORT FIELD LANDING PROCEDURE- 40° FLAPS

Figure 5-47

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Skytech, inc.

ROCK HILL—YORK COUNTY AIRPORT
580 AIRPORT ROAD
ROCK HILL, SOUTH CAROLINA 29732

TELEPHONE 803 / 366-5108
SALES FAX 803 / 980-7228
SERVICE FAX 803 / 366-5230
www.skytechinc.com

WEIGHT & BALANCE
Airplane Basic Empty Weight

AIRCRAFT WEIGHED

Scales - Virtual Measurement & Control, Model VM-501, S/N VC5-02105 (Calibrated Aug 27, 2007)

	WEIGHT	*ARM*	*MOMENT*
Nose Wheel	903.00 lbs.	25.30 in.	22,845.90 in. lbs.
Right Main Wheel	1319.00 lbs.	109.80 in.	144,826.20 in. lbs.
Left Main Wheel	1396.00 lbs.	109.80 in.	153,280.80 in. lbs.
TOTAL:	**3,618.00 lbs.**	**88.71 in.**	**320,952.90 in. lbs.**

REGISTRATION NO: N53347

S/N: 3449221

AIRCRAFT MAKE: Piper

MODEL: PA-34-220T

NORMAL CATEGORY:

New Empty Weight	3,618.00 lbs.
New C.G.	88.71 in.
New Moment	320,952.90 in. lbs.
New Useful Load	**812.00 lbs.**
Maximum Ramp Weight	4,430.00 lbs.

UTILITY CATEGORY:

New Empty Weight	N/A
New C.G.	N/A
New Moment	N/A
New Useful Load	N/A
Gross Weight	N/A

DATE: November 09, 2007

PREPARED BY:
Bryan Pressley
CRS# C41R727N

PA-34-220T		Serial Number		Registration Number			Page Number	
Date	Item No.	Description of Article or Modification	Added (+) Removed (-)	Weight Change			Running Basic Empty Weight	
				Wt.	Arm	Moment /100	Wt.	Moment /100
07/10/01		As licensed					3579.1	314832.7
03/30/02		SKYWATCH WX500 STORMSCOPE					3596.5	318604.2
10/10/06		AVIDYNE EX500 MFD XMD076-01 XM WEATHER					3596.8	318793.0

WEIGHT AND BALANCE RECORD
Figure 6-7

PA-34-220T		Serial Number		Registration Number			Page Number	
Date	Item No.	Description of Article or Modification	Added (+) Removed (-)	Weight Change			Running Basic Empty Weight	
				Wt.	Arm	Moment /100	Wt.	Moment /100

WEIGHT AND BALANCE RECORD (cont)
Figure 6-7 (cont)

6.7 GENERAL LOADING RECOMMENDATIONS

The following general loading recommendation is intended only as a guide. The charts, graphs, and instructions should be checked to assure the airplane is within the allowable weight vs. center of gravity envelope.

STANDARD 5 SEAT AND CONSOLE CONFIGURATION:

(a) Pilot Only
Load rear baggage compartment to capacity first. Without aft baggage, fuel load may be limited by forward envelope for some combinations of optional equipment.

(b) 2 Occupants - Pilot and Passenger in Front
Load rear baggage compartment to capacity first. Without aft baggage, fuel load may be limited by forward envelope for some combinations of optional equipment.

(c) 3 Occupants - 2 in front, 1 in middle
Load rear baggage compartment to capacity first. Baggage in nose may be limited by forward envelope. Without aft baggage, fuel may be limited by forward envelope for some combinations of optional equipment.

(d) 4 Occupants - 2 in front, 1 in middle, 1 in rear
Investigation is required to determine optimum location for baggage.

(e) 4 Occupants - 2 in front, 2 in rear
Investigation is required to determine optimum location for baggage.

(f) 5 Occupants - 2 in front, 1 in middle, 2 in rear
With 5 occupants the aft passengers, weight, fuel and baggage may be limited by envelope. Investigation is required to determine optimum location for baggage. Note placard if installed.

OPTIONAL SIX SEAT CONFIGURATION:

(g) 4 Occupants - 2 in front, 2 in middle
Load rear baggage compartment to capacity first. Baggage in nose may be limited by forward envelope. Without aft baggage, fuel load may be limited by forward envelope for some combinations of optional equipment.

(h) 5 Occupants - 2 in front, 2 in middle, 1 in rear
Investigation is required to determine optimum location for baggage.

6.7 GENERAL LOADING RECOMMENDATIONS (Cont)

(i) 5 Occupants - 1 in front, 2 in middle, 2 in rear
Load forward baggage compartment to capacity first. Aft baggage and/or fuel load may be limited by aft envelope.

(j) 6 Occupants - 2 in front, 2 in middle, 2 in rear
With six occupants, the aft passengers weight, fuel and baggage may be limited by envelope. Investigation is required to determine optimum location for baggage. Note placard if installed.

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.

6.9 WEIGHT AND BALANCE DETERMINATION FOR FLIGHT

(a) Add the weight of all items to be loaded to the basic empty 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 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.

NOTES

Actual fuel allowance for start-up, taxi and run-up (23 lbs. max.) should be determined based on local operating condition.

Moment due to gear retraction does not significantly affect C.G. location.

	Weight (Lbs.)	Arm Aft Datum (Inches)	Moment (In Lbs)
Basic Empty Weight	3212	88.5	284262
Pilot and Front Passenger	340	85.5	29070
Passengers (Center Seats) (Aft Facing)		119.1	
Passengers (Rear Seats)	340	157.6	53584
Baggage (Forward) (100 Lbs. Max.)	58	22.5	1305
Baggage (Aft) (85 Lbs. Max.)		178.7	
Zero Fuel Weight	3950	93.2	368221
Fuel (122 Gal. Max.)	480	93.6	44928
Ramp Weight (4430 Lbs. Max.)	4430	93.3	413149
Fuel Allowance for Start, Taxi Runup	23	93.6	-2153
Takeoff Weight (4407 Lbs. Max.)	4407	93.3	410996

The center of gravity (C.G.) of this sample loading problem is at 93.3 inches aft of the datum line. Locate this point (93.3) on the C.G. range and weight graph. Since this point falls within the weight C.G. envelope, this loading meets the weight and balance requirements.

Takeoff Weight (4407 Lbs. Max.)	4407	93.3	410996
Minus Estimated Fuel Burnoff	450	93.6	42120
Landing Weight (4407 Lbs. Max.)	3957	93.2	368876

Locate the center of gravity for the landing weight on the C.G. range and weight graph. If this point falls within the weight C.G. envelope, the loading may be assumed acceptable for landing.

IT IS THE RESPONSIBILITY OF THE PILOT AND AIRCRAFT OWNER TO ENSURE THAT THE AIRPLANE IS LOADED PROPERLY.

SAMPLE LOADING PROBLEM
Figure 6-9

	Weight (Lbs.)	Arm Aft Datum (Inches)	Moment (In Lbs)
Basic Empty Weight			
Pilot and Front Passenger		85.5	
Passengers (Center Seats) (Aft Facing)		119.1	
.			
Passengers (Rear Seats)		157.6	
Baggage (Forward) (100 Lbs. Max.)		22.5	
Baggage (Aft) (85 Lbs. Max.)		178.7	
Zero Fuel Weight			
Fuel (122 Gal. Max.)		93.6	
Ramp Weight (4430 Lbs. Max.)			
Fuel Allowance for Start, Taxi Runup	23	93.6	2153
Takeoff Weight (4407 Lbs. Max.)			

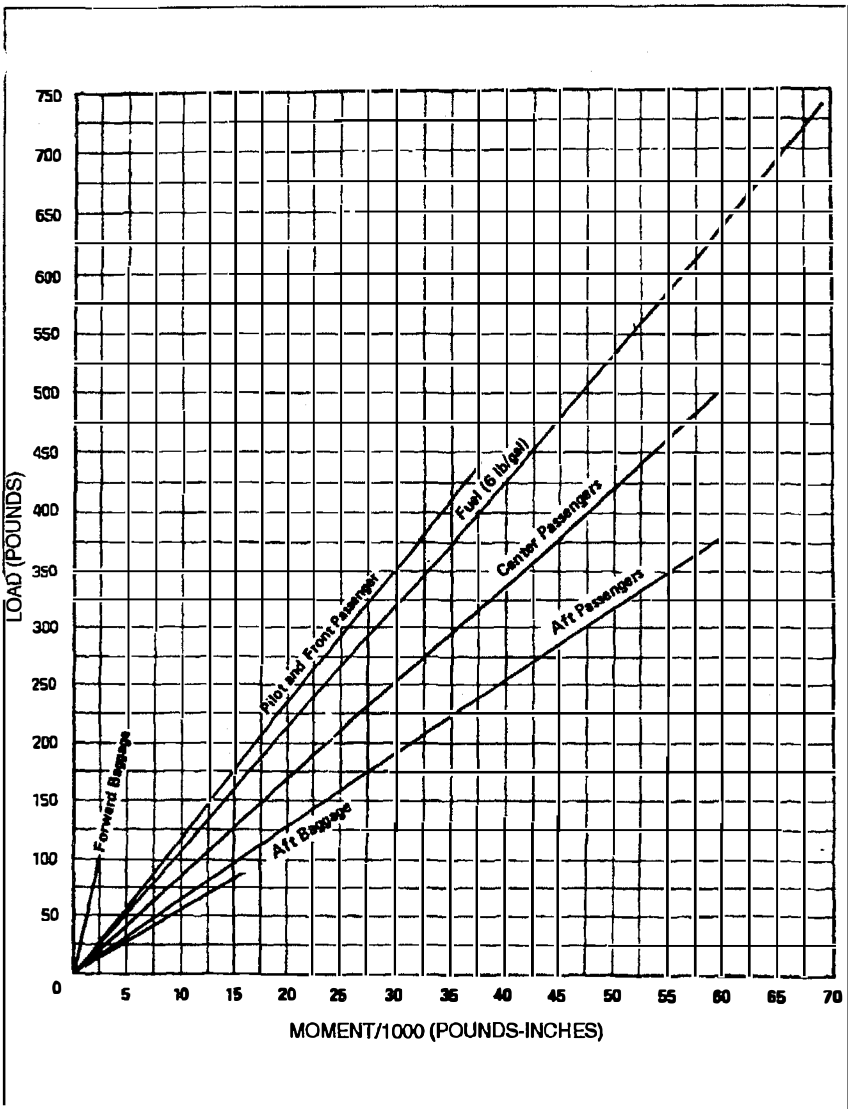
The center of gravity (C.G.) for the takeoff weight of the actual loading problem is at _______ inches aft of the datum line. Locate this point (_____) on the C.G. range and weight graph. If this point falls within the weight C.G. envelope, this loading meets the weight and balance requirements.

Takeoff Weight (4407 Lbs. Max.)			
Minus Estimated Fuel Burnoff		93.6	
Landing Weight (4407 Lbs. Max.)			

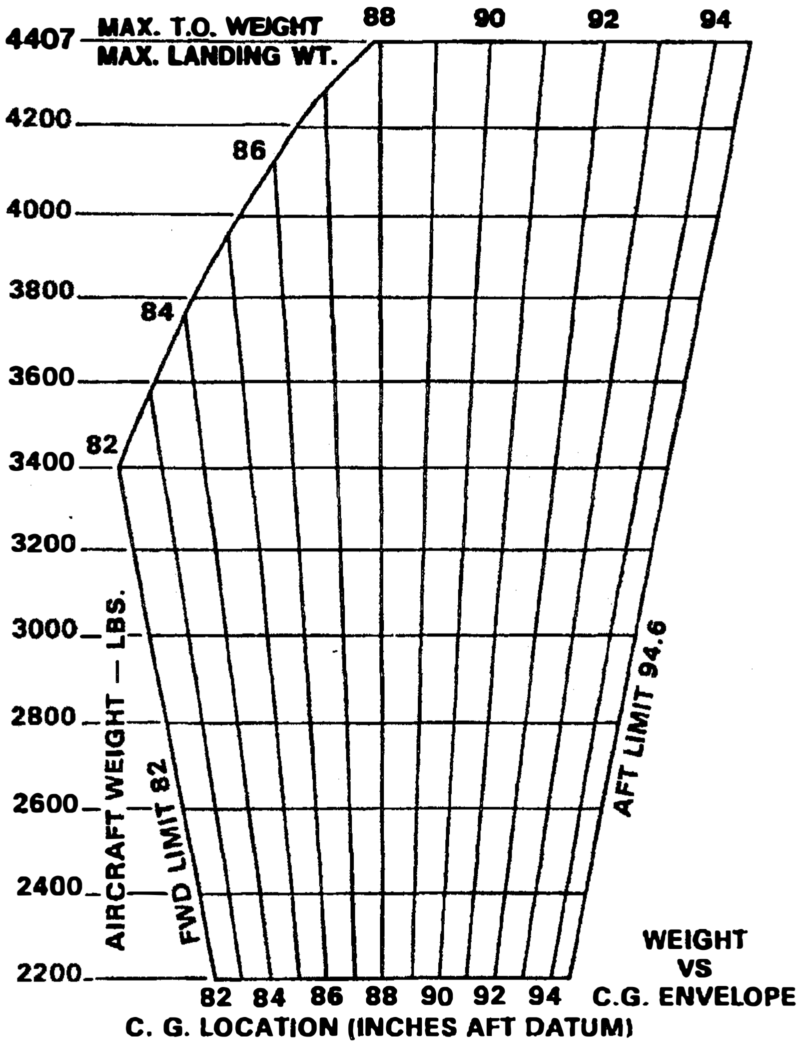
Locate the center of gravity for the landing weight on the C.G. range and weight graph. If this point falls within the weight C.G. envelope, the loading may be assumed acceptable for landing

IT IS THE RESPONSIBILITY OF THE PILOT AND AIRCRAFT OWNER TO ENSURE THAT THE AIRPLANE IS LOADED PROPERLY.

WEIGHT AND BALANCE LOADING FORM
Figure 6-11



LOADING GRAPH
Figure 6-13



Moment change due to retracting Landing Gear = -32 in. - lbs.

C.G. RANGE AND WEIGHT
Figure 6-15

EQUIPMENT LIST CHANGES

Serial No. 3449221 Registration No. N53347 PA-34-220T, SENECA V

Items **removed** from Original Equipment List

Item No.		Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lbs.-In.)
149.	Garmin GTX-327 Transponder Installation with AR-850 **(see Item 231)**.			
153.	Dual Comm/Nav Antenna Installation with Dual GPS provisions, Piper Drawing 101310-003 and 101273-004			
	f.) GPS Antenna (Dual), Piper Drawing 101273-004			
	3.) Coax Cable #1, Piper Drawing 101265-005	-0.52	84.59	-44.24
	6.) Coax Cable #2, Piper Drawing 101266-004	-0.50	84.59	-42.30
157.	Emergency Locator Transmitter Installation, Piper Drawing 06327-011, Cert. Basis TSO C91a			
	a.) Artex ELT 110-4 Kit, Piper Code 599-515			
	1.) Artex Transmitter 110-4 Unit/Bracket, Piper Code 599-515	-4.260	268.020	-1141.765
	3.) Coax Cable, Artex 611-6013, Piper Code 599-515	-0.140	254.090	-35.573
	4.) Remote Switch, Artex 645-6196, Piper Code 599-515	-0.070	67.320	-4.712
	b.) Harness and Hardware, Piper Drawing 06327-011	-0.498	175.56	-87.372
231.	Garmin GTX-327 Transponder Installation with AR-850 and Alt. Preselect, Piper Drawing 104419-3			
	a.) Garmin GTX327 Transponder Unit 011-00490-10, Piper PS50040-12-12, Piper Code 651-938	-2.90	64.065	-185.7885
	b.) Garmin Connector/Rack Kit 011-00338-00, Piper PS50040-12-12, Piper Code 651-938	-0.64	64.07	-41.00
237.	Bendix King RDR-2000 Weather Radar System with FSD 700, Piper Drawing 37916-016			
	b.) Avidyne Flight Max FSD D98-0001-45, Piper Code 651-998	-7.28	63.65	-463.37
	1.) Avidyne Flight Max FSD Tray D98-00002-02, Piper Code 651-998	-1.17	63.65	-74.47

EQUIPMENT LIST CHANGES

Serial No. 3449221 Registration No. N53347 PA-34-220T, SENECA V

Items **installed** – additions to the Equipment List

Item No.		Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lbs.-In.)
153.	Dual Comm/Nav Antenna Installation with Dual GPS provisions			
	f.) GPS Antenna (Dual), Piper Drawing 101273-004			
	3.) Coax Cable #1, RG400 Antenna coax cable	0.52	84.59	44.24
	6.) Coax Cable #2, RG400 Antenna coax cable	0.50	84.59	42.30
157.	Emergency Locator Transmitter Installation			
	a.) ARTEX C406-N Emergency Locator Transmitter system			
	1.) ARTEX C406-N ELT Transmitter, P/N 453-5060	4.63	268.02	1240.93
	2.) Antenna, ARTEX Rod, P/N 110-338	3.13	218.00	682.34
	3.) Remote Switch, ARTEX 345-6196-04	0.05	67.32	3.37
	4.) Buzzer Assembly, ARTEX 130-4004	0.10	261.0	26.10
231.	Garmin GTX-330 Mode S Transponder Installation			
	a.) Garmin GTX330 Mode S Transponder Unit, P/N 011-00455-00	4.20	64.065	269.07
237.	Bendix King RDR-2000 Weather Radar System with FSD 700, Piper Drawing 37916-016			
	b.) Avidyne Flight Max EX500 MFD, P/N 700-00007-005	7.20	63.65	458.28

	Bendix/King KR 87 Automatic Direction Finder (ADF) Installation			
	a.) Bendix/King KR 87 Automatic Direction Finder (ADF) system			
	1.) KR 87 ADF Receiver, P/N 066-01072-04	2.95	64.0	188.80
	2.) KI 229 Radio Magnetic Indicator (RMI), P/N 066-3038-00	2.80	64.0	179.20
	3.) KA 44B ADF Antenna, P/N 071-1234-00	4.20	210.0	882.00
	Bendix/King KN 63 Distance Measuring Equipment (DME) Installation			
	a.) Bendix/King KN 63 Distance Measuring Equipment (DME) system			
	1.) KN 63 DME, P/N 066-1070-01	2.80	175.0	490.00
	2.) KDI 572 Master Indicator, P/N 066-01069-00	0.80	64.0	51.20
	3.) KA 61 DME Antenna, P/N 071-00221-0010	0.40	112.5	45.00

Piper

THE NEW PIPER AIRCRAFT, INC.

EQUIPMENT LIST

The following is a list of standard and optional equipment for the PA-34-220T Seneca V. Optional equipment items marked with an X are installed on the airplane. All items are as described below at the time of licensing by the manufacturer. The New Piper Aircraft, Inc. will not revise this equipment list once the aircraft is licensed. It is the owner's responsibility to retain and amend this equipment list to reflect changes in equipment installed in this airplane.
Unless otherwise indicated, the installation certification basis for the equipment included in this list is the aircraft's approved type design.

THE NEW PIPER AIRCRAFT INC. PA-34-220T, SENECA V

SERIAL NO. 3449221 REGISTRATION NO. N53347 DATE 07/10/01

Item No.	Item	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lbs.-In.)
	(a) Propeller and Propeller Accessories			
1.	Two Blade Propeller Installation			
	a.) ~~Hartzell, Hub Model BHC-J2YF-2CUF Blade Model - FC8459(B)-8R~~			
	(left) McCauley Model 3AF32C522 Blade Model G-82NJA-6	64.5	17.9	1154.6
	b.) ~~Hartzell, Hub Model BHC-J2YF-2CLUF Blade Model - FJC8459(B)-8R~~			
	(right) McCauley Model 3AF32C523 Blade Model L-82NJA-6	64.5	17.9	1154.6
	c.) Two Blade Spinner Assemblies			
	1.) Piper Drawing 37138-10 assembly (left)	6.0	16.8	100.8
	2.) Piper Drawing 37138-11 assembly (right)	6.0	16.8	100.8
	(b) Engine and Engine Accessories			
3.	Hartzell Governor, Piper Drawing 37845-16 (left engine)	3.6	28.5	102.6
	Hartzell Governor, Piper Drawing 37845-17 (right Engine)	3.6	28.5	102.6
5.	Two Engines			
	Teledyne Continental Model, TSI0-360-RB			
	Fuel Injected, Turbocharged (left) Cert. Basis - (E9CE)	426.5	44.4	18936.6
	Teledyne Continental Model, LTSI0-360-RB			
	Fuel Injected, Turbocharged (right) Cert. Basis - (E9CE)	421.5	44.2	18630.3
	(c) Landing Gear and Brakes			
7.	Main Wheel Assemblies - Heavy Duty Group			
	Parker Hannifin Wheel & Brake Division			
	Wheel Assembly 40-120C (2) Piper PS50035-14			
	Brake Assembly 30-83A (2) Piper PS50121-5, Cert. Basis - TSO C26a			
	Michelin Aircraft Tire Corporation			
	6.00 x 6 Ribbed Type III 8 Ply Rating Tire with Tubes			
	MA 024-317-0 (2) Piper PS50119-7A - Cert. Basis TSO-C62	41.0	109.7	4497.7

Item No.	Item	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lbs.-In.)
	(c) Landing Gear and Brakes -continued			
9.	Nose Wheel Assembly			
	a.) Parker Hannifin Wheel & Brake Division, Wheel Assembly No. 40-56B Piper PS50035-23, Cert. Basis - TSO C26a	4.3	25.4	109.2
	b.) Michelin Aircraft Tire Corporation - 6.00 x 6 Ribbed Type III 8 Ply Rating Tire with Tubes -MA 024-317-0 (1), Piper PS50119-7A Cert. Basis - TSO C62	9.8	25.5	249.9
	(d) Electrical Equipment			
11.	Wing Nav/Strobe Light (right), Whelen 90071-01, Piper Code 572-592, Piper Drawing 89424-5, Cert. Basis - TSO C30b	0.8	105.0	84.0
13.	Wing Nav/Strobe Light (left), Whelen 90071-00, Piper Code 572-593, Piper Drawing 89424-6, Cert. Basis - TSO C30b	0.8	105.0	84.0
15.	Wing Tip Landing/Recognition Light (2), Piper PS10008-4594, Piper Code 472-071)	1.6	89.0	142.4
17.	Fin Strobe (Tail), Whelen 01-0790111-02, Piper Code 683-504 Piper Drawing 89424-10	0.3	289.0	86.7
19.	Power Supply, Whelen A413A-HDA-CF-14/28, Piper Code 481-247 Piper Drawing 89424-10	2.1	231.0	485.1
21.	Nose Gear Landing/Taxi Lights (2), Piper PS10008-4594, Piper Code 472-071, Piper Drawing 96240-2 (Arm with nose gear in extended	1.6	27.0	43.2
23.	Battery, Gill, G-247, Piper Drawing 100885-2	42.5	175.9	7475.8
25.	Voltage Regulator (2), Piper Drawing 84199-5	1.2	23.3	28.0
27.	Battery Relay, 6041H202A, Piper Drawing 89803-13	1.1	185.9	204.5
29.	Starter Relay (2) (RBM Controls 70-117222-3), Piper Drawing 26898-3	1.6	42.8	68.5
31.	Alternators (2) - TCM P/N 654200 (Electro Systems ES4024 - weight included in basic engine weight)	—	—	—
33.	External Power Receptacle, Piper Drawing 84563-3	2.3	172.4	396.5
35.	Stall Warning Detector, (2) (Safe Flight 186-18) Piper Drawing 87291-7	0.4	80.2	32.1

Item No.	Item	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lbs.-In.)
	(d) Electrical Equipment -continued			
37.	Stall Warning Horn, Piper PS50177-2, Piper Drawing 83352	0.2	64.6	12.9
39.	Radio Master Switch Relay 6041 H299 (2), Piper Drawing 83352	0.5	6.2	3.1
41.	Heated Pitot Head, Piper Drawing 56832-7	0.4	100.0	40.0
43.	External Power Relay, Piper Drawing 89803-13	0.8	185.9	148.7
45.	Pulse Light Assembly, Piper Drawing 101295-3	1.0	51.0	51.0
47.	Power Point Assembly, Instrument Panel, Piper Drawing 104179	0.075	66.450	4.962
	(e) Instruments			
49.	Flap Indicator, Mid-Continent MD190	0.5	65.8	32.9
51.	Altimeter, Piper PS50008-11-2, Cert. Basis-TSO C10b	0.9	65.9	59.3
53.	Airspeed Indicator, Piper PS 50049-66T, Cert. Basis - TSO C2b	0.7	66.8	46.8
55.	Compass, Piper Drawing 87217-4, Cert. Basis - TSO C7c	0.9	70.0	63.0
57.	Manifold Pressure Indicator, Piper Drawing 100624-2, Piper Code 602-201) (2)	1.0	65.6	65.6
59.	Fuel Flow/CHT Indicator, Piper Drawing 100624-5, Piper Code 602-204) (2)	1.4	65.6	91.8
61.	TIT Indicator, Piper Drawing 100624-4, Piper Code 602-203 (2)	1.0	65.6	65.6
63.	RPM Indicator, Piper Drawing 100624-3, Piper Code 602-202 (2)	1.0	65.6	65.6
65.	Tachometer Generator (2), Piper PS50172-1-3	1.2	56.8	68.2
67.	Oil Temp/Oil Press. Indicator, Piper Drawing 100624-6, Piper Code 602-205 (2)	1.4	65.6	91.8
69.	Fuel Quantity Indicator, Piper Drawing 100624-8, Piper Code 602-207	0.7	65.6	45.9
71.	Engine Hour Meter, Piper Drawing 89481-2	0.3	67.5	20.3
73.	Digital Display Indicator, Piper Drawing 100624-1 (Piper Code no. 680-475)	1.4	64.7	90.6

Item No.	Item	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lbs.-In.)
	(e) Instruments - continued			
75.	Vacuum Indicator, Piper Drawing 100624-7, Piper Code 602-206	0.5	65.6	32.8
77.	Vacuum Pump Installation - Pumps(2)			
	a.) Vacuum Pump (1), Airborne 441cc-7, Piper Drawing 100790	3.2	58.0	185.6
	b.) Vacuum Pump (1), Airborne 442cw-6, Piper Drawing 100790	3.2	58.0	185.6
79.	Narco AR-850 Encoder Installation, Piper Drawing 37814-004, Cert. Basis TSO C88(a)			
	a.) Narco AR -850 Altitude Reporter, Piper PS50040-30-5, Piper Code 599-012	0.57	51.09	29.07
	b.) Narco AR -850 Altitude Reporter Mounting Tray 53873-0102, Piper Code 599-012	0.08	51.09	4.09
	c.) Altitude Reporter Hose, Tube and Hardware, Piper Drawing 37814-004	0.23	57.36	13.48
81.	Vertical Speed, Piper Drawing 99010-5, Cert. Basis- TSO C8b	1.0	65.9	65.9
83.	Turn Coordinator, Piper PS50030-3-5 or 11-2, Cert. Basis TSO C3b	1.2	66.1	79.3
85.	Clock/Recorder DVR-300i-XT, Piper Code 600-103	0.9	67.4	60.7
87.	Heated Hour Recorder, Piper Drawing 37164-11	0.3	206.7	62.0
	(f) Cabin Interior			
89.	Pilot Adjustable Seat (leather) with headrest, armrest and lumbar support, Piper Drawing 89026-12	25.59	91.20	2333.81
91.	CoPilot Adjustable Seat (leather) with headrest, armrest and lumbar support Piper Drawing 89026-13	25.61	91.20	2335.63
93.	Center Club Seat(leather)- (left) with Headrest, Piper Drawing 89036-2	18.58	112.80	2095.82
95.	Center Club Seat (leather) -(right) with Headrest, Piper Drawing 89036-2	18.66	112.80	2104.85
97.	Aft Seat(leather)-(left) with Headrest, Piper Drawing 89046-2	15.68	163.40	2562.11
99.	Aft Seat(leather)-(right) with Headrest and center armrest, Piper Drawing 89046-4	18.16	162.20	2945.55

Item No.	Item	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lbs.-In.)
	(f) Cabin Interior - continued			
105.	Pilot restraint system Piper Drawing 78087-015, Cert. Basis TSO-C114/JTSO-C114			
	a.) Pilot Inertia Reel, Schroth 5-01-260701, Piper Code 564-886, Piper Drawing 104211-004	1.30	120.10	156.67
	b.) Pilot stiffening Sleeve, Schroth 5-01-260701, Piper Code 564-886, Piper Drawing 104211-004	0.52	91.20	47.70
107.	CoPilot Restraint System, Piper Drawing 78087-015, Cert. Basis TSO-C114/JTSO-C114			
	a.) CoPilot Inertia Reel, Schroth 5-01-265701, Piper Code 564-887, Piper Drawing Number 104211-005	1.30	120.10	156.31
	b.) CoPilot Stiffening Sleeve, Schroth 5-01-265701, Piper Code 564-887, Piper Drawing Number 104211-005	0.53	91.20	48.02
109.	Center Seat Belt Restraint System (LH), Piper Drawing 37825-013, Cert. Basis TSO-C114/JTSO-C114			
	a.) Center Seat Inertia Reel, Schroth 5-01-595701, Piper Code 564-889, Piper Drawing Number 104211-006	0.87	108.90	94.53
	b.) Center Seat stiffening Sleeve, Schroth 5-01-595701, Piper Code 564-889, Piper Drawing Number 104211-006	0.37	113.20	42.39
111.	Center Seat belt Restraint System (RH), Piper Drawing 37825-013, Cert. Basis TSO-C114/JTSO-C114			
	a.) Center Seat Inertia Reel, Schroth 5-01-590701, Piper Code 564-888, Piper Drawing 104211-007	0.87	108.90	94.85
	b.) Center Seat Stiffening Sleeve, Schroth 5-01-590701, Piper Code 564-888, Piper Drawing 104211-007	0.38	113.20	42.62
113.	Aft Seat Restraint System (LH), Piper Drawing 78087-015, Cert. Basis TSO-C114/JTSO-C114			
	a.) Aft Seat Inertia Reel, Schroth 5-01-280701, Piper Code 564-892, Piper Drawing 104211-002	1.27	181.50	230.05
	b.) Aft Seat stiffening Sleeve, Schroth 5-01-280701, Piper Code 564-892, Piper Drawing 104211-002	0.53	163.40	86.93
115	Aft Seat Restraint System (RH), Piper Drawing 78087-015, Cert. Basis TSO-C114/JTSO-C114			
	a.) Aft Seat Inertia Reel, Schroth 5-01-285701, Piper Code 564-893, Piper Drawing Number 104211-003	1.27	181.50	230.41
	b.) Aft Seat Stiffening Sleeve, Schroth 5-01-285701, Piper Code 564-893, Piper Drawing Number 104211-003	0.52	163.40	85.21
117	Refreshment Console Installation, Piper Drawing 37825-11			
	a.) Refreshment Console, Piper Drawing 104215	10.1	118.5	1196.9
	b.) Igloo "Legend Six-Packer" Cooler, Piper Code 602-022	1.7	118.5	201.5

Item No.	Item	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lbs.-In.)
	(f) Cabin Interior - continued			
119.	Executive Writing Table, Piper Drawing 85366-2 (ICI P-0336-02)	3.0	142.1	426.97
121.	Fire Extinguisher installation (Piper Drawing 100801-3), Saber 1211-1301 Halon Model 600	2.3	103.6	238.3
123.	Window Shades Installation, Piper Drawing 100836-2	7.8	143.6	1120.1
125.	Assist Straps, Piper Drawing 79455-0	0.3	120.0	36.0
127.	Baggage Straps, Piper Drawing 66804-0	1.3	177.0	230.1
129.	Sun Visors Installation (2), Piper Drawing 85458-2	1.6	75	120
	(g) Miscellaneous			
131.	Combustion Heater, ElectroSystems 91E88-1(EL), Piper Code 691-700	21.0	215.0	4515
133.	Combustion Heater Blower Assembly, ElectroSystems 90D39-2	5.4	221.4	1195.6
135.	Ventilation Air Blower Installation			
	a.) Fresh Air Blower Installation, Piper Drawing 78630-7	8.8	212.8	1872.6
	b.) Cable Installation, Piper Drawing 89402-3	2.0	188.0	376.0
137.	Tow Bar, Piper Drawing 96331-0	4.4	8.0	35.2
139.	Locking Fuel Caps (2), Piper Drawing 39824-3	0.85	93.85	80.10
	(h) Autopilot			
143.	S-TEC System 55X Autopilot with Compass ST-180/ HSI and Flight Director Installation-Piper Drawing 104580-2			
	a.) S-TEC 6405-28L Turn Coordinator, Piper Code 694-102	1.80	63.98	115.16
	b.) S-TEC 01192-0-51T Programmer Computer, Piper Code 652-123	2.70	63.85	172.395
	c.) S-TEC 55254-1 Programmer Computer Mounting Tray	0.35	64.07	22.55
	d.) S-TEC Programmer Computer Hardware	0.04	61.97	2.20
	e.) S-TEC 0111 Transducer, Piper Code 651-981	0.20	55.60	11.12
	f.) S-TEC Transducer Kit Hardware	0.19	55.60	10.52
	g.) S-TEC 0106-R9 Roll Servo, Piper Code 651-982	2.90	119.05	345.25
	h.) S-TEC Roll Servo Bracket, Cable and Kit Hardware	0.76	121.43	92.77
	i.) S-TEC 0108-P2 Pitch Servo, Piper Code 651-983	2.90	115.8	335.82
	j.) S-TEC Pitch Servo Bracket, Cable and Kit Hardware	0.64	116.31	74.87
	k.) S-TEC 0106-T8 Trim Servo, Piper Code 651-984	2.90	190.05	551.15
	l.) S-TEC Trim Servo Bracket, Cable and Kit Hardware	0.43	192.92	83.47

Item No.	Item	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lbs.-In.)
	(h) Autopilot - continued			
143.	S-TEC System 55X Autopilot with Compass ST-180/ HSI and Flight Director Installation-Piper Drawing 104580-2 - **continued**			
	m.) S-TEC 01240-1 Trim Monitor, Piper Code 651-989	0.30	57.98	17.39
	n.) S-TEC 6542 Trim Horn, Piper Code 651-989	0.08	66.11	4.96
	o.) S-TEC Trim Monitor and Horn Bracket, Cable and Hardware	0.038	61.04	2.30
	p.) S-TEC Autopilot Harness	5.76	112.75	649.44
	q..) S-TEC Switch Installation Kit 90411-7, Piper Code 651-986,	0.139	73.94	10.28
	ST-180 Compass Installation (HSI) S-TEC 901480 Kit, Piper Code 652-126			
	r.) S-TEC 6443-PA Horizontal Situation Indicator	2.90	63.40	183.86
	s.) S-TEC 6444 Remote Gyro	3.40	35.00	119.00
	t.) S-TEC 01171-P Slaving Panel	0.10	67.30	6.73
	u.) S-TEC 6446 Flux Sensor	0.30	89.30	26.79
	v.) S-TEC 90480-1 Kit Installation Hardware	0.63	50.21	31.63
	w.) Compass ST-180/ HSI Installation Hardware, Piper Drawing 101382	3.65	55.31	201.79
	Single Cue Flight Director System, Piper Code 652-127			
	x.) S-TEC 6413-0-P-28L Steering Horizon	3.00	64.25	192.75
	y.) S-TEC 01188-1PX Annunciator	0.54	66.49	35.84
	z.) S-TEC Flight Director Placards and Trim Kit 90481-1	0.112	68.04	7.614
	aa.) Autopilot Installation Hardware	0.44	67.182	29.709
	(i) Avionics Equipment			
145.	Garmin GNS 530/430 System Installation - Dual COM/NAV/GPS, Piper Drawing 104421-004			
	a.) Garmin GNS530 #1 with mount, connectors and data card, Piper PS50040-40-3, Piper Code 601-220, Cert. Basis-TSO C37d,C38d,C40c,C36e,C34e,C129a	8.47	64.065	542.69
	b.) Garmin GNS430 #2 with mount, connectors and data card, Piper PS50040-40-1, Piper Code 601-214, Cert. Basis-TSO C37d,C38d,C40c,C36e,C34e,C129a	6.48	64.065	415.1412
	c.) Cables/harnesses and hardware, Piper Drawing 104421-004	4.53	67.89	307.31
147.	Garmin GI-106 VOR /LOC Indicator, Piper Code 602-239, Cert. Basis-TSO C36c,C40a,C34c	1.02	65.39	66.6978
149.	Garmin GTX-327 Transponder Installation with AR-850, Piper Drawing 104419-2, Cert. Basis-TSO C74C			
	a.) Garmin GTX327 Transponder Unit P/N 011-00490-10, Piper PS50040-12-12 Piper Code 651-938	2.90	64.07	185.79
	b.) Garmin Connector/Rack Kit P/N 011-00338-00, Piper PS50040-12-12, Piper Code 651-938	0.64	64.07	41.00
	c.) Garmin Transponder Antenna P/N 010-10160-00,Piper Code 683-724	0.21	60.98	12.81
	d.) Harness, Backing plate, and Hardware, Piper Drawing 104419-2	1.62	64.35	104.13

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SECTION 7

DESCRIPTION AND OPERATION OF THE AIRPLANE AND ITS SYSTEMS

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SECTION 7

DESCRIPTION AND OPERATION OF THE AIRPLANE AND ITS SYSTEMS

7.1 THE AIRPLANE

The SENECA V is a twin-engine, all metal, retractable landing gear, turbocharged airplane. It has seating for up to six occupants, (1) one hundred pound luggage compartments located in the nose, and (1) eighty-five pound luggage area aft of the rear seats.

7.3 AIRFRAME

The basic airframe is of aluminum alloy with steel engine mounts and landing gear and thermo-plastic or fiberglass fairings. Aerobatics are prohibited in this airplane since the structure is not designed for aerobatic loads.

The fuselage is a semi-monocoque structure. There is a front door on the right side and a rear door on the left. A cargo door is installed aft of the rear passenger door. Both rear doors may be opened for loading large pieces of cargo. A door on the left side of the nose section gives access to the nose section baggage compartment.

The wing is of a conventional design and employs a laminar flow NACA 652-415 airfoil section. The main spar is located at approximately 40% of the chord aft of the leading edge. The wings are attached to the fuselage by the insertion of the butt ends of the spar into a spar box carry-through, which is an integral part of the fuselage structure. The bolting of the spar ends into the spar box carry-through structure, which is located under the center seats, provides in effect a continuous main spar. The wings are also attached fore and aft of the main spar by an auxiliary front spar and a rear spar. The rear spar, in addition to taking torque and drag loads, provides a mount for flaps and ailerons. Each wing contains three fuel tanks as standard equipment. The tanks on one side are filled through a single filler neck located well outboard of the engine nacelle.

7.3 AIRFRAME (Cont)

A vertical stabilizer, an all-movable horizontal stabilator. and a rudder make up the empennage. The stabilator incorporates an anti-servo tab which improves longitudinal stability and provides longitudinal trim. This tab moves in the same direction as the stabilator, but with increased travel. Rudder effectiveness is increased by a servo tab on the rudder This tab lags behind the rudder inputs.

7.5 ENGINES AND PROPELLERS

Engines

The Seneca V is powered by two Teledyne Continental Motors L/TSIO-360-RB engines. They are direct drive, horizontally opposed, fuel injected, air cooled. turbocharged-aftercooled with the variable wastegate, variable-absolute control system. Maximum continuous rated power is 220 horsepower at 2600 RPM and 38 inches Hg. manifold pressure.

Accessories normally installed include a belt-driven alternator, a propeller governor, two magnetos, an oil filter, a starter, one gear-driven vacuum pump and a belt-driven air conditioning compressor. (TSIO-360-RB only)

The engines are equipped with engine mounted oil coolers with low temperature bypass systems and engine mounted oil filters. A winterization plate is provided to restrict air during winter operation. (See Winterization in Section 8). Asymmetric thrust is eliminated by the counter-rotation of the engines, the left engine rotating in a clockwise direction when viewed from the cockpit, and the right engine rotating counterclockwise.

The engine oil dipstick is accessible through an access door on the top of the engine cowling. The oil dipsticks are not interchangeable from one engine to the other.

The engine is accessible through a removable four piece fiberglass engine cowling. Engine mounts are constructed of steel tubing, and a fully focalized bed type dynafocal configuration is incorporated to reduce vibration.

Turbocharger

Turbocharging is accomplished by an Allied Signal Garrett turbocompressor. Turbochargers extract energy from engine cylinder exhaust gases and use this energy to compress engine induction air. This allows the engine to maintain rated power at altitude. When engine induction air is compressed by the turbocharger, the air temperature is increased. The elevated air temperature is reduced by an air aftercooler located between the compressor and the throttle. This aids in engine cooling and improves engine power and efficiency.

The turbocharger extracts exhaust energy from the cylinders to pressurize the induction air. Air flows through a flush inlet located on the right side of the lower cowling and into an induction air box, where it is filtered and then passes on to the turbo compressor. 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 the intake stroke. Air then flows through an aftercooler where air temperature is reduced, further increasing the density of air available to the cylinder. Downstream of the aftercooler, induction air flows across the throttle butterfly valve into individual intake tubes 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 the turbocharger where exhaust energy is extracted to drive the compressor.

Turbo compressed air is throttled across the throttle butterfly as set by the throttle lever. A variable absolute control system monitors pressure differential and uses engine oil pressure to automatically position the waste gate valve. The waste gate bleeds excess exhaust gas from the exhaust transition to the tailpipe, bypassing the turbocharger. Thus the controller automatically maintains manifold pressure.

The engine is 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 38 inches Hg. In the event of a controller malfunction, there is a pressure relief valve on the induction wing assembly which will relieve manifold pressure at approximately 42 in. Hg.

Manifold pressure limits can be exceeded with full throttle operation during certain off standard ambient conditions and low engine oil temperature. During such conditions limit manifold pressure to 38 inches maximum.

7.5 ENGINES AND PROPELLERS (Cont)

Induction Air System

CAUTION

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

The engine air induction system receives ram air through a flush inlet located on the right side of the lower cowling. Air enters this inlet and flows through a removable air filter located in an airbox which is an integral part of the cowling. The filter removes dust and other foreign matter from the induction air. However, in the event the flush inlet or the filter should become obstructed by ice or other causes, the pilot must manually select alternate air to provide air to the engine. This alternate air control is located on the center console just below the engine control quadrant. When the induction air lever is up, or on primary air, the engine is operating on filtered air drawn through the flush inlet in the cowling. When the lever is down, or on alternate air, the engine is operating on unfiltered air, drawn from inside the cowling. In addition to the alternate air door, this lever actuation also controls a butterfly valve located in the air duct which supplies cooling air to the aftercooler. The purpose of this valve is to simultaneously close off the cooling air to the induction aftercooler when alternate air is selected thus providing additional heat to the induction air to eliminate any ice in the induction system should it form.

Application of alternate air will result in a loss of manifold pressure when operating at high altitude where the turbocharger wastegate is closed. Loss of manifold pressure of up to 5 inches of Hg. can result at maximum continuous power, with a possible greater reduction resulting at cruise power settings.

Fuel Injection System

The engines are equipped with a Precision RSA-5AD2 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 injection nozzles. A fuel vent system provides a common reference point vent pressure to the engine driven fuel pump and injection nozzles. The vent source is taken downstream of the turbocharger to ensure proper vent pressure during turbocharger operation.

Propellers

Counter-rotation of the propellers provides balance thrust during takeoff and climb and eliminates the critical engine factor in single-engine flight.

The Seneca V is equipped with all metal, two blade, constant speed, controllable pitch and fully feathering Hartzell propellers installed as standard equipment. Three blade, all metal, constant speed, controllable pitch and fully feathering McCauley propellers are installed as optional equipment.

Constant propeller rotational speed (rpm) is maintained by a balance of air load and engine rotational forces. The Hartzell 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 mechanically linked to the propeller blades. Governor oil pressure against the piston works to decrease propeller blade pitch, thus increasing propeller and engine rpm. The counterweights located on the propeller blade shank cause a centrifugal twisting moment on the propeller blade which works to increase blade pitch and decrease propeller and engine rpm. Simple control of the interaction of these and other forces to maintain a constant rpm is provided by the propeller control lever in the cockpit.

Each propeller is controlled by the propeller control levers located in the center of the power control quadrant. Feathering of a propeller is accomplished by moving the propeller control lever fully aft through the low rpm detent, into FEATHER position. Feathering takes place in approximately six seconds. Unfeathering is accomplished by moving the propeller control forward and engaging the starter until the propeller is windmilling.

Unfeathering Accumulators *

An optional propeller unfeathering system may be installed which consists of increased capacity governors, gas charged accumulators and a latching propeller control lever.

The feathering governors are designed to operate in the conventional manner in addition to their accumulator unfeathering capability.

The accumulators store engine oil under pressure from the governors which is released back to the governors for propeller unfeathering when the propeller control levers are unlatched and are moved forward from the feathered position.

The feathering latches hold the propeller control lever in the feathered position and prevent inadvertent unfeathering. These latches must be manually released (pushed forward) to unfeather the propeller but do not change the feathering procedure.

With this system installed the feathering time is approximately six seconds and unfeathering times is six to eight seconds depending on the oil temperature.

A feathering lock, operated by centrifugal force, prevents feathering during shut down by making it impossible to feather anytime the engine speed falls below 800 rpm. For this reason, when airborne, and the pilot wishes to feather a propeller to save an engine, they must be sure to move the propeller control into FEATHER position before the engine speed drops below 800 rpm.

* Optional Equipment with Hartzell propeller installation only.

7.7 ENGINE CONTROLS

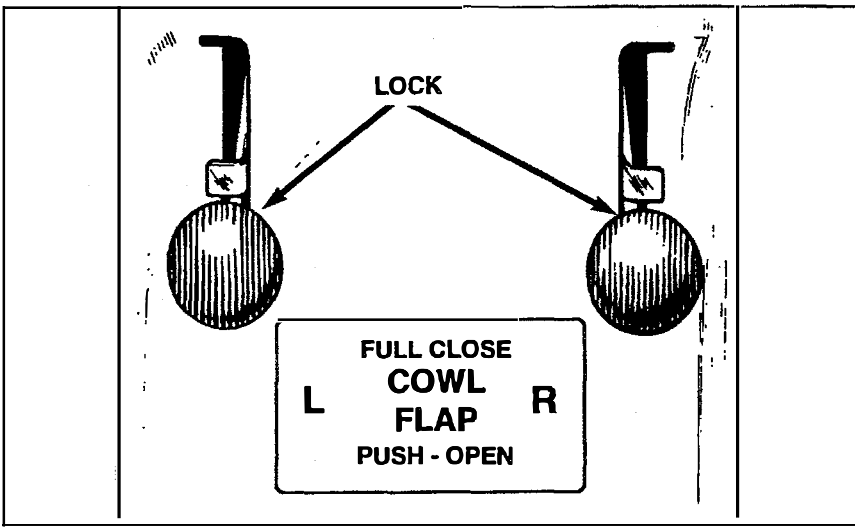
Engine controls consist of a throttle, a propeller control and a mixture control lever for each engine. These controls are located on the control quadrant on the lower center of the instrnment panel where they are accessible to both the pilot and the copilot. The controls utilize teflon-lined control cables to reduce friction and binding.

The throttle levers are used to adjust the manifold pressure. Some aircraft incorporate gear up warning horn micro-switches which are activated by either or both throttles contacting the switches during the lower portion of throttle lever travel (approximately 14 in. Hg. MAP and below). If the landing gear is not locked down, the horn will sound until the gear is down and locked or until the power setting is increased. This is a safety feature to warn the pilot of an inadvertent gear up landing.

All throttle operations should be made with a smooth, not too rapid movement to prevent unnecessary engine wear or damage to the engines, and to allow time for the turbocharger speed to stabilize.

The propeller control levers are used to adjust the propeller speed from high RPM (low pitch) to feather (high pitch).

The mixture control levers are used to adjust the air to fuel ratio. An engine is shut down by the placing of the mixture control lever in the full lean (idle cut-off) position.



COWL FLAP CONTROL
Figure 7-1

The friction adjustment lever on the right side of the control quadrant may be adjusted to increase or decrease the friction holding the throttle, propeller, and mixture controls or to lock the controls in a selected position.

The alternate air controls are located on the control quadrant just below the engine control levers. When an alternate air lever is in the up, or OFF, position the engine is operating on filtered air; when the lever is in the down, or ON, position the engine is operating on unfiltered, heated air. Should the primary air source become blocked, the alternate air control lever must be moved and locked to the down (alternate air ON) position.

The cowl flap control levers (Figure 7-1), located below the control quadrant, are used to regulate cooling air for the engines. The levers have three positions: full open, full closed, and intermediate. A lock incorporated in each control lever locks the cowl flap in the selected position. To operate the cowl flaps, depress the lock and move the lever toward the desired setting. Release the lock after initial movement and continue movement of the lever. The control will stop and lock into place at the next setting. The lock must be depressed for each selection of a new cowl flap setting. The full open position is used for climb and ground operations while the intermediate lever position is used for single engine operation.

7.9 LANDING GEAR

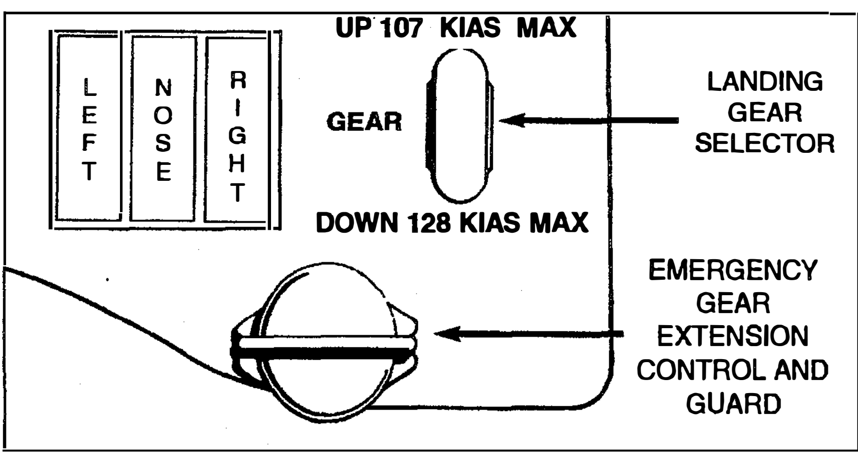
The SENECA V is equipped with hydraulically operated, fully retractable, tricycle landing gear. On takeoff, the gear should be retracted before an airspeed of 107 KIAS is exceeded. The landing gear may be lowered at any speed up to 128 KIAS.

NORMAL OPERATION

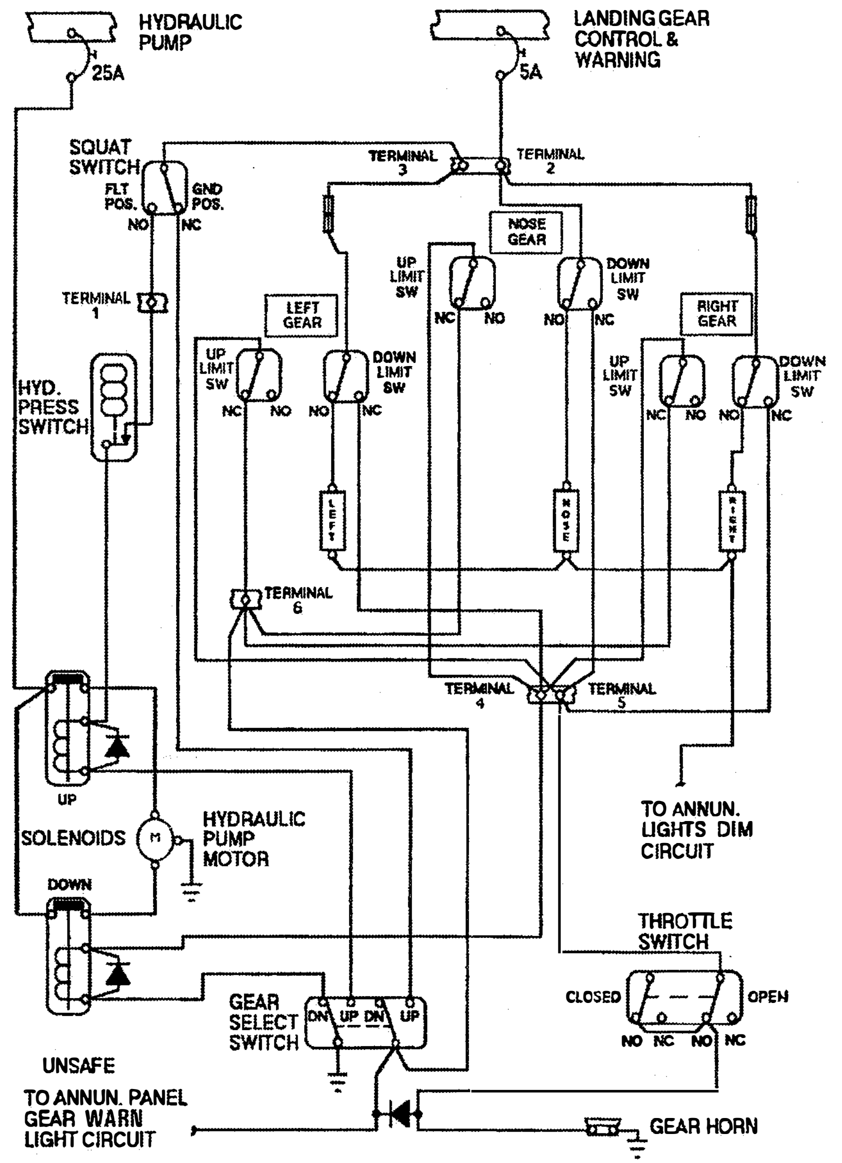
Hydraulic pressure for gear operation is furnished by an electrically powered, reversible hydraulic pump (refer to Figures 7-5 and 7-7). The pump is activated by a two-position gear selector switch located to the left of the control quadrant on the instrument panel (Figure 7-3). The gear selector switch, which has a wheel-shaped knob, must be pulled out before it is moved to the UP or DOWN position. When hydraulic pressure is exerted in one direction, the gear is retracted; when it is exerted in the other direction, the gear is extended. Gear extension or retraction normally takes six to seven seconds but may take up to 15 seconds.

CAUTION

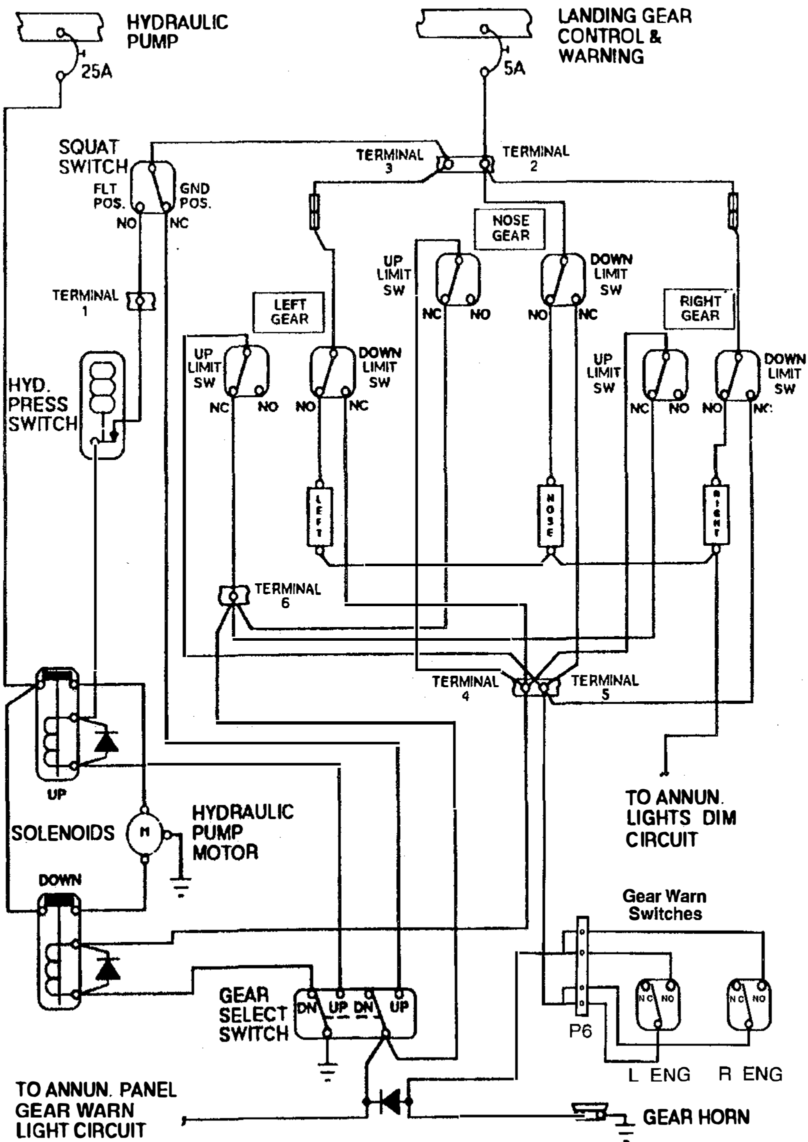
If the landing gear is in transit, and the hydraulic pump is running, it is NOT advisable to move the gear selector switch to the opposite position before the gear has reached its full travel limit, because a sudden reversal may damage the electric pump.



LANDING GEAR SELECTOR
Figure 7-3



LANDING GEAR ELECTRICAL SYSTEM SCHEMATIC
(For aircraft with throttle mounted gear warning horn micro-switches)
Figure 7-5



LANDING GEAR ELECTRICAL SYSTEM SCHEMATIC
(For aircraft with engine mounted gear warning horn MAP switches)
Figure 7-5a

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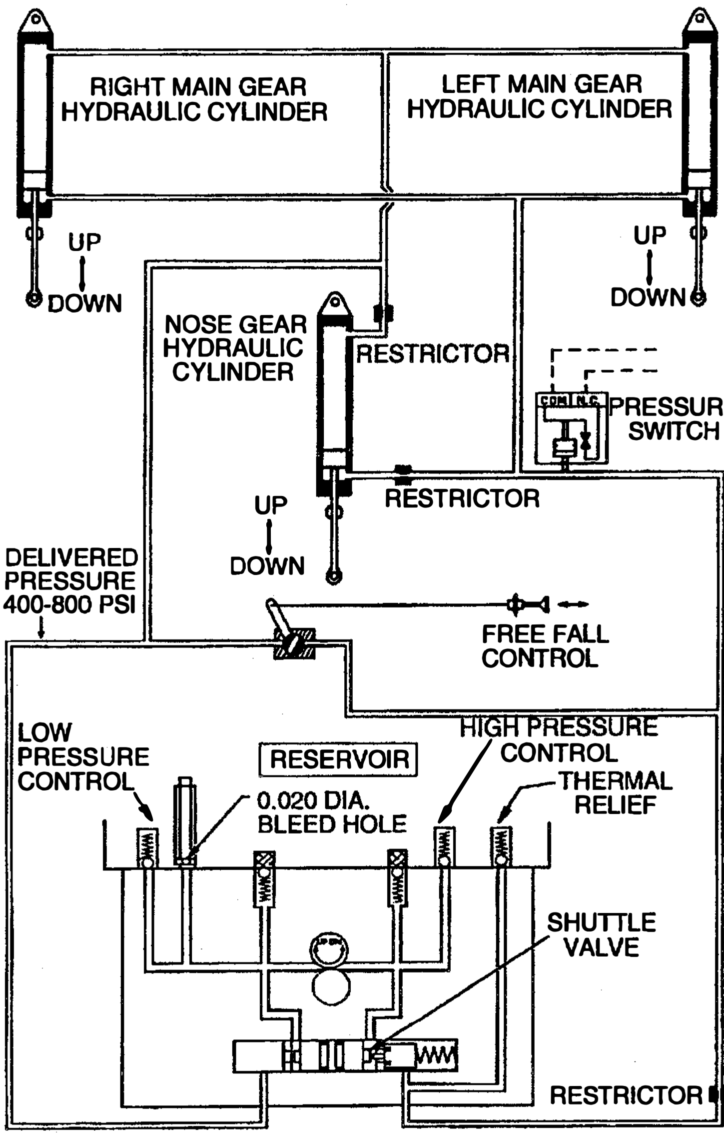
7.9 LANDING GEAR (Cont)



LANDING GEAR HYDRAULIC SYSTEM SCHEMATIC
Figure 7-7

When the gear is fully extended or fully retracted and the gear selector is in the corresponding position, electrical limit switches stop the flow of current to the motor of the hydraulic pump.

When the landing gear is retracted, the main wheels retract inboard into the wings and the nose wheel retracts forward into the nose section. Aerodynamic loads and springs assist in gear extension and in locking the gear in the down position. During gear extension, once the nose has started toward the down position, the airstream pushes against it and assists in moving it to the downlocked position. After the gear is down and the downlock hooks engage, springs maintain force on each hook to keep it locked until it is released by hydraulic pressure.

A convex mirror on the left engine nacelle both serves as a taxiing aid and allows the pilot to visually confirm the condition of the nose gear.

ANNUNCIATOR LIGHTS

If the gear is in neither the full up nor the full down position, a red warning light located in the annunciator cluster illuminates.

The three green lights to the left of the landing gear selector switch illuminate to indicate that each of the three landing gear is down and locked.

The green gear lights are dimmed when the DAY/NIGHT dimmer switch is in the night position. If the green lights are not observed after the landing gear selector switch is placed in the DOWN position, the first thing to check is the proper position of the DAY/NIGHT dimmer switch.

NOTE:

DAY/NIGHT dimmer switch must be in the DAY position to obtain full intensity of the gear position indicator lights during daytime flying. When aircraft is operated at night, the switch should be in the night position to dim the gear lights.

7.9 LANDING GEAR (Cont)

ANNUNCIATOR LIGHTS (Cont)

If one or two of the three green lights do not illuminate when the gear down position has been selected, any of the following conditions could exist for each light that is out:

(a) The gear is not locked down.
(b) A bulb is burned out.
(c) There is a malfunction in the indicating system.

In order to check the bulbs, push the square indicator lights in until a click is heard then gently pull out the light assembly only far enough to expose bulbs, the bulbs can then be interchanged. Replace the light assembly by slowly pushing the assembly in until it clicks.

WARNING HORN

Should the throttle be placed in a low setting - as for a landing approach while the gear is retracted, a warning horn sounds to alert the pilot that the gear is retracted. The gear warning horn emits a 90 cycle per minute beeping sound.

Some aircraft incorporate gear up warning horn micro-switches mounted in the throttle quadrant. Other aircraft incorporate gear up warning manifold pressure switches mounted on each engine. In either configuration, the gear warning horn will activate under the following conditions:

(a) The gear is not locked down and the manifold pressure has fallen below approximately 14 inches on either one or both engines.
(b) The gear selector switch is in the UP position when the airplane is on the ground.

SAFETY SWITCH

To prevent inadvertent gear retraction should the gear selector switch be placed in the UP position when the airplane is on the ground, a squat switch located on the left main gear will prevent the hydraulic pump from actuating if the master switch is turned on. On takeoff, when the landing gear oleo strut drops to its full extension, the safety switch closes to complete the circuit which allows the hydraulic pump to be activated to raise the landing gear when the gear selector is moved to the UP position. During the preflight check, be sure the landing gear selector is in the DOWN position and that the three green gear indicator lights are illuminated.

EMERGENCY EXTENSION

The landing gear is designed to extend even in the event of hydraulic failure. Since the gear is held in the retracted position by hydraulic pressure, should the hydraulic system fail for any reason, gravity will allow the gear to extend. To extend and lock the gears in the event of hydraulic failure, it is necessary only to relieve the hydraulic pressure.

Emergency gear extension must not be attempted at airspeeds in excess of 85 KIAS. An emergency gear extension knob, located beneath the gear selector switch is provided for this purpose. Pulling this knob releases the hydraulic pressure holding the gear in the up position and allows the gear to fall free. During normal operation, this knob is covered by a guard to prevent inadvertent extension of the gear. Before pulling the emergency gear extension knob, place the landing gear selector switch in the DOWN position to prevent the pump from trying to raise the gear.

NOTE

If the emergency gear knob has been pulled out to lower the gear by gravity, due to a gear system malfunction, leave the control in its extended position until the airplane has been put on jacks to check the proper function of the landing gears hydraulic and electrical systems. See PA-34-220T (Seneca V) Maintenance Manual for proper landing gear system check out procedures.

If the airplane is being used for training purposes or a pilot check out mission, and the emergency gear extension has been pulled out, it may be pushed in again when desired if there has not been any apparent malfunction of the landing gear system.

7.9 LANDING GEAR (Cont)

HYDRAULIC RESERVOIR

The hydraulic reservoir for landing gear operation is an integral part of the gear hydraulic pump. Access to the combination pump and reservoir is through a panel in the nose baggage compartment. For filling instructions, see the PA-34-220T (Seneca V) Maintenance Manual.

GROUND OPERATION

The nose gear is steerable through a 27 degree arc either side of center by use of a combination of full rudder pedal travel and brakes. A gear centering spring, incorporated in the nose gear steering system, prevents shimmy tendencies. A bungee assembly reduces ground steering effort and dampens shocks and bumps during taxiing. When the gear is retracted, the nose wheel centers as it enters the wheel well, and the steering linkage disengages to reduce pedal loads in flight. The landing lights, located on the nose gear, turn off automatically when the gear is retracted.

TIRES

All three landing gear carry 6.00 x 6 tires. The nose wheel has a 6-ply tire and the main wheels have 8-ply tires. For information on servicing the tires, see Tire Inflation in Section 8 of this Handbook.

STRUTS

Struts for the landing gear are air-oil assemblies. Strut exposure should be checked during each preflight inspection. If a need for service or adjustment is indicated, refer to the instructions printed on the units. Should more detailed landing gear service information be required, refer to the PA-34-220T (Seneca V) Maintenance Manual.

7.11 BRAKE SYSTEM

NORMAL OPERATION

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 the copilot's rudder pedals. A brake system hydraulic reservoir, independent of the landing gear hydraulic reservoir, is located behind a panel in the rear top of the nose 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.

PARKING BRAKE

The parking brake knob is located on the lower left instrument panel. To set the parking brake, first depress and hold the toe brake pedals and then pull out the parking brake knob. To release the parking brake, first depress and hold the toe brake pedals and then push in on the parking brake knob.

WARNING

No braking will occur if knob is pulled prior to brake application.

7.13 FLIGHT CONTROL SYSTEM

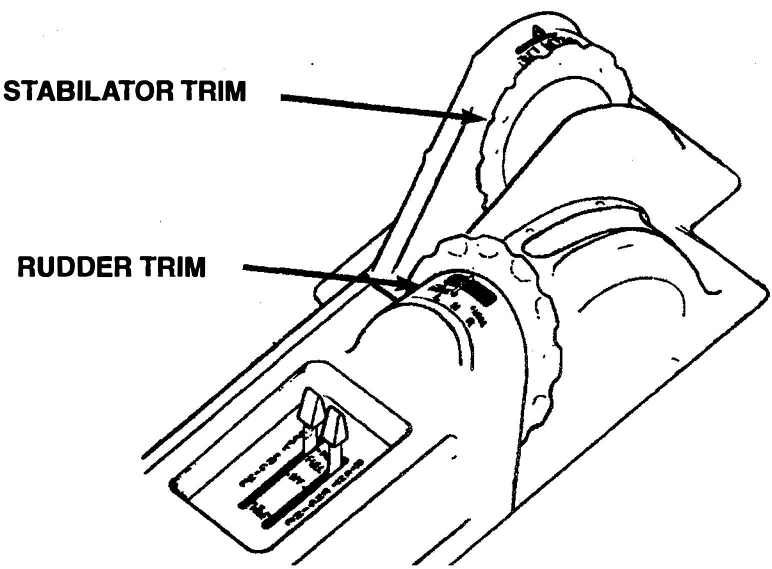
Dual flight controls are installed in the SENECA V as standard equipment. The controls actuate the control surfaces through a cable system.

CONTROL SURFACES

The ailerons are of the Frise type. This design allows the leading edge of the aileron to extend into the airstream to provide increased drag and improved roll control. The differential deflection of the ailerons tends to eliminate adverse yaw in turning maneuvers and to reduce the amount of coordination required in normal turns.

The horizontal tail surface (stabilator) is of the all movable slab type with an anti-servo tab mounted on the trailing edge. This tab, actuated by a control mounted on the console between the front seats, also acts as a longitudinal trim tab (refer to Figure 7-9).

The vertical tail is fitted with a rudder which incorporates a combination rudder trim and servo tab. The rudder trim control is located on the control console between the front seats (refer to Figure 7-9).



TRIM CONTROLS
Figure 7-9

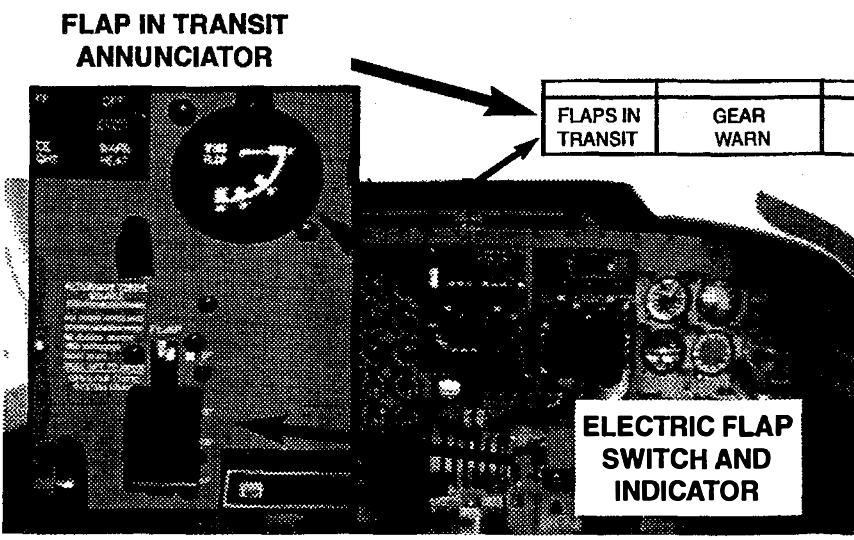
FLAPS

The flaps are electrically operated (refer to Figure 7-11). A control lever is located on the lower right instrument panel. An indicator light is located in the annunciator panel. Selection of a new flap position will activate the flap motor and the light. When the flaps reach the desired position the flap motor is automatically switched off and the indicator light goes out.

In the event of a flap drive malfunction; move the flap lever until the light goes out. The flap position can be determined by the electric flap position indicator located on the instrument panel, just above the flap handle.

There are four stops for the flap control lever, full up (0° flap), 1st notch (10° flap), 2nd notch (25° flap), and full down (40° flap).

A past center lock incorporated in the actuating linkage hold the flap when it is in the retracted position so that it may be used as a step on the right side. Since the flap will not support a step load except in the fully retracted position, the flaps should be retracted when people are entering or leaving the airplane.



ELECTRIC FLAP SYSTEM
Figure 7-11

7.15 FUEL SYSTEM

FUEL TANKS

Fuel is stored in fuel tanks located in each wing. The tanks in each wing are interconnected to function as a single tank (refer to Figure 7-13). All tanks on each side are filled through a single filler in the outboard tank, and as fuel is consumed from the inboard tank, it is replenished by fuel from outboard.

Only three gallons of fuel in each wing is unusable, giving the SENECA V a total 122 usable gallons. The minimum fuel grade is 100 or 100LL Aviation Grade.

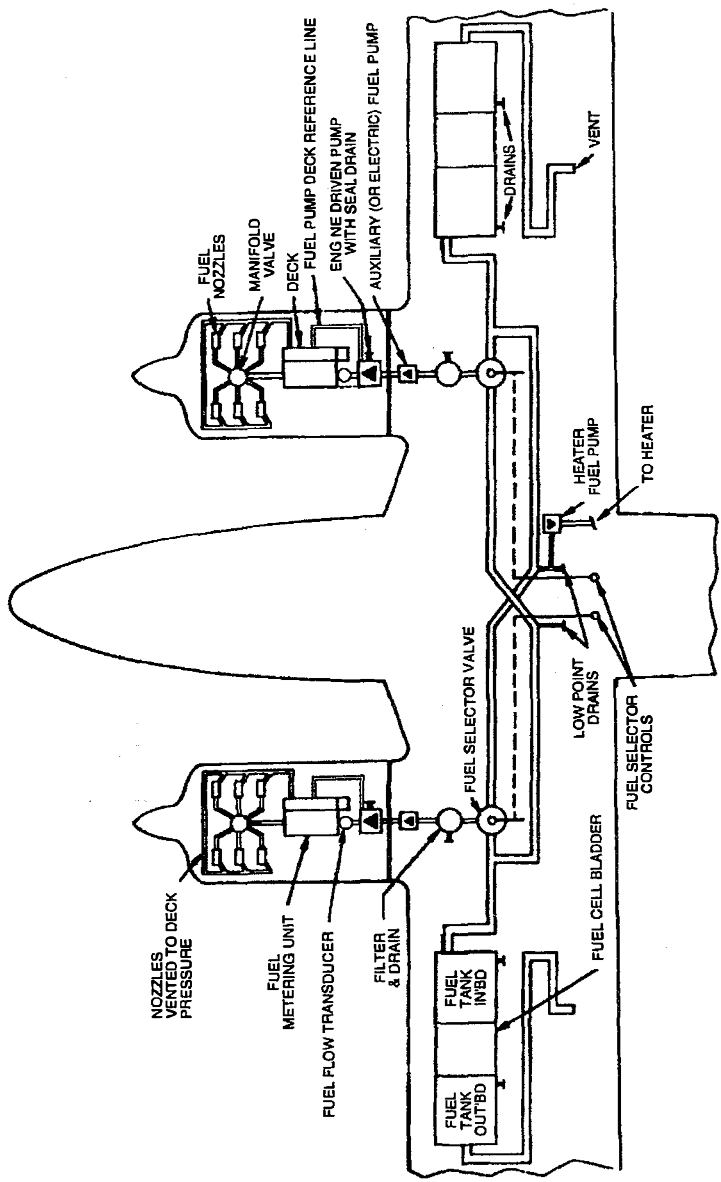
The fuel tank vents, one installed under each wing, feature an anti-icing design to prevent ice formation from blocking the fuel tank vent lines.

FUEL INJECTION SYSTEM

Each engine has an engine-driven fuel pump that is a part of the fuel injection system. An standby fuel system is provided. The purpose of the electrically-powered standby fuel system is to supply fuel to the engine in case of engine-driven fuel pump shaft failure or malfunction, for ground and inflight engine starting, and for vapor suppression.

The two standby fuel pump switches are located in the overhead switch panel and are two-position rocker switches: ON and OFF.

In case of a failed engine-driven fuel pump, the emergency standby fuel pump should be engaged by selecting the appropriate switch on the overhead switch panel labeled FUEL PUMP.



FUEL SYSTEM SCHEMATIC
Figure 7-13

FUEL DRAINS

Before each flight, fuel must be drained from low points in the fuel system to ensure that any accumulation of moisture or sediment is removed from the system and to check for proper fuel. Fuel drains are provided for each fuel filter (2), each fuel tank (4), and each crossfeed line (2).

The fuel filter drains are located on the outboard underside of each engine nacelle; two fuel tank drains are located on the underside of each wing; fuel crossfeed drains are located at the lowest point in the fuel system, on the underside of the fuselage, just inboard of the trailing edge of the right wing flap.

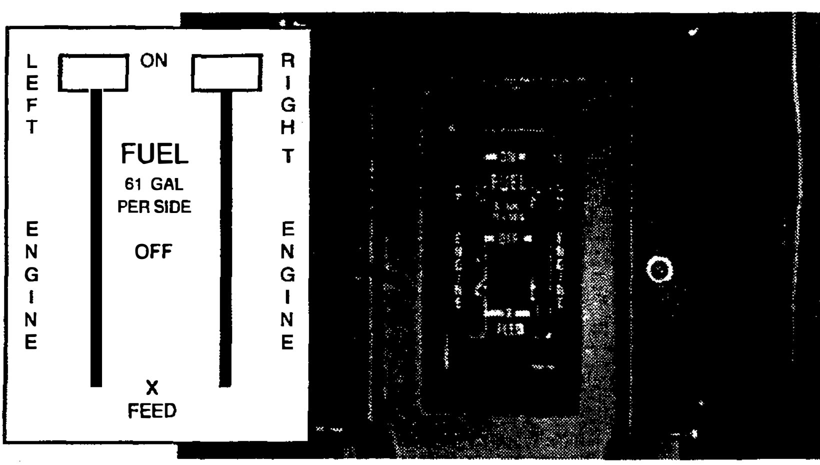
7.15 FUEL SYSTEM (Cont)

FUEL CONTROLS

Fuel management controls are located on the console between the front seats. There is a control lever for each of the engines, and each is placarded ON - OFF - X FEED. During normal operation, the levers are in the ON position, and each engine draws fuel from the tanks on the same side as the engine. The two fuel systems are interconnected by crossfeed lines. When the X FEED position is selected, the engine will draw fuel from the tanks on the opposite side in order to extend range and keep fuel weight balanced during single-engine operation. During the crossfeed operation, a crossfeed annunciator will illuminate to inform the pilot that crossfeed is selected. The OFF position shuts off the fuel flow to that engine.

NOTE

When one engine is inoperative and the fuel selector for the operating engine is on X FEED, the selector for the inoperative engine must be in the OFF position. Do not operate with both selectors on X FEED. Do not take off with a selector on X FEED.



FUEL CONTROLS
Figure 7-15

7.17 ELECTRICAL SYSTEM

The electrical system of the SENECA V is capable of supplying sufficient current for complete night IFR equipment.

ALTERNATORS

Primary electrical power is supplied by two 28 volt, 85 ampere alternators (Figure 7-17), one mounted on each engine.

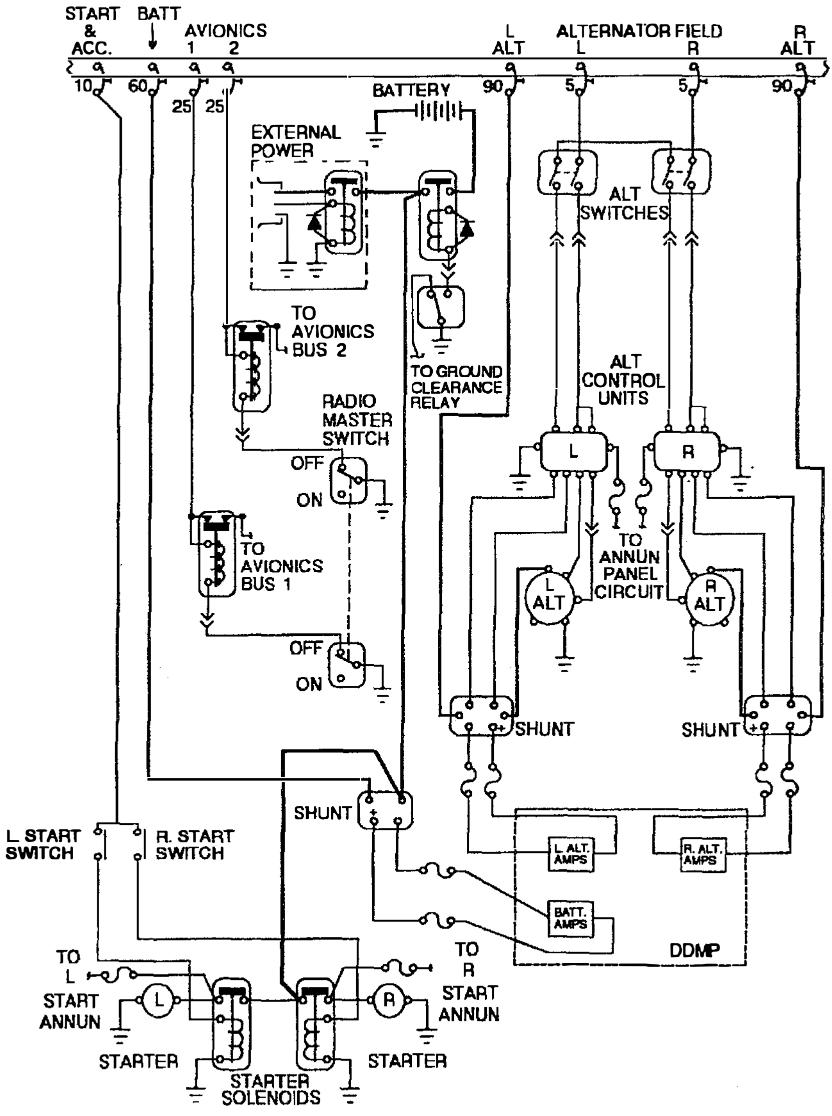
BATTERY

A 19 ampere-hour, 24 volt battery provides current for starting, for use of electrical equipment when the engines are not running, and for a source of stored electrical power to back up the alternator output. The battery, which is located in the aft fuselage section and is accessible through an access panel in the rear baggage compartment, is normally kept charged by the alternators. If it becomes necessary to charge the battery, it should be removed from the airplane.

ALTERNATOR CONTROL UNITS

Two solid state alternator control units maintain effective load sharing while regulating electrical system bus voltage to 28 volts. The alternator control unit in each alternator circuit prevents damage to electrical and avionics equipment by taking an alternator off the line if its output exceeds 32 volts. If this should occur, the alternator light on the annunciator panel will illuminate. Alternator control units are located on a shelf in the right hand nose section.

7.17 ELECTRICAL SYSTEM (Cont)



ALTERNATOR AND STARTER SCHEMATIC
Figure 7-17

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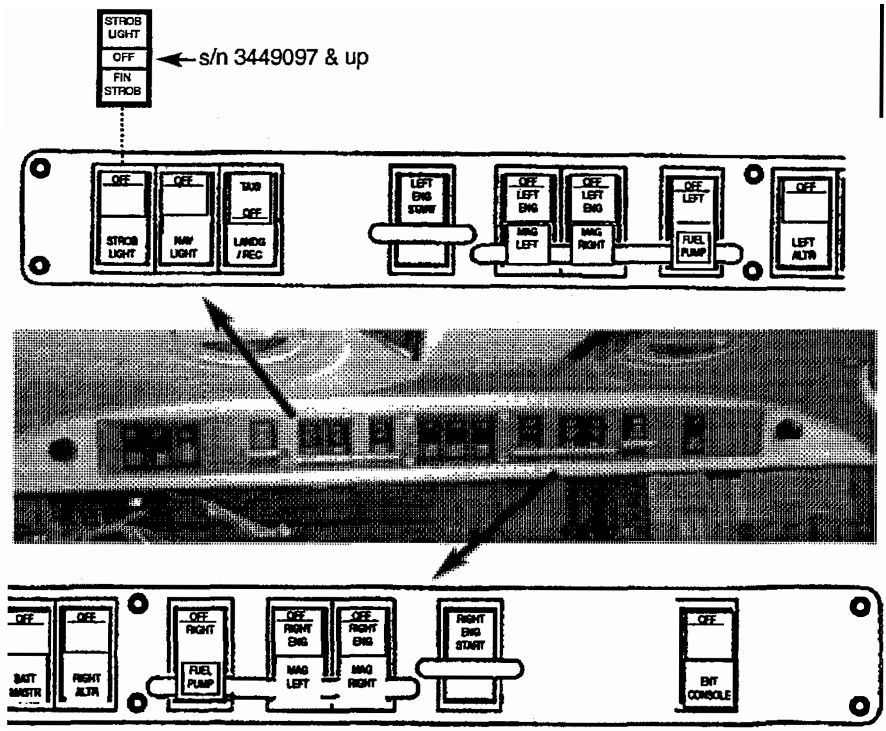
SWITCHES

All powerplant and exterior light switches are grouped in an overhead switch panel. Switches dedicated for avionics and anti/de-ice, are conveniently located below the avionics stacks. (Figure 7-19)

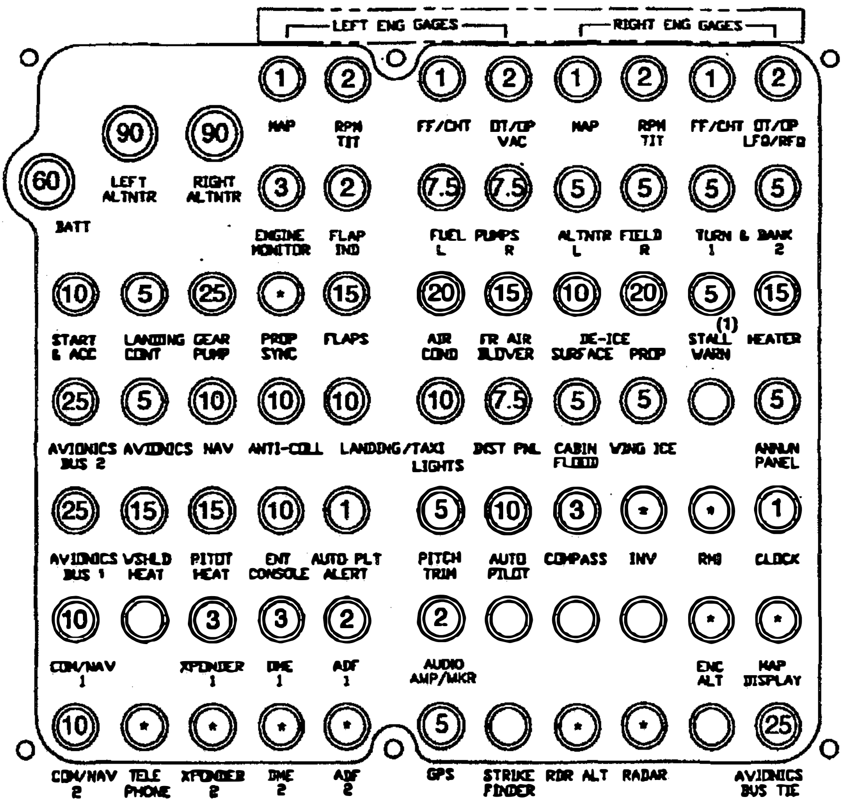


SWITCH PANEL
Figure 7-19

7.17 ELECTRICAL SYSTEM (Cont)

CIRCUIT BREAKERS

The electrical system and equipment are protected by circuit breakers located on a circuit breaker panel on the lower right side of the instrument panel. In the event of equipment malfunctions or a sudden surge of current, a circuit breaker can trip automatically. The pilot can reset the breaker by pressing it in (preferably after a few minutes cooling period). The circuit breakers can be pulled out manually. Optional ice protection and airconditioner C/B's shown. (* Other optional equipment C/B locations.)

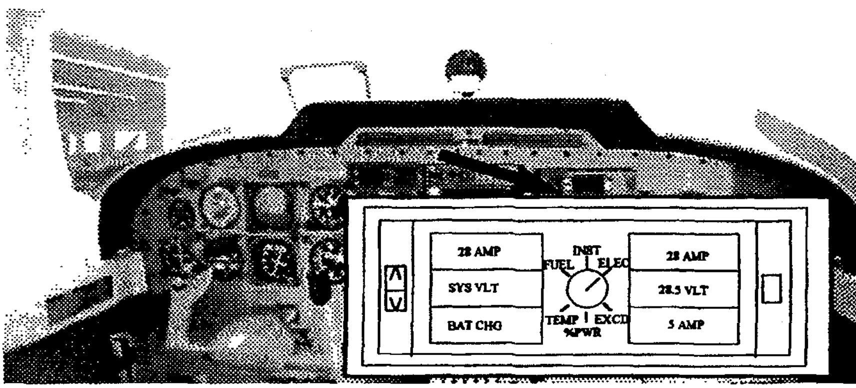


TYPICAL CIRCUIT BREAKER PANEL

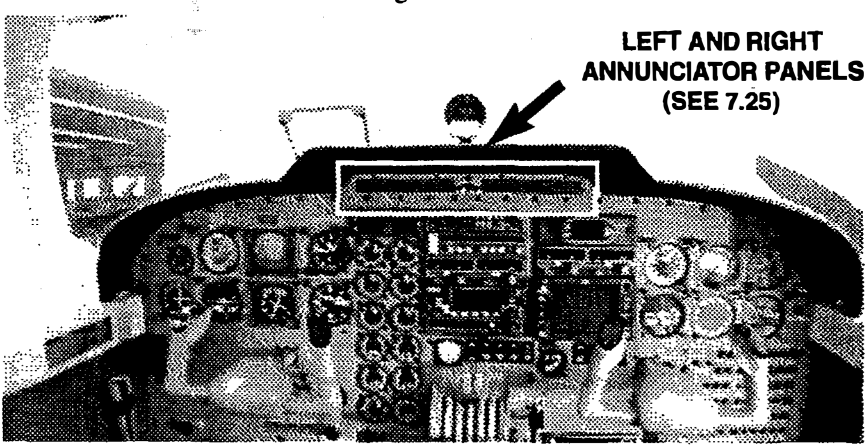
Figure 7-21

7.17 ELECTRICAL SYSTEM (Cont)

The two electrical system annunciator lights L ALT INOP and R ALT INOP (Figure 7-25) are located in the annunciator clusters. When either alternator fails, or is selected OFF, the appropriate red ALT INOP annunciator light will illuminate. A low voltage monitor will illuminate the red annunciator light LOW BUS VOLTAGE when the bus voltage drops below 25 ±.3 volts (See figures below). A fuse provides overload protection for the voltage monitor.



VOLTMETER / AMMETER (DDMP)
Figure 7-23



ANNUNCIATORS
Figure 7-25

7.17 ELECTRICAL SYSTEM (Cont)

In the event that either alternator inop. annunciator should illuminate, the status of the alternator can be verified by selecting the electrical mode of the Digital Display Monitoring Panel (DDMP).

Should an overvoltage condition occur in either alternator, its alternator control unit will shut off the voltage to that alternator. Output from from either alternator can be shut off manually by turning that alternators switch off.

Approximately 2500 RPM or more is required to obtain full alternator output of 85 amperes. It is normal to have low output at idle RPM. This is due to the reduced drive ratio from the engine.

Should either alternator ammeter indicate a load much higher than the known consumption of the electrical equipment in use, an alternator malfunction should be suspected and the respective alternator switch turned off. In this event, the remaining alternator should show a normal indication on the ammeter after approximately one minute.

If both alternators indicate a load much higher than the known consumption for more than approximately five minutes, an electrical defect other than the alternator system should be suspected because a discharged battery will reduce the alternator load as it approaches the charged conditions.

A zero ammeter reading indicates an alternator is not producing current and should be accompanied by illumination of the ALT annunciator light. A single alternator is capable of supporting a continued flight in case of alternator or engine failure in most conditions: however, with deicing equipment and other high loads, care must be exercised to prevent the loads from exceeding the 85 ampere rating and subsequent depletion of the battery.

For abnormal and/or emergency operations and procedures, refer to Section 3 in this Handbook.

7.17 ELECTRICAL SYSTEM (Cont)

LIGHTS

Interior lighting consists of instrument panel post lights, overhead lights and internally lighted avionics and switches. Radio, panel and switch lights are controlled by the rheostat switches located below the pilots control column.

Two floodlights, mounted in the overhead panel, provide additional instrument and cockpit lighting for night flying. Each light is controlled by a rheostat switch located in the overhead switch panel. A map light window in the lens is actuated by an adjacent switch.

Exterior lighting systems include nose-mounted taxi lights, nose-mounted and wing tip landing lights, navigation lights and strobe/anti-collision lights.

WARNING

Anti-collision lights should not be operating when flying through cloud, fog or haze, since the reflected light can produce spatial disorientation. Strobe lights should not be used in close proximity to the ground, such as during taxiing, takeoff or landing. Fin strobe (if installed) may be used on ground.

An optional cabin courtesy light system consists of a front entrance light over the forward cabin door (switch located next to light) and rear entrance light (switch located on cabin side panel), which replaces the reading light over the aft cabin door. These lights are operated individually with switches that are incorporated as part of each light assembly. The courtesy light circuit is independent of the aircraft battery switch; therefore, the lights can be operated regardless of the position of the battery switch. Unless the engines are running, the courtesy lights should not be left on for extended time periods, as battery depletion could result.

EXTERNAL POWER RECEPTACLE

An external power receptacle starting installation is located on the left rear fuselage. A cable from an external power source can be connected to the receptacle, thus allowing the operator to crank the engine without having to gain access to the airplane's battery.

CAUTION

External power is supplied directly to the electrical bus. Turn off all electrical equipment before applying or removing external power.

Turn the battery master and alternator switches and all electrical equipment OFF. Insert the external power source plug into the external power receptacle. This completes a circuit which permits current to flow from the external power source directly to the starter contactors and the electrical bus. 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 the external power, refer to ENGINE START CHECKLISTS - Section 4.

7.19 VACUUM SYSTEM

The vacuum system operates the air driven gyro instruments. The vacuum system (Figure 7-27) consists of a vacuum pump on each engine, plus plumbing and regulating equipment.

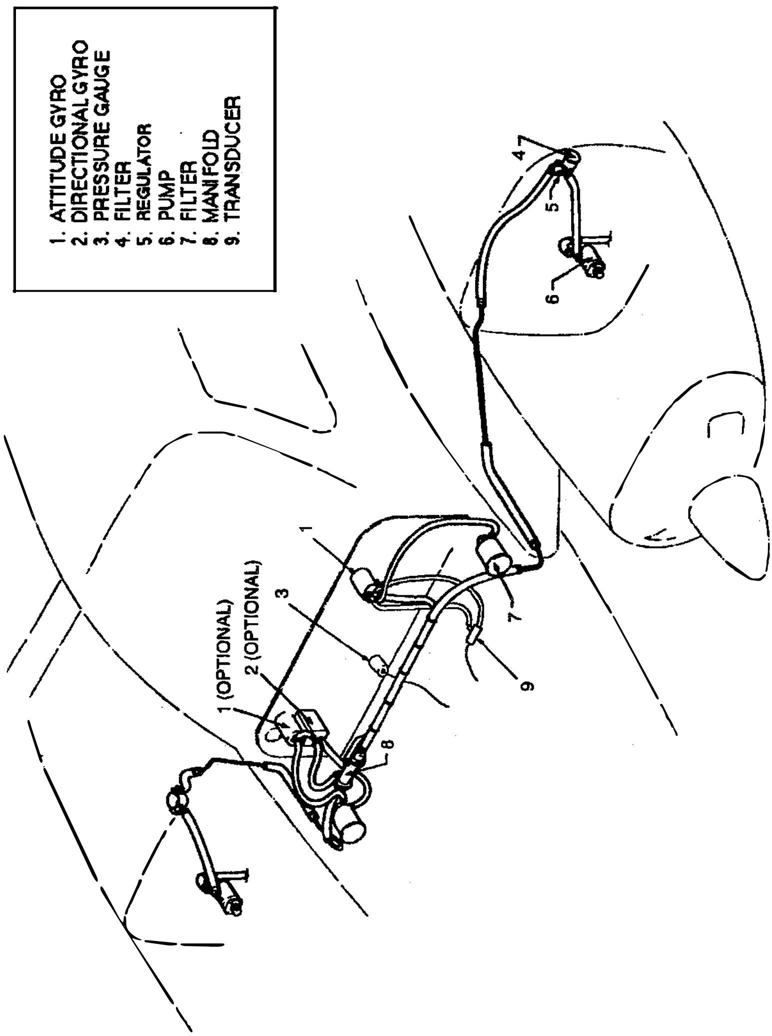
The vacuum pumps are dry type pumps, which eliminates the need for an air oil separator and its plumbing. A shear drive protects the engine from damage. If the drive shears the gyros will become inoperative.

The vacuum gauge, mounted on the bottom left of the instrument gauges (refer to Figure 7-35), provides valuable information to the pilot about the operation of the vacuum system.

A decrease in pressure in a system that has remained constant over an extended period, may indicate a dirty filter, dirty screens, possibly a sticking vacuum regulator or leak in system. Two amber VACUUM INOP indicator lights are provided in the annunciator panel (one for the left engine and one for the right engine) and will illuminate should the system vacuum fall below a specified pressure.

Zero pressure would indicate a sheared pump drive, defective pump, possibly a defective gauge or collapsed line. In the event of any gauge variation from the norm, the pilot should have a mechanic check the system to prevent possible damage to the system components or eventual failure of the system.

A vacuum regulator is provided in the system to protect the gyros. The valve is set so the normal vacuum reads within the normal operating range, a setting which provides sufficient vacuum to operate all the gyros at their rated RPM. Higher settings will damage the gyros and with a low setting the gyros will be unreliable. The regulator is located on the aft side of each engine firewall.



VACUUM SYSTEM
Figure 7-27

7.21 PITOT STATIC SYSTEM

Pitot pressure for the airspeed indicator is picked up by the pitot head installed on the bottom of the left wing and carried through lines within the wing and fuselage to the gauge on the instrument panel (refer to Figure 7-29). Static pressure for the altimeter, vertical speed and airspeed indicators is sensed by two static source pads, one on each side of the rear fuselage forward of the stabilator. They connect to a single line leading to the instruments. The dual pickups balance out differences in static pressure caused by side slips or skids.

An alternate static source control valve is located below the instrument panel to the right of the control quadrant. When the valve is set to the alternate position, the altimeter, vertical speed indicator and airspeed indicator will be using cabin air for static pressure. During alternate static source operation, these instruments may give slightly different readings, depending on conditions within the cabin. Airspeed, setting of heating and ventilating controls, or the position of the storm window can influence cabin air pressure. The pilot can determine the effects of the alternate static source on instrument readings by switching from standard to alternate sources at different airspeeds and heating and ventilating configurations (including open storm window below 129 KIAS).

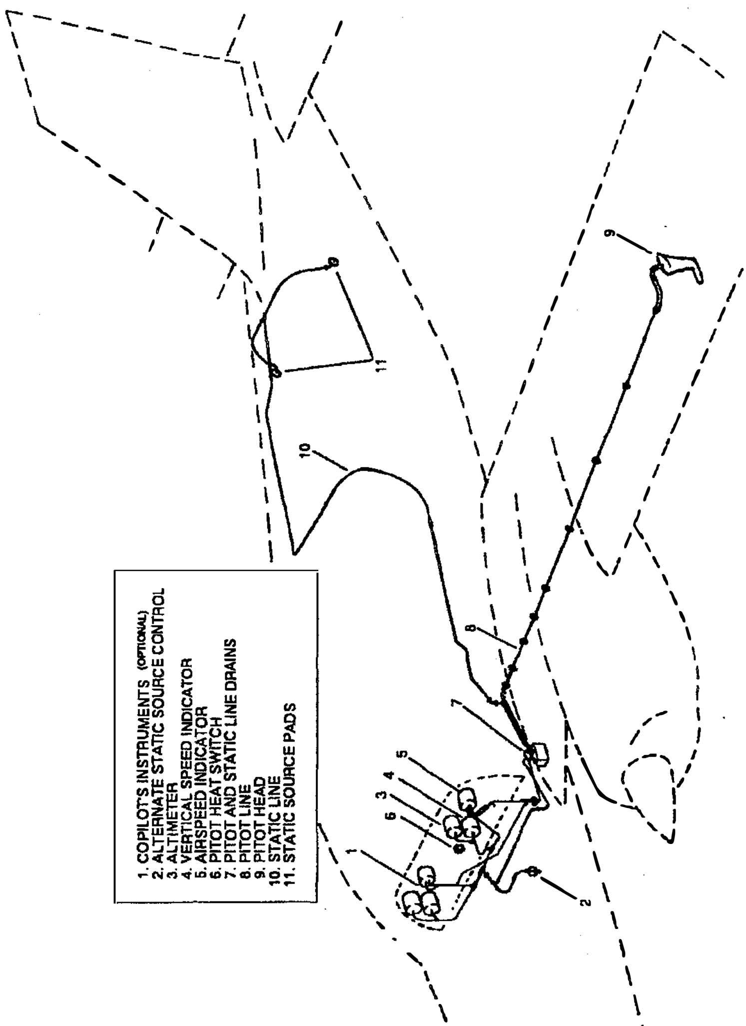
The holes in the sensors for pitot and static pressure must be fully open and free from blockage. Partially or completely blocked sensor holes will give erratic or zero readings on the instruments. To prevent bugs and water from entering the pitot holes when the airplane is parked, a cover should be placed over the pitot head.

NOTE

During preflight, check to make sure the pitot cover is removed.

A heated pitot head, which alleviates problems with icing and heavy rain, is installed as standard equipment. The switch for pitot heat is located below the left avionics stack. The pitot heat system has a separate circuit breaker located in the circuit breaker panel and labeled PITOT HEAT. A visual alert is provided for off or inoperative conditions by an annunciator labeled PITOT HEAT OFF/INOP located in the right annunciator panel. 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.

If one or more of the pitot static instruments malfunction, the system should be checked for dirt, leaks, or moisture. The pitot and static lines may be drained through separate drains located on the side panel to the left of the pilot's seat.



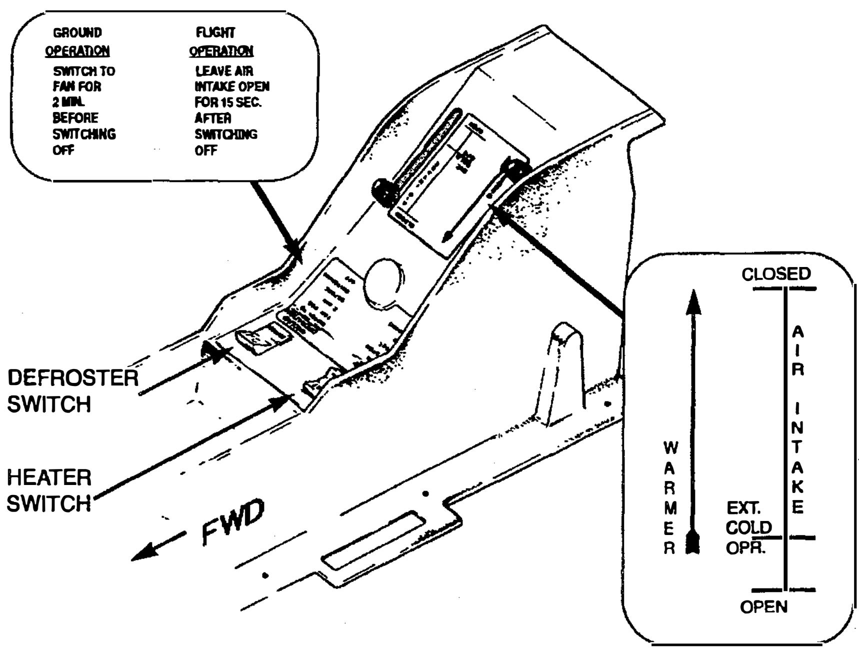
PITOT STATIC SYSTEM
Figure 7-29

7.23 HEATING, VENTILATING AND DEFROSTING SYSTEM

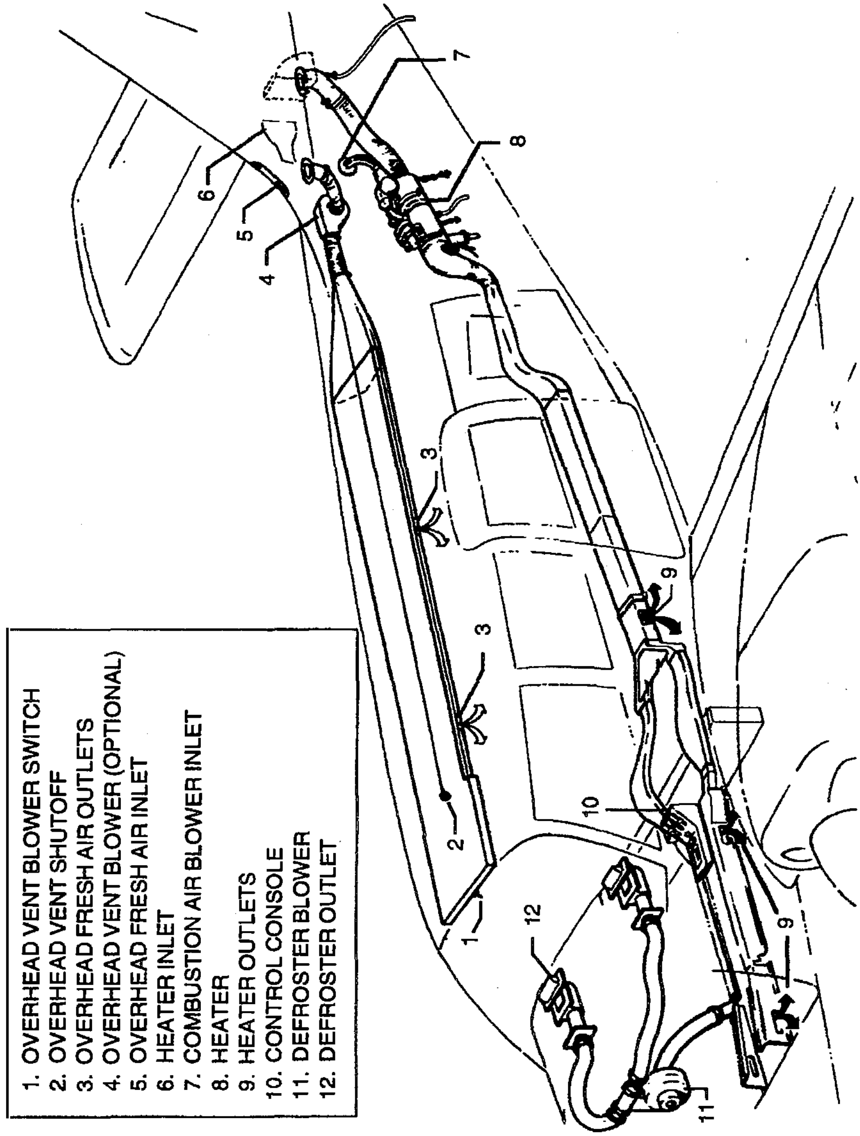
HEAT AND DEFROST SYSTEM

Heated air for cabin heat and windshield defrosting is provided by a combustion heater located in the aft fuselage behind the cabin baggage compartment close-out panel (refer to Figure 7-33). Air from the heater is ducted forward along the cabin floor to outlets at each seat and to the windshield area.

Operation of the combustion heater is controlled by a three-position switch located to the left on the control console (Figure 7-31) between the front seats and labeled FAN, OFF and HEAT. Airflow and temperature are regulated by the two levers on the console. The right-hand lever regulates AIR INTAKE and the left-hand lever regulates cabin temperature. Cabin comfort can be maintained as desired through various combinations of lever positions. Passengers have secondary control over heat output by individually adjustable outlets at each seat location.



HEAT, VENTILATION & DEFROST CONTROL CONSOLE
Figure 7-31



CABIN HEATING, VENTILATING AND DEFROSTING SYSTEM
Figure 7-33

For cabin heat, the AIR INTAKE lever on the heater control console must be partially or fully open and the three-position switch set to the HEAT position. This simultaneously starts fuel flow and ignites the heater; and, during ground operation, it also activates the ventilation blower which is an integral part of the combustion heater.

With instant starting and no need for priming, heat should be felt within a few seconds. When cabin air reaches the temperature selected on the cabin temperature lever, ignition of the heater cycles automatically to maintain the selected temperature.

The combustion heater uses fuel from the airplane fuel system. An electric fuel pump draws fuel from the right tank at a rate of approximately one-half gallon per hour. Fuel used for heater operation should be considered when planning for a flight.

To introduce fresh, unheated air into the cabin during flight, the air intake should be open and the heater OFF. Ram air enters the system and can be individually regulated at each cabin floor outlet.

When heat is not desired during ground operation, place the three-position switch in the FAN position and the ventilation blower sends fresh air through the heater ductwork for cabin ventilation and windshield defogging. When the heater controls are used either for cabin heat or for ventilation, air is automatically ducted to the windshield area for defrosting.

The flow of defroster air to the windshield area can be increased by the activation of a defroster fan. The fan is controlled by a two-position defroster switch located on the control console between the front seats and labeled DEFROST - ON - OFF.

Safety Switches

Two safety switches activated by the intake valve and located aft of the heater unit prevent both fan and heater operation when the air intake lever is in the closed position. A micro switch, which actuates when the landing gear is retracted, turns off the ventilation blower so that in flight the cabin air is circulated by ram air pressure only.

7.23 HEATING, VENTILATING AND DEFROSTING SYSTEM (Cont)

Overheat Switch and Annunciator

An overheat switch located in the heater unit acts as a safety device to render the heater inoperative if a malfunction should occur. Should the switch deactivate the heater, the red HEATER OVERHEAT light on the annunciator panel will illuminate. The overheat switch is located on the forward outboard end of the heater vent jacket. The red reset button on the heater shroud can be reached through the bulkhead access panel in the aft cabin close-out panel.

To prevent activation of the overheat switch upon normal heater shutdown during ground operation, turn the three-position switch to FAN for two minutes with the air intake lever in the open position before turning the switch to OFF. During flight, leave the air intake lever open for a minimum of fifteen seconds after turning the switch to OFF.

OVERHEAD VENTILATION

Overhead outlets also supply fresh air for cabin ventilation. The occupant of each seat can manually adjust a louvered outlet in the ceiling to regulate the flow of fresh air to that seat area. Pulling the CABIN AIR control, located in the ceiling behind the speaker, stops the flow of air through the ceiling outlets.

A fresh air blower is installed in the overhead ventilation system to provide additional fresh air flow during ground operation. The switch, labeled LOW - OFF - HI, is in the right instrument panel next to the c/b panel. (See item 10 Fig. 7-35.)

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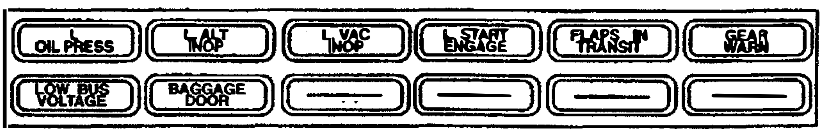
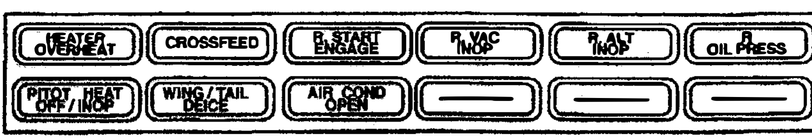
7.25 INSTRUMENT PANEL

The instrument panel (Figure 7-35) is designed to accommodate the customary advanced flight instruments and the normally required power plant instruments. The pilots artificial horizon is vacuum operated while the directional gyro (HSI) and turn and bank are electrically operated. The vacuum gauge is located on the bottom left of the instrument stack and is marked with a green arc from 4.8 to 5.2 in.Hg. to indicate the system is supplying adequate vacuum to the various instruments. The turn coordinator, located to the left of the directional gyro, is electrically operated.

Two annunciator panels are located above the engine gauges and avionics. Each panel arrangement contains twelve annuncaitors, six across and two high. The annunciator panels incorporate a press-to-test feature and a day/night switch located between the two clusters. The annunciator provides a visual warning of possible malfunctions including failure alert and pre-cautionary warnings.



Left Annunciator Cluster



Right Annunciator Cluster

While the illumination of some of these lights in flight is an indication of a possible system malfunction, illumination of others is just an indication of a system condition. The pilot should closely monitor instrument panel gauges to check the condition of a system whose corresponding light on the annunciator panel illuminates.

During preflight the operational status of the annunciator panel should be tested by use of the press-to-test button. When the button is depressed all annunciator panel lights should illuminate.

NOTE

When an engine is feathered, the alternator, gyro vacuum and engine oil pressure annunciator lights will remain illuminated.

The engine gauges are 2 in. round instruments located vertically in two columns under the left annunciator panel (see Fig. 7-35 for exact location). Included are manifold pressure, tachometer (RPM), turbine inlet temperature (TIT), fuel flow, cylinder head temperature, oil pressure and oil temperature. The normal operating range for ground and flight operation is indicated on the instruments by a green arc. Yellow arcs indicate a caution range while red lines dictate minimum or maximum limits.

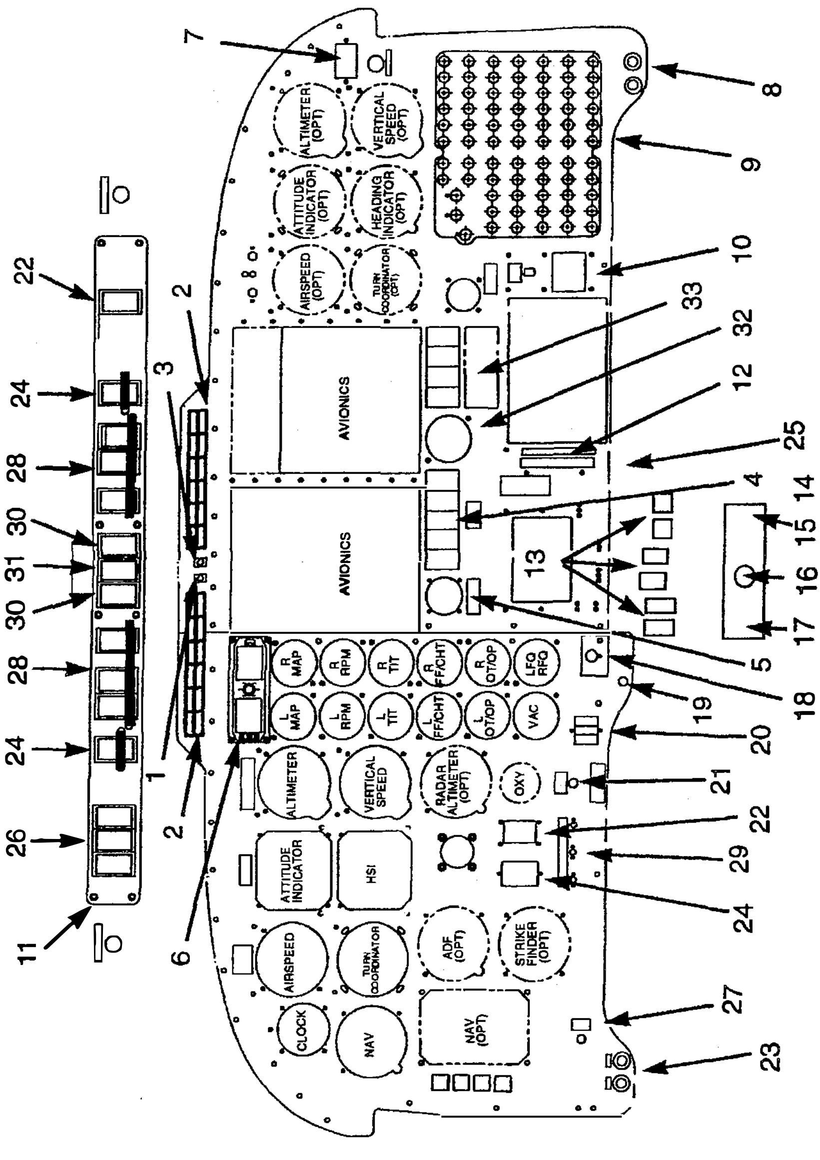
Engine and electrical switches are located in a single row switch cluster in an overhead switch panel. The row of switches include the battery master, left and right alternator, standby fuel pumps, left and right magnetos, left and right starter and entertainment console. Nav., strobe, recognition and landing/taxi light switches are located to the far left in the overhead switch panel. Anti/de-ice switches are located below the left avionics stack. A 2 inch round flap indicator is located above and slightly to the right of the flap selector. The parking brake handle (park brake - pull) is located below and to the far left instrument panel. Jacks for the pilots microphone and headset are below and to the left of the parking brake handle.

Instrument panel lighting is provided by post lights, overhead panel lights and internally lighted engine gauges, avionics and switches. Optimum cockpit lighting for night flying is achieved by using a combination of the panel lights and the overhead flood lights. The panel lights are adjusted by three rheostats labeled switch lights, panel lights and avionics located below the pilots control column. The overhead lights are adjusted by rheostats adjacent the overhead switch panel. A white map light can be selected from either overhead flood light.

7.25 INSTRUMENT PANEL (Continued)

TYPICAL INSTRUMENT PANEL

1. DAY/NIGHT DIMMER SWITCH
2. ANNUNCIATOR PANEL
3. ANNUNCIATOR PANEL PRESS TO TEST SWITCH
4 ICE PROTECTION CONTROLS (SWITCHES LEFT TO RIGHT) SURFACE DEICE, PROP HEAT, WINDSHIELD HEAT, ICE LIGHT, AND PITOT/STALL WARN HEAT
5. AMMETER (DEICE SYSTEM)
6. DIGITAL DISPLAY MONITORING PANEL
7. HOUR METER
8. COPILOT'S MIKE & PHONE JACKS
9. CIRCUIT BREAKER PANEL
10. AIR CONDITIONING SYSTEM SWITCHES (OPT)
11. OVERHEAD SWITCH PANEL
12. WING FLAP SELECTOR
13. CONTROL LEVERS (FROM LEFT TO RIGHT)
    L & R THROTTLE
    L & R PROPELLER
    L & R MIXTURE
14. CONTROL FRICTION LOCK (ON RIGHT SIDE OF QUADRANT)
15. ALTERNATE AIR CONTROL LEVER - RIGHT
16. PROPELLER SYNCROPHASER
17. ALTERNATE AIR CONTROL LEVER - LEFT
18. LANDING GEAR SELECTOR
19. EMERGENCY GEAR EXTENSION KNOB & GUARD
20. GEAR DOWN ANNUNCIATOR LIGHTS
21. OXYGEN CONTROL
22. ELT SWITCH PANEL
23. PILOT'S MIKE & PHONE JACKS
24. KA 51 COMPASS SLAVING SWITCH PANEL
25. ALTERNATE STATIC SOURCE (BEHIND PANEL)
26. EXTERNAL LIGHTING SWITCHES
27. PARKING BRAKE HANDLE
28. ENGINE SYSTEMS SWITCHES
29. DIMMER CONTROLS
30. ALTERNATOR SWITCHES
31. BATTERY MASTER SWITCH
32 WING FLAP INDICATOR
33. AVIONICS SWITCHES



TYPICAL INSTRUMENT PANEL

Figure 7-35 (cont)

7.25 INSTRUMENT PANEL (Continued)

Radios are mounted in two stacks above and to the right of the control quadrant in the upper instrument panel. Radios are also located on the lower left of the co-pilots panel. A radio master (radio mstr) switch is located below the right avionics stack. It controls the power to all radios through the radio master contactor. The radio master switch has an on and off position. When the battery master (batt mstr) switch is turned on, power is supplied to the radio master switch relay, opening the contactors and preventing current flow to the radios. When the radio master (radio mstr) switch is turned on, power is removed from the radio master switch relay, allowing the contactor to spring closed and permitting current flow to the radios.

Ground clearance energy saver system provides direct power to comm#1 with the battery master switch in the off position. An internally lit switch, located below the right avionics stack provides annunciation for engagement of the system. When the switch is engaged direct aircraft battery power is applied to comm #1, audio amplifier and radio accessories. Ground clearance must be turned off or deplection of battery could result. To turn off the ground clearance, turn the battery master switch on momentarily, then off.

NOTE:

The battery master switch must be in the off position for ground clearance system to operate.

The control quadrant - throttles, propeller and mixture controls is in the center of the lower instrument panel. To the left of the control quadrant is the landing gear selector and the emergency landing gear extender knob. To the right of the control quadrant is the control friction lock and the four position, electric flap control.

The optional copilot's flight instruments are on the upper right instrument panel. The circuit breaker panel located in the lower right instrument panel contains breakers for the BATTERY, two ALTERNATORS, the main bus and two avionics busses (AVI BUS #1 & #2).

Jacks for the copilot's microphone and headset are to the right and below the circuit breaker panel.

7.25a FLIGHTLINE ENGINE INSTRUMENT/ENGINE MONITORING SYSTEM

The Flightline Engine Instrument/Engine Monitoring System is a microprocessor based instrument with analog and digital format displays of engine related instruments. The Engine Instrument/Engine Monitoring System can be divided into two parts: 1) the Digital Display Monitoring Panel (DDMP) and 2) the single/dual analog instrument displays (see Figure 1).

The DDMP is a microprocessor which monitors/records engine parameter exceedences and provides the interface between a GPS receiver and engine parameter sensors for digital display of the analog instruments, engine power, and fuel management. The DDMP displays its information on 6 eight character displays which are controlled via an Up/Dwn button, a Select button, and a rotary mode selection knob.

The rotary mode selection knob allows the user to cycle through the 6 top level operations:

1. FUEL - Fuel management
2. INST - Engine instrument display
3. ELEC - Electrical parameter display
4. EXCD - Exceedence record display
5. %PWR - Engine per cent power display/determination
6. TEMP - Temperature display

7.25a FLIGHTLINE ENGINE INSTRUMENT/ENGINE MONITORING SYSTEM (CONT'D)

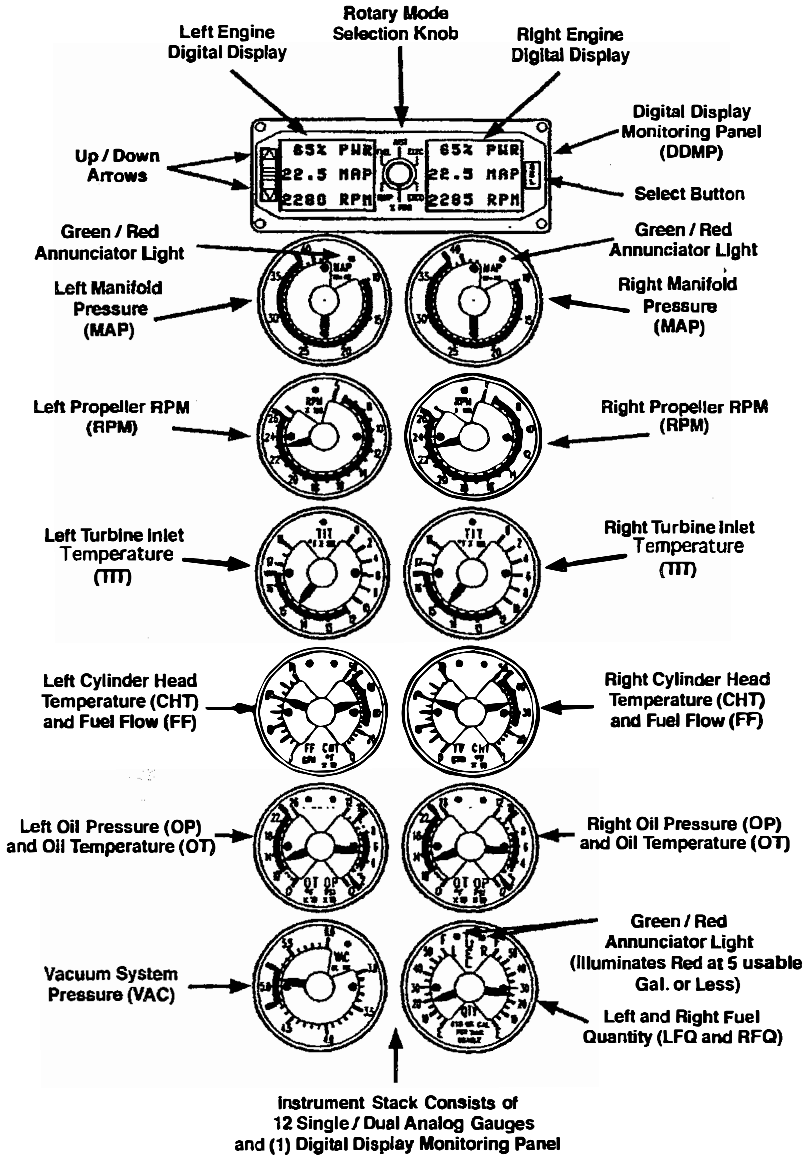
Below the DDMP are two vertical stacks of analog instruments which display (going top to bottom/left to right), manifold pressure (MAP), Propeller RPM (RPM), turbine inlet temperature (TIT), fuel flow (FF), cylinder head temperature (CHT), oil temperature (OT), oil pressure (OP), vacuum system pressure (VAC), and left/right fuel quantity (QTY). Each left/right analog indicator displays its respective engine parameter and provides data for the DDMP. Analog instruments consist of a 2 inch nonreflective glass face/dial, controllable backlighting, and an annunciator light capable of showing steady green or steady/flashing red. A steady green annunciator indicates that analog parameter is being displayed digitally in the DDMP. A steady red annunciator is illuminated when an engine parameter limit has been exceeded. Any exceedence condition will override the current DDMP display and show the parameter in exceedence, the exceedence value, illuminate a red annunciator light, (see Figure 2) and activate an audible tone. The exceedence audible tone and DDMP exceedence display will continue until the select switch is depressed. The red annunciator light will remain illuminated until the parameter is no longer in exceedence. If multiple exceedences occur, the operator must acknowledge each exceedence individually to mute the audible alarm. A steady red annunciator light in the fuel quantity gauge indicates 5 gallons or less of usable fuel remaining. Brightness of the analog instrument backlighting and DDMP display can be adjusted using the cockpit panel lighting control. Analog instrument annunciator light intensity is controlled using the panel annunciator Day/Night dimmer switch.

NOTE:

When both analog and digital presentations exist for an aircraft instrument, analog formats are the primary source of information and digital displays are considered as advisory only.

The Engine Instrument/Engine Monitoring System performs the following self-test sequence during initial power up to verify proper system operation:

1. DDMP displays Seneca model and Flightline Revision number.
2. Current Date/Time will be displayed.
3. Illumination of Red annunciator lights.
4. Analog indicator pointers will go to full scale.
5. Red annunciator lights will extinguish.
6. Illumination of Green annunciator lights.
7. Audible horn will sound for approximately 1 second.
8. Analog indicator pointers will return to rest position.
9. Green annunciator lights will extinguish.
10. Illumination of all 8 characters in each DDMP display window.
11. Internal system checks.



FLIGHTLINE ENGINE INSTRUMENT/ENGINE MONITORING
Figure 1

7.25a FLIGHTLINE ENGINE INSTRUMENT/ENGINE MONITORING SYSTEM (CONT'D)

During nonnal operations, all indicators and their associated sensors will have continuous system health monitoring. In the event an indicator or sensor error is detected during the self-test sequence or nonnal operations, an audible horn will sound for 3 seconds, a DDMP instrument fail message will be displayed, and a flashing red annunciator light will illuminate indicating the following:

1. 2 flashes/second - instrument failure.
2. 4 flashes/second - sensor failure.

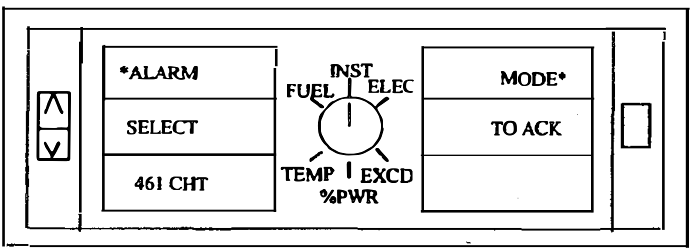


Figure 2

TOP LEVEL OPERATIONS:

FUEL MANAGEMENT (FUEL)

The fuel management mode provides fuel management functions based on inputs from pilot fuel loading entries, fuel flow sensors, and the Global Positioning System (GPS). This information is intended to assist the pilot in fuel management but should be considered as advisory only. No allowances for deviations (weather, ATC delays, etc.) or fuel reserves are factored into fuel management calculations, therefore the pilot is the final authority for all fuel management decisions.

All fuel management functions are based on total usable fuel available, therefore it is very important to visually verify and input accurate fuel loadings.

NOTE:

Usable fuel load entries are the combined total of all fuel tanks and not a per tank value.

Once an accurate fuel loading has been determined, fuel loading entry into the DDMP is initiated by placing the rotary selection knob on FUEL. Press the Select button until the Fuel Loading window is displayed (See Figure 3). The 3 options of 1) full fuel loading, 2) partial fuel loading, or 3) cancel to terminate the fuel loading procedure can be chosen.

To enter a fuel load, use the Up/Down arrows to position the cursor next to "FULL" or "PARTIAL" and press Select. "FULL" defaults to 122 gallons (maximum usable fuel) and allows the pilot to decrease the fuel loading to lower fuel loading values if desired. "PARTIAL" defaults to 0 gallons and allows the pilot to increase the fuel loading value to any value up to maximum usable fuel (122 gallons). Pressing Select again will bring up the fuel loading confirmation window. Choose yes or no using the Up/Down arrows then press Select to enter. If the fuel loading window has been selected in error, the CANCEL option can be chosen using the Up/Down arrows then the Select button to terminate the fuel loading sequence.

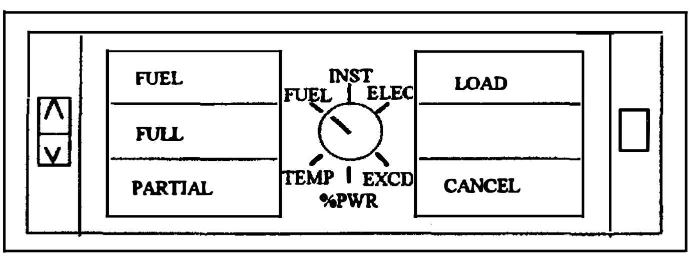


Figure 3

Once an accurate loading of usable fuel is entered in the DDMP, two additional fuel management displays (Figures 4 and 5) can be presented by pressing the Select button. More depressions of the Select button will simply cycle through the fuel load entree and two fuel management displays.

7.25a FLIGHTLINE ENGINE INSTRUMENT/ENGINE MONITORING SYSTEM (CONT'D)

FUEL MANAGEMENT DISPLAY #1

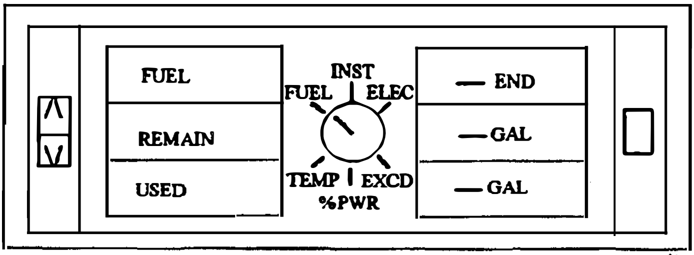


Figure 4

END - Endurance/flight time remaining. This calculation is based on current fuel flow rate and usable fuel remaining.
REMAIN - Fuel remaining in tank. This calculation is based on last usable fuel load entree and fuel used.
USED - Fuel used. This calculation is based on fuel used since last usable fuel load entree.

FUEL MANAGEMENT DISPLAY #2

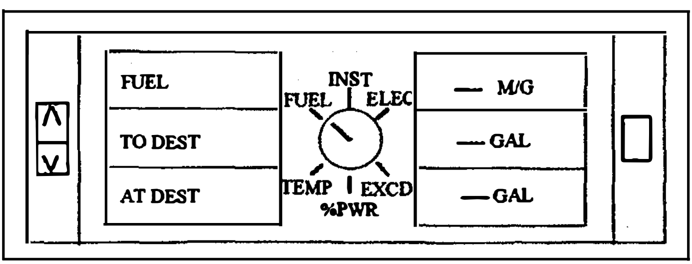


Figure 5

M/G - Nautical miles/gallon of fuel. This calculation is based on current fuel flow rate and GPS ground speed.
To DEST - fuel required to destination (current GPS waypoint). This calculation is based on current fuel flow rate, GPS distance to waypoint, and GPS ground speed.
At DEST - fuel remaining at destination (current GPS waypoint). This calculation is based on current usable fuel remaining, fuel flow rate, GPS distance to waypoint, and GPS ground speed.

ENGINE INSTRUMENT DISPLAY (INST)

The INST mode of operation enables the user to digitally display any of the engine related analog instruments in their respective left and right DDMP windows (See figure 6). The INST mode is selected by placing the rotary selection knob on INST. The Select button is then used to choose the parameter display location in one of the 6 DDMP windows. Once the DDMP display window is determined, the Up/Down button can be used to sequence through the appropriate analog instruments and choose the display parameter. This process would be repeated until all 6 DDMP windows are configured. The default DDMP instrument configuration after each Flightline system power up is MAP, RPM, and TIT.

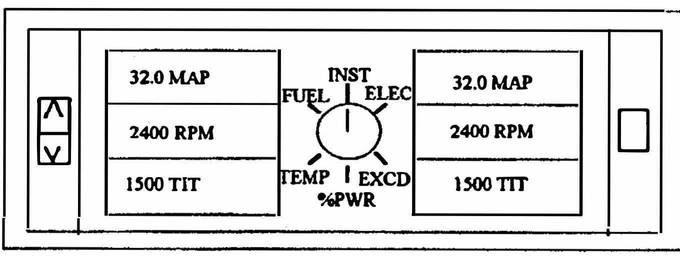


Figure 6

ELECTRICAL DISPLAY (ELEC)

The electrical mode displays electrical system information on left/right alternator amperage output, main bus voltage, and battery charge/discharge rate (see Figure 7).

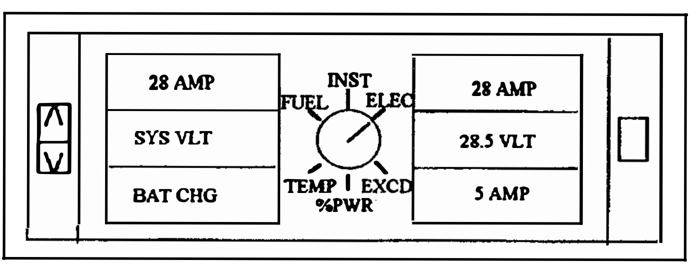


Figure 7

7.25a FLIGHTLINE ENGINE INSTRUMENT/ENGINE MONITORING SYSTEM (CONT'D)

EXCEEDENCE DISPLAY (EXCD)

The EXCD mode of operation enables the user to display any parameter limitation exceedence that has occurred during ground/flight operations. Parameter name, duration of exceedence (hrs:min:sec), exceedence peak value, exceedence sequence number, time of day, and date are recorded during each occurrence in chronological order for over 200 exceedence records. Any exceedences beyond the DDMP memory limit will start to overwrite old exceedence records. Display of exceedences is accomplished by placing the rotary knob on EXCD. The DDMP will display the most resent exceedence in the format shown in figure 8. Additional exceedence records can be viewed in chronological order using the up/down arrows. Exceedence records can be cleared from the DDMP display by pressing Select which brings up the menu in Figure 9. Using the Up/Down arrows you can move to the "Clear All" window and then press select which clears all exceedences from the DDMP display. Choosing Cancel will revert back to the exceedence display format in Figure 8.

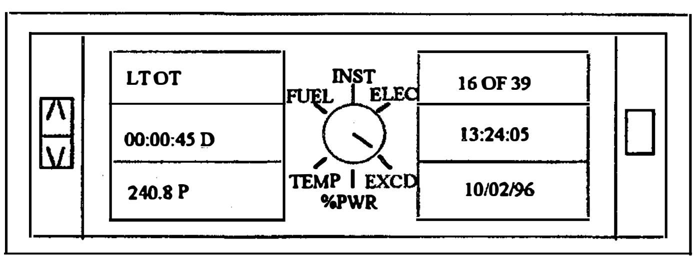


Figure 8

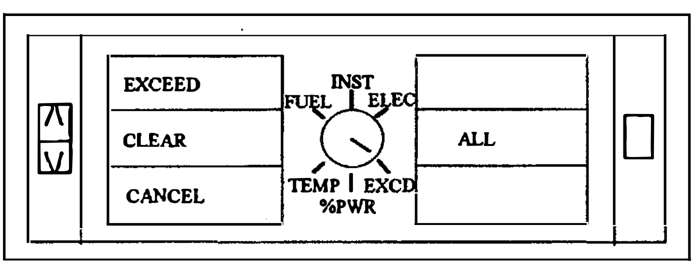


Figure 9

The following abbreviations are used in the exceedence mode:

1.	LO VLT	Low System Voltage
2.	HI VLT	High System Voltage
3.	LT MAP	High Left Manifold Pressure
4.	RT MAP	High Right Manifold Pressure
5.	LT RPM	High Left RPM
6.	RT RPM	High Right RPM
7.	LT TIT	High Left Turbine Inlet Temperature
8.	RT TIT	High Right Turbine Inlet Temperature
9.	LT CHT	High Left Cylinder Head Temperature
10.	RT CHT	High Right Cylinder Head Temperature
11.	LT OT	High Left Oil Temperature
12.	RT OT	High Right Oil Temperature
13.	LT LOP	Low Left Oil Pressure
14.	RT LOP	Low Right Oil Pressure
15.	LT HOP	High Left Oil Pressure
16.	RT HOP	High Right Oil Pressure
17.	LO VAC	Low Vacuum
18.	HI VAC	High Vacuum
19.	LFQ	Low Left Fuel Quantity
20.	RFQ	Low Right Fuel Quantity

PERCENT POWER DISPLAY (%PWR)

The percent power mode initially displays current cruise power output in 5% increments, manifold pressure, and RPM of each engine (see Figure 10) based on measured manifold pressure, RPM, pressure altitude, outside air temperature, and fuel flow. Any engine powers outside of the cruise range (50 % to 80 %) will produce – – – 's in the DDMP % power window.

NOTE:

The Pilots Operating Handbook (Report: VB 1649) shall be the final authority if any inconsistency exists between DDMP % Power Display information and the Pilot's Operating Handbook performance charts.

7.25a FLIGHTLINE ENGINE INSTRUMENT/ENGINE MONITORING SYSTEM (CONT'D)

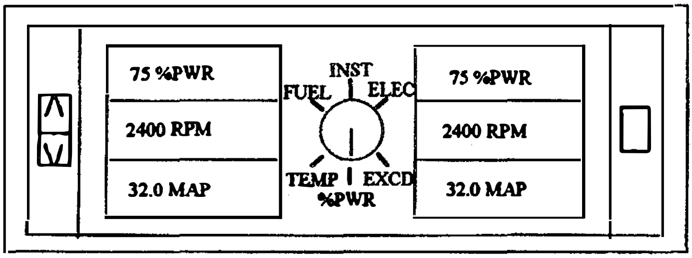


Figure 10

A desired percent power setting can be chosen by pressing the select button to bring up the display shown in Figure 11. Initially, current values of %PWR, RPM, and MAP are displayed. %PWR can be incrementally changed using the Up/Down arrows from 50% to 80% power in 5% increments. As %PWR is changed, a suggested RPM (close to current engine RPM) will be displayed along with approximate values of MAP and fuel flow using best economy leaning procedures. If a different engine RPM is desired, the Select button is pressed to navigate to the RPM window and the Up/Down arrows used to vary the RPM in 100 RPM increments. This variation in RPM changes expected values of MAP and fuel flow accordingly. Once the desired %PWR and RPM combination are chosen, subsequent pressing of the Select button will choose the Return window and then cycle back to the original percent power display (Figure 10).

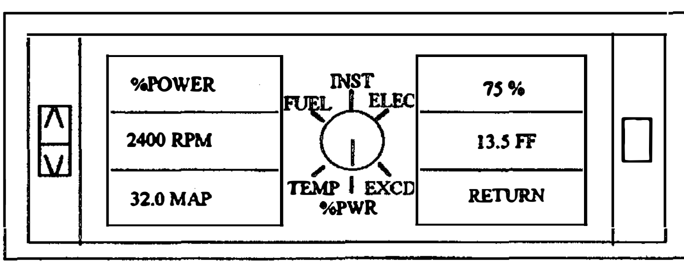


Figure 11

TEMPERATURE DISPLAY (TEMP)

The temperature mode displays outside air temperature and cabin air temperature in both degrees F and degrees C. The Select button will cycle the temperature display between degrees F and degrees C. (See Figure 12).

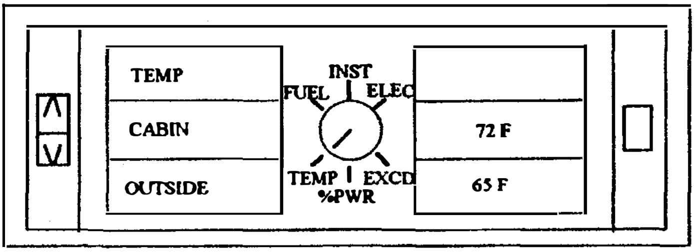


Figure 12

DDMP MAINTENANCE MODE

The maintenance mode provides maintenance operations, System Self Test, and time of day/date adjustment functions to the operator . This mode is entered by depressing the Up/Down arrow and the Select keys while in the ELEC Mode in the following sequence:

1. Up arrow
2. Down arrow
3. Up arrow - twice
4. Select Key

The DDMP will then display the format seen in Figure 13.

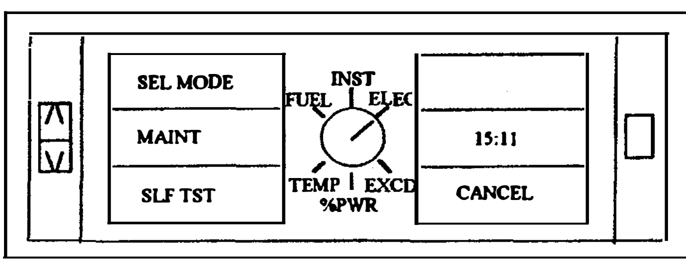


Figure 13

7.25a FLIGHTLINE ENGINE INSTRUMENT/ENGINE MONITORING SYSTEM (CONT'D)

The MAINT menu provides access to factory calibrations of instruments and should not be entered/tampered with by unauthorized personnel. Access to this menu is limited to personnel with knowledge of the 4 character access code.

The SLF TST menu allows the operator to activate the system self test sequence that occurs during initial power up.

The Date and time menus allow initial input of date and time into system memory (see Figure 14). Maneuver to the desired window (time or date) using Up/Down buttons and press Select to open the menu. Press Select again to activate the left most pair of digits and increment the numbers to the desired setting using the Up/Down arrows. This procedure of pressing Select to activate the adjacent digit pairs and incrementing using Up/Down arrows is repeated until the new date or time is entered. Date and time will be retained in memory indefinitely until further adjustment is necessary. Termination of the date/time menu is initiated by choosing Return using the Up/Dwn arrows and then the Select button.

The Cancel menu returns the DDMP back to the ELEC display.

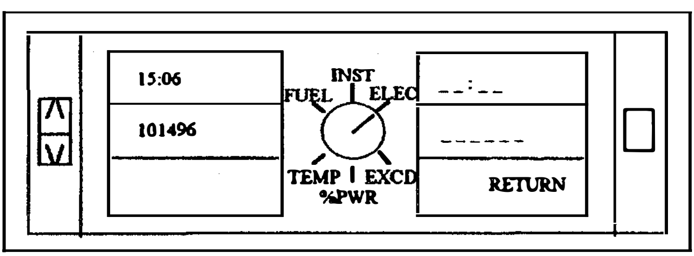


Figure 14

AUXILIARY COMMUNICATIONS

DDMP information can be accessed/stored on a personal computer via a RS-232 connection (located under pilot's side instrument panel) and standard terminal emulation software. DDMP data can be accessed using the terminal emulation software instructions and the following required settings:

Baud Rate:	9600
Parity:	None
Data Bits	8
Stop Bits:	1

7.25a FLIGHTLINE ENGINE INSTRUMENT/ENGINE MONITORING SYSTEM (CONT'D)

Once a DDMP data connection has been made, the operator should select the "Data Dump" option. The DDMP will then send current instrument data to the connected device enabling a permanent record of the flight to be stored to disk. Data is sent approximately every 5 seconds in a comma delimited ASCII format for each of the following parameters:

Parameter	Units
Manifold Pressure	In Hg
Propeller RPM	RPM
Turbine Inlet Temperature	°F
Fuel Flow	Gal/Hr
Cylinder Head Temperature	°F
Oil Temperature	F
Oil Pressure	PSI
Vacuum Pressure	In Hg
Fuel Quantity	Gal
Cabin Air Temperature	°F
Outside Air Temperature	°F
Pressure Altitude	Ft
System Voltage	Volts
Alternator Current	Amps
Battery Charge Current	Amps

Additional auxiliary communication options may be found in the Flightline Instrument Maintenance Manual.

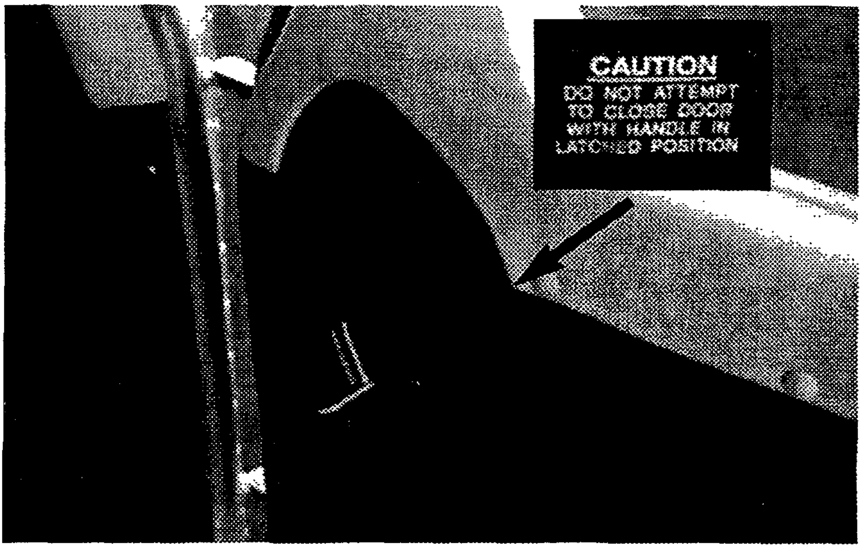
7.27 CABIN FEATURES

Cabin entry for the front seats is made through the cabin door on the right side of the airplane. To close the cabin door, hold the door closed with the armrest while moving the side door latch (Figure 7-37) down to the LATCHED position.

Cabin entry for the center and rear seats is made through the aft cabin door on the left side of the airplane. This door is double latched. To close the aft cabin door, pull the door closed with both the arm rest and the upper assist strap. Then engage the top latch to the LATCHED position. Both latches must be secure before flight.

The aft cargo door is opened by a lever located on the forward edge of the door. Pulling down on the lever disengages two locking pins from the frame.

7.27 CABIN FEATURES (Continued)



FRONT CABIN DOOR SIDE LATCH
Figure 7-37

STANDARD FEATURES

Standard front cabin features include door locks (fore and aft cabin and nose baggage), a pilot's stonn window, map pockets, and sun visors. An armrest is located on the side panel adjacent to each front seat. Additional standard cabin items are pockets on the front seat backs, cabin sound-proofing, passenger assist straps and baggage restraint straps in the nose and aft baggage areas.

SEATS

All seat backs have three positions: normal, intermediate and recline. An adjustment lever is located at the base of each seat back on the outboard side.

The pilots and co-pilots seats are adjustable fore, aft and vertically. They are adjustable fore and aft by lifting the bar below the seat front and moving to the desired position. Release the handle and move the seat until the locking pin engages. Pivoting armrests are provided on the inboard side of each front seat.

To raise the vertically adjustable pilot and copilot seats, push back on the pushbutton located at the lower right of each seat, relieve the weight from the seat and it will rise. To lower the seat, push the button and apply weight until the proper position is reached.

The center and rear seats are easily removed to provide room for bulky items. Removal of the seats is accomplished by removing the two bolts holding the aft attach points and sliding the seat aft.

NOTE

To remove the center seats, retainers securing the back legs of the seats must be unlocked. Releasing the retainers is accomplished by depressing the plunger behind each rear leg. Any time the seats are installed in the airplane, the retainers should be in the locked position.

To remove the rear seats, depress the plunger behind each front leg and slide seat to rear.

CAUTION

Removal of any seats(s) require Weight and Balance computations. Refer to Section 6 of this POH to determine suitability for flight with seats removed.

SEAT BELTS AND SHOULDER HARNESSES

Seat belts and adjustable shoulder harnesses with inertial reels are standard on all seat locations. The pilot should adjust this fixed seat belt strap so that all controls are accessible while maintaining adequate restraint for the occupant. The seat belt should be snugly fastened over each unoccupied seat.

The shoulder harness is routed over the shoulder adjacent to the window and attached to the seat belt in the general area of the occupant's inboard hip. A check of the inertial reel mechanism is made by pulling sharply on the strap. The reel should lock in place and prevent the strap from extending. For normal body movements, the strap will extend or retract as required.

Shoulder harnesses shall be worn during takeoff, landing and during an emergency situation.

7.27 CABIN FEATURES (Continued)

Other features suiting individual needs are headrests, a fire extinguisher, an oxygen system, and a special cabin sound-proofing package are just a few.

A refreshment console is located between the center seats. It is removed in a manner identical to the removal of the center seats.

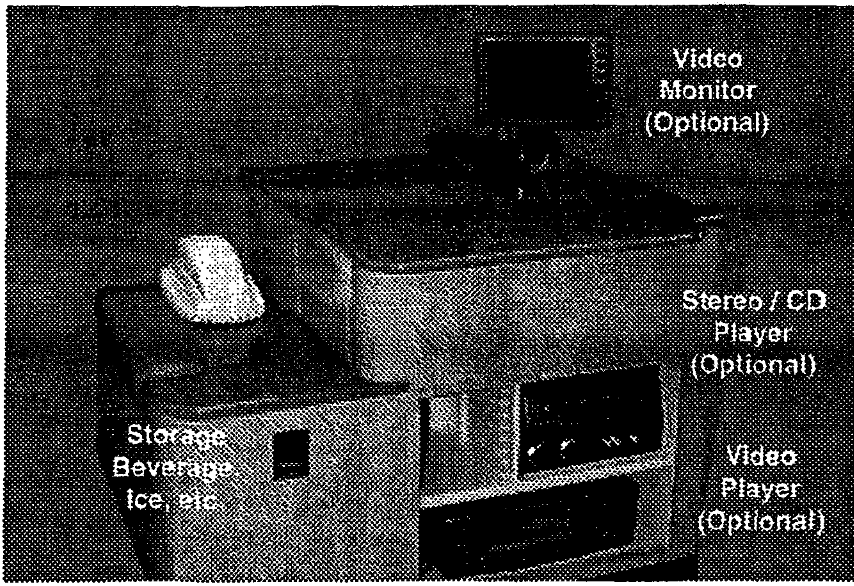
A cabin work table, serving the two seats on the right side of the passenger cabin, is offered with the club seating arrangement. The table must be stowed during takeoff and landing. If the table is to be used, it should be set up after a level cruise is established.

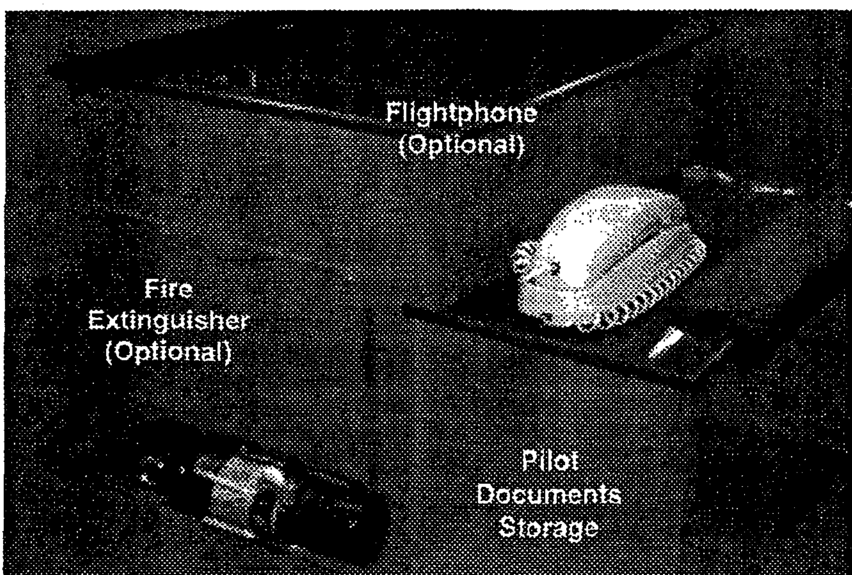
To set the cabin work table, simply pull up then out. To stow the cabin work table, lift up and slide it back in to the side panel.

OPTIONAL FEATURES

Air conditioning is among the very few cabin options. This option if installed will enhance the environment of the aircraft cabin by supplying conditioned air that is adjustable by the user. Complete details of this option can be found in Section 9, Supplement 2 at the end of this book.

Another option is the entertainment/executive console in place of the right hand aft facing seat. Some of the features are a horizontally sliding, pull out table, an area set up for a multi-media entertainment system, a monitor, a phone and pilots reference material compartment. (See Figure 7-39.)





ENTERTAINMENT/EXECUTIVE CONSOLE (OPTIONAL)
Figure 7-39

7.29 BAGGAGE AREA

There are two separate baggage compartments. One, the nose section baggage compartment, is accessible through a baggage door on the left side of the nose section. It has a maximum weight capacity of 100 pounds. The cabin baggage compartment, located aft of seats five and six has a weight capacity of 85 pounds. This compartment is loaded and unloaded through the rear cabin door. Tie-down straps are provided and should be used at all times. A cargo loading door, installed aft of the rear door, facilitates the loading of bulky items. The forward baggage compartment and passenger doors use the same key. The key can be removed from the forward baggage compartment door only when in the locked position. (See Fig. 7-40.)

CAUTION

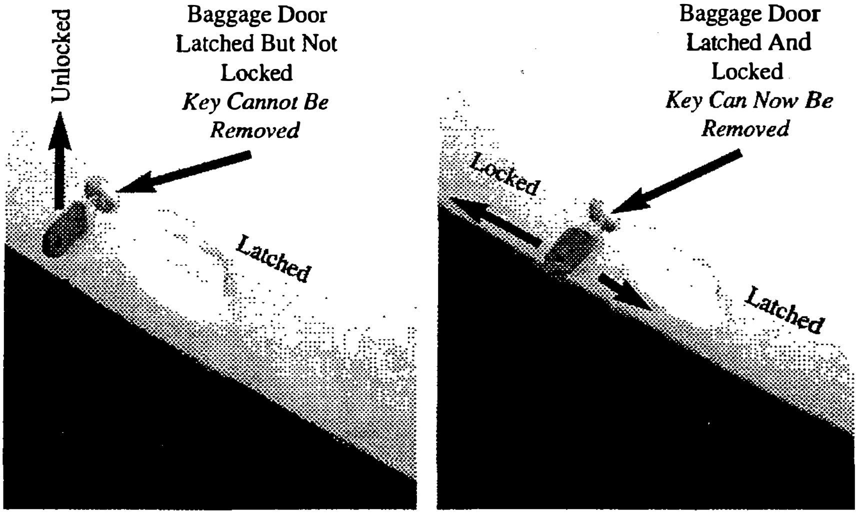
It is the pilot's responsibility to be sure that the nose baggage door is latched and locked properly. If the nose baggage door key can be removed in the unlocked position, immediate service to or replacement of the locking mechanism should occur.

A nose section baggage compartment light illuminates automatically whenever the baggage door is opened. The baggage compartment light is independent of the aircraft battery switch; therefore, when the baggage door is opened, the light will illuminate regardless of the position of the battery switch. The baggage door should not be left open or ajar for extended time periods as battery depletion could result.

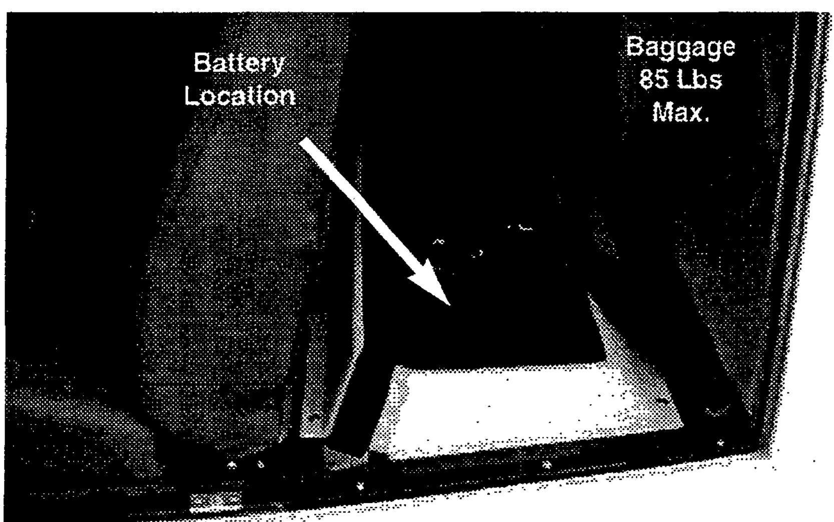
A forward baggage door ajar annunciator system senses the baggage door latch pin position. Failure to latch the forward baggage door will illuminate an amber light on the pilot's annunciator panel. The annunciator, when illuminated, is Baggage Door advising the pilot of this condition.

NOTE

It is the pilot's responsibility to be sure when baggage is loaded that the airplane C.G. falls within the allowable C.G. range. (See Weight and Balance Section.)



NOSE BAGGAGE DOOR
Figure 7-40



7.31 FINISH

All exterior surfaces are finished with polyurethane.

To allow proper paint matching, paint colors and mixing numbers are noted in the front of the original airframe logbook.

7.33 STALL WARNING

An approaching stall is indicated by a stall warning indicator which is activated between five and ten knots above stall speed. Mild airframe buffeting and gentle pitching may also precede the stall. Stall speeds are shown on the Stall Speed vs Angle of Bank graph in the Section 5.

The stall warning indicator consists of a continuous sounding horn located behind the instrument panel. The stall warning horn has a different sound from that of the gear warning horn which has a 90 cycles per minute beeping sound.

The stall warning indicator is activated by two lift detectors on the leading edge of the left wing, outboard of the engine nacelle. The inboard detector activates the indicator when the flaps are in the 25 and 40 degree positions, the outboard when the flaps are set to 0° to 10°.

A squat switch in the stall warning system does not allow the units to be activated on the ground.

7.35 EMERGENCY LOCATOR TRANSMITTER

The Emergency Locator Transmitter (ELT) meets the requirements of FAR 91.52. It operates on self-contained batteries and is located in the aft portion of the fuselage just below the stabilator leading edge and is accessible through a plate on the right side of the fuselage. This plate is attached with slotted-head nylon screws for ease of removal; these screws may be readily removed with a variety of common items such as a dime, key, knife blade, etc. If there are no tools available in an emergency, the screw heads may be broken off by any means.

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 or 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 the tests must be made at any other time, the tests should be coordinated with the nearest FAA tower or flight service station.

7.35 EMERGENCY LOCATOR TRANSMITTER (Continued)

ARTEX 110-4 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 lower center portion of the pilot's instrument panel to allow the transmitter to be armed or turned on from inside the cabin. The switch is normally in ARM position. Moving the switch to ON will activate the transmitter. A warning light located above the remote switch will alert you when ever the ELT is activated.

Should the ELT be activated inadvertently it can be reset by either positioning the remote switch to the ON then immediately relocating it to the ARM position, or by setting the switch on the ELT to ON and then back to OFF.

In the event the transmitter is activated by an impact, it can be turned off by moving the ELT switch OFF. Normal operation can then be restored by resetting the switch to ARM. It may also be turned off and reset by positioning the remote switch to the ON and then immediately to the ARM position.

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.

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AIRPLANE HANDLING, SERVICING AND MAINTENANCE

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SECTION 8

AIRPLANE HANDLING, SERVICING AND MAINTENANCE

8.1 GENERAL

This section provides general guidelines relating to the handling, servicing, and maintenance of the SENECA V. For complete maintenance instructions, refer to the PA-34-220T Maintenance Manual.

WARNING

Inspection, maintenance and parts requirements for all non-PIPER approved STC installations are not included in this handbook. When a non-PIPER approved STC installation is incorporated on the airplane, those portions of the airplane affected by the installation must be inspected in accordance with the inspection program published by the owner of the STC. Since non-PIPER approved STC installations may change systems interface, operating characteristics and component loads or stresses on adjacent structures, PIPER provided inspection criteria may not be valid for airplanes with non-PIPER approved STC installations.

WARNING

Modifications must be approved in writing by PIPER prior to installation. Any and all other installations, whatsoever, of any kind will void this warranty in it's entirety.

8.1 GENERAL (CONTINUED)

WARNING

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

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

Additionally, reworked or salvaged parts or those parts obtained from non-PIPER approved sources, may have service histories which are unknown or cannot be authenticated, may have been subjected to unacceptable stresses or temperatures or may have other hidden damage not discernible through routine visual or nondestructive testing. This may render the part, component or structural assembly, even though originally manufactured by PIPER, unsuitable and unsafe for airplane use.

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

8.1 GENERAL (CONTINUED)

Every owner should stay in close contact with an authorized Piper Service Center or Piper's Customer Service 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 sent directly to the latest FAA-registered owners in the United States (U.S.) and Piper Service Centers worldwide. Depending on the nature of the release, material and labor allowances may apply. This information is provided to all authorized Piper Service Centers.

Piper Service Letters deal with product improvements and servicing techniques pertaining to the airplane. They are sent to Piper Service Centers and, if necessary, to the latest FAA-registered owners in the U.S. Owners should give careful attention to Service Letter information.

Piper Service Spares Letters offer improved parts, kits and optional equipment which were not available originally, and which may be of interest to the owner.

Piper offers a subscription service for Service Bulletins, Service Letters, and Service Spares Letters. This service is available to interested persons such as owners, pilots, and mechanics at a nominal fee, and may be obtained through an authorized Piper Service Center or Piper's Customer Service Department.

Maintenance manuals, parts catalogs, and revisions to both, are available from Piper Service Centers or Piper's Customer Service Department.

Any correspondence regarding the airplane should include the airplane model and serial number to ensure proper response.

8.3 AIRPLANE INSPECTION PERIODS

WARNING

All inspection intervals, replacement time limits, overhaul time limits, the method of inspection, life limits, cycle limits, etc., recommended by PIPER are solely based on the use of new, remanufactured or overhauled PIPER approved parts. If parts are designed, manufactured, remanufactured, overhauled and/or approved by entities other than PIPER, then the data in PIPER'S maintenance/service manuals and parts catalogs are no longer applicable and the purchaser is warned not to rely on such data for non-PIPER parts. All inspection intervals, replacement time limits, overhaul time limits, the method of inspection, life limits, cycle limits, etc., for such non-PIPER parts must be obtained from the manufacturer and/or seller of such non-PIPER parts.

Piper has developed inspection items and required inspection intervals (i.e.: 50, 100, 500, and 1000 hours) for the specific model aircraft. Appropriate forms are contained in the applicable Piper Maintenance Manual, and should be complied with by a properly trained, knowledgeable, and qualified mechanic at a Piper Authorized Service Center or a reputable repair shop. Piper cannot accept responsibility for the continued airworthiness of any aircraft not maintained to these standards, and/or not brought into compliance with applicable Service Bulletins issued by Piper, instructions issued by the engine, propeller, or accessory manufacturers, or Airworthiness Directives issued by the FAA.

A programmed Inspection, approved by the Federal Aviation Administration (FAA), is also available to the owner. This involves routine and detailed inspections to allow maximum utilization of the airplane. Maintenance inspection costs are reduced, and the maximum standard of continuous airworthiness is maintained. Complete details are available from all local distributors representing The New Piper Aircraft, Inc.

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.

A spectographic 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 FAR Part 61 may perform certain preventive maintenance described in FAR Part 43. This maintenance may be performed only on an aircraft which the pilot owns or operates and which is not used to carry persons or property for hire, except as provided in applicable FAR's. Although such maintenance is allowed by law, each individual should make a self-analysis as to whether he has the ability to perform the work.

All other maintenance required on the airplane should be accomplished by appropriately licensed personnel.

If maintenance is accomplished, an entry must be made in the appropriate logbook. The entry should contain:

(a) The date the work was accomplished.
(b) Description of the work.
(c) Number of hours on the aircraft.
(d) The certificate number of pilot performing the work.
(e) Signature of the individual doing the work.

8.7 AIRPLANE ALTERATIONS

If the owner desires to have his aircraft modified, he must obtain FAA approval for the alteration. Major alterations accomplished in accordance with Advisory Circular 43.13-2, when performed by an A & P mechanic, may be approved by the local FAA office. Major alterations to the basic airframe or systems not covered by AC 43.13-2 require a Supplemental Type Certificate.

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 Form FAA-337, if applicable.
 (3) Aircraft equipment list.

Although the aircraft and engine logbooks are not required to be in the aircraft, they should be made available upon request. Logbooks should be complete and up to date. Good records will reduce maintenance cost by giving the mechanic information about what has or has not been accomplished.

8.9 GROUND HANDLING

(a) Towing

The airplane may be moved on the ground by the use of the nose wheel steering bar that is stowed in the baggage compartment or by power equipment that will not damage or excessively strain the nose gear steering assembly.

CAUTIONS

When towing with power equipment, do not turn the nose gear beyond its steering radius in either direction, as this will result in damage to the nose gear and steering mechanism.

Do not tow the airplane when the controls are secured.

In the event towing lines are necessary, ropes should be attached to both main gear struts as high up on the tubes as possible. Lines should be long enough to clear the nose and / or tail by not less than fifteen feet, and a qualified person should ride in the pilot's seat to maintain control by use of the brakes.

(b) Taxiing

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, the parking brake is released and power should be applied to start the taxi roll. The following checks should be performed:

(1) Taxi a few feet forward and apply the toe brakes to determine their effectiveness.
(2) Taxi with the propeller set in low pitch, high RPM setting.
(3) While taxiing, make slight turns to ascertain the effectiveness of the steering.
(4) Observe wing clearance when taxiing near buildings or other stationary objects. If possible, station an observer outside the airplane.
(5) When taxiing over uneven ground, avoid holes and ruts.

8.9 GROUND HANDLING (cont)

(6) Do not operate the engine at high RPM when running up or taxiing over ground containing loose stones, gravel, or any loose material that may cause damage to the propeller blades.

(c) Parking

When parking the airplane, be sure that it is sufficiently protected from adverse weather conditions and that it presents no danger to other aircraft. When parking the airplane for any length of time or overnight, it is suggested that it be moored securely.

(1) To park the airplane, head it into the wind if possible.
(2) The parking brake knob is located on the lower left of the instrument panel. To set the parking brake, first depress and hold the toe brake pedals and then pull out the parking brake knob. To release the parking brake, first depress and hold the toe brake pedals and then push in on the parking brake knob.

WARNING

No braking will occur if knob is pulled prior to brake application.

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 stabilator 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 stabilator by looping the seat belt through the control wheel and pulling it snug.
(4) Block the wheels.

(5) Secure tie-down ropes to the wing tie-down rings and to the tail skid at approximately 45 degree angles to the ground. When using rope of non-synthetic material, leave sufficient slack to avoid damage to the airplane should the ropes contract.

CAUTION

Use bowline knots, square knots or locked slip knots. Do not use plain slip knots.

NOTE

Additional preparations for high winds include using tie-down ropes from the landing gear forks 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 doors should be locked when the airplane is unattended.

8.11 ENGINE INDUCTION AIR FILTERS

(a) Removing the induction air filter:
Removal of the induction air filter should be accomplished by personnel authorized by the appropriate civil aviation authority.

(b) Inspection of Induction Air Filters:
Inspection of the induction air filters should occur prior to each flight and may be accomplished by observing the filter just inside the NACA duct on each engine. If paper element is torn, ruptured, or if screen is damaged, the filter must be replaced. A more thorough inspection at a maintenance facility should occur at least once every 50 hours, and more often, when operating in harsh conditions.

(c) Cleaning and Replacement of Induction Air Filters:
The induction air filters must be cleaned at least once every 50 hours, and more often, even daily, when operating in dusty conditions. Inspect filter. The usable life of the filter should be restricted to one year or 500 hours, whichever comes first.

8.11 ENGINE INDUCTION AIR FILTERS (cont)

(d) Installation of induction Air Filters

Installation of the induction air filter should be accomplished by personnel authorized by the appropriate civil aviation authority.

8.13 BRAKE SERVICE

The brake system is filled with MIL-H-5606 (petroleum base) hydraulic brake fluid. This should be checked periodically or at every 50-hour inspection and replenished when necessary. The brake reservoir is located in the forward maintenance area. Remove the four screws and rotate the fiberglass nose cone forward and down. The reservoir is located at the top rear of the compartment. Keep the fluid level at the level marked on the reservoir.

No adjustment of brake clearance is necessary. Refer to the Maintenance Manual for brake lining replacement instructions.

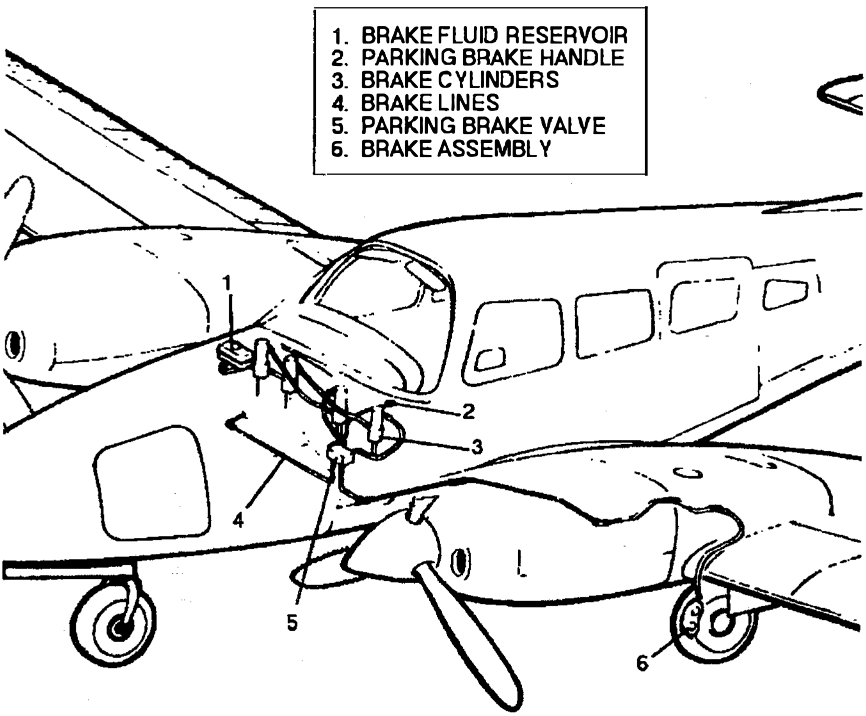
8.15 LANDING GEAR SERVICE

Two jack points are provided for jacking the aircraft for servicing. One is located outboard of each main landing gear. Before jacking, attach a tail support to the tail skid. Approximately 500 pounds of ballast should be placed on the tail support.

CAUTION

Be sure to apply sufficient support ballast; otherwise the airplane may tip forward, and the nose section could be damaged.

Landing gear oleos should be serviced according to instruction on the units. Under normal static load (empty weight of airplane plus full fuel and oil). main oleo struts should be exposed approximately 3.20 inches and the nose oleo strut should be exposed 2.50 inches. Refer to the Maintenance Manual for complete information on servicing oleo struts.



BRAKE SYSTEM
Figure 8-1

8.17 PROPELLER SERVICE

The gas charge in the propeller cylinder should be kept at the pressure specified on the placard located in the spinner cap. The pressure in the cylinder will increase about one-third psi for every degree Fahrenheit increase in temperature. This effect should be considered when checking pressure. The charge maintained must be accurate and free of excessive moisture since moisture may freeze the piston during cold weather. Dry nitrogen gas is recommended.

CHAMBER PRESSURE REQUIREMENTS WITH TEMPERATURE FOR HARTZELL COUNTERWEIGHT TYPE PROPELLERS

FOR PROPELLER HUBS:
BHC-J2YF-2CUF and BHC-J2YF-2CLUF

Temp. °F	Pressure (PSI)
70 to 100	41 ± 1
40 to 70	38 ± 1
0 to 40	36 ± 1
-30 to 0	33 ± 1

NOTE: Do not check pressure or charge with propeller in feather position.

The spinner and backing plate-should be cleaned and inspected for cracks frequently. Before each flight the propeller should be inspected for nicks, scratches, or corrosion. If found, they should be repaired as soon as possible by a rated mechanic, since a nick or scratch causes 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, all surfaces should be cleaned and waxed periodically.

The gas charge in the optional unfeathering accumulators should be maintained at 90 - 100 PSI. It is important to use nitrogen only for this purpose since any moisture in the system may freeze and render it inoperative. Do not check this charge pressure while engine is running.

8.19 OIL REQUIREMENTS

The oil capacity of the Teledyne Continental engines is 8 quarts per engine with a minimum safe quantity of 3 quarts per engine. It is recommended that oil be added if the quantity falls to 6 quarts. It is recommended that engine oil be drained and renewed every 100 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:

	OIL VISCOSITY Aviation Grade	S.A.E. No.
Below 40°F	1065	30
Above 40°F	1100	50

8.21 FUEL SYSTEM

(a) Servicing Fuel System

The fuel screens in the strainers require cleaning at 50 hour or 90 day intervals, whichever occurs first. The fuel gascolator strainers are located in the wing between the fuel selector valves and the auxiliary pumps in the nacelles. The fuel injector screen is located in the housing where the fuel inlet line connects to the injector. This screen should be cleaned every 50 hours of operation.

(b) Fuel Requirements (AVGAS ONLY)

The minimum aviation grade fuel for the SENECA V 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 Continental Service Bulletin - Fuel and Oil Grades.

8.21 FUEL SYSTEM (cont)

A summary of current grades as well as the previous fuel designations is shown in the following chart:

FUEL GRADE COMPARISON CHART

Previous Commercial Fuel Grades (ASTM-D910)			Current Commercial Fuel Grades (ASTM-D910-75)			Current Military Fuel Grades (MIL-G 5572E) Amendment No. 3		
Grade	Color	Max. TEL ml/U.S. gal	Grade	Color	Max. TEL ml/U.S. gal	Grade	Color	Max. TEL ml/U.S. gal
80/87	red	0.5	80	red	0.5	80/87	red	0.5
91/98	blue	2.0	*100LL	blue	2.0	none	none	none
100/130	green	3.0	100	green	**3.0	100/130	green	**3.0
115/145	purple	4.6	none	none	none	115/145	purple	4.6

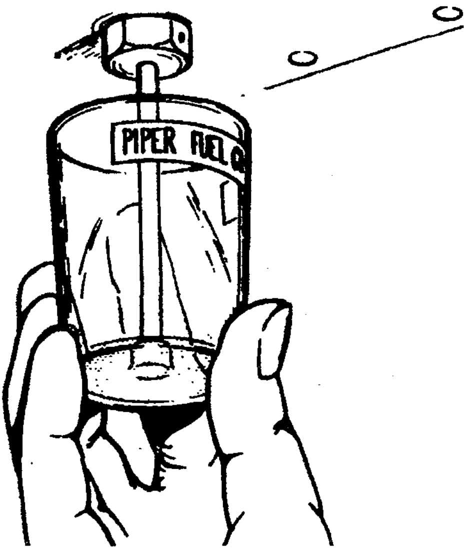
* Grade 100LL fuel in some overseas countries is currently colored green and designated as 100L.
** Commercial fuel grade 100 and grade 100/130 (both of which are colored green) having TEL content of up to 4 ml/U.S. gallon are approved for use in all engines certificated for use with grade 100/130 fuel.

The operation of the aircraft is approved with an anti-icing additive in the fuel. When an anti-icing additive is used it must meet the specification MIL-I-27686, must be uniformly blended with the fuel while refueling, must not exceed 0.15% by volume of the refueled quantity, and to ensure its effectiveness should be blended at not less than 0.10% by volume. One and one half liquid ozs. per ten gallon 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

Some fuels have anti-icing additives preblended in the fuel at the refinery, so no further blending should be performed.

Fuel additive cannot be used as a substitute for preflight draining of the fuel system.



FUEL DRAIN
Figure 8-3

CAUTION

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.

(c) Filling Fuel Tanks

Observe all safety precautions required when handling gasoline. Fill the fuel tanks to the bottom of the filler neck with 100 grade fuel. Each wing holds a maximum of 64 gallons, giving a total of 128 gallons of fuel.

8.21 FUEL SYSTEM (cont)

(d) Draining Fuel Strainer, Sumps and Lines

Each gascolator strainer is provided with a quick drain which should be drained before the first flight of the day and after refueling, to check for fuel contamination and proper fuel. If contamination is found, fuel should be drained until the contamination stops. If contamination persists after draining fuel for a minute, contact a mechanic to check the fuel system.

Each fuel tank is provided with a fuel quick drain to check for contamination. Each tank should be checked for contamination in accordance with the above procedure. Crossfeed drains are located on the bottom of the fuselage inboard of the right flap. The fuel drained at each quick drain should be collected in a transparent container and examined for contamination.

CAUTION

When draining fuel, be sure that no fire hazard exists before starting the engines.

(e) Draining Fuel System

The bulk of the fuel may be drained either by opening the valve at the inboard end of each tank or by siphoning. The remaining fuel in the lines may be drained through the gascolators and the two drains located on the bottom of the fuselage, inboard of the right flap.

8.23 TIRE INFLATION

For maximum service from the tires, keep them inflated to the proper pressures. The main gear tires should be inflated to 55 psi and the nose gear tire should be inflated to 40 psi.

Interchange the tires on the main wheels, if necessary, to produce even wear. All wheels and tires are balanced before original installation, and the relationship of the tire, tube, and wheel should be maintained if at all possible. Unbalanced wheels can cause extreme vibration on takeoff. In the installation of new components, it may be necessary to rebalance the wheel with the tire mounted.

When checking the pressure, examine the tires for wear, cuts, bruises, and slippage.

8.25 BATTERY SERVICE

Access to the 24-volt 19 ampere hour battery is gained through an access cover located in the aft baggage compartment.

The battery fluid level must not be brought above the baffle plates. It should be checked every 30 days to determine that the fluid level is proper and the connections are tight and free of corrosion. DO NOT fill the battery above the baffle plates. DO NOT fill the battery with acid - use distilled water only. A hydrometer check will determine the percent of charge in the battery.

If the battery is not properly charged, recharge it starting with a rate of 4 amperes and finishing with a rate of 2 amperes. Quick charges are not recommended.

The external power receptacle is located on the lower left fuselage below the cargo door. Be sure that the master switch is off while inserting or removing a plug at this receptacle. Connect 24 VDC external power source only.

Refer to the PA-34-220T Maintenance Manual for detailed procedures for cleaning and servicing the battery.

8.27 SERIAL NUMBER PLATES

The serial number plate is located on the left side of the fuselage near the leading edge of the stabilator. The serial number should always be used when referring to the airplane on service or warranty matters.

8.29 LUBRICATION

Lubrication at regular intervals is an essential part of the maintenance of an airplane. For lubrication instructions and a chart showing lubrication points, types of lubricants to be used, lubrication methods and recommended frequencies, refer to the PA-34-220T Maintenance Manual.

8.31 CLEANING

(a) Cleaning Engine Compartment

Before cleaning the engine compartment, place a strip of tape on the magneto vents to prevent any solvent from entering these units.

(1) Place a large pan under the engine to catch waste.

CAUTION

Do not spray solvent into the alternator, pressure pump, starter, air intakes, or alternate air inlets.

(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 operate the engine until excess solvent has evaporated or otherwise been removed.

(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.

(4) Remove the protective tape from the magnetos.

(5) Lubricate the controls, bearing surfaces, etc., in accordance with the Lubrication Chart in the PA-34-220T Maintenance Manual.

(b) Cleaning Landing Gear

Before cleaning the landing gear, place a plastic cover or similar material over the wheel and brake assembly.

(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 in the PA-34-220T Maintenance Manual.

CAUTION

Do not brush the micro switches.

8.31 CLEANING (cont)

(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 solution could cause damage. To wash the airplane, use the following procedure:

(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.

(d) Cleaning Windshield and Windows

(1) Remove dirt, mud and other loose particles from exterior surfaces with clean water.

(2) Wash with mild soap and warm water or with aircraft plastic cleaner. Use a soft cloth or sponge in a straight back and forth motion. Do not rub harshly.

(3) Remove oil and grease with a cloth moistened with kerosene.

CAUTION

Do not use gasoline, alcohol, benzene, carbon tetrachloride, thinner, acetone, or window cleaning sprays.

(4) After cleaning plastic surfaces, apply a thin coat of hard polishing wax. Rub lightly with a soft cloth. Do not use a circular motion.

(5) A severe scratch or mar in plastic can be removed by rubbing out the scratch with jeweler's rouge. Smooth both sides and apply wax.

(e) Cleaning Headliner, Side Panels and Seats

(1) Clean headliner, side panels, and seats with a stiff bristle brush, and vacuum where necessary.

(2) Soiled upholstery, except leather, may be cleaned with a good upholstery cleaner suitable for the material. Carefully follow the manufacturer's instructions. Avoid soaking or harsh rubbing.

CAUTION

Solvent cleaners require adequate ventilation.

(3) Leather should be cleaned with saddle soap or a mild hand soap and water.

(f) Cleaning Carpet

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 removed and cleaned like any household carpet.

8.31 CLEANING (cont)

(g) Cleaning 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.

As an alternate cleaning solvent, use benzol or nonleaded gasoline. Moisten the cleaning cloth in the solvent, scrub lightly, and then, with a clean, dry cloth, wipe dry so that the cleaner does not have time to soak into the rubber. Petroleum products such as these are injurious to rubber, and therefore should be used sparingly if at all.

With the deicer boots properly cleaned, a coating of Agemaster No. 1 should be applied as described in the PA-34-220T Maintenance Manual. This treatment helps protect the boot rubber from ozone attack, aging and weathering.

After the Agemaster coating is dry, a coating of B.F. Goodrich Icex may be applied to the boots if icing conditions are anticipated. For specific instructions refer to the PA-34-220T Maintenance Manual.

8.33 WINTERIZATION

For winter operation a winterization kit is installed on the inlet opening of the oil cooler outboard chamber of the plenum chamber. This kit should be installed whenever the ambient temperature is 50°F or less. When the kit is not being used it can be stowed in the nose cone compartment, left hand side, forward of the door, using the strap provided.

* Optional equipment

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SECTION 9

SUPPLEMENTS

TABLE OF CONTENTS (Continued)

SECTION 9

SUPPLEMENTS

ISSUED: JANUARY 23, 1997
REVISED: JANUARY 12, 2004

PILOT'S OPERATING HANDBOOK
AND
FAA APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 1
FOR
FIXED OXYGEN SYSTEM INSTALLATION
SCOTT AVIATION PRODUCTS
AMBASSADOR MARK III

This supplement must be attached to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the optional fixed oxygen system is installed per the Equipment List. The information contained herein supplements or supersedes the information in the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual only in those areas listed herein. For limitations, procedures and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

FAA APPROVED: ______________________
PETER E. PECK
D.O.A. NO. SO-1
THE NEW PIPER AIRCRAFT, INC.
VERO BEACH, FLORIDA

DATE OF APPROVAL: JANUARY 23, 1997

SECTION 1 - GENERAL

This supplement supplies information necessary for the operation of the airplane when the optional fixed oxygen system is installed in accordance with FAA Approved Piper data.

This fixed oxygen system provides supplementary oxygen for the crew and passengers during high altitude flights (above 10,000 feet). The major components of the Scott oxygen system are a 77 cubic foot oxygen cylinder, an oxygen supply gauge, an ON-OFF flow control knob, a pressure regulator, six plug-in receptacles and six oxygen masks.

The oxygen cylinder is mounted in the forward baggage compartment. When fully charged, the cylinder contains oxygen at a pressure of 1850 psi at 70°F. The oxygen supply gauge is mounted in the pilot's instrument panel. The oxygen flow control knob, labeled Oxygen/ Pull-On is also mounted in the pilot's instrument panel. The pressure regulator is mounted directly on the oxygen cylinder, once the oxygen flow control knob is on, each of the oxygen plug-in receptacles operates as an automatic on-off valve. The oxygen cylinder can be recharged through the forward baggage compartment on the left side of the fuselage.

If high altitude flight is anticipated, it should be determined that the oxygen supply is adequate for the proposed flight and that the passengers are briefed. When oxygen is required, the control knob should be pulled to the ON position, allowing oxygen to flow from the cylinder through the system. Connecting the constant flow mask fitting to a receptacle and turning it 90 degrees clockwise, automatically releases oxygen to the mask through the on-off valve feature of the receptacle. The occupant then dons the mask and breathes normally for a sufficient supply of oxygen.

Each mask assembly oxygen line incorporates a flow indicator. When the red pellet in the indicator disappears, oxygen is flowing through the line normally. If the red indicator appears in any of the lines during a period when oxygen use is essential, descend immediately to a safe altitude.

When not in use, masks may be stowed in the storage pockets behind the front and center seats. Always remove fittings from the oxygen receptacles and stow the mask when they are not in use. If the control knob is pulled on and the fitting is in the receptacle, oxygen will flow through the mask continuously. Masks may be damaged if they are not properly stowed.

CAUTION

Positively **NO SMOKING** while oxygen is being used by anyone in the aircraft.

To stop the flow of oxygen through the system, the control knob should be pushed to the OFF position. To bleed down low pressure lines, it is recommended that the mask assembly be left connected to the outlet for at least three minutes after the control knob is turned off.

To preclude the possibility of fire by spontaneous combustion, oil, grease, paint, hydraulic fluid, and other flammable material should be kept away from oxygen equipment.

SECTION 2- LIMITATIONS

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

DURATION IN HOURS AT ALTITUDE
(Based on 90% Consumption)

Persons Using System	10,000	15,000	20,000	25,000
1	9.3	9.8	10.1	10.3
2	4.7	4.9	5.1	5.2
3	3.1	3.3	3.4	3.4
4	2.3	2.5	2.5	2.6
5	1.9	2.0	2.0	2.1
6	1.6	1.6	1.7	1.7

SECTION 3 - EMERGENCY PROCEDURES

(a) Time of useful consciousness at 25,000 feet is approximately 3 minutes.
(b) If oxygen flow is interrupted as evidenced by the flow indicators or hypoxic indications:
   (1) Install another mask unit.
   (2) Install mask connection in an unused outlet if available.
   (3) If flow is not restored, immediately descend to below 12,500 feet.

In the event an emergency descent becomes necessary, CLOSE the throttles and move the propeller controls full FORWARD. Adjust the mixture control as necessary to attain smooth operation. Extend the landing gear at 130 KIAS and maintain this airspeed.

SECTION 4- NORMAL PROCEDURES

PREFLIGHT

(a) Check oxygen quantity.
(b) Turn on oxygen system and check flow indicators on all masks. All masks are stored in the seat pockets of the front and middle seats.

IN-FLIGHT

(a) Adjust oxygen mask.
(b) Turn on system.
(c) Monitor flow indicators and quantity.

CAUTION

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

SECTION 5 - PERFORMANCE

No changes to the basic performance provided by Section 5 of this Pilot's Operating Handbook are necessary for this supplement.

PILOT'S OPERATING HANDBOOK
AND
FAA APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 2
FOR
AIR CONDITIONING INSTALLATION

This supplement must be attached to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the optional air conditioning system is installed per the Equipment List. The information contained herein supplements or supersedes the information in the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual only in those areas listed herein. For limitations, procedures and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

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VERO BEACH, FLORIDA

DATE OF APPROVAL: JANUARY 23, 1997

SECTION 1 - GENERAL

This supplement supplies information necessary for the operation of the airplane when the optional air conditioning system is installed in accordance with FAA Approved Piper data.

The air conditioning system is a recirculating air system. The major components include an evaporator, condenser, compressor, blower, switches and temperature controls.

The evaporator is located behind the rear baggage compartment. This cools the air used for the air conditioning system.

The condenser is mounted aft of the firewall on the left engine. A retractable condenser scoop extends when the air conditioner is ON and retracts to a flush position when the air conditioner is OFF.

If the air conditioner is operated on the ground, the condenser scoop operates to a ground opening position which is larger than the in-flight opening. A circuit through the squat switch on the right main gear prevents the scoop from operating to the ground opening when the aircraft is in flight.

The compressor is mounted on the rear outboard side of the left engine. It has an electric clutch which automatically engages or disengages the compressor.

Air from the baggage area is drawn through the evaporator by the blower and distributed through an overhead duct to individual outlets located adjacent to each occupant.

The switches and temperature control are located on the lower right side of the instrument panel. The temperature control regulates the temperature of the cabin. Turning the control clockwise increases cooling; counterclockwise decreases cooling.

The fan speed switch and the air conditioning ON-OFF switch are below the temperature control. The fan can be operated independently of the air conditioning; however, the fan must be ON for air conditioner operation. Turning either switch OFF will disengage the compressor clutch and retract the condenser door. Cooling air should be felt within one minute after the air conditioner is turned on.

NOTE

If the system is not operating in 5 minutes, turn the system OFF until the fault is corrected.

The fan switch allows operation of the fan with the air conditioner turned OFF to aid in cabin air circulation. LOW or HIGH can be selected to direct a flow of air through the air conditioner outlets in the overhead duct. These outlets can be adjusted or turned off individually.

The condenser door light (Air Cond Door Open) is located in the annunciator panel and illuminates when the door is open and extinguishes when the door is closed.

A circuit breaker on the circuit breaker panel protects the aircraft electrical system.

SECTION 2- LIMITATIONS

(a) To ensure maximum climb performance the air conditioner must be turned OFF manually prior to takeoff to disengage the compressor and retract the condenser door. Also the air conditioner must be turned OFF manually before the landing approach in preparation for a possible go-around.

(b) Placards
In full view of the pilot, in the area of the air conditioner controls when the air conditioner is installed:

WARNING

AIR CONDITIONER MUST BE OFF PRIOR TO TAKEOFF AND LANDING AND ONE ENGINE INOPERATIVE OPERATIONS.

SECTION 3- EMERGENCY PROCEDURES

No changes to the basic Emergency Procedures provided by Section 3 of this Pilot's Operating Handbook are necessary for this supplement.

SECTION 4 - NORMAL PROCEDURES

Prior to takeoff, the air conditioner should be checked for proper operation as follows:

(a) Check aircraft battery switch ON.

(b) Turn the air conditioner control switch to ON and the fan switch to one of the operating positions - the AIR COND DOOR OPEN annunciator light will illuminate, thereby indicating proper air conditioner condenser door actuation.

(c) Turn the air conditioner control switch to OFF - the AIR COND DOOR OPEN annunciator warning light will go out, thereby indicating the air conditioner door is in the retracted position.

(d) If the AIR COND DOOR OPEN annunciator light does not respond as specified above an air conditioner system or indicator bulb malfunction is indicated and further investigation should be conducted prior to flight.

The above operational check may be performed during flight if an inflight failure is suspected.

The condenser door light is located in the right annunciator cluster panel and illuminates when the door is open and extinguishes when the door is closed.

SECTION 5 - PERFORMANCE

Operation of the air conditioner will cause slight decreases in cruise speed and range. Power from the engine is required to run the compressor, and the condenser door, when extended, causes a slight increase in drag. When the air conditioner is turned OFF there is normally no measurable difference in climb, cruise or range performance of the airplane.

NOTE

To ensure maximum climb performance the air conditioner must be turned OFF manually before takeoff to disengage the compressor and retract the condenser door. Also the air conditioner must be turned OFF manually before the landing approach in preparation for a possible go-around. The air conditioner must be OFF during all one engine inoperative operations.

Although the cruise speed and range are only slightly affected by the air conditioner operation, these changes should be considered in preflight planning. To be conservative, the following figures assume that the compressor is operating continuously while the airplane is airborne. This will be the case only in extremely hot weather.

(a) The decrease in true airspeed is approximately 4 KTS at all power settings.
(b) The decrease in range may be as much as 25 nautical miles for the 93 gallon capacity.
(c) The decrease in range may be as much as 35 nautical miles for the 122 gallon capacity.

Climb performance is affected by the air conditioner operation. A decrease in the rate of climb of as much as 80 fpm can be expected at all altitudes with the air conditioner operating.

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PILOT'S OPERATING HANDBOOK
AND
FAA APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 3
FOR
ICE PROTECTION SYSTEM INSTALLATION

This supplement must be attached to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the optional ice protection system is installed per the Equipment List. The information contained herein supplements or supersedes the information in the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual only in those areas listed herein. For limitations, procedures and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

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DATE OF APPROVAL: JANUARY 23, 1997

SECTION 1 - GENERAL

This supplement supplies information necessary for the operation of the airplane when the optional Ice Protection System is installed in accordance with FAA Approved Piper data.

For flight into known icing conditions, a complete ice protection system (Figure 9-1) is required on the SENECA V.

SECTION 2 - LIMITATIONS

(a) The ice protection system was designed and tested for operation in the meteorological conditions of 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 and/or mixed conditions or for icing conditions more severe than those of FAR 25, Appendix C. Therefore, flight in those conditions may exceed the capabilities of the ice protection system.**

(b) Equipment required for flight into known or forecast icing:
 (1) Pneumatic wing and empennage boots and SURF DEICE annunciation.
 (2) Wing ice detection light.
 (3) Electrothermal propeller deice pads on the propeller blades.
 (4) Electrically heated windshield and WSHLD HEAT annunciation.
 (5) Heated lift detector.
 (6) Heated pitot head.
 (7) 2 Operating alternators.
 (8) 2 Operating vacuum pumps.
 (9) Alternate static source.
 (10) All equipment required for night IFR flight.

(c) If all the equipment listed is not installed and operative, the following placard must be installed in full view of the pilot.

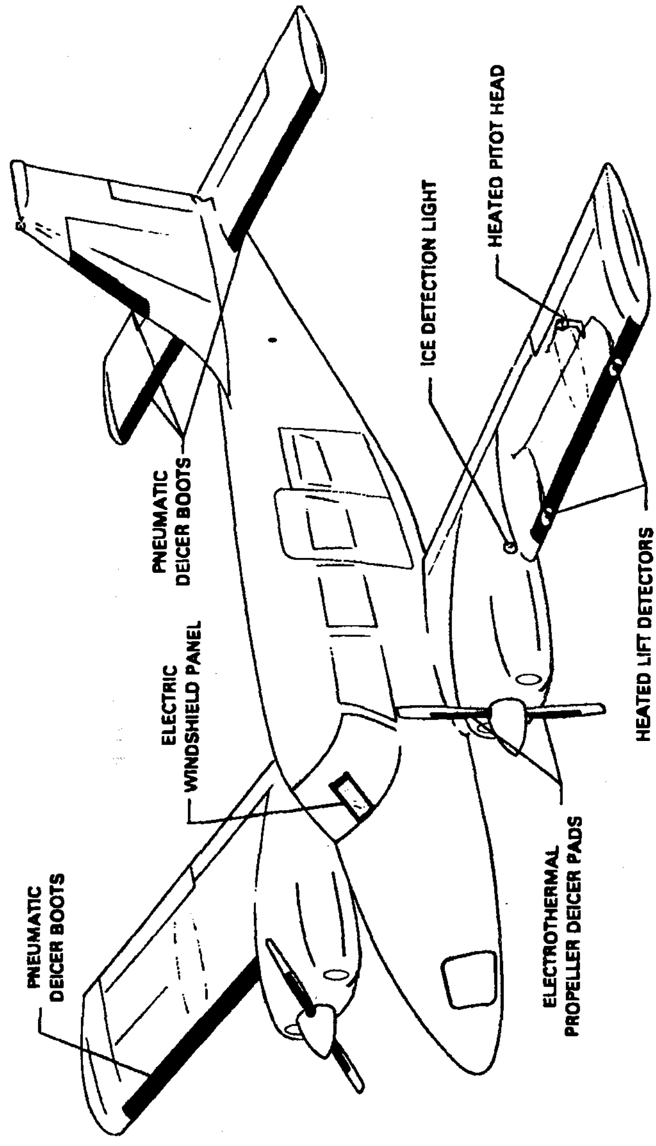
WARNING

THIS AIRCRAFT IS NOT APPROVED FOR FLIGHT IN ICING CONDITIONS.

PLACARDS

On instrument panel in full view of the pilot:
(S/N 3449105, 3449134, 3449140 thru 3449146, 3449150 thru 3449158, 3449161 thru 3449174, unless Piper Service Bulletin 1043 has been complied with)

FLIGHT INTO KNOWN ICING
ABOVE 20,000 FT. MSL
NOT APPROVED


PNEUMATIC DEICER BOOTS
ELECTRIC WINDSHIELD PANEL
PNEUMATIC DEICER BOOTS
ICE DETECTION LIGHT
HEATED PITOT HEAD
HEATED LIFT DETECTORS
ELECTROTHERMAL PROPELLER DEICER PADS

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.

ENGINE FAILURE IN ICING CONDITIONS

Select alternate air and attempt restart.

If unable to restart engine:

Inoperative Propeller ....FEATHER
Airspeed ....at or above 88 KIAS
Descend if necessary to maintain airspeed.

Electrical Load ....REDUCE
Avoid further icing conditions if possible.

Land as soon as practical.

Maintain at least 89 KIAS on final.

Do not extend gear or lower flaps until certain of making field.
Flaps ....25°

ALTERNATOR FAILURE IN ICING CONDITIONS

(Left or Right Alternator Inop. annunciator light illuminated)

NOTE

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

Verify failure....................CHECK AMMETER
Electrical load (if Low Bus Voltage
annunciator illuminated)....................Reduce until load is less than
85 amps & LOW BUS VOLTAGE
annunciator extinguished.
Failed ALTR switch....................OFF
Failed ALTR circuit breaker....................CHECK and RESET
as required
Failed ALTR switch (after OFF at
least one second)....................ON

If power not restored:
Failed ALTR switch....................OFF
Ammeter....................Monitor and maintain
below 85 amps

While one alternator will supply sufficient current for minimum required avionics and cockpit lighting, use of deicing equipment, particularly windshield or propeller heat, may be limited. Immediate action should be taken to avoid or exit icing conditions. Under no circumstances may the total electrical load exceed 85 amps. The electric cabin heater, cabin recirculation blowers, and position, strobe, and landing lights should not be used unless absolutely necessary.

SECTION 3 - EMERGENCY PROCEDURES (CONT'D)

SINGLE VACUUM PUMP FAILURE IN ICING CONDITIONS

(Left or Right Vacuum Inop. light illuminated - annunciator panel)

Gyro Suction Gauge................................Check (within normal operating range).

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

PROPELLER HEAT SYSTEM MALFUNCTION

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

Propeller control ....exercise
Propeller heat ammeter ....check for proper indications:
(a) ON (needle in green arc) for approx. 90 seconds
(b) OFF for approx. 90 seconds

A reading below the green arc during the ON cycle 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.

SURFACE DEICE MALFUNCTION

If SURFACE DE-ICE annunciator light remains illuminated more than 30 seconds, pull the surface deice circuit breaker. Immediate action should be taken to exit icing conditions.

SECTION 4- NORMAL PROCEDURES

The Piper SENECA V is approved for flight into known icing conditions when equipped with the complete Piper Ice Protection System. Operating in icing conditions of the 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.

Therefore, on the basis of flight tests, the following guidelines should be observed.

(a) **Flight into severe icing is not approved.**

(b) **Freezing rain must always be avoided.**

(c) Moderate icing conditions above 10,000 ft. should be avoided whenever possible; if moderate icing conditions are encountered above 10,000 ft., a descent to a lower altitude should be initiated if practical.

(d) Operation in light icing is approved at all altitudes.

Icing conditions of any kind should be avoided whenever possible, since any minor malfunction which may occur is potentially more serious in icing conditions.

WARNING

Do not cycle pneumatic boots with less than 1/4 inch of ice accumulation; operation of boots with less than 1/4 inch ice accumulation can result in failure to remove ice.

Do not hold momentary surface deice switch ON.

Continuous attention of the pilot is required to monitor the rate of ice build-up in order to effect the boot cycle at the optimum time. Boots should be cycled when ice has built to between 1/4 and 1/2 inch thickness on the leading edge to assure proper ice removal. Repeated boot cycles at less than 1/4 inch can cause a cavity to form under the ice and prevent ice removal, boot cycles at thicknesses greater than 1/2 inch may also fail to remove ice.

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 have high water content and should be avoided whenever possible. **Freezing rain must always be avoided.**

NOTE

Pneumatic boots must be cleaned regularly for proper operation in icing conditions. 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 should be functionally checked for proper operation. Before entering probable icing conditions use the following procedures:

(a) Windshield defroster - ON (immediately)
(b) Pitot heat - ON (immediately)
(c) Windshield heat ON (immediately)
(d) Propeller deice - ON (when entering icing conditions)
(e) Wing deice - ON (after 1/4 to 1/2 inch accumulation)
(f) Relieve propeller unbalance (if required) by increasing RPM briefly. Repeat as required.

Heat for the lift detectors is activated by the pitot heat switch.

When ice has accumulated on the unprotected surfaces of the airplane, aerodynamic buffet commences between 5 and 10 knots above the stall speed. A substantial margin of airspeed should be maintained above the normal stall speed, since the stall speed may increase by up to 10 knots in prolonged icing encounters. Allow for increased landing distance due to higher approach speeds.

SECTION 4- NORMAL PROCEDURES (Continued)

If ice is remaining on the unprotected surfaces of the airplane at the termination of the flight, the landing should be made using full flaps and carrying a slight amount of power whenever practical, and approach speeds should be increased by 10 to 15 knots.

Cruise speed may be significantly reduced in prolonged icing encounters. If icing conditions are encountered at altitudes above 10,000 feet, it may be necessary to descend in order to maintain airspeed above the best rate of climb speed (88 KIAS).

NOTE

Pneumatic boots must be regularly cleaned and waxed for proper operation in icing conditions. Pitot, windshield and lift detector heat should be checked on the ground before dispatch into icing conditions.

SECTION 5- PERFORMANCE

WARNING

Ice accumulation of the unprotected surfaces can result in significant performance loss.

Installation of ice protection equipment results in a 30 F. P. M. decrease in single engine climb performance and a reduction of 850 feet in single engine service ceiling.

All other performance is unchanged.

SECTION 6 - WEIGHT AND BALANCE

Factory installed optional equipment is included in the licensed weight and balance data in Section 6 of the Aircraft Flight Manual.

SECTION 7 - DESCRIPTION AND OPERATION OF THE ICE PROTECTION SYSTEM AND EQUIPMENT

For flight into known icing conditions (FIKI), a complete ice protection system (9-1) is required on the Seneca V.

The complete ice protection system consists of the following components: Pneumatic wing and empennage boots, wing ice detection light, electrothermal propeller deice pads, electrically heated windshield panel, heated lift detectors, heated pitot head. A single component or a combination of components may be installed. However, the warning placard specified in Section 2 of this supplement is required when the complete system is not installed. Such a placard is also required if any component is inoperative.

The aircraft is designed to allow operation in the meteorological conditions of the FAR 25 envelopes for continuous maximum and intermittent maximum icing. **The airplane is not designed to operate for an indefinite period of time in every icing condition encountered in nature.** Activation of the ice protection system prior to entering icing conditions and attempting to minimize the length of the icing encounter will contribute significantly to the ice flying capabilities of the airplane.

Pneumatic Boot Deice System

The pneumatic wing and empennage boots are installed on the leading edges of the wings, the vertical stabilizer and the horizontal stabilator. During normal operation, when the surface deicer system is off, the engine-driven pneumatic pumps apply a constant suction to the deicer boots to provide smooth, streamlined leading edges.

Deicer boots are inflated by a momentary ON type SURFACE DE-ICE switch (Figure 9-3) located on the instrument panel above the control quadrant. Actuation of the surface deice switch activates a system cycle timer that energizes the pneumatic pressure control valves until the system pressure reaches 17 psi or until 6 seconds is reached. The boot solenoid valves are activated and air pressure is released to the boots, inflating all surface deicers on the airplane.

SECTION 7 - DESCRIPTION AND OPERATION OF THE ICE PROTECTION SYSTEM AND EQUIPMENT (CONT'D)

Pneumatic Boot Deice System (Cont'd)

A green indicator light (Wing/Tail Deice) located in the right annunciator cluster illuminates when the wing-tail deicer surface boots are inflated above 8 psi. When the cycle is complete, the deicer solenoid valves permit automatic overboard exhaustion of pressurized air. Suction is then reapplied to the deicer boots.

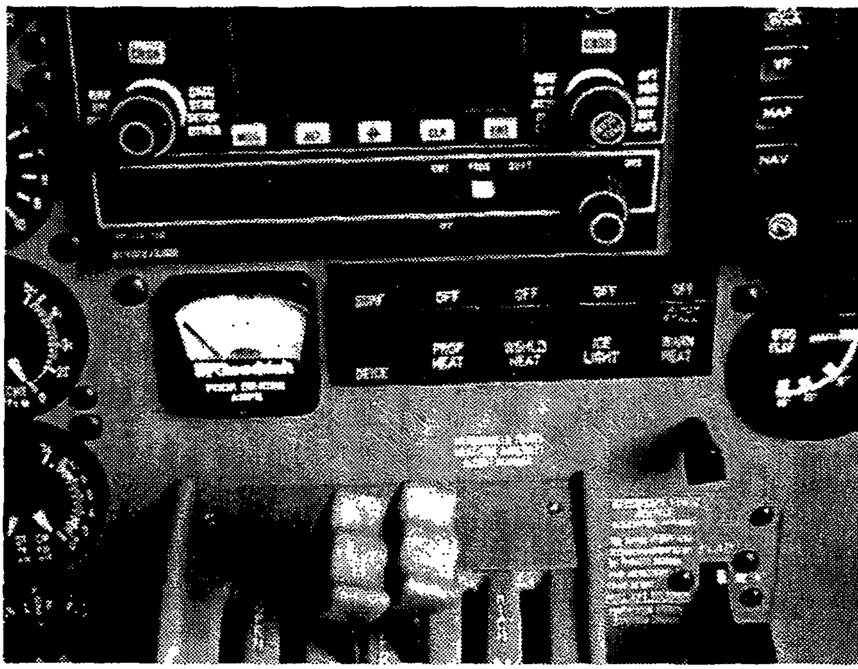
Circuit protection for the surface deicer system is provided by a SURFACE DE-ICE circuit breaker located on the circuit breaker panel.

Wing Ice Detection Light

Wing icing conditions may be detected during night flight by use of an ice detection light installed in the outboard side of the left engine nacelle. The light is controlled by a WING ICE LIGHT switch (Figure 9-3). A WING ICE LIGHT circuit breaker located in the circuit breaker panel provides circuit protection.

Propeller Deice Pad System

Electrothermal propeller deicer pads are bonded to the leading edges of the propeller blades. The system is controlled by an ON-OFF type PROP DE-ICE switch (Figure 9-3). Power for the propeller deicers is supplied by the airplane's electrical system through a PROP DE-ICE circuit breaker in the circuit breaker panel. When the prop deice switch is actuated, power is applied to a timer through the PROP DE-ICER ammeter which monitors the current through the propeller deicing system. With the propeller deicing system on, the prop deicer ammeter needle should indicate within the shaded portion of the ammeter for a normal reading.



ICE DETECTION LIGHT, SURFACE DEICER, PROPELLER DEICER AND HEATED WINDSHIELD CONTROL SWITCHES
Figure 9-3

SECTION 7 - DESCRIPTION AND OPERATION OF THE ICE PROTECTION SYSTEM AND EQUIPMENT (CONT'D)

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 deicer pads.

The McCauley 3-blade propellers and Hartzell two blade propellers are deiced by heating the entire deicer pads alternately in the following sequence:

(a) The entire deicer pads on the right engine for 90 seconds.

(b) The entire deicer pads on the left engine for 90 seconds.

When the system is turned ON, heating may begin on any one of the above steps, depending upon the positioning of the timer switch when the system was turned OFF from previous use. Once begun, cycling will proceed in the above sequence and will continue until the system is turned off.

A preflight check of the propeller deicers can be performed by turning the prop deice switch on and feeling the propeller deicer pads for proper heating sequence. The deicer pad should become warm to the touch.

The heat provided by the deicer pads reduces the adhesion between the ice and the propeller so that centrifugal force and the blast of airstream cause the ice to be thrown off the propeller blades in very small pieces.

Heated Windshield Panel

A heated glass panel is installed on the exterior of the pilot's windshield to provide visibility in icing conditions. The panel is heated by current from the airplane's electrical power supply and controlled by an ON-OFF control switch. The control switch is located below the left avionics stack and is placarded WINDSHIELD PANEL HEAT - SEE AIRCRAFT FLIGHT MANUAL.

SECTION 7 - DESCRIPTION AND OPERATION OF THE ICE PROTECTION SYSTEM AND EQUIPMENT (CONT'D)

CAUTION

If the airplane is to be flown with the heated glass panel removed, rotate the receptacle plate 180° and replace it to cover the holes in the fuselage skin. Also replace the windshield collar screws.

An operational check may be performed by turning the heated windshield panel switch on for a period not exceeding 30 seconds. Proper operation is indicated by the glass section being warm to the touch.

Heated Lift Detectors and Heated Pitot Head

Two heated lift detectors and a heated pitot head installed on the left wing are controlled by a single ON-OFF type PITOT HEAT switch located below the left avionics stack.

The heated lift detectors, one inboard and one outboard on the left wing, are installed to prevent icing conditions from interfering with operation of the stall warning transmitters. A Stall Warn circuit breaker in the circuit breaker panel protects the system against an overvoltage condition. The stall warning system should not be depended on when there is ice on the wing.

A heated pitot head, mounted under the left wing, is installed to provide heat to alleviate ice accumulation from blocking the pressure intake. The heated pitot head also has a separate circuit breaker located in the circuit breaker panel labeled Pitot Heat.

CAUTION

Care should be taken when an operational check of the heated pitot head and the heated lift detectors is being performed. Both units become very hot. Ground operation should be limited to 3 minutes maximum to avoid damaging the heating elements.

With the PITOT HEAT switch ON, check the heated pitot head and heated lift detector for proper heating.

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PILOT'S OPERATING HANDBOOK
AND
FAA APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 4
FOR
PROPELLER SYNCHROPHASER INSTALLATION

This supplement must be attached to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the optional propeller synchrophaser is installed per the Equipment List. The information contained herein supplements or supersedes the information in the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual only in those areas listed herein. For limitations, procedures and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

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DATE OF APPROVAL: JANUARY 23, 1997

SECTION I - GENERAL

This supplement supplies information necessary for the operation of the airplane when the optional propeller synchrophaser is installed in accordance with FAA Approved Piper data.

The function of the synchrophaser is to maintain both propellers at the same RPM and at a selected phase angle. This eliminates the propeller beat effect and minimizes vibration.

When the propeller synchrophaser is installed, the left engine is established as the master engine, and the right engine is equipped with a slave governor which automatically maintains its RPM with the left engine RPM.

When the propeller synchrophaser is installed, a three-position switch is located on the throttle quadrant below the propeller controls. It is labeled OFF for manual control and 1 or 2 for propeller synchrophaser. A blue press-to-test light is located below the switch and illuminates when the propellers are out of synchronization.

SECTION 2- LIMITATIONS

Placards:
On the throttle quadrant below engine and propeller controls:

> USE OFF POSITION FOR TAKEOFF, LANDING AND SINGLE ENGINE OPERATIONS.

SECTION 3- EMERGENCY PROCEDURES

The propeller synchrophaser must be in the OFF position for all single engine operations.

SECTION 4- NORMAL PROCEDURES

During taxi, takeoff, landing or single engine operations the propeller synchrophaser switch should be in the OFF position. The blue press-to-test light below the switch will illuminate while the propellers are out of synchronization, whether the switch is in the OFF, 1, or 2 position.

When the switch is in the OFF position the propellers can be synchronized manually and the light will go out when propeller synchronization is complete.

For automatic synchronization, the propellers should be synchronized manually to within approximately 10 RPM and the switch placed in the 1 position. The blue light will go out when synchronization is complete. For a given RPM and power setting, switch position 2 may provide smoother operation by means of providing a different phase angle. Set the switch to position 1 or 2, whichever provides the smoothest operation. Normally, propeller synchrophasing will take place within a few seconds, but occasionally it may take up to a full minute.

When the power setting is to be changed, the synchrophaser switch should be set to OFF for 30 seconds before the power setting is adjusted; then the synchrophaser switch may be returned to the 1 or 2 position, whichever provides the smoothest operation. If the propeller RPM differential exceeds 50 RPM, the switch should be set at OFF for 30 to 40 seconds; then the propellers can be synchronized again and the synchrophaser switch returned to 1 or 2.

Pulling the circuit breakers completely deactivates the propeller synchrophaser system. If the master switch is turned OFF or if there is an electrical system failure, the slave engine will return to the controlled selected RPM plus approximately 25 RPM out of synchronization regardless of the position of the synchrophaser switch.

SECTION 5- PERFORMANCE

No changes to the basic performance provided by Section 5 of this Pilot's Operating Handbook are necessary for this supplement.

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PILOT'S OPERATING HANDBOOK
AND
FAA APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 6
FOR
BENDIX/KING RDR 2000 VERTICAL PROFILE
WEATHER RADAR SYSTEM

This supplement must be attached to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the optional Bendix/King RDR 2000 Vertical Profile Weather Radar System is installed per the Equipment List. The information contained herein supplements or supersedes the information in the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual only in those areas listed herein. For limitations, procedures, and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

FAA APPROVED

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DATE OF APPROVAL JANUARY 23, 1997

SECTION 1 - GENERAL

This supplement supplies information necessary for the operation of the airplane when the optional Bendix/King RDR 2000 Vertical Profile Weather Radar System is installed in accordance with FAA Approved Piper data.

SECTION 2 - LIMITATIONS

Do not operate the radar during refueling operations or within 15 feet of trucks or containers accommodating flammables or explosives. Do not allow personnel within 15 feet of area being scanned by antenna when system is transmitting.

SECTION 3 - EMERGENCY PROCEDURES

No changes to the basic Emergency Procedures provided by Section 3 of this Pilot's Operating Handbook are necessary for this supplement.

SECTION 4 - NORMAL PROCEDURES

WARNING

Do not operate the radar during refueling operations or within 15 feet of trucks or containers accommodating flammables or explosives. Do not allow personnel within 15 feet of area being scanned by antenna when system is transmitting.

NOTE

At altitudes above 4,500 feet AGL when the range is set to 2.5 miles, a small sector of return may be observed as an arc at approximately 1.5 miles on the weather display. This is ground reflection which will diminish with increasing range. This anomaly is not significant and does not effect the operation or display of weather radar.

Preflight and normal operating procedures are outlined in the Bendix/King RDR 2000 Vertical Profile Weather Radar System Pilot's Guide, P/N 006-08755-0000, latest revision.

SECTION 5 - PERFORMANCE

No change to the aircraft Performance provided by Section 5 of this Pilot's Operating Handbook are necessary for this supplement.

SECTION 6 - WEIGHT AND BALANCE

Factory installed optional equipment is included in the licensed weight and balance data in Section 6 of the basic Pilot's Operating Handbook.

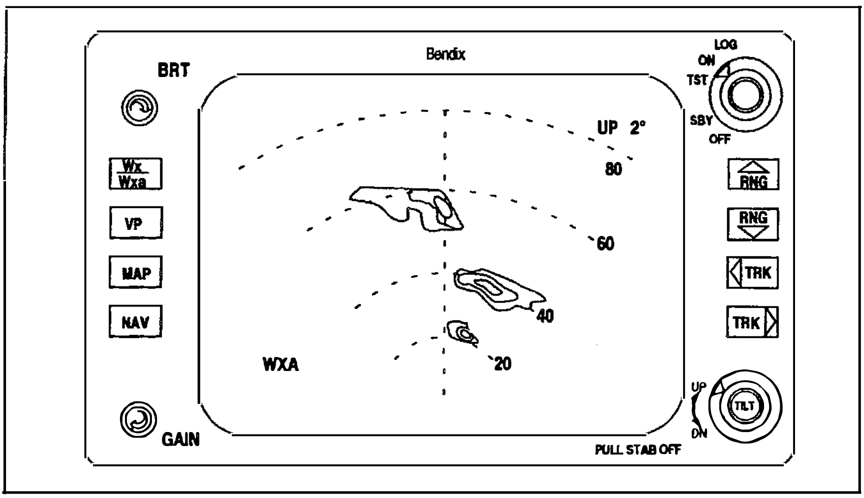
SECTION 7 - DESCRIPTION AND OPERATION

The RDR 2000 Vertical Profile Weather Radar system consists of the:

a. RS 181A sensor which combines the system components of antenna, receiver, and transmitter.
b. The IN 182A indicator which incorporates all the operational controls.

The system's antenna is installed inside the nose of the aircraft.

OPERATION AND CONTROLS



RDR 2000 CONTROLS AND INDICATOR
Figure 7-1

Operation and Controls (cont.)

CONTROL/ DISPLAY	FUNCTION
BRT Control	Adjusts brightness of the display for varying cockpit light conditions.
Wx/Wxa Button	When pressed, alternately selects between the Wx (weather) and Wxa (weather alert) modes of operation. Wx or Wxa will appear in the lower left of the display. Areas of high rainfall appear in magenta color. When the Wxa mode is selected, magenta areas of storms flash between magenta and black.
VP Button	When pressed, selects and deselects the vertical profile mode of operation. Selecting the VP mode of operation (see Figure 7-3) will not change the selected mode of operation: TST, Wx, Wxa, or MAP. Once in VP, these modes may be changed as desired. VP will engage from the MAP mode but NAV will be disabled during VP operation.
MAP Button	When pressed places indicator in ground-mapping mode. Selecting ground-mapping (MAP) will disable the weather-alert feature and will activate the gain control. The magenta color is not activated while in the ground-mapping (MAP) mode.
NAV Button	When pressed, places indicator in navigation mode so that preprogrammed waypoints may be displayed. If other modes are also selected, the NAV display will be superimposed on them. This button is effective only if an optional radar graphics unit and flight management system is installed. If actuated without these units, NO NAV will appear at lower left screen. The radar is still capable of displaying weather.

OPERATION AND CONTROLS (CONT.)

CONTROL/ DISPLAY	FUNCTION
GAIN Control Knob	Manual gain control becomes active ***only*** when ground-mapping (MAP) is selected. Gain is internally set in ***all other*** modes.
Radar Function Selector Switch	1. **LOG** position is used only when the Bendix/King IU 2023 series radar graphics unit is installed along with a compatible long range navigation system, a listing of the latitudes and longitudes of selected waypoints will be displayed. If a compatible RNAV is used, selected VOR frequencies, along with bearings and distances to waypoints, will be presented. No radar transmission occurs in this mode.
	2. **ON** position selects the condition of normal operation, allowing for weather detection or other modes of operation. Radar transmission exists in the ON position.
	3. **TST** position will display the test pattern on the indicator (see Figure 7-5); no transmission occurs.The antenna will scan while in the test (TST) mode.
	4. **SBY** position places system in the standby condition during warm-up and when the system is not in use. After 30 seconds in this mode during warm-up, the system is in a state of readiness. No radar transmissions occurs; the antenna is parked in the down position. STBY is displayed in the lower left of the display.

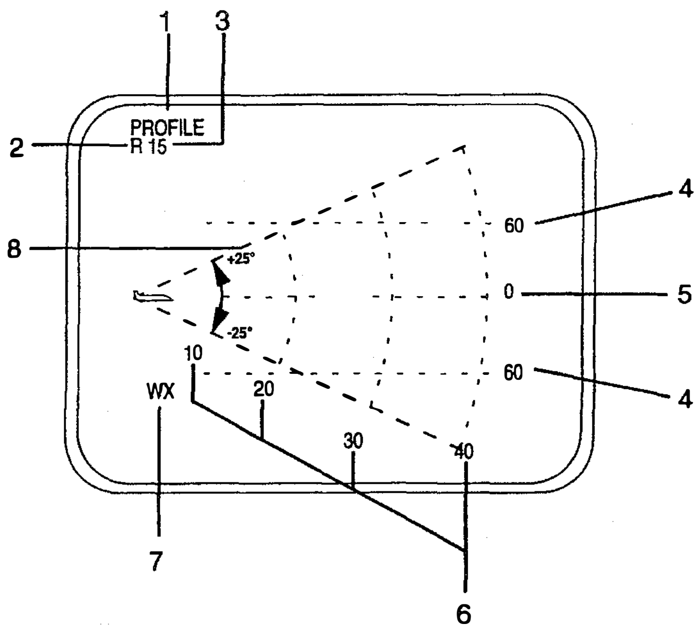
OPERATION AND CONTROLS (CONT.)

CONTROL/ DISPLAY	FUNCTION
Radar Function Selector Switch (cont.)	5. **OFF** position removes primary power from the radar indicator and the sensor. The antenna is parked in the down position.
RNG ▲ Selector Button	When pressed clears the display and advances the indicator to the next higher range. Selected range is displayed in upper right corner of the last range mark (Figure 7-1) and distance to other range rings is displayed along the right edge.
RNG ▼ Selector Button	When pressed clears the display and decreases the indicator to the next lower range. Selected range is displayed in upper right corner of the last range mark (Figure 7-1) and distance to other range rings is displayed along the right edge.
TRK ▷ and ◁ TRK Buttons	When pressed provides a yellow azimuth line and a digital display of the azimuth line placement left or right from the nose of the aircraft. For vertical profile (VP) operations, the track button performs two functions:

OPERATION AND CONTROLS (CONT.)

CONTROL/ DISPLAY	FUNCTION
	1. Prior to engaging VP, the appropriate button (left or right) is used to place the track line at the desired azimuth angle to be vertically scanned (sliced). When VP is engaged, the slice will be taken at the last position of the track line, whether it is visible or not. If the track line has not been selected after power has been applied to system and VP is engaged, the slice will be taken at 0 degrees (directly in front of the aircraft). 2. Continuously holding the TRK button will result in the system slicing in two-degree increments.
Antenna **TILT** Adjustment Knob	Permits manual adjustment of antenna tilt to a maximum of 15° up or down in order to obtain the best indicator presentation. The tilt angle is displayed in the upper right corner of the display. Depending upon the MOD status of the indicator, tilt read out may display in tenth degree.

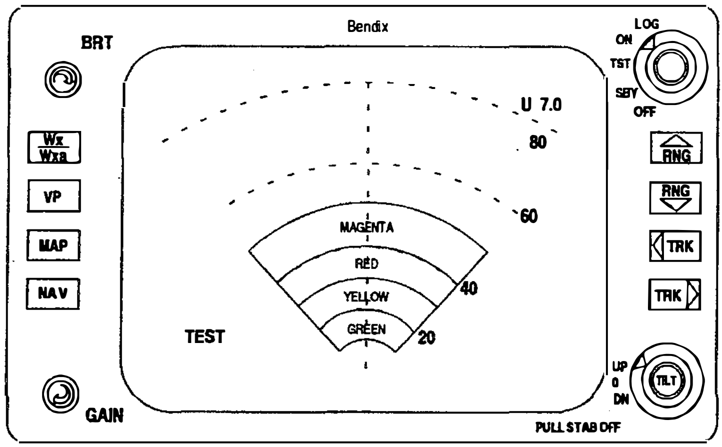
OPERATION AND CONTROLS (CONT.)



VERTICAL PROFILE MODE (RDR 2000)
Figure 7-3

1. Vertical PROFILE mode annunciation
2. Left or right track annunciation.
3. Degrees of track left or right of aircraft nose.
4. Displays plus and minus thousands of feet from relative altitude. Will vary with selected range.
5. Relative altitude reference line.
6. Range rings.
7. Selected weather mode (Wx or Wxa).
8. Vertical profile scan angle of 50°.

OPERATION AND CONTROLS (CONT.)



TEST PATTERN
Figure 7-5

Complete and detailed description on the function and use of the various controls and displays are outlined in the Bendix/King RDR 2000 Vertical Profile Weather Radar System Pilot's Guide, P/N 006-08755-0000, latest revision.

PILOT'S OPERATING HANDBOOK
AND
FAA APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 12
FOR
GARMIN GNS 430 VHF COMMUNICATION TRANSCEIVER/VOR/ILS RECEIVER/GPS RECEIVER
WITH
TRAFFIC ADVISORY & LIGHTNING STRIKE ADVISORY DATA

This supplement must be attached to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the Garmin GNS 430 VHF Communication Transceiver/VOR/ILS Receiver/GPS Receiver with Traffic Advisory & Lightning Strike Advisory Data 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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SECTION 1 - GENERAL

The GNS 430 System is a fully integrated, panel mounted instrument, which contains a VHF Communications Transceiver, a VOR/ILS Receiver, and a Global Positioning System (GPS) Navigation computer. The system consists of a GPS Antenna, GPS Receiver, VHF VOR/LOC/GS Antenna, VOR/ILS Receiver, VHF COMM Antenna and a VHF Communications Transceiver. The primary function of the VHF Communication portion of the equipment is to facilitate communication with Air Traffic Control. The primary function of the VOR/ILS Receiver portion of the equipment is to receive and demodulate VOR, Localizer, and Glide Slope signals. The primary function of the GPS portion of the system is to acquire signals from the GPS system satellites, recover orbital data, make range and Doppler measurements, and process this information in real- time to obtain the user's position, velocity, and time.

Provided the GARMIN GNS 430's GPS receiver is receiving adequate usable signals, it has been demonstrated capable of and has been shown to meet the accuracy specifications for:

- VFR/IFR enroute, terminal, and non-precision instrument approach (GPS, Loran-C, VOR, VOR-DME, TACAN, NDB, NDB- DME, RNAV) operation within the U.S. National Airspace System in accordance with AC 20-138.

- One of the approved sensors, for a single or dual GNS 430 installation, for North Atlantic Minimum Navigation Performance Specification (MNPS) Airspace in accordance with AC 91-49 and AC 120- 33.

- The system meets RNP5 airspace (BRNAV) requirements of AC 90-96 and in accordance with AC 20-138, and JAA AMJ 20X2 Leaflet 2 Revision 1, provided it is receiving usable navigation information from the GPS receiver.

NOTE

Navigation is accomplished using the WGS-84 (NAD-83) coordinate reference datum. Navigation data is based upon use of only the Global Positioning System (GPS) operated by the United States of America.

SECTION 2 - LIMITATIONS

A. The GARMIN GNS 430 Pilot's Guide, p/n 190-00140-00, Rev. A, dated October 1998, or later appropriate revision, must be immediately available to the flight crew whenever navigation is predicated on the use of the system.

The Garmin 400 Series Pilot's Guide Addendum, p/n 190-00140-10, Rev. A, dated October 1999, Display Interface for Traffic and Weather Data, must be immediately available to the flight crew if the BF Goodrich WX-500 Stormscope or the BF Goodrich SKYWATCH Traffic Advisory System (TAS) is installed.

B. The GNS 430 must utilize the following or later FAA approved software versions:

Sub-System	Software Version
Main	2.00
GPS	2.00
Comm	1.22
VOR/LOC	1.25
G/S	2.00

The main software version is displayed on the GNS 430 self test page immediately after turn-on for 5 seconds. The remaining system software versions can be verified on the AUX group sub-page 2, "SOFTWARE/DATABASE VER".

SECTION 2 - LIMITATIONS (continued)

C. IFR enroute and terminal navigation predicated upon the GNS 430's GPS Receiver is prohibited unless the pilot verifies the currency of the data base or verifies each selected waypoint for accuracy by reference to current approved data.

D. Instrument approach navigation predicated upon the GNS 430's GPS Receiver must be accomplished in accordance with approved instrument approach procedures that are retrieved from the GPS equipment data base. The GPS equipment data base must incorporate the current update cycle.

E. Instrument approaches utilizing the GPS receiver must be conducted in the approach mode and Receiver Autonomous Integrity Monitoring (RAIM) must be available at the Final Approach Fix.

F. Accomplishment of ILS, LOC, LOC-BC, LDA, SDF, MLS or any other type of approach not approved for GPS overlay with the GNS 430's GPS receiver is not authorized.

G. Use of the GNS 430 VOR/ILS receiver to fly approaches not approved for GPS require VOR/ILS navigation data to be present on the external indicator.

H. When an alternate airport is required by the applicable operating rules, it must be served by an approach based on other than GPS or Loran-C navigation, the aircraft must have the operational equipment capable of using that navigation aid, and the required navigation aid must be operational.

I. VNAV information may be utilized for advisory information only. Use of VNAV information for Instrument Approach Procedures does not guarantee Step-Down Fix altitude protection, or arrival at approach minimums in normal position to land.

SECTION 2 - LIMITATIONS (continued)

J. If not previously defined, the following default settings must be made in the "SETUP 1" menu of the GNS 430 prior to operation (refer to Pilot's Guide for procedure if necessary):

1. dis, spd.........nm kt (sets navigation units to "nautical miles" and "knots")
2. alt, vs...........ft fpm (sets altitude units to "feet" and "feet per minute")
3. map datum...WGS 84 (sets map datum to WGS-84, see not below)
4. posn.............deg-min (sets navigation grid units to decimal minutes)

NOTE

In some areas outside the United States, datums other than WGS-84 or NAD-83 may be used. If the GNS 430 is authorized for use by the appropriate Airworthiness authority, the required geodetic datum must be set in the GNS 430 prior to its use for navigation.

SECTION 3 - EMERGENCY PROCEDURES

ABNORMAL PROCEDURES

A. If GARMIN GNS 430 navigation information is not available or invalid, utilize remaining operational navigation equipment as required.

B. If "RAIM POSITION WARNING" message is displayed the system will flag and no longer provide GPS based navigational guidance. The crew should revert to the GNS 430 VOR/ILS receiver or an alternate means of navigation other than the GNS 430's GPS receiver.

C. If "RAIM IS NOT AVAILABLE" message is displayed in the enroute, terminal, or initial approach phase of flight, continue to navigate using the GPS equipment or revert to an alternate means of navigation other than the GNS 430's GPS receiver appropriate to the route and phase of flight. When continuing to use GPS navigation, position must be verified every 15 minutes using the GNS 430's VOR/ILS receiver or another IFR-approved navigation system.

D. If "RAIM IS NOT AVAILABLE" message is displayed while on the final approach segment, GPS based navigation will continue for up to 5 minutes with approach CDI sensitivity (0.3 nautical mile). After 5 minutes the system will flag and no longer provide course guidance with approach sensitivity. Missed approach course guidance may still be available with 1 nautical mile CDI sensitivity by executing the missed approach.

E. In an in-flight emergency, depressing and holding the Comm transfer button for 2 seconds will select the emergency frequency of 121.500 Mhz into the "Active" frequency window.

SECTION 4 - NORMAL PROCEDURES

CAUTION

Familiarity with the enroute operation of the GNS 430 does not constitute proficiency in approach operations. Do not attempt approach operations in IMC prior to attaining proficiency in the use of the GNS 430 approach feature.

A. DETAILED OPERATING PROCEDURES

Normal operating procedures are described in the GARMIN GNS 430 Pilot's Guide, p/n 190-00140-00, Rev. A, dated October 1998, or later appropriate revision.

B. PILOT'S DISPLAY

The GNS 430 System data will appear on the Nav No. 2 Indicator. The source of data is either GPS or VLOC as annunciated on the display above the CDI key.

C. CROSSFILL OPERATIONS

Crossfill capabilities exist between the GNS 430 and GNS 530 systems. Refer to the Garmin GNS 430 Pilot's Guide for detailed crossfill operating instructions.

D. AUTOMATIC LOCALIZER COURSE CAPTURE

By default, the GNS 430 automatic localizer course capture feature is enabled. This feature provides a method for system navigation data present on the external indicator to be switched automatically from GPS guidance to localizer/glide slope guidance at the point of course intercept on a localizer at which GPS derived course deviation equals localizer derived course deviation. If an offset from the final approach course is being flown, it is possible that the automatic switch from GPS course guidance to localizer/glide slope course guidance will not occur. It is the pilot's responsibility to ensure correct system navigation data is present on the external indicator before continuing a localizer based approach beyond the final approach fix.

SECTION 4 - NORMAL PROCEDURES (continued)

E. DISPLAY OF LIGHTNING STRIKE DATA

Lightning strike data detected by the BF Goodrich WX-500 Stormscope will appear on the moving map and weather pages of the GNS 430. For detailed operating instructions regarding the interface of the GNS 430 with the WX-500, refer to the WX-500 Pilot's Guide and the GNS 430 Pilot's Guide Addendum for the WX-500 Stormscope interface.

F. DISPLAY OF TRAFFIC ADVISORY DATA

Traffic data detected by the BF Goodrich SKYWATCH™ Traffic Advisory System (TAS) will appear on the moving map and traffic display pages of the GNS 430. For detailed operating instructions regarding the interface of the GNS 430 with the SKYWATCH, refer to the FAA approved Flight Manual Supplement for the SKYWATCH, the Pilot's Guide for the SKYWATCH and the GNS 430 Pilot's Guide Addendum for the SKYWATCH Traffic Advisory System interface. The Operate/Standby feature is controlled through the Avidyne FlightMax 740.

SECTION 5 - PERFORMANCE

No Change.

SECTION 6 - WEIGHT AND BALANCE

Factory installed optional equipment is included in the licensed weight and balance data in the Equipment List attached to the Pilot's Operating Handbook.

SECTION 7 - DESCRIPTION AND OPERATION

See the GNS 430 Pilot's Guide for a complete description of the GNS 430 system.

PILOT'S OPERATING HANDBOOK
AND
FAA APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 13
FOR
GARMIN GNS 530 VHF COMMUNICATION TRANSCEIVER/VOR/ILS RECEIVER/GPS RECEIVER
WITH
TRAFFIC ADVISORY AND LIGHTNING STRIKE ADVISORY DATA

This supplement must be attached to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the Garmin GNS 530 VHF Communication Transceiver/VOR/ILS Receiver/Global Positioning System is installed per the Equipment List. The information contained herein supplements or supersedes the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual only in those areas listed herein. For limitations, procedures and performance information not contained in this supplement, consult the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

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SECTION 1 - GENERAL

The GNS 530 System is a fully integrated, panel mounted instrument, which contains a VHF Communications Transceiver, a VOR/ILS Receiver, and a Global Positioning System (GPS) Navigation computer. The system consists of a GPS Antenna, GPS Receiver, VHF VOR/LOC/GS Antenna, VOR/ILS Receiver, VHF COMM Antenna and a VHF Communications Transceiver. The primary function of the VHF Communication portion of the equipment is to facilitate communication with Air Traffic Control. The primary function of the VOR/ILS Receiver portion of the equipment is to receive and demodulate VOR, Localizer, and Glide Slope signals. The primary function of the GPS portion of the system is to acquire signals from the GPS system satellites, recover orbital data, make range and Doppler measurements, and process this information in real- time to obtain the user's position, velocity, and time.

Provided the GARMIN GNS 530's GPS receiver is receiving adequate usable signals, it has been demonstrated capable of and has been shown to meet the accuracy specifications for:

- VFR/IFR enroute, terminal, and non-precision instrument approach (GPS, Loran-C, VOR, VOR-DME, TACAN, NDB, NDB- DME, RNAV) operation within the U.S. National Airspace System in accordance with AC 20-138.
- One of the approved sensors, for a single or dual GNS 530 installation, for North Atlantic Minimum Navigation Performance Specification (MNPS) Airspace in accordance with AC 91-49 and AC 120- 33.
- The system meets RNP5 airspace (BRNAV) requirements of AC 90-96 and in accordance with AC 20-138, and JAA AMJ 20X2 Leaflet 2 Revision 1, provided it is receiving usable navigation information from the GPS receiver.

NOTE

Navigation is accomplished using the WGS-84 (NAD-83) coordinate reference datum. Navigation data is based upon use of only the Global Positioning System (GPS) operated by the United States of America.

SECTION 2 - LIMITATIONS

A. The GARMIN GNS 530 Pilot's Guide, p/n 190-00181-00, Rev. A, dated November 1999, or later appropriate revision, must be immediately available to the flight crew whenever navigation is predicated on the use of the system.

B. The Garmin 500 Series Pilot's Guide Addendum, Display Interface for Traffic and Weather Data, must be immediately available to the flight crew if the B.F. Goodrich WX-500 Stormscope® or the B.F. Goodrich SKYWATCH™ Traffic Advisory System (TAS) is installed.

C. The GNS 530 must utilize the following or later FAA approved software versions:

Sub-System	Software Version
Main	2.00
GPS	2.00
Comm	1.22
VOR/LOC	1.25
G/S	2.00

The main software version is displayed on the GNS 530 self test page immediately after turn-on for 5 seconds. The remaining system software versions can be verified on the AUX group sub-page 2, "SOFTWARE/DATABASE VER".

D. IFR enroute and terminal navigation predicated upon the GNS 530's GPS Receiver is prohibited unless the pilot verifies the currency of the data base or verifies each selected waypoint for accuracy by reference to current approved data.

E. Instrument approach navigation predicated upon the GNS 530's GPS Receiver must be accomplished in accordance with approved instrument approach procedures that are retrieved from the GPS equipment data base. The GPS equipment data base must incorporate the current update cycle.

1. Instrument approaches utilizing the GPS receiver must be conducted in the approach mode and Receiver Autonomous Integrity Monitoring (RAIM) must be available at the Final Approach Fix.

SECTION 2 - LIMITATIONS (continued)

2. Accomplishment of ILS, LOC, LOC-BC, LDA, SDF, MLS or any other type of approach not approved for GPS overlay with the GNS 530's GPS receiver is not authorized.
3. Use of the GNS 530 VOR/ILS receiver to fly approaches not approved for GPS require VOR/ILS navigation data to be present on the external indicator.
4. When an alternate airport is required by the applicable operating rules, it must be served by an approach based on other than GPS or Loran-C navigation, the aircraft must have the operational equipment capable of using that navigation aid, and the required navigation aid must be operational.
5. VNAV information may be utilized for advisory information only. Use of VNAV information for Instrument Approach Procedures does not guarantee Step-Down Fix altitude protection, or arrival at approach minimums in normal position to land.

F. If not previously defined, the following default settings must be made in the "SETUP 1" menu of the GNS 530 prior to operation (refer to Pilot's Guide for procedure if necessary):

1. dis, spd	nm kt (sets navigation units to "nautical miles" and "knots")
2. alt, vs .	ft fpm (sets altitude units to "feet" and "feet per minute")
3. map datum..	WGS 84 (sets map datum to WGS-84, see not below)
4. posn ...	deg-min (sets navigation grid units to decimal minutes)

NOTE

In some areas outside the United States, datums other than WGS-84 or NAD-83 may be used. If the GNS 530 is authorized for use by the appropriate Airworthiness authority, the required geodetic datum must be set in the GNS 530 prior to its use for navigation.

SECTION 3 - EMERGENCY PROCEDURES

ABNORMAL PROCEDURES

A. If GARMIN GNS 530 navigation information is not available or invalid, utilize remaining operational navigation equipment as required.

B. If "RAIM POSITION WARNING" message is displayed the system will flag and no longer provide GPS based navigational guidance. The crew should revert to the GNS 530 VOR/ILS receiver or an alternate means of navigation other than the GNS 530's GPS receiver.

C. If "RAIM IS NOT AVAILABLE" message is displayed in the enroute, terminal, or initial approach phase of flight, continue to navigate using the GPS equipment or revert to an alternate means of navigation other than the GNS 530's GPS receiver appropriate to the route and phase of flight. When continuing to use GPS navigation, position must be verified every 15 minutes using the GNS 530's VOR/ILS receiver or another IFR-approved navigation system.

D. If "RAIM IS NOT AVAILABLE" message is displayed while on the final approach segment, GPS based navigation will continue for up to 5 minutes with approach CDI sensitivity (0.3 nautical mile). After 5 minutes the system will flag and no longer provide course guidance with approach sensitivity. Missed approach course guidance may still be available with 1 nautical mile CDI sensitivity by executing the missed approach.

E. In an in-flight emergency, depressing and holding the Comm transfer button for 2 seconds will select the emergency frequency of 121.500 Mhz into the "Active" frequency window.

SECTION 4 - NORMAL PROCEDURES

CAUTION

Familiarity with the enroute operation of the GNS 530 does not constitute proficiency in approach operations. Do not attempt approach operations in IMC prior to attaining proficiency in the use of the GNS 530 approach features.

A. DETAILED OPERATING PROCEDURES

Normal operating procedures are described in the GARMIN GNS 530 Pilot's Guide, p/n 190-00181-00, Rev. A, dated November 1999, or later appropriate revision.

B. PILOT'S DISPLAY

The GNS 530 System data will appear on the Pilot's HSI. The source of data is either GPS or VLOC as annunciated on the display above the CDI key.

C. AUTOPILOT/FLIGHT DIRECTOR OPERATION

Coupling of the GNS 530 System steering information to the autopilot/flight director can be accomplished by engaging the autopilot/flight director in the NAV or APR mode.

When the autopilot/flight director system is using course information supplied by the GNS 530 System and the course pointer is not automatically driven to the desired track, the course pointer on the HSI must be manually set to the desired track (DTK) indicated by the GNS 530. For detailed autopilot/flight director operational instructions, refer to the FAA Approved Flight Manual Supplement for the autopilot/flight director.

D. CROSSFILL OPERATIONS

Crossfill capabilities exist between the GNS 530 and GNS 430 systems. Refer to the Garmin GNS 530 Pilot's Guide for detailed crossfill operating instructions.

SECTION 4 - NORMAL PROCEDURES (continued)

E. AUTOMATIC LOCALIZER COURSE CAPTURE

By default, the GNS 530 automatic localizer course capture feature is enabled. This feature provides a method for system navigation data present on the external indicators to be switched automatically from GPS guidance to localizer/glide slope guidance at the point of course intercept on a localizer at which GPS derived course deviation equals localizer derived course deviation. If an offset from the final approach course is being flown, it is possible that the automatic switch from GPS course guidance to localizer/glide slope course guidance will not occur. It is the pilot's responsibility to ensure correct system navigation data is present on the external indicator before continuing a localizer based approach beyond the final approach fix.

F. DISPLAY OF LIGHTNING STRIKE DATA

Lightning strike data detected by the BF Goodrich WX-500 Stormscope will appear on the moving map and weather pages of the GNS 530. For detailed operating instructions regarding the interface of the GNS 530 with the WX-500, refer to the WX-500 Pilot's Guide and the GNS 530 Pilot's Guide Addendum for the WX-500 Stormscope interface.

G. DISPLAY OF TRAFFIC ADVISORY DATA

Traffic data detected by the BF Goodrich SKYWATCH™ Traffic Advisory System (TAS) will appear on the moving map and traffic display pages of the GNS 530. For detailed operating instructions regarding the interface of the GNS 530 with the SKYWATCH, refer to the FAA approved Flight Manual Supplement for the SKYWATCH, the Pilot's Guide for the SKYWATCH and the GNS 530 Pilot's Guide Addendum for the SKYWATCH Traffic Advisory System interface.

SECTION 5 - PERFORMANCE

There is no change to aircraft performance with this equipment installed.

SECTION 6 - WEIGHT AND BALANCE

Factory installed optional equipment is included in the licensed weight and balance data in Section 6 of the basic Pilot's Operating Handbook.

SECTION 7 - DESCRIPTION AND OPERATION

See the GNS 530 Pilot's Guide for a complete description of the GNS 530 system.

PILOT'S OPERATING HANDBOOK
AND
FAA APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 16
FOR
BF GOODRICH AEROSPACE
WX-500 STORMSCOPE - SERIES II WEATHER MAPPING SENSOR

This supplement must be attached to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the BF Goodrich Aerospace WX-500 Stormscope is installed. 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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SECTION 1 - GENERAL

This supplement provides information necessary for the operation of the aircraft with the BF Goodrich WX-500 Stormscope.

WARNING

Never use your Stormscope system to attempt to penetrate a thunderstorm. The FAA Advisory Circular, Subject: Thunderstorms, and the Airman's Information Manual (AIM) recommend that a pilot "avoid by at least 20 miles any thunderstorm identified as severe or giving an intense radar echo."

CAUTION

There are several atmospheric phenomena other than nearby thunderstorms that can cause isolated discharge points in the strike display mode. Clusters of two or more discharge points in the strike display mode, however, do indicate thunderstorm activity when they reappear after clearing the screen. Avoid the clusters and you'll avoid the thunderstorms. In the cell display mode, even a single discharge point may represent thunderstorm activity and should be avoided.

SECTION 2 - LIMITATIONS

The BF Goodrich Aerospace WX-500 Stormscope Users Guide, p/n 009-11501-001, Rev. A, dated September 10, 1997, or later appropriate revision, must be immediately available to the flight crew whenever weather avoidance is predicated on the use of this system.

SECTION 3 - EMERGENCY PROCEDURES

No change.

SECTION 4 - NORMAL PROCEDURES

Normal operating procedures are described in the BF Goodrich Aerospace WX-500 Stormscope Users Guide, p/n 009-11501-001, Rev. A, dated September 10, 1997, or later appropriate revision.

SECTION 5 - PERFORMANCE

No change.

SECTION 6 - WEIGHT AND BALANCE

Factory installed optional equipment is included in the licensed empty weight and balance data in Section 6 of the Pilot's Operating Handbook.

SECTION 7 - DESCRIPTION AND OPERATION

A. OPERATING PROCEDURES

See the BF Goodrich Aerospace WX-500 Stormscope Users Guide for a complete description of the WX-500 system.

B. PILOT'S DISPLAY (Airplane Dependent)

The BF Goodrich Aerospace WX-500 Stormscope's data will appear on either the Avidyne FlightMax 740, the Garmin GNS 530, or the Garmin GNS 430.

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PILOT'S OPERATING HANDBOOK
AND
FAA APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 19
FOR
S-TEC SYSTEM 55X TWO AXIS
AUTOMATIC FLIGHT GUIDANCE SYSTEM

The FAA approved operational supplement for the S-TEC System 55X Autopilot, installed in accordance with STC SA09385AC-D, is required for operation of this system. S-TEC will be responsible to supply and revise the operational supplement. It is permitted to include the S-TEC supplement in this location of the Pilot's Operating Handbook unless otherwise stated by S-TEC. The information contained in the S-TEC supplement may supersede or supplement the information in the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual with respect to the operation of the S-TEC System 55X Autopilot. For limitations, procedures and performance information not contained in the S-TEC supplement, consult the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

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S-TEC CORPORATION
MINERAL WELLS, TEXAS 76067

FAA/DAS APPROVED
PILOT'S OPERATING HANDBOOK AND/OR AIRPLANE FLIGHT MANUAL SUPPLEMENT FOR Piper model PA-34-220T WITH S-TEC SYSTEM 55/55X TWO AXIS AUTOMATIC FLIGHT GUIDANCE SYSTEM WITH TRIM MONITOR
(28 Volt System)

REG. NO. N53347

SER. NO. 3449221

This Supplement must be attached to the applicable FAA Approved Airplane Flight Manual, Pilot's Operating Handbook, or Pilot's Operating Handbook and FAA Approved Airplane Flight Manual for aircraft modified by the installation of S-TEC System 55/55X Autopilot Model ST-842 installed in accordance with STC SA09385AC-D. The information contained herein supplements or supersedes the basic manual. For limitations, procedures and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook and/or Airplane Flight Manual.

SECTION I

GENERAL

This manual is to acquaint the pilot with the features and functions of the System 55/55X Two Axis Autopilot and to provide operating instructions for the system when installed in the listed aircraft model(s). The aircraft must be operated within the limitations herein provided when the autopilot is in use.

FAA/DAS APPROVED ______________
Walter F. Davis

S-TEC CORPORATION
DAS 5 SW
P/N: 891850✓
DATE: 6-30-99

S-TEC CORPORATION
MINERAL WELLS, TEXAS 76067

FAA/DAS APPROVED
PILOT'S OPERATING HANDBOOK AND/OR
AIRPLANE FLIGHT MANUAL SUPPLEMENT
FOR
Piper model PA-34-220T

LOG OF REVISIONS				
REV. NO.	PAGES AFFECTED	DESCRIPTION	APPROVED	DATE
1	1, 3, 5, 9, 10, 11	Added System 55X information. Removed Optional Equipment section Renumbered pages.	UFO	12-08-00

FAA/DAS APPROVED
P/N: 891850
DATE: 6-30-99

SECTION II

OPERATING LIMITATIONS

1. Autopilot operation not authorized above 180 KIAS.
2. Flap extension limited to two (2) notches (25°) or less during autopilot operations.
3. Go-arounds or missed approach maneuvers not authorized during autopilot operation.
4. Autopilot use prohibited during take-off and landing.
5. Category I operations only.
6. S-TEC System 55 Pilot's Operating Handbook, P/N 8747, dated 10-16-00 or later revision, or S-TEC System 55X Pilot's Operating Handbook, P/N 87109, dated 11-08-00 or later revision, must be carried in the aircraft and be available to the pilot while in flight.

SECTION III

EMERGENCY OPERATING PROCEDURES

In the event of an autopilot malfunction, or anytime the autopilot is not performing as expected or commanded, do not attempt to identify the system problem. Immediately regain control of the aircraft by overpowering the autopilot as necessary and then immediately disconnect the autopilot. Do not re-engage the autopilot until the problem has been identified and corrected.

1. The autopilot may be disconnected by:
   a. Depressing the "AP Disconnect" Switch on the left horn of the pilot's control wheel.

b. Placing the "AP Master Switch" in the "OFF" position.

c. Momentarily interrupting aircraft electrical power at the battery master switch.

d. Pulling the autopilot circuit breaker.

2. Trim:

a. In the event of a trim failure, manually control aircraft and DEPRESS AND HOLD "Trim Interrupt/AP Disconnect Switch" on control wheel.

b. Place trim master switch in "OFF" position, pull circuit breaker, release interrupt switch.

c. Retrim aircraft. Leave trim system OFF until corrected.

3. Altitude loss during a malfunction and recovery:

a. An autopilot or autotrim malfunction during climb, cruise or decent with a three second delay in recovery initiation could result in as much as 57° bank and a 380 ft. altitude loss. Maximum altitude loss recorded in descent.

b. An autopilot or autotrim malfunction during an approach with one second delay in recovery initiation could result in as much as a 20° bank and a 60 ft. altitude loss. Maximum altitude loss measured with flaps down 2 notches, gear down and operating coupled or uncoupled, single or multi-engine.

The above values are the worst case for all the models covered by this document.

4. Single Engine Operations - Autopilot Mode:
   a. Engine failure during an autopilot approach operation: Disengage autopilot conduct remainder of approach manually.
   b. Engine failure during normal climb, cruise, descent: Retrim aircraft, perform normal aircraft engine out procedures.
   c. Maintain aircraft yaw trim throughout all single engine operations.

SECTION IV

NORMAL OPERATING PROCEDURES

For detailed normal operating procedures, including system description, pre-flight and inflight procedures refer to S-TEC System 55 Pilot's Operating Handbook, P/N 8747, dated 10-16-00 or later revision, or S-TEC System 55X Pilot's Operating Handbook, P/N 87109, dated 11-08-00 or later revision.

CAUTION: When S-TEC Flight Director is installed and operating, the Flight Director Autopilot should be disconnected using the control wheel disconnect switch only. Any other means of disconnect (breaker, ON-OFF switch, etc.) may leave steering bars in view, but inoperable.

NOTE: For smoother altitude captures, thus enhancing passenger comfort, engage altitude hold mode at rates of climb or descent of 1,000 FPM or less.

CONTROL WHEEL SWITCHES

The left grip of the pilot's control wheel will normally contain the following autopilot switches:

- Manual Electric Trim
- Trim Interrupt/A/P Disconnect Switch
- Control Wheel Steering (CWS)

If the optional co-pilot switch arrangement is installed, the same three switches with the same functions will be installed in the right grip of the co-pilot's control wheel.

ELECTRIC TRIM SYSTEM

The S-TEC Electric Trim System is designed to accept any single failure, either mechanical or electrical, without uncontrolled operation resulting during operations in the Manual Electric Trim Mode. During autotrim mode the system is designed to limit the effect of any failure causing trim operation. In order to assure proper operation of these safeguards, it is necessary to conduct a simple pre-flight test of the system. Following is a brief description and a preflight test procedure for the trim system.

TRIM SYSTEM WITH TRIM MONITOR

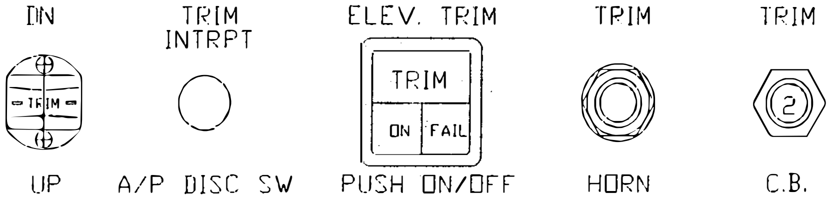


FIGURE 1

SYSTEM DESCRIPTION

The trim monitor system consists of the components pictured in Figure 1 and is designed to alert the pilot of a trim failure or trim in motion.

The system is activated by pushing the trim master switch on. A green On light, a yellow Trim light and a red Fail light will illuminate in the switch and the trim audio horn will activate for one second, as a test. A trim fault will cause the Trim and Fail lights to illuminate along with continuous horn operation. The pilot should press and hold the red Trim Interrupt button and conduct the emergency procedures listed in Section III of this AFMS.

PREFLIGHT TRIM CHECK (With Trim Monitor)

MANUAL ELECTRIC TRIM - Test Prior To Each Flight

1. Check trim circuit breaker -- IN
2. Trim master switch - Push ON - confirm green light ON after completion of test cycle.
3. A/P master switch - ON
4. Operate trim switch (both knob sections) - NOSE DN. Check that trim moves nose down and yellow trim light in trim master switch flashes while trim is in motion. The trim "in motion" indicator in the autopilot programmer should flash "TRIM" also. Conduct the same test in the NOSE UP direction.

5. With trim operating up or down depress the red control wheel interrupt switch for three seconds minimum. Confirm that trim action stops while switch is pressed. This action should also trigger the trim monitor horn with "Trim" steady and "Fail" flashing in the trim master switch. Recycle the trim master switch to delete the horn.
6. Overpower check - With trim operating electrically, grasp the manual trim wheel and overpower the electric trim to stop trim motion.
7. Operate each half of the trim switch separately - Trim should not operate unless both switch knob segments are moved together.

AUTOTRIM

1. Position elevator control half way aft from full forward.
2. Engage HDG and ALT modes of autopilot.
3. Grasp control and slowly apply forward pressure (nose down). After approximately 3 seconds automatic trim should run NOSE UP. The yellow trim indicator in trim master switch should flash simultaneously with the trim indicator in the A/P programmer.
4. Conduct the same test by slowly applying aft pressure on the elevator control, confirming that autotrim runs NOSE DOWN and trim indicators flash while trim is in motion.
5. Move manual trim switch up or down - Autopilot should disconnect and trim should operate in the commanded direction. (Trim switch will disconnect A/P only when a pitch mode is engaged.)
6. Reengage autopilot HDG and ALT modes - Press trim interrupt/AP disconnect switch - Autopilot should disconnect.
7. Retrim aircraft for take off - Check all controls for freedom of motion and determine that autopilot and trim have disconnected.

If either the manual electric or autotrim fails any portion of the above check procedure, push the Trim Master Switch "OFF" and do not attempt to use the trim system until the fault is corrected. With the Trim Master Switch "OFF" the autopilot trim indicators will return to operation.

If the electric trim system suffers a power failure in flight the system will automatically revert to the trim indicator lights located in the autopilot annunciator panel. If this occurs push the Trim Master Switch "OFF" and trim manually, using the indicators until the fault can be located and corrected.

GLIDE SLOPE FLIGHT PROCEDURE

Approach the GS intercept point (usually the O.M.) with the flaps set to approach deflection of 1-2 notches (See Limitations Section) and with the aircraft stabilized in altitude hold mode. At the glide slope intercept, lower the landing gear and adjust power for desired descent speed. For best tracking results make power adjustments in small, smooth increments to maintain desired airspeed. At the missed approach point or the decision height, disconnect the autopilot for landing or for the go-around maneuver. (See Limitations Section.) If a missed approach is required, the autopilot may be reengaged after the aircraft has been reconfigured for and established in a stabilized climb.

SECTION V

PERFORMANCE

The text of this Section not affected by installation of this equipment.

SECTION VI

WEIGHT AND BALANCE

The text of this Section not affected by installation of this equipment.

SECTION VII

DESCRIPTION AND OPERATION OF THE AIRPLANE AND ITS SYSTEMS

The text of this Section not affected by installation of this equipment.

SECTION VIII

AIRPLANE HANDLING, SERVICING AND MAINTENANCE

The text of this Section not affected by installation of this equipment.

SECTION IX

SUPPLEMENTS

Refer to contents of this supplement for operation for System 55/55X Automatic Flight Control System.

SECTION X

OPERATING TIPS

The text of this Section not affected by installation of this equipment.

S-TEC CORPORATION
MINERAL WELLS, TEXAS 76067

FAA/DAS APPROVED
PILOT'S OPERATING HANDBOOK AND/OR
AIRPLANE FLIGHT MANUAL SUPPLEMENT
FOR
Piper model PA-34-220T
WITH
S-TEC YAW DAMPER SYSTEM
(28 Volt System)

REG. NO. N53347

SER. NO. 3449221

This Supplement must be attached to the applicable FAA Approved Airplane Flight Manual, Pilot's Operating Handbook or Pilot's Operating Handbook and FAA Approved Airplane Flight Manual for aircraft modified by the installation of S-TEC Yaw Damper System Model ST-842 installed in accordance with STC SA09385AC-D. The information contained herein supplements the information of the basic POH and/or AFM; for limitations, procedures and performance information not contained in this supplement, consult the basic POH and/or AFM.

SECTION I

GENERAL

This manual is to acquaint the pilot with the features and functions of the S-TEC Yaw Damper System and to provide operating instructions for the system when installed in the listed aircraft model(s). The aircraft must be operated within the limitations herein provided when the yaw damper is in use.

FAA/DAS APPROVED ____________________
Walter F. Davis

S-TEC CORPORATION
DAS 5 SW
P/N: 891851
DATE: 6-30-99

FAA/DAS APPROVED
PILOT'S OPERATING HANDBOOK AND/OR
AIRPLANE FLIGHT MANUAL SUPPLEMENT
FOR
Piper model PA-34-220T

LOG OF REVISIONS

REV. NO.	PAGES AFFECTED	DESCRIPTION	APPROVED	DATE
1	1, 4, 7, 8	Removed reference to 65 A/P and added NOTE to page 7. Added System 55X information.	UFD	12-08-00

SECTION II

OPERATING LIMITATIONS

1. Yaw Damper operation prohibited above 205 KIAS.

SECTION III

EMERGENCY OPERATING PROCEDURES

In the event of abnormal operation of the Yaw Damper System, do not attempt to trouble shoot the system. Immediately stabilize the aircraft by application of manual rudder control to overpower the rudder servo and disengage the yaw damper. Do not attempt further operation of the system until the problem has been identified and corrected.

1. For abnormal operation, conduct the following procedure:

    a. Manually stabilize the aircraft by application of rudder controls.
    b. Mode Selector Switch - OFF.
    c. Yaw Damper Circuit Breaker - PULL. (This removes all electrical power to the system.)
    d. Retrim aircraft as necessary.

2. Altitude loss during a Yaw Damper System malfunction:

a. A Yaw Damper malfunction during climb, cruise or descent with a three second delay in recovery initiation could result in 3° of yaw and 12° bank and 140 ft. altitude loss.

b. A Yaw Damper malfunction during an approach with a one second delay in recovery initiation could result in a slight yaw and no significant altitude loss.

A Yaw Damper malfunction during autopilot operation may result in yaw/bank angle and altitude losses less than those listed due to the corrections provided by the autopilot.

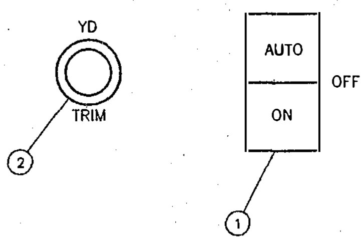
SECTION IV

NORMAL OPERATING PROCEDURES

4-1 SYSTEM DESCRIPTION

The S-TEC Yaw Damper System consists of a yaw acceleration computer-amplifier unit, a rudder servo and an instrument panel mounted control switch and trim adjustment unit. The sensor is a small mechanical accelerometer which is used to sense yaw motion and also aircraft yaw trim. Aside from the accelerometer and the rudder servo, the system contains no other moving parts. The panel mounted control switch provides an AUTO (engage-disengage) position, an OFF position and an ON position. The computer is powered directly from the system circuit breaker. The control panel provides engagement-disengagement control of the rudder servo.

4-2 COCKPIT CONTROLS AND FUNCTIONS



1. Mode Selector Switch - This control provides the following mode functions:

   a. OFF - The center switch position labeled OFF, disengages the rudder servo by inhibiting power to the servo engagement solenoid mechanism.
   b. ON - This switch position engages the rudder servo and provides full time operation of the system.
   c. AUTO - The auto, or automatic, mode is an optional method of operation which operates in conjunction with an installed autopilot system. If the Yaw Damper System is interconnected to the installed autopilot and with the mode switch in the AUTO position, the yaw damper will engage automatically when the roll axis of the autopilot is engaged. If the installed autopilot provides a control wheel mounted disconnect switch, the yaw damper will disengage when the switch is used to disconnect the autopilot. This mode will be the normal operating mode when used in conjunction with an autopilot.

2. Yaw Trim - The Yaw Trim knob may be used by the pilot to effect small yaw trim changes to center the "ball" in the turn-slip instrument. Once adjusted for center, further adjustments will rarely be necessary. Clockwise rotation will provide a right rudder input and counter-clock-wise will provide a left rudder input. When making an adjustment, rotate knob in small increments and allow 3-5 seconds for the adjustments to take effect. Normal changes in trim required during airspeed changes will be accomplished automatically for 1/8 to 1/4 ball deflections.

4-3 PRE-FLIGHT

NOTE: During system functional checks the system must be provided adequate system voltage (14 VDC or 28 VDC as appropriate).

1. Mode Selector Switch - Move to ON position, feel for engagement of the rudder servo by moving rudder pedals. Depress right and left rudder pedals alternately to assure override capability - rudder will require more than normal ground operating force to overpower the servo. No unusual play, rough pedal action or noise should be detected during the check.

2. Mode Selector Switch - OFF - Rudder Servo should disconnect from Rudder Control System, freeing pedal action.

3. Mode Selector Switch - AUTO

   a. Autopilot Disengaged - no action or engagement of rudder servo should occur.

b. Engage Autopilot (Roll Section minimum) - rudder servo should engage.
c. Disengage Autopilot - rudder servo should disengage.

4. During Taxi - check yaw damper operation as follows.

   a. Move mode selector switch - ON.
   b. Alternately tap right and left brake, yaw damper response will be felt in the rudder pedals as aircraft responds in yaw to individual brake application.
   c. Mode Selector Switch - OFF - Move rudder pedals to determine that rudder servo has disconnected.
   d. Yaw Damper should be OFF for take off.

4-5 IN-FLIGHT

1. Trim aircraft for existing flight conditions.
2. Engage Yaw Damper as desired.
3. During an approach operation in turbulence there will be some rudder feedback. If this feedback is objectionable, disengage the Yaw Damper System.
4. Yaw Damper should be OFF for landing.

NOTE: After making large power, configuration or flight profile changes, it is advisable to disconnect the yaw damper to verify that the rudder is in trim then reengage the yaw damper. The yaw damper will not trim the rudder automatically.

SECTION V

PERFORMANCE

The text of this Section not affected by installation of this equipment.

SECTION VI

WEIGHT AND BALANCE

The text of this Section not affected by installation of this equipment.

SECTION VII

DESCRIPTION AND OPERATION OF THE AIRPLANE AND ITS SYSTEMS

The text of this Section not affected by installation of this equipment.

SECTION VIII

AIRPLANE HANDLING, SERVICING AND MAINTENANCE

The text of this Section not affected by installation of this equipment.

SECTION IX

SUPPLEMENTS

Refer to contents of this supplement for operation for System 55/55X Yaw Damper System.

SECTION X

OPERATING TIPS

The text of this Section not affected by installation of this equipment.

PILOT'S OPERATING HANDBOOK
AND
FAA APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 21
FOR
GARMIN GMA 340 AUDIO PANEL

This supplement must be attached to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the Garmin GMA 340 is installed per the Equipment List. The information contained herein supplements or supersedes the information in the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual only in those areas listed herein. For limitations, procedures, and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

FAA APPROVED: Christina L. Marsh
CHRISTINA L. MARSH
D.O.A. NO. SO-1
THE NEW PIPER AIRCRAFT, INC.
VERO BEACH, FLORIDA

DATE OF APPROVAL February 23, 2001

SECTION 1 - GENERAL

This supplement supplies information necessary for the operation of the airplane when the Garmin GMA 340 audio panel is installed in accordance with FAA approved Piper data.

SECTION 2 - LIMITATIONS

No change.

SECTION 3 - EMERGENCY PROCEDURES

No change.

SECTION 4 - NORMAL PROCEDURES

AUDIO CONTROL SYSTEM OPERATION:

- Select the desired transmitter audio selector button (COM1, COM2, OR COM3) and verify that the buttons LED is illuminated.
- INTERCOM VOL Control (ICS) - Adjust to desired listening level.
- INTERCOM VOX (voice) Sensitivity Control - ROTATE CONTROL knob clockwise to the middle range and then adjust as required for desired voice activation or hot mic intercom.
- If desired, select the speaker function button. Selecting this button allows radio transmissions to be received over the cabin speaker.

NOTE

Audio level is controlled by the selected NAV radio volume control.

MARKER BEACON RECEIVER OPERATION:

- TEST Button - PRESS to verify all marker lights are operational.
- SENS Button - SELECT HI for airway flying for LO for ILS/LOC approaches.

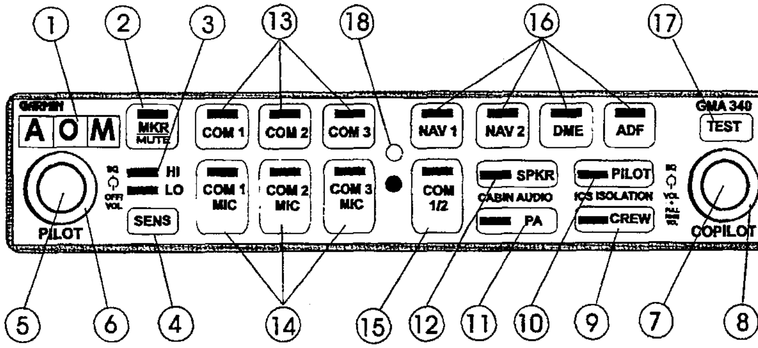
SECTION 5 - PERFORMANCE

No change.

SECTION 6 - WEIGHT AND BALANCE

Factory installed optional equipment is included in the licensed weight and balance data in section 6 of the Airplane Flight Manual.

SECTION 7 - DESCRIPTION AND OPERATION



1. Marker Beacon Lamps
2. Marker Beacon Receiver Audio Select/Mute Button
3. Marker Beacon Receiver Sensitivity Selection Indicator LED
4. Marker Beacon Receiver Sensitivity Selection Button
5. Unit On/Off, Pilot Intercom System (ICS) Volume
6. Pilot ICS Voice Activated (VOX) Intercom Squelch Level
7. Copilot and Passenger ICS Volume Control (Pull out for Passenger Volume)
8. Copilot/Passenger VOX Intercom Squelch Level
9. Crew Isolation Intercom Mode Button
10. Pilot Isolation Intercom Mode Button
11. Passenger Address (PA) Function Button
12. Speaker Function Button
13. Transceiver Audio Selector Buttons (COM1, COM2, COM3)
14. Transmitter (Audio/Mic) Selection Buttons
15. Split COM Button
16. Aircraft Radio Audio Selection Buttons (NAV1, NAV2, DME, ADF)
17. Annunciator Test Button
18. Photocell - Automatic Annunciator Dimming

SECTION 7 - DESCRIPTION AND OPERATION (continued)

ON/OFF, Pilot Intercom System (ICS) Volume Control

The GMA 340 is powered OFF when the left small knob (5) is rotated fully CCW into the detent. To turn the unit ON, rotate the knob clockwise past the click. The knob then functions as the pilot ICS volume control. A fail safe circuit connects the pilot's headset and microphone directly to COM1 in case power is interrupted or the unit is turned OFF.

Transceivers

Selection of either COM1, COM2, or COM3 for both MIC and audio source is accomplished by pressing either COM1, MIC, COM2 MIC, COM3 MIC (14). The activeCOM audio is always heard on the headphones.

Additionally, each audio source can be selected independently by pressing COM1, COM2, or COM3 (13). When selected this way, they remain active as audio sources regardless of which transceiver has been selected for microphone use.

When a microphone is keyed, the active transceiver's MIC button LED blinks approximately one per second to indicate that the radio is transmitting.

NOTE

Audio level is controlled by the selected COM radio volume controls.

Split COM

Pressing the COM 1/2 button (15) activates the split COM function. When this mode is active, COM1 is dedicated solely to the pilot for MIC/Audio while COM2 is dedicated to the copilot for MIC/Audio. The pilot and copilot can simultaneously transmit in this mode over separate radios. Both pilots can still listen to COM3, NAV1, NAV2, DME, ADF, and MRK as selected. The split COM mode is cancelled by pressing the COM 1/2 button a second time.

When in the split COM mode the copilot may make PA announcements while the pilot continues using COM1 independently. When the PA button is pressed after the split com mode is activated the copilot's mic is output over the cabin speaker when keyed. A second press of the PA button returns the copilot to normal split COM operation.

SECTION 7 - DESCRIPTION AND OPERATION (continued)

Aircraft Radios and Navigation

Pressing NAV1, NAV2, DME, ADF (16) or MRK (2) selects each audio source. A second button press deselects the audio.

Speaker Output

Pressing the SPKR button (12) selects the aircraft radios over the cabin speaker. The speaker output is muted when a COM microphone is keyed.

PA Function

The PA mode is activated by pressing the PA button (11). Then, when either the pilot's or copilot's microphone is keyed, the corresponding mic audio is heard over the cabin speaker. If the SKR button is also active, then any selected speaker audio is muted while the microphone is keyed. The SPKR button does not have to be previously active in order to use the PA function.

Intercom System (ICS)

Intercom volume and squelch (VOX) are adjusted using the following front panel knobs:

- **Left Small Knob** - Unit ON/OFF power control and pilot's ICS volume. Full CCW detent position is OFF.
- **Left Large Knob** - Pilot ICS mic VOX squelch level. CW rotation increases the amount of mic audio (VOX level) required to break squelch. Full CCW is the "HOT MIC" position (no squelch).
- **Right Small Knob** - IN position: Copilot ICS volume. OUT position: Passenger ICS volume.
- **Right Large Knob** - Copilot and passenger mic VOX squelch level. CW rotation increases the amount of mic audio (VOX level) required to break squelch. Full CCW is the "HOT MIC" position.
- **PILOT Mode** - This mode isolates the pilot from everyone else and dedicates the aircraft radios to the pilot exclusively. The copilot and passengers share communications between themselves but cannot communicate with the pilot or hear the aircraft radios.
- **CREW Mode** - This mode places the pilot and copilot on a common ICS communication channel with the aircraft radios. The passengers are on their own intercom channel and can communicate with each other, but cannot communicate with the crew or hear the aircraft radios.

SECTION 7 - DESCRIPTION AND OPERATION (continued)

Marker Beacon Receiver

The GMA 340's marker beacon receiver controls are located on the left side of the front panel (1 - 4). The SENS button selects either high or low sensitivity as indicated by the HI or LO LED being lit. Low sensitivity is used on ILS approaches while high sensitivity allows operation over airway markers or to get an earlier indication of nearing the outer marker during an approach.

The marker audio is initially selected by pressing the MKR/Mute button (2). If no beacon signal is received, then a second button press will deselect the marker audio. This operation is similar to selecting any other audio source on the GMA 340. However, if the second button press occurs while a marker beacon signal is received, then the marker audio is muted but not deselected. The buttons LED will remain lit to indicate that the source is still selected. When the current marker signal is no longer received, the audio is automatically un-muted. While in the muted state, pressing the MKR/Mute button deselects the marker audio. The button's LED will extinguish to indicate that the marker audio is no longer selected.

PILOT'S OPERATING HANDBOOK
AND
FAA APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 27
FOR
GARMIN GTX 330 TRANSPONDER

This supplement must be attached to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the Garmin GTX 330 Transponder is installed per the Equipment List. The information contained herein supplements or supersedes the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual only in those areas listed herein. For limitations, procedures and performance information not contained in this supplement, consult the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

FAA APPROVED:

ALBERT J. MILL
D.O.A. NO. SO - 1
THE NEW PIPER AIRCRAFT, INC.
VERO BEACH, FLORIDA

DATE OF APPROVAL: January 12, 2004

SECTION 1 - GENERAL

This supplement supplies information necessary for the operation of the airplane when the Garmin GTX 330 Transponder is installed in accordance with FAA approved Piper data.

SECTION 2 - LIMITATIONS

A. Display of TIS traffic information is advisory only and does not relieve the pilot responsibility to "see and avoid" other aircraft. Aircraft maneuvers shall not be predicated on the TIS displayed information.
B. Display of TIS traffic information does not constitute a TCAS I or TCAS II collision avoidance system as required by 14 CFR Part 121 or Part 135.
C. Title 14 of the Code of Federal Regulations (14 CFR) states that "When an Air Traffic Control (ATC) clearance has been obtained, no pilot-in-command (PIC) may deviate from that clearance, except in an emergency, unless he obtains an amended clearance." Traffic information provided by the TIS up-link does not relieve the PIC of this responsibility.
D. The 400/500 Series Garmin Display Interfaces (Pilot's Guide Addendum) P/N 190-00140-13 Rev. A or later revision must be accessible to the flight crew during flight.
E. 400/500 Series Main Software 4.00 or later FAA approved software is required to operate the TIS interface and provide TIS functionality.

SECTION 3 - EMERGENCY PROCEDURES

To transmit an emergency signal:

- Mode Selection Key - ALT
- Code Selection - SELECT 7700

To transmit a signal representing loss of all communications:

- Mode Selection Key - ALT
- Code Selection - SELECT 7600

SECTION 4 - NORMAL PROCEDURES

BEFORE TAKEOFF:

- To transmit Mode C (Altitude Reporting) code in flight:

- Mode Selection Key - ALT
- Code Selector Keys - SELECT assigned code.

To transmit Mode A (Aircraft Identification) code in flight:

- Mode Selector Key - ON
- Code Selector Keys - SELECT assigned code.

NOTE

During normal operation with the ON mode selected, the reply indicator 'R" flashes, indicating transponder replies to interrogations.

NOTE

Mode A reply codes are transmitted in ALT also; however, Mode C codes only are suppressed when the Function Selector ON key is selected.

1. DETAILED TRANSPONDER OPERATING PROCEDURES

   Normal transponder operating procedures are described in the GARMIN GTX 330 Pilot's Guide, P/N 190-00207-00, Rev. A, or later appropriate revision.

2. DISPLAY OF TRAFFIC INFORMATION SERVICE (TIS) DATA

   TIS surveillance data uplinked by Air Traffic Control (ATC) radar through the GTX 330 Mode S Transponder will appear on the interfaced display device (Garmin 400 or 500 series products). For detailed operating instructions and information regarding the TIS interface, refer to the 400/500 Series Garmin Display Interfaces (Pilot's Guide Addendum) P/N 190-00140-13 Rev. A or later appropriate revision.

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

See the 400/500 Series Garmin Display Interfaces (Pilot's Guide Addendum), P/N 190-00140-13, and GTX 330 Pilot's Guide, P/N 190-00207-00, for a complete description of the GTX 330 system.

GARDNER AVIATION SPECIALIST,INC.
215 BARRY WHATLEY WAY
GRIFFIN, GEORGIA 30224
REPAIR STATION #G3SR222J/JAA.5128

B.F. Goodrich SKY497
SKYWATCH Traffic Advisory System

FAA APPROVED FLIGHT MANUAL SUPPLEMENT

AIRCRAFT MAKE: PIPER

AIRCRAFT MODEL: PA-34-220T

AIRCRAFT SERIAL NO: 3449221

AIRCRAFT REG. NO: N53347

This document must be carried in the aircraft at all times. This Flight Manual Supplement describes the operating procedures for the B.F. Goodrich SKYWATCH has been installed in accordance with manufactures' install manual # 009-10800-001 Rev. C, dated February 23, 2001 and FAA Form 337 dated APR 0 4 2002.

For aircraft that have an FAA Approved Flight Manual, this document will serve as the FAA Approved B.F. Goodrich SKYWATCH Flight Manual Supplement. For those aircraft which do not have an FAA Approved Flight Manual, this document will serve as the FAA Approved B.F. Goodrich SKYWATCH Flight Manual Supplement.

The information contained herein supplements the basic Approved Flight Manual only in those areas listed herein. For limitations, procedures, and performance information not contained in this document, consult the basic Airplane Flight Manual.

FAA Approved: Anthony B. Browne ANTHONY B. BROWNE
Anthony B. Browne
Principle Avionics Inspector
Date: APR 0 4 2002
Atlanta
Flight Standards District Office
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B.F. Goodrich SKY497
SKYWATCH Traffic Advisory System

Log of Revisions

Revision	Revised Pages	Description of Revisions	Date	FAA Approval

FAA Approved: SO11

Date: APR 0 4 2002

Table of Contents

The TA calls attention to a possible collision threat using the Avidyne Multifunction Display and the voice message "TRAFFIC, TRAFFIC." The TA is intended to assist the pilot in achieving visual acquisition of the threat aircraft.

SKYWATCH is considered a backup system to the "SEE-AND-AVOID" concept and the ATC Radar environment.

C. DEFINITIONS

A. Other Traffic - Any traffic within the selected display range and within +/ 2,700 feet vertically that is not generating a TA.

B. Traffic Advisory (TA) Threat information given to the pilot pertaining to the position of intruding aircraft in the immediate vicinity. The information contains no suggested maneuver.

II. LIMITATIONS AND CONDITIONS

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

B. If the Pilot is advised by ATC to disable transponder altitude reporting, SKYWATCH must be turned OFF.

C. Operation of the SKYWATCH system requires that the SKYWATCH Pilots Guide be kept on the aircraft and available to the pilot at all times.

D. SKYWATCH can only detect aircraft which are transponder equipped.

III. NORMAL PROCEDURES

A. SELF-TEST

A. The SKYWATCH system should be tested prior to flight.

B. After completion of self-test, the "TRAFFIC ADVISORY SYSTEM TEST PASSED: audio annunciation will be heard and the display will revert to the standby screen.

C. If "TRAFFIC ADVISORY SYSTEM TEST FAILED" is heard or the SKY497 FAILED screen appears the SKYWATCH system should be turned OFF.
NOTE: The SELF TEST is inhibited when the aircraft is airborne.

B. STANDBY CHARACTERISTICS

A. SKYWATCH system will display SKY497 STANDBY when the aircraft is on the ground and not racking or processing traffic information. Standby gives the system the ability to track targets while on the ground. Pressing the OPR button activates the system and changes the display from the Standby screen to the Above (ABV) mode and 6nm range. The ranges available are 6nm and 2nm and are selected by pressing the DisplayRange button.

B. To go back into Standby, press the STB button. The system will go back to the SKY497 STANDBY screen and will not track targets again until the system is either manually switched out of Standby, while on the ground or automatically switched out of Standby 8 seconds after the aircraft has departed.

C. The SELF TEST works while in the SKY497 STANDBY screen by pressing the TEST Button.

D. The SKYWATCH system while in flight or operating on the ground will display 3 altitude display modes: Above (ABV), Normal (NRM), and Below (BLW). These modes are activated by pressing the Altitude display mode button. Refer to the pilot's guide for the SKYWATCH Traffic Advisory System Model SKY497 P/N 009-10801-001 Rev A or latest FAA approved revision.

C. ABNORMAL PROCEDURES

A. IF "TRAFFIC ADVISORY SYSTEM TEST FAILED" is heard or the SKY497 FAILED screen appears the SKYWATCH system should be turned OFF.

B. If the barometric altimeter fails in flight and is the altitude source for the transponder, turn SKYWATCH OFF.

D. RESPOND TO TRAFFIC ADVISORIES

A. When the SKY497 issues a TA, scan outside for the intruder aircraft. Call ATC for guidance and if you visually acquire the traffic use normal right-of-way procedures to maintain separation.

B. Do not attempt maneuvers based solely on traffic information shown on the SKY497 display. Information on the display is provided to the flight crew as an aid in visually acquiring traffic; it is not a replacement for ATC and See & Avoid techniques.

IV. EMERGENCY PROCEDURES

No Change.

V. PERFORMANCE

No Change.

VI. WEIGHT AND BALANCE

See current weight and balance data.

VII. SYSTEM DESCRIPTION

This system consists of a remote mounted TRC97 transmitter receiver computer and the NY164 antenna located on top of the fuselage. The SKYWATCH system displays information both the Garmin GNS530 and GNS430 GPS navigation systems. This system is also interfaced with the HSI for synchro heading information.
A circuit breaker for this system is located in the avionics circuit breaker panel.

FLIGHT MANUAL SUPPLEMENT

Avidyne FlightMax EX500 Multi Function Display

This document must be carried in the aircraft at all times when the Avidyne FlightMax 700-00007-XXX-() EX500 is installed in accordance with Engineering Order EO-116 and must be attached to the approved Airplane Flight Manual of:

Piper PA34-220T
S/N 3449221

The information contained herein supplements or supersedes the basic manual only in those areas listed. For limitations and procedures not contained in this supplement consult the basic Airplane Flight Manual.

This Document is approved under EASA.A.C.08767

DIAMOND MAINTENANCE GMBH
Ferdinand-Graf-von-Zeppelin Straße 5
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AUSTRIA

SECTION I – GENERAL

Avidyne FlightMax EX500, P/N 700-00007-XXX-(), is a multi-function display capable of presenting information from multiple sensors. Information shown on the FlightMax display is intended as an aid to situational awareness.

SECTION II – LIMITATIONS

The Avidyne FlightMax may only be operated in IMC conditions as a radar display when used in conjunction with an independent lightning detection and display system.

SECTION III – EMERGENCY PROCEDURES

No Change

SECTION IV – NORMAL PROCEDURES

IMC Operation with Weather Radar

While operating in IMC conditions with weather radar active, activate lightning detection system and monitor. Correlate lightning strike information with painted radar information to confirm proper system operation.

In the event that radar and lightning do not coincide, contact ATC for the latest severe weather information.

SECTION V – PERFORMANCE

No change

SECTION VI – WEIGHT AND BALANCE

Following the equipment change the new empty mass and the corresponding CG position must be determined by calculation or by weighting of the aircraft. Empty mass, empty mass CG position, and the empty mass moment must be entered in the Mass and Balance Report by an authorized person.

SECTION VII – SYSTEM DESCRIPTION

No change

SECTION VIII – AIRCRAFT HANDLING

No change

SECTION IX – SUPPLEMENTS

This document must be added to the supplement section of aircraft POH/AFM

SECTION X – SAFETY INFORMATION

No change

SYSTEM FIFTY FIVE X QUICK REFERENCE

Engage AP roll mode from ready (RDY). AP flies heading selected on D.G or HSI.

Push HDG + NAV, APR, or REV simultaneously for pilot selected angle of intercept.

Navigation intercept and track. NAV APR is automatic when a LOC freq. is selected on the nav receiver used for AP operation. Pressing NAV twice will activate GPSS mode.

Allows Pilot to select high gain (same as LOC) for VOR or GPS approach.

For LOC back course inbound or outbound front course intercept and track.

NOTE: With HSI, always set course pointer to the inbound FRONT course heading for either front or back course approach.

NOTE: CWS, HDG, NAV or REV mode must be engaged to engage any Pitch mode.

Engages Altitude Hold

Engages Vertical Speed.

Allows VS command in 100 ft. increments with VS knob.

Adjusts altitude up or down in 20 ft. increments in ALT mode (+/- 360 ft.)

NOTE: If optional ALT. Selector/Alerter is installed it must be off or in MAN mode to use VS knob for VS commands.

ADDITIONAL FEATURES/ANNUNCIATIONS

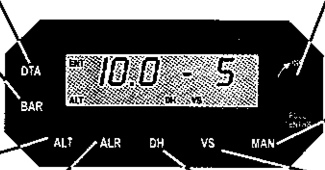
RDY	Indicates system has passed self test and is ready to engage.
CWS	Remote switch activation. Autopilot Roll and Pitch modes must be engaged BEFORE CWS can be activated. Press and Hold CWS Switch permits maneuvering of aircraft as desired. Autopilot synchronized with existing Roll and Pitch attitude when released. CWS and VS is annunciated.
FAIL	Indicates a) System did not pass self test on initial power-up. b) NAV Warning Flag – VOR/LOC or GPS with Autopilot NAV mode engaged. NAV will flash. c) GS Warning Flag with Autopilot GS mode engaged. GS will flash
TRIM	Indicates Trim in motion OR trim required if Auto trim is off or inoperative.
GPSS	Pressing NAV twice will activate GPSS Mode. GPSS is annunciated.

Press APR mode a second time when in NAV APR mode to disable GS coupling. GS will flash (no fail indication). Press again to restore.

To capture GS from above: a) Press ALT again IF already in ALT Mode.
b) If in VS mode, Press ALT then ALT again.

NOTE: To capture from above, GS must be valid (no flag) and localizer course deviation must be 50% or less.

ALTITUDE SELECTOR/ALERTER QUICK REFERENCE



Opens or closes data entry mode

Selects BARO for calibration entry – Set to nearest tenth Hg. Push again for MB entry.

Selects Altitude for entry of target altitude. In operating mode, push to view target altitude. Push again to view encoder alt.

Arms Alt. Alert audible. Push On / Push Off

Input selector knob Pull to select tenths input of BARO, ALT and DH.

Push to revert control of Vertical Speed to the Autopilot Programmer (VS numbers are blank) Push again for control by the selector.

Selects Vertical Speed for entry of climb or descent in 100 ft. increments.

Selects Decision Height for entry. In operating mode, push to activate or deactivate audible alert.

POINTS TO REMEMBER

- Set Barometric calibration, Altitude and / or Vertical Speed following initial power up self-test. System will be in data entry mode following self test.
- **Push "DTA" to enter or change any data EXCEPT vertical speed –"VS". Once entered, push "DTA" to close the entry mode or the unit can not communicate your input / settings to the autopilot.**
- When "ENT" is displayed, the function flashing is the one selected for change or input. Once set, push "DTA" to close the data entry mode.
- To activate Pre-Selected ALTITUDE and VERTICAL SPEED, push BOTH the ALT and VS function buttons ON THE AUTOPILOT Programmer AT THE SAME TIME. This will be confirmed by both ALT and VS modes being annunciated on the AUTOPILOT PROGRAMMER.
- If "VS", +/- and a number are not displayed, "MAN" mode has been selected and Vertical Speed commands must be input from the AUTOPILOT programmer. A target Altitude can still be pre-selected and the Autopilot "VS and "ALT" function buttons pushed at the same time to activate.
- For COMPLETE details of operation and additional features and functions, refer to the Pilot's Operating Handbook for this product.
- If you are unsure of correct operation, it is always best to turn off the Altitude Selector / Alerter and revert to normal Autopilot operation.
- If Encoder data is lost or is not present, the Altitude Selector / Alerter will chime three times and display dashes until Encoder data is restored.

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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 Seneca V.

10.2 SAFETY TIPS

A small child should be placed in an approved child restraint seat during aircraft operation. ***The child should not be held or share a seat belt with another person.*** Acceptable child restraint seats are defined in publications such as Federal Aviation Administration Advisory Circular 91-62a.

10.3 OPERATING TIPS

(a) Learn to trim for takeoff so that only a very light back pressure on the 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) Flaps may be lowered at airspeeds up to 113 KIAS. To reduce flap operating loads, it is desirable to have the airplane at a slower speed before extending the flaps. The flap step will not support weight if the flaps are in any extended position. The flaps must be placed in the UP position before they will lock and support weight on the step.

(d) Before attempting to reset any circuit breaker, allow a two to five minute cooling off period.

(e) Always determine position of landing gear by checking the gear position lights.

(f) The shape of the wing fuel tanks is such that in certain maneuvers the fuel may move away from the tank outlet. If the outlet is uncovered, the fuel flow will be interrupted and a temporary loss of power may result. Pilots can prevent inadvertent uncovering of the outlet by avoiding maneuvers which could result in uncovering the outlet.

10.3 OPERATING TIPS (Continued)

(f) (Cont'd)

Extreme running turning takeoffs should be avoided as fuel flow interruption may occur.

Prolonged slips and 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.

(g) The rudder pedals are suspended from a torque tube which extends across the fuselage. The pilot should become familiar with the proper positioning of his feet on the rudder pedals so as to avoid interference with the torque tube when moving the rudder pedals or operating the toe brakes.

(h) Anti-collision lights should not be operating when flying through overcast and clouds, since reflected light can produce spatial disorientation. Do not operate strobe lights when taxiing in the vicinity of other aircraft.

(i) 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.

(j) Pilots who fly above 10,000 feet should be aware of the need for special physiological training. Appropriate training is available at approximately twenty-three Air Force Bases throughout the United States for a small fee. 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. 0. 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.

10.3 OPERATING TIPS (Continued)

(k) Sluggish RPM control and propeller overspeed with poor RPM recovery after rapid throttle application are indications that nitrogen pressure in the propeller dome is low.

(l) Experience has shown that the training advantage gained by pulling a mixture control or turning off the fuel to simulate engine failure at low altitude is not worth the risk assumed, therefore it is recommended that instead of using either of these procedures to simulate loss of power at low altitude, the throttle be retarded slowly to idle position. Fast reduction of power may be harmful to the engine. A power setting of 2300 RPM is recommended for simulated one engine operation.

(m) Before starting either engine, check that all radio switches, light switches and the pitot heat switch are in the OFF position so as not to create an overloaded condition when the starter is engaged.

(n) The airplane should not be flown in severe turbulence as damage to the airframe structure could result.

(o) The best speed for takeoff is about 75 KIAS under normal conditions. Trying to pull the airplane off the ground at too low an airspeed decreases the controllability of the airplane in the event of an engine failure.

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