PILOT'S OPERATING HANDBOOK

PIPER CHEROKEE ARCHER II

FAA APPROVED IN NORMAL AND UTILITY CATEGORIES BASED ON CAR 3 AND FAR PART 21, SUBPART J. THIS HANDBOOK INCLUDES THE MATERIAL REQUIRED TO BE FURNISHED TO THE PILOT BY CAR 3 AND FAR PART 21, SUBPART J AND CONSTITUTES THE APPROVED AIRPLANE FLIGHT MANUAL AND MUST BE CARRIED IN THE AIRPLANE AT ALL TIMES.

AIRPLANE SERIAL NO. 28-7890100

AIRPLANE REGISTRATION NO. ~~N47596~~ N78BG

PA-28-181
REPORT: VB-790

FAA APPROVED BY: Ward Evans

WARD EVANS
D.O.A. NO. SO-1
PIPER AIRCRAFT CORPORATION
VERO BEACH, FLORIDA

DATE OF APPROVAL: JUNE 18, 1976

PIPER

HANDBOOK PART NO. 761 624

WARNING

EXTREME CARE MUST BE EXERCISED TO LIMIT THE USE OF THIS MANUAL TO APPLICABLE AIRCRAFT. THIS MANUAL REVISED AS INDICATED BELOW OR SUBSEQUENTLY REVISED IS VALID FOR USE WITH THE AIRPLANE IDENTIFIED ON THE FACE OF THE TITLE PAGE WHEN OFFICIALLY APPROVED. SUBSEQUENT REVISIONS SUPPLIED BY PIPER AIRCRAFT CORPORATION MUST BE PROPERLY INSERTED.

MODEL PA-28-181, CHEROKEE ARCHER II

PILOT'S OPERATING HANDBOOK, REPORT: VB-790 REVISION 4

PIPER AIRCRAFT CORPORATION
APPROVAL SIGNATURE AND STAMP

Published by
PUBLICATIONS DEPARTMENT
Piper Aircraft Corporation
Issued: June 18, 1976

APPLICABILITY

Application of this handbook is limited to the specific Piper PA-28-181 model airplane designated by serial number and registration number on the face of the title page of this handbook.

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

REVISIONS

The information compiled in the Pilot's Operating Handbook will be kept current by revisions distributed to the airplane owners.

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

I. Revisions

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

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

II. Identification of Revised Material

Revised text and illustrations shall be indicated by a black vertical line along the outside margin of the page, opposite revised, added or deleted material. A line along the outside margin of the page opposite the page number will indicate that an entire page was added.

Black lines will indicate only current revisions with changes and additions to or deletions of existing text and illustrations. Changes in capitalization, spelling, punctuation or the physical location of material on a page will not be identified by symbols.

ORIGINAL PAGES ISSUED

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

Title, ii through v, 1-1 through 1-14, 2-1 through 2-8, 3-1 through 3-12, 4-1 through 4-16, 5-1 through 5-28, 6-1 through 6-52, 7-1 through 7-26, 8-1 through 8-16, 9-1 through 9-14, 10-1 through 10-2.

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS

Current Revisions to the PA-28-181 Cherokee Archer II Pilot's Operating Handbook, REPORT: VB-790 issued June 18, 1976

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
Rev. 1 - 761 624 (PR760804)	2-1	Revised "Never Exceed Speed" KIAS value.	Ward Evans Ward Evans August 4, 1976
	2-2	Revised Airspeed Indicator Markings.	
	6-i	Revised report number at bottom of page.	
	6-41	Revised Arm and Moment for item 177.	
	6-43	Revised items 193, 195 and 197.	
Rev. 2 - 761 624 (PR770120)	3-4	Revised Open Door procedure.	
	3-11	Revised para. 3.27 info.	
	4-7	Added Caution to para. 4.9; relocated material to page 4-8.	
	4-8	Added relocated material from page 4-7.	
	4-14	Added Note to para. 4.31.	
	4-15	Revised stall speed in para. 4.35.	
	5-4	Revised wording in para. 5.5 (c).	
	5-6	Revised fuel quantity figure in para. 5.5 (g).	
	5-23	Revised 55% & 75% range figures in Fig. 5-25.	
	6-4	Added A & B values to Fig. 5-1.	
	6-5	Revised weight and balance formula.	
	6-21	Added Weight, Arm and Moment to item 29 a.; added item 29 b.; changed existing item 29 b. to 29 c.	
	6-35	Revised item 79 Arm and Moment.	
	6-37	Revised item 115 Dwg. 99002-5 to -8 and item 117 Dwg. 99003-5 to -7.	
	6-44	Revised footnote.	
	6-48	Revised item 257b. Arm and Moment.	
	7-21	Added info to para. 7.25.	Ward Evans Ward Evans Jan. 20, 1977
	10-1	Revised 10.3(c); relocated material to page 10-2.	
	10-2	Added relocated material from page 10-1.	
Rev. 3 - 761 624 (PR770225)	1-6	Corrected to "Meteorological."	
	3-11	Revised NOTE.	
	4-4	Revised Hot Start procedure.	
	4-9	Revised 4.13 (b).	
	6-4	Revised Leveling Diagram illustration.	Ward Evans Ward Evans Feb. 25, 1977
	6-49	Revised Dwg. Nos. of items 287 and 289.	
	7-25	Added ELT test info.	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
Rev. 4 - 761 624 (PR770712)	1-3	Added new propeller to 1.5 and added footnote.	
	1-11, 1-12, 1-13, 1-14	Revised section 1.21, Conversion Factors.	
	2-2	Added new propeller to 2.7, item (j) and added footnote.	
	4-4	Revised Starting With External Power Source.	
	4-9	Revised item 4.13 (d) Starting Engine With External Power Source.	
	4-10	Added CAUTION.	
	5-9	Revised page nos.; revised titles; added pages; added figures.	
	5-19	Added ser. nos.	
	5-20	Relocated Fig. 5-19 to page 5-21; added new chart (Fig. 5-18)."	
	5-21	Relocated Fig. 5-21 to page 5-23; added relocated Fig. 5-19; added ser. nos.	
	5-22	Relocated Fig. 5-23 to page 5-25; added new chart (Fig. 5-20).	
	5-23	Relocated Fig. 5-25 to page 5-27; added relocated Fig. 5-21; added ser. nos.	
	5-24	Relocated Fig. 5-27 to page 5-29; added new chart (Fig. 5-22).	
	5-25	Relocated Fig. 5-29 to page 5-30; added relocated Fig. 5-23; added ser. nos.	
	5-26	Relocated Fig. 5-31 to page 5-31; added new chart (Fig. 5-24).	
	5-27	Relocated Fig. 5-33 to page 5-32; added relocated Fig. 5-25; added ser. nos.	
	5-28	Relocated Fig. 5-35 to page 5-33; added new chart (Fig. 5-26).	
	5-29	Added page (added relocated Fig. 5-27).	
	5-30	Added page (added relocated Fig. 5-29).	
	5-31	Added page (added relocated Fig. 5-31).	
	5-32	Added page (added relocated Fig. 5-33).	
	5-33	Added page (added relocated Fig. 5-35).	
	5-34	Added page (int. blank).	
	6-17	Added item 3.	
	6-33	Added items 76 and 77.	
	6-45	Added item 223; renumbered items; relocated item.	
	6-46	Added relocated items; renumbered items; added new items; relocated items; removed footnotes; added footnote.	
	6-47	Added relocated items; renumbered items; added new items; relocated items; added footnote.	

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
Rev. 4 - 761 624 (PR770712) (cont)	6-48	Added relocated items; renumbered items; added new items; revised item 277; relocated items; added footnotes.	
	6-48a	Added page (added relocated items and new item).	
	6-48b	Added page.	
	6-49	Renumbered items; revised items 325 and 329.	
	6-50	Renumbered items; revised item 349.	Ward Evans Ward Evans July 12, 1977
	7-1	Added new propeller model to para. 7.5.	
	7-18	Revised alternate static source description in para. 7.21.	
Rev. 5 - 761 624 (PR780703)	1-4	Revised note.	
	2-2	Revised propeller tolerance RPM.	
	2-7	Added additional Takeoff Check List.	
	3-3	Added Primer information to "Engine Power Loss During Takeoff" check list.	
	3-7	Added Primer information to "Engine Power Loss During Takeoff."	
	4-5	Added Primer information to "Before Takeoff" check list.	
	4-9	Deleted "pressing in" of magneto switch as necessary.	
	4-12	Added Primer checked information to paragraph.	
	5-5	Changed item 5 from Cruise Fuel to Cruise Fuel Consumption.	
	5-25	Added note to graph.	
	5-26	Added note to graph.	
	5-27	Added note to graph.	
	5-28	Added note to graph.	
	6-1	Changed paragraph.	
	6-35	Changed item 93.	
	6-41	Added Collins VHF-250 to item 169, added Collins VIR-350 to item 171.	
	6-42	Relocated item 187, 189 and 191; added items to 189 and 191.	
	6-43	Relocated item 187, 189 and 191, added items 194 and 195, changed item 195 to 196.	
	6-44	Relocated items 201, 203 and 205, revised item 211.	
	6-50	Added vendor information to item 349.	
	7-21	Added "Caution" to 7.23.	
	7-24	Removed ELT information from 7.37.	
	8-i	Added 8.29 Cold Weather Operation to table of contents.	for Ward Evans July 3, 1978
	8-15	Added 8.29 Cold Weather Operation.	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
Rev. 10 - 761 624 (PR900608)	1-3	Moved item (c) to pg. 1-4.	
	1-4	Relocated item (c) from pg. 1-3. Revised item (c).	
	8-1	Revised para. 8.1.	
	8-3	Revised para. 8.3.	
	8-4	Revised para. 8.5.	
	8-11	Revised para. 8.19. Added Note.	D. H. Trompler July 30, 1990
	8-11a	Revised Fuel Grade Comparison Chart.	
	9-9	Revised Emergency Operation, Item (a) (2).	

TABLE OF CONTENTS

SECTION 1 - GENERAL

TABLE OF CONTENTS

SECTION 1

GENERAL

SECTION 1

GENERAL

1.1 INTRODUCTION

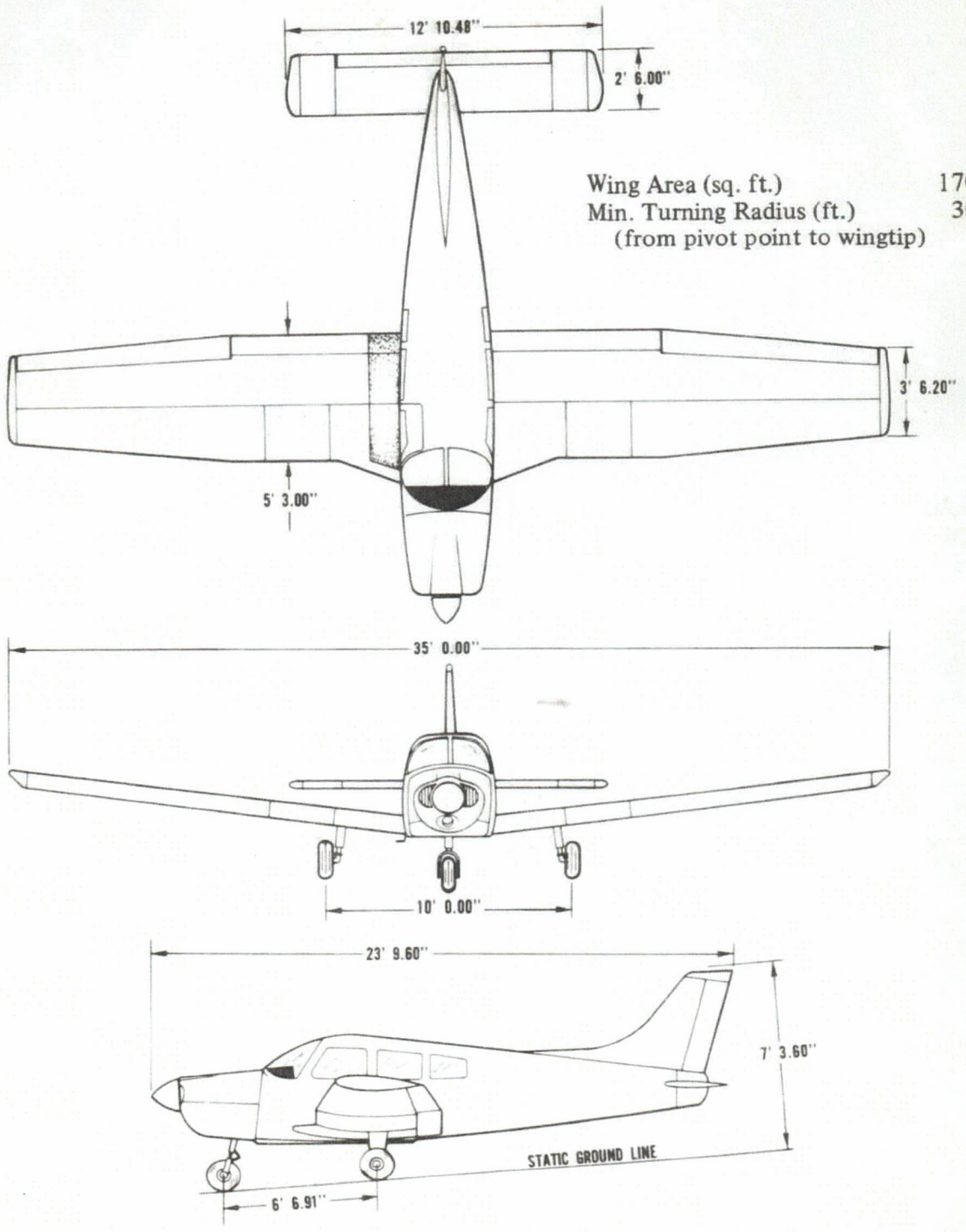
This Pilot's Operating Handbook is designed for maximum utilization as an operating guide for the pilot. It includes the material required to be furnished to the pilot by C.A.R. 3 and FAR Part 21, Subpart J. It also contains supplemental data supplied by the airplane manufacturer.

This handbook is not designed as a substitute for adequate and competent flight instruction, knowledge of current airworthiness directives, 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 familiarize himself with the limitations, performance, procedures and operational handling characteristics of the airplane before flight.

The handbook has been divided into numbered (arabic) 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 left blank intentionally.



THREE VIEW

Figure 1-1

1.3 ENGINES

(a)	Number of Engines	1
(b)	Engine Manufacturer	Lycoming
(c)	Engine Model Number	O-360-A4A or O-360-A4M
(d)	Rated Horsepower	180
(e)	Rated Speed (rpm)	2700
(f)	Bore (inches)	5.125
(g)	Stroke (inches)	4.375
(h)	Displacement (cubic inches)	361.0
(i)	Compression Ratio	8.5:1
(j)	Engine Type	Four Cylinder, Direct Drive Horizontally Opposed, Air Cooled

1.5 PROPELLERS

(a)	Number of Propellers	1
(b)	Propeller Manufacturer	Sensenich
(c)	Model	76EM8S5-0-60* or 76EM8S5-0-62**
(d)	Number of Blades	2
(e)	Propeller Diameter (inches)	
	(1) Maximum	76
	(2) Minimum	76
(f)	Propeller Type	Fixed Pitch

1.7 FUEL

AVGAS ONLY

(a)	Fuel Capacity (U.S. gal.) (total)	50
(b)	Usable Fuel, Total	48
(c)	Fuel Grade, Aviation	
	(1) Minimum Octane	100/130 Green
	(2) Specified Octane	100/130 Green
	(3) Alternate Fuel	Refer to latest issue of Lycoming Instruction No. 1070.

1.9 OIL

(a)	Oil Capacity (U.S. Quarts)	8
(b)	Oil Specification	Refer to latest issue of Lycoming Instruction No. 1014.

*Serial nos 28-7790001 through 28-7790607.
**Serial nos. 28-7890001 and up.

(c) Oil Viscosity per Average Ambient Temp. for Starting

	MIL-L-6082B Mineral SAE Grade	MIL-L-22851 Ashless Dispersant SAE Grades
(1) All Temperatures	--	15W-50 or 20W-50
(2) Above 80°F	60	60
(3) Above 60°F	50	40 or 50
(4) 30°F to 90°F	40	40
(5) 0°F to 70°F	30	30, 40 or 20W-40
(6) 0°F to 90°F	20W-50	20W-50 or 15W-50
(7) Below 10°F	20	30 or 20W-30

When operating temperatures overlap indicated ranges, use the lighter grade oil.

1.11 MAXIMUM WEIGHTS

	NORMAL	UTILITY
(a) Maximum Takeoff Weight (lbs)	2550	2130
(b) Maximum Landing Weight (lbs)	2550	2130
(c) Maximum Weights in Baggage Compartment	200	0

1.13 STANDARD AIRPLANE WEIGHTS*

(a) Standard Empty Weight (lbs): Weight of a standard airplane including unusable fuel, full operating fluids and full oil	1416
(b) Maximum Useful Load (lbs): The difference between the Maximum Takeoff Weight and the Standard Empty Weight	1134

1.15 BAGGAGE SPACE

(a) Compartment Volume (cubic feet)	24
(b) Entry Width (inches)	22
(c) Entry Height (inches)	20

1.17 SPECIFIC LOADINGS

(a) Wing Loading (lbs per sq ft)	15.0
(b) Power Loading (lbs per hp)	14.2

*These values are approximate and may vary from one aircraft to another. Refer to Figure 6-5 for the Standard Empty Weight value and Useful Load value to be used for C.G. calculation for the aircraft specified.

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."
M	Mach Number is the ratio of true airspeed to the speed of sound.
TAS	True Airspeed is the airspeed of an airplane relative to undisturbed air which is the CAS corrected for altitude, temperature and compressability.
V_A	Maneuvering Speed is the maximum speed at which application of full available aerodynamic control will not overstress the airplane.
V_{FE}	Maximum Flap Extended Speed is the highest speed permissible with wing flaps in a prescribed extended position.
V_{NE}/M_{NE}	Never Exceed Speed or Mach Number is the speed limit that may not be exceeded at any time.
V_{NO}	Maximum Structural Cruising Speed is the speed that should not be exceeded except in smooth air and then only with caution.
V_S	Stalling Speed or the minimum steady flight speed at which the airplane is controllable.
V_{SO}	Stalling Speed or the minimum steady flight speed at which the airplane is controllable in the landing configuration.
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) Meteorogolical Terminology

ISA	International Standard Atmosphere in which: The air is a dry perfect gas; The temperature at sea level is 15° Celcius (59° Fahrenheit); The pressure at sea level is 29.92 inches hg. (1013 mb); 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 millibars).
Pressure Altitude	Altitude measured from standard sea-level pressure (29.92 in. Hg) by a pressure or barometric altimeter. It is the indicated pressure altitude corrected for position and instrument error. In this handbook, altimeter instrument errors are assumed to be zero.
Station Pressure	Actual atmospheric pressure at field elevation.
Wind	The wind velocities recorded as variables on the charts of this handbook are to be understood as the headwind or tailwind components of the reported winds.

(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

EGT Gauge	Exhaust Gas 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	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.
MEA	Minimum en route IFR altitude.
Route Segment	A part of a route. Each end of that part is identified by: (1) a geographical location; or (2) a point at which a definite radio fix can be established.

(f) Weight and Balance Terminology

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

1.21 CONVERSION FACTORS

MULTIPLY	BY	TO OBTAIN
acres	0.4047	ha
	43560	sq. ft.
	0.0015625	sq. mi.
atmospheres (atm)	76	cm Hg
	29.92	in. Hg
	1.0133	bar
	1.033	kg/cm^2
	14.70	lb./sq. in.
	2116	lb./sq. ft.
bars (bar)	0.98692	atm.
	14.503768	lb./sq. in.
British Thermal Unit (BTU)	0.2519958	kg-cal
centimeters (cm)	0.3937	in.
	0.032808	ft.
centimeters of mercury at 0°C (cm Hg)	0.01316	atm
	0.3937	in. Hg
	0.1934	lb./sq. in.
	27.85	lb./sq. ft.
	135.95	kg/m^2
centimeters per second (cm/sec.)	0.032808	ft./sec.
	1.9685	ft./min.
	0.02237	mph
cubic centimeters (cm^3)	0.03381	fl. oz.
	0.06102	cu. in.
	3.531×10^{-5}	cu. ft.
	0.001	l
	2.642×10^{-4}	U.S. gal.
cubic feet (cu.ft.)	28317	cm^3
	0.028317	m^3
	1728	cu. in.
	0.037037	cu. yd.
	7.481	U.S. gal.
	28.32	l
cubic feet per minute (cu. ft./min.)	0.472	l/sec.
	0.028317	m^3/min.

MULTIPLY	BY	TO OBTAIN
cubic inches (cu. in.)	16.39	cm^3
	1.639×10^{-5}	m^3
	5.787×10^{-4}	cu. ft.
	0.5541	fl. oz.
	0.01639	l
	4.329×10^{-3}	U.S. gal.
	0.01732	U.S. qt.
cubic meters (m^3)	61024	cu. in.
	1.308	cu. yd.
	35.3147	cu. ft.
	264.2	U.S. gal.
cubic meters per minute (m^3/min.)	35.3147	cu. ft./min.
cubic yards (cu. yd.)	27	cu. ft.
	0.7646	m^3
	202	U.S. gal.
degrees (arc)	0.01745	radians
degrees per second (deg./sec.)	0.01745	radians/sec.
drams, fluid (dr. fl.)	0.125	fl. oz.
drams, avdp. (dr. avdp.)	0.0625	oz. avdp.
feet (ft.)	30.48	cm
	0.3048	m
	12	in.
	0.33333	yd.
	0.0606061	rod
	1.894×10^{-4}	mi.
	1.645×10^{-4}	NM
feet per minute (ft./min.)	0.01136	mph
	0.01829	km/hr.
	0.508	cm/sec.
	0.00508	m/sec.

MULTIPLY	BY	TO OBTAIN
feet per second (ft./sec.)	0.6818	mph
	1.097	km/hr.
	30.48	cm/sec.
	0.5921	kts.
foot-pounds (ft.-lb.)	0.1383255	m-kg
	3.24×10^{-4}	kg-cal
foot-pounds per minute (ft.-lb./min.)	3.030×10^{-5}	hp
foot-pounds per second (ft.-lb./sec.)	1.818×10^{-5}	hp
gallons, Imperial (Imperial gal.)	277.4	cu. in.
	1.201	U.S. gal.
	4.546	l
gallons, U.S. dry (U.S. gal. dry)	268.8	cu. in.
	1.556×10^{-1}	cu. ft.
	1.164	U.S. gal.
	4.405	l
gallons, U.S. liquid (U.S. gal.)	231	cu. in.
	0.1337	cu. ft.
	4.951×10^{-3}	cu. yd.
	3785.4	cm^3
	3.785×10^{-3}	m^3
	3.785	l
	0.83268	Imperial gal.
	128	fl. oz.
gallons per acre (gal./acre)	9.353	l/ha
grams (g)	0.001	kg
	0.3527	oz. avdp.
	2.205×10^{-3}	lb.
grams per centimeter (g/cm)	0.1	kg/m
	6.721×10^{-2}	lb./ft.
	5.601×10^{-3}	lb./in.
grams per cubic centimeter (g/cm^3)	1000	kg/m^3
	0.03613	lb./cu. in.
	62.43	lb./cu. ft.

MULTIPLY	BY	TO OBTAIN
hectares (ha)	2.471	acres
	107639	sq. ft.
	10000	m^2
horsepower (hp)	33000	ft.-lb./min.
	550	ft.-lb./sec.
	76.04	m-kg/sec.
	1.014	metric hp
horsepower, metric	75	m-kg/sec.
	0.9863	hp
inches (in.)	25.40	mm
	2.540	cm
	0.0254	m
	0.08333	ft.
	0.027777	yd.
inches of mercury at 0 °C (in. Hg)	0.033421	atm
	0.4912	lb./sq. in.
	70.73	lb./sq. ft.
	345.3	kg/m^2
	2.540	cm Hg
	25.40	mm Hg
inch-pounds (in.-lb.)	0.011521	m-kg
kilograms (kg)	2.204623	lb.
	35.27	oz. avdp.
	1000	g
kilogram-calories (kg-cal)	3.9683	BTU
	3087	ft.-lb.
	426.9	m-kg
kilograms per cubic meter (kg/m^3)	0.06243	lb./cu. ft.
	0.001	g/cm^3
kilograms per hectare (kg/ha)	0.892	lb./acre
kilograms per square centimeter (kg/cm^2)	0.9678	atm
	28.96	in. Hg
	14.22	lb./sq. in.
	2048	lb./sq. ft.

MULTIPLY	BY	TO OBTAIN
kilograms per square meter (kg/m^2)	2.896×10^{-3}	in. Hg
	1.422×10^{-3}	lb./sq. in.
	0.2048	lb./sq. ft.
kilometers (km)	1×10^{-5}	cm
	3280.8	ft.
	0.6214	mi.
	0.53996	NM
kilometers per hour (km/hr.)	0.9113	ft./sec.
	58.68	ft./min.
	0.53996	kt
	0.6214	mph
	0.27778	m/sec.
	16.67	m/min.
knots (kt)	1	nautical mph
	1.689	ft./sec.
	1.1516	statute mph
	1.852	km/hr.
	51.48	m/sec.
liters (l)	1000	cm^3
	61.02	cu. in.
	0.03531	cu. ft.
	33.814	fl. oz.
	0.264172	U.S. gal.
	0.2200	Imperial gal.
	1.05669	qt.
liters per hectare (l/ha)	13.69	fl. oz./acre
	0.107	gal./acre
liters per second (l/sec.)	2.12	cu. ft./min.
meters (m)	39.37	in.
	3.280840	ft.
	1.0936	yd.
	0.198838	rod
	6.214×10^{-4}	mi.
	5.3996×10^{-4}	NM
meter-kilogram (m-kg)	7.23301	ft.-lb.
	86.798	in.-lb.

MULTIPLY	BY	TO OBTAIN
meters per minute (m/min.)	0.06	km/hr.
meters per second (m/sec.)	3.280840	ft./sec.
	196.8504	ft./min.
	2.237	mph
	3.6	km/hr.
microns	3.937×10^{-5}	in.
miles, statue (mi.)	5280	ft.
	1.6093	km
	1609.3	m
	0.8684	NM
miles per hour (mph)	44.7041	cm/sec.
	4.470×10^{-1}	m/sec.
	1.467	ft./sec.
	88	ft./min.
	1.6093	km/hr.
	0.8684	kt
miles per hour square (m/hr. sq.)	2.151	ft./sec. sq.
millibars	2.953×10^{-2}	in. Hg
millimeters (mm)	0.03937	in.
millimeters of mercury at 0°C (mm Hg)	0.03937	in. Hg
nautical miles (NM)	6080	ft.
	1.1516	statute mi.
	1852	m
	1.852	km
ounces, avdp. (oz. avdp.)	28.35	g
	16	dr. avdp.
ounces, fluid (fl. oz.)	8	dr. fl.
	29.57	cm^3
	1.805	cu. in.
	0.0296	l
	0.0078	U.S. gal.

MULTIPLY	BY	TO OBTAIN
ounces, fluid per acre (fl. oz./ acre)	0.073	l/ha
pounds (lb.)	0.453592	kg
	453.6	g
	3.108×10^{-2}	slug
pounds per acre (lb./acre)	1.121	kg/ha
pounds per cubic foot (lb./cu. ft.)	16.02	kg/m^3
pounds per cubic inch (lb./cu. in.)	1728	lb./cu. ft.
	27.68	g/cm^3
pounds per square foot (lb./sq. ft.)	0.1414	in. Hg
	4.88243	kg/m^2
	4.725×10^{-4}	atm
pounds per square inch (psi or lb./sq. in.)	5.1715	cm Hg
	2.036	in. Hg
	0.06804	atm
	0.0689476	bar
	703.1	kg/m^2
quart, U.S. (qt.)	0.94635	l
	57.749	cu. in.
radians	57.30	deg. (arc)
	0.1592	rev.
radians per second (radians/sec.)	57.30	deg./sec.
	0.1592	rev./sec.
	9.549	rpm
revolutions (rev.)	6.283	radians
revolutions per minute (rpm or rev./min.)	0.1047	radians/sec.
revolutions per second (rev./sec.)	6.283	radians/sec.

MULTIPLY	BY	TO OBTAIN
rod	16.5	ft.
	5.5	yd.
	5.029	m
slug	32.174	lb.
square centimeters (cm^2)	0.1550	sq. in.
	0.001076	sq. ft.
square feet (sq. ft.)	929	cm^2
	0.092903	m^2
	144	sq. in.
	0.1111	sq. yd.
	2.296×10^{-5}	acres
square inches (sq. in.)	6.4516	cm^2
	6.944×10^{-3}	sq. ft.
square kilometers (km^2)	0.3861	sq. mi.
square meters (m^2)	10.76391	sq. ft.
	1.196	sq. yd.
	0.0001	ha
square miles (sq. mi.)	2.590	km^2
	640	acres
square rods (sq. rods)	30.25	sq. yd.
square yards (sq. yd.)	0.8361	m^2
	9	sq. ft.
	0.0330579	sq. rods
yards (yd.)	0.9144	m
	3	ft.
	36	in.
	0.181818	rod

SECTION 2 - LIMITATIONS

TABLE OF CONTENTS

SECTION 2

LIMITATIONS

SECTION 2

LIMITATIONS

2.1 GENERAL

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

This airplane must be operated as a normal or utility category airplane in compliance with the operating limitations stated in the form of placards and markings and those given in this section and this complete 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.	154	148
Maximum Structural Cruising Speed (V_{NO}) - Do not exceed this speed except in smooth air and then only with caution.	125	121
Design Maneuvering Speed (V_A) - Do not make full or abrupt control movements above this speed.		
At 2550 LBS. G.W.	113	111
At 1634 LBS. G.W.	89	89

> 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. Manuevering speed should not be exceeded while operating in rough air.

Maximum Flaps Extended Speed (V_{FE}) - Do not exceed this speed with the flaps extended.	102	100

2.5 AIRSPEED INDICATOR MARKINGS

MARKING	IAS
Red Radial Line (Never Exceed)	(154 KTS)
Yellow Arc (Caution Range - Smooth Air Only)	(125 KTS to 154 KTS)
Green Arc (Normal Operating Range)	(55 KTS to 125 KTS)
White Arc (Flap Down)	(49 KTS to 102 KTS)

2.7 POWER PLANT LIMITATIONS

(a)	Number of Engines	1
(b)	Engine Manufacturer	Lycoming
(c)	Engine Model No.	O-360-A4M with carburetor setting 10-3878
(d)	Engine Operating Limits	
	(1) Maximum Horsepower	180
	(2) Maximum Rotation Speed (RPM)	2700
	(3) Maximum Oil Temperature	245°F
(e)	Oil Pressure	
	Minimum (red line)	25 PSI
	Maximum (red line)	90 PSI
(f)	Fuel Pressure	
	Minimum (red line)	.5 PSI
	Maximum (red line)	8 PSI
(g)	Fuel Grade (minimum octane)	100/130 - Green
(h)	Number of Propellers	1
(i)	Propeller Manufacturer	Sensenich
(j)	Propeller Model	76EM8S5-0-60* or 76EM8S5-0-62**
(k)	Propeller Diameter	
	Minimum	76 IN.
	Maximum	76 IN.
(l)	Propeller Tolerance (static RPM at maximum permissible throttle setting)	Not above 2425 RPM* Not below 2325 RPM* Not above 2375 RPM** Not below 2275 RPM**

No additional tolerance permitted.

*Serial nos. 28-7790001 through 28-7790607.
**Serial nos. 28-7890001 and up.

2.9 POWER PLANT INSTRUMENT MARKINGS

(a)	Tachometer	
	Green Arc (Normal Operating Range)	500 to 2700 RPM
	Red Line (Maximum Continuous Power)	2700 RPM
(b)	Oil Temperature	
	Green Arc (Normal Operating Range)	75° to 245°F
	Red Line (Maximum)	245°F
(c)	Oil Pressure	
	Green Arc (Normal Operating Range)	60 PSI to 90 PSI
	Yellow Arc (Caution Range) (Idle)	25 PSI to 60 PSI
	Red Line (Minimum)	25 PSI
	Red Line (Maximum)	90 PSI
(d)	Fuel Pressure	
	Green Arc (Normal Operating Range)	.5 PSI to 8 PSI
	Red Line (Minimum)	.5 PSI
	Red Line (Maximum)	8 PSI

2.11 WEIGHT LIMITS

		NORMAL	UTILITY
(a)	Maximum Weight	2550 LBS	1950 LBS
(b)	Maximum Baggage	200 LBS	0 LBS

NOTE

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

2.13 CENTER OF GRAVITY LIMITS

(a) Normal Category

Weight Pounds	Forward Limit Inches Aft of Datum	Rearward Limit Inches Aft of Datum
2550	88.6	93.0
2050 (and less)	82.0	93.0

(b) Utility Category

Weight Pounds	Forward Limit Inches Aft of Datum	Rearward Limit Inches Aft of Datum
1950 (and less)	82.0	86.5

NOTES

Straight line variation between points given.

The datum used is 78.4 inches ahead of the wing leading edge at the inboard intersection of the straight and tapered section.

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

2.15 MANEUVER LIMITS

(a) Normal Category - All acrobatic maneuvers including spins prohibited.
(b) Utility Category - Approved maneuvers for bank angles exceeding 60°.

	Entry Speed
Steep Turns	113 KIAS
Lazy Eights	113 KIAS
Chandelles	113 KIAS

2.17 FLIGHT LOAD FACTORS

	NORMAL	UTILITY
(a) Positive Load Factor (Maximum)	3.8 G	4.4 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) Non Icing

2.21 FUEL LIMITATIONS

(a) Total Capacity	50 U.S. GAL
(b) Unusable Fuel	2 U.S. GAL
The unusable fuel for this airplane has been determined as 1.0 gallon in each wing in critical flight attitudes.	
(c) Usable Fuel	48 U.S. GAL
The usable fuel in this airplane has been determined as 24.0 gallons in each wing.	

2.23 PLACARDS

In full view of the pilot:

"THIS AIRPLANE MUST BE OPERATED AS A NORMAL OR UTILITY CATEGORY AIRPLANE IN COMPLIANCE WITH THE OPERATING LIMITATIONS STATED IN THE FORM OF PLACARDS, MARKINGS AND MANUALS.

ALL MARKINGS AND PLACARDS ON THIS AIRPLANE APPLY TO ITS OPERATION AS A UTILITY CATEGORY AIRPLANE. FOR NORMAL AND UTILITY CATEGORY OPERATION, REFER TO THE PILOT'S OPERATING HANDBOOK.

NO ACROBATIC MANEUVERS ARE APPROVED FOR NORMAL CATEGORY OPERATIONS. SPINS ARE PROHIBITED FOR NORMAL AND UTILITY CATEGORY."

In full view of the pilot, one of the following takeoff checklists and the following landing check list will be installed:

TAKEOFF CHECK LIST

Fuel on proper tank
Electric fuel pump on
Engine gauges checked
Flaps - set
Carb heat off

Mixture set
Seat backs erect

Fasten belts/harness
Trim tab - set
Controls - free
Door - latched
Air Conditioner - off

TAKEOFF CHECK LIST

Fuel on proper tank
Electric fuel pump on
Engine gauges checked
Flaps - set
Carb heat off

Mixture set
Primer locked
Seat backs erect

Fasten belts/harness
Trim tab - set
Controls - free
Door - latched
Air conditioner - off

LANDING CHECK LIST

Fuel on proper tank
Mixture rich
Electric fuel pump on

Seat back erect

Flaps - set (102 KIAS max.)
Fasten belts/harness
Air Conditioner - off

The "AIR COND OFF" item in the above takeoff and landing check lists is mandatory for air conditioned aircraft only.

In full view of the pilot, in the area of the air conditioner control panel when the air conditioner is installed:

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

Adjacent to upper door latch:

"ENGAGE LATCH BEFORE FLIGHT."

On inside of the baggage compartment door:

"BAGGAGE MAXIMUM 200 LBS"
"UTILITY CATEGORY OPERATION - NO BAGGAGE OR AFT PASSENGERS ALLOWED. NORMAL CATEGORY OPERATION - SEE PILOT'S OPERATING HANDBOOK WEIGHT AND BALANCE SECTION FOR BAGGAGE AND AFT PASSENGER LIMITATIONS."

In full view of the pilot:

"MANEUVERING SPEED 113 KIAS AT 2550 LBS. (SEE P.O.H.)"

"UTILITY CATEGORY OPERATION - NO AFT PASSENGERS ALLOWED."

"DEMONSTRATED CROSS WIND COMPONENT - 17 KTS."

On the instrument panel in full view of the pilot when the oil cooler winterization kit is installed:

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

In full view of the pilot:

"UTILITY CATEGORY OPERATION ONLY."

(1) NO AFT PASSENGERS ALLOWED.
(2) ACROBATIC MANEUVERS ARE LIMITED TO THE FOLLOWING:

	ENTRY SPEED
SPINS PROHIBITED	
STEEP TURNS	113 KIAS
LAZY EIGHTS	113 KIAS
CHANDELLES	113 KIAS

On the instrument panel in full view of the pilot:

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

SECTION 3 - EMERGENCY PROCEDURES

TABLE OF CONTENTS

SECTION 3

EMERGENCY PROCEDURES

SECTION 3

EMERGENCY PROCEDURES

3.1 GENERAL

The recommended procedures for coping with various types of emergencies and critical situations are provided by this section. All of required (FAA regulations) emergency procedures and those necessary for the safe operation of the airplane as determined by the operating and design features of the airplane are presented.

Emergency procedures associated with those optional systems and equipment which require handbook supplements are provided by Section 9 (Supplements).

The first portion of this section consists of an abbreviated emergency check list which supplies an action sequence for critical situations with little emphasis on the operation of systems.

The remainder of the section is devoted to amplified emergency procedures containing additional information to provide the pilot with a more complete understanding of the procedures.

These procedures are suggested as the best course of action for coping with the particular condition described, but are not a substitute for sound judgment and common sense. Since emergencies rarely happen in modern aircraft, their occurrrence is usually unexpected and the best corrective action may not always be obvious. Pilots should familiarize themselves with the procedures given in this section and be prepared to take appropriate action should an emergency arise.

Most basic emergency procedures, such as power off landings, are a normal part of pilot training. Although these emergencies are discussed here, this information is not intended to replace such training, but only to provide a source of reference and review, and to provide information on procedures which are not the same for all aircraft. It is suggested that the pilot review standard emergency procedures periodically to remain proficient in them.

3.3 EMERGENCY PROCEDURES CHECK LIST

ENGINE FIRE DURING START

Starter . . . . . crank engine
Mixture . . . . . idle cut-off
Throttle . . . . . open
Electric fuel pump . . . . . OFF
Fuel selector . . . . . OFF
Abandon if fire continues

ENGINE POWER LOSS DURING TAKEOFF

If sufficient runway remains for a normal landing, land straight ahead.

If insufficient runway remains:
Maintain safe airspeed
Make only shallow turn to avoid obstructions
Flaps as situation requires

If sufficient altitude has been gained to attempt a restart:
Maintain safe airspeed
Fuel selector . . . . . switch to tank containing fuel
Electric fuel pump . . . . . check ON
Mixture . . . . . check RICH
Carburetor heat . . . . . ON
Primer . . . . . locked
If power is not regained, proceed with power off landing.

ENGINE POWER LOSS IN FLIGHT

Fuel selector . . . . . switch to tank containing fuel
Electric fuel pump . . . . . ON
Mixture . . . . . RICH
Carburetor heat . . . . . ON
Engine gauges . . . . . check for indication of cause of power loss
Primer . . . . . check locked
If no fuel pressure is indicated, check tank selector position to be sure it is on a tank containing fuel.

When power is restored:
Carburetor heat . . . . . OFF
Electric fuel pump . . . . . OFF

If power is not restored prepare for power off landing.
Trim for 76 KIAS

POWER OFF LANDING

Locate suitable field.
Establish spiral pattern.
1000 ft. above field at downwind position for normal landing approach.
When field can easily be reached slow to 66 KIAS for shortest landing.

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

When committed to landing:
Ignition . . . . . OFF
Master switch . . . . . OFF
Fuel selector . . . . . OFF
Mixture . . . . . idle cut-off
Seat belt and harness . . . . . tight

FIRE IN FLIGHT

Source of fire . . . . . check

Electrical fire (smoke in cabin):
Master switch . . . . . OFF
Vents . . . . . open
Cabin heat . . . . . OFF
Land as soon as practicable.

Engine fire:
Fuel selector . . . . . OFF
Throttle . . . . . CLOSED
Mixture . . . . . idle cut-off
Electric fuel pump . . . . . check OFF
Heater and defroster . . . . . OFF
Proceed with power off landing procedure.

LOSS OF OIL PRESSURE

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

LOSS OF FUEL PRESSURE

Electric fuel pump . . . . . .ON
Fuel selector . . . . . check on full tank

HIGH OIL TEMPERATURE

Land at nearest airport and investigate the problem.
Prepare for power off landing.

ALTERNATOR FAILURE

Verify failure
Reduce electrical load as much as possible.
Alternator circuit breakers . . . . . check
Alt switch . . . . . OFF (for 1 second), then on

If no output:
Alt switch . . . . . .OFF

Reduce electrical load and land as soon as practical.

SPIN RECOVERY

Throttle . . . . . idle
Ailerons . . . . . neutral
Rudder . . . . . full opposite to direction of rotation
Control wheel . . . . . .full forward
Rudder . . . . . neutral (when rotation stops)
Control wheel . . . . . .as required to smoothly regain level flight altitude

OPEN DOOR

If both upper and side latches are open, the door will trail slightly open and airspeeds will be reduced slightly.

To close the door in flight:
Slow airplane to 87 KIAS
Cabin vents . . . . . .close
Storm window . . . . . .open

If upper latch is open . . . . . .latch
If side latch is open . . . . . pull on armrest while moving latch handle to latched position

If both latches are open . . . . . .latch side latch then top latch

ENGINE ROUGHNESS

Carburetor heat . . . . . .ON

If roughness continues after one min:
Carburetor heat . . . . . .OFF
Mixture . . . . . .adjust for max. smoothness
Electric fuel pump . . . . . .ON
Fuel selector . . . . . switch tanks
Engine gauges . . . . . check
Magneto switch . . . . . "L" then "R" then "BOTH"

If operation is satisfactory on either one, continue on that magneto at reduced power and full "RICH" mixture to first airport.

Prepare for power off landing.

3.5 AMPLIFIED EMERGENCY PROCEDURES (GENERAL)

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

3.7 ENGINE FIRE DURING START

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

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

If the engine has started, continue operating to try to pull the fire into the engine.

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

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

3.9 ENGINE POWER LOSS DURING TAKEOFF

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

If sufficient runway remains to complete a normal landing, land straight ahead.

If insufficient runway remains, maintain a safe airspeed and make only a shallow turn if necessary to avoid obstructions. Use of flaps depends on the circumstances. Normally, flaps should be fully extended for touchdown.

If sufficient altitude has been gained to attempt a restart, maintain a safe airspeed and switch the fuel selector to another tank containing fuel. Check the electric fuel pump to insure that it is "ON" and that the mixture is "RICH." The carburetor heat should be "ON" and the primer checked to insure that it is locked.

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

If power is not regained, proceed with the Power Off Landing procedure (refer to the emergency check list and paragraph 3.13).

3.11 ENGINE POWER LOSS IN FLIGHT

Complete engine power loss is usually caused by fuel flow interruption and power will be restored shortly after fuel flow is restored. If power loss occurs at a low altitude, the first step is to prepare for an emergency landing (refer to paragraph 3.13). An airspeed of at least 76 KIAS should be maintained.

If altitude permits, switch the fuel selector to another tank containing fuel and turn the electric fuel pump "ON." Move the mixture control to "RICH" and the carburetor heat to "ON." Check the engine gauges for an indication of the cause of the power loss. Check to insure the primer is locked. If no fuel pressure is indicated, check the tank selector position to be sure it is on a tank containing fuel.

When power is restored move the carburetor heat to the "OFF" position and turn "OFF" the electric fuel pump.

If the preceding steps do not restore power, prepare for an emergency landing.

If time permits, turn the ignition switch to "L" then to "R" then back to "BOTH." Move the throttle and mixture control levers to different settings. This may restore power if the problem is too rich or too lean a mixture or if there is a partial fuel system restriction. Try other fuel tanks. Water in the fuel could take some time to be used up, and allowing the engine to windmill may restore power. If power is due to water, fuel pressure indications will be normal.

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

If power is not regained, proceed with the Power Off Landing procedure (refer to the emergency check list and paragraph 3.13).

3.13 POWER OFF LANDING

If loss of power occurs at altitude, trim the aircraft for best gliding angle 76 KIAS (Air Cond. off) and look for a suitable field. If measures taken to restore power are not effective, and if time permits, check your charts for airports in the immediate vicinity; it may be possible to land at one if you have sufficient altitude. If possible, notify the FAA by radio of your difficulty and intentions. If another pilot or passenger is aboard, let him help.

When you have located a suitable field, establish a spiral pattern around this field. Try to be at 1000 feet above the field at the downwind position, to make a normal landing approach. When the field can easily be reached, slow to 66 KIAS with flaps down for the shortest landing. Excess altitude may be lost by widening your pattern, using flaps or slipping, or a combination of these.

Touchdown should normally be made at the lowest possible airspeed.

When committed to a landing, close the throttle control and shut "OFF" the master and ignition switches. Flaps may be used as desired. Turn the fuel selector valve to "OFF" and move the mixture to idle cut-off. The seat belts and shoulder harness (if installed) should be tightened. Touchdown should be normally made at the lowest possible airspeed.

3.15 FIRE IN FLIGHT

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

Check for the source of the fire first.

If an electrical fire is indicated (smoke in the cabin), the master switch should be turned "OFF." The cabin vents should be opened and the cabin heat turned "OFF." A landing should be made as soon as possible.

If an engine fire is present, switch the fuel selector to "OFF" and close the throttle. The mixture should be at idle cut-off. Turn the electric fuel pump "OFF." In all cases, the heater and defroster should be "OFF." If radio communication is not required, select master switch "OFF." Proceed with power off landing procedure.

NOTE

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

3.17 LOSS OF OIL PRESSURE

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

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

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

If engine stoppage occurs, proceed with Power Off Landing.

3.19 LOSS OF FUEL PRESSURE

If loss of fuel pressure occurs, turn "ON" the electric fuel pump and check that the fuel selector is on a full tank.

If the problem is not an empty tank, land as soon as practical and have the engine-driven fuel pump and fuel system checked.

3.21 HIGH OIL TEMPERATURE

An abnormally high oil temperature indication may be caused by a low oil level, an obstruction in the oil cooler, damaged or improper baffle seals, a defective gauge, or other causes. Land as soon as practical at an appropriate airport and have the cause investigated.

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

3.23 ALTERNATOR FAILURE

Loss of alternator output is detected through zero reading on the ammeter. Before executing the following procedure, insure that the reading is zero and not merely low by actuating an electrically powered device, such as the landing light. If no increase in the ammeter reading is noted, alternator failure can be assumed.

The electrical load should be reduced as much as possible. Check the alternator circuit breakers for a popped circuit.

The next step is to attempt to reset the overvoltage relay. This is accomplished by moving the "ALT" switch to "OFF" for one second and then to "ON." If the trouble was caused by a momentary overvoltage condition (16.5 volts and up) this procedure should return the ammeter to a normal reading.

If the ammeter continues to indicate "O" output, or if the alternator will not remain reset, turn off the "ALT" switch, maintain minimum electrical load and land as soon as practical. All electrical load is being supplied by the battery.

3.25 SPIN RECOVERY

Intentional spins are prohibited in this airplane. If a spin is inadvertently entered, immediately move the throttle to idle and the ailerons to neutral.

Full rudder should then be applied opposite to the direction of rotation followed by control wheel full forward. When the rotation stops, neutralize the rudder and ease back on the control wheel as required to smoothly regain a level flight attitude.

3.27 OPEN DOOR

The cabin door on the Cherokee is double latched, so the chances of its springing open in flight at both the top and side are remote. However, should you forget the upper latch, or not fully engage the side latch, the door may spring partially open. This will usually happen at takeoff or soon afterward. A partially open door will not affect normal flight characteristics, and a normal landing can be made with the door open.

If both upper and side latches are open, the door will trail slightly open, and airspeed will be reduced slightly.

To close the door in flight, slow the airplane to 87 KIAS, close the cabin vents and open the storm window. If the top latch is open, latch it. If the side latch is open, pull on the armrest while moving the latch handle to the latched position. If both latches are open, close the side latch then the top latch.

3.29 ENGINE ROUGHNESS

Engine roughness is usually due to carburetor icing which is indicated by a drop in RPM, and may be accompanied by a slight loss of airspeed or altitude. If too much ice is allowed to accumulate, restoration of full power may not be possible; therefore, prompt action is required.

Turn carburetor heat on (See Note). RPM will decrease slightly and roughness will increase. Wait for a decrease in engine roughness or an increase in RPM, indicating ice removal. If no change in approximately one minute, return the carburetor heat to "OFF."

If the engine is still rough, adjust the mixture for maximum smoothness. The engine will run rough if too rich or too lean. The electric fuel pump should be switched to "ON" and the fuel selector switched to the other tank to see if fuel contamination is the problem. Check the engine gauges for abnormal readings. If any gauge readings are abnormal, proceed accordingly. Move the magneto switch to "L" then to "R," then back to "BOTH." If operation is satisfactory on either magneto, proceed on that magneto at reduced power, with mixture full "RICH," to a landing at the first available airport.

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

NOTE

Partial carburetor heat may be worse than no heat at all, since it may melt part of the ice, which will refreeze in the intake system. When using carburetor heat, therefore, always use full heat, and when ice is removed return the control to the full cold position.

SECTION 4 - NORMAL PROCEDURES

TABLE OF CONTENTS

SECTION 4

NORMAL PROCEDURES

SECTION 4

NORMAL PROCEDURES

4.1 GENERAL

This section clearly describes the recommended procedures for the conduct of normal operations for the Cherokee Archer II. All of the required (FAA regulations) procedures and those necessary for the safe operation of the airplane as determined by the operating and design features of the airplane are presented.

Normal procedures associated with those optional systems and equipment which require handbook supplements are provided by Section 9 (Supplements).

These procedures are provided to present a source of reference and review and to supply information on procedures which are not the same for all aircraft. Pilots should familiarize themselves with the procedures given in this section in order to become proficient in the normal operations of the airplane.

The first portion of this section consists of a short form check list which supplies an action sequence for normal operations with little emphasis on the operation of the systems.

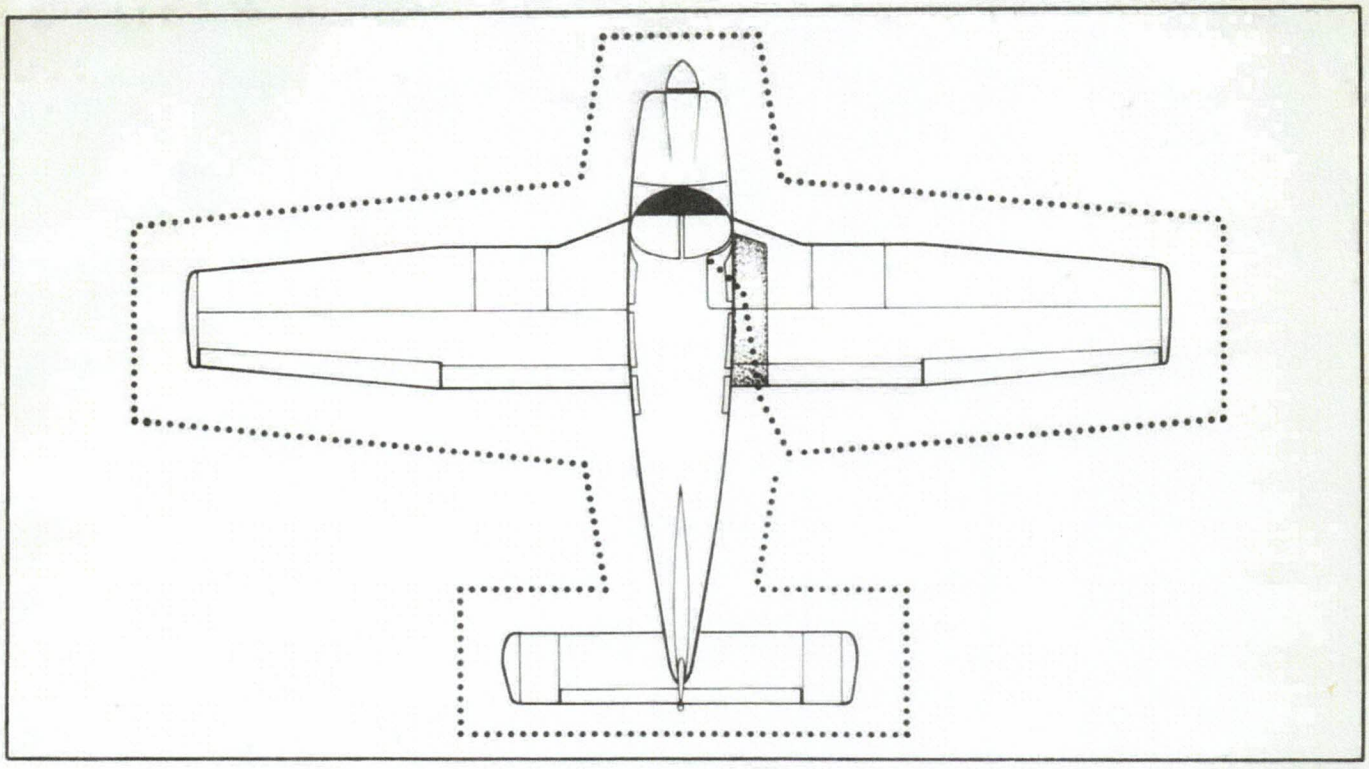
The remainder of the section is devoted to amplified normal procedures which provide detailed information and explanations of the procedures and how to perform them. This portion of the section is not intended for use as an in-flight reference due to the lengthly explanations. The short form check list should be used for this purpose.

4.3 AIRSPEEDS FOR SAFE OPERATIONS

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

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

(a)	Best Rate of Climb Speed	76 KIAS
(b)	Best Angle of Climb Speed	64 KIAS
(c)	Turbulent Air Operating Speed (See Subsection 2.3)	113 KIAS
(d)	Maximum Flap Speed	102 KIAS
(e)	Landing Final Approach Speed (Flaps 40°)	66 KIAS
(f)	Maximum Demonstrated Crosswind Velocity	17 KTS



WALK-AROUND

Figure 4-1

4.5 NORMAL PROCEDURES CHECK LIST

PREFLIGHT CHECK

Control wheel . . . . . .release belts
Master switch . . . . . .ON
Fuel quantity gauges . . . . . check
Master switch . . . . . .OFF
Ignition . . . . . .OFF
Exterior . . . . . check for damage
Control surfaces . . . . . check for interference - free of ice, snow, frost
Hinges . . . . . .check for interference
Wings . . . . . free of ice, snow, frost
Stall warning . . . . . check
Navagation lights . . . . . check
Fuel tanks . . . . . check supply visually - secure caps
Fuel tank sumps . . . . . .drain
Fuel vents . . . . . .open
Main gear struts . . . . . .proper inflation (4.50 in.)
Tires . . . . . check
Brake blocks . . . . . check
Pitot head . . . . . remove cover - holes clear
Windshield . . . . . .clean
Propeller and spinner . . . . . check
Fuel and oil . . . . . check for leaks
Oil . . . . . check level
Dipstick . . . . . .properly seated
Cowling . . . . . secure
Inspection covers . . . . . secure
Nose wheel tire . . . . . check
Nose gear strut . . . . . .proper inflation (3.25 in.)
Air inlets . . . . . clear
Alternator belt . . . . . .check tension
Tow bar and control locks . . . . . .stow
Baggage . . . . . stowed properly - secure
Baggage door . . . . . close and secure
Fuel strainer . . . . . .drain
Primary flight controls . . . . . .proper operation
Cabin door . . . . . close and secure
Required papers . . . . . on board
Seat belts and harness . . . . . fastened - check inertia reel

BEFORE STARTING ENGINE

Brakes . . . . . set
Carburetor heat . . . . . full COLD
Fuel selector . . . . . desired tank

STARTING ENGINE WHEN COLD

Throttle . . . . . 1/4" open
Master switch . . . . . ON
Electric fuel pump . . . . . ON
Mixture . . . . . full RICH
Starter . . . . . engage
Throttle . . . . . adjust
Oil pressure . . . . . check

If engine does not start within 10 sec. prime and repeat starting procedure.

STARTING ENGINE WHEN HOT

Throttle . . . . . 1/2" open
Master switch . . . . . ON
Electric fuel pump . . . . . ON
Mixture . . . . . full RICH
Starter . . . . . engage
Throttle . . . . . adjust
Oil pressure . . . . . check

STARTING ENGINE WHEN FLOODED

Throttle . . . . . open full
Master switch . . . . . ON
Electric fuel pump . . . . . OFF
Mixture . . . . . idle cut-off
Starter . . . . . engage
Mixture . . . . . advance
Throttle . . . . . retard
Oil pressure . . . . . check

STARTING WITH EXTERNAL POWER SOURCE

Master switch . . . . . OFF
All electrical equipment . . . . . OFF
Terminals . . . . . connect
External power plug . . . . . insert in fuselage
Proceed with normal start
Throttle . . . . . lowest possible RPM
External power plug . . . . . disconnect from fuselage
Master switch . . . . . ON - check ammeter
Oil pressure . . . . . check

WARM-UP

Throttle . . . . . 800 to 1200 RPM

TAXIING

Chocks . . . . . removed
Taxi area . . . . . clear
Throttle . . . . . apply slowly
Brakes . . . . . check
Steering . . . . . check

GROUND CHECK

Throttle . . . . . 2000 RPM
Magnetos . . . . . max. drop 175 RPM
-max. diff. 50 RPM
Vacuum . . . . . 5.0" Hg. ± .1
Oil temp . . . . . check
Oil pressure . . . . . check
Air conditioner . . . . . check
Annunciator panel . . . . . press-to-test
Carburetor heat . . . . . check
Engine is warm for takeoff when throttle can be opened without engine faltering.
Electric fuel pump . . . . . OFF
Fuel pressure . . . . . check
Throttle . . . . . retard

BEFORE TAKEOFF

Master switch . . . . . .ON
Flight instruments . . . . . check
Fuel selector . . . . . .proper tank
Electric fuel pump . . . . . .ON
Engine gauges . . . . . check
Carburetor heat . . . . . .OFF
Seat backs . . . . . .erect
Mixture . . . . . set
Primer . . . . . .locked
Belts/harness . . . . . .fastened
Empty seats . . . . . seat belts snugly fastened
Flaps . . . . . set
Trim tab . . . . . set
Controls . . . . . free
Doors . . . . . latched
Air conditioner . . . . . .OFF

TAKEOFF

NORMAL

Flaps . . . . . set
Tab . . . . . set
Accelerate to 52 to 65 KIAS
Control wheel . . . . . back pressure to rotate to climb attitude

SHORT FIELD, OBSTACLE CLEARANCE

Flaps . . . . . 25° (second notch)
Accelerate to 41 to 49 KIAS depending on aircraft weight
Control wheel . . . . . back pressure to rotate to climb attitude
After breaking ground, accelerate to 45 to 54 KIAS depending on aircraft weight
Accelerate to best flaps up angle of climb speed - 64 KIAS, slowly retract the flaps and climb past the obstacle.
Accelerate to best flaps up rate of climb speed - 76 KIAS

SOFT FIELD

Flaps . . . . . 25° (second notch)
Accelerate to 41 to 49 KIAS depending on aircraft weight
Control wheel . . . . . back pressure to rotate to climb attitude
After breaking ground, accelerate to 45 to 54 KIAS depending on aircraft weight
Accelerate to best flaps up rate of climb speed 76 KIAS
Flaps . . . . . .retract slowly

CLIMB

Best rate (flaps up) . . . . . 76 KIAS
Best angle (flaps up) . . . . . 64 KIAS
En route . . . . . 87 KIAS
Electric fuel pump . . . . . OFF at desired altitude

CRUISING

Reference performance charts and Avco-Lycoming Operator's Manual.
Normal max power 75%
Power . . . . . set per power table
Mixture . . . . . adjust

APPROACH AND LANDING

Fuel selector . . . . . .proper tank
Seat backs . . . . . .erect
Belts/harness . . . . . fasten
Electric fuel pump . . . . . .ON
Mixture . . . . . set
Flaps . . . . . set - 102 KIAS max
Air conditioner . . . . . .OFF
Trim to 75 KIAS
Final approach speed (flaps 40°) . . . . . 66 KIAS

STOPPING ENGINE

Flaps	retract
Electric fuel pump	OFF
Air conditioner	OFF
Radios	OFF
Throttle	full aft
Mixture	idle cut-off
Magnetos	OFF
Master switch	OFF

PARKING

Parking brake	set
Control wheel	secured with belts
Flaps	full up
Wheel chocks	in place
Tie downs	secure

4.7 AMPLIFIED NORMAL PROCEDURES (GENERAL)

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

4.9 PREFLIGHT CHECK

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

CAUTION

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

Upon entering the cockpit, release the seat belts securing the control wheel. Turn "ON" the master switch and check the fuel quantity gauges for sufficient fuel. After the fuel quantity check is made turn the master switch "OFF" and check that the ignition switch is "OFF."

To begin the exterior walk-around, check for external damage and operational interference of the control surfaces or hinges. Insure that the wings and control surfaces are free of snow, ice, frost or any other foreign materials.

An operational check of the stall warning system and navigation lights should now be made. Turn the master switch "ON." Lift the detector while checking to determine if the horn is actuated and check that the navigation lights are illuminated. The master switch should be returned to the "OFF" position after the checks are complete.

A visual check of the fuel tank quantity should be performed. Remove the filler cap from each tank and visually check the supply and color. Be sure to secure the caps properly after the check is complete.

The fuel system sumps and strainer should be drained daily prior to the first flight and after refueling to avoid the accumulation of contaminants such as water or sediment. Each fuel tank is equipped with an individual quick drain located at the lower inboard rear corner of the tank. The fuel strainer is equipped with a quick drain located on the front lower corner of the firewall. Each of the fuel tank sumps should be drained first. Then the fuel strainer should be drained twice, once with the fuel selector valve on each tank. Each time fuel is drained, sufficient fuel should be allowed to flow to ensure removal of contaminants. This fuel should be collected in a suitable container, examined for contaminants, and then discarded.

CAUTION

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

Each quick drain should be checked after closing it to make sure it has closed completely and is not leaking.

Check all of the fuel tank vents to make sure they are open.

Next, complete a check of the landing gear. Check the main gear shock struts for proper inflation. There should be 4.50 inches of strut exposure under a normal static load. The nose gear should be checked for 3.25 inches of strut exposure. Check all tires for cuts and wear and insure proper inflation. Make a visual check of the brake blocks for wear or damage.

Remove the cover from the pitot head on the underside of the left wing. Check the pitot head to make sure the holes are open and clear of obstructions.

Don't forget to clean and check the windshield.

The propeller and spinner should be checked for defects or nicks.

Lift the cowling and check for any obvious fuel or oil leaks. Check the oil level. Make sure that the dipstick has properly seated after checking. Secure the cowling and check the inspection covers.

Check the air inlets for foreign matter and the alternator belt for proper tension.

Stow the tow bar and check the baggage for proper storage and security. The baggage compartment doors should be closed and secure.

Upon entering the aircraft, ascertain that all primary flight controls operate properly. Close and secure the cabin door and check that all the required papers are in order and in the airplane.

Fasten the seat belts and shoulder harness and check the function of the inertia reel by pulling sharply on the strap. Fasten seat belts on empty seats.

4.11 BEFORE STARTING ENGINE

Before starting the engine the brakes should be set "ON" and the carburetor heat lever moved to the full COLD position. The fuel selector should then be moved to the desired tank.

4.13 STARTING ENGINE

(a) Starting Engine When Cold

Open the throttle lever approximately 1/4 inch. Turn "ON" the master switch and the electric fuel pump.

Move the mixture control to full "RICH" and engage the starter by rotating the magneto switch clockwise. When the engine fires, release the magneto switch, and move the throttle to the desired setting.

If the engine does not fire within five to ten seconds, disengage the starter, prime the engine and repeat the starting procedure.

(b) Starting Engine When Hot

Open the throttle approximately 1/2 inch. Turn "ON" the master switch and the electric fuel pump. Move the mixture control lever to full RICH and engage the starter by rotating the magneto switch clockwise. When the engine fires, release the magneto switch and move the throttle to the desired setting.

(c) Starting Engine When Flooded

The throttle lever should be full "OPEN." Turn "ON" the master switch and turn "OFF" the electric fuel pump. Move the mixture control lever to idle cut-off and engage the starter by rotating the magneto switch clockwise. When the engine fires, release the magneto switch, advance the mixture and retard the throttle.

(d) Starting Engine With External Power Source

An optional feature called the Piper External Power (PEP) allows the operator to use an external battery to crank the engine without having to gain access to the airplane's battery.

Turn the master switch OFF and turn all electrical equipment OFF. Connect the RED lead of the PEP kit jumper cable to the POSITIVE (+) terminal of an external 12-volt battery and the BLACK lead to the NEGATIVE (-) terminal. Insert the plug of the jumper cable into the socket located on the fuselage. Note that when the plug is inserted, the electrical system is ON. Proceed with the normal starting technique.

After the engine has started, reduce power to the lowest possible RPM, to reduce sparking, and disconnect the jumper cable from the aircraft. Turn the master switch ON and check the alternator ammeter for an indication of output. DO NOT ATTEMPT FLIGHT IF THERE IS NO INDICATION OF ALTERNATOR OUTPUT.

NOTE

For all normal operations using the PEP jumper cables, the master switch should be OFF, but it is possible to use the ship's battery in parallel by turning the 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 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.

4.15 WARM-UP

Warm-up the engine at 800 to 1200 RPM for not more than two minutes in warm weather and four minutes in cold. 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 throttle may be opened fully without backfiring or skipping, and without a reduction in engine oil pressure.

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.

4.17 TAXIING

Before attempting to taxi the airplane, ground personnel should be instructed and approved by a qualified person authorized by the owner. Ascertain that the propeller back blast and taxi areas are clear.

Power should be applied slowly to start the taxi roll. Taxi a few feet forward and apply the brakes to determine their effectiveness. While taxiing, make slight turns to ascertain the effectiveness of the steering.

Observe wing clearances when taxiing near buildings or other stationary objects. If possible, station an observer outside the airplane.

Avoid holes and ruts when taxiing over uneven ground.

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.

4.19 GROUND CHECK

The magnetos should be checked at 2000 RPM. Drop off on either magneto should not exceed 175 RPM and the difference between the magnetos should not exceed 50 RPM. Operation on one magneto should not exceed 10 seconds.

Check the vacuum gauge; the indicator should read 5.0" ± .1" Hg at 2000 RPM.

Check the annunciator panel lights with the press-to-test button. Also check the air conditioner.

Carburetor heat should also be checked prior to takeoff to be sure the control is operating properly and to clear any ice which may have formed during taxiing. Avoid prolonged ground operation with carburetor heat "ON" as the air is unfiltered.

The electric fuel pump should be turned "OFF" after starting or during warm-up to make sure that the engine driven pump is operating. Prior to takeoff the electric pump should be turned ON again to prevent loss of power during takeoff should the engine driven pump fail. Check both oil temperature and oil pressure. The temperature may be low for some time if the engine is being run for the first time of the day. The engine is warm enough for takeoff when the throttle can be opened without the engine faltering.

4.21 BEFORE TAKEOFF

All aspects of each particular takeoff should be considered prior to executing the takeoff procedure.

Turn "ON" the master switch and check and set all of the flight instruments as required. Check the fuel selector to make sure it is on the proper tank (fullest). Turn "ON" the electric fuel pump and check the engine gauges. The carburetor heat should be in the "OFF" position.

All seat backs should be erect.

The mixture should be set and the primer checked to insure that it is locked. The seat belts and shoulder harness should be fastened. Fasten the seat belts snugly around the empty seats.

Exercise and set the flaps and trim tab. Insure proper flight control movement and response.

All doors should be properly secured and latched.

On air conditioned models, the air conditioner must be "OFF" to insure normal takeoff performance.

4.23 TAKEOFF

The normal takeoff technique is conventional for the Cherokee Archer II. The tab should be set slightly aft of neutral, with the exact setting determined by the loading of the airplane. Allow the airplane to accelerate to 48 to 53 KIAS depending on the weight of the aircraft and ease back on the control wheel to rotate to climb attitude.

The procedure used for a short field takeoff with an obstacle clearance or a soft field takeoff differs slightly from the normal technique. The flaps should be lowered to 25 ° (second notch). Allow the aircraft to accelerate to 41 to 49 KIAS depending on the aircraft weight and rotate the aircraft to climb attitude. After breaking ground, accelerate to 45 to 54 KIAS, depending on aircraft weight. Continue to climb while accelerating to the flaps-up rate of climb speed, 76 KIAS if no obstacle is present or 64 KIAS if obstacle clearance is a consideration. Slowly retract the flaps while climbing out.

4.25 CLIMB

The best rate of climb at gross weight will be obtained at 76 KIAS. The best angle of climb may be obtained at 64 KIAS. At lighter than gross weight these speeds are reduced somewhat. For climbing en route, a speed of 87 KIAS is recommended. This will produce better forward speed and increased visibility over the nose during the climb.

When reaching the desired altitude, the electric fuel pump may be turned off.

4.27 CRUISING

The cruising speed of the Cherokee Archer II is determined by many factors, including power setting, altitude, temperature, loading and equipment installed in the airplane.

The normal maximum cruising power is 75% of the rated horsepower of the engine. Airspeeds which may be obtained at various altitudes and power settings can be determined from the performance graphs provided by Section 5.

Use of the mixture control in cruising flight reduces fuel consumption significantly, especially at higher altitudes. The mixture should be leaned during cruising operation above 5000 ft. altitude and at pilot's discretion at lower altitudes when 75% power or less is being used. If any doubt exists as to the amount of power being used, the mixture should be in the full "RICH" position for all operations under 5000 feet.

To lean the mixture, disengage the lock and pull the mixture control until the engine becomes rough, indicating that the lean mixture limit has been reached in the leaner cylinders. Then enrich the mixture by pushing the control towards the instrument panel until engine operation becomes smooth.

If the airplane is equipped with the optional exhaust gas temperature (EGT) gauge, a more accurate means of leaning is available to the pilot. For this procedure, refer to the "Avco-Lycoming Operator's Manual."

Always remember that the electric fuel pump should be turned "ON" before switching tanks, and should be left on for a short period thereafter. In order to keep the airplane in best lateral trim during cruising flight, the fuel should be used alternately from each tank. It is recommended that one tank be used for one hour after takeoff, then the other tank be used for two hours; then return to the first tank, which will have approximately one and one half hours of fuel remaining if the tanks were full at takeoff. The second tank will contain approximately one half hour of fuel. Do not run tanks completely dry in flight. The electric fuel pump should be normally "OFF" so that any malfunction of the engine driven fuel pump is immediately apparent. If signs of fuel starvation should occur at any time during flight, fuel exhaustion should be suspected, at which time the fuel selector should be immediately positioned to the other tank and the electric fuel pump switched to the "ON" position.

4.29 APPROACH AND LANDING

Check to insure the fuel selector is on the proper (fullest) tank and that the seat backs are erect. The seat belts and shoulder harness should be fastened and the inertia reel checked.

Turn "ON" the electric fuel pump and turn "OFF" the air conditioner. The mixture should be set in the full "RICH" position.

The airplane should be trimmed to an initial approach speed of about 75 KIAS with a final approach speed of 66 KIAS with flaps extended. The flaps can be lowered at speeds up to 102 KIAS, if desired.

The mixture control should be kept in full "RICH" position to insure maximum acceleration if it should be necessary to open the throttle again. Carburetor heat should not be applied unless there is an indication of carburetor icing, since the use of carburetor heat causes a reduction in power which may be critical in case of a go-around. Full throttle operation with carburetor heat on can cause detonation.

The amount of flap used during landings and the speed of the aircraft at contact with the runway should be varied according to the landing surface and conditions of wind and airplane loading. It is generally good practice to contact the ground at the minimum possible safe speed consistent with existing conditions.

Normally, the best technique for short and slow landings is to use full flap and enough power to maintain the desired airspeed and approach flight path. Mixture should be full "RICH," fuel on the fullest tank, and electric fuel pump "ON." Reduce the speed during the flareout and contact the ground close to the stalling speed. After ground contact hold the nose wheel off as long as possible. As the airplane slows down, gently lower the nose and apply the brakes. Braking is most effective when flaps are raised and back pressure is applied to the control wheel, putting most of the aircraft weight on the main wheels. In high wind conditions, particularly in strong crosswinds, it may be desirable to approach the ground at higher than normal speeds with partial or no flaps.

4.31 STOPPING ENGINE

At the pilot's discretion, the flaps should be raised and the electric fuel pump turned "OFF."

NOTE

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

The air conditioner and radios should be turned "OFF," and the engine stopped by disengaging the mixture control lock and pulling the mixture control back to idle cut-off. The throttle should be left full aft to avoid engine vibration while stopping. Then the magneto and master switches must be turned "OFF."

4.33 PARKING

If necessary, the airplane should be moved on the ground with the aid of the nose wheel tow bar provided with each airplane and secured behind the rear seats. The aileron and stabilator controls should be secured by looping the safety belt through the control wheel and pulling it snug. The flaps are locked when in the "UP" position and should be left retracted.

Tie downs can be secured to rings provided under each wing and to the tail skid. The rudder is held in position by its connections to the nose wheel steering and normally does not have to be secured.

4.35 STALLS

The stall characteristics of the Cherokee Archer II are conventional. An approaching stall is indicated by a stall warning horn which is activated between five and ten miles per hour above stall speed. Mild airframe buffeting and gentle pitching may also precede the stall.

The gross weight stalling speed of the Cherokee Archer II with power off and full flaps is 49 KIAS. With the flaps up this speed is increased 6 KTS. Loss of altitude during stalls varies from 100 to 350 feet, depending on configuration and power.

NOTE

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

During preflight, the stall warning system should be checked by turning the master switch "ON," lifting the detector and checking to determine if the horn is actuated. The master switch should be returned to the "OFF" position after the check is complete.

4.37 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)

4.39 WEIGHT AND BALANCE

It is the responsibility of the owner and pilot to determine that the airplane remains within the allowable weight vs. center of gravity envelope while in flight.

For weight and balance data, refer to Section 6 (Weight and Balance).

SECTION 5 - PERFORMANCE

TABLE OF CONTENTS

SECTION 5

PERFORMANCE

SECTION 5

PERFORMANCE

5.1 GENERAL

All of the required (FAA regulations) and complementary performance information applicable to the Cherokee Archer II is provided by this section.

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

5.3 INTRODUCTION TO PERFORMANCE AND FLIGHT PLANNING

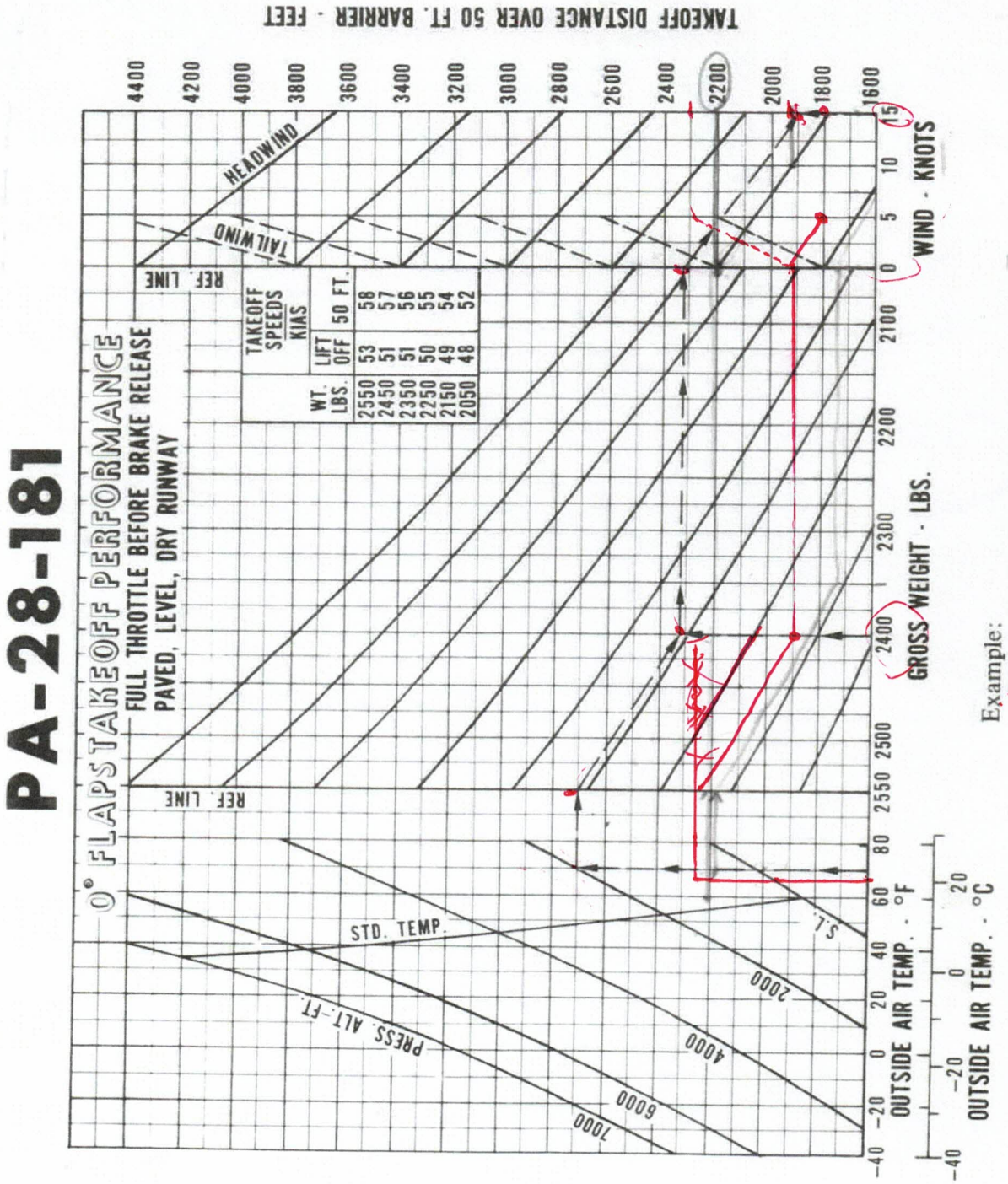
The performance information presented in this section is based on measured Flight Test Data corrected to I.C.A.O. standard day conditions and analytically expanded for the various parameters of weight, altitude, temperature, etc.

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.

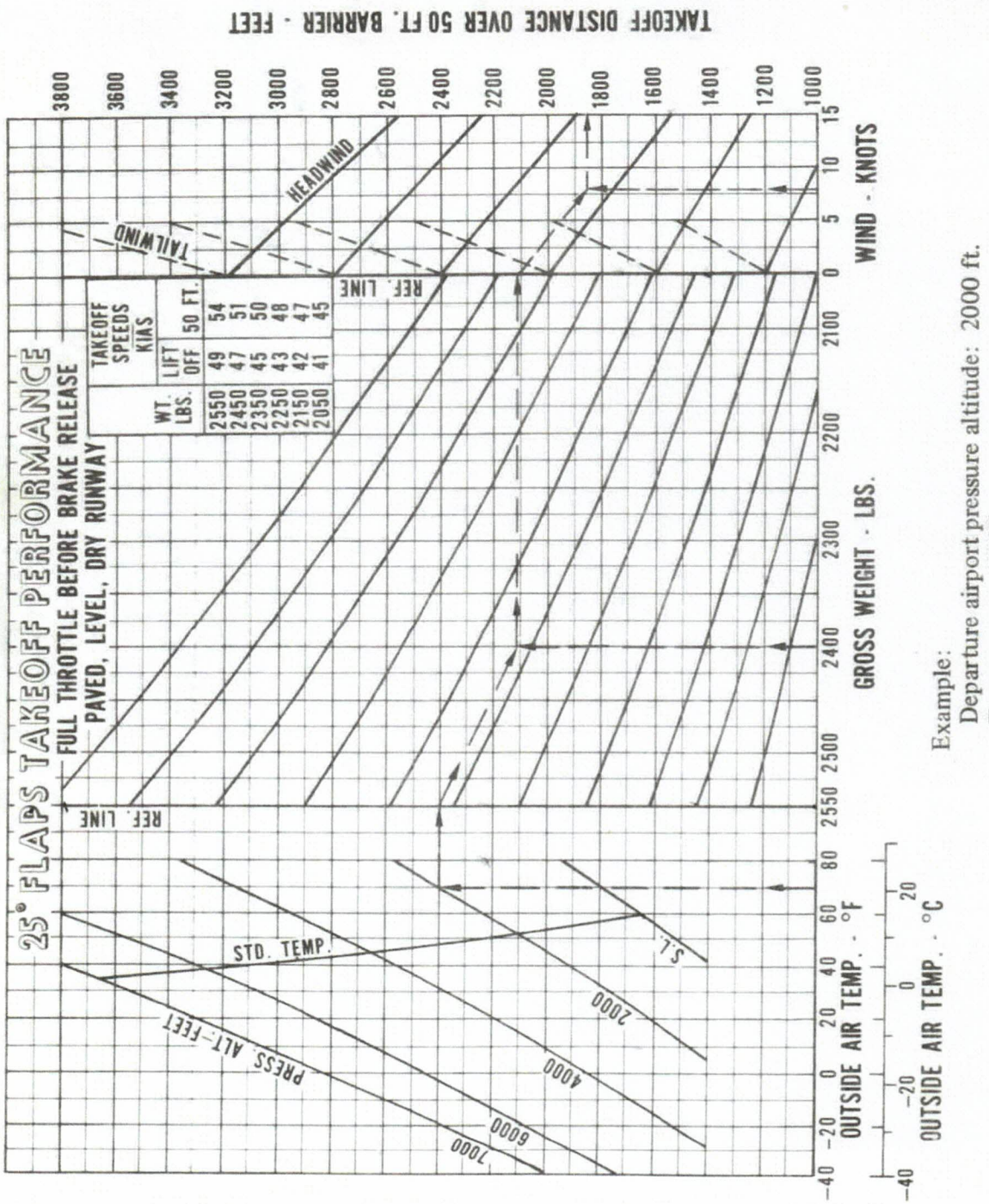
The information provided by paragraph 5.5 (Flight Planning Example) outlines a detailed flight plan using the performance charts in this section. Each chart includes its own example to show how it is used.



Example:
Departure airport pressure altitude: 2000 ft.
Temperature: 70°F
Wind: 15 KT. (headwind)
Gross weight: 2400 lbs.
Takeoff distance: 1900 ft.

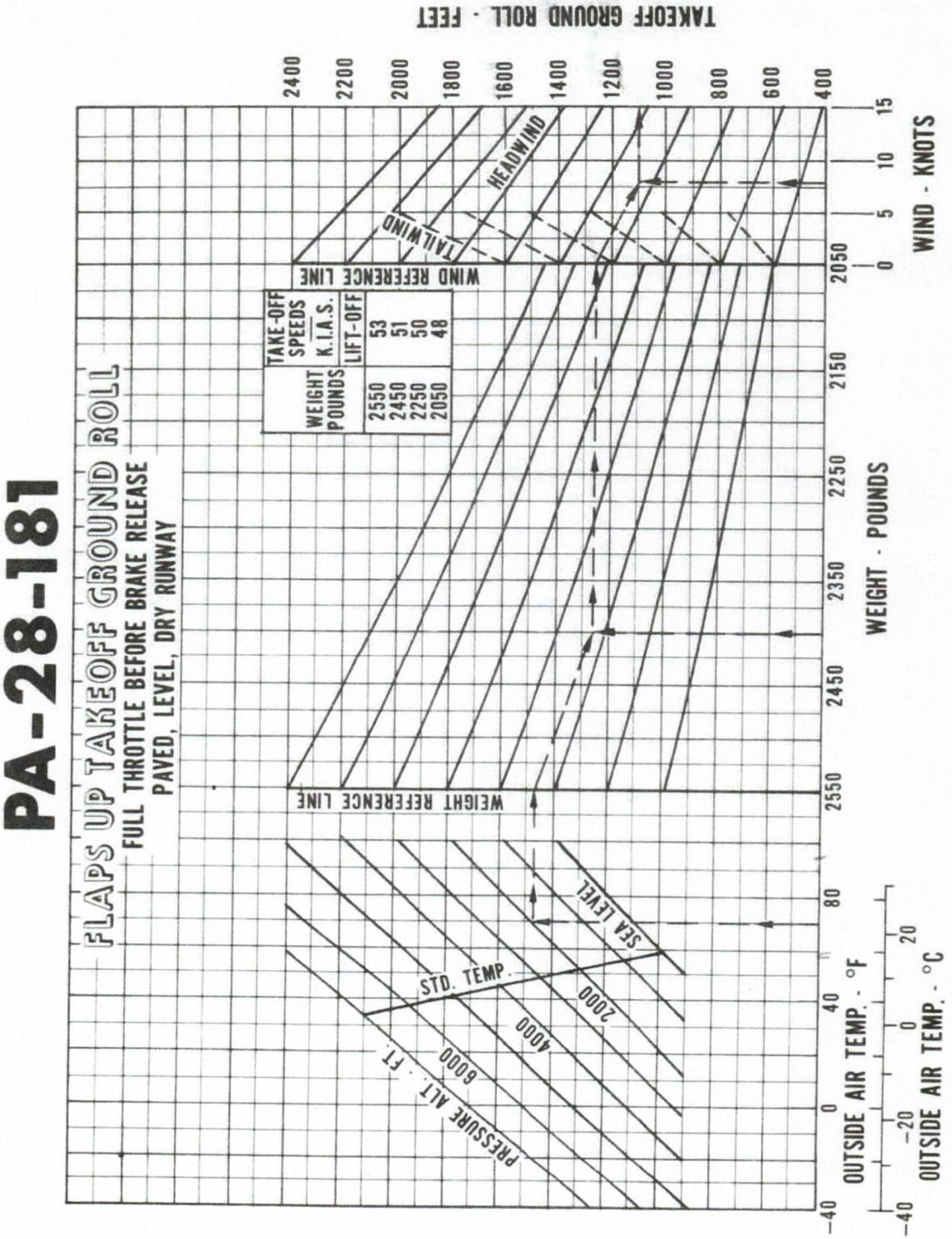
FLAPS UP TAKEOFF PERFORMANCE

Figure 5-5



25° FLAPS TAKEOFF PERFORMANCE

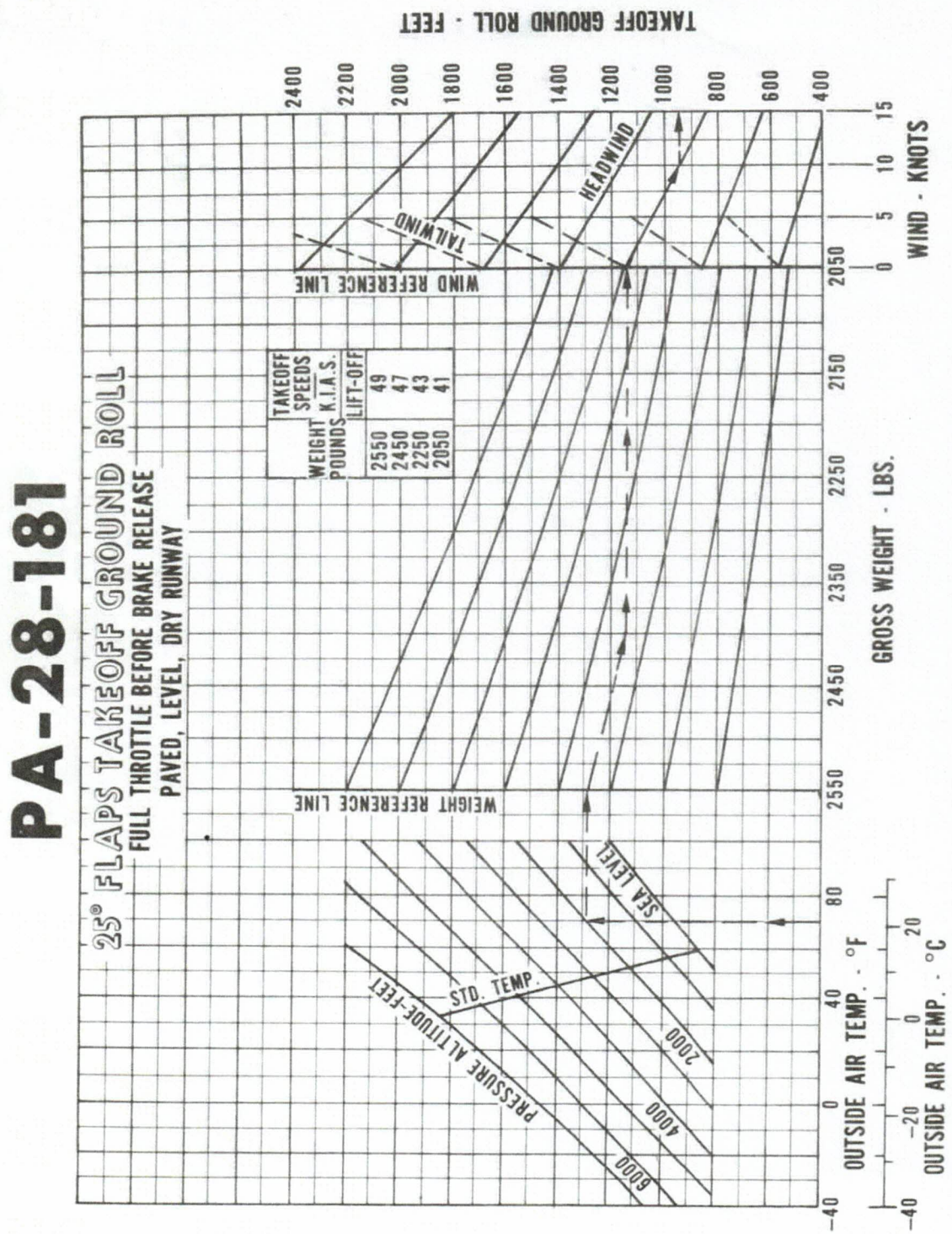
Figure 5-7



Example:
Departure airport pressure altitude: 2000 ft.
Temperature: 70°F
Gross weight: 2400 lbs.
Wind: 8 knots (headwind)
Takeoff ground roll: 1100 ft.

FLAPS UP TAKEOFF GROUND ROLL

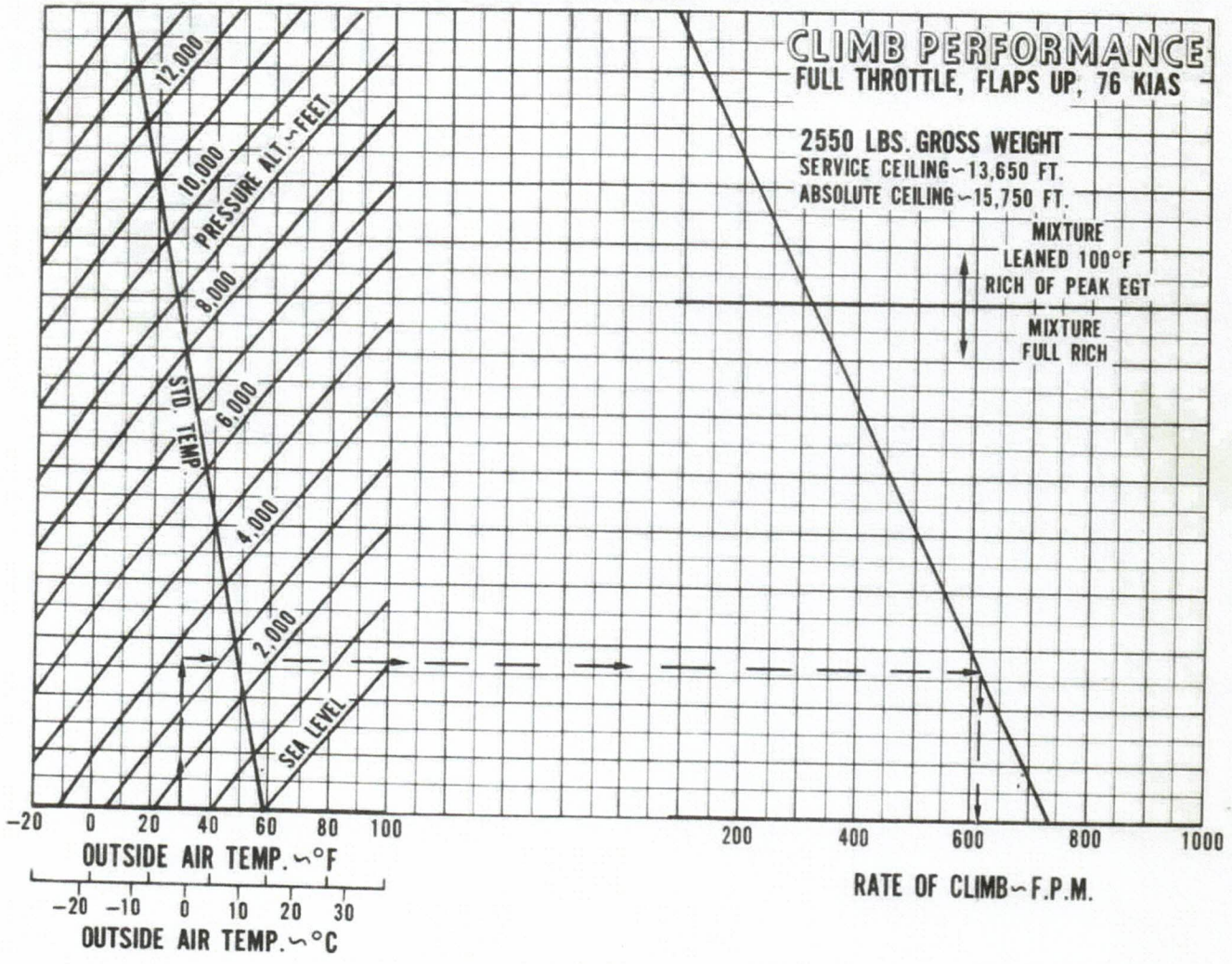
Figure 5-9



Example:
Departure airport pressure altitude: 2000 ft.
Temperature: 70°F
Gross weight: 2400 lbs.
Wind: 10 knots (headwind)
Takeoff ground roll: 950 ft.

25°FLAPS TAKEOFF GROUND ROLL
Figure 5-11

PA-28-181

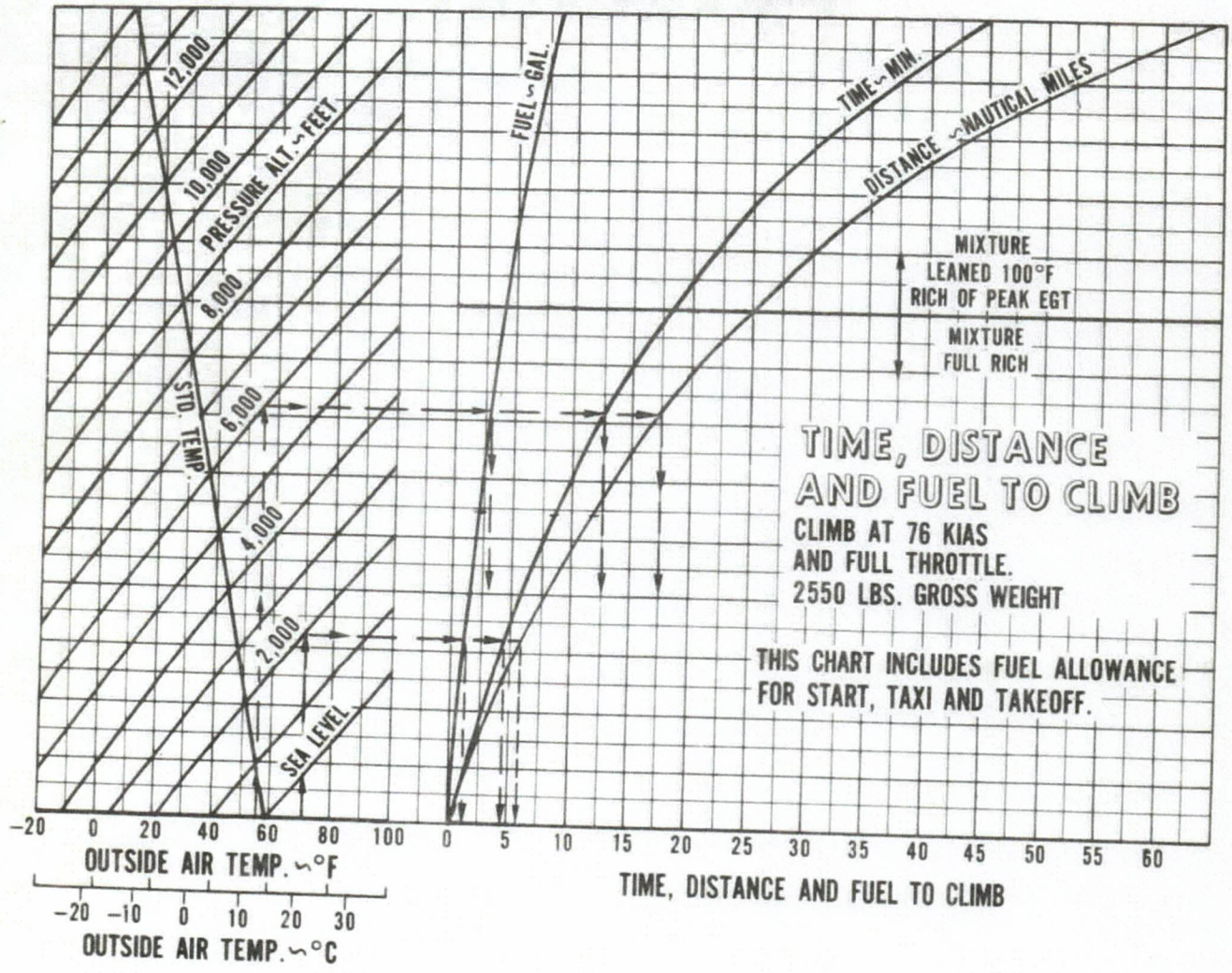


Example:
Climb pressure altitude: 3600 ft.
OAT: 30°F
Rate of climb: 620 F.P.M.

CLIMB PERFORMANCE

Figure 5-13

PA-28-181



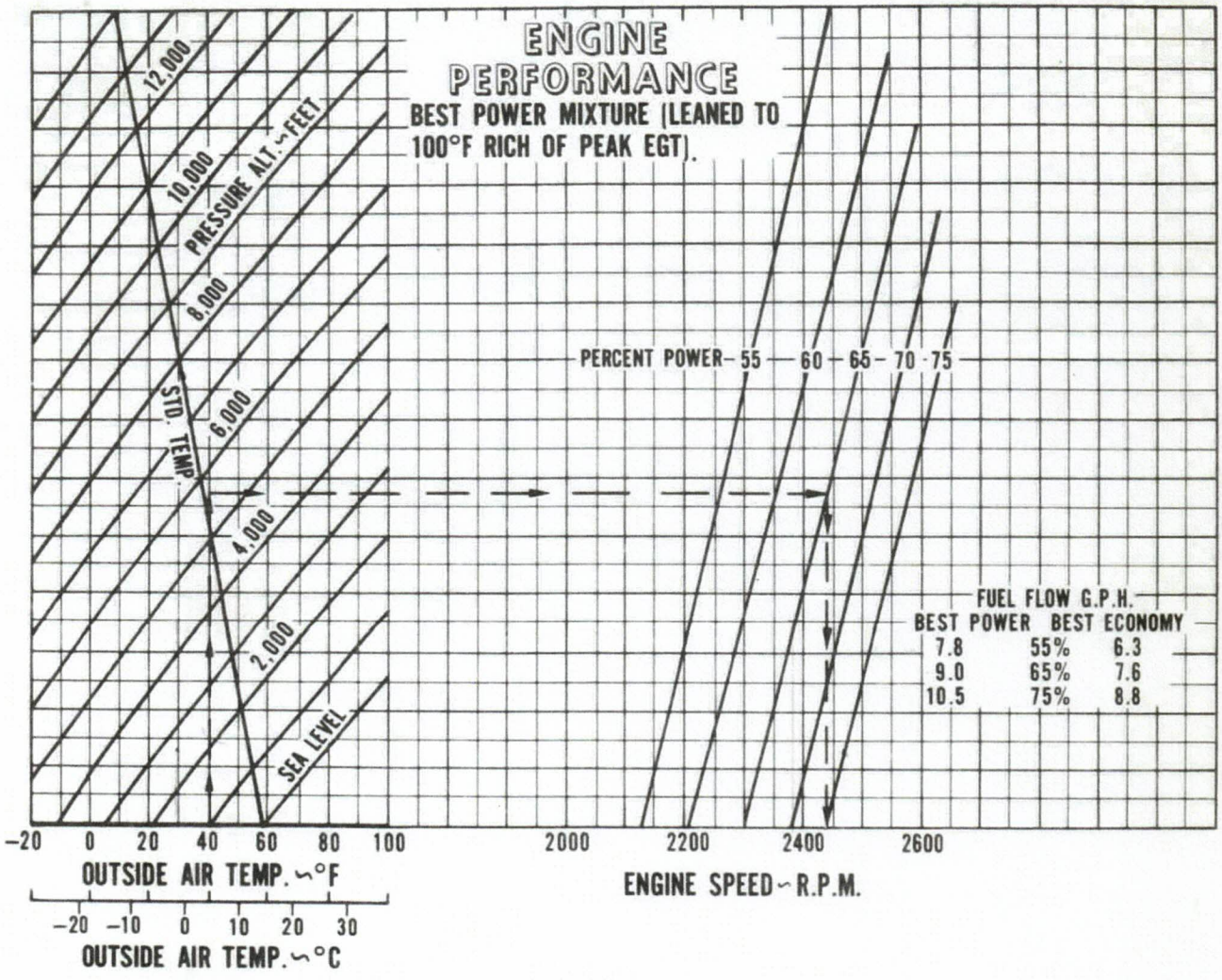
Example:

Departure airport pressure altitude: 2000 ft.
Departure airport temperature: 70° F
Cruise pressure altitude: 6000 ft.
Cruise OAT: 55°F
Time to climb: 12.5 min. minus 4.5 min. = 8 min.
Distance to climb: 17.5 miles minus 6.5 miles = 11 nautical miles
Fuel to climb: 3 gal. minus 1 gal. = 2 gal.

TIME, DISTANCE AND FUEL TO CLIMB

Figure 5-15

PA-28-181

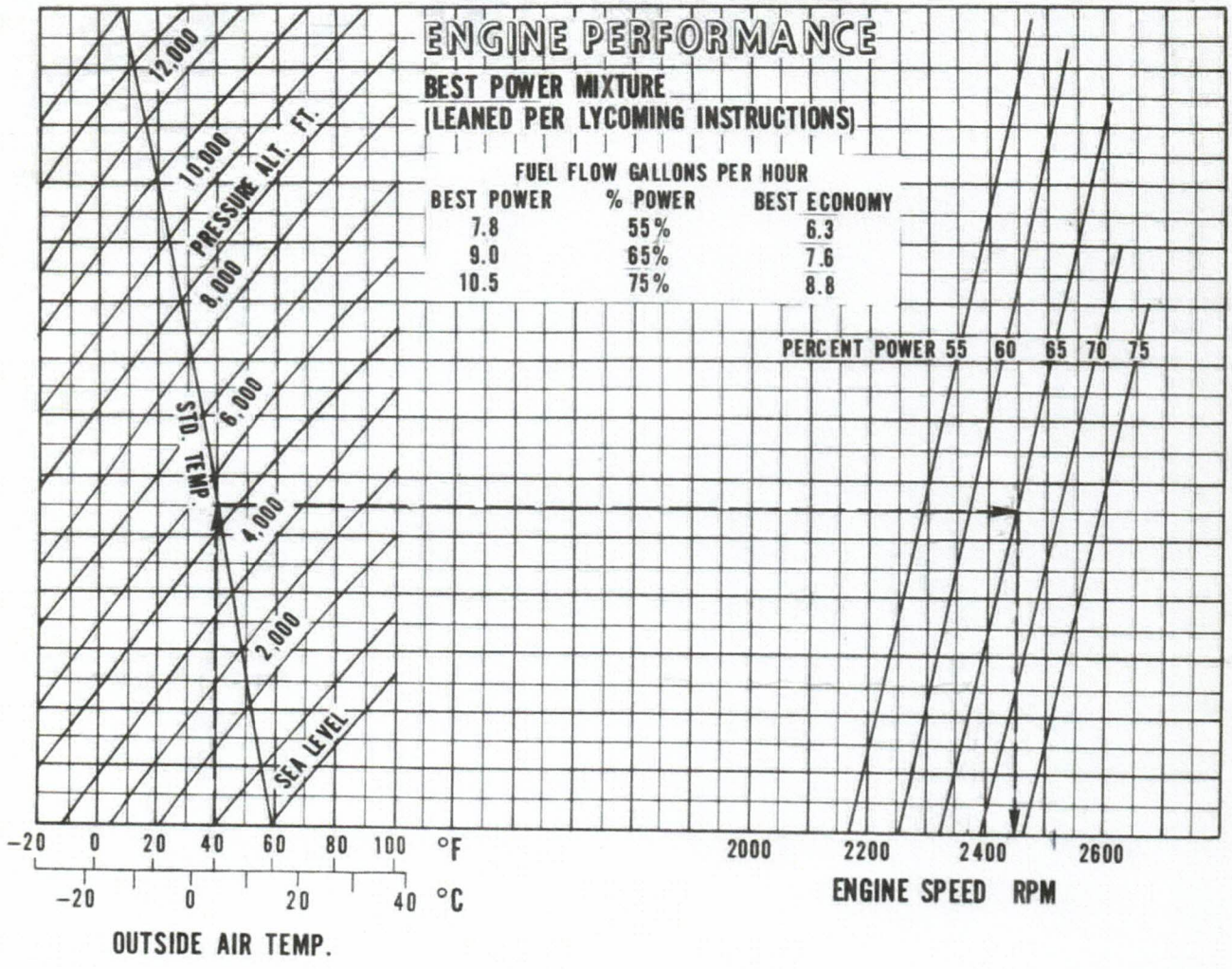


Example:
Cruise pressure altitude: 5500 ft.
Cruise OAT: 40° F
Percent power: 65%
Engine RPM: 2440 RPM

ENGINE PERFORMANCE (SERIAL NOS. 28-7790001 THROUGH 7790607)

Figure 5-17

PA-28-181



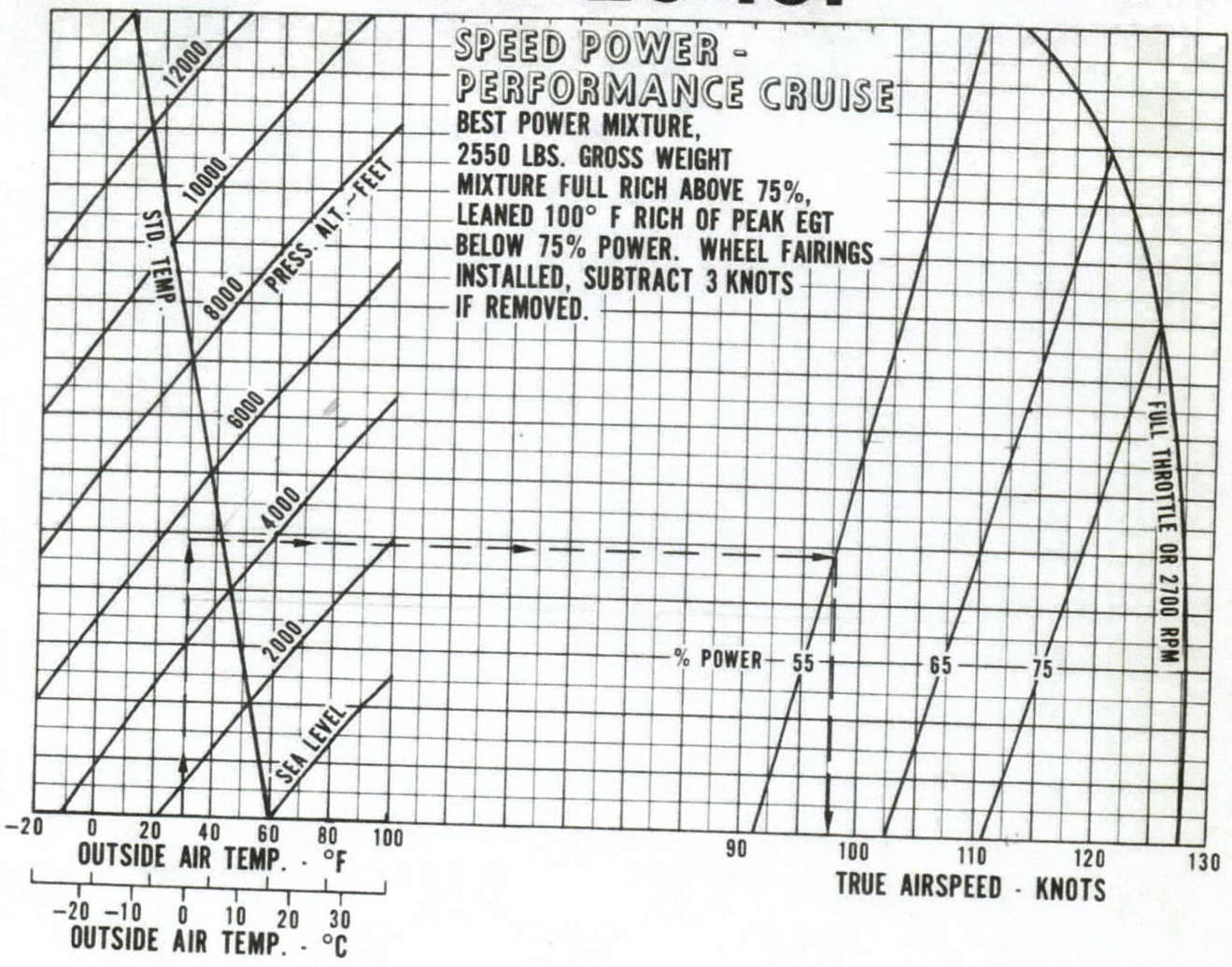
Example:

Cruise pressure altitude: 5500 ft.
Cruise OAT: 40° F
Percent power: 65%
Engine RPM: 2450 RPM

ENGINE PERFORMANCE (SERIAL NOS. 28-7890001 AND UP)

Figure 5-18

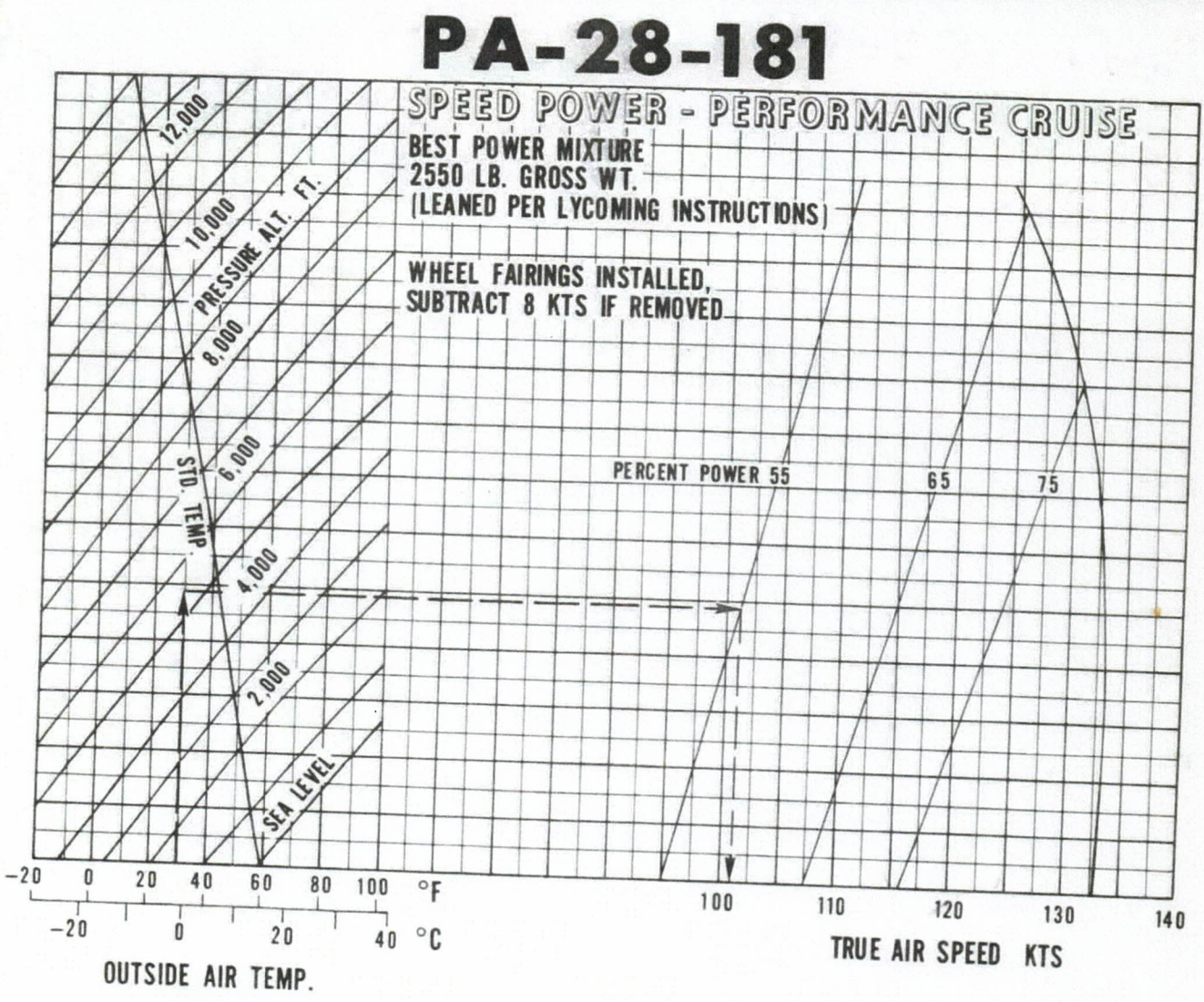
PA-28-181



Example:
Cruise pressure altitude: 5500 ft.
Cruise OAT: 30°F
Power: 55%
True airspeed: 97.5 knots

SPEED POWER - PERFORMANCE CRUISE (SERIAL NOS. 28-7790001 THROUGH 7790607)

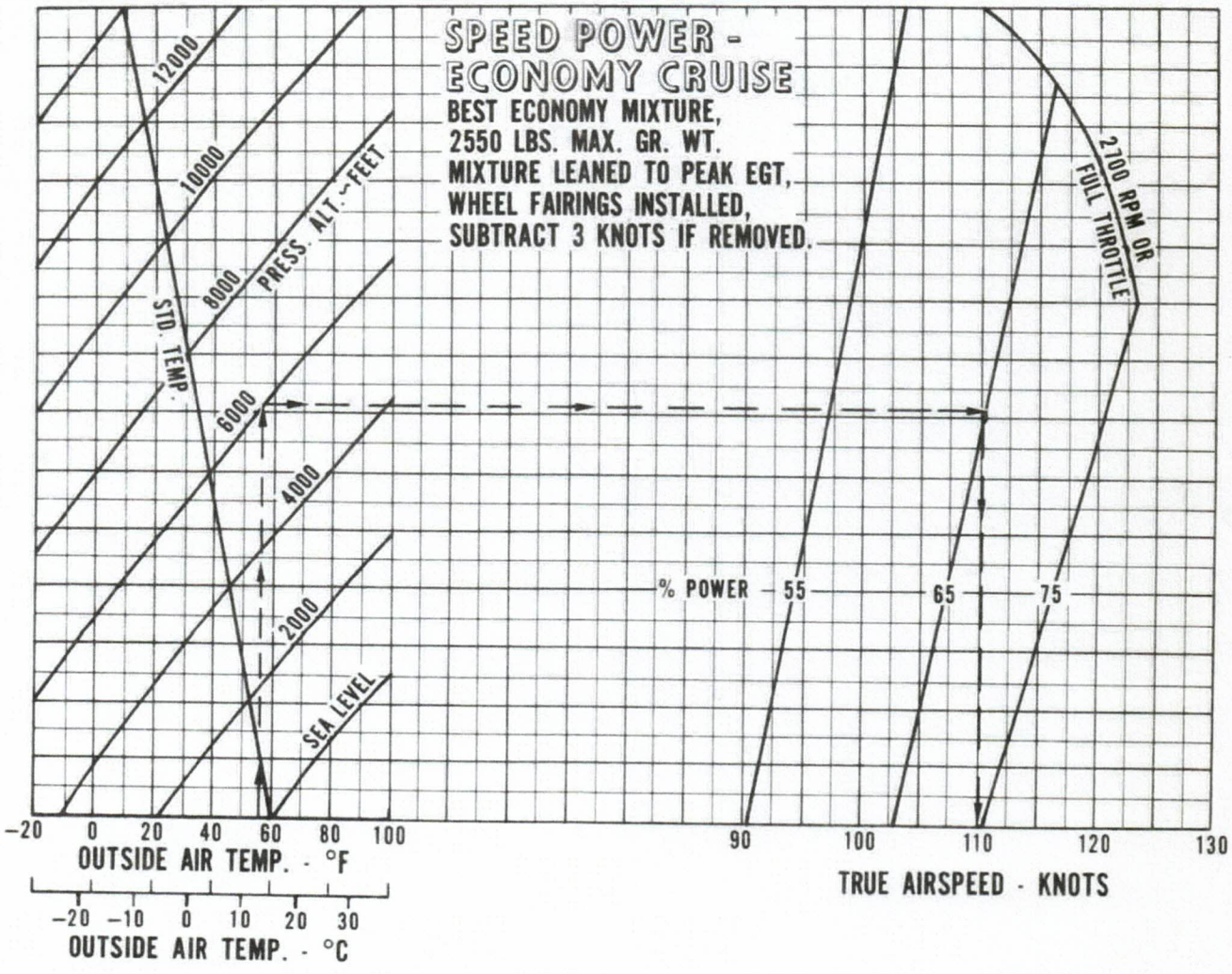
Figure 5-19



Example:
Cruise pressure altitude: 5500 ft.
Cruise OAT: 30° F
Power setting: 55%
True airspeed: 101 knots

SPEED POWER - PERFORMANCE CRUISE (SERIAL NOS. 28-7890001 AND UP)
Figure 5-20

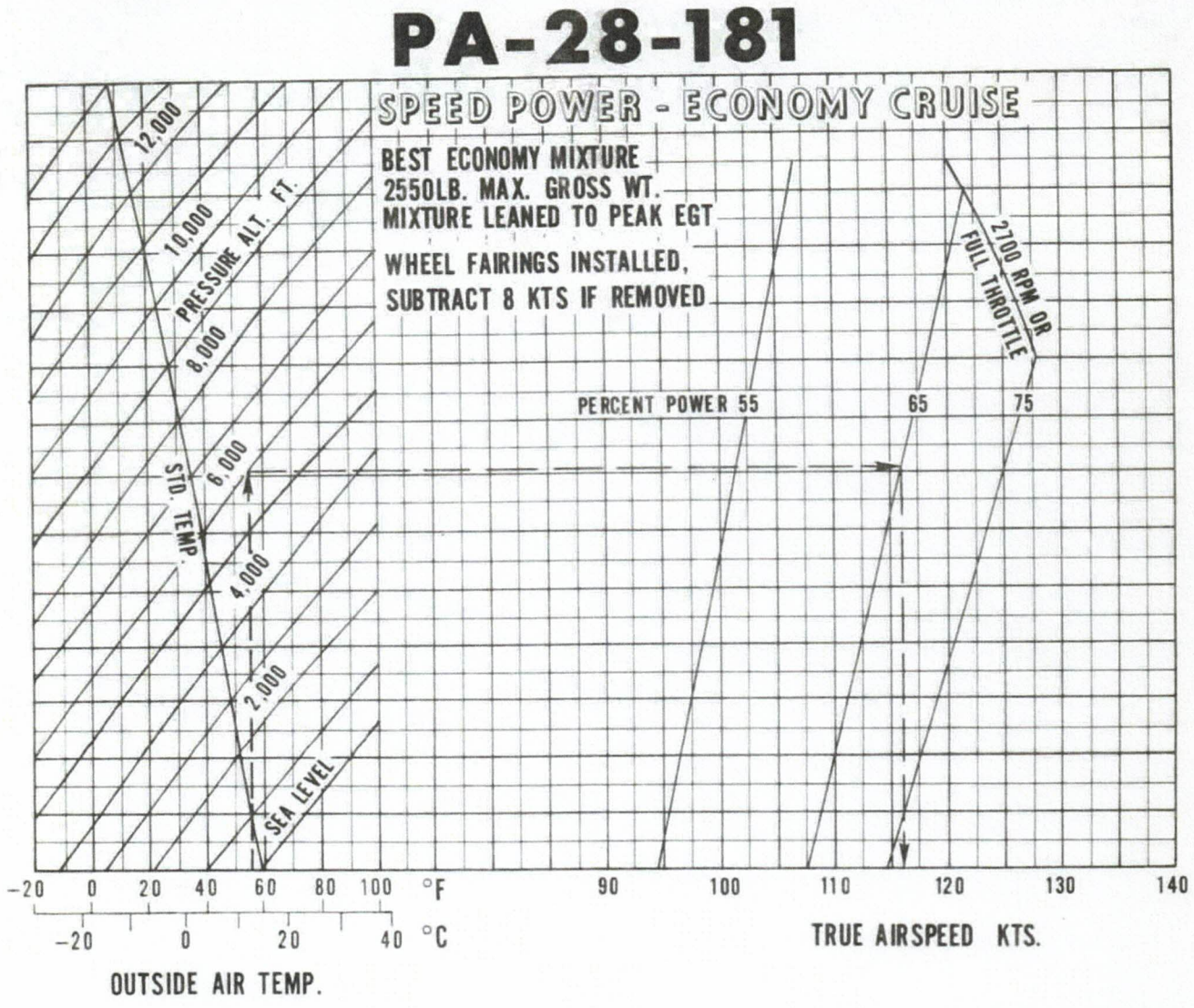
PA-28-181



Example:
Cruise pressure altitude: 6000 ft.
Cruise OAT: 55°F
Power: 65%
True airspeed: 110 knots

SPEED POWER - ECONOMY CRUISE (SERIAL NOS. 28-7790001 THROUGH 7790607)

Figure 5-21

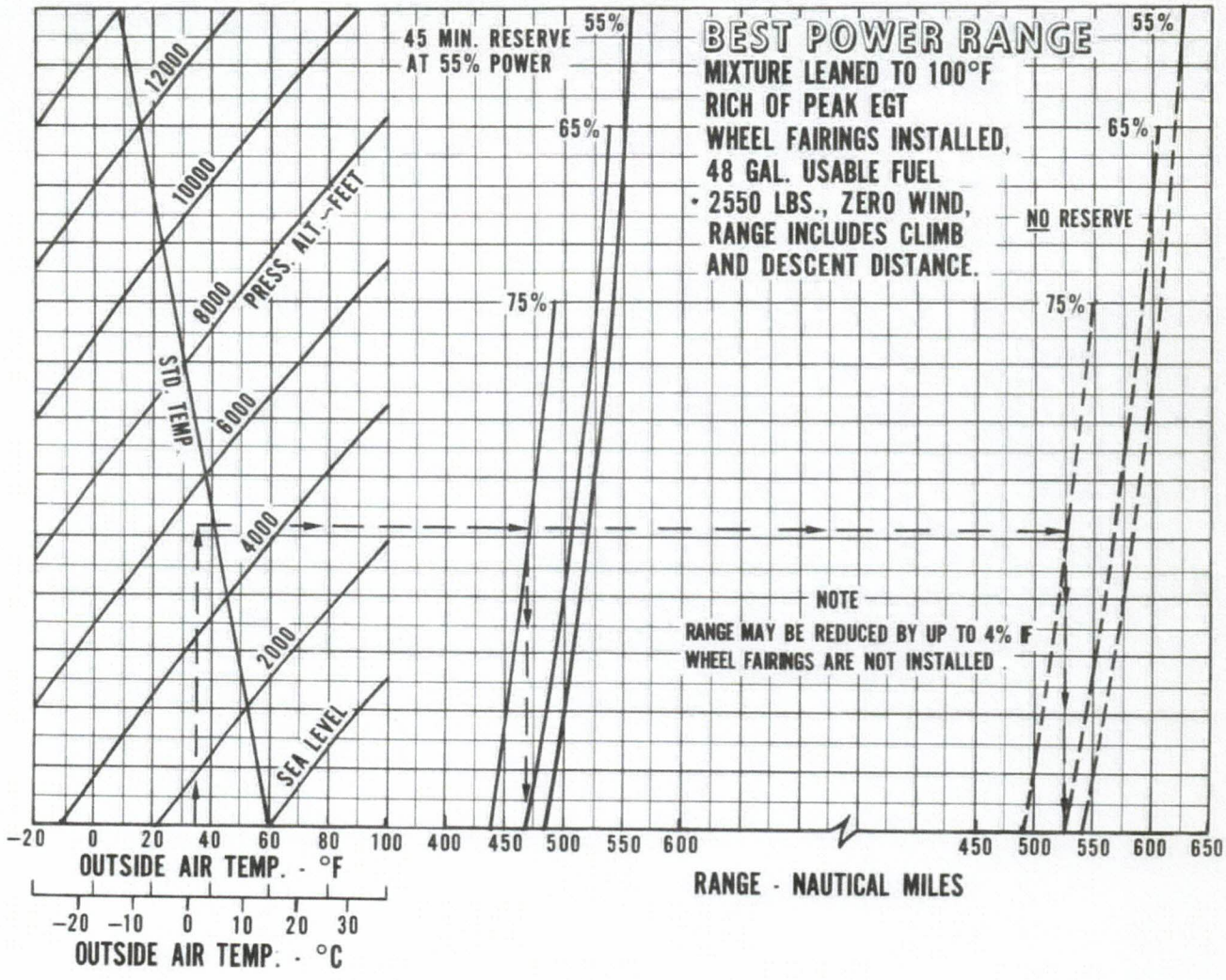


Example:
Cruise pressure altitude: 6000 ft.
Cruise OAT: 55° F
Power setting: 65%
True airspeed: 116 knots

SPEED POWER - ECONOMY CRUISE (SERIAL NOS. 28-7890001 AND UP)

Figure 5-22

PA-28-181



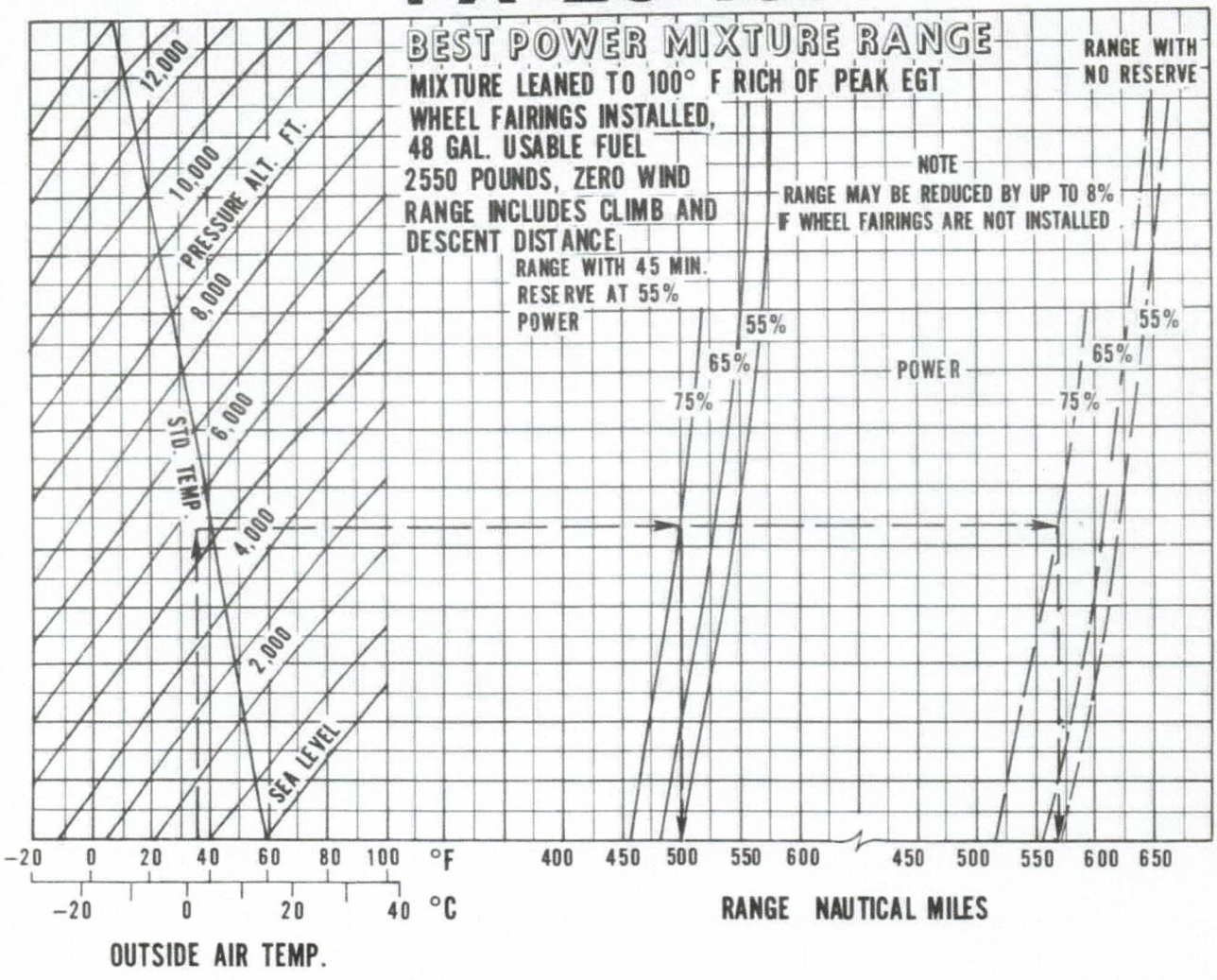
Example:

Cruise pressure altitude: 5500 ft.
Cruise OAT: 35°F
Power setting: 75%
Range (with reserve): 470 nautical miles
Range (no reserve): 525 nautical miles

BEST POWER MIXTURE RANGE (SERIAL NOS. 28-7790001 THROUGH 7790607)

Figure 5-23

PA-28-181

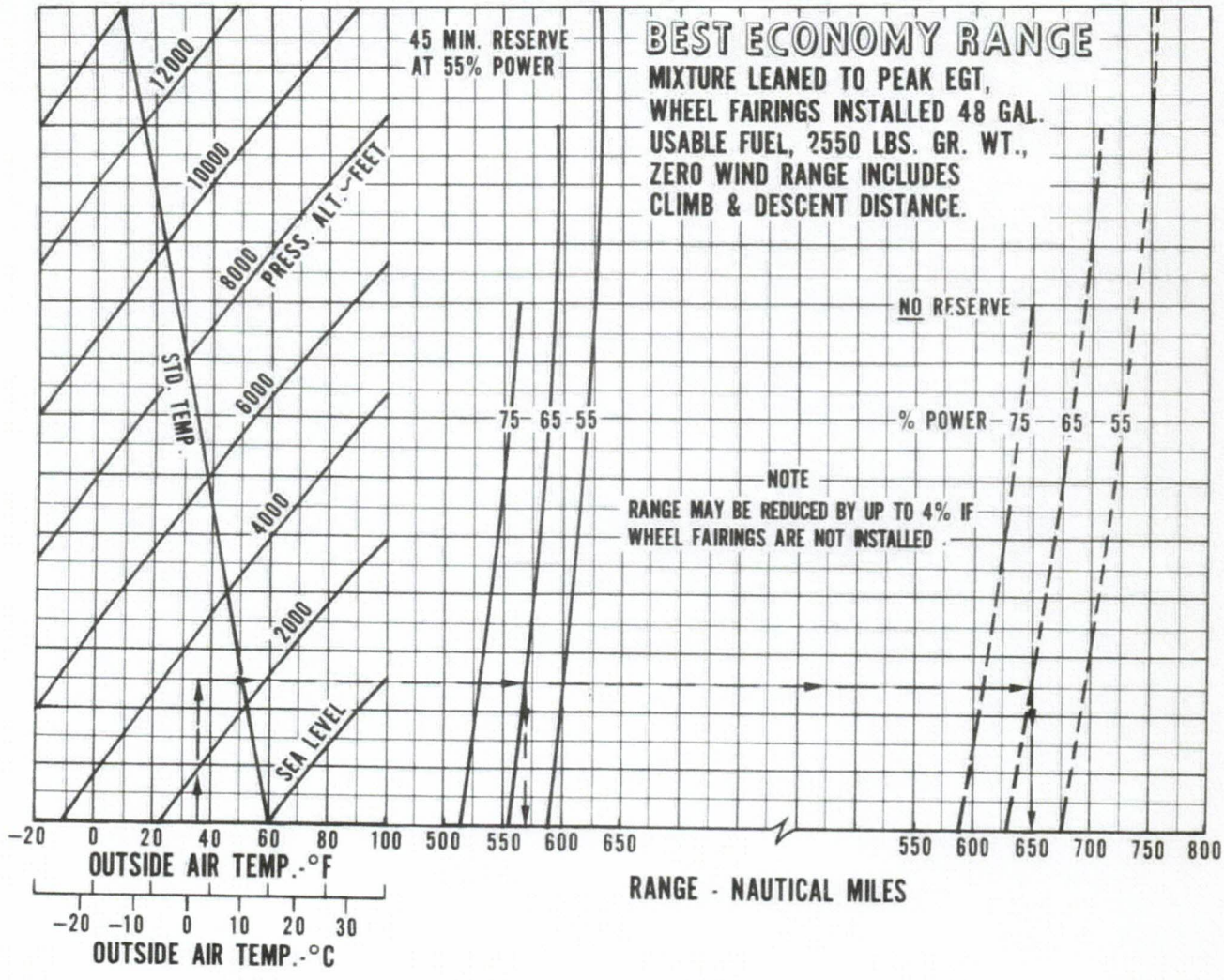


Example:
Cruise pressure altitude: 5500 ft.
Cruise OAT: 35° F
Power setting: 75%
Range (with reserve): 500 nautical miles
Range (no reserve): 570 nautical miles

BEST POWER MIXTURE RANGE (SERIAL NOS. 28-7890001 AND UP)

Figure 5-24

PA-28-181



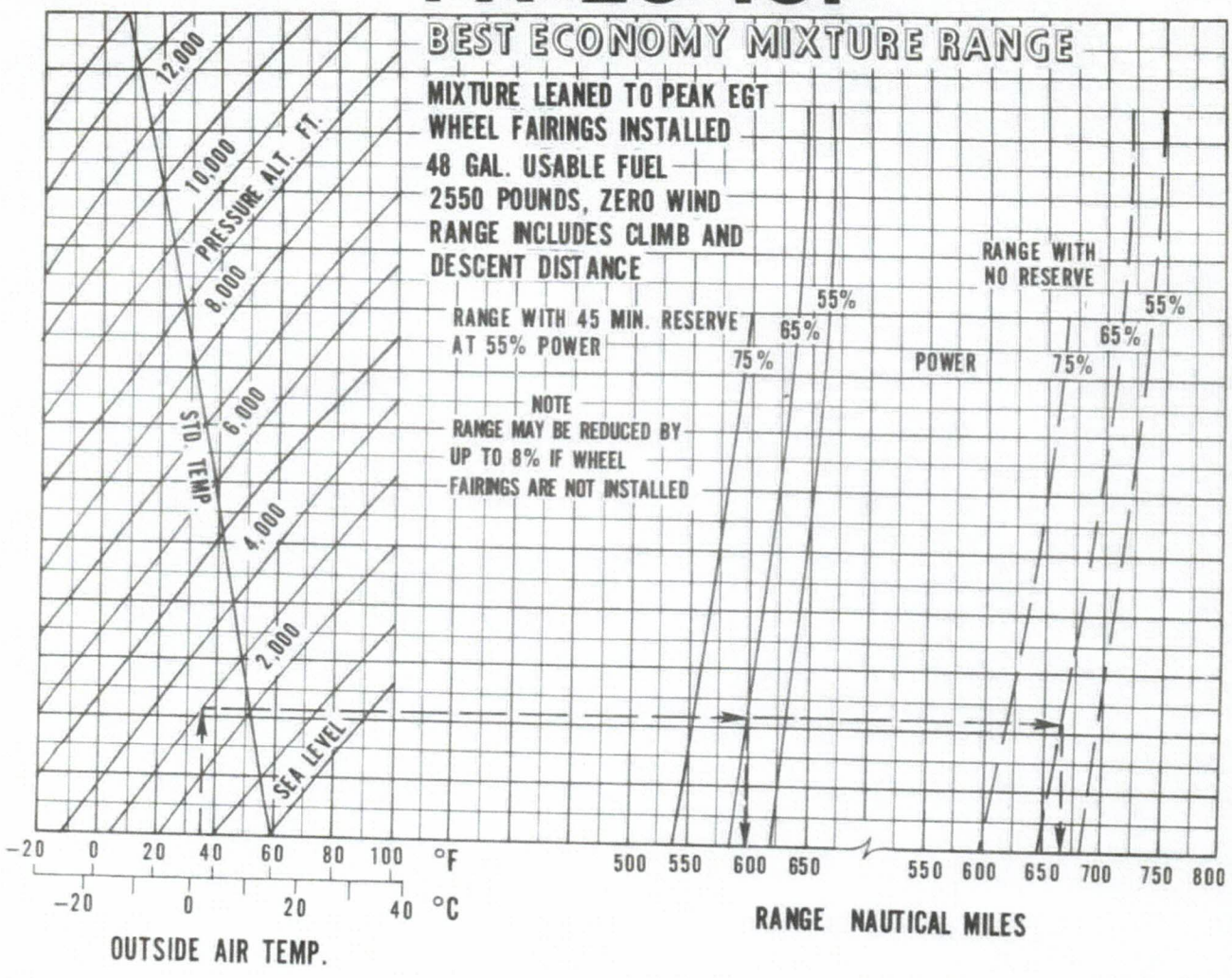
Example:

Cruise pressure altitude: 3000 ft.
Cruise OAT: 35°F
Power setting: 65%
Range (with reserve): 570 nautical miles
Range (no reserve): 650 nautical miles

BEST ECONOMY MIXTURE RANGE (SERIAL NOS. 28-7790001 THROUGH 7790607)

Figure 5-25

PA-28-181



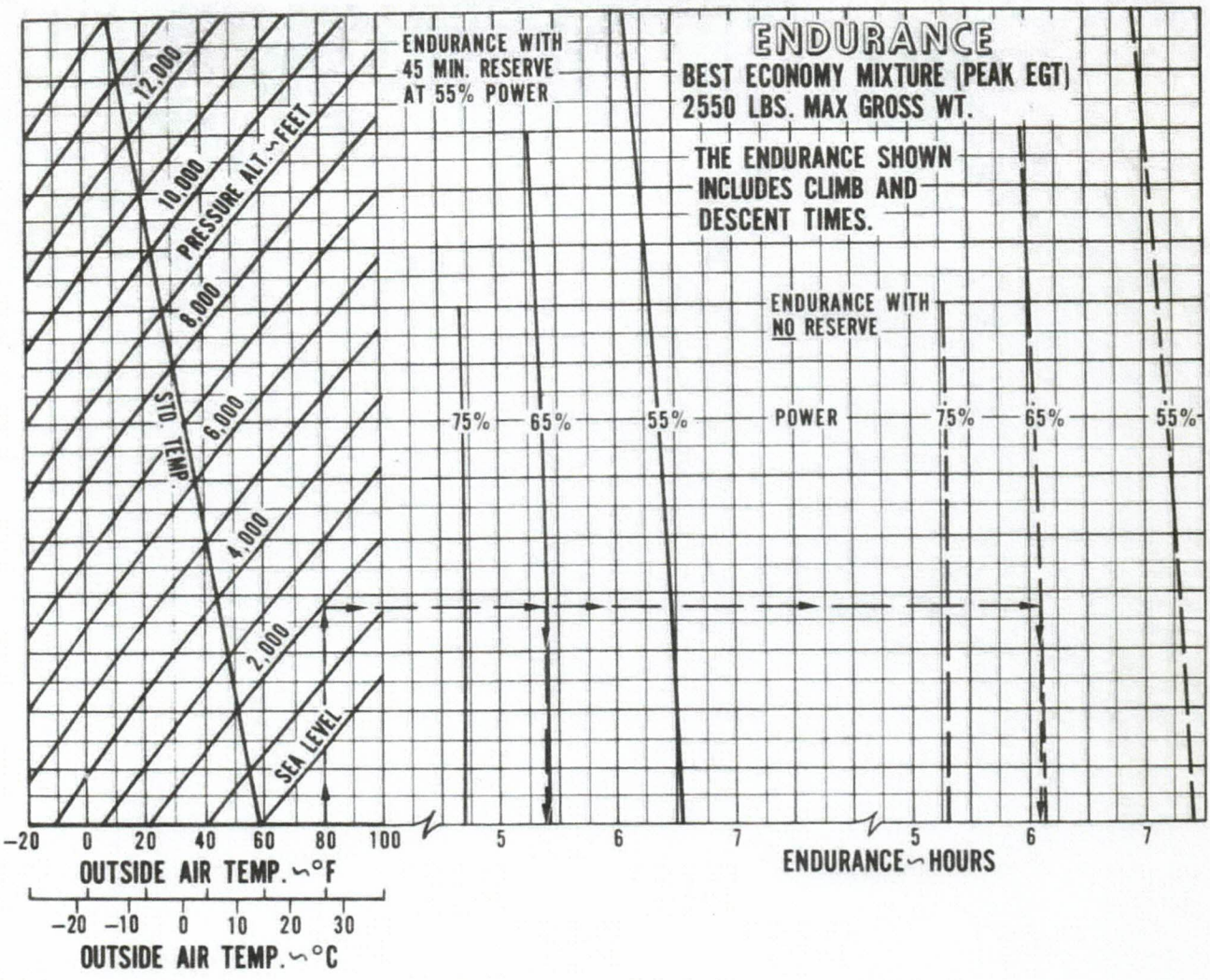
Example:

Cruise pressure altitude: 3000 ft.
Cruise OAT: 35°F
Power setting: 65%
Range (with reserve): 600 nautical miles
Range (no reserve): 660 nautical miles

BEST ECONOMY MIXTURE RANGE (SERIAL NOS. 28-7890001 AND UP)

Figure 5-26

PA-28-181

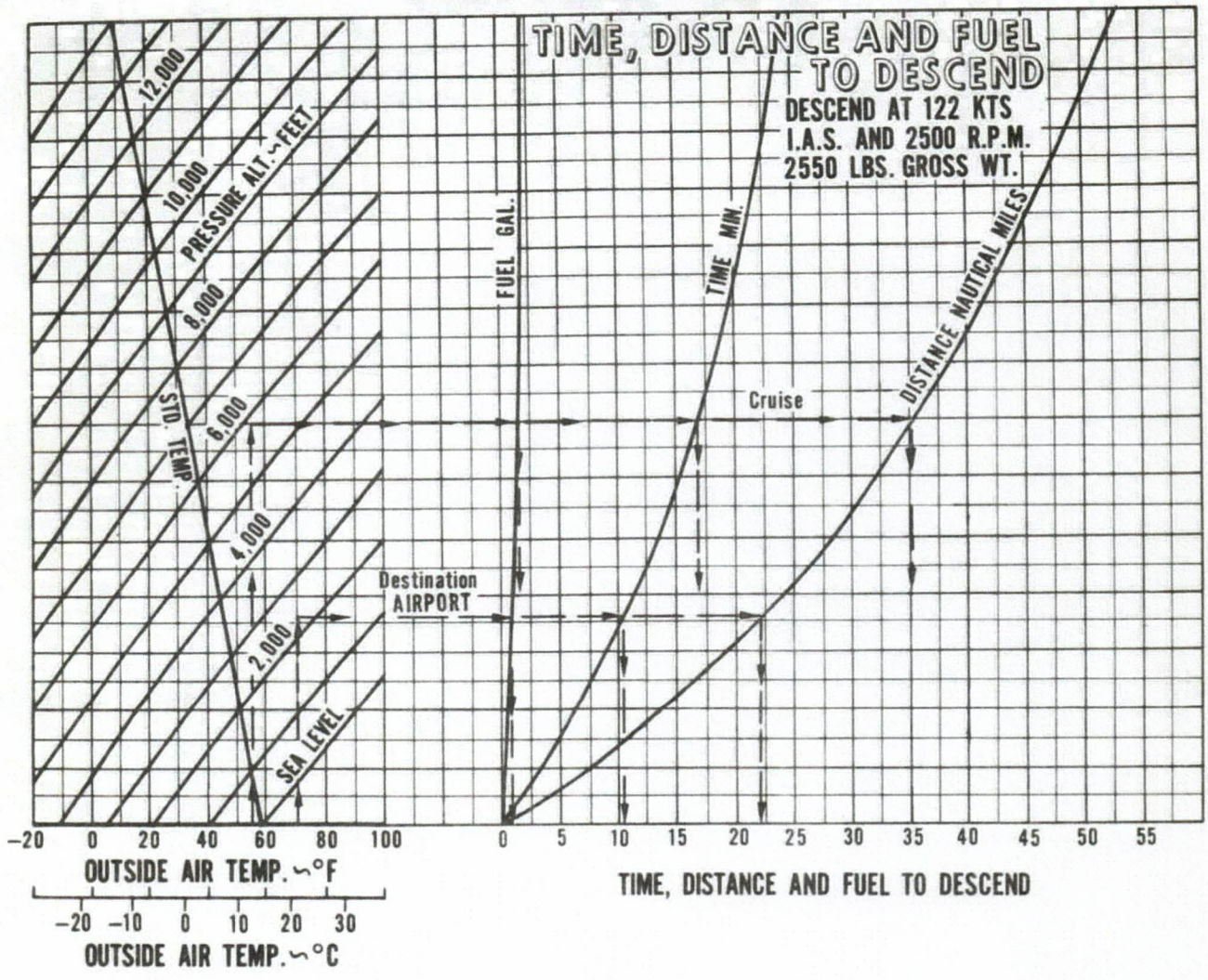


Example:
Cruise pressure altitude: 2000 ft.
Cruise OAT: 80°F
Power setting: 65%
Endurance (with reserve): 5.37 hrs.
Endurance (no reserve): 6.1 hrs.

ENDURANCE

Figure 5-27

PA-28-181



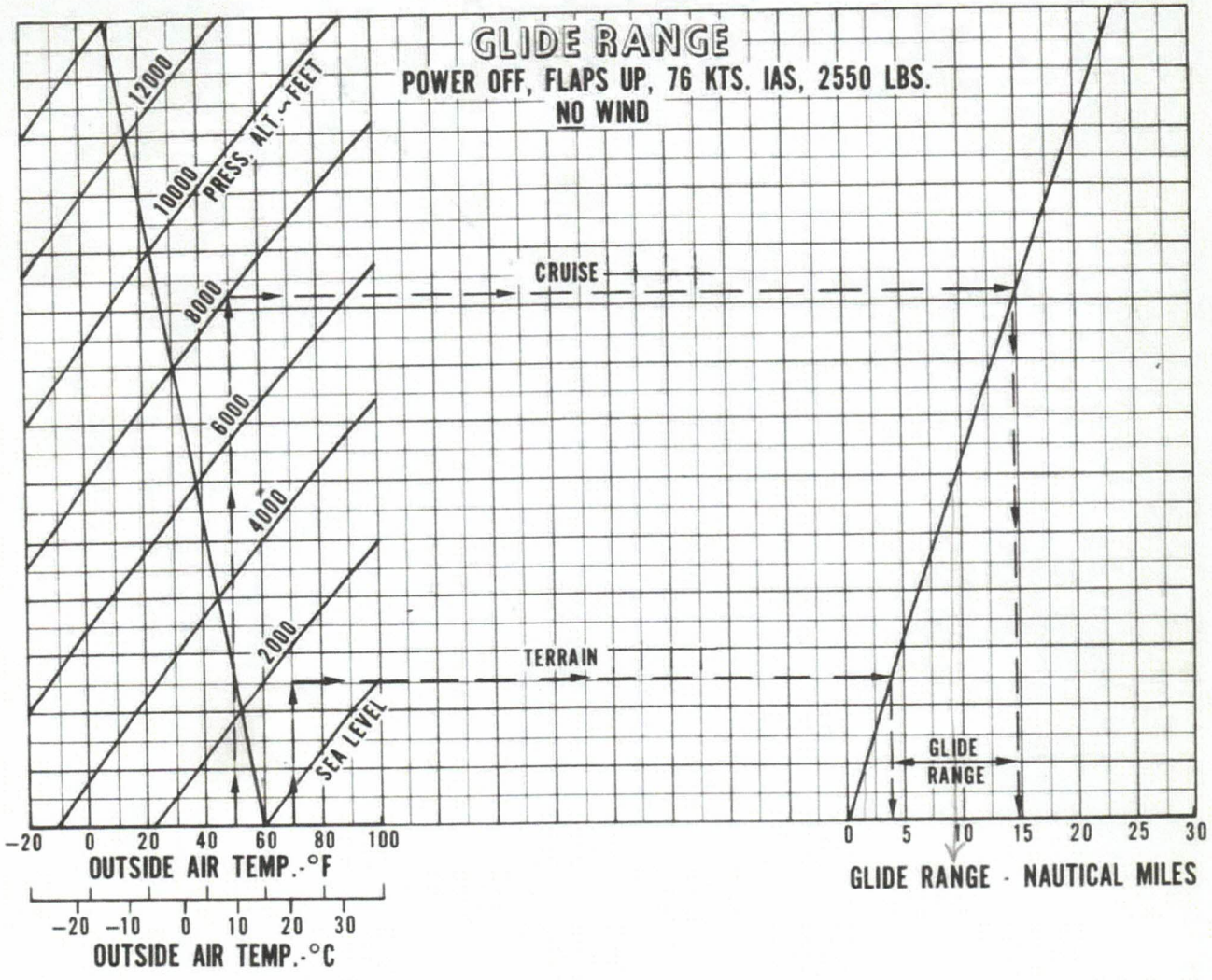
Example:

Cruise pressure altitude: 6000 ft.
Cruise OAT: 55°F
Destination airport pressure altitude: 2300 ft.
Destination airport temperature: 70°F
Fuel to descend: (1.7 gal. minus 1 gal.) = .7 gal.
Time to descend: (17 min. minus 10.5 min.) = 6.5 min.
Distance to descend (35 miles minus 22 miles) = 13 nautical miles

TIME, DISTANCE AND FUEL TO DESCEND

Figure 5-29

PA-28-181

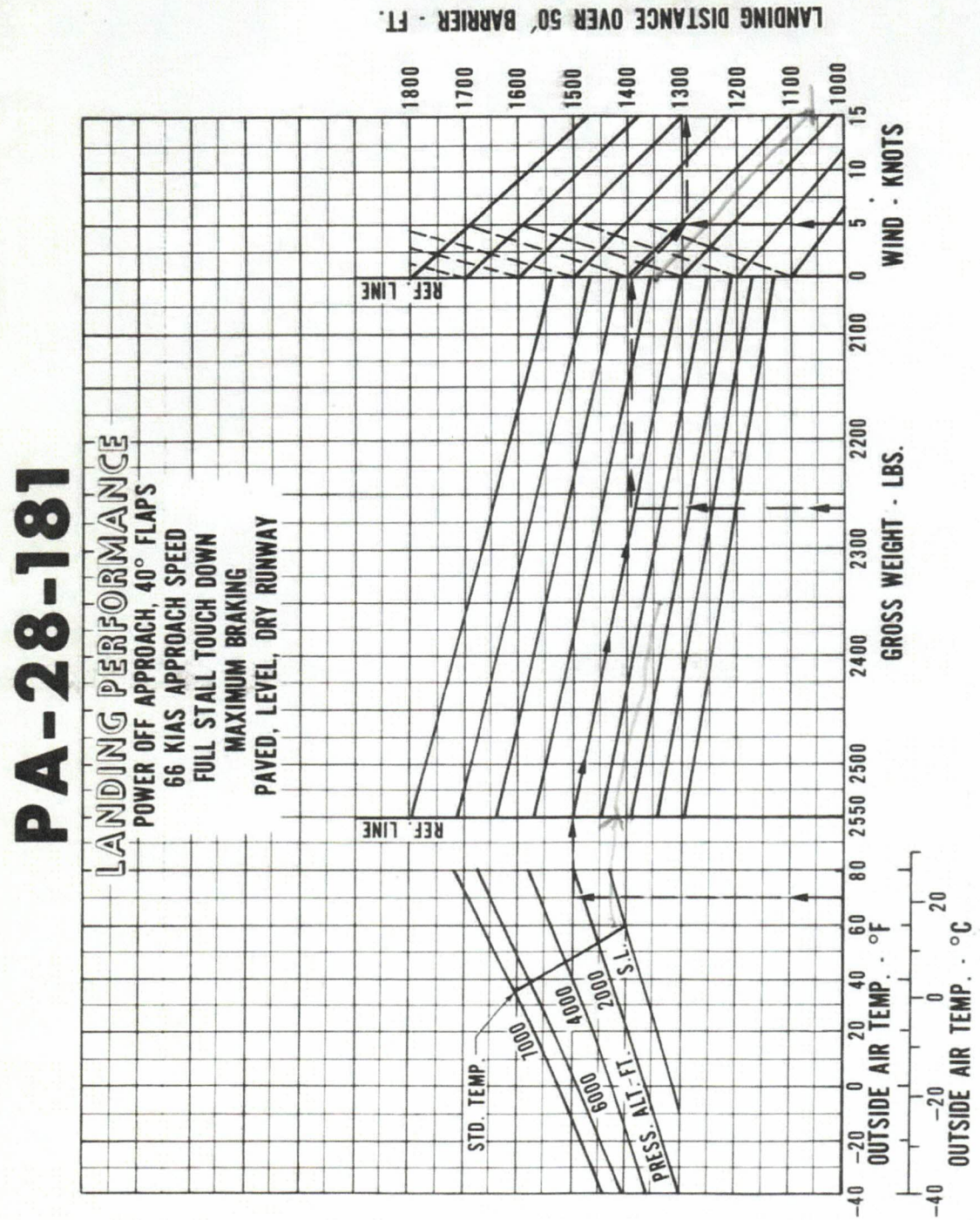


Example:

Cruise pressure altitude: 8000 ft.
Cruise OAT: 50°F
Terrain pressure altitude: 1500 ft.
Terrain temperature: 70°F
Glide Range: 14.5 miles minus 3.5 miles = 11 nautical miles

GLIDE RANGE

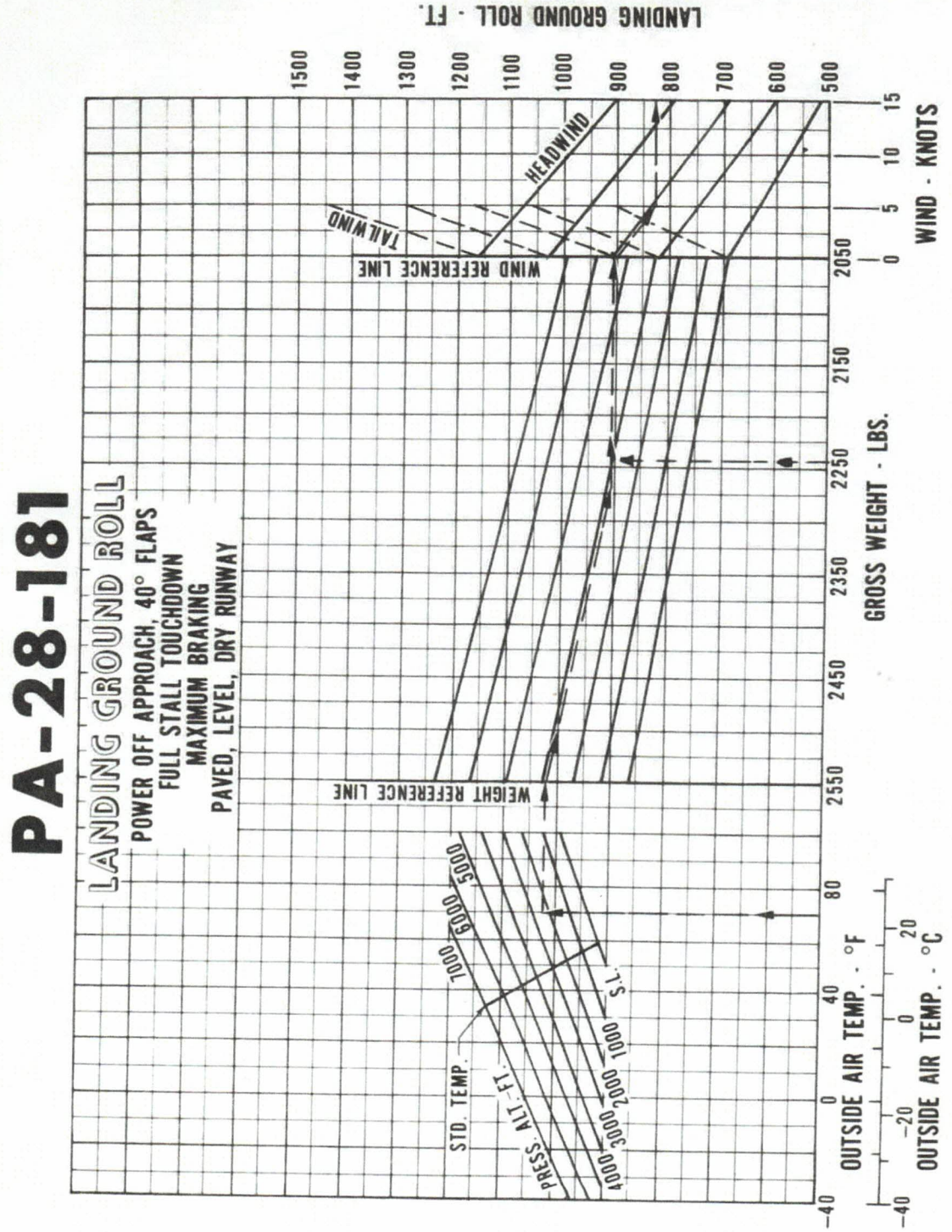
Figure 5-31



Example:
Airport pressure altitude: 2300 ft.
Gross weight: 2264
Temperature: 70°F
Wind: 5 knots (headwind)
Landing distance: 1290 ft.

LANDING PERFORMANCE

Figure 5-33



Example:
Airport pressure altitude: 2300 ft.
Airport temperature: 70°F
Gross weight: 2264 lbs.
Wind: 5 knots (headwind)
Ground roll: 825 ft.

LANDING GROUND ROLL

Figure 5-35

SECTION 6 - WEIGHT & BALANCE

TABLE OF CONTENTS

SECTION 6

WEIGHT AND BALANCE

SECTION 6

WEIGHT AND BALANCE

6.1 GENERAL

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

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

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

A properly loaded airplane, however, will perform as intended. This airplane is designed to provide excellent performance and safety within the flight envelope. Before the airplane is delivered, it is weighed, and a basic empty weight and C.G. location is computed (basic empty weight consists of the standard empty weight of the airplane plus the optional equipment). Using the basic empty weight and C.G. location, the pilot can easily determine the weight and C.G. position for the loaded airplane by computing the total weight and moment and then determining whether they are within the approved envelope.

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

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

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

6.3 AIRPLANE WEIGHING PROCEDURE

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

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

(a) Preparation

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

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

(3) Defuel airplane. Then open all fuel drains until all remaining fuel is drained. Operate engine on each tank until all undrainable fuel is used and engine stops. Then add the unusable fuel (2.0 gallons total, 1.0 gallons each wing).

(4) Fill with oil to full capacity.

(5) Place pilot and copilot seats in fourth (4th) notch, aft of forward position. Put flaps in the fully retracted position and all control surfaces in the neutral position. Tow bar should be in the proper location and all entrance and baggage doors closed.

(6) Weigh the airplane inside a closed building to prevent errors in scale readings due to wind.

(b) Leveling

(1) With airplane on scales, block main gear oleo pistons in the fully extended position.

(2) Level airplane (refer to Figure 6-3) deflating nose wheel tire, to center bubble on level.

(c) Weighing - Airplane Basic Empty Weight

(1) With the airplane level and brakes released, record the weight shown on each scale. Deduct the tare, if any, from each reading.

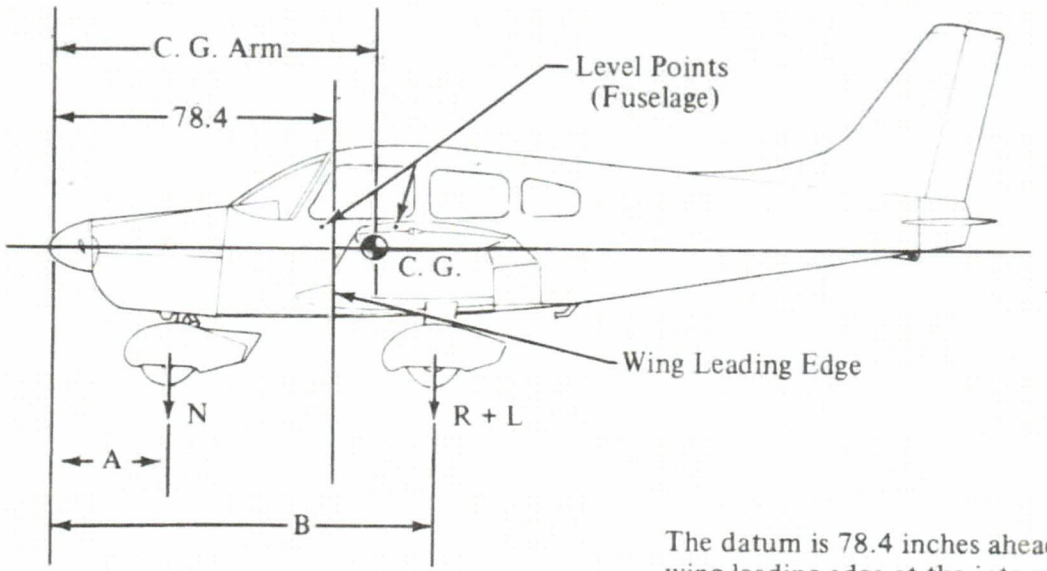
Scale Position and Symbol	Scale Reading	Tare	Net Weight
Nose Wheel (N)			
Right Main Wheel (R)			
Left Main Wheel (L)			
Basic Empty Weight, as Weighed (T)	–	–	

WEIGHING FORM

Figure 6-1

(d) Basic Empty Weight Center of Gravity

(1) The following geometry applies to the PA-28-181 airplane when it is level. Refer to Leveling paragraph 6.3 (b).



The datum is 78.4 inches ahead of the wing leading edge at the intersection of the straight and tapered secti...

A = 31.0

B = 109.7

LEVELING DIAGRAM

Figure 6-3

(2) The basic empty weight center of gravity (as weighed including optional equipment, full oil and unusable fuel) can be determined by the following formula:

$$\text{C.G. Arm} = \frac{N(A) + (R + L)(B)}{T} \quad \text{inches}$$

Where: $T = N + R + L$

(2) The basic empty weight center of gravity (as weighed including optional equipment, full oil and unusable fuel) can be determined by the following formula:

$$\text{C.G. Arm} = \frac{N(A) + (R + L)(B)}{T} \quad \text{inches}$$

Where: $T = N + R + L$

6.5 WEIGHT AND BALANCE DATA AND RECORD

The Basic Empty Weight, Center of Gravity Location and Useful Load listed in Figure 6-5 are for the airplane as delivered from the factory. These figures apply only to the specific airplane serial number and registration number shown.

The basic empty weight of the airplane as delivered from the factory has been entered in the Weight and Balance Record (Figure 6-7). This form is provided to present the current status of the airplane basic empty weight and a complete history of previous modifications. Any change to the permanently installed equipment or modification which affects weight or moment must be entered in the Weight and Balance Record.

DUNCAN AVIATION

Reg: N78BG **Make: PIPER**
Model: PA28-181 **S/N: 28-7890100**
Date: 02/05/20

CALCULATED WT & BALANCE AND EQUIPMENT LIST REVISION

Units of Measure: Weight (Lbs), Arm (Ins), Moment (Lbs x Ins)

		WEIGHT	ARM	MOMENT
LAST KNOWN WT/BALANCE DATE:	August 1, 2019	1,579.36	88.13	139,193.97

INSTALLED EQUIPMENT

DESCRIPTION	P/N	WEIGHT	ARM	MOMENT
G-5 ATT IND	011-03890-00	0.98	60.00	58.80
G-5 HDG IND	011-03890-00	0.98	60.00	58.80
GAD-29B NAV INTERFACE	011-03236-11	0.65	54.00	35.10
GMU-11 MAGNATOMERE	011-04349-01	0.35	118.00	41.30

REMOVED EQUIPMENT

DESCRIPTION	P/N	WEIGHT	ARM	MOMENT
DIRECTIONAL GYRO	1U262-003-14	-2.60	59.70	-155.22
GI-106A	013-00049-01	-1.25	59.00	-73.75

TOTALS (NET CHANGE):	-0.89	0.03	-34.97
NEW EMPTY WEIGHT/CG:	**1,578.47**	**88.16**	**139,159.00**

NEW USEFUL LOAD: **971.53**

SIGNED: DUNCAN QI 1286

Steven E. Helwig

DATED: **2/5/2020**

Weight and Balance Data

Aircraft Registration N78BC Make PIPER Model 181 S/N 28-7890100

Owners Name LEVINE

Address

Items	Weight	Arm	Moment
Previous weight	1573.36	88.05	138535.77
Installed wheel Fairings	+6.00	109.7	658.2

SUPERCEDED 2.05.2020

Aircraft New Empty Weight 1579.36

Aircraft New Empty Weight CG 88.133

Aircraft New Empty Weight Moment 139193.97

Gross Weight 2550

Useful Load 970.64 Normal Ulility

Date 8-1-19 Mechanic A. Wolf FAA Cert# 254881340

WEIGHT AND BALANCE/EQUIPMENT LIST REVISION

NAME: LeVine & Sons LLC
DATE: 12-2-13
AIRCRAFT MAKE/TYPE: Piper
MODEL #: PA 28-181
REGISTRATION #: N-78BG
SERIAL #: 28-7890100

PREVIOUS DATE: 11-1-1980 WEIGHT: 1,588.56 ARM: 87.7965 MOMENT: 139462.9700

EQUIPMENT LIST	IN	OUT	WEIGHT	ARM	MOMENT
1 (P/N) 149NL (S/N) FN-401308 (Desc.) SKY-TEC STARTER	X		9.3	30	279
2 M2-4722		X	-18.5	30	-555
3					
4					

AIRCRAFT EMPTY WEIGHT: 1579.36
ARM: 88.13
MOMENT: 139193.97
GROSS WEIGHT: 2550
USEFUL LOAD: 970.64

SIGNATURE

AUTHORIZATION AP 2548813 40

NOTE: Weight and balance must be completed and attached to pilot's operating handbook.

Sky-Tec Serial Numbers Beginning w/

Lycoming Starters
- CN - 9.3 lbs.
- FN - 9.3 lbs.
- CNE - 9.3 lbs.
- FNE - 9.3 lbs.
- FNR - 9.3 lbs.
- FNER - 9.3 lbs.
- C(x)H - 10.2 lbs.
- F(x)H - 10.2 lbs.
- C(x)M - 8.5 lbs.
- F(x)M - 8.5 lbs.
- C4E - 8.5 lbs.
- F4E - 8.5 lbs.
- H(x)M - 8.5 lbs.
- H4E - 8.5 lbs.
- C(x)C - 8.9 lbs.
- F(x)C - 8.9 lbs.
- H(x)C - 8.9 lbs.
- C(x)L - 8.1 lbs.
- F(x)L - 8.1 lbs.
- C(x)P - 8.1 lbs.
- F(x)P - 8.1 lbs.

Continental Starters
- 2C - 9.2 lbs.
- 2CR - 9.2 lbs.
- (x)C3 - 6.9 lbs.
- (x)C5 - 9.1 lbs.

Skycom AVIONICS, INC.

Skycom Avionics, Inc.

Aircraft Weight & Balance Report

Aircraft: N 78BG Type: PIPER PA-28-181 S/N: 28-7890100
Model:

Prior Empty Weight: 1,595.3 As Of: 11/01/1980 Prior Useful Load: 954.7
Prior Longitudinal Moment: 139,907.8100 Arm: 87.7000

Items Removed:

Date	Description	Weight	Longitudinal Arm	Longitudinal Moment
6/21/2006	1-B/King KX-170B Nav/Com (NSN)	7.40	56.6000	418.8400
6/21/2006	1-B/King KI-208 Indicator S/N 1518	1.00	59.0000	59.0000
6/21/2006	1-B/King KN-61 DME S/N 2928	8.00	185.0000	1,480.0000
6/21/2006	1-B/King KI-266 DME Indicator S/N 8579	0.80	59.0000	47.2000
6/21/2006	1 B/King KA-60 DME Antenna S/N 0385	0.20	240.0000	48.0000
6/21/2006	1-B/King KR-86 ADF S/N 14540	6.60	58.0000	382.8000
6/21/2006	1-B/King KA-42B ADF Antenna S/N 7238	2.40	118.0000	283.2000
6/21/2006	1-B/King KMA-20 Audio Pnl S/N 27887	2.30	58.0000	133.4000
6/21/2006	1-Comant CI-102 Marker Antenna	0.60	118.0000	70.8000
6/21/2006	1-AEC 1A-2N-1G-B Antenna Coupler	0.20	56.6000	11.3200
6/21/2006	1-BOR6 Clock S/N 6132946	0.20	60.0000	12.0000
	Total of Items Removed:	29.70		-2,946.5600

Items Installed:

Date	Description	Weight	Longitudinal Arm	Longitudinal Moment
6/21/2006	1-Garmin GMA-340 AudPnl S/N 96277764	1.70	58.0000	98.6000
6/21/2006	1-Garmin GNS-530 GPS S/N 78415830	7.20	56.6000	407.5200
6/21/2006	1-Garmin GA-56 GPS Ant. S/N 59416916	0.50	80.5000	40.2500
6/21/2006	1-Garmin GI-106A Ind. S/N D06-10649	1.25	59.0000	73.7500
6/21/2006	1-Garmin GDL-69A DataLink S/N 47752975	2.80	185.0000	518.0000
6/21/2006	1-Garmin GA-55 DL Ant. S/N 87503784	0.50	80.5000	40.2500
6/21/2006	1-Ryan 9900BX TCAD Processor S/N 060443	5.50	185.0000	1,017.5000
6/21/2006	1-Ryan 70-2040 Xpndr Coupler S/N 060512	0.50	56.6000	28.3000
6/21/2006	1-Ryan Bottom Traffic Antenna S/N 3497	0.66	118.0000	77.8800
6/21/2006	1-Ryan Top Traffic Antenna S/N 3476	0.75	75.0000	56.2500
6/21/2006	1-Comant CI-1725 Diplexer S/N 120536	0.20	56.6000	11.3200
6/21/2006	1-Comant CI-105 Xpndr Ant. S/N 27063	0.20	170.0000	34.0000
6/21/2006	1-Comant CI-102 Marker Ant. S/N 5091855	0.60	118.0000	70.8000
6/21/2006	1-Davtron 800 Digital Clock S/N 21935	0.10	60.0000	6.0000
6/21/2006	1-Lonestar CRB-6457 Fan S/N 003-005773	0.50	56.6000	28.3000
	Total of Items Installed:	22.96		2,508.7200

New Final Figures:

Weight: 1,588.56 **Useful Load:** 961.44
Longitudinal Moment: 139,469.9700 **Arm:** 87.7965

Supersedes 2-27-06

MEMBER NATA National Air Transportation Association

WAUKESHA COUNTY AIRPORT / CRITES FIELD
2441 AVIATION DRIVE, WAUKESHA, WI 53188
(262) 521-8180 FAX: (262) 521-0539
FAA REPAIR STATION NO. NC5D062N

MEMBER AEA

CLARK AVIATION, INC.

SUPPLEMENTAL WEIGHT AND BALANCE DATA AND EQUIPMENT LIST

MAKE PIPER SERIAL NO. 28-7890100

MODEL PA-28-181 REG. NO. 78BL

PREPARED BY RICHARD MILEHAM DATE 11-1-80

ITEM	WEIGHT	ARM	MOMENT
REMOVE EMERGENCY LOCATOR TRANSMITTER	1.7	236.2	402
INSTALL EMERGENCY LOCATOR TRANSMITTER	3.5	236.2	827

SUPERCEDED 6/21/2006

CATEGORY	EMPTY WEIGHT	EMPTY CENTER OF GRAVITY	USEFUL LOAD
	1595.3	87.7 (Arm) 139.9 (Moment)	954.7

JOLIET AVIONICS, INC.

DUPAGE COUNTY AIRPORT
WEST CHICAGO, ILLINOIS 60185

MINOR ALTERATIONS

DATE : October 10, 1977

OWNER : Clark Aviation
Bloomington-Normal Airport
ADDRESS: Bloomington, Illinois 61701

AIRCRAFT MAKE: Piper

YEAR: 1978

MODEL: PA-28-181

SERIAL NO.: 28-7890100

REG. NO.: N47596

DESCRIPTION OF WORK:

INSTALLED: (1) King KMA-20, (2) King KX-170B, (1) King KI-208, (1) King KI-209, (1) King KN-75, (1) King KR-86, (1) King KA-42B, (1) King KT-76A, (1) King KN-61, (1) King KI-266, (1) King KE-127, (1) Mitchell IC388M, (1) CI-157 Nav Antenna, (1) CI-121 Com Antenna, (1) CI-121 Com Antenna, (1) CI-102 MKR Antenna, (1) Radio Cooling Kit, (1) Cabin Speaker.

This installation has been checked in accordance with applicable FAR's and is approved for return to service by this repair station.

ITEM	WEIGHT	ARM	MOMENT
OLD AIRCRAFT EMPTY WEIGHT:	1542.2	87.4	134777.0
INSTALLED:			
(1) King KMA-20	2.3	58.0	133.4
(2) King KX-170B	14.8	56.6	837.7
(1) King KI-208	1.0	59.0	59.0
(1) King KI-209	1.2	59.0	70.8
(1) King KN-75	1.5	185.0	277.5
(1) King KR-86	6.6	58.0	382.8
(1) King KA-42B	2.4	118.0	283.2
(1) King KT-76A	3.1	58.0	179.8
(1) King KN-61	8.0	185.0	1480.0
(1) King KI-266	1.0	59.0	59.0
(1) King KE-127	1.1	52.0	57.2
(1) Mitchell IC-388M	1.0	59.3	59.3
(1) CI-157 Nav Antenna	1.4	195.7	273.9
(1) CI-121 Com Antenna	1.0	144.3	144.3
(1) CI-121 Com Antenna	1.0	170.7	170.7
(1) CI-102 MKR Antenna	1.0	118.0	118.0
(1) Radio Cooling Kit	1.0	59.0	59.0
(1) Cabin Speaker	1.9	99.0	188.1
	1593.5		139610.7

Superseded 11-1-80

AIRCRAFT GROSS WEIGHT: 2550.0

NEW A/C EMPTY WEIGHT : 1593.5

NEW A/C E.W.C.G. : 87.61

NEW A/C USEFUL LOAD : 956.5

FAA REPAIR STATION #3159 CLASS III

SIGNATURE William C. Parker
CHIEF INSPECTOR

PAGE 1 OF 1 PAGES

MODEL PA-28-181 CHEROKEE ARCHER II

Airplane Serial Number 28-7890100

Registration Number N47596

Date 9/15/77

AIRPLANE BASIC EMPTY WEIGHT

Item	Weight (Lbs)	x	C. G. Arm (Inches Aft of Datum)	=	Moment (In-Lbs)
Standard Empty Weight* ~~Actual~~ Computed	1412.0		85.4		120482
Optional Equipment	130.2		109.8		14295
Basic Empty Weight	1542.2		87.4		134777

*The standard empty weight includes full oil capacity and 2.0 gallons of unusable fuel.

SUPERSEDED
See Form dated 10/10/77
N.A.E.W. 1593.5 Center of Gravity 87.61
Signature
Date 10/10/77

AIRPLANE USEFUL LOAD

(Gross Weight) - (Basic Empty Weight) = Useful Load

Normal Category (2550 lbs) - (1542.2 lbs) = 1007.8 lbs.

Utility Category (1950 lbs) - (1542.2 lbs) = 407.8 lbs.

THIS BASIC EMPTY WEIGHT, C.G. AND USEFUL LOAD ARE FOR THE AIRPLANE AS DELIVERED FROM THE FACTORY. REFER TO APPROPRIATE AIRCRAFT RECORD WHEN ALTERATIONS HAVE BEEN MADE.

WEIGHT AND BALANCE DATA FORM

Figure 6-5

PA-28-181	Serial Number 28-7890100	Registration Number N4759G	Page Number

Date	Item No. In	Item No. Out	Description of Article or Modification	Weight Change Added (+) Wt. (Lb.)	Added (+) Arm (In.)	Added (+) Moment /100	Removed (-) Wt. (Lb.)	Removed (-) Arm (In.)	Removed (-) Moment /100	Running Basic Empty Weight Wt. (Lb.)	Running Basic Empty Weight Moment /100
9/15/77			As Delivered							1642.2	1347.7

WEIGHT AND BALANCE RECORD

Figure 6-7

PA-28-181			Serial Number	Registration Number					Page Number		
Date	Item No.		Description of Article or Modification	Weight Change						Running Basic Empty Weight	
				Added (+)			Removed (-)				
	In	Out		Wt. (Lb.)	Arm (In.)	Moment /100	Wt. (Lb.)	Arm (In.)	Moment /100	Wt. (Lb.)	Moment /100
			As Delivered								

WEIGHT AND BALANCE RECORD (cont)

Figure 6-7 (cont)

6.7 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.

	Weight (Lbs)	Arm Aft Datum (Inches)	Moment (In-Lbs)
Basic Empty Weight	1542.2	87.4	134777
Pilot and Front Passenger	340.0	80.5	27370
Passengers (Rear Seats)*	340.0	118.1	40154
Fuel (48 Gallon Maximum) (48x6 = 288)	288	95.0	27360
Baggage*	39.8	142.8	5683
Total Loaded Airplane	2550	92.3	235344

The center of gravity (C.G.) of this sample loading problem is at 92.3 inches aft of the datum line. Locate this point (92.3) 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.

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

*Utility Category Operation - No baggage or rear passengers allowed.

SAMPLE LOADING PROBLEM (NORMAL CATEGORY)

Figure 6-9

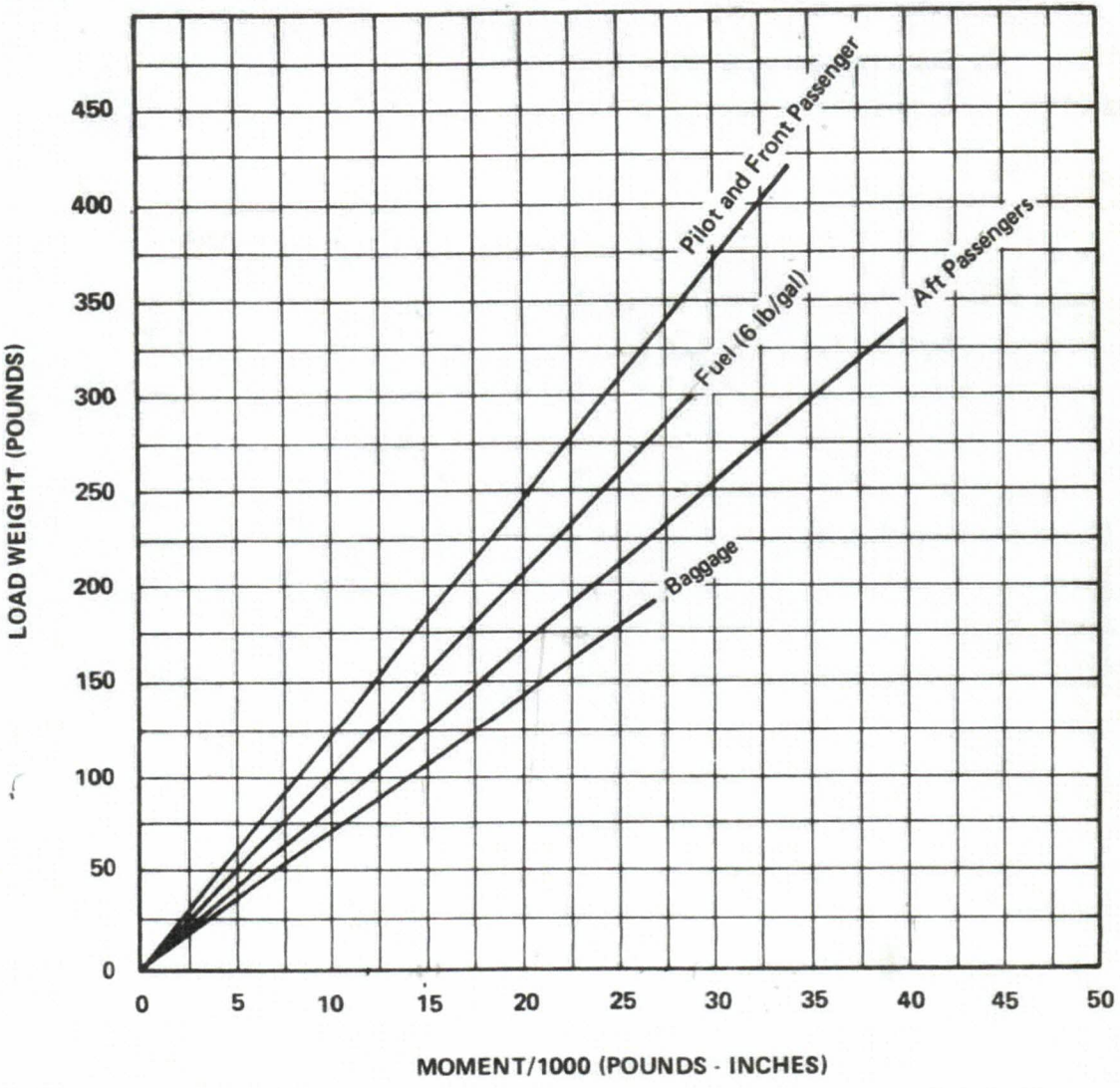
	Weight (Lbs)	Arm Aft Datum (Inches)	Moment (In-Lbs)
Basic Empty Weight	1,579	87.7	138,478
Pilot and Front Passenger	446	80.5	35,920
Passengers (Rear Seats)*	370	118.1	29,526
Fuel (48 Gallon Maximum) 6# per gallon		95.0	2,375
Baggage*	120	142.8	2,856
Total Loaded Airplane	2281		279

Totals must be within approved weight and C.G. limits. It is the responsibility of the airplane owner and the pilot to insure that the airplane is loaded properly. The Basic Empty Weight C.G. is noted on the Weight and Balance Data Form (Figure 6-5). If the airplane has been altered, refer to the Weight and Balance Record for this information.

*Utility Category Operation - No baggage or rear passengers allowed.

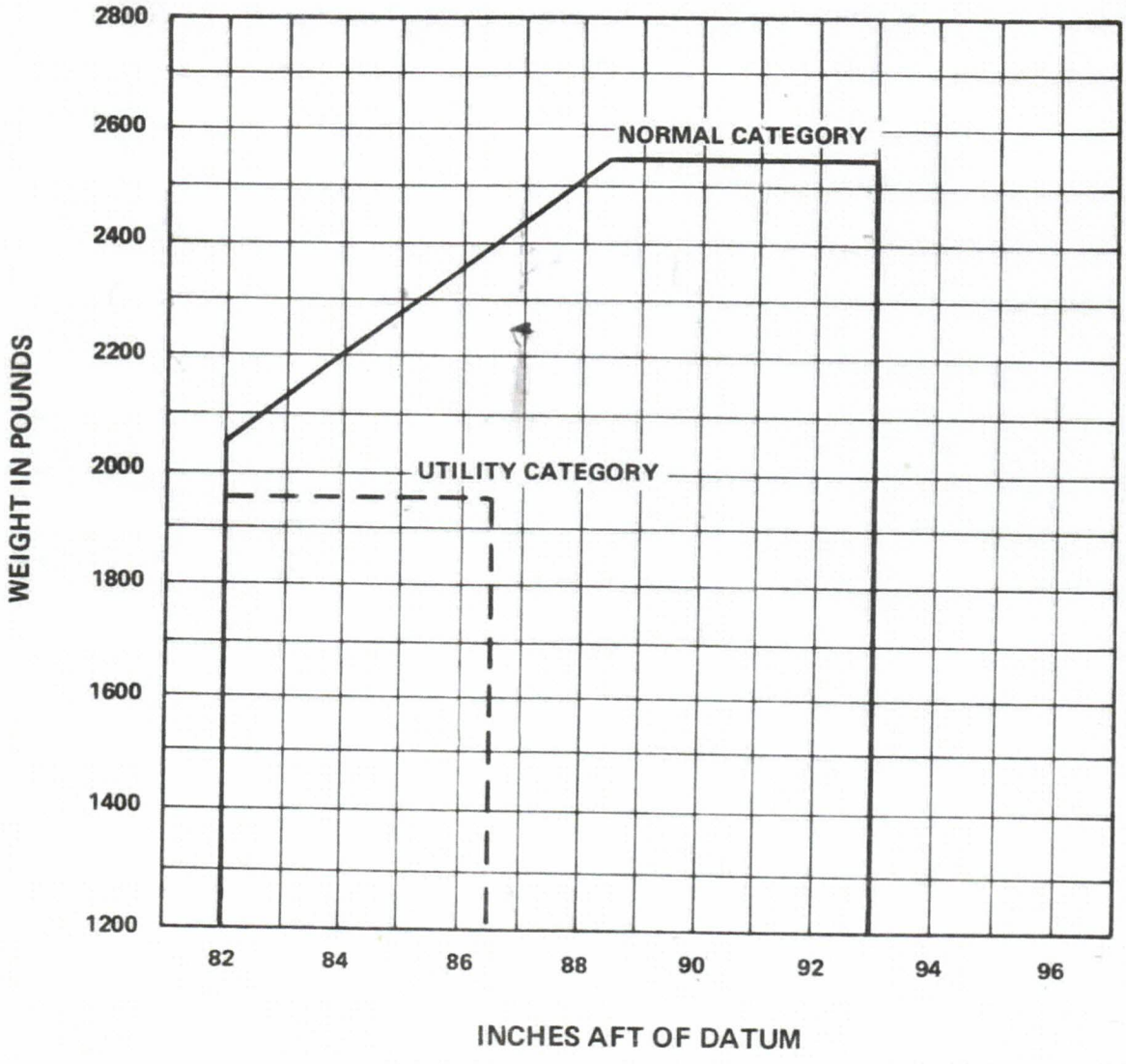
WEIGHT AND BALANCE LOADING FORM

Figure 6-11



LOADING GRAPH

Figure 6-13



C. G. RANGE AND WEIGHT

Figure 6-15

6.9 EQUIPMENT LIST

The following is a list of equipment which may be installed in the PA-28-181. It consists of those items used for defining the configuration of an airplane when the basic empty weight is established at the time of delivery. Only those standard items which are alternate standard items and those required to be listed by the certificating authority (FAA) are presented. Items marked with an "X" are those items which were installed on the airplane described below as delivered by the manufacturer.

PIPER AIRCRAFT CORPORATION PA-28-181 CHEROKEE ARCHER II

SERIAL NO. 28-7890100 REGISTRATION NO. N47596 DATE: 9/15/77

(a) Propeller and Propeller Accessories

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
1	Propeller, Sensenich 76EM8S5-0-60, Piper Spec. PS50077-8 Cert. Basis - TC P4EA				
3	Propeller, Sensenich 76EM8S5-0-62, Piper Spec. PS50077-42 Cert. Basis - TC P4EA				

(b) Engine and Engine Accessories

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
11	Engine - Lycoming Model O-360-A4M Piper Dwg. 62941-16 Cert. Basis - TC E286				
13	Oil Filter - Lycoming No. 75528 (AC *OF5578770) Cert. Basis - TC E286	———	3.3	35.5	117
15	Oil Filter - Lycoming *LW-13743 (Champion *CH-48110) Cert. Basis - TC E286	X ———	2.8	35.5	99

(c) Landing Gear and Brakes

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
27	Two Main Wheel Assemblies Piper Dwg. 63370-0 & -1 a. Cleveland Aircraft Products Wheel Assembly No. 40-86 Brake Assembly No. 30-55 Cert. Basis - TSO C26a				
	b. Two Main 4-Ply Rating Tires 6.00-6 with Regular Tubes Cert. Basis - TSO C62				
29	One Nose Wheel a. Cleveland Aircraft Products Wheel Assembly No. 40-76B (Less Brake Drum) Cert Basis - TSO C26a	———	4.3	31.0	133
	b. McCauley Industrial Corp. Wheel Assy. No. D-30625 Cert. Basis - TSO C26b	X ———	5.5	31.0	171
	c. One Nose Wheel 4-Ply Rating Tire 6.00-6 with Regular Tube Cert. Basis - TSO C62				

(d) Electrical Equipment

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)

(e) Instruments

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
53	Airspeed Indicator, Piper Spec. PS50049-30S Cert. Basis - TSO C2b				
55	Altimeter, Piper Spec. PS50008-2 or -3 Cert. Basis - TSO C10b				
57	Compass Cert. Basis - TSO C7c				

(f) Miscellaneous

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
65	Forward Seat Belts (2) Piper Spec. PS50039-4-2A Cert. Basis - TSO C22f				
67	Rear Seat Belts (2) Piper Spec. PS50039-4-3 Cert. Basis - TSO C22f				

(g) Engine and Engine Accessories (Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)

(h) Propeller and Propeller Accessories
(Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)

(i) Landing Gear and Brakes
(Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
73	Nose Wheel Fairing Piper Dwg. 65348-2 Cert. Basis - TC 2A13	____	3.6	36.3	131
75	Main Wheel Fairings Piper Dwg. 65237 Cert. Basis - TC 2A13	____	7.6	113.6	863
76	Nose Wheel Fairing Piper Dwg. 37896-3 Cert. Basis - TC 2A13	X	10.3	36.3	374
77	Main Wheel Fairings Piper Dwg. 37885-2, -3 Cert. Basis - TC 2A13	X	20.6	113.6	2340

(j) Electrical Equipment
(Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
79	Instrument Panel Lights Cert. Basis - TC 2A13	X	0.3	62.8	19
81	Instrument Light Grimes 15-0083-7 Cert. Basis - TC 2A13	X	0.1	99.0	10
83	Cabin Light Cert. Basis - TC 2A13	X	0.3	99.0	30
85	Landing Light, G. E. Model 4509 Cert. Basis - TC 2A13	X	.5	13.1	7
87	Navigation Lights (Wing) (2) Grimes Model A1285 (Red and Green) Cert. Basis - TC 2A13		0.4	106.6	43
89	Navigation Light (Rear) (1), Grimes Model 2064 (White) Cert. Basis - TC 2A13	X	.2	281.0	56
91	Rotating Beacon Cert. Basis - TC 2A13	X	1.5	263.4	395
93	Anti-Collision Lights (Wing Tip) (Whelen) Cert. Basis - STC SA800EA	X	5.7	157.9	900
95	Heated Pitot Head, Piper Dwg. 69041-7 Cert. Basis - TC 2A13	X	.4	100.0	40
97	Piper Pitch Trim Piper Dwg. 69378-3 Cert. Basis - TC 2A13		4.7	145.6	684
99	Battery 12V 35 A.H. Rebat R35 (Wt. 27.2 lbs.) Cert. Basis - TC 2A13	X	*5.3	168.0	890

*Weight and moment difference between standard and optional equipment.

(j) Electrical Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
101	Auxiliary Power Receptacle, Piper Dwg. 68815 Cert. Basis - TC 2A13	X	2.7	178.5	482
103	External Power Cable, Piper Dwg. 62355 Cert. Basis - TC 2A13	X	4.6	142.8	657
105	Lighter, *200462, 12 Volt Universal Cert. Basis - TC 2A13	X	.2	62.9	13

(k) Instruments
(Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
113	Vacuum System Installation Cert. Basis - TC 2A13	X _____	4.5	39.1	176
115	Attitude Gyro, Piper Dwg. 99002-2, -3, -4 or -8 Cert. Basis - TSO C4c	_____	2.2	59.4	131
117	Directional Gyro, Piper Dwg. 99003-2, -3, -4 or -7 Cert. Basis - TSO C5c	_____	2.6	59.7	155
119	Tru-Speed Indicator, Piper Spec. PS50049-30T Cert. Basis - TSO C2b	X	(same as standard equipment)		
121	Encoding Altimeter, Piper PS50008-6 or -7 Cert. Basis - TSO C10b, C88	_____	* .9	60.3	54
123	Vertical Speed Piper Dwg. 99010-2, -4 or -5 Cert. Basis - TSO C8b	X _____	1.0	65.9	66
125	Alternate Static Source Cert. Basis - TC 2A13	X _____	.4	61.0	24
127	Turn and Slip Indicator, Piper PS50030-2 or -3 Cert. Basis - TSO C3b	X _____	2.6	59.7	155
129	Exhaust Gas Temperature, Piper Dwg. 99026 Cert. Basis - TC 2A13	X _____	.7	55.4	39
131	Manifold Pressure Gauge Piper Spec. PS50031-3 or -4 Cert. Basis - TC 2A13	_____	0.9	60.8	55

*Weight and moment difference between standard and optional equipment.

(k) Instruments
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
133	Engine Hour Meter Piper Dwg. 79548-0 Cert. Basis - TC 2A13	X	0.3	61.2	18
135	Clock Cert. Basis - TC 2A13	X	.4	62.4	25
137	Air Temperature Gauge, Piper Dwg. 99479-0 or -2 Cert. Basis - TC 2A13	X	.2	72.6	15

(l) Autopilots
(Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
157	AutoFlite II Cert. Basis - STC SA3066SW-D	———	5.6	91.8	514
159	AutoControl IIIB	X	9.6	77.6	745
	a. Omni Coupler, *1C388 Cert. Basis - STC SA3065SW-D	———	1.0	59.3	59

(m) Radio Equipment
(Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
169	Collins VHF-250 or VHF-251 Comm Transceiver				
	a. Single	———	4.0	56.9	228
	b. Dual	———	8.1	56.9	461
	Cert. Basis - TSO C37b, C38b				
171	Collins VIR-350 or VIR-351 Nav Receiver				
	a. Single	———	3.9	57.4	224
	b. Dual	———	7.9	57.4	453
	Cert. Basis - TSO C40a, C36c				
173	Collins IND-350 VOR/LOC Indicator				
	a. Single	———	1.0	60.2	60
	b. Dual	———	2.0	60.2	120
	Cert. Basis - TSO C40a, C36c				
175	Collins IND-351 VOR/LOC/ GS Indicator				
	Cert. Basis - TSO C40a, C36c	———	1.3	60.2	78
177	Collins GLS-350 Glide Slope Receiver				
	Cert. Basis - TSO C34c	———	2.0	181.8	364
179	Collins RCR-650 ADF Receiver and Antenna and IND-650 Indicator				
	Cert. Basis - TSO C41c	———	6.6	104.8	692
181	Collins AMR-350 Audio/Marker Panel				
	Cert. Basis - TSO C35d, C50b	———	*3.3	110.0	363

*Weight includes antenna and cable.

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
183	Collins TDR-950 Transponder Cert. Basis - TSO C74c	_____	*2.8	62.9	176
187	King KX 170 ( ) VHF Comm/Nav				
	a. Transceiver, Single	_____	7.5	56.6	425
	b. Transceiver, Dual	_____	15.0	56.6	849
	Cert. Basis - TC 2A13				
189	King KX 175 ( ) VHF				
	a. Transceiver	_____	9.4	56.6	532
	b. King KN 72 VOR/LOC Converter	_____	1.3	183.6	239
	c. King KN 73 Glide Slope Receiver	_____	3.2	184.3	590
	d. King KN 75 Glide Slope Receiver	_____	1.6	184.3	295
	e. King KN 77 VOR/LOC Converter	_____	3.6	183.6	661
	f. King KI-204 VOR/ILS Indicator	_____	1.7	60.5	103
	g. King KNI 520 VOR/ILS Indicator	_____	2.8	60.5	169
	Cert Basis - TSO C36c, C37b, C38b, C40a				
191	King KX 175 ( ) VHF				
	a. Transceiver (2nd)	_____	8.6	56.6	487
	b. King KN 72 VOR/LOC Converter	_____	1.3	183.6	239
	c. King KN 77 VOR/LOC Converter	_____	4.2	183.6	771
	d. King KI-203 VOR/ILS Indicator	_____	1.6	60.5	97
	e. King KNI 520 VOR/ILS Indicator	_____	2.8	60.5	169
	Cert. Basis - TSO C36c, C37b, C38b, C40a				

*Weight includes antenna.

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
193	King KI 201 ( ) VOR/ LOC Ind.				
	a. Single	_____	2.5	59.6	149
	b. Dual	_____	5.0	59.9	300
	Cert. Basis - TC 2A13				
194	King KI 208 VOR/LOC Indicator				
	a. Single	_____	1.0	59.6	60
	b. Dual	_____	2.0	59.9	120
	Cert. Basis - TSO C34c, C36c, C40a				
195	King KI 209 VOR/LOC/GS Indicator				
	Cert. Basis - TSO C34c, C36c, C40a	_____	1.2	59.9	72
196	King KI 213 VOR/LOC/GS Indicator				
	Cert. Basis - TC 2A13	_____	2.5	60.4	151
197	King KI 214 ( ) VOR/ LOC/GS Ind.				
	Cert. Basis - TC 2A13	_____	3.3	59.9	198
199	King KN 74 R-Nav				
	Cert. Basis - TC 2A13	_____	4.7	56.6	266
201	King KN 61 DME				
	Cert. Basis - TC 2A13	_____	12.5	179.0	2237
203	King KN 65A DME				
	Cert. Basis - TSO C66a	_____	13.0	174.9	2274
205	King KR 85 Digital ADF	_____	8.6	85.2	733
	a. Audio Amplifier	_____	0.8	51.0	41
	Cert. Basis - TSO C41b				

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
207	King KR 86 ADF				
	a. First	_____	6.7	91.6	614
	b. Second	_____	9.7	107.0	1038
	c. Audio Amplifier	_____	0.8	51.0	41
	Cert. Basis - TC 2A13				
209	King KMA 20 ( ) Audio Panel				
	Cert. Basis - TSO C35c, C50b	_____	*3.7	70.8	262
211	King KT 76 ( )/78 ( ) Transponder				
	Cert. Basis - TSO C74b	_____	*3.1	58.1	180

*Weight includes antenna and cable.

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
213	Narco Comm 10A VHF Transceiver Cert. Basis - TC 2A13	_____	3.9	57.4	224
215	Narco Comm 11A VHF Transceiver a. Single b. Dual Cert. Basis - TC 2A13	_____ _____	3.6 7.1	57.4 57.4	207 408
217	Narco Comm 11B VHF Transceiver a. Single b. Dual	_____ _____	3.9 7.8	57.4 57.4	224 448
219	Narco Comm 111 VHF Transceiver a. Single b. Dual Cert. Basis - TSO C37b, C38b	_____ _____	3.0 6.0	57.4 57.4	172 344
221	Narco Comm 111B VHF Transceiver a. Single b. Dual Cert. Basis - TSO C37b, C38b	_____ _____	3.9 7.8	57.4 57.4	224 448
223	Narco Comm 120 VHF Transceiver a. Single b. Dual Cert. Basis - TSO C37b, C38b	_____ _____	4.8 8.6	56.9 57.4	273 494
225	Narco Nav 10 VHF Receiver Cert. Basis - TC 2A13	_____	1.9	58.6	111
227	Narco Nav 11 VHF Receiver a. Single b. Dual Cert. Basis - TC 2A13	_____ _____	2.8 5.6	58.6 58.6	164 328
229	Narco Nav 12 VHF Receiver Cert. Basis - TC 2A13	_____	3.4	58.6	199

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
231	Narco Nav 14 VHF Receiver Cert. Basis - TC 2A13	———	2.5	57.4	144
233	Narco Nav 111 Cert. Basis - TSO C36c, C40a, C66a	———	2.5	58.6	147
235	Narco Nav 112 Receiver Cert. Basis - TSO C36c, C40a, C66c, C34c	———	3.3	58.6	193
237	Narco Nav 114 VHF Receiver Cert. Basis - TSO C38b, C40a, C36c, C34c, C66a	———	2.5	57.4	144
239	Narco Nav 121 VHF Receiver a. Single b. Dual Cert. Basis - TSO C36c, C40c, C66a	——— ———	3.1 6.2	58.4 58.4	181 362
241	Narco Nav 122 VHF Receiver a. Single b. Dual Cert. Basis - TSO C35d, C36c, C40c, C66a	——— ———	* 5.1 * 8.6	99.4 82.9	507 713
243	Narco Nav 122A VHF Receiver a. Single b. Dual Cert. Basis - TSO C34c, C35d, C36c, C40c, C66a	——— ———	* 5.2 * 8.8	98.5 82.2	512 723
245	Narco Nav 124A VHF Receiver a. Single b. Dual Cert. Basis - TSO C35d, C36c, C40a, C66a	——— ———	* 6.2 *10.9	92.3 77.2	572 841

*Weight includes marker antenna and cable.

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
247	Narco ID 124 VOR/LOC/GS Indicator				
	a. Single	_____	1.2	60.5	73
	b. Dual	_____	2.4	60.5	145
	Cert. Basis - TSO C34c, C35d, C36c, C40c				
249	Narco UGR-2A Glide Slope				
	a. Single	_____	4.2	154.0	647
	b. Dual	_____	8.4	220.0	1848
	Cert. Basis - TSO C34b				
251	Narco UGR-3 Glide Slope				
	Cert. Basis - TC 2A13	_____	4.2	154.0	647
253	Narco MBT-12-R, Marker Beacon				
	Cert. Basis - TC 2A13	_____	3.1	69.1	214
255	Narco CP-125 Audio Selector Panel				
	Cert. Basis - TC 2A13	_____	2.2	55.0	121
257	Narco CP-135 Audio Selector Panel				
	Cert. Basis - TSO C50b	_____	2.2	55.0	121
259	Narco CP-135M Audio Selector Panel				
	Cert. Basis - TSO C50b, C35d	_____	* 3.7	114.3	423
261	Narco DME-190				
	Cert. Basis - TC 2A13	_____	** 5.9	60.9	359
263	Narco DME-190 TSO				
	Cert. Basis - TSO C66a	_____	** 5.9	60.9	359
265	Narco DME-195 Receiver and Indicator				
	Cert. Basis - TSO C66a	_____	**13.2	154.5	2039

*Weight includes marker antenna and cable.
**Weight includes antenna and cable.

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
267	Narco ADF-140				
	a. Single	_____	6.0	91.2	547
	b. Dual	_____	*17.9	107.6	1926
	Cert. Basis - TSO C41c				
269	Narco ADF-141				
	a. Single	_____	6.0	91.2	547
	b. Dual	_____	*17.9	107.6	1926
	Cert. Basis - TSO C41c				
271	Narco AT50A Transponder				
	Cert. Basis - TSO C74b	_____	** 3.0	57.3	172
	a. Narco AR-500 Altitude Encoder				
	Cert. Basis - TSO C88	_____	1.0	51.5	52
273	Narco AT150 Transponder				
	Cert. Basis - TSO C74c	_____	** 3.0	57.3	172
	a. Narco AR-500 Altitude Encoder				
	Cert. Basis - TSO C88	_____	1.0	51.5	52
275	Antenna and Cable				
	a. Nav Receiving	_____	1.4	195.7	274
	b. # 1 VHF Comm	_____	0.7	125.7	88
	c. # 2 VHF Comm	_____	0.8	147.5	118
	d. Glide Slope (Single)	_____	0.9	120.0	108
	e. Glide Slope (Dual)	_____	2.8	154.0	431
	f. Single ADF Sense	_____	0.4	150.0	60
	Cert. Basis - TC 2A13				
277	Anti Static Antenna and Cable				
	a. # 1 VHF Comm	_____	1.4	144.3	202
	b. # 2 VHF Comm	_____	1.5	170.7	256
	c. Single ADF Sense	_____	0.5	147.5	74
	Cert. Basis - TC 2A13				
279	Emergency Locator Transmitter	X	3.5	236.2	402
	a. Antenna and Coax	X	0.2	224.4	45
	b. Shelf and Access Hole	X	0.3	235.4	71
	Cert. Basis - TC 2A13				

*Weight includes dual antenna and cable.
**Weight includes antenna and cable.

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
281	Microphone				
	a. Piper Dwg. 68856-10	_____	0.3	64.9	19
	b. Piper Dwg. 68856-11	_____	0.6	69.9	42
	c. Piper Dwg. 68856-12	_____	0.3	64.9	19
	Cert. Basis - TC 2A13				
283	Boom Microphone - Headset Piper Dwg. 37921-2				
	Cert. Basis - TC 2A13	_____	0.3	80.5	24
285	Cabin Speaker				
	Cert. Basis - TC 2A13	_____	0.8	99.0	79
287	Headset, Piper Dwg. 68856-10				
	Cert. Basis - TC 2A13	_____	0.5	60.0	30
	(1) King KMA-20		2.3	58.0	
	(2) King KX-170B		14.8	56.6	
	(1) King KI-208		1.0	59.0	
	(1) King KI-209		1.2	59.0	
	(1) King KN-75		1.5	185.0	
	(1) King KR-86		6.6	58.0	
	(1) King KA-42B		2.4	118.0	
	(1) King KT-76A		3.1	58.0	
	(1) King KN-61		8.0	185.0	
	(1) King KI-266		1.0	59.0	
	(1) King KE-127		1.1	52.0	
	(1) Mitchell IC388M		1.0	59.3	
	(1) CI-157 Nav Antenna		1.4	195.7	
	(1) CI-121 Com Antenna		1.0	144.3	
	(1) CI-121 Com Antenna		1.0	170.7	
	(1) CI-102 MKR Antenna		1.0	118.0	
	(1) Radio Cooling Kit		1.0	59.0	
	(1) Cabin Speaker		1.9	99.0	

(n) Miscellaneous
(Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
321	Zinc Chromate Finish Cert. Basis - TC 2A13	____	5.0	158.0	790
323	Stainless Steel Control Cables Cert. Basis - TC 2A13	____	–	–	–
325	Air Conditioner, Piper Dwg. 99575-3 Cert. Basis - TC 2A13	____	68.3	103.6	7076
327	Overhead Vent System Piper Dwg. 76304-9 Cert. Basis - TC 2A13	____	6.4	159.6	1022
329	Overhead Vent System with Ground Ventilating Blower Piper Dwg. 76304-10 Cert. Basis - TC 2A13	X	14.9	172.2	2566
331	Assist Step, Piper Dwg. 65384 Cert. Basis - TC 2A13	X	1.8	156.0	281
333	Super Cabin Sound Proofing, Piper Dwg. 79601-3 Cert. Basis - TC 2A13	X	18.1	86.8	1571
335	Adjustable Front Seat (Left), Piper Dwg. 79591-0/79591-2 Cert. Basis - TC 2A13	X	*6.6	80.7	533
337	Adjustable Front Seat (Right), Piper Dwg. 79591-1/79591-3 Cert. Basis - TC 2A13	X	*6.8	80.0	544

*Weight and moment difference between standard and optional equipment.

(n) Miscellaneous
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
339	Headrests (2) Front, Piper Dwg. 79337-18 Cert. Basis - TC 2A13	X	2.2	94.5	208
341	Headrests (2) Rear, Piper Dwg. 79337-18 Cert. Basis - TC 2A13	X	2.2	132.1	291
343	Inertia Safety Belts (Rear) (2) 0.8 lbs. each, Piper PS50039-4-14 Cert. Basis - TC 2A13		1.6	140.3	224
345	Assist Strap, Piper Dwg. 79455 Cert. Basis - TC 2A13	X	0.2	109.5	22
347	Deluxe Carpeting Cert. Basis - TC 2A13	X	*2.8	101.9	285
349	Fire Extinguisher, a. Piper Dwg. 76167-2, Scott 42211-00		4.6	71.0	327
	b. Piper Dwg. 37872-2, Graviner HA1014-01 Cert. Basis - TC 2A13		5.6	57.9	324

*Weight and moment difference between standard and optional equipment.

(n) Miscellaneous
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
TOTAL OPTIONAL EQUIPMENT			130.2	109.8	14295

EXTERIOR FINISH

Base Color Juneau White

Trim Color Baja Yellow

Accent Color Lime Green

Registration No. Color mGreen

Type Finish Lacquer

GARMIN Ltd. or its subsidiaries
c/o GARMIN International, Inc.
1200 E. 151st Street
Olathe, Kansas 66062 U.S.A.

FAA Approved
AIRPLANE FLIGHT MANUAL SUPPLEMENT
or
SUPPLEMENTAL AIRPLANE FLIGHT MANUAL
for the
GARMIN G5 ELECTRONIC FLIGHT INSTRUMENT
as installed in

Piper PA-28-181

Make and Model Airplane

Registration Number: N78BG Serial Number: 28-7890100

This document serves as an Airplane Flight Manual Supplement or as a Supplemental Airplane Flight Manual when the aircraft is equipped in accordance with Supplemental Type Certificate SA01818WI for the installation and operation of the Garmin G5 Electronic Flight Instrument. This document must be carried in the airplane at all times.

The information contained herein supplements or supersedes the information made available to the operator by the aircraft manufacturer in the form of clearly stated placards or markings, or in the form of an FAA approved Airplane Flight Manual, only in those areas listed herein. For limitations, procedures and performance information not contained in this document, consult the basic placards or markings, or the basic FAA approved Airplane Flight Manual.

FAA APPROVED BY: David G Armstrong

David G. Armstrong

ODA STC Unit Administrator

GARMIN International, Inc

ODA-240087-CE

DATE: 7/19/19

Garmin International, Inc.
1200 E. 151st Street
Olathe, KS 66062 USA
Telephone: 913-397-8200
www.garmin.com

Garmin International, Inc

Log of Revisions

FAA Approved AIRPLANE FLIGHT MANUAL SUPPLEMENT

or

SUPPLEMENTAL AIRPLANE FLIGHT MANUAL

GARMIN G5 ELECTRONIC FLIGHT INSTRUMENT

REV NO.	PAGE NO(S)	DESCRIPTION	DATE OF APPROVAL	FAA APPROVED
1	ALL	Original Issue	7/22/2016	Robert Murray ODA STC Unit Administrator
2	ALL	Added information regarding G5 DG/HSI.	4/28/2017	Robert Murray ODA STC Unit Administrator
3	ALL	Added interface to 3rd party autopilots.	10/18/2017	Robert Murray ODA STC Unit Administrator
4	ALL	Added note to General section.	10/26/17	Paul Mast ODA STC Unit Administrator
5	ALL	Reformatted document. Updated system messages interface. Added DG/HSI reversion description.	12/20/17	Robert Murray ODA STC Unit Administrator
6	ALL	Added interface description to GAD 13. Added information regarding multiple NAV source inputs.	See Cover	See Cover

This page intentionally left blank.

Table of Contents

SECTION 1 – GENERAL

The G5 Electronic Flight Instrument can display the following information to the pilot depending on the installation and location of the G5 instrument.

- Primary attitude
- Primary slip and turn rate information
- Primary heading
- Secondary airspeed
- Secondary altimeter
- Secondary ground track

When installed in place of the attitude indicator, the primary function of the G5 is to provide attitude information to the pilot. When installed in place of the rate of turn indicator, the primary function of the G5 is to provide turn rate and slip ball information to the pilot. When installed in place of the directional gyro, the primary function of the G5 is to provide directional information to the pilot.

NOTE:

The pilot is reminded to perform appropriate flight and navigation instrument cross checks for the type of operation being conducted.

In case of a loss of aircraft electrical power, a backup battery (optional when installed as a DG/HSI) sustains the G5 Electronic Flight Instrument for up to four hours.

An optional GAD 29B may be installed to provide course and heading datum to an autopilot based on the data selected for display on the HSI.

An optional GAD 13 and OAT probe may be installed to provide measured outside air temperature (OAT) to the G5 for display of true airspeed (TAS), outside air temperature, winds, and density altitude.

This STC allows the removal of the aircraft's vacuum system if it is not required to support any other airframe system.

Abbreviations and Terminology

The following glossary is applicable within the airplane flight manual supplement

ADI	Attitude Direction Indicator
AFMS	Airplane Flight Manual Supplement
ATT	Attitude
CDI	Course Deviation Indicator
DG	Directional Gyro
DR	Dead Reckoning
FAA	Federal Aviation Administration
GPS	Global Positioning System
GPSS	GPS Roll Steering
HDG	Heading
HSI	Horizontal Situation Indicator
ILS	Instrument Landing System
LOC	Localizer (no glideslope available)
LOI	Loss of Integrity
OAT	Outside Air Temperature
TAS	True Airspeed
VFR	Visual Flight Rules
VHF	Very High Frequency
VOR	VHF Omni-directional Range

SECTION 2 – LIMITATIONS

System Software Requirements

The G5 must utilize the following or later FAA approved software versions for this AFMS revision to be applicable:

Component	Software Version
G5 Electronic Flight Instrument	6.20

Use of Secondary Instruments

The original type design approved instruments for airspeed, altitude and vertical speed remain the primary indications for these parameters.

If the G5 Electronic Flight Instrument is installed in place of the rate of turn indicator, the original type design approved instrument for attitude remains in the primary indication for attitude.

If the G5 Electronic Flight Instrument is installed in place of the directional gyro, the original type design approved instruments for attitude remains the primary indication for attitude.

NOTE:

For aircraft approved for VFR-only operations, the G5 Electronic Flight Instrument may be installed as an attitude indicator and rate of turn indicator.

Kinds of Operations

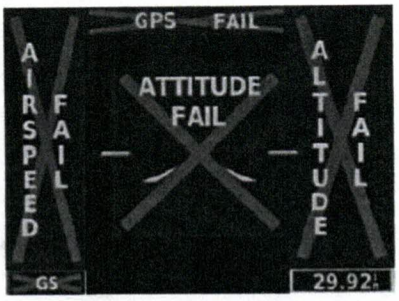
No Change except for the following:

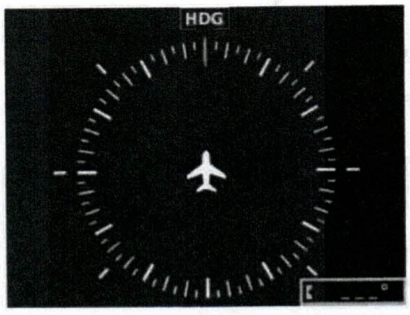
- When a portable navigation source is selected on the G5, it shall not be used for the primary means of navigation for IFR operations.

SECTION 3 – EMERGENCY PROCEDURES

G5 Failure Indications

If a G5 function fails, a large red 'X' is typically displayed over the instrument(s) or data experiencing the failure. Upon G5 power-up, certain instruments remain invalid as equipment begins to initialize. All instruments should be operational within one minute of power-up. If any instrument remains flagged and it is not likely an installation related problem, the G5 should be serviced by a Garmin-authorized repair facility.





Attitude Failure

Attitude failure is indicated by removal of the sky/ground presentation, a red X, and a yellow "ATTITUDE FAIL" on the display.

Rate-of-turn and slip information will not be available.

1. Use standby instruments.
2. Seek VFR conditions or land as soon as practical.

Heading Failure, Loss of Magnetometer Data, or Magnetic Field Error

A heading failure, loss of magnetometer data, or magnetic field error is indicated by removal of the digital heading readout, a red X, and a yellow "HDG" on the display.

1. Use standby magnetic compass.

NOTE:

If the G5 DG/HSI has a valid GPS signal the G5 DG/HSI instrument will display the GPS track information in magenta.

GPS Failure

If GPS navigation receivers and/or navigation information are not available or invalid, the G5 will display Dead Reckoning mode (DR) or Loss of Integrity mode (LOI) on the HSI in the lower left corner.

If Alternate Navigation Sources (ILS, LOC, VOR) Are Available:

1. Use alternate navigation source.

If No Alternate Navigation Sources Are Available:

If DR is Displayed on HSI:

1. Use the amber CDI for course information.
2. Fly toward known visual conditions.

If LOI is Displayed on HSI:

1. Fly toward known visual conditions.

For aircraft equipped with a GAD 29B interfaced to an autopilot, GPSS will be displayed in amber text when GPSS emulation has been selected from the G5 menu.

1. Deselect GPSS from the G5 menu and select a different autopilot mode.

Attitude Aligning

During system initialization, the G5 displays the message 'ALIGNING' over the attitude indicator. The G5 will typically display valid attitude within the first minute of power-up. The G5 can also align itself while taxiing and during level flight.

If the "ALIGNING" indication occurs during flight and attitude remains displayed, the attitude display is acceptable for use for flight in instrument conditions. The message will clear when the attitude solution is within the systems internal accuracy tolerances. It is recommended to maintain wings level to reduce the time for the system to align.

Attitude Aligning / Keep Wings Level

If the "ALIGNING KEEP WINGS LEVEL" indication occurs during flight, the G5 has detected an invalid attitude solution and will not display any attitude information.

1. Use standby instruments to maintain wings level flight. The system will display attitude when internal accuracy tolerances have been met.
2. If attitude does not return, seek VFR conditions or land as soon as practical.

Loss of Electrical Power to the G5 Display

In the event of a loss of aircraft electrical power to the G5 attitude display, the indicator will continue to function on its internal battery. If an internal battery is installed on the optional G5 HSI, the indicator will continue to function on the internal battery if aircraft power is lost. Internal battery endurance is indicated on the G5 display in hours and minutes. The charging symbol will be removed and the internal battery will not be charged.

In the event the G5 attitude display powers down, the optional G5 HSI will automatically revert to displaying attitude information. It will not revert back to the DG/HSI format if the G5 attitude unit regains power. The DG/HSI presentation may be selected from the G5 menu on the G5 DG/HSI unit after reversion to the attitude display.

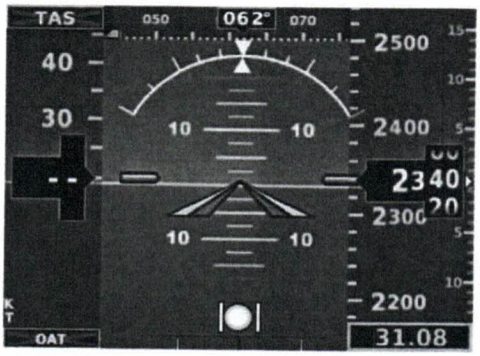
Loss of Electrical Power to the GAD 29B (If Installed)

In the event of a loss of aircraft electrical power to the optional GAD 29B, the heading and course datum will be unavailable to the autopilot and the autopilot may deviate from the intended path or may disconnect. GPS flight plan course information may be displayed on the HSI and VFR will be displayed in amber text on the HSI. GPSS will be displayed in amber text, if GPSS mode is selected.

1. Deselect GPSS from the G5 menu and select a different autopilot mode.
2. Lateral GPS course guidance may only be used in VFR conditions.

Loss of Electrical Power to the GAD 13 (If Installed)

In the event of a loss of aircraft electrical power to the optional GAD 13, the OAT and TAS indications will be replaced with a red X. The Density Altitude indication will be removed, and "No Wind Data" will be displayed in the wind field.



1. Use an alternate source of outside air temperature to calculate true airspeed, density altitude, and winds.

SECTION 4 – NORMAL PROCEDURES

G5 Power Button and Knob

The G5 display will power on with the application of aircraft power. The G5 power button is used to turn the display on and off. Press and hold the power button to turn the display off.

The knob performs the following functions:

Press	Press to access the Menu. From the Menu, press to select the desired menu item. Press to accept the displayed value when editing numeric data or selecting from a list. Press to sync the heading or track bug for the HSI.
Turn	From the Menu, turn the Knob to move the cursor to the desired menu item. For the ADI, rotate to adjust the baro setting on the secondary altitude display. For the HSI, rotate to adjust the heading or track bug. Turn to select the desired value when editing numeric data or selecting from a list.

Backlight Intensity Adjustment

The power up state of the G5 backlight is in Auto adjustment mode.

To adjust the backlighting:

To select Manual mode from Auto mode:

1. While the unit is turned on, press the Power button.
2. Turn the knob to manually adjust the backlight intensity.
3. Press the knob to close the backlight page.

To select Auto mode from Manual mode:

1. While the unit is turned on, press the Power button.
2. Press the Power button again to select Auto.
3. Press the knob to close the backlight page.

Prior to Flight in Instrument Meteorological Conditions

1. Press the Power button on the G5 attitude indicator.
2. Verify the battery status indicator is green on the G5 attitude indicator.

Autopilot Operations with the G5 HSI

The G5 and optional GAD 29B offer various integration capabilities dependent upon the type of autopilot installed in a particular aircraft.

The G5 Electronic Flight Instrument installation in this aircraft provides the following autopilot functions (appropriate boxes will be checked):

- ☐ This installation does not interface with the autopilot (basic wing leveling autopilot or no autopilot is installed in the aircraft).
- ☐ A GAD 29B Adapter is installed in this aircraft.
  - ☐ Course / NAV Selection coupling to the autopilot.
  - ☐ Heading Bug coupling capability to the autopilot.
  - ☐ Roll Steering (GPSS) emulated via heading mode.

    OR
  - ☐ Roll Steering capable autopilot (GPSS menu function for emulation not applicable).

Course / NAV Selection Coupling to the Autopilot (If Configured)

When operating the autopilot in NAV mode, the deviation information from the installed navigation sources (i.e. GPS or NAV) is switched via the navigation source. The NAV source displayed on the HSI is the NAV source the autopilot is following. Many autopilots also use the course datum to determine the best intercept angles when operating in NAV mode.

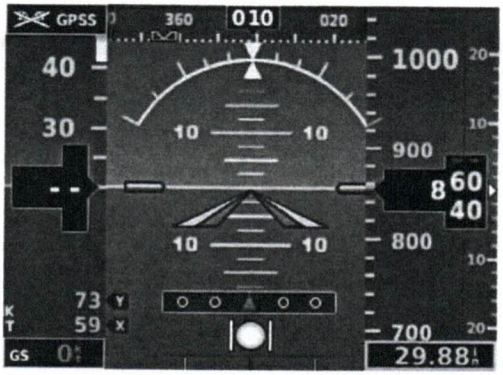
Heading Bug Coupling Capability to the Autopilot (If Configured)

When operating the autopilot in HDG mode, the difference between the HDG bug location on the HSI and the actual aircraft heading creates an error signal which the autopilot will minimize by turning in the direction of the bug. If the bug is turned more than 180 degrees, the autopilot may turn the airplane in the opposite direction of the desired turn.

Roll Steering (GPSS) Emulated via HDG Mode (If Configured)

For autopilots that do not support digital GPSS signals, GPSS functionality may be emulated by operating the autopilot in HDG mode and selecting GPSS from the G5 menu. If the autopilot is already designed to receive roll steering information, the data is transmitted digitally from the navigator to the autopilot.

When GPSS is selected on the G5 menu, the heading bug on the HSI changes to a hollow outline and a crossed-out heading bug appears on the G5 HSI display indicating that the autopilot is not coupled to the heading bug. The bug is still controllable and may still be used for reference.



When GPSS is selected on the G5, GPSS turn commands are converted into a heading error signal to the autopilot. When the autopilot is operated in HDG mode, the autopilot will fly the turn commands from the GPS

navigator. If the GPSS data is invalid (for example, if there is no active GPS leg) or the selected HSI source on the G5 HSI is not GPS, the annunciated GPSS text will be yellow and a zero turn command will be sent to the autopilot.

HSI Source Selection (If Configured)

For aircraft configured with two navigation inputs to the G5, the desired source may be selected using the G5 knob and menu selection. Press the G5 knob to cycle between the NAV1 and NAV2 input.

HSI Portable Navigation Device GPS VFR Annunciation (If Configured)

For aircraft configured for a portable navigation device input to the G5, a GPS VFR indicated in magenta will be displayed on the HSI. When the G5 with a portable navigation device is interfaced there is not enough guidance data for IFR use.

SECTION 5 – PERFORMANCE

No change.

SECTION 6 – WEIGHT AND BALANCE

See current weight and balance data.

SECTION 7 – SYSTEM DESCRIPTION

Refer to Garmin G5 Electronic Flight Instrument Pilot's Guide for Certified Aircraft, part number 190-01112-12 Rev A (or later approved revisions), for a description of the G5 electronic flight instrument. This reference material is not required to be on board the aircraft but does contain a more in depth description of all the functions and capabilities of the G5.

The ATT circuit breaker supplies power to the G5 instrument for normal power operation and to charge the internal battery.

The DG circuit breaker supplies power to the G5 instrument for normal power operation when configured as a DG, and to charge the internal battery (if installed).

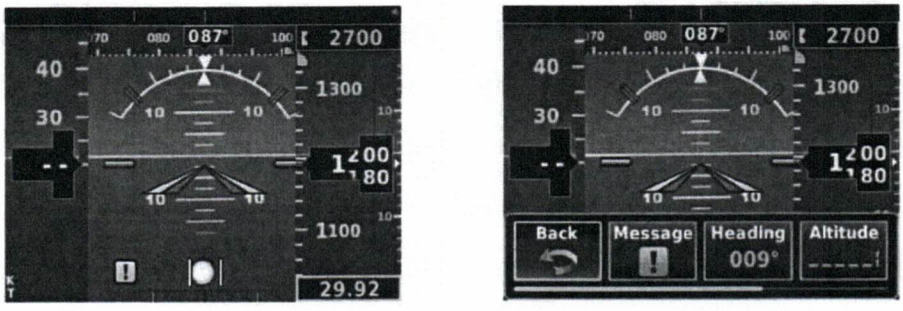
The HSI circuit breaker supplies power to the G5 instrument for normal power operation when configured as an HSI, and to charge the internal battery (if installed).

The GAD circuit breaker supplies power to the optional GAD 29 adapter and optional GAD 13 adapter for normal power operation.

System Messages

The G5 has the capability to display system messages to the crew along the bottom of the display. A system message is indicated through a white ! indication on the G5.

Messages can be displayed by pressing the G5 knob, and selecting the Message menu item.



(For Reference Only)

The following table shows the meaning of each message. System messages are displayed in white text.

Message	Meaning
External Power Lost	Aircraft power has been removed from the G5.
Critical battery fault! Powering off	Battery has critical fault condition and the unit is about to power off to avoid damage to the battery.
Battery fault	Battery has a fault condition – unit needs service.
Battery charger fault	Battery charger has a fault condition – unit needs service.
Low battery	Battery charge level is low.
Hardware fault	Unit has a hardware fault – unit needs service.
Power supply fault	Unit power supply fault detected – unit needs service.
Unit temperature limit exceeded	Unit is too hot or too cold.
Network address conflict	Another G5 with the same address is detected on the network (most commonly a wiring error on one of the units).
Communication error	General communication error (most commonly appears in conjunction with Network Address Conflict message).
Factory calibration data invalid	Unit calibration data not valid – unit needs service.
Magnetic field model database out of date	Internal magnetic field database is out of date - software update required.
Magnetometer Hardware fault	The magnetometer has detected a fault – unit needs service. Heading data may not be available.
Using external GPS data	GPS data from another network LRU is being used. The unit's internal GPS receiver is enabled, but unable to establish a GPS fix.
Not receiving RS-232 data	The G5 is not receiving RS-232 data from the GPS navigator – system needs service.
Not receiving ARINC 429 data	The G5 is not receiving ARINC 429 data from the navigation source – system needs service.
GPS receiver fault	The G5 on-board GPS receiver has a fault.
ARINC 429 interface configuration error	The G5 ARINC 429 port is receiving information from an incorrect source – system needs service.
Software version mismatch	The G5 attitude indicator and the G5 HSI units have different software. Cross fill of baro, heading and altitude bugs is disabled.

These messages remain while the condition persists.

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

MAJOR REPAIR AND ALTERATION
(Airframe, Powerplant, Propeller, or Appliance)

Form Approved
Budget Bureau No. 04-R060.1

FOR FAA USE ONLY
OFFICE IDENTIFICATION

INSTRUCTIONS: Print or type all entries. See FAR 43.9, FAR 43 Appendix B, and AC 43.9-1 (or subsequent revision thereof) for instructions and disposition of this form.

1. AIRCRAFT	MAKE: Piper	MODEL: PA-28-181
	SERIAL NO.: 28-7890100	NATIONALITY AND REGISTRATION MARK: N47596
2. OWNER	NAME (As shown on registration certificate): Clark Aviation	ADDRESS (As shown on registration certificate): Bloomington-Normal Airport Bloomington, Illinois 61701

3. FOR FAA USE ONLY

4. UNIT IDENTIFICATION / **5. TYPE**

UNIT	MAKE	MODEL	SERIAL NO.	5. REPAIR	5. ALTERATION
AIRFRAME	◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆ (As described in item 1 above) ◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆				X
POWERPLANT					
PROPELLER					
APPLIANCE	TYPE				
	MANUFACTURER				

6. CONFORMITY STATEMENT

A. AGENCY'S NAME AND ADDRESS	B. KIND OF AGENCY		C. CERTIFICATE NO.
Joliet Avionics, Inc. DuPage County Airport West Chicago, Illinois 60185		U.S. CERTIFICATED MECHANIC	3159
		FOREIGN CERTIFICATED MECHANIC	
	X	CERTIFICATED REPAIR STATION	
		MANUFACTURER	

D. I certify that the repair and/or alteration made to the unit(s) identified in item 4 above and described on the reverse or attachments hereto have been made in accordance with the requirements of Part 43 of the U.S. Federal Aviation Regulations and that the information furnished herein is true and correct to the best of my knowledge.

DATE	SIGNATURE OF AUTHORIZED INDIVIDUAL
October 10, 1977	William C. Joeckel

7. APPROVAL FOR RETURN TO SERVICE

Pursuant to the authority given persons specified below, the unit identified in item 4 was inspected in the manner prescribed by the Administrator of the Federal Aviation Administration and is [X] APPROVED [ ] REJECTED

BY							OTHER (Specify)
		FAA FLT. STANDARDS INSPECTOR		MANUFACTURER		INSPECTION AUTHORIZATION	
		FAA DESIGNEE	X	REPAIR STATION		CANADIAN DEPARTMENT OF TRANSPORT INSPECTOR OF AIRCRAFT	

DATE OF APPROVAL OR REJECTION	CERTIFICATE OR DESIGNATION NO.	SIGNATURE OF AUTHORIZED INDIVIDUAL
October 10, 1977	3159	William C. Joeckel

FAA Form 337 (7-67)

(8320)

NOTICE

Weight and balance or operating limitation changes shall be entered in the appropriate aircraft record. Any alteration must be compatible with all previous alterations to assure continued conformity with the applicable airworthiness requirements.

DESCRIPTION OF WORK ACCOMPLISHED *(If more space is required, attach additional sheets. Identify with aircraft nationality and registration mark and date work completed.)*

Installed King Model KE-127 S/N 25298 Altitude Reporter which meets or exceeds requirements and specifications of TSO-C88 interconnected with a King Model KT-76A S/N 3967 transponder TSO'd to C-74B or C and installed in accordance to Appendix 1 Advisory Circular 43-6. Blind Encoder and King KT-76A transponder checked with IFR, ATC-600 Test Set in accordance with Part 43, Appendix F for compliance with FAR 91.177 and FAR 91.36 this date.

Static System tested in accordance with FAR 91.170 and Part 43, Appendix "E" as required.----------THE END----------

☐ ADDITIONAL SHEETS ARE ATTACHED

U.S. GOVERNMENT PRINTING OFFICE : 1967 OF—272-085

US Department of Transportation
Federal Aviation Administration

MAJOR REPAIR AND ALTERATION
(Airframe, Powerplant, Propeller, or Appliance)

Form Approved OMB No. 2120-0020 11/30/2007	Electronic Tracking Number
For FAA Use Only	

INSTRUCTIONS: Print or type all entries. See Title 14 CFR §43.9, Part 43 Appendix B, and AC 43.9-1 (or subsequent revision thereof) for instructions and disposition of this form. This report is required by law (49 U.S.C. §44701). Failure to report can result in a civil penalty for each such violation. (49 U.S.C. §46301(a))

1. Aircraft	Nationality and Registration Mark: N78BG	Serial No.: 28-7890100	
	Make: PIPER	Model: PA-28-181	Series: NA
2. Owner	Name *(As shown on registration certificate)*: APTL LLC	Address *(As shown on registration certificate)*: Address: 1001 S MAIN ST STE 49	
		City: KALISPELL	State: MT
		Zip: 59901-5635	Country: USA

3. For FAA Use Only

4. Type		5. Unit Identification			
Repair	Alteration	Unit	Make	Model	Serial No.
☐	X	AIRFRAME	———	*(As described in Item 1 above)*	———
☐	☐	POWERPLANT			
☐	☐	PROPELLER			
☐	☐	APPLIANCE	Type / Manufacturer		

6. Conformity Statement

A. Agency's Name and Address

Name: Duncan Aviation
Address: 255 E Tropicana Ave
City: Las Vegas State: NV
Zip: 89169 Country: USA

B. Kind of Agency

	U. S. Certified Mechanic		Manufacturer
	Foreign Certified Mechanic	C. Certificate No.	
X	Certified Repair Station	JG0R164N	
	Certified Maintenance Organization		

D. I certify that the repair and/or alteration made to the unit(s) identified in item 5 above and described on the reverse or attachments hereto have been made in accordance with the requirements of Part 43 of the U.S. Federal Aviation Regulations and that the information furnished herein is true and correct to the best of my knowledge.

Extended range fuel per 14 CFR Part 43 App. B ☐

Signature/Date of Authorized Individual

DUNCAN QI 1286
Steven E. Helwig *05 FEB 2020*

7. Approval for Return to Service

Pursuant to the authority given persons specified below, the unit identified in item 5 was inspected in the manner prescribed by the Administrator of the Federal Aviation Administration and is ☒ Approved ☐ Rejected

BY		FAA Flt. Standards Inspector		Manufacturer		Maintenance Organization		Persons Approved by Canadian Department of Transportation
		FAA Designee	X	Repair Station		Inspection Authorization		Other *(Specify)*

Certificate or Designation No.: JG0R164N

Signature/Date of Authorized Individual

DUNCAN QI 1286
Steven E. Helwig *05 FEB 2020*

FAA Form 337 (10-06)

NOTICE

Weight and balance or operating limitation changes shall be entered in the appropriate aircraft record. An alteration must be compatible with all previous alterations to assure continued conformity with the applicable airworthiness requirements.

8. Description of Work Accomplished
(If more space is required, attach additional sheets. Identify with aircraft nationality and registration mark and date work completed.)

N78BG	05 FEB 2020
Nationality and Registration Mark	Date

A. Removed the Model 52D54 Directional Gyro P/N 1U262-003-14 and #1 Garmin GI-106A NAV/GPS Indicator P/N 013-00049-01.

B. Installed a New Dual Garmin G5 Attitude and Heading Indicator P/N 011-03890-00, GMU-11 Magnetometer P/N 011-04349-01, GAD-29B NAV Interface P/N 011-03236-11.

C. The Dual Garmin G5 Electronic Flight Instrument System for Certified Aircraft was installed in accordance with the follow on procedures of FAA STC # SA01818WI with AML Original Issue date July 22, 2016 and Amended on July 19, 2019 and data provided in the Garmin G5 AML STC Master Drawing List, Drawing No. 005-01112-01 Rev. 19 dated December 12, 2019.

D. The Dual Garmin G5 System was installed in accordance with Garmin International STC Installation Manual P/N 190-01112-10 Rev. 21 dated December 12, 2019.

E. All methods, techniques, practices and Structural aspects of the installation conform to the guidelines of FAA AC 43.13-1B Change 1, Chapter 7, Section's 2 (7-15), 4 (7-63) and 5 (7-86) and FAA AC 43.13-2B Chapter 1 (106)(108)(111), Chapter 2 (207-209).

F. The Dual G5 Indicators are mounted in the Pilots Instrument Panel in place of the removed Directional Gyro location and the relocated Attitude Gyro Indicator utilizing Garmin's G5 Adapter Plate P/N 115-02642-00 and the supplied 6 each #6-32 MS24693 screws.

G. The Garmin GMU-11 is a Remote Mounted AHRS unit that is installed in the Right Hand Outboard section of the Wing and is secured using the supplied 4 each #6-32 MS24693 screws and Lock nuts.

H. The GAD-29B NAV Interface Adapter is mounted on the top of the existing KX-170B Rack assembly in Right Hand Radio Rack using 4 each #6-32 MS24693 screws and lock nuts.

I. The G5 System Function checks were completed satisfactorily in accordance with Garmin International G5 Part 23 AML STC Installation Manual P/N 190-01112-10 Rev. 21 dated December 12, 2019.

J. Completed an electrical load check and found to be within the limits of AC 43.13-1B Change 1 Chapter 11 Paragraphs 11-35 (a) and 11-36.

K. Equipment list was revised and Weight and Balance information has been updated.

L. Provided the Owner/Operator with the FAA Approved Airplane Flight Manual Supplement from Garmin International Document Number 190-01112-13 Rev. 6 dated July 19, 2019 for the new Garmin Dual G5 Electronic Flight Instrument System.

M. The Garmin International Dual G5 system Instructions for Continued Airworthiness Document Number 190-01112-11 Rev. 6 dated June 30, 2019 from the Garmin International G5 Electronic Flight Instrument Part 23 STC Maintenance Manual have been provided to the owner/operator.

This alteration was performed on Duncan Aviation Work Oder No. 76X1A.

----------END----------

☐ Additional Sheets Are Attached

1. Approving Civil Aviation Authority/Country:	2.	3. Form Tracking Number:
FAA/United States	**AUTHORIZED RELEASE CERTIFICATE** FAA Form 8130–3, AIRWORTHINESS APPROVAL TAG	169642176-6

4. Organization Name and Address:	5. Work Order/Contract/Invoice Number:
GARMIN International 1200 E. 151st St. Olathe, KS 66062 Certificate Number PQ3742CE	169642176

6. Item:	7. Description:	8. Part Number:	9. Quantity:	10. Serial Number:	11. Status/Work:
1	Kit, Standard, G5 for Certificated Aircraft	011-03809-00	1	4JQ035185	New

12. Remarks:

Airworthiness Approval
This PMA part is not a critical component
Included in K10-00280-00

13a. Certifies the items identified above were manufactured in conformity to:

- ☒ Approved design data and are in a condition for safe operation.
- ☐ Non-approved design data specified in Block 12.

14a. ☐ 14 CFR 43.9 Return to Service ☐ Other regulation specified in Block 12

Certifies that unless otherwise specified in Block 12, the work identified in Block 11 and described in Block 12 was accomplished in accordance with Title 14, Code of Federal Regulations, part 43 and in respect to that work, the items are approved for return to service.

13b. Authorized Signature:	13c. Approval/Authorization No.:	14b. Authorized Signature:	14c. Approval/Certificate No.:
Bradley J. Miller	ODA-240087-CE		
13d. Name (Typed or Printed):	**13e. Date (dd/mmm/yyyy):**	**14d. Name (Typed or Printed):**	**14e. Date (dd/mmm/yyyy):**
Bradley J. Miller	05/Dec/2019		

User/Installer Responsibilities

It is important to understand that the existence of this document alone does not automatically constitute authority to install the aircraft engine/propeller/article.

Where the user/installer performs work in accordance with the national regulations of an airworthiness authority different than the airworthiness authority of the country specified in Block 1, it is essential that the user/installer ensures that his/her airworthiness authority accepts aircraft engine(s)/propeller(s)/article(s) from the airworthiness authority of the country specified in Block 1.

Statements in Blocks 13a and 14a do not constitute installation certification. In all cases, aircraft maintenance records must contain an installation certification issued in accordance with the national regulations by the user/installer before the aircraft may be flown.

1. Approving Civil Aviation Authority/Country:	2.	3. Form Tracking Number:
FAA/United States	**AUTHORIZED RELEASE CERTIFICATE** FAA Form 8130–3, AIRWORTHINESS APPROVAL TAG	169642176-7

4. Organization Name and Address:	5. Work Order/Contract/Invoice Number:
GARMIN International 1200 E. 151st St. Olathe, KS 66062 Certificate Number PQ3742CE	169642176

6. Item:	7. Description:	8. Part Number:	9. Quantity:	10. Serial Number:	11. Status/Work:
1	Kit, Standard, G5 for Certificated Aircraft	011-03809-00	1	4JQ035246	New

12. Remarks:

Airworthiness Approval
This PMA part is not a critical component
Included in K10-00280-00

13a. Certifies the items identified above were manufactured in conformity to:

☒ Approved design data and are in a condition for safe operation.
☐ Non-approved design data specified in Block 12.

14a. ☐ 14 CFR 43.9 Return to Service ☐ Other regulation specified in Block 12

Certifies that unless otherwise specified in Block 12, the work identified in Block 11 and described in Block 12 was accomplished in accordance with Title 14, Code of Federal Regulations, part 43 and in respect to that work, the items are approved for return to service.

13b. Authorized Signature:	13c. Approval/Authorization No.:	14b. Authorized Signature:	14c. Approval/Certificate No.:
Bradley J. Miller	ODA-240087-CE		
13d. Name (Typed or Printed):	**13e. Date (dd/mmm/yyyy):**	**14d. Name (Typed or Printed):**	**14e. Date (dd/mmm/yyyy):**
Bradley J. Miller	05/Dec/2019		

User/Installer Responsibilities

It is important to understand that the existence of this document alone does not automatically constitute authority to install the aircraft engine/propeller/article.

Where the user/installer performs work in accordance with the national regulations of an airworthiness authority different than the airworthiness authority of the country specified in Block 1, it is essential that the user/installer ensures that his/her airworthiness authority accepts aircraft engine(s)/propeller(s)/article(s) from the airworthiness authority of the country specified in Block 1.

Statements in Blocks 13a and 14a do not constitute installation certification. In all cases, aircraft maintenance records must contain an installation certification issued in accordance with the national regulations by the user/installer before the aircraft may be flown.

1. Approving Civil Aviation Authority/Country:	2.	3. Form Tracking Number:
FAA/United States	**AUTHORIZED RELEASE CERTIFICATE** **FAA Form 8130–3, AIRWORTHINESS APPROVAL TAG**	169642176-2

4. Organization Name and Address:	5. Work Order/Contract/Invoice Number:
GARMIN International 1200 E. 151st St. Olathe, KS 66062 Certificate Number PQ3742CE	169642176

6. Item:	7. Description:	8. Part Number:	9. Quantity:	10. Serial Number:	11. Status/Work:
1	GAD 29B, PMA	011-03236-11	1	5DL009662	New

12. Remarks:

Airworthiness Approval
This PMA part is not a critical component
Included in P/N 010-01172-11

13a. Certifies the items identified above were manufactured in conformity to:

- ☒ **Approved design data and are in a condition for safe operation.**
- ☐ **Non-approved design data specified in Block 12.**

14a. ☐ **14 CFR 43.9 Return to Service** ☐ **Other regulation specified in Block 12**

Certifies that unless otherwise specified in Block 12, the work identified in Block 11 and described in Block 12 was accomplished in accordance with Title 14, Code of Federal Regulations, part 43 and in respect to that work, the items are approved for return to service.

13b. Authorized Signature:	13c. Approval/Authorization No.:	14b. Authorized Signature:	14c. Approval/Certificate No.:
Steven Cummins	ODA-240087-CE		
13d. Name (Typed or Printed):	**13e. Date (dd/mmm/yyyy):**	**14d. Name (Typed or Printed):**	**14e. Date (dd/mmm/yyyy):**
Steven Cummins	04/Dec/2019		

User/Installer Responsibilities

It is important to understand that the existence of this document alone does not automatically constitute authority to install the aircraft engine/propeller/article.

Where the user/installer performs work in accordance with the national regulations of an airworthiness authority different than the airworthiness authority of the country specified in Block 1, it is essential that the user/installer ensures that his/her airworthiness authority accepts aircraft engine(s)/propeller(s)/article(s) from the airworthiness authority of the country specified in Block 1.

Statements in Blocks 13a and 14a do not constitute installation certification. In all cases, aircraft maintenance records must contain an installation certification issued in accordance with the national regulations by the user/installer before the aircraft may be flown.

1. Approving Civil Aviation Authority/Country:	2.	3. Form Tracking Number:
FAA/United States	**AUTHORIZED RELEASE CERTIFICATE** **FAA Form 8130–3, AIRWORTHINESS APPROVAL TAG**	169642176-1

4. Organization Name and Address:	5. Work Order/Contract/Invoice Number:
GARMIN International 1200 E. 151st St. Olathe, KS 66062 Certificate Number PQ3742CE	169642176

6. Item:	7. Description:	8. Part Number:	9. Quantity:	10. Serial Number:	11. Status/Work:
1	GMU 11, PMA	011-04349-01	1	56J017838	New

12. Remarks:

Airworthiness Approval
This PMA part is not a critical component
Included in P/N 010-01788-01

13a. Certifies the items identified above were manufactured in conformity to:

- ☒ **Approved design data and are in a condition for safe operation.**
- ☐ **Non-approved design data specified in Block 12.**

14a. ☐ **14 CFR 43.9 Return to Service** ☐ **Other regulation specified in Block 12**

Certifies that unless otherwise specified in Block 12, the work identified in Block 11 and described in Block 12 was accomplished in accordance with Title 14, Code of Federal Regulations, part 43 and in respect to that work, the items are approved for return to service.

13b. Authorized Signature:	13c. Approval/Authorization No.:	14b. Authorized Signature:	14c. Approval/Certificate No.:
Steven Cummins	ODA-240087-CE		
13d. Name (Typed or Printed):	**13e. Date (dd/mmm/yyyy):**	**14d. Name (Typed or Printed):**	**14e. Date (dd/mmm/yyyy):**
Steven Cummins	04/Dec/2019		

User/Installer Responsibilities

It is important to understand that the existence of this document alone does not automatically constitute authority to install the aircraft engine/propeller/article.

Where the user/installer performs work in accordance with the national regulations of an airworthiness authority different than the airworthiness authority of the country specified in Block 1, it is essential that the user/installer ensures that his/her airworthiness authority accepts aircraft engine(s)/propeller(s)/article(s) from the airworthiness authority of the country specified in Block 1.

Statements in Blocks 13a and 14a do not constitute installation certification. In all cases, aircraft maintenance records must contain an installation certification issued in accordance with the national regulations by the user/installer before the aircraft may be flown.

4.4 Special Inspection Requirements

After a suspected lightning strike, the following actions must be performed for the specific LRU.

GTP 59 Temperature Probe

Inspect the GTP 59 temperature probe for signs of lightning damage. Check the self-sealing washer (P/N 212-00026-00) used on the probe tip outside of the aircraft for any evidence of melting or lack of seal. Replace the washer if damaged. If there is evidence of lightning strike to the GTP 59 temperature probe or any lightning damage, replace the probe.

Tube-and-fabric aircraft must replace the GTP 59 bond strap (if installed) in accordance with Section 4 of the Garmin G5 Electronic Flight Instrument Part 23 AML STC Installation Manual (190-01112-10).

4.3 Electrical Bonding Test

LRU electrical bonding must be checked every 2,000 flight hours or 10 years, whichever occurs first.

4.3.1 Requirements

- Disconnect any cables and connectors normally attached to the LRU.
- Resistance must be measured from a bare metal portion of the LRU (chassis or connector) to an airframe grounding location.
- The airframe grounding location should be as close to the LRU as possible, unless otherwise noted in
- Table 4-2.

4.3.2 Test Equipment

Calibrated 4 wire Milliohm meter and Kelvin probes are required for this test.

4.3.3 Electrical Bonding Test Procedures.

- Using a calibrated milliohm meter and Kelvin probes measure the resistance of each LRU between the locations noted in
- Table 4-2, and record the result of each installed LRU. Some equipment on the list are optional and may not be installed.
- Ensure the resistance does not exceed 10 milliohms except for the GTP that shall be less than 2.5 milliohms.
- If the measured resistance is greater 10 milliohms, bonding must be improved to meet applicable requirements for a new installation in accordance with Section 4 of *Garmin G5 Electronic Flight Instrument Part 23 AML STC Installation Manual* (190-01112-10).

Table 4-2 – Electrical Bonding Procedure

Unit	Measurement Location (2)	Result (milliohm)
G5	J51 backshell to local structure adjacent to the ground stud **(1)**	mΩ
GMU 11	P111 backshell to local structure adjacent to the ground stud **(1)**	mΩ
GAD 29 / 29B	Chassis mounting screw to adjacent aircraft ground	mΩ
GAD 13	Chassis mounting screw to adjacent aircraft ground	mΩ
GTP 59	Probe and adjacent local metal structure for metal and tube and fabric aircraft. For composite aircraft no bonding requirement	mΩ

Notes:

(1) This is the ground stud to which the LRU bonding strap is connected
(2) For remote LRUs bonded to the back of the instrument panel via an installed aluminum foil ground plane, the bonding measurement must be taken between the remote LRU and the instrument panel.

4.2.5 GTP 59 Temperature Probe

The GTP 59 unit maintenance is 'on condition' only. See section 6 for equipment removal and installation. No component-level overhaul is required. Reference Table 4-1 for necessary tests or checks and the specific intervals for the GTP 59.

4.2.6 Maintenance Intervals

Table 4-1 shows items installed by this STC which must undergo tests or checks at specific intervals.

Table 4-1, Maintenance Intervals

Item	Description/Procedure	Manual Section No.	Interval
G5 unit	Removal & Installation	6.1	On Condition
	Altimeter System Test	7.7	24 calendar months
G5 battery	Removal & Installation	0	On Condition
	Capacity Check	4.2.7	12 calendar months
G5 mounting ring	Removal & Installation	6.3	On Condition
GMU 11 unit	Removal & Installation	6.5	On Condition
GAD 29/29B unit	Removal & Installation	6.6	On Condition
GAD 13 unit	Removal & Installation	6.7	On Condition
GTP 59 unit	Removal & Installation	6.8	On Condition
	Special Inspection Requirements	4.4	On Condition

4.2.7 Battery Capacity Check

1. Without power applied to the aircraft, turn on the G5 by pressing the power button in the lower left corner of the unit.
2. Note the remaining battery capacity (%) at the top left corner of the display.
3. After about a minute, the remaining capacity will change from (%) to time (hour:min).
4. If the remaining capacity is less than one hour (1:00), allow the battery to charge until the capacity shows greater than 95% and repeat the check.
5. If the remaining capacity is less than one hour (1:00) after charging, the battery must be replaced.

GARMIN.

4 INSTRUCTIONS FOR CONTINUED AIRWORTHINESS

4.1 Airworthiness Limitations

The Airworthiness Limitations section is FAA-approved and specifies maintenance required under §§ 43.16 and 91.403 of Title 14 of the Code of Federal Regulations, unless an alternative program has been FAA-approved.

There are no new (or additional) airworthiness limitations associated with this equipment and/or installation.

FAA APPROVED David G. Armstrong
STC Unit Administrator
ODA-240087-CE

Date 7/19/2019

4.2 Servicing Information

This section addresses servicing information for the G5 Electronic Flight Display, Battery, GMU 11 magnetometer and the GAD 29/29B data bus converter.

4.2.1 G5 Electronic Flight Instrument

The G5 unit maintenance is 'on condition' only. See section 6 for equipment removal and installation. No component-level overhaul is required. Reference Table 4-1 for necessary tests or checks and the specific intervals for the G5.

4.2.2 GMU 11 Magnetometer

The GMU 11 unit maintenance is 'on condition' only. See section 6 for equipment removal and installation. No component-level overhaul is required. Reference Table 4-1 for necessary tests or checks and the specific intervals for the GMU 11.

NOTE

After replacing or servicing electrical components near the GMU 11 magnetometer, the Magnetometer Interference Test (reference Section 7.8) and Magnetometer Calibration Procedure (reference Section 7.5.3)must be performed.

4.2.3 GAD 29/29B Data Bus Converter

The GAD 29/29B unit maintenance is 'on condition' only. See section 6 for equipment removal and installation. No component-level overhaul is required. Reference Table 4-1 for necessary tests or checks and the specific intervals for the GAD 29/29B.

4.2.4 GAD 13 Data Bus Converter

The GAD 13 unit maintenance is 'on condition' only. See section 6 for equipment removal and installation. No component-level overhaul is required. Reference Table 4-1 for necessary tests or checks and the specific intervals for the GAD 13.

Garmin International, Inc.
1200 E. 151st Street
Olathe, Kansas 66062 U.S.A.

FAA APPROVED

AIRPLANE FLIGHT MANUAL SUPPLEMENT
or
SUPPLEMENTAL AIRPLANE FLIGHT MANUAL

for the
Garmin GTX 33X and GTX 3X5 Transponders with ADS-B
as installed in

Piper PA28-181
Make and Model Airplane

Registration Number: N78BG Serial Number: 28-7890100

This document serves as an FAA Approved Airplane Flight Manual Supplement or Supplemental Airplane Flight Manual when the GTX 33X or GTX 3X5 with ADS-B is installed in accordance with Supplemental Type Certificate SA01714WI. This document must be incorporated into the FAA Approved Airplane Flight Manual or provided as an FAA Approved Supplemental Airplane Flight Manual.

The information contained herein supplements the FAA approved Airplane Flight Manual. For limitations, procedures, loading and performance information not contained in this document, refer to the FAA approved Airplane Flight Manual, markings, or placards.

FAA Approved By: Michael Warren

Michael Warren
ODA STC Unit Administrator
Garmin International, Inc.
ODA-240087-CE

Date: 08-MAR-2016

LOG OF REVISIONS				
	Page			
Revision Number	Date	Number	Description	FAA Approved
1	05/01/2013	All	Complete Supplement	Robert Murray Robert Murray ODA STC Unit Administrator Garmin International, Inc. ODA-240087-CE Date: 05/01/2013
2	03/08/2016	All	New supplement format with GTX 3X5 added.	See cover page

Table of Contents

Section 1. GENERAL

1.1 GTX 33X

The Garmin GTX 33X family consists of the GTX 330 ES and GTX 33 ES (Non-Diversity Mode S Transponders) and the GTX 330D ES and GTX 33D ES (Diversity Mode S Transponders). The ES option of any of the transponders provides ADS-B extended squitter functionality.

All Garmin GTX 33X transponders are a radio transmitter/receiver that operates on radar frequencies, receiving ground radar or TCAS interrogations at 1030 MHz and transmitting a coded response of pulses to ground-based radar on a frequency of 1090 MHz. Each unit is equipped with IDENT capability and will reply to ATCRBS Mode A, Mode C and Mode S All-Call interrogation. Interfaces to the GTX 33X are shown in the following block diagrams.

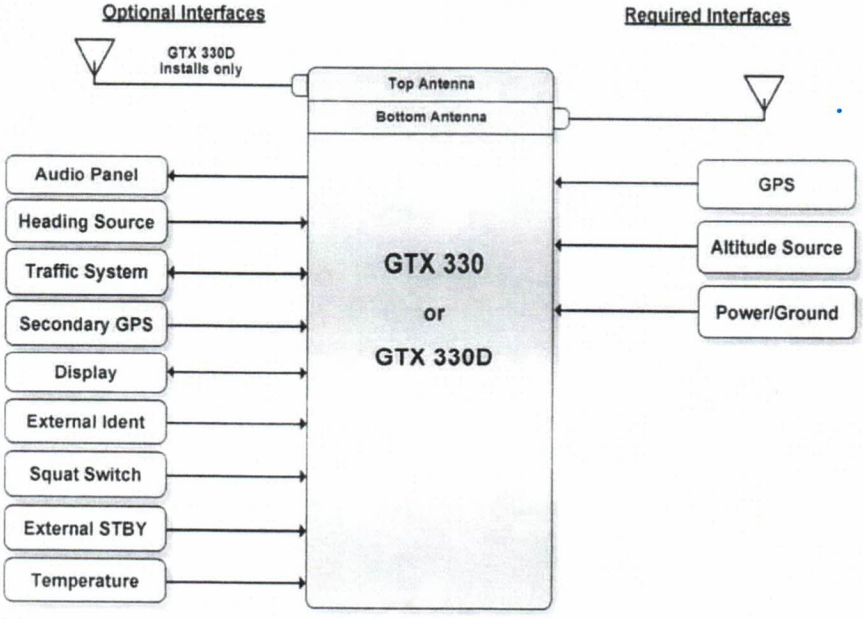


Figure 1 – GTX 330 or GTX 33D Interface Summary

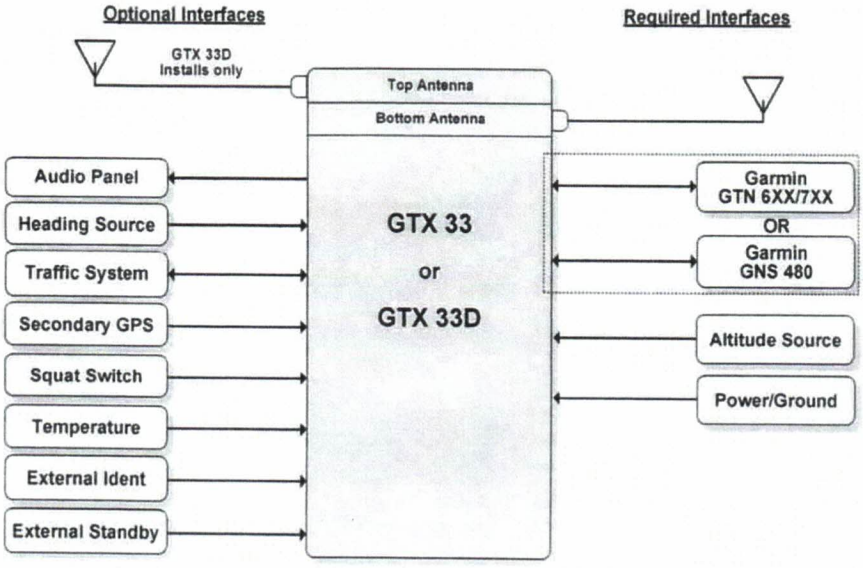


Figure 2 – GTX 33 or GTX 33D Interface Summary

The GTX 33X performs the following functions:

- Transmission of ADS-B out data on 1090 extended squitter (1090ES) (1090 MHz)
    - Integration of data from internal and external sources to transmit the following data per 14 CFR 91.227:
        - GPS Position, Altitude, and Position Integrity
        - Ground Track and/or Heading, Ground Speed, and Velocity Integrity
        - Air Ground Status
        - Flight ID, Call Sign, ICAO Registration Number
        - Capability and Status Information
        - Transponder Squawk Code, IDENT, and Emergency Status
    - Pressure Altitude Broadcast Inhibit
- Reception of TIS-A traffic data from a ground station
- Provide TIS-A traffic alerting to the pilot via interfaced display and audio output

1.2 GTX 3X5

The Garmin GTX 3X5 family consists of the GTX 335, 335R, 345, and 345R transponders. The functional differences between each of these transponders are described in Table 1.

Function	GTX 335	GTX 335 w GPS	GTX 335R	GTX 335R w GPS	GTX 345	GTX 345 w GPS	GTX 345R	GTX 345R w GPS
Panel mount	X	X			X	X		
Remote mount			X	X			X	X
Mode S	X	X	X	X	X	X	X	X
ADS-B (out)	X	X	X	X	X	X	X	X
ADS-B Traffic					X	X	X	X
FIS-B					X	X	X	X
Internal GPS		X		X		X		X
Bluetooth					X	X	X	X
Optional Garmin Altitude Encoder	X	X	X	X	X	X	X	X

Table 1 – GTX 3X5 Unit Configurations

Interfaces to the GTX 3X5 are shown in Figure 3.

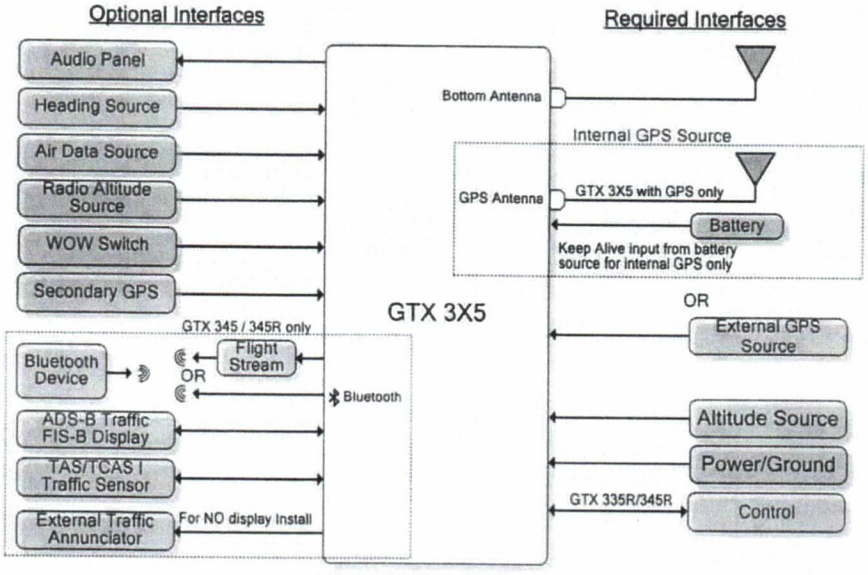


Figure 3 – GTX 3X5 Interface Summary

The GTX 3X5 performs the following functions:

- Transmission of ADS-B out data on 1090 extended squitter (1090ES) (1090 MHz)
    - Integration of data from internal and external sources to transmit the following data per 14 CFR 91.227:
        - GPS Position, Altitude, and Position Integrity
        - Ground Track and/or Heading, Ground Speed, and Velocity Integrity
        - Air Ground Status
        - Flight ID, Call Sign, ICAO Registration Number
        - Capability and Status Information
        - Transponder Squawk Code, IDENT, and Emergency Status
    - Pressure Altitude Broadcast Inhibit

The GTX 335 performs the following additional functions:

- Reception of TIS-A traffic data from a ground station
- Provide TIS-A traffic alerting to the pilot via interfaced display and audio output.

The GTX 345 performs the following additional functions:

- Reception of ADS-B In data on 1090 MHz
  - ADS-B (Data directly from another transmitting aircraft)
  - ADS-R (Rebroadcast of ADS-B data from a ground station)
- Reception of ADS-B In data on UAT (978 MHz)
  - ADS-B (Data directly from another transmitting aircraft)
  - ADS-R (Rebroadcast of ADS-B data from a ground station)
  - TIS-B (Broadcast of secondary surveillance radar) (SSR) derived traffic information from a ground station.
  - FIS-B (Broadcast of aviation data from a ground station)
- Provide ADS-B traffic information and alerting to the pilot via an interfaced display
  - Correlation and consolidation of traffic data from multiple traffic sources
  - Aural and visual traffic alerting
- Provide FIS-B data to the pilot via an interfaced display
  - Graphical and textual weather products
    - NEXRAD
    - PIREPs
    - AIRMET/SIGMETs
    - METARs
    - TAFs
    - Winds Aloft
  - Aviation Data
    - TFRs
    - NOTAMs

1.3 Capabilities

The Garmin GTX 33X and GTX 3X5 as installed in this aircraft have been shown to meet the equipment requirements of 14 CFR § 91.227 when operating in accordance with sections 2.1 and 2.2 of this supplement.

1.4 Installation Configuration

This aircraft is equipped with a GTX 33X and/or GTX 3X5 with the following interfaces/ features:

Equipment Installed:

Transponder #1	Transponder #2 (if installed)
☐ GTX 330	☐ GTX 330
☐ GTX 330D	☐ GTX 330D
☐ GTX 33	☐ GTX 33
☐ GTX 33D	☐ GTX 33D
☐ GTX 335	☐ GTX 335
☐ GTX 335R	☐ GTX 335R
☑ GTX 345	☐ GTX 345
☐ GTX 345R	☐ GTX 345R

Interfaced GPS/SBAS Position Source(s):

GPS #1	GPS #2 (if installed)
☐ Internal	☐ Internal
☐ GTN 6XX/7XX Series	☐ GTN 6XX/7XX Series
☑ GNS 400W/500W Series	☐ GNS 400W/500W Series
☐ GNS 480	☐ GNS 480
☐ GIA 63	☐ GIA 63
☐ GDL 88 (GTX 330 only)	☐ GDL 88 (GTX 330 only)

Interfaced Pressure Altitude Source:

Pressure Altitude Source #1	Pressure Altitude Source #2 (if installed)
☑ Gillam	☐ _____
☐ Garmin Altitude Encoder	☐ Garmin Altitude Encoder

Interfaced Remote Control Display (Required for remotely mounted GTX variants):

Transponder #1 Remote Control Display	Transponder #2 Remote Control Display (if installed)
☐ GTN 6XX/7XX	☐ GTN 6XX/7XX
☐ GNS 480	☐ GNS 480
☐ G950/1000 Display	☐ G950/1000 Display

Interfaced Active Traffic System:

☐ None

☐ TCAD

☑ TAS/TCAS

NOTE

If the system includes all of the following components:

- GTX 345R,
- G950/1000 Display, and
- TCAD or TAS/TCAS

Then the aircraft is no longer equipped with a TSO compliant active TCAD, TAS or TCAS system. Any operational requirement to be equipped with such system is no longer met.

1.5 Definitions

The following terminology is used within this document:

ADS-B:	Automatic Dependent Surveillance-Broadcast
AFM:	Airplane Flight Manual
AFMS:	Airplane Flight Manual Supplement
ATCRBS:	Air Traffic Control Radar Beacon System
CFR:	Code of Federal Regulations
ES:	Extended Squitter
GNSS:	Global Navigation Satellite System
GNS:	Garmin Navigation System
GPS:	Global Positioning System
GTX:	Garmin Transponder
GTN:	Garmin Touchscreen Navigator
ICAO:	International Civil Aviation Organization
LRU:	Line Replaceable Unit
PABI:	Pressure Altitude Broadcast Inhibit
POH:	Pilot Operating Handbook
SBAS:	Satellite-Based Augmentation System
SW:	Software
TCAS:	Traffic Collision Avoidance System
TIS:	Traffic Information Service
TX:	Transmit

Section 2. LIMITATIONS

2.1 Minimum Equipment

The GTX 33X and GTX 3X5 must have the following system interfaces fully functional in order to be compliant with the requirements for 14 CFR 91.227 ADS-B Out operations:

Interfaced Equipment	Number Installed	Number Required
Uncorrected Pressure Altitude Source	1	1
GPS SBAS Position Source	1 or more	1
Remote Control Display (for remotely mounted transponders)	1 or more	1

Table 2 – Required Equipment

2.2 ADS-B Out

The GTX 33X and GTX 3X5 only comply with 14 CFR 91.227 for ADS-B Out when all required functions are operational. When the system is not operational, ADS-B Out transmit failure messages will be present on the remote control display interface, or the GTX 330 or GTX 3X5 panel display.

2.3 TIS Traffic Display with User Navigation Angle

Display of TIS traffic from a GTX 33/330 or GTX 335 is not permitted with an interfacing display configured for a navigation angle of "user".

2.4 Applicable System Software

This AFMS/AFM is applicable to the software versions shown in Table 3.

The Main GTX software version is displayed on the splash screen during start up for the GTX 330 and GTX 3X5 panel mounted units, and the External LRU or System page on the interfaced remote control display for remotely mounted GTX transponders.

Software Item	Software Version *(or later FAA Approved versions for this STC)*
GTX 33X Main SW Version	8.02
GTX 3X5 Main SW Version	2.02

Table 3 - Software Versions

2.5 Pressure Altitude Broadcast Inhibit (PABI)

Pressure Altitude Broadcast Inhibit shall only be enabled when requested by Air Traffic Control while operating within airspace requiring an ADS-B Out compliant transmitter per 14 CFR 91.227. PABI is enabled by selecting the GTX to ON mode.

2.6 Datalinked Weather Display (GTX 345 Only)

Do not use datalink weather information for maneuvering in, near, or around areas of hazardous weather. Information provided by datalink weather products may not accurately depict current weather conditions.

Do not use the indicated datalink weather product age to determine the age of the weather information shown by the datalink weather product. Due to time delays inherent in gathering and processing weather data for datalink transmission, the weather information shown by the datalink weather product may be significantly older than the indicated weather product age.

Do not rely solely upon datalink services to provide Temporary Flight Restriction (TFR) or Notice to Airmen (NOTAM) information.

2.7 Portable Electronic Devices

This STC does not relieve the operator from complying with the requirements of 91.23 or any other operational regulation regarding portable electronic devices.

Section 3. EMERGENCY PROCEDURES

3.1 Emergency Procedures

No Change.

3.2 Abnormal Procedures

3.2.1 LOSS OF AIRCRAFT ELECTRICAL POWER GENERATION

XPDR Circuit Breaker ..... **PULL**

Transponder and ADS-B Out functions will no longer be available.

NOTE

This guidance is supplementary to any guidance provided in the POH or AFM for the installed aircraft for loss of power generation.

3.2.2 LOSS OF GPS/SBAS POSITION DATA

When the GPS/SBAS receiver is inoperative or GPS position information is not available or invalid, the GTX will no longer be transmitting ADS-B Out data.

For GTX 330 installations:

NO ADSB annunciator illuminated:

Interfaced GPS position sources ..... **VERIFY VALID POSITION**

For GTX 3X5 installations:

NO 1090ES TX annunciator illuminated:

Interfaced GPS position sources ..... **VERIFY VALID POSITION**

For GTX 33 and GTX 3X5R installations:

Reference Display Device documentation for applicable annunciation:

Interfaced GPS position sources ..... **VERIFY VALID POSITION**

3.2.3 Dual GTX 3X5R Transponders in a G950/1000 installation

If Transponder #1 fails and Transponder #2 is activated by the pilot, the G1000 display will provide nuisance alerts unless power is removed from Transponder #1.

Transponder #1 Failed, Transponder #2 Active

Transponder #1 Circuit Breaker ..... **PULL**

Section 4. NORMAL PROCEDURES

The procedures described below are specific only to the panel mounted GTX 330 or GTX 3X5 transponders. Cockpit Reference Guides and Pilot Guides for interfaced remote control displays will provide additional operating information specific to the displays or other traffic systems.

ADS-B Out functionality resides within the GTX transponders thereby providing a single point of entry for Mode 3/A code, Flight ID, IDENT functionality and activating or deactivating emergency status for both transponder and ADS-B Out functions. Details on performing these procedures are located in the GTX 330/330D Pilot's Guide and GTX 3X5 Series Transponder Pilot's Guide.

4.1 Unit Power On

For GTX 330 installations:

GTX Mode ..... **VERIFY ALT**
NO ADSB ..... **CONSIDERED**

For GTX 3X5 installations:

GTX Mode ..... **VERIFY ALT**
NO 1090ES TX ..... **CONSIDERED**

NOTE

The NO ADS-B or NO 1090ES TX Annunciation (or associated display annunciations) may illuminate as the unit powers on and begins to receive input from external systems, to include the SBAS position source.

4.2 Before Takeoff

For GTX 330 installations:

ADS-B TX ..... **VERIFY ON**
NO ADSB ..... **EXTINGUISHED**

For GTX 3X5 installations:

1090ES TX CTL ..... **VERIFY ON**
NO 1090ES TX ..... **EXTINGUISHED**

NOTE

The ADS-B TX or 1090ES TX CTL must be turned on and the NO ADS-B or NO 1090ES TX Annunciation (or associated display annunciations) must be **EXTINGUISHED** for the system to meet the requirements specified in 14 CFR 91.227. This system must be operational in certain airspaces after January 1, 2020 as specified by 14 CFR 91.225.

Section 5. PERFORMANCE

No change.

Section 6. WEIGHT AND BALANCE

See current weight and balance data.

Section 7. SYSTEM DESCRIPTION

The Garmin GTX 330 and GTX 3X5 Pilot's Guides, part numbers, and revisions listed below contain additional information regarding GTX system description, control, and function.

Title	Part Number	Revision
GTX 330 Pilot's Guide	190-00207-00	Rev. G (or later)
GTX 3X5 Pilot's Guide	190-01499-00	Rev. A (or later)

Pilot's Guides for interfaced displays, part numbers and revisions listed below, provide additional operating information for the Garmin GTX 33 and GTX 3X5R.

Title	Part Number	Revision
Garmin GTN 725/750 Pilot's Guide	190-01007-03	Rev. E (or later)
Garmin GTN 625/635/650 Pilot's Guide	190-01004-03	Rev. E (or later)
GNS 480 Pilot's Guide	190-00502-00	Rev. D (or later)
GTX 3X5 Series Transponder G1000 Pilot's Guide	190-01499-01	Rev. A (or later)

7.1 GTX TIS Behavior

The TIS Standby/Operate controls for GTX 33/330 and GTX 335 units only function when the aircraft is airborne.

7.2 GTX 345R and G950/1000 No Bearing Traffic Alerts

No visual indication is provided for no bearing traffic alerts. Only an aural indication of the no bearing traffic alert is provided. If an aural alert for no bearing traffic has been previously issued, a "no bearing traffic clear" aural indication will be provided once all traffic alerts are resolved.

All aural alerts are inhibited below 500' AGL, therefore a "no bearing traffic clear" aural may not be heard in a landing or touch and go flight scenario.

4 INSTRUCTIONS FOR CONTINUED AIRWORTHINESS

This section provides Instructions for Continued Airworthiness for the GTX 33X and GTX 3X5 with ADS-B installation. This section satisfies the requirements for continued airworthiness as defined by 14 CFR Part 23.1529 and Part 23 appendix G. Information in this section is required to maintain the continued airworthiness of the GTX 33X and GTX 3X5 as installed under this AML STC.

4.1 Applicability

This document applies to all aircraft equipped with GTX 33X and GTX 3X5 units with ADS-B per STC SA01714WI.

Modification of an aircraft by this Supplemental Type Certificate (STC) obligates the aircraft operator to include the maintenance information provided by this document in the operator's Aircraft Maintenance Manual and the operator's Aircraft Scheduled Maintenance Program.

4.2 Airworthiness Limitations

There are no airworthiness limitations associated with this type design change (STC SA01714WI).

The Airworthiness Limitations section is FAA approved and specifies maintenance required under §43.16 and §91.403 of the Federal Aviation Regulations unless an alternative program has been FAA approved.

FAA APPROVED

Michael Warren — 08-MAR-2016

Michael Warren
ODA STC Unit Administrator
ODA-240087-CE

Date

4.3 Servicing Information

GTX 33X and GTX 3X5 LRU maintenance is "on condition" only. Component-level overhaul is not required for the GTX 33X and GTX 3X5 with ADS-B installation.

4.3.1 On Condition Servicing

On Condition replacement and/or servicing should occur when an item exhibits conditions, symptoms, and/or abnormalities as defined in section 5 of this manual. Replacement and/or servicing should be made only after the technician troubleshoots the system by using the guidance in this manual along with common avionics maintenance practices.

4.3.2 Special Tools

The following tools are needed to perform maintenance tasks.

- Calibrated milliohm meter with an accuracy of ±0.1 milliohm or better
- Calibrated transponder ramp tester
- Calibrated Pitot/static ramp tester
- GTX 3X5 Install Tool (remote units only)
- 50 Ω 5 watt antenna load

4.4 Maintenance Intervals

Table 4-1 shows systems and components, installed by this STC, which must undergo tests or checks at specific intervals. The inspections based on calendar elapsed time have specifically stated intervals.

NOTE

The maintenance intervals listed in the table below must be adhered to for each installed GTX.

Table 4-1 Maintenance Intervals

Item	Description/Procedure	Section No.	Interval
Equipment Removal and Reinstallation	Removal and reinstallation of GTX LRUs.	6	On Condition
Cleaning	The GTX 330 and GTX 335/345 display and bezel may be cleaned periodically. Cleaning is accomplished using a soft cotton cloth dampened with clean water. **DO NOT** use any chemical cleaning agents. Avoid scratching the surface of the display.	N/A	On Condition
Antenna Visual Inspection	Removal and replacement.	4.5	On Condition
Lightning Strike - Actual or Suspected	Inspect the coaxial cable connections, GTX bonding hardware (including bonding straps and tape), antenna, and surrounding areas.	4.5	On Condition
	The GTX 33X and GTX 3X5 receiver sensitivity must be tested and shown to comply with Title 14 CFR Part 43 Appendix F.	8.4.2	On Condition
Testing	The GTX 33X and GTX 3X5 must be tested and shown to comply with Title 14 CFR Part 91.227.	8.4.3	Replacement of GPS Position source(s).
Equipment Visual Inspection	A visual inspection of the equipment installed by this STC must be performed.	4.5	12 Calendar Months
Testing	The GTX 33X and GTX 3X5 must be tested and shown to comply with Title 14 CFR Part 91.411, 91.413, and Part 43 Appendix E and F.	8.4.2	Refer to Title 14 CFR Part 91.411, 91.413, and Part 43 Appendix E and F.
Electrical Bonding Test	An electrical bonding test must be performed on equipment installed by this STC.	4.6	10 Years or 2000 hours

4.5 Visual Inspection

Perform a visual inspection in accordance with requirements in this section. Check for corrosion, damage, or other defects for each of the installed items. Replace any damaged parts as required. Inspection may require the temporary removal of a unit or units to gain access to connectors. Follow guidance in section 6 for equipment removal and replacement. Refer to appendix A of this manual for equipment locations. Refer to the specific Aircraft Maintenance Manual for instructions on removing any access panels.

GTX 330/330D/335/345 Visual Inspection

During normal aircraft inspections not to exceed 12 calendar month intervals, conduct a visual inspection of the GTX 330/330D/335/345 installation in the following locations.

Instrument Panel

1. Inspect all GTX 330/330D/335/345 keys for legibility of labels and markings.
2. Inspect GTX 330/330D/335/345 units for security of attachment.
3. Inspect mounting rack and hardware for integrity.
   a. Verify the racks, fasteners, and support structure are in good condition and securely fastened.
   b. Inspect for signs of corrosion.
   c. For composite aircraft, inspect any aluminum foil tape used to ground the GTX and verify that it is not torn, damaged, or showing signs of corrosion. If any of these occur then the tape must be replaced. Refer to appendix B for details.
4. Inspect any bonding straps for corrosion, loose connections, or signs of damage. Refer to appendix B for details.
5. Inspect the condition of the wiring harnesses and coaxial cables.
   a. Inspect all instrument panel wiring and coax for chafing, damage, proper routing of wire bundles and security of attachment in accordance with AC 43.13-1B, chapter 11, section 8, paragraph 11-96. Pay particular attention to possible areas of chafing.
   b. Verify that the harness shows no signs of cracking, chafing, abrasion, melting, or any other form of damage.
   c. Inspect the GTX 330/330D/335/345 connectors for corrosion or other defects. Check the integrity of the shield block ground attachments to the harness connector assembly as well as the integrity of the individual shields and their attachment.

GTX 33/33D/335R/345R Visual Inspection

During normal aircraft inspections not to exceed 12 calendar month intervals, conduct a visual inspection of the GTX 33/33D/335R/345R installation in the following locations.

Remote Mount Rack

1. Inspect GTX 33/33D/335R/345R units for security of attachment.
2. Inspect mounting rack and hardware for integrity.
   a. Verify the racks, fasteners, and support structure are in good condition and are securely fastened.
   b. Inspect for signs of corrosion.
   c. For composite aircraft, inspect any aluminum foil tape used to ground the GTX and verify that it is not torn, damaged, or showing signs of corrosion. If any of these occur then the tape must be replaced. Refer to appendix B for details.
3. Inspect any bonding straps for corrosion, loose connections, or signs of damage. Refer to appendix B for details.
4. Inspect the condition of the wiring harnesses and coaxial cables.
   a. Verify that all wiring and cables are securely fastened.
   b. Verify that the harness shows no signs of cracking, chaffing, abrasion, melting, or any other form of damage.
   c. Inspect the GTX 33/33D/335R/345R connectors for corrosion or other defects. Check the integrity of the shield block ground attachments to the harness connector assembly as well as the integrity of the individual shields and their attachment.

Antenna Visual Inspection

During normal aircraft inspections not to exceed 12 calendar month intervals, conduct a visual inspection of the transponder antennas for the following.

1. Leading edge erosion, cracks, dents, or broken antenna. If these conditions are present, antenna must be replaced. Refer to antenna manufacturer's replacement instructions for details.
2. If the attachment is not secure, re-work the installation and complete electrical bonding test specified in section 4.6.
3. Condition of base seals. In the event the antenna seal shows sign of damage or decomposition, re-seal and complete the electrical bonding test specified in section 4.6.

Post Lightning Strike Inspection

A post lightning strike inspection must be performed for a suspected or actual lightning strike to antennas or any temperature sensor connected to the GTX unit. Inspect antenna or sensor and surrounding installation to verify that structural damage has not occurred around the areas where lightning may have attached. If there is visible sign of damage to the antenna or sensor, then it should be replaced.

Inspect the antenna coax connection to GTX unit, grounding hardware, bonding straps or tape, and surrounding areas of the remotely mounted GTX to verify damage has not occurred. Repair any damaged areas and components, then complete the electrical bonding test specified in section 4.6.

4.6 Electrical Bonding Test

1. Disconnect the antenna coaxial cable from the GTX 33X or GTX 3X5.
2. Disconnect all connectors from the GTX 33X or GTX 3X5.
3. Measure the DC resistance between each of the following test points and the aircraft ground reference as defined in table B-1 and verify the resistance is less than or equal to the appropriate periodic test resistance value.
   - Top metal case of GTX 330/335/345 #1 (if installed)
   - Top metal case of GTX 330/335/345 #2 (if installed)
   - GTX 33/335R/345R #1 chassis (if installed)
   - GTX 33/335R/345R #2 chassis (if installed)
4. If the resistance is more than the periodic test resistance value in table B-1, the bond must be improved enough to meet the reconditioned resistance value.

4.7 Additional Instructions

Electrical load information for the GTX is provided in section 2.6.

NOTICE

Weight and balance or operating limitation changes shall be entered in the appropriate aircraft record. An alteration must be compatible with all previous alterations to assure continued conformity with the applicable airworthiness requirements.

8. Description of Work Accomplished
(If more space is required, attach additional sheets. Identify with aircraft nationality and registration mark and date work completed.)

N78BG	10/18/2016
Nationality and Registration Mark	Date

Equipment Removed:
Bendix King Honeywell KT-76C

Equipment Installed:
Garmin GTX 345 p/n 011-03302-00

Removed B/K Kt-76C p/n 066-01156-0101 and installed Garmin GTX 345 P/N: 011-03302-00 I/A/W STC #SA01714WI and Garmin GTX 345 Part 23 AML STC Installation Manual P/N: 190-00734-10 Rev 6.
No change in electrical load and weight and balance is negligible (.51lbs) Work performed under WO# 3032.

END

☐ Additional Sheets Are Attached

US Department of Transportation
Federal Aviation Administration

MAJOR REPAIR AND ALTERATION
(Airframe, Powerplant, Propeller, or Appliance)

Form Approved OMB No. 2120-0020 2/28/2011	Electronic Tracking Number
For FAA Use Only	

INSTRUCTIONS: Print or type all entries. See Title 14 CFR §43.9, Part 43 Appendix B, and AC 43.9-1 (or subsequent revision thereof) for instructions and disposition of this form. This report is required by law (49 U.S.C. §44701). Failure to report can result in a civil penalty for each such violation. (49 U.S.C. §46301(a))

1. Aircraft	Nationality and Registration Mark: N78BG	Serial No.: 28-7890100	
	Make: Piper	Model: PA28-181	Series:
2. Owner	Name *(As shown on registration certificate)*: Levine & Sons LLC	Address *(As shown on registration certificate)*: Address 704 Willowbend Dr; City Blue Bell; State PA; Zip 19422-4204; Country USA	

3. For FAA Use Only

4. Type		5. Unit Identification			
Repair	Alteration	Unit	Make	Model	Serial No.
☐	☑	AIRFRAME	———	*(As described in Item 1 above)*	———
☐	☐	POWERPLANT			
☐	☐	PROPELLER			
☐	☐	APPLIANCE	Type / Manufacturer		

6. Conformity Statement

A. Agency's Name and Address	B. Kind of Agency			
Name LV Avionics		U. S. Certificated Mechanic		Manufacturer
Address 600 Hayden Circle		Foreign Certificated Mechanic	C. Certificate No.	
City Allentown State PA	✓	Certificated Repair Station		
Zip 18109 Country USA		Certificated Maintenance Organization	CRS# J6MR763X	

D. I certify that the repair and/or alteration made to the unit(s) identified in item 5 above and described on the reverse or attachments hereto have been made in accordance with the requirements of Part 43 of the U.S. Federal Aviation Regulations and that the information furnished herein is true and correct to the best of my knowledge.

Extended range fuel per 14 CFR Part 43 App. B ☐	Signature/Date of Authorized Individual
	Michael Ionata 10/18/2016

7. Approval for Return to Service

Pursuant to the authority given persons specified below, the unit identified in item 5 was inspected in the manner prescribed by the Administrator of the Federal Aviation Administration and is ☑ Approved ☐ Rejected

BY								
		FAA Flt. Standards Inspector		Manufacturer		Maintenance Organization		Persons Approved by Canadian Department of Transport
		FAA Designee	✓	Repair Station		Inspection Authorization		Other *(Specify)*

Certificate or Designation No.	Signature/Date of Authorized Individual
CRS# J6MR763X	Michael Ionata 10/18/2016

DUNCAN AVIATION

Reg: N78BG
Model: PA28-181
Date: 02/05/20

Make: PIPER
S/N: 28-7890100

CALCULATED WT & BALANCE AND EQUIPMENT LIST REVISION

Units of Measure: Weight (Lbs), Arm (Ins), Moment (Lbs x Ins)

		WEIGHT	ARM	MOMENT
LAST KNOWN WT/BALANCE DATE:	August 1, 2019	1,579.36	88.13	139,193.97

INSTALLED EQUIPMENT

DESCRIPTION	P/N	WEIGHT	ARM	MOMENT
G-5 ATT IND	011-03890-00	0.98	60.00	58.80
G-5 HDG IND	011-03890-00	0.98	60.00	58.80
GAD-29B NAV INTERFACE	011-03236-11	0.65	54.00	35.10
GMU-11 MAGNATOMERE	011-04349-01	0.35	118.00	41.30

REMOVED EQUIPMENT

DESCRIPTION	P/N	WEIGHT	ARM	MOMENT
DIRECTIONAL GYRO	1U262-003-14	-2.60	59.70	-155.22
GI-106A	013-00049-01	-1.25	59.00	-73.75

TOTALS (NET CHANGE):	-0.89	0.03	-34.97
NEW EMPTY WEIGHT/CG:	**1,578.47**	**88.16**	**139,159.00**

NEW USEFUL LOAD: **971.53**

SIGNED: DUNCAN QI 1206

Steven E. Helwig

DATED: **2/5/2020**

U.S. Department of Transportation
Federal Aviation Administration

MAJOR REPAIR AND ALTERATION
(Airframe, Powerplant, Propeller, or Appliance)

Form Approved OMB No.2120-0020 2/28/2011 | Electronic Tracking Number

For FAA Use Only

INSTRUCTIONS: Print or type all entries. See Title CFR §43.9, Part 43 Appendix B, and AC 43.9-1 (or subsequent revision thereof) for instructions and disposition of this form. This report is required by law (49 U.S.C. §44701). Failure to report can result in a civil penalty for each such violation (49 U.S.C. §46301(a)).

1. Aircraft

Nationality and Registration Mark	Serial No.
N78BG	28-7890100
Make	**Model** / **Series**
Piper	PA-28-181 / 28 Series

2. Owner

Name (As shown on registration certificate): Levine and Sons LLC

Address (As shown on registration certificate)
Address 704 Willowbend Dr
City Blue Bell State PA
Zip 19422 Country USA

3. For FAA Use Only

4. Type		5. Unit Identification			
Repair	Alteration	Unit	Make	Model	Serial No.
☐	☒	AIRFRAME	———	*(As described in item 1 above)*	———
☐	☐	POWERPLANT			
☐	☐	PROPELLER			
☐	☐	APPLIANCE	Type / Manufacturer		

6. Conformity Statement

A. Agency's Name and Address
Name Eric Lacko
Address 4954 Clauss Rd
City Schneckville State PA
Zip 18078 Country USA

B. Kind of Agency
☒ U.S. Certificated Mechanic
☐ Foreign Certificated Mechanic
☐ Certificated Repair Station
☐ Certificated Maintenance Organization
☐ Manufacturer

C. Certificate No. 3017923

D. I certify that the repair and/or alteration made to the unit(s) identified in item 5 above and described on the reverse or attachments hereto have been made in accordance with the requirements of Part 43 of the U.S. Federal Aviation Regulations and that the information furnished herein is true and correct to the best of my knowledge.

Extended range fuel per 14 CFR Part 43 App. B ☐

Signature/Date of Authorized Individual Eric Lacko 4/11/2014

7. Approval for Return To Service

Pursuant to the authority given persons specified below, the unit identified in item 5 was inspected in the manner prescribed by the Administrator of the Federal Aviation Administration and is ☑ APPROVED ☐ REJECTED

BY								
	☐	FAA Flt. Standards Inspector	☐	Manufacturer	☐	Maintenance Organization	☐	Persons Appoved by Canadian Department of Transport
	☐	FAA Designee	☐	Repair Station	☒	Inspection Authorization	Other	*(Specify)*

Certificate or Designation No. IA 3519207

Signature/Date of Authorized Individual Joseph Flurry 4/11/2014

FAA Form 337 (10-06)

NOTICE

Weight and balance or operating limitation changes shall be entered in the appropriate aircraft record. An alteration must be compatible with all previous alterations to assure continued conformity with the applicable airworthiness requirements.

8. Description of Work Accomplished

(If more space is required, attach additional sheets. Identify with aircraft nationality and registration mark and date work completed.)

N78BG	4/11/2014
Nationality and Registration Mark	Date

Validated the previous installation of the GNS 530 that was installed IAW Garmins instructions and approved via an FAA stamped field approval document on FAA form 337 dated 6/21/2006. Verified this aicraft and all interfaced equipment are covered under the STC AML. The unit was removed and upgraded to GNS530WAAS. The existing location of the unit was determined to meet the field-of-view requirements without the need for external annunciation.. The existing RG-58 antenna cable was removed and replaced with RG-142 cable. The existing wire was inspected and determined to be IAW the STC AML installation data. The existing GPS GA-56 antenna was removed and replaced with a GA-35 WAAS approved antenna using the approved mounting previsions of the previous installation. The 530 WAAS is configured identical to the original 530 unit. Removed the old flight manual supplement and installed a GNS 530 WAAS flightmanual supplement P/N 190-00357-03 RevB in the aircraft POH. There is no change to the weight and balance. The electrical load analysis remains valid since the new unit draws the same or less current than the original. The upgrade was done IAW Garmins STC Upgrade Installation Manual P/N 190-00357-06 and the 530 WAAS install manual P/N 190-00357-02 and STC # SA01933LA. A new ICA manual for the 530WAAS P/N 190-00357-65 and GA-35 Antenna ICA P/N 190-00673-01 is included in the aircraft maintenance records. This supercedes previous ICA data for the 530.

----------END----------

☐ Additional Sheets Are Attached

United States Of America

Department of Transportation - Federal Aviation Administration

Supplemental Type Certificate

Number **SA01933LA**

This Certificate issued to

Garmin AT, Inc.
2345 Turner Road S.E.
Salem, Oregon 97302

*certifies that the change in the type design for the following product with the limitations and conditions therefor as specified hereon meets the airworthiness requirements of Part * of the Regulations*

Original Product Type Certificate Number: * See attached Approved Model List (AML)

Make: No. SA01933LA for list of approved aircraft

Model: Models and applicable airworthiness regulations.

Description of Type Design Change: Installation of Garmin Model 400W / 500W Series GPS-WAAS Navigation System in accordance with FAA Approved Garmin 400W Series Master Data List, Drawing No.: 005-C0221-00, Revision "B", dated October 1, 2007, or later FAA approved revision; or FAA Approved Garmin 500W Series Master Data List, Drawing No.: 005-C0221-01, Revision "B", dated October 1, 2007, or later FAA approved revision. Use applicable FAA approved 400W Series Airplane Flight Manual Supplement, document No. 190-00356-03, Rev. "Original", dated November 20, 2007 or later FAA approved revision; FAA Approved 500W Series Airplane Flight Manual Supplement document No. 190-00357-03, Rev. "Original", dated November 20, 2007 or later FAA approved revision; or FAA Approved Airplane Flight Manual Supplement as defined in Master Data List 005-C0221-00 or 005-C0221-01 defined above.

Limitations and Conditions: This approval should not be incorporated in any aircraft unless it is determined that the interrelationship between this installation and any previous approved configuration will not introduce any adverse effect upon the airworthiness of the aircraft. If the holder agrees to permit another person to use this certificate to alter the product, the holder shall give the other person written evidence of that permission. *This certificate and the supporting data which is the basis for approval shall remain in effect until surrendered, suspended, revoked or a termination date is otherwise established by the Administrator.*

Date of application: January 31, 2006

Date of issuance: November 6, 2006

Date reissued:

Date amended: November 20, 2007

By direction of the Administrator

(Signature)

Project Manager, Systems & Equipment Branch,
Los Angeles Aircraft Certification Office

Any alteration of this certificate is punishable by a fine of not exceeding $1,000, or imprisonment not exceeding 3 years, or both.

This certificate may be transferred in accordance with FAR 21.47.

GARMIN

February 22, 2007

Subject: STC Permission to use STC SA01933LA for
Garmin Model 400W / 500W Series GPS-WAAS Navigation System

Consistent with Order 8110.4B and AC 21-40, Garmin AT, Inc. grants permission to Garmin dealers, installers, and owners of the Garmin Model 400W / 500W Series GPS-WAAS Navigation System to use STC SA01933LA and the data associated with it, for the sole and express purpose of installation and approval of the installation of the Garmin Model 400W / 500W Series GPS-WAAS Navigation System, and associated interfaces to other previously approved equipment.

John Macnab
General Manager
Garmin AT, Inc.

Garmin AT, Inc.
2345 Turner Road SE
Salem Oregon 97302
P 800-525-6726

FAA APPROVED MODEL LIST (AML) NO. SA01933LA

GARMIN AT, INC.

Installation of Garmin Model 400W / 500W Series GPS-WASS Navigation Systems

Issued Date: November 6, 2006

Revision: "Original"

Aircraft Make and Model Designation	Type Certificate Number	Certification Basis	Required Approved Data & Added Model Specific Limitations	AML Revision Date
Adam Aircaft				
A500	A00009DE	FAR 23	005-C0221-00 005-C0221-01	
Aermacchi S.p.A (Siai Marchetti)				
S.205-18/F, S.205-18/R, S.205-20/F, S.205-20/R S.205-22/R, S.208, S.208A	A9EU	FAR 23	005-C0221-00 005-C0221-01	
F.260, F.260B, F.260C, F.260D, F.260E, F.260F	A10EU	CAR 3	005-C0221-00 005-C0221-01	
S.211A	A86EU	FAR 23	005-C0221-00 005-C0221-01	
Aero Commander (Dynac Aerospace Corp)				
10, 10A, 100, 100A, 100-180	1A21	CAR 3	005-C0221-00 005-C0221-01	
Aeronautica Macchi S.p.A (Macchi)				
AL 60, AL 60-B, AL 60-F5, AL 60-C5	7A12	CAR 3	005-C0221-00 005-C0221-01	
AM-3	A19EU	FAR 23	005-C0221-00 005-C0221-01	
Aerostar Aircraft Corp. (Piper Aerostar)				
PA-60-600, PA-60-601 (Aerostar 601), PA-60-601P Aerostar 601P), PA-60-602P (Aerostar 602P), PA-60-700P (Aerostar 700P)	A17WE	FAR 23	005-C0221-00 005-C0221-01	
360, 400	A11WE	FAR 23	005-C0221-00 005-C0221-01	
American Champion				
402	A3CE	CAR 3	005-C0221-00 005-C0221-01	
7GCA, 7GCB, 7KC, 7GCBA, 7GCAA, 7GCBC, 7KCAB	A-759	CAR 4a	005-C0221-00 005-C0221-01	
8KCAB, 8GCBC	A21CE	FAR 23	005-C0221-00 005-C0221-01	
Aviat (Sky International)				
A-1, A-1A, A-1B	A22NM	FAR 23	005-C0221-00 005-C0221-01	
S-1S, S-1T, S-2, S-2A, S-2S, S-2B, S-2C	A8SO	FAR 23	005-C0221-00 005-C0221-01	
Bellanca (Alexandria Aircraft LLC)				

Aircraft Make and Model Designation	Type Certificate Number	Certification Basis	Required Approved Data & Added Model Specific Limitations	AML Revision Date
ZLIN Z-242L, Z-143L	A76EU	FAR 23	005-C0221-00 005-C0221-01	
Navion Aircraft Company, Ltd. (Navion)				
Navion, Navion A, Navion B, Navion D, Navion E, Navion F, Navion G, Navion H	A-782	CAR 3	005-C0221-00 005-C0221-01	
North American (Rockwell International)				
BC-1A, AT-6, AT-6A, AT-6B, AT-6C, AT-6D, AT-6F, SNJ-7, T-6G	A-2-575	CAR 4a	005-C0221-00 005-C0221-01	
NA-260	1A18	CAR 3	005-C0221-00 005-C0221-01	
OMF (Ostmeck. Flugzeugbau GmbH)				
OMF-100-160	A46CE	FAR 23	005-C0221-00 005-C0221-01	
Partenavia (Vulcanair S.p.A.)				
P68, P68B, P68C, P68C-TC, P68 "Observer," P68 "Observer 2," P68 TC "Observer", AP68TP 300 "Spartacus", AP68TP 600 "Viator", VA300	A31EU	FAR 23	005-C0221-00 005-C0221-01	
Piaggio (Piaggio Aero Industries S.p.A)				
P-180	A59EU	FAR 23	005-C0221-00 005-C0221-01	
Pilatus Aircraft Limited				
PC-12, PC-12/45 PC-12/47	A78EU	FAR 23	005-C0221-00 005-C0221-01	
PC-6, PC-6-H1, PC-6-H2, PC-6/350, PC-6/350-H1, PC-6/350-H2, PC-6/A, PC-6/A-H1, PC-6/A-H2, PC-6/B-H2, PC-6/B1-H2, PC-6/B2-H2, PC-6/B2-H4, PC-6/C-H2, PC-6/C1-H2	7A15	CAR 3	005-C0221-00 005-C0221-01	
PC-7	A50EU	FAR 23	005-C0221-00 005-C0221-01	
Piper (New Piper)				
PA-12, PA-12S	A-780	CAR 3	005-C0221-00 005-C0221-01	
PA-18, PA-18S, PA-18-105, PA-18S-105, PA-18A, PA-18-125, PA-18S-125, PA-18AS-125, PA-18-135, PA-18A-135, PA-18S-135, PA-18AS-135, PA-18-150, PA-18A-150, PA-18S-150, PA-18AS-150, PA-19, PA19S	1A2	CAR 3	005-C0221-00 005-C0221-01	
PA-20, PA-20S, PA-20-115, PA-20S-115, PA-20-135, PA-20S-135	1A4	CAR 3	005-C0221-00 005-C0221-01	
PA-22, PA-22-108, PA-22-135, PA-22S-135, PA-22-150, PA-22S-150, PA-22-160, PA-22S-160	1A6	CAR 3	005-C0221-00 005-C0221-01	
PA-23, PA-23-160, PA-23-235, PA-23-250, PA-E23-250	1A10	CAR 3	005-C0221-00 005-C0221-01	
PA-24, PA-24-250, PA-24-260, PA-24-400	1A15	CAR 3	005-C0221-00 005-C0221-01	
PA-28-140, PA-28-150, PA-28-151, PA-28-160, PA-28-161, PA-28-180, PA-28-235, PA-28S-160, PA-28R-180, PA-28S-180, PA-28-181, PA-28R-200, PA-28R-201, PA-28R-201T, PA-28RT-201, PA-28RT-201T, PA-28-201T, PA-28-236	2A13	CAR 3	005-C0221-00 005-C0221-01	

GARMIN Ltd. or its subsidiaries
c/o Garmin International
1200 E. 151st Street, Olathe, KS 66062 USA

FAA APPROVED

AIRPLANE FLIGHT MANUAL SUPPLEMENT
or
SUPPLEMENTAL AIRPLANE FLIGHT MANUAL
for
GARMIN 500W SERIES GPS-WAAS NAVIGATION SYSTEM
as installed in

Piper PA-28-181
Make and Model Airplane

Reg. No. N78BG S/N 28-7890100

This document serves as an Airplane Flight Manual Supplement or as a Supplemental Airplane Flight Manual when the aircraft is equipped with the Garmin 500W Series unit. This document must be carried in the airplane at all times when the Garmin 500W Series unit is installed in accordance with STC SA01933LA-D.

The information contained herein supplements or supersedes the information made available to the operator by the manufacturer in the form of clearly stated placards, markings, or manuals or in the form of an FAA approved Airplane Flight Manual, only in those areas listed herein. For limitations, procedures and performance information not contained in this document, consult the basic placards, markings, or manuals or the basic FAA approved Airplane Flight Manual.

FAA Approved By: David G Armstrong

David G Armstrong
ODA STC Unit Administrator
Garmin International, Inc.
ODA-240087-CE

Date: 7/31/09

GARMIN Ltd. or its subsidiaries
c/o Garmin International
1200 E. 151st Street, Olathe, KS 66062 USA

AIRPLANE FLIGHT MANUAL SUPPLEMENT
or SUPPLEMENTAL AIRPLANE FLIGHT MANUAL
for a Garmin 500W Series Navigation System

LOG OF REVISIONS				
Rev. No.	Page No.	Date	Description	FAA Approved
A Original	All	11-20-07	Complete Supplement	Seyed-Youssef Hashemi Mgr. Flt. Test Br., ANM-160L FAA, Los Angeles ACO Transport Airplane Directorate Date November 20, 2007
B	All	7/31/09	Added '-D' to STC number, added LP approach type	David G Smith ODA STC Unit Administrator ODA-240087-CE Garmin International, Inc.

GARMIN Ltd. or its subsidiaries
c/o Garmin International
1200 E. 151st Street, Olathe, KS 66062 USA

AIRPLANE FLIGHT MANUAL SUPPLEMENT
or SUPPLEMENTAL AIRPLANE FLIGHT MANUAL
for a Garmin 500W Series Navigation System

Table of Contents

GARMIN Ltd. or its subsidiaries
c/o Garmin International
1200 E. 151st Street, Olathe, KS 66062 USA

AIRPLANE FLIGHT MANUAL SUPPLEMENT
or SUPPLEMENTAL AIRPLANE FLIGHT MANUAL
for a Garmin 500W Series Navigation System

Section 1. GENERAL

1.1 Garmin 500W Series GPS/WAAS Nav Com

The Garmin 500W Series GPS/WAAS Navigator is a panel-mounted product that contains a GPS/WAAS receiver for GPS approved primary navigation under TSO C146a, (plus optional VHF Com and VHF Nav radios) in an integrated unit with a moving map and color display. The 500W Series unit features a graphical display which may also be used to depict traffic, weather, or terrain data. Optional TAWS annunciation and audio is available in some installations.

The navigation functions are operated by dedicated keys and graphical menus which are controlled by the buttons and the dual concentric rotary knob along the bottom and right side of the display.

Optional VHF Com and VHF Nav radio functions are controlled via dedicated buttons and knobs on the left side of the display and adjacent to frequencies they are controlling.

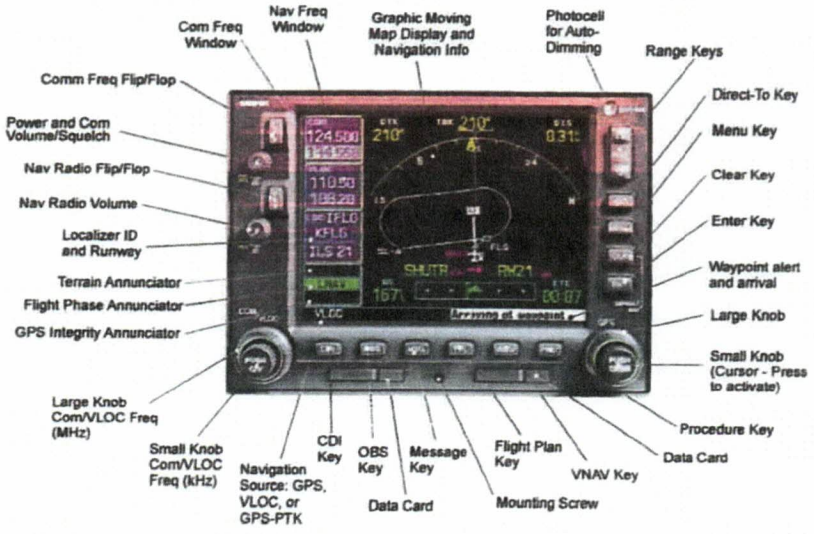


Figure 1 - 500W Series Control and Display Layout

Section 2. LIMITATIONS

2.1 Pilot's Guide

The GARMIN 500W Series Pilot's Guide, part number and revision listed below (or later applicable revisions), must be immediately available for the flight crew whenever navigation is predicated on the use of the 500W Series unit.

- 500W Series Pilot's Guide & Reference P/N 190-00357-00 Rev E
- 400W/500W Series Optional Displays P/N 190-00356-30 Rev F
- 400W/500W Series Display Interfaces P/N 190-00356-31 Rev B

This AFM supplement does not grant approval for IFR operations to aircraft limited to VFR operations. Additional aircraft systems may be required for IFR operational approval. Systems limited to VFR shall be placarded in close proximity to the 500W Series unit
"**GPS LIMITED TO VFR USE ONLY**".

2.2 System Software:

The system must utilize the Main and GPS software versions listed below (or later FAA approved versions). The software versions are displayed on the self-test page immediately after turn-on for approximately 5 seconds or they can be accessed in the AUX pages.

Subsequent software versions may support different functions. Check the 500W Series Pilot's Guide for further information.

Table 1 - Approved Software Versions

Software Item	**Approved Software Version** *(or later FAA approved versions for this STC)*	
	SW version	As displayed on unit
Main SW Version	3.30	3.30
GPS SW Version	3.2	3.2

2.3 Navigation Database

The 500W Series unit database card must be installed. (IAW the TSO deviations granted to Garmin for the 500W unit, navigation database cards may not be marked with the part number. The software automatically precludes invalid databases for use by the 500W)

a) IFR enroute and terminal navigation is prohibited unless the pilot verifies the currency of the database or verifies each selected waypoint for accuracy by reference to current approved data.

b) GPS instrument approaches using the 500W Series units are prohibited, unless the 500W Series unit's approach data is verified by the pilot or crew to be current. Instrument approaches must be accomplished in accordance with an approved instrument approach procedure that is loaded from the 500W Series unit database.

c) Installations with dual 400W/500W Series units will only crossfill between units when they contain the same database cycle. Updating of each database must be accomplished on the ground prior to flight.

2.4 Terrain Database

The 500W Series unit supports Terrain or TAWS (optional) and requires a Terrain database card to be installed in order for either feature to operate. The table below lists compatible database cards for the 500W series. Each of the data base cards contains the following data:

a) The Terrain Database has an area of coverage from North 75° Latitude to South 60° Latitude in all longitudes.

b) The Airport Terrain Database has an area of coverage that includes the United States, Canada, Mexico, Latin America, and South America.

c) The Obstacle Database has an area of coverage that includes the United States, and is updated as frequently as every 56 days.

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

Table 2 – Approved Terrain Database Cards

Part Number	Description
010-10201-20	Data Card, TAWS / Terrain, 128MB
010-10201-21	Data Card, TAWS / Terrain, 256MB

2.5 Navigation

No navigation is authorized north of 89° (degrees) north latitude or south of 89° (degrees) south latitude.

2.6 Approaches

a) During GPS approaches, the pilot must verify the 500W Series unit is operating in the approach mode. (LNAV, LNAV+V, L/VNAV, LP, or LPV)

b) When conducting approaches referenced to true North, the heading selection on the AUX pages must be adjusted to TRUE.

c) Accomplishment of an ILS, LOC, LOC-BC, LDA, SDF, MLS, VOR approach, or any other type of approach not approved for GPS overlay, is not authorized with GPS navigation guidance.

d) Use of the GNS 530W VOR/LOC/GS receiver to fly approaches not approved for GPS requires VOR/LOC/GS navigation data to be present on the external indicator (i.e. proper CDI source selection).

e) For aircraft with remote source selection annunciation or remote GPS navigation annunciations installed, conducting IFR approaches is prohibited if the remote annunciation is found to be inoperative during pre-flight. (This limitation does not prohibit the conduct of an IFR approach if the required remote annunciation fails during flight. The indications provided on the 500W Series unit display may be used as a backup).

f) Except in emergency conditions, IFR approaches are prohibited whenever any physical or visual obstruction (such as a throw-over yoke) restricts pilot view or access to the 500W Series unit or the affected CDI.

2.7 Autopilot Coupling

IFR installations of a Garmin 500W Series unit allow the operator to fly all phases of flight based on the navigation information presented to the pilot; however, not all modes may be coupled to the autopilot. All autopilots may be coupled in Oceanic (OCN), Enroute (ENR), and Terminal (TERM) modes; however, the FAA requires that vertical coupling of an autopilot for approaches be demonstrated to meet their intended function and provide safe and proper operation to published minimums. This installation is limited to:

☒ No limitations for autopilot coupling.

☐ Lateral GPS coupling (LNAV only). For 530W units: The GS of an ILS (VLOC) may be coupled to the autopilot without any limitations.

This limitation may be removed after an FAA Flight Test demonstration. Contact Garmin International, Tech Support for additional information.

2.8 Terrain Display [Units without TAWS]

Terrain refers to the display of terrain information. Pilots are NOT authorized to deviate from their current ATC clearance to comply with terrain/obstacle alerts. Terrain unit alerts are advisory only and are not equivalent to warnings provided by TAWS. Navigation must not be predicated upon the use of the terrain display.

The terrain display is intended to serve as a situational awareness tool only. By itself, it may not provide either the accuracy or the fidelity on which to base decisions and plan maneuvers to avoid terrain or obstacles.

2.9 TAWS Function [Units with TAWS]

TAWS is an optional extension of Terrain. Pilots are authorized to deviate from their current ATC clearance to the extent necessary to comply with TAWS warnings. Navigation must not be predicated upon the use of TAWS.

Display of the terrain and obstacles is supplemental data only. Maneuvering solely by reference to the terrain and obstacle display is not recommended or authorized.

2.10 VNAV

VNAV information may be utilized for advisory information only. Use of VNAV information for Instrument Approach Procedures does not guarantee Step-Down Fix altitude protection, or arrival at approach minimums in a normal position to land.

2.11 Weather Display

If an optional weather receiver is interfaced to the 500W Series unit, the weather information displayed is limited to supplemental use only and may not be used in lieu of an official weather data source.

2.12 Traffic Display

Traffic may be displayed on the 500W Series unit when connected to an approved optional TCAS, TAS, or TIS traffic device. These systems are capable of providing traffic monitoring and alerting to the pilot. Traffic shown on the display may or may not have traffic alerting available. The display of traffic is an aid to visual acquisition and may not be utilized for aircraft maneuvering. Display of this traffic data and related operations are described in the 500W Series unit Pilot's Guide.

Section 3. EMERGENCY PROCEDURES

3.1 Emergency Procedures

No change.

3.2 Abnormal Procedures

a) If the Garmin 500W Series unit GPS navigation information is not available, or is invalid, utilize other remaining operational navigation equipment installed in the airplane as appropriate. If the 500W Series unit loses GPS position and reverts to Dead Reckoning mode (indicated by the annunciation of "DR" in the lower left of the display), the moving map will continue to be displayed. Aircraft position will be based upon the last valid GPS position and estimated by Dead Reckoning methods. Changes in airspeed or winds aloft can affect the estimated position substantially. Dead Reckoning is only available in Enroute mode; Terminal and Approach modes do not support DR.

b) If a "Loss of Integrity" (INTEG) message is displayed during:
   - Enroute/Terminal: continue to navigate using GPS equipment and periodically cross-check the GPS guidance to other approved means of navigation.
   - GPS Approach: GPS approaches are not authorized under INTEG - Execute missed approach or revert to alternate navigation.

c) During a GPS LPV precision approach or GPS LNAV/VNAV approach, the 500W Series unit will downgrade the approach if the Vertical alarm limits are exceeded. This will cause the vertical guidance to flag as unavailable. The procedure may be continued using the LNAV only minimums.

d) During a GPS LP approach, the 500W Series may downgrade the approach prior to the Final Approach Fix if alarm limits are exceeded. If this occurs, a message will be displayed advising the pilot to use LNAV minimums. If alarm limits are exceeded after the Final Approach Fix, the 500W Series unit will flag the lateral guidance and generate a system message "ABORT APPROACH loss of navigation". Immediately upon viewing the message the unit will revert to Terminal alarm limits. If the position integrity is within these limits lateral guidance will be restored

and the GPS may be used to execute the missed approach, otherwise alternate means of navigation should be utilized.

e) During any GPS approach in which precision and non-precision alarm limits are exceeded, the 500W Series unit will flag the lateral guidance and generate a system message "ABORT APPROACH loss of navigation". Immediately upon viewing the message the unit will revert to Terminal alarm limits. If the position integrity is within these limits lateral guidance will be restored and the GPS may be used to execute the missed approach, otherwise alternate means of navigation should be utilized.

Section 4. NORMAL PROCEDURES

Refer to the 500W Series unit Pilot's Guide defined in paragraph 2.1 on page 6 of this document for normal operating procedures. This includes all GPS operations, VHF COM and NAV, and Multi-Function Display information. For information on TIS traffic, data linked weather, or TAWS see the Pilot's Guide addendum for optional displays. For information on active traffic sensor or Stormscope operation and displays see the Pilot's Guide addendum for display interfaces.

Although intuitive and user friendly the 500W Series unit requires a reasonable degree of familiarity to prevent operations without becoming too engrossed at the expense of basic instrument flying in IMC and basic see-and-avoid in VMC. Pilot workload will be higher for pilots with limited familiarity in using the unit in an IFR environment, particularly without the autopilot engaged. Garmin provides excellent training tools with the Pilot's Guide and PC based simulator. Pilots should take full advantage of these training tools to enhance system familiarization. Use of an autopilot is strongly encouraged when using the 500W Series unit in IMC conditions.

4.1 Approaches with Vertical Guidance

The 500W Series unit supports three types of GPS approaches with vertical guidance: LPV approaches, LNAV/VNAV (annunciated as L/VNAV) approaches, and LNAV approaches with advisory vertical guidance (annunciated as LNAV+V). For LNAV approaches with advisory vertical guidance, the 500W Series will annunciate LNAV+V indicating vertical guidance is available. LNAV minimums will be controlling in this case.

NOTE:

If flying an LPV or LNAV/VNAV approach, be prepared to fly the LNAV only approach prior to reaching the final approach fix (FAF). If the GPS integrity is not within vertical approach limits, the system will flag the vertical guidance. This may be annunciated by a downgrade to LNAV message.

For additional information on approaches with vertical guidance refer to the 500W Series unit Pilot's Guide.

4.2 Approaches without Vertical Guidance

The 500W Series unit supports Localizer Performance approaches (annunciated as LP). Published LP minimums will be controlling in this case.

NOTE:

If flying an LP approach, be prepared to fly the LNAV only approach prior to reaching the final approach fix (FAF). If the GPS integrity is not within LP approach limits, the system will notify the pilot by a downgrade to LNAV message.

For additional information on LP approaches refer to the 500W Series unit Pilot's Guide.

4.3 Autopilot Operation

The Garmin 500W Series may be coupled to an optional autopilot if installed in the aircraft when operating as prescribed in the LIMITATIONS section of this manual. For lateral guidance, some installations may utilize GPSS or GPS Roll Steering in lieu of the analog deviation information. If an HSI is used with GPSS engaged, the pilot should rotate the course pointer as prompted on the 500W Series unit to prevent loss of situational awareness and to prevent the aircraft from turning inappropriately if the autopilot is switched from digital (GPSS) to analog mode. For autopilot operational instructions, refer to the FAA approved Flight Manual or Flight Manual Supplement for the autopilot.

4.4 Coupling the Autopilot during approaches

The Garmin 500W Series supports analog and digital (GPSS) control interfaces to an optionally installed autopilot. Some autopilots revert to ROLL mode (wings level) and/or flag a NAV failure if the digital data becomes unavailable or is inhibited. The CDI selection of VLOC should inhibit the digital control interface. When switching between GPS and VLOC the pilot should be aware that the autopilot may need to be re-engaged into APR or NAV mode after changing the CDI source.

Autopilot coupling to GPS vertical guidance requires that the autopilot be engaged in an analog APR mode identical to coupling to an ILS. Some autopilots may revert to ROLL mode when the navigation outputs of the 500W Series unit sequence to the final approach fix. In these installations

the unit will be configured to PROMPT the pilot to "Enable the autopilot approach outputs" in order to prevent the autopilot from entering ROLL mode without the pilot being aware of the transition.

☒ This installation prompts the pilot and requires the pilot to enable the A/P outputs just prior to engaging the autopilot in APR mode.

☐ This installation supports a seamless transition from digital (GPSS) to analog guidance for the autopilot. To capture the vertical guidance, the pilot may engage the autopilot in APR mode at any time when the GPS Glide Slope (VDI) becomes valid (displayed without a FLAG).

☐ This installation interfaces to the autopilot in analog mode only. To capture the vertical guidance, the pilot may engage the autopilot in APR mode at any time when the GPS Glide Slope (VDI) becomes valid.

☒ The autopilot does not support any vertical capture or tracking in this installation.

Analog only autopilots should use APR mode for coupling to LNAV approaches. Autopilots which support digital roll steering commands (GPSS) may utilize NAV mode and take advantage of the digital tracking during LNAV only approaches.

4.5 TAWS Cautions and Warning [if installed]

Should a terrain awareness Caution occur, take positive corrective action based on analysis of all the available information. If this elevates to a terrain awareness Warning, immediately initiate and continue a maximum rate climb until the alert ceases. Only vertical maneuvers are recommended, unless visual meteorological conditions (VMC) exist or the pilot can determine that turning in addition to the climbing maneuver is the safest course of action.

4.6 WFDE Prediction Program

The Garmin WAAS Fault Detection and Exclusion (WFDE) Prediction Program is required for Remote/Oceanic operations.

The Prediction Program should be used in conjunction with the Garmin 400W/500W Simulator. After entering the intended route of flight in the Simulator flight plan the pilot selects the FDE Prediction Program under the Options menu of the Simulator program.

For detailed information refer to the WFDE prediction program instructions (190-00643-01). The availability of FDE is only required for Oceanic or Remote operations.

Section 5. PERFORMANCE

No change.

Section 6. WEIGHT AND BALANCE

See current weight and balance data.

Section 7. SYSTEM DESCRIPTIONS

See Garmin 500W Series unit Pilot's Guide for a complete description of the 500W Series unit.

US Department of Transportation
Federal Aviation Administration

MAJOR REPAIR AND ALTERATION
(Airframe, Powerplant, Propeller, or Appliance)

Form Approved
OMB No. 2120-0020

For FAA Use Only

Office Identification

INSTRUCTIONS: Print or type all entries. See FAR 43.9, FAR 43 Appendix B, and AC 43.9-1 (or subsequent revision thereof) for instructions and disposition of this form. This report is required by law (49 U.S.C. 1421). Failure to report can result in civil penalty not to exceed $1,000 for each such violation (Section 901 Federal Aviation Act of 1958).

1. Aircraft	Make: Piper	Model: PA28-181
	Serial No.: 28-7890100	Nationality and Registration Mark: N78BG
2. Owner	Name *(As shown on registration certificate)*: Clark Aviation LLC C/O John P. Stachota	Address *(As shown on registration certificate)*: 725 Summit Ct West bend, WI 53095

3. For FAA Use Only

4. Unit Identification / **5. Type**

Unit	Make	Model	Serial No.	Repair	Alteration
AIRFRAME	*(As described in Item 1 above)*				X
POWERPLANT					
PROPELLER					
APPLIANCE	Type / Manufacturer				

6. Conformity Statement

A. Agency's Name and Address	B. Kind of Agency		C. Certificate No.
Eric W. Paradis West Bend Air, Inc. 330 Earl Steir Drive West Bend, WI 53095	X	U.S. Certificated Mechanic	395562348
		Foreign Certificated Mechanic	
		Certificated Repair Station	
		Manufacturer	

D. I certify that the repair and/or alteration made to the unit(s) identified in item 4 above and described on the reverse or attachments hereto have been made in accordance with the requirements of Part 43 of the U.S. Federal Aviation Regulations and that the information furnished herein is true and correct to the best of my knowledge.

Date: 7-26-2000

Signature of Authorized Individual: Eric W Paradis

7. Approval for Return To Service

Pursuant to the authority given persons specified below, the unit identified in item 4 was inspected in the manner prescribed by the Administrator of the Federal Aviation Administration and is [X] APPROVED [ ] REJECTED

BY		FAA Flt. Standards Inspector		Manufacturer	X	Inspection Authorization	Other *(Specify)*
		FAA Designee		Repair Station		Person Approved by Transport Canada Airworthiness Group	

Date of Approval or Rejection	Certificate or Designation No.	Signature of Authorized Individual
7-26-2000	387901572 IA	Peter T. Hoff

FAA Form 337 (12-88)

NOTICE

Weight and balance or operating limitation changes shall be entered in the appropriate aircraft record. An alteration must be compatible with all previous alterations to assure continued conformity with the applicable airworthiness requirements.

8. Description of Work Accomplished
(If more space is required, attach additional sheets. Identify with aircraft nationality and registration mark and date work completed.)

N78BG 7-26-2000

Installed fiberglass Met-Co-Aire forward fin P/N 1816-01 and aft fin P/N 1815-01 in accordance with STC # SA5512NM, supplied Met-Co-Aire instructions and Drawing SD 2802.

----------END----------

☐ Additional Sheets Are Attached

* U.S.G.P.O. 1990-761-753

NOTICE

Weight and balance or operating limitation changes shall be entered in the appropriate aircraft record. An alteration must be compatible with all previous alterations to assure continued conformity with the applicable airworthiness requirements.

8. Description of Work Accomplished
(If more space is required, attach additional sheets. Identify with aircraft nationality and registration mark and date work completed.)

N78BG 7-26-2000

Installed fiberglass Met-Co-Aire forward fin P/N 1816-01 and aft fin P/N 1815-01 in accordance with STC # SA5512NM, supplied Met-Co-Aire instructions and Drawing SD 2802.

----------END----------

☐ Additional Sheets Are Attached

* U.S.G.P.O. 1990-761-753

Met-Co-Aire
AIRCRAFT MODIFICATIONS

P. O. Box 2216, Fullerton, California 92633 (714) 870-4610

****

INSTALLATION INSTRUCTIONS FOR MET-CO-AIRE FORWARD & AFT FIN FAIRINGS

MCA P/N 1816-01 & 1815-01 RESPECTIVELY

****

PRELIMINARY NOTES:

A) Please read all instructions completely before beginning installation.

B) Install these parts in accordance with the accepted methods and procedures as outlined in FAA regulations Part 43.13 and associated publication "Airframe and Powerplant Mechanics" AC 65-15A.

C) These are direct replacement parts for the manufacturer originals. Accordingly they should be installed in the same manner as the originals. Any attendant parts such as stiffeners, doublers, mouldings, fasteners, etc. should be re-attached as per the original installation.

****

TO INSTALL FORWARD FIN FAIRING P/N 1816-01

1) Remove existing fin from aircraft by carefully drilling off the heads of the rivets holding fin to fuselage. Drill only deep enough to sever head from shank. Be careful not to upset existing hole in fuselage.
Remove rear screws and remove fin from aircraft.

2) Either by using a hole finder, or by tape and location marking, or by using the original fin as a template, locate the attachment holes and mark on the new part.

3) Drill the rivet mounting holes in the flange area of the new part using the correct size drill (normally a #30 .1825 Dia). Minimum edge distance is 1/4" (.250) from centerline of hole.

Drill the screw mounting holes in the aft end of the part. This accepts a countersunk screw and washer assembly, therefore the finished hole size is 5/16" (.3125). Maintain an edge distance of at least 5/16" from centerline of hole.

4) Position fin into place as per original installation. Make sure hole alignments are correct. Rivet fin securely to fuselage using AN-470-AD-4-5 aluminum rivets. Note that length of rivet may vary according to the particular installation. Be sure to use the correct rivet for your individual application. Also use a lower pressure setting on rivet gun so as to avoid potential of damaging fiberglass fin.

(cont.)

Met-Co-Aire AIRCRAFT MODIFICATIONS

P. O. Box 2216, Fullerton, California 92633 (714) 870-4610

5) Screw aft end of fin into place using countersunk screw and washer assemblies as per original assembly.
Screw is an MS24693-S48 (formerly AN507-832R6) 8-32 X 3/8" countersunk flat head machine screw.
Screw is used with a (- 8) Tinnerman countersunk washer.

6) Ascertain no adverse interference or inadvertent damage has occurred to aircraft.

7) Make log book entry: "Installed Met-Co-Aire forward fin fairing p/n 1816-01 according to installation drawing SD 2802."
FAA-PMA approved per STC # No weight change.

****

TO INSTALL AFT FIN FAIRING P/N 1815-01

A) Review "Preliminary Notes" section - page 1.

1) Remove existing fairing from aircraft by unscrewing fin from vertical stabilizer and forward fin.

2) Either by using a hole finder, or by tape and location marking, or by using the original fin as a template, locate the attachment holes and mark on the new part. Be accurate.

3) On models carrying an internal stiffener located by the leading edge of the part, transfer this stiffener from the original part to the new one by squeeze riveting it into place using (4 ea.) AN-426-AD-3-3 countersunk rivets. (Again, length of rivet may vary according to particular situation.)

On models using Tinnerman clips, simply transfer the clips to the new part.

4) Drill 5/16" (.3125) mounting screw attachment holes in new part. Maintain a minimum edge distance of 5/16" from centerline of hole.
This part accepts an MS24693-S48 (formerly AN507-832R6) countersunk flat head machine screw (8-32 X 3/8") with a Tinnerman (-8) countersunk washer. Screw part securely in place as per original installation.

5) Ascertain no interferences or inadvertent damage has occurred to the aircraft.

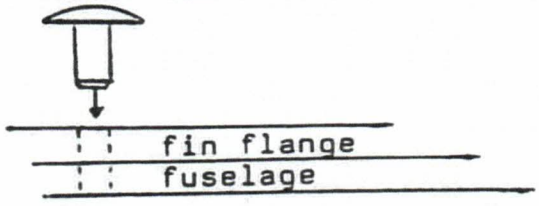
6) Make log book entry: "Installed Met-Co-Aire aft fin fairing p/n 1815-01 according to installation drawing SD 2802."
FAA-PMA approved per STC # No weight change.

Met-Co-Aire
AIRCRAFT MODIFICATIONS

P. O. Box 2216, Fullerton, California 92633 (714) 870-4610

FWD. & AFT. FIN FAIRINGS -INSTALL DWG. - PAGE 3 (cont.)

AN-470-AD-4-5
RIVET (36 PLACES)

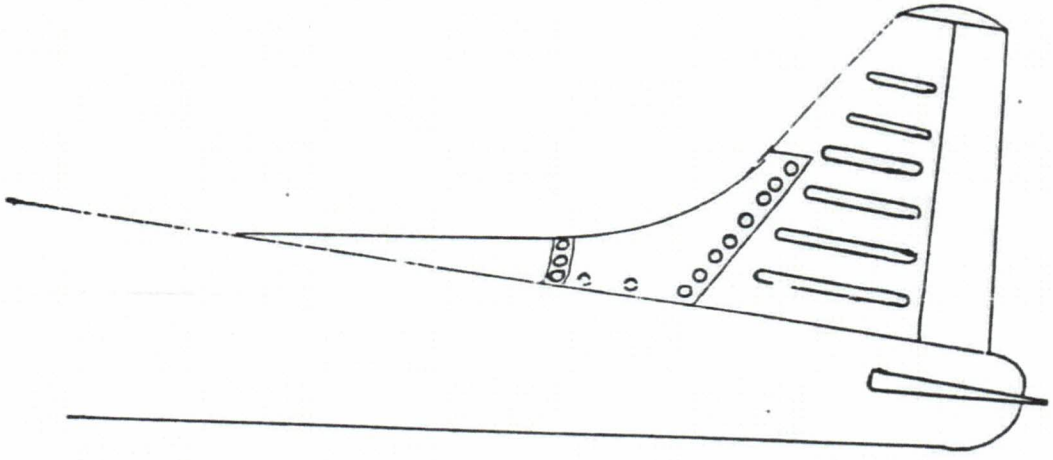


FORWARD FIN

MS24693-S48
C.S. MACHINE SCREW
(24 PLACES)

TINNERMAN (-8)
C.S. WASHER
(24 PLACES)

AFT FIN



PARTS LIST

QTY	PART NO.	DESCRIPTION
1	1816-01	FWD. FIN FAIRING
1	1815-01	AFT. FIN FAIRING

Applicable to Piper Models:
PA-28: - 140, 151, 161, 180, 181, 235, 236, 201T.
PA-28R: - 200, 201, 201T,
PA-28R: - T201 (fwd. only) T201T (fwd. only).

PA-32: 260,300,301, 301T.
PA-32R: 300,301,301T
PA-32RT: 300,300T(fw

Dwg. Scale: None Approved By:
Date 12-6-90

Drawn By: RVV
Revised:

FAA and PMA Approved

SD 2802

United States of America

Department of Transportation — Federal Aviation Administration

Supplemental Type Certificate

Number SA5512NM

This certificate, issued to Met-Co-Aire
14656 1/2 Firestone Boulevard
La Mirada, CA 90638

certifies that the change in the type design for the following product with the limitations and conditions thereof as specified hereon meets the airworthiness requirements of Part 3 *of the* Civil Air Regulations.

Original Product — Type Certificate Number: 2A13
Make: Piper
Model: PA 28-140, -150, -161,-180, -181, -235, -236, -201T; PA 28R-200, 201, -201T; PA 28RT-201, -201T

Description of Type Design Change:

This STC changes the material for forward and aft dorsal fin fairing from plastic to fiberglass for PA-28 series aircraft via Met-Co-Aire Master Drawing List #1000 Rev. New, dated December 06, 1991. There is a related STC (SA5513NM issued to Met-Co-Aire) that uses the same Master Drawing List to modify the PA-32 series. Two STCs issued for the same modification are necessary because of the overwhelming number of models that are eligible for this design change.

Limitations and Conditions: This approval should not be extended to other aircraft on which other previous modifications, including change in type design, are incorporated unless it is determined that the interrelationship will introduce no adverse effect on the airworthiness of that aircraft. A copy of this certificate shall be maintained as part of the permanent records for the modified aircraft.

This certificate and the supporting data which is the basis for approval shall remain in effect until surrendered, suspended, revoked, or a termination date is otherwise established by the Administrator of the Federal Aviation Administration.

Date of application: June 24, 1991
Date of issuance: December 18, 1991
Date reissued: September 20, 1995
Date amended:

By direction of the Administrator

Michael A. Murphy
Manager, Technical and Administrative
Support Staff, ANM-103L

(Title)

Any alteration of this certificate is punishable by a fine of not exceeding $1,000, or imprisonment not exceeding 3 years, or both.

This certificate may be transferred in accordance with FAR 21.47.

FAA Form 8110-2 (10-68)

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

STATEMENT OF COMPLIANCE WITH THE FEDERAL AVIATION REGULATIONS

DATE: February 4, 2005

AIRCRAFT OR AIRCRAFT COMPONENT IDENTIFICATION

MODEL:	MODEL:	TYPE (Airplane, Radio, Helicopter, Etc.	NAME OF APPLICANT:
STOCK	STOCK	STOCK	PYRAMID TRIM PRODUCTS, INC.

LIST OF DATA

IDENTIFICATION	TITLE
Fabric: Boucle Mango P/N BCL404 D/L# 12477 PO# 12626 Test Report No: 12263	Determination of flammability of materials per Carol's Aircraft Interiors, Inc. Procedure No. 870406 (Test Method #2). Approved 6/27/87.

PURPOSE OF DATA

To comply with FAR 25.853 (a) for materials used in aircraft interiors.

APPLICABLE REQUIREMENTS (List specific sections)

FAR 25.853 (a) Appendix F, Part I (a) (1) (ii).

CERTIFICATION - Under the authority vested by direction of the Administrator and in accordance with the conditions and limitations of appointment under Part 183 of the Federal Aviation Regulations, data listed above and on attached sheets numbered _____ AS ABOVE have been examined in accordance with established procedures and found to comply with applicable requirements of the Federal Aviation Regulations.

I (~~We~~) Therefore ☐ Recommend approval of these data

☒ Approve these data

SIGNATURE(S) OF DESIGNATED ENGINEERING REPRESENTATIVE(S)	DESIGNATION NUMBERS(S)	CLASSIFICATION(S)
Carol Ann Carter	DERT-510414CE	STRUCTURES FLAMMABILITY ONLY

FAA Form 8110-3 (11-70) SUPERSEDES PREVIOUS EDITION

FLAMMABILITY TEST REPORT

CAROL'S AIRCRAFT INTERIORS, INC.
611 SCOTTWOODS DRIVE
AUBURN, AL 36830
(334) 887-9674
FAX: (334) 887-9645

TEST REPORT NO: 12263

TEST DATE: February 4, 2005

MATERIAL IDENTIFICATION: Fabric: Boucle/Mango P/N BCL404 D/L# 12477 PO# 12626

APPLICATION: STOCK

CUSTOMER: PYRAMID TRIM PRODUCTS, INC.

12 SECOND VERTICAL IGNITION: FAR 25.853 (a) Appendix F, Part I (a) (1) (ii).
Requirements: 15 sec. extinguish time: 8 inch burn length: 5 sec drip extinguish time:

Fill:	Extinguish Time: 8.1	Burn Length: 3.2	Drip Extinguish Time: 0
Fill:	Extinguish Time: 13.7	Burn Length: 3.0	Drip Extinguish Time: 0
Fill:	Extinguish Time: 12.0	Burn Length: 3.4	Drip Extinguish Time: 0
Warp:	Extinguish Time: 4.9	Burn Length: 3.0	Drip Extinguish Time: 0
Warp:	Extinguish Time: 2.1	Burn Length 3.3	Drip Extinguish Time: 0
Warp:	Extinguish Time: 8.8	Burn Length: 3.7	Drip Extinguish Time: 0

COMMENTS:

Tested by: Carol Ann Carter DERT 510414-CE Structures (Flammability Only)

PASSED: X

FAILED:

Skycom Avionics, Inc.

Aircraft Weight & Balance Report

Aircraft: N 78BG Type: PIPER PA-28-181 S/N: 28-7890100
Model:

Prior Empty Weight: 1,595.3 As Of: 11/01/1980 Prior Useful Load: 954.7
Prior Longitudinal Moment: 139,907.8100 Arm: 87.7000

Items Removed:

Date	Description	Weight	Longitudinal Arm	Longitudinal Moment
6/21/2006	1-B/King KX-170B Nav/Com (NSN)	7.40	56.6000	418.8400
6/21/2006	1-B/King KI-208 Indicator S/N 1518	1.00	59.0000	59.0000
6/21/2006	1-B/King KN-61 DME S/N 2928	8.00	185.0000	1,480.0000
6/21/2006	1-B/King KI-266 DME Indicator S/N 8579	0.80	59.0000	47.2000
6/21/2006	1 B/King KA-60 DME Antenna S/N 0385	0.20	240.0000	48.0000
6/21/2006	1-B/King KR-86 ADF S/N 14540	6.60	58.0000	382.8000
6/21/2006	1-B/King KA-42B ADF Antenna S/N 7238	2.40	118.0000	283.2000
6/21/2006	1-B/King KMA-20 Audio Pnl S/N 27887	2.30	58.0000	133.4000
6/21/2006	1-Comant CI-102 Marker Antenna	0.60	118.0000	70.8000
6/21/2006	1-AEC 1A-2N-1G-B Antenna Coupler	0.20	56.6000	11.3200
6/21/2006	1-BOR6 Clock S/N 6132946	0.20	60.0000	12.0000
	Total of Items Removed:	29.70		-2,946.5600

Items Installed:

Date	Description	Weight	Longitudinal Arm	Longitudinal Moment
6/21/2006	1-Garmin GMA-340 AudPnl S/N 96277764	1.70	58.0000	98.6000
6/21/2006	1-Garmin GNS-530 GPS S/N 78415830	7.20	56.6000	407.5200
6/21/2006	1-Garmin GA-56 GPS Ant. S/N 59416916	0.50	80.5000	40.2500
6/21/2006	1-Garmin GI-106A Ind. S/N D06-10649	1.25	59.0000	73.7500
6/21/2006	1-Garmin GDL-69A DataLink S/N 47752975	2.80	185.0000	518.0000
6/21/2006	1-Garmin GA-55 DL Ant S/N 87503784	0.50	80.5000	40.2500
6/21/2006	1-Ryan 9900BX TCAD Processor S/N 060443	5.50	185.0000	1,017.5000
6/21/2006	1-Ryan 70-2040 Xpndr Coupler S/N 060512	0.50	56.6000	28.3000
6/21/2006	1-Ryan Bottom Traffic Antenna S/N 3497	0.66	118.0000	77.8800
6/21/2006	1-Ryan Top Traffic Antenna S/N 3476	0.75	75.0000	56.2500
6/21/2006	1-Comant CI-1125 Diplexer S/N 120536	0.20	56.6000	11.3200
6/21/2006	1-Comant CI-105 Xpndr Ant. S/N 27063	0.20	170.0000	34.0000
6/21/2006	1-Comant CI-102 Marker Ant. S/N 5091855	0.60	118.0000	70.8000
6/21/2006	1-Davtron 800 Digital Clock S/N 21935	0.10	60.0000	6.0000
6/21/2006	1-Lonestar CRB-6457 Fan S/N 003-005773	0.50	56.6000	28.3000
	Total of Items Installed:	22.96		2,508.7200

New Final Figures:

Weight:	**1,588.56**	**Useful Load:**	**961.44**
Longitudinal Moment:	**139,469.9700**	**Arm:**	**87.7965**

Must GNS-530 IFR

U.S. Department of Transportation
Federal Aviation Administration

MAJOR REPAIR AND ALTERATION
(Airframe, Powerplant, Propeller, or Appliance)

Form Approved
OMB No. 2120-0020

For FAA Use Only
Office Identification

INSTRUCTIONS: Print or type all entries, See FAR 43.9, FAR 43 Appendix B, and AC 43.9-1 (or subsequent revision thereof) for instructions and disposition of this form. This report is required by law (49 U.S.C. 1421). Failure to report can result in a civil penalty not to exceed $1,000.00 for each such violation (Section 901 Federal Aviation Act of 1958).

1. Aircraft	Make: PIPER	Model: PA-28-181
	Serial No.: 28-7890100	Nationality and Registration Mark: N 78BG
2. Owner	Name *(As shown on registration certificate)*: Strachota, John P.	Address *(As shown on registration certificate)*: 725 Summit Court, West Bend, WI 53095

3. For FAA Use Only

"THE DATA IDENTIFIED HEREIN COMPLIES WITH THE APPLICABLE AIRWORTHINESS REQUIREMENTS AND IS APPROVED FOR THE ABOVE DESCRIBED AIRCRAFT, SUBJECT TO CONFORMITY INSPECTION BY A PERSON AUTHORIZED IN FAR 43, SECTION 43.7"

DATE July 12, 2006 SIGNATURE /Dan McCue/ FAA AGL-FSDO 13

4. Unit Identification / **5. Type**

Unit	Make	Model	Serial No.	Repair	Alteration
AIRFRAME	~~~~~~~~~~ *(As described in Item 1 above)* ~~~~~~~~~~				X
POWERPLANT					
PROPELLER					
APPLIANCE	Type:				
	Manufacturer:				

6. Conformity Statement

A. Agency's Name and Address	B. Kind of Agency	C. Certificate No.
Skycom Avionics, Inc. 2441 Aviation Drive Waukesha, WI 53188	[ ] U.S. Certificated Mechanic [ ] Foreign Certificated Mechanic [X] Certificated Repair Station [ ] Manufacturer	NC5D062N

D. I certify that the repair and/or alteration made to the unit(s) identified in item 4 above and described on the reverse or attachments hereto have been made in accordance with the requirements of Part 43 of the U.S. Federal Aviation Regulations and that the information furnished herein is true and correct to the best of my knowledge.

Date	Signature of Authorized Individual
7/12/2006	

7. Approval For Return To Service

Pursuant to the authority given persons specified below, the unit identified in item 4 was inspected in the manner prescribed by the Administrator of the Federal Aviation Administration and is [X] APPROVED [ ] REJECTED

BY							
	[ ]	FAA Flt Standards Inspector	[ ]	Manufacturer	[ ]	Inspection Authorization	Other *(Specify)*
	[ ]	FAA Designee	[X]	Repair Station	[ ]	Person Approved by Transport Canada Airworthiness Group	

Date of Approval or Rejection	Certificate or Designation No.	Signature of Authorized Individual
7/12/06	NC5D062N	

FAA Form 337 (12-88)

SECTION 7 - DESCRIPTION AND OPERATION OF THE AIRPLANE AND ITS SYSTEMS

TABLE OF CONTENTS

SECTION 7

DESCRIPTION AND OPERATION

OF THE AIRPLANE AND ITS SYSTEMS

SECTION 7

DESCRIPTION AND OPERATION

OF THE AIRPLANE AND ITS SYSTEMS

7.1 THE AIRPLANE

The PA-28-181 Cherokee is a single-engine, low-wing monoplane of all metal construction. It has four-place seating, two hundred pound baggage capacity, and a 180 horsepower engine.

7.3 AIRFRAME

The basic airframe, except for a tubular steel engine mount, steel landing gear struts, and other miscellaneous steel parts, is of aluminum alloy construction. The extremities - the wing tips, the cowling, the tail surfaces - are of fiberglass or ABS thermoplastic. Aerobatics are prohibited in this airplane since the structure is not designed for aerobatic loads.

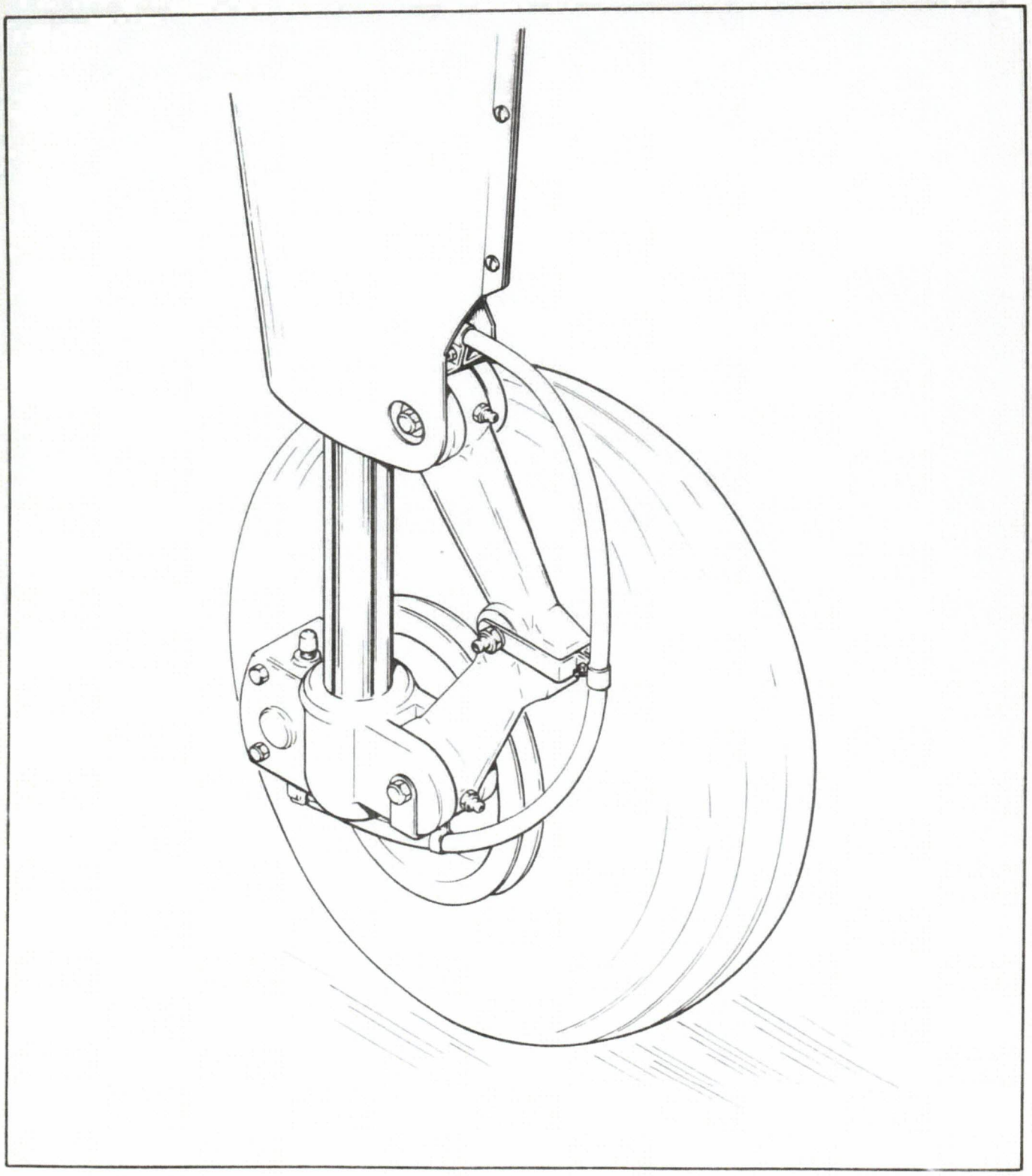
The semi-tapered wings have a laminar flow type NACA 65_2-415 airfoil. The wings are attached to each side of the fuselage by insertion of the butt ends of the respective main spars into a spar box carry-through which is an integral part of the fuselage structure, providing, in effect, a continuous main spar with splices at each side of the fuselage. There are also fore and aft attachments at the rear spar and at an auxiliary front spar.

7.5 ENGINE AND PROPELLER

The Cherokee 181 is powered by a Lycoming O-360-A4M four cylinder, direct drive, horizontally opposed engine rated at 180 horsepower at 2700 rpm. It is furnished with a starter, a 60 ampere, 14 volt alternator, a shielded ignition, vacuum pump drive, a fuel pump, and a dry, automotive type carburetor air filter.

The exhaust system is made entirely from stainless steel and is equipped with dual mufflers. A heater shroud around the mufflers is provided to supply heat for the cabin and windshield defrosting.

The Sensenich 76EM8S5-0-60 or 76EM8S5-0-62 fixed-pitch propeller is made from a one-piece alloy forging.



MAIN WHEEL ASSEMBLY

Figure 7-1

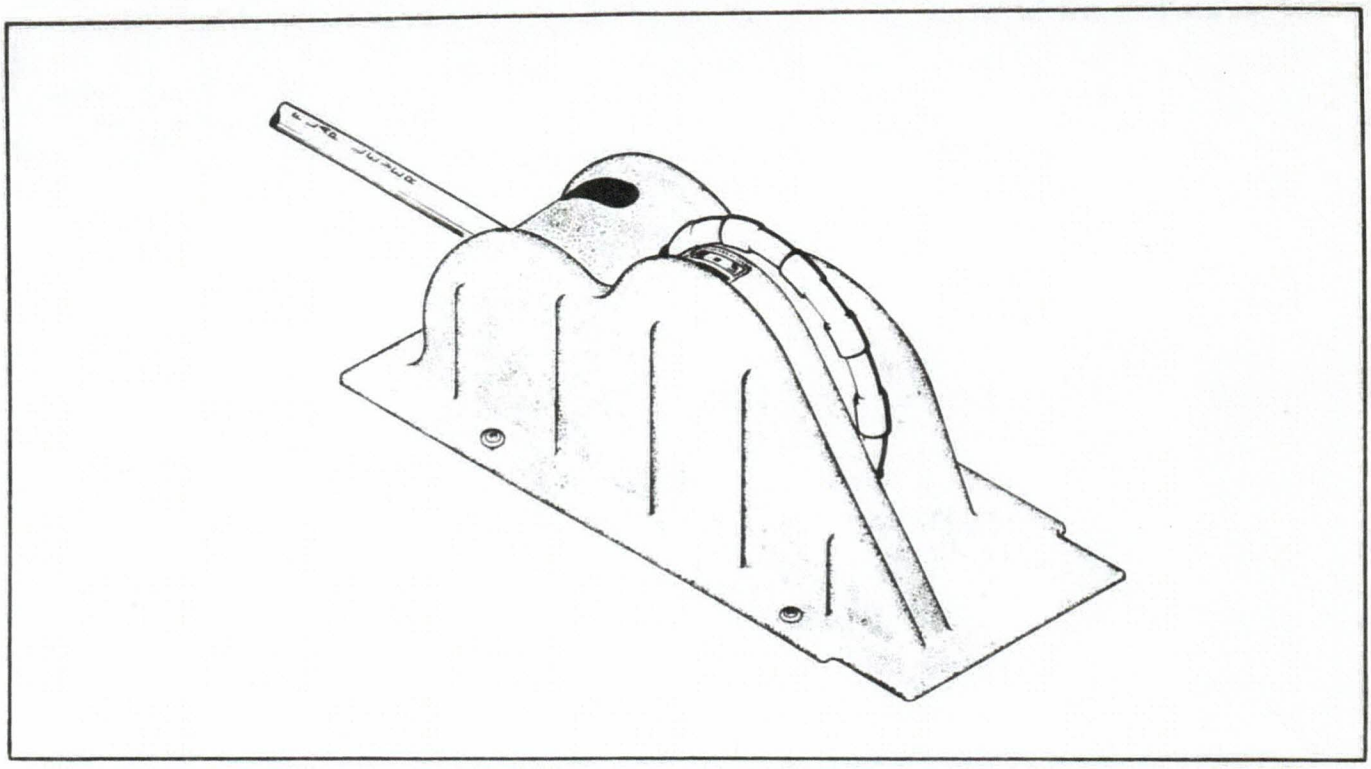
7.7 LANDING GEAR

The three landing gears use Cleveland 6.00 x 6 wheels, the main gear wheels (Figure 7-1) being provided with brake drums and Cleveland single disc hydraulic brake assemblies. All three wheels use 6.00 x 6, four-ply rating, Type III tires with tubes.

The nose gear is steerable through a 30 degree arc either side of center by use of the rudder pedals and brakes. A spring device incorporated in the rudder pedal torque tube assembly aids in rudder centering and provides rudder trim. The nose gear steering mechanism also incorporates a bungee assembly to reduce steering effort and to dampen shocks and bumps during taxiing. A shimmy dampener is included in the nose gear.

The three struts are of the air-oil type, with a normal extension of 3.25 inches for the nose gear and 4.50 inches for the main gear.

The standard brake system for this Cherokee consists of dual toe brakes attached to the rudder pedals and a hand lever and master cylinder located below and behind the left center of the instrument sub-panel. The toe brakes and the hand brake have their own brake cylinders, but they share a common reservoir. The brake fluid reservoir is installed on the top left front face of the fire wall. The parking brake is incorporated in the master cylinder and is actuated by pulling back on the brake lever, depressing the knob attached to the left side of the handle, and releasing the brake lever. To release the parking brake, pull back on the brake lever to disengage the catch mechanism and allow the handle to swing forward (refer to Figure 7-5).



FLIGHT CONTROL CONSOLE

Figure 7-3

7.9 FLIGHT CONTROLS

Dual controls are provided as standard equipment, with a cable system used between the controls and the surfaces. The horizontal tail (stabilator) is of the all-movable slab type with a trim tab mounted on the trailing edge of the stabilator to reduce the control system forces. This tab is actuated by a control wheel on the floor between the front seats (Figure 7-3).

A rudder trim adjustment is mounted on the right side of the pedestal below the throttle quadrant and permits directional trim as needed in flight (refer to Figure 7-5).

The flaps are manually operated and spring-loaded to return to the up position. A past-center lock incorporated in the actuating linkage holds the flap when it is in the up position so that it may be used as a step on the right side. The flap will not support a step load except when in the full up position, so it must be completely retracted when used as a step. The flaps have three extended positions, 10, 25 and 40 degrees.

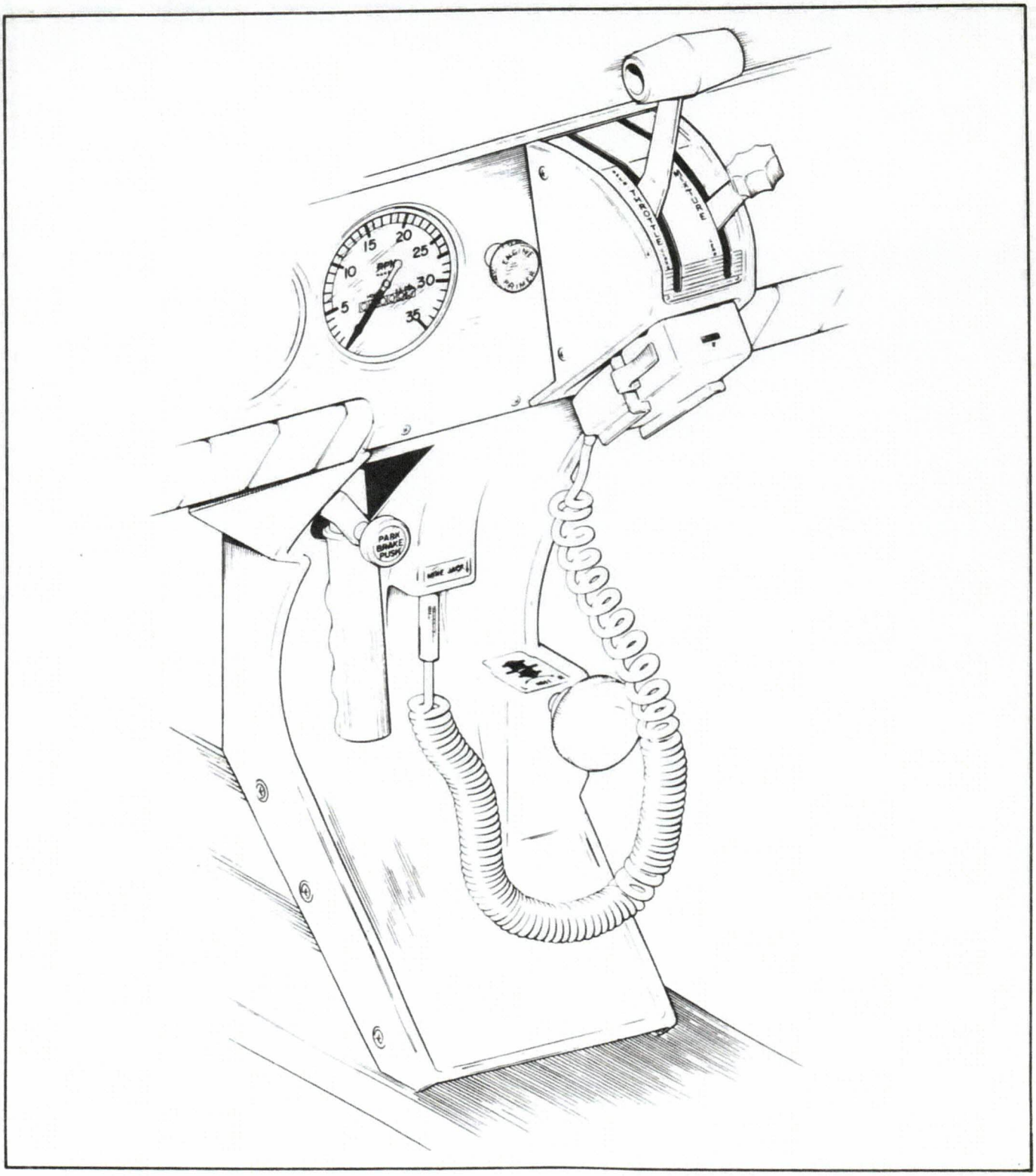
7.11 ENGINE CONTROLS

Engine controls consist of a throttle control and a mixture control lever. These controls are located on the control quadrant on the lower center of the instrument panel (Figure 7-5) 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 lever is used to adjust engine RPM. The mixture control lever is used to adjust the air to fuel ratio. The engine is shut down by the placing of the mixture control lever in the full lean position. In addition, the mixture control has a lock to prevent inadvertent activation of the mixture control. For information on the leaning procedure, see the Avco-Lycoming Operator's Manual.

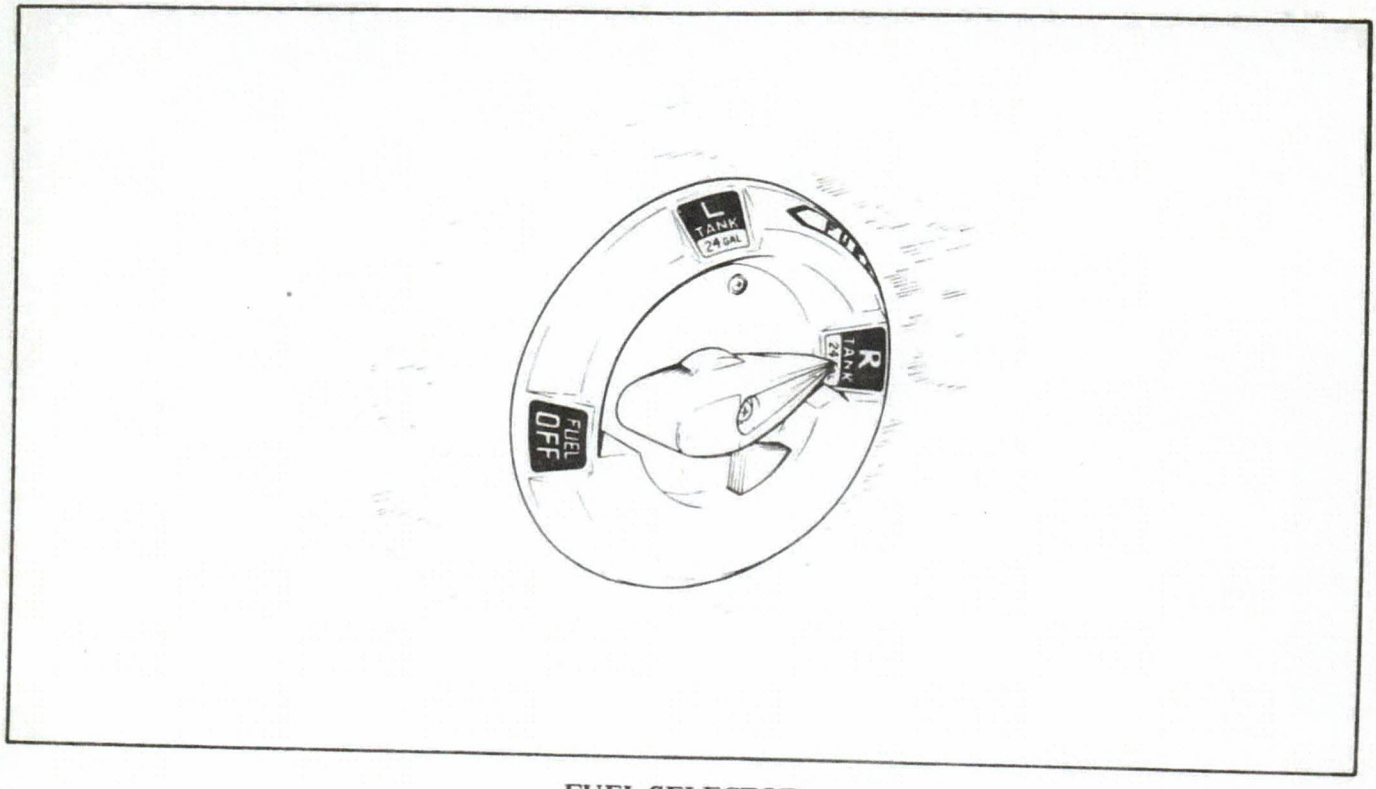
The friction adjustment lever on the right side of the control quadrant may be adjusted to increase or decrease the friction holding the throttle and mixture controls or to lock the controls in a selected position.

The carburetor heat control lever is located to the right of the control quadrant on the instrument panel. The control is placarded with two positions: "ON" (down), "OFF" (up).



CONTROL QUADRANT AND CONSOLE

Figure 7-5



FUEL SELECTOR

Figure 7-7

7.13 FUEL SYSTEM

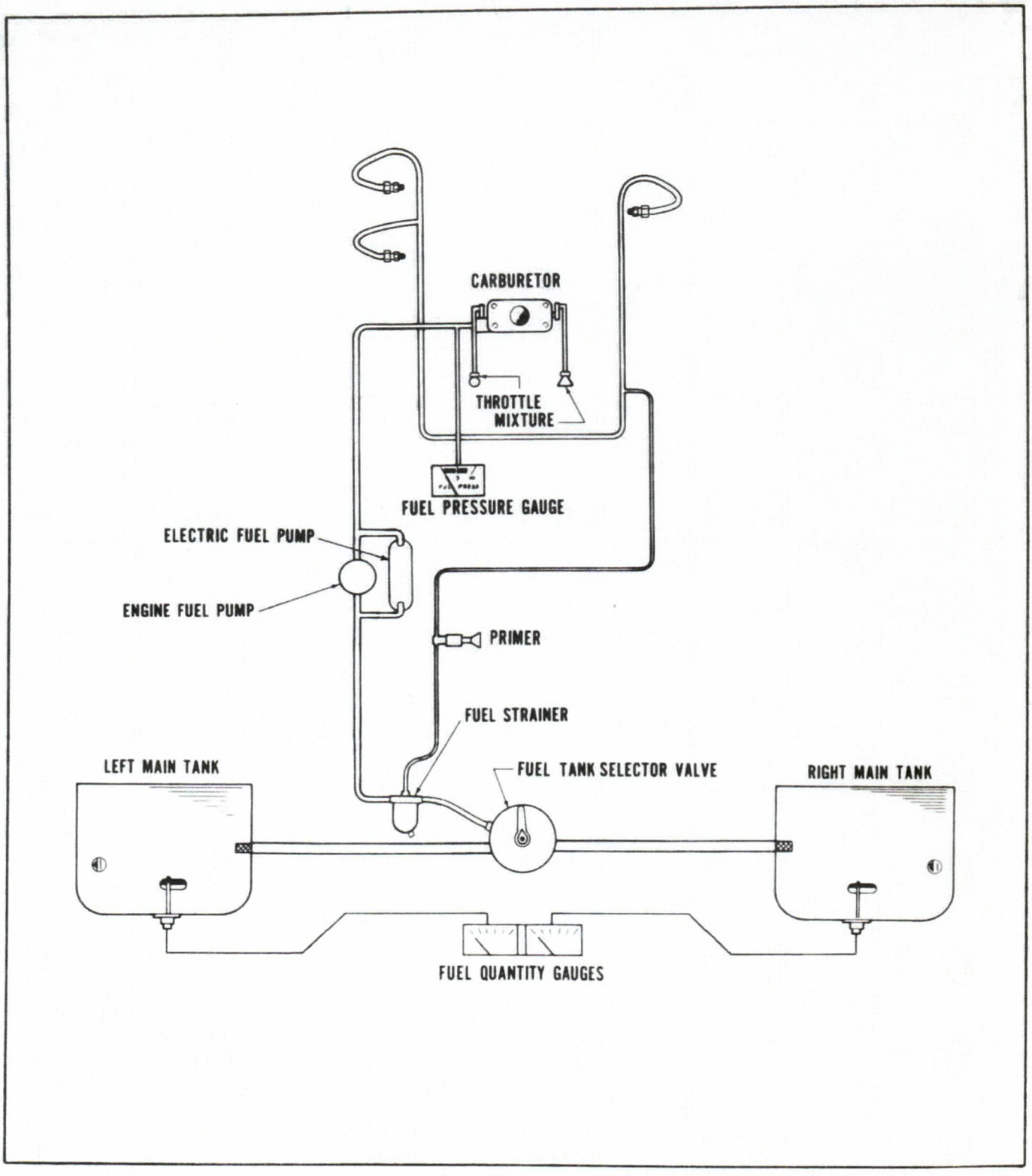
Fuel is stored in two twenty-five gallon (24 gallons usable) tanks which are secured to the leading edge structure of each wing by screws and nut plates.

The fuel selector control (Figure 7-7) is located on the left side-panel, forward of the pilot's seat. The button on the selector cover must be depressed and held while the handle is moved to the OFF position. The button releases automatically when the handle is moved back into the ON position.

An auxiliary electric fuel pump is provided in case of failure of the engine driven pump. The electric pump should be on for all takeoffs and landings, and when switching tanks. The pump switch is located in the switch panel above the throttle quadrant.

The fuel drains should be opened daily prior to first flight to check for water or sediment. Each tank has an individual drain at the bottom, inboard rear corner.

A fuel strainer, located on the lower left front of the fire wall, has a drain which is accessible from outside the nose section. The strainer should also be drained before the first flight of the day. Refer to paragraph 8.21 for the complete fuel draining procedure.



FUEL SYSTEM SCHEMATIC

Figure 7-9

Fuel quantity and pressure are indicated on gauges located in a cluster on the left side of the instrument panel.

An optional engine priming system is available to facilitate starting. The primer pump is located to the immediate left of the throttle quadrant (refer to Figure 7-5).

7.15 ELECTRICAL SYSTEM

The electrical system includes a 14-volt, 60 amp alternator, a 12-volt battery, a voltage regulator, an overvoltage relay and a master switch relay (Figure 7-11). The battery is mounted in a thermoplastic box immediately aft of the baggage compartment. The regulator and overvoltage relay are located on the forward left side of the fuselage behind the instrument panel.

Electrical switches are located on the right center instrument panel, and the circuit breakers are located on the lower right instrument panel. A rheostat switch on the left side of the switch panel controls the navigational lights and the radio lights. The similar switch on the right side controls and dims the panel lights.

Standard electrical accessories include a starter, electric fuel pump, stall warning indicator, cigar lighter, fuel gauge, ammeter, and annunciator panel.

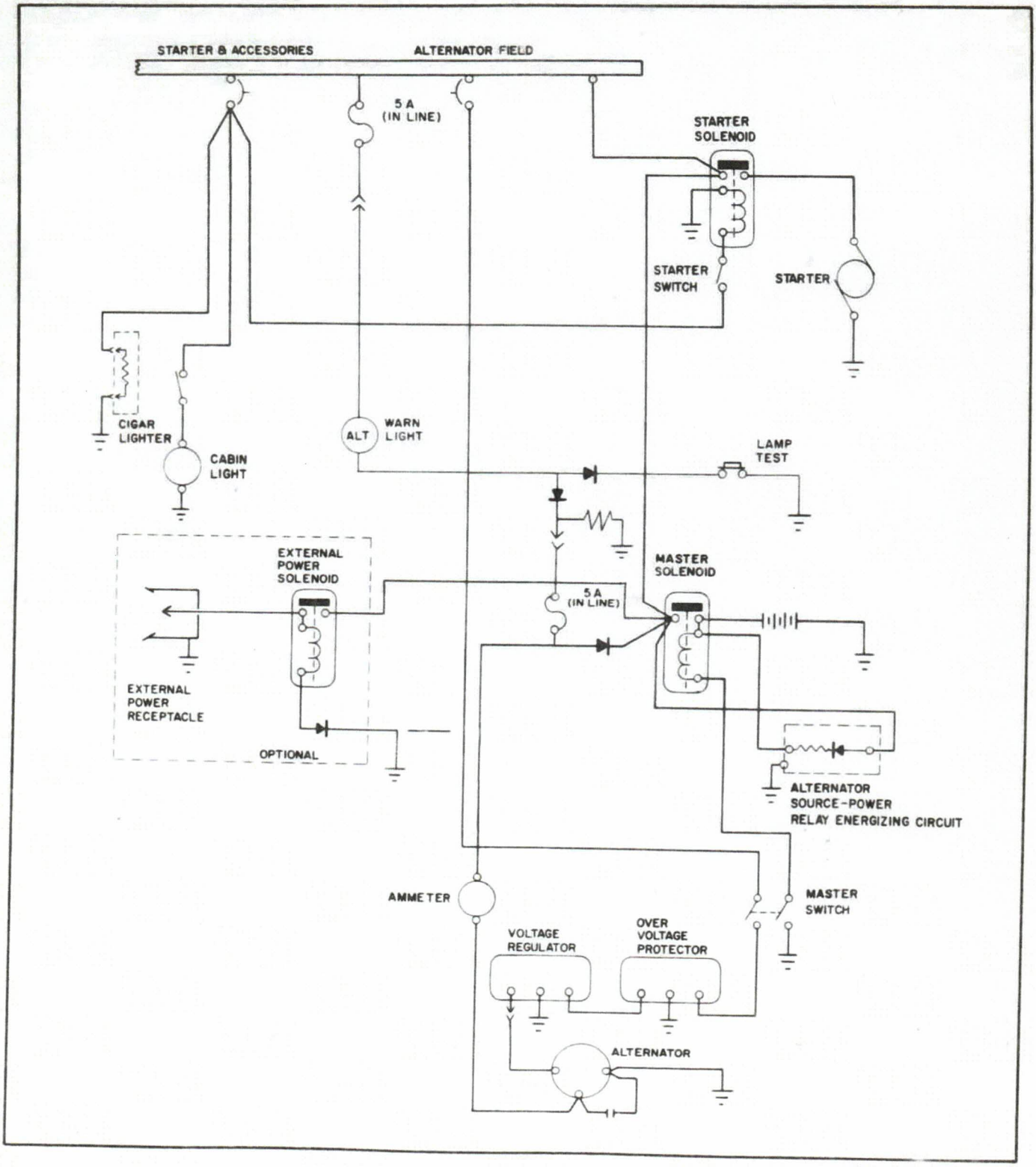
The annunciator panel includes alternator and low oil pressure indicator lights. When the optional gyro system is installed, the annunciator panel also includes a low vacuum indicator light. The annunciator panel lights are provided only as a warning to the pilot that a system may not be operating properly, and that he should check and monitor the applicable system gauge to determine when or if any necessary action is required.

Optional electrical accessories include navigation lights, anti-collision light, landing light, instrument lighting, and cabin dome light. Circuits will handle the addition of communications and navigational equipment.

The words "master switch" used hereafter in this manual indicate both sides of the switch; battery side "BAT" and alternator side "ALT" are to be depressed simultaneously to OFF or ON as directed.

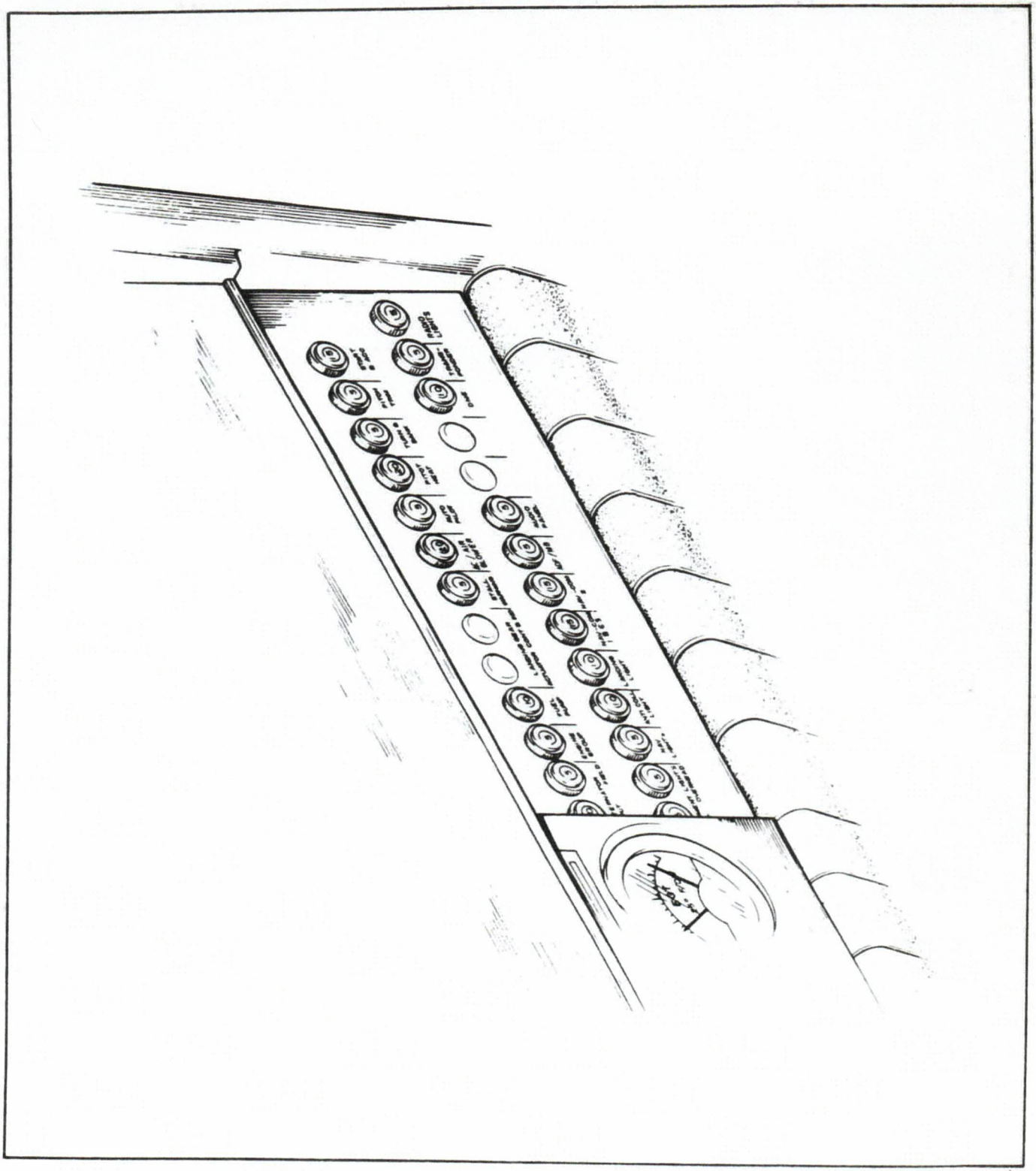
Unlike previous generator systems, the ammeter does not indicate battery discharge; rather it displays in amperes the load placed on the alternator. With all electrical equipment off (except master switch) the ammeter will be indicating the amount of charging current demanded by the battery. As each item of electrical equipment is turned on, the current will increase to a total appearing on the ammeter. This total includes the battery. The maximum continuous load for night flight, with radios on, is about 30 amperes. This 30 ampere value, plus approximately two amperes for a fully charged battery, will appear continuously under these flight conditions. The amount of current shown on the ammeter will tell immediately if the alternator system is operating normally, as the amount of current shown should equal the total amperage drawn by the equipment which is operating.

If no output is indicated on the ammeter during flight, reduce the electrical load by turning off all unnecessary electrical equipment. Check both 5 ampere field breaker and 60 ampere output breaker and reset if open. If neither circuit breaker is open, turn off the "ALT" switch for 1 second to reset the overvoltage relay. If ammeter continues to indicate no output, maintain minimum electrical load and terminate flight as soon as practical.



ALTERNATOR AND STARTER SCHEMATIC

Figure 7-11



CIRCUIT BREAKER PANEL

Figure 7-13

7.17 VACUUM SYSTEM

The vacuum system is designed to operate the air driven gyro instruments. This includes the directional and attitude gyros when installed. The system consists of an engine driven vacuum pump, a vacuum regulator, a filter and the necessary plumbing.

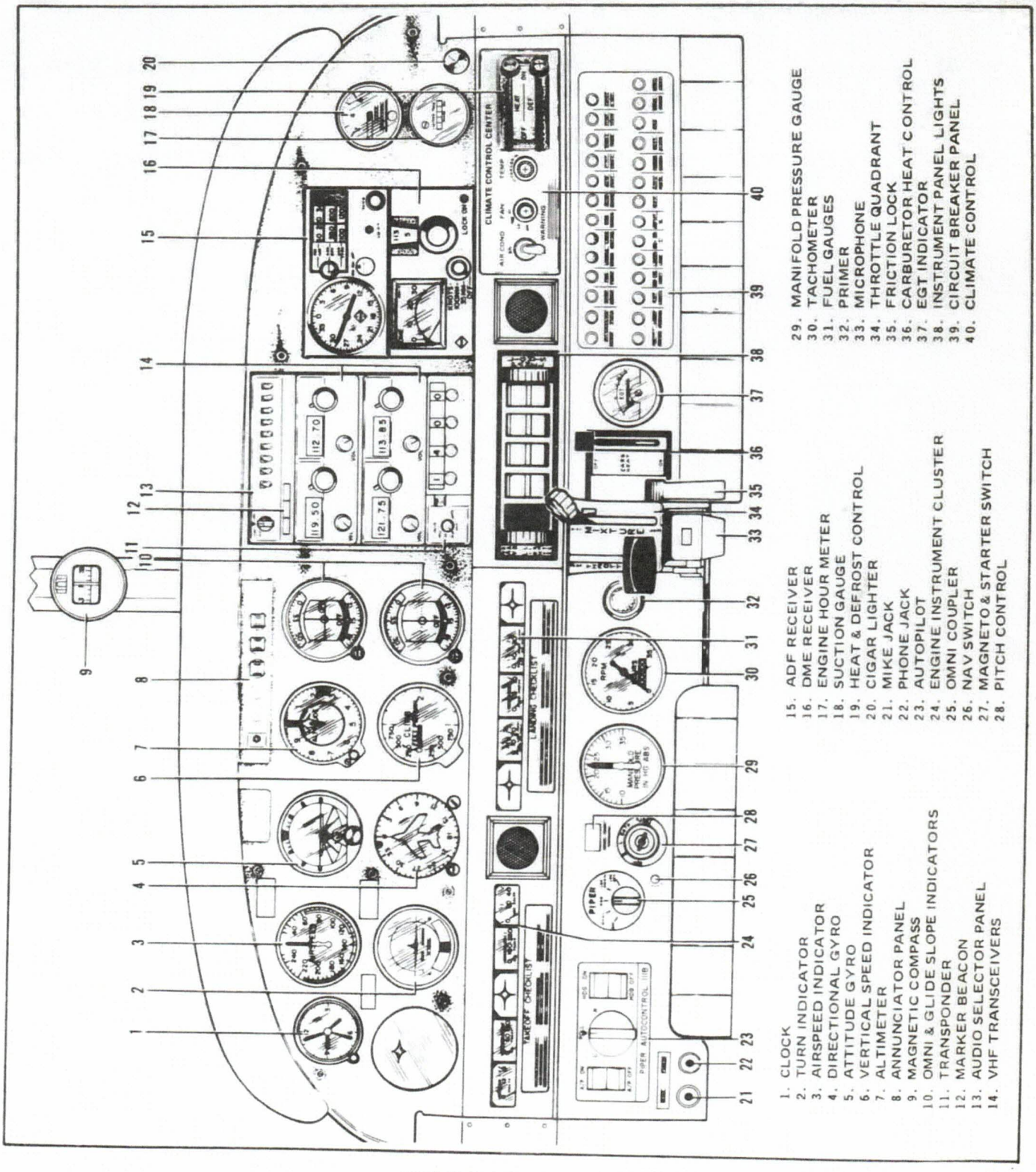
The vacuum pump is a dry type pump which eliminates the need for an air/oil separator and its plumbing. A shear drive protects the pump from damage. If the drive shears, the gyros will become inoperative.

The vacuum gauge, mounted on the right instrument panel to the right of the radios, 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 (a low vacuum indicator light is provided in the annunciator panel). 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 5.0 ± .1 inches of mercury, 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 behind the instrument panel and is accessible from below the instrument panel.

7.19 INSTRUMENT PANEL

The instrument panel (Figure 7-15) of the Cherokee is designed to accommodate the customary advanced flight instruments and the normally required power plant instruments. The artificial horizon and directional gyro are vacuum operated through use of a vacuum pump installed on the engine, while the turn and bank instrument is electrically operated. A vacuum gauge is mounted on the far right side of the instrument panel. The radios and circuit breakers are on the right hand instrument panel. Extra circuits are provided for the addition of optional radio equipment. An annunciator panel is mounted in the upper instrument panel to warn the pilot of a possible malfunction in the alternator, oil pressure, or vacuum systems.



INSTRUMENT PANEL

Figure 7-15

7.21 PITOT-STATIC SYSTEM

The system supplies both pitot and static pressure for the airspeed indicator, altimeter, and the optional vertical speed indicator (Figure 7-17).

Pitot and static pressure are picked up by a pitot head installed on the bottom of the left wing and carried through pitot and static lines within the wing and fuselage to the gauges on the instrument panel.

An alternate static source is available as optional equipment. The control valve is located below the left side of the instrument panel. When the valve is set in the alternate position, the altimeter, vertical speed indicator and airspeed indicator will be using cabin air for static pressure. The storm window and cabin vents must be closed and the cabin heater and defroster must be on during alternate static source operation. The altimeter error is less than 50 feet unless otherwise placarded.

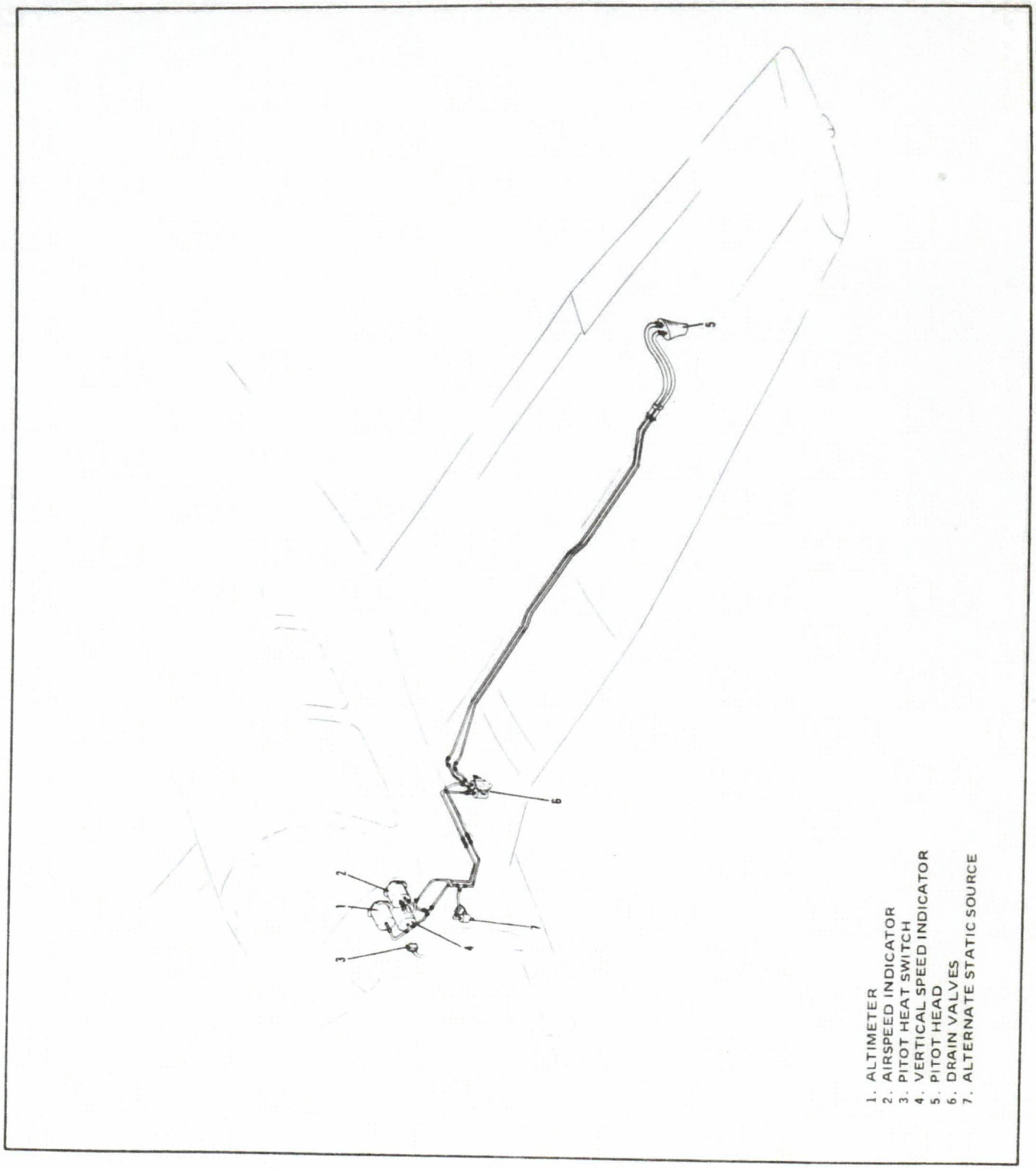
Both the pitot and static lines can be drained through separate drain valves located on the left lower side of the fuselage interior.

A heated pitot head, which alleviates problems with icing and heavy rain, is available as optional equipment. The switch for the heated pitot head is located on the electrical switch panel to the left of the right control wheel.

To prevent bugs and water from entering the pitot and static pressure holes, a cover should be placed over the pitot head. A partially or completely blocked pitot head will give erratic or zero readings on the instruments.

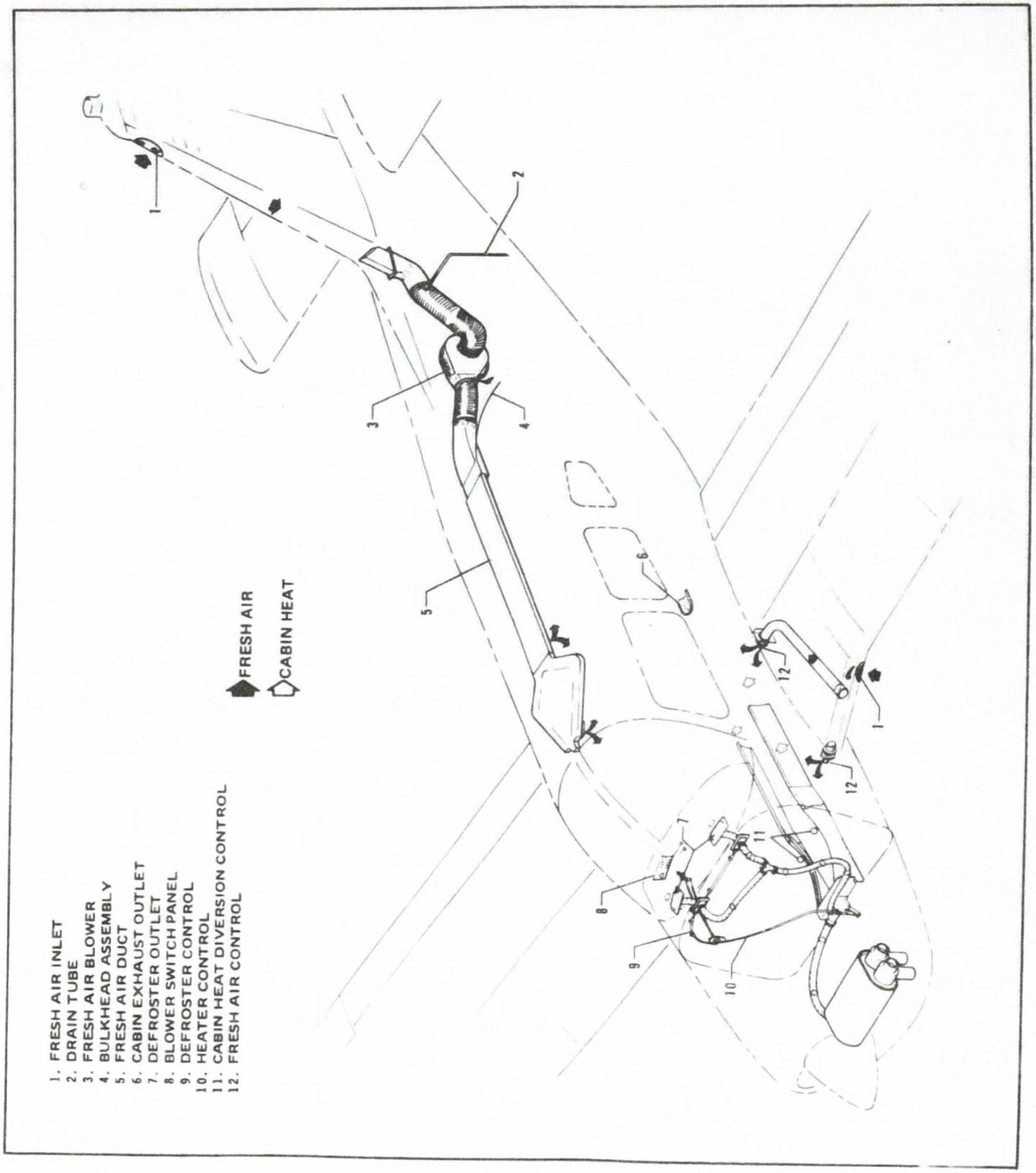
NOTE

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



PITOT-STATIC SYSTEM

Figure 7-17



HEATING AND VENTILATING SYSTEM

Figure 7-19

7.23 HEATING AND VENTILATING SYSTEM

Heat for the cabin interior and the defroster system is provided by a heater muff attached to the exhaust system (Figure 7-19). The amount of heat desired can be regulated with the controls located on the far right side of the instrument panel.

The air flow can be regulated between the front and rear seats by levers located on top of the heat ducts next to the console.

Fresh air inlets are located in the leading edge of the wing near the fuselage. An adjustable outlet is located on the side of the cabin near the floor at each seat location; overhead air outlets are offered as optional equipment. Air is exhausted through an outlet under the rear seat. A cabin air blower, incorporated in the ventilating system, is also available as optional equipment. An optional overhead ventilating system with a cabin air blower is available on models without air conditioning. This blower is operated by a "FAN" switch with 4 positions - "OFF," "LOW," "MED," or "HIGH."

CAUTION

When cabin heat is operated, heat duct surface becomes hot. This could result in burns if arms or legs are placed too close to heat duct outlets or surface.

7.25 CABIN FEATURES

For ease of entry and exit and pilot-passenger comfort, the front seats are adjustable fore and aft. The rear seats may be removed to provide room for bulky items. Rear seat installations incorporate leg retainers with latching mechanisms which must be released before the rear seats can be removed. Releasing the retainers is accomplished on earlier models by turning the latching mechanisms 90° with a coin or screwdriver. Releasing the retainers is accomplished on later models by depressing the plunger behind each rear leg. Armrests are also provided for the front seats. All seats are available with optional headrests and optional vertical adjustment may be added to the front seats.

The cabin interior includes a pilot storm window, two sun visors, ash trays, two map pockets, and pockets on the backs of each front seat.

A single strap shoulder harness controlled by an inertia reel is standard equipment for the front seats, and is offered as an option for the rear seats. The shoulder strap is routed over the shoulder adjacent to the windows and attached to the lap belt in the general area of the person's inboard hip.

A check of the inertia reel mechanism is made by pulling sharply on the strap. The reel will lock in place under this test and prevent the strap from extending. Under normal movement the strap will extend and retract as required.

7.27 BAGGAGE AREA

A 24 cubic foot baggage area, located behind the rear seats, is accessible either from the cabin or through an outside baggage door on the right side of the aircraft. Maximum capacity is 200 pounds. Tie-down straps are provided and should be used at all times.

NOTE

It is the pilot's responsibility to be sure when the baggage is loaded that the aircraft C.G. falls within the allowable C.G. Range (refer to Section 6 - Weight and Balance).

7.29 STALL WARNING

An approaching stall is indicated by a stall warning horn which is activated between five and ten knots above stall speed. Mild airframe buffeting and gentle pitching may also precede the stall. Stall speeds are shown on graphs in the Performance Section. The stall warning horn emits a continuous sound and is activated by a lift detector installed on the leading edge of the left wing. During preflight, the stall warning system should be checked by turning the master switch "ON," lifting the detector and checking to determine if the horn is actuated.

7.31 FINISH

All exterior surfaces are primed with etching primer and finished with acrylic lacquer. To keep a new look, economy size "Touch-Up" spray paint cans are available from Piper Dealers.

7.33 AIR CONDITIONING*

The air conditioning system is a recirculating air system. The major items include: evaporator, condenser, compressor, blower, switches and temperature controls.

The evaporator is located behind the left rear side of the baggage compartment. This cools the air that is used for air conditioning.

The condenser is mounted on a retractable scoop located on the bottom of the fuselage and to the rear of the baggage compartment area. The scoop extends when the air conditioner is "ON" and retracts to a flush position when the system is "OFF."

The compressor is mounted on the forward right underside of the engine. It has an electric clutch which automatically engages or disengages the compressor to the belt drive system of the compressor.

An electrical blower is mounted on the aft side of the rear cabin panel. 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 in the climate control center panel. The temperature control regulates the desired temperature of the cabin. Turn the control clockwise for increased cooling, counterclockwise for decreased cooling.

Located inboard of the temperature control is the fan speed switch and the air conditioning "ON-OFF" switch. The fan can be operated independently of the air conditioning. However, it 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 cabin air circulation if desired. A "LOW," "MED" or "HIGH" flow of air can be selected to the air conditioner outlets located in the overhead duct. The outlets can be adjusted or turned off by each occupant to regulate individual cooling effect.

The "DOOR OPEN" indicator light is located to the left of the radio stack in front of the pilot. The light illuminates whenever the condenser door is open and remains on until the door is closed.

A circuit breaker located on the circuit breaker panel protects the air conditioning electrical system.

Whenever the throttle is in the full throttle position, it actuates a micro switch which disengages the compressor and retracts the scoop. This is done to obtain maximum power and maximum rate of climb. The fan continues to operate and the air will remain cool for approximately one minute. When the throttle is retarded approximately 1/4 inch, the clutch will engage and the scoop will extend, again supplying cool, dry air.

*Optional equipment

7.35 PIPER EXTERNAL POWER*

An optional starting installation known as Piper External Power (PEP) is accessible through a receptacle located on the right side of the fuselage aft of the wing. An external battery can be connected to the socket, thus allowing the operator to crank the engine without having to gain access to the airplane's battery.

7.37 EMERGENCY LOCATOR TRANSMITTER*

The Emergency Locator Transmitter (ELT) when installed, 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 three slotted-head nylon screws for ease of removal; these screws may be readily removed with a variety of common items such as a dime, a key, a knife blade, etc. If there are no tools available in an emergency the screw heads may be broken off by any means. The ELT is an emergency locator transmitter which meets the requirements of FAR 91.52. The unit operates on a self-contained battery.

The battery has a useful life of 10 years. However, to comply with FAA regulations it must be replaced after 5 years of shelf life or service life. The battery should also be replaced if the transmitter has been used in an emergency situation or if accumulated test time exceeds one hour. The replacement date is marked on the transmitter label.

On the unit itself is a three position selector switch placarded "OFF," "ARM" and "ON." The "ARM" position is provided to set the unit to the automatic position so that it will transmit only after impact and will continue to transmit until the battery is drained to depletion or until the switch is manually moved to the "OFF" position. The "ARM" 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. The "ON" position is provided so the unit can be used as a portable transmitter or in the event the automatic feature was not triggered by impact or to periodically test the function of the transmitter.

Select the "OFF" position when changing the battery, when rearming the unit if it has been activated for any reason, or to discontinue transmission.

NOTE

If the switch has been placed in the "ON" position for any reason, the "OFF" position has to be selected before selecting "ARM." If "ARM" is selected directly from the "ON" position, the unit will continue to transmit in the "ARM" position.

*Optional equipment

A pilot's remote switch, located on the left side panel, is provided to allow the transmitter to be controlled from inside the cabin. The pilot's remote switch is placarded "ON, AUTO/ARM and OFF/RESET." The switch is normally left in the "AUTO/ARM" position. To turn the transmitter off, move the switch momentarily to the "OFF/RESET" position. The aircraft master switch must be "ON" to turn the transmitter "OFF." To actuate the transmitter for tests or other reasons, move the switch upward to the "ON" position and leave it in that position as long as transmission is desired.

The unit is equipped with a portable antenna to allow the locator to be removed from the airplane in case of an emergency and used as a portable signal transmitter.

The locator should be checked during the ground check to make certain the unit has not been accidentally activated. Check by tuning a radio receiver to 121.5 MHz. If there is an oscillating sound, the locator may have been activated and should be turned off immediately. Reset to the "ARM" position and check again to insure against outside interference.

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 tests must be made at any other time, the tests should be coordinated with the nearest FAA tower or flight service station.

SECTION 8 - AIRPLANE HANDLING, SERVICE & MAINTENANCE

TABLE OF CONTENTS

SECTION 8

AIRPLANE HANDLING, SERVICING AND MAINTENANCE

SECTION 8

AIRPLANE HANDLING, SERVICING, AND MAINTENANCE

8.1 GENERAL

This section provides general guidelines relating to the handling, servicing, and maintenance of the Archer II. For complete maintenance instructions, refer to the PA-28 Service Manual.

Every owner should stay in close contact with an authorized Piper Service Center or Piper's Customer Services Department to obtain the latest information pertaining to their airplane, and to avail themselves of Piper Aircraft's support systems.

Piper Aircraft Corporation 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 Aircraft, 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.

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.

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 Aircraft Corporation 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 Services Department.

Service manuals, parts catalogs, and revisions to both, are available from Piper Service Centers or Piper's Customer Services Department.

Any correspondence regarding the airplane should include the airplane model and serial number to ensure proper response.

8.3 AIRPLANE INSPECTION PERIODS

Piper Aircraft Corporation has developed inspection items and required inspection intervals for the PA-28 (see PA-28 Service and Inspection Manuals). The PA-28 Service Manual contains appropriate forms, and all inspection procedures should be complied with by a properly trained, knowledgeable, and qualified mechanic at an authorized Piper Service Center or a reputable repair shop. Piper Aircraft Corporation 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 Aircraft Corporation, instructions issued by the engine, propeller, or accessory manufacturers, or Airworthiness Directives issued by the FAA.

A Progressive Inspection, approved by the Federal Aviation Administration (FAA), is also available to the owner. This involves routine and detailed inspections to allow maximum utilization of the airplane. Maintenance inspection costs are reduced, and the maximum standard of continued airworthiness is maintained. Complete details are available from Piper Aircraft Corporation.

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 spectrographic analysis of the engine oil is available from several sources. This inspection, if performed properly, provides a good check of the internal condition of the engine. To be accurate, induction air filters must be cleaned or changed regularly, and oil samples must be taken and sent in at regular intervals.

8.5 PREVENTIVE MAINTENANCE

The holder of a pilot certificate issued under Federal Aviation Regulations (FAR) Part 61 may perform certain preventive maintenance as defined in the FARs. This maintenance may be performed only on an aircraft which the pilot owns and operates, and which is not used in air carrier or air taxi/commercial operations service.

All other aircraft maintenance must be accomplished by a person or facility appropriately certificated by the Federal Aviation Administration (FAA) to perform that work.

Anytime maintenance is accomplished, an entry must be made in the appropriate aircraft maintenance records. The entry shall include:

(1) The date the work was accomplished.
(2) Description of the work.
(3) Number of hours on the aircraft.
(4) The certificate number of pilot performing the work.
(5) 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.
  (3) Aircraft Radio Station License if transmitters are installed.

(b) To be carried in the aircraft at all times:
  (1) Pilot's Operating Handbook.
  (2) Weight and Balance data plus a copy of the latest Repair and Alteration Form FAA-337, if applicable.
  (3) Aircraft equipment list.

Although the aircraft and engine logbooks are not required to be in the aircraft, they should be made available upon request. Logbooks should be complete and up to date. Good records will reduce maintenance cost by giving the mechanic information about what has or has not been accomplished.

8.9 GROUND HANDLING

(a) Towing

The airplane may be moved on the ground by the use of the nose wheel steering bar that is stowed below the forward ledge of the baggage compartment or by power equipment that will not damage or excessively strain the nose gear steering assembly. Towing lugs are incorporated as part of the nose gear fork.

CAUTION

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.

CAUTION

Do not tow the airplane when the controls are secured.

In the event towing lines are necessary, ropes should be attached to both main gear struts as high up on the tubes as possible. Lines should be long enough to clear the nose and/or tail by not less than fifteen feet, and a qualified person should ride in the pilot's seat to maintain control by use of the brakes.

(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, power should be applied to start the taxi roll, and the following checks should be performed:

(1) Taxi a few feet forward and apply the brakes to determine their effectiveness.
(2) While taxiing, make slight turns to ascertain the effectiveness of the steering.
(3) Observe wing clearance when taxiing near buildings or other stationary objects. If possible, station an observer outside the airplane.
(4) When taxiing over uneven ground, avoid holes and ruts.
(5) 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) Set the parking brake by pulling back on the brake lever and depressing the knob on the handle. To release the parking brake, pull back on the handle until the catch disengages; then allow the handle to swing forward.

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 AIR FILTER

(a) Removing Engine Air Filter

(1) Remove the lower cowl.
(2) Remove the wing nuts securing the filter. Remove the filter.

(b) Cleaning Engine Air Filter

The induction air filter must be cleaned at least once every 50 hours, and more often, even daily, when operating in dusty conditions. Extra filters are inexpensive, and a spare should be kept on hand for use as a rapid replacement.

To clean the filter:
(1) Tap the filter gently to remove dirt particles, being careful not to damage the filter. DO NOT wash the filter in any liquid. DO NOT attempt to blow out dirt with compressed air.
(2) If the filter is excessively dirty or shows any damage, replace it immediately.
(3) Wipe the filter housing with a clean cloth and install the filter. The usable life of the filter should be restricted to one year or 500 hours, whichever comes first.

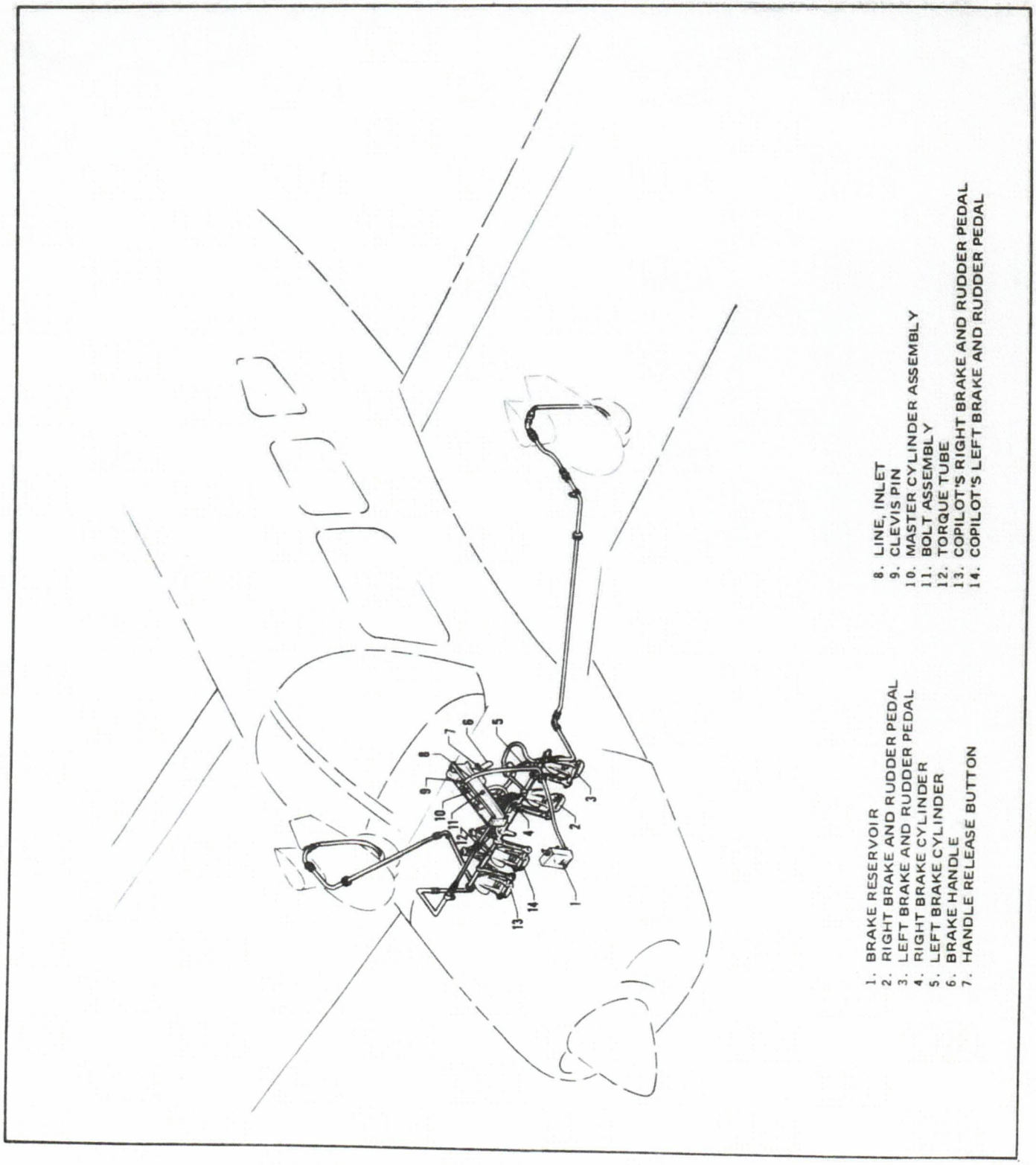
(c) Installation Of Engine Air Filter

After cleaning or when replacing the filter, install the filter in the reverse order of removal.

8.13 BRAKE SERVICE

The brake system is filled with MIL-H-5606 (petroleum base) hydraulic brake fluid. The fluid level should be checked periodically or at every 50 hour inspection and replenished when necessary. The brake reservoir is located on the fire wall in the engine compartment. If the entire system must be refilled, fill with fluid under pressure from the brake end of the system. This will eliminate air from the system.

No adjustment of the brake clearances is necessary. If after extended service brake blocks become excessively worn, they should be replaced with new segments.



BRAKE SYSTEM

Figure 8-1

8.15 LANDING GEAR SERVICE

The three landing gears use Cleveland Aircraft Products 6.00 x 6, four-ply rating, type III tires and tubes. (Refer to paragraph 8.23.)

Wheels are removed by taking off the hub cap, cotter pin, axle nut, and the two bolts holding the brake segment in place. Mark tire and wheel for reinstallation; then dismount by deflating the tire, removing the three through-bolts from the wheel and separating the wheel halves.

Landing gear oleos on the Cherokee Archer II should be serviced according to the instructions on the units. The main oleos should be extended under normal static load until 4.50 ± .25 inches of oleo piston tube is exposed, and the nose gear should show 3.25 ± .25 inches. Should the strut exposure be below that required, it should be determined whether air or oil is required by first raising the airplane on jacks. Depress the valve core to allow air to escape from the strut housing chamber. Remove the filler plug and slowly raise the strut to full compression. If the strut has sufficient fluid, it will be visible up to the bottom of the filler plug hole and will then require only proper inflation.

Should fluid be below the bottom of the filler plug hole, oil should be added. Replace the plug with valve core removed; attach a clear plastic hose to the valve stem of the filler plug and submerge the other end in a container of hydraulic fluid. Fully compress and extend the strut several times, thus drawing fluid from the container and expelling air from the strut chamber. To allow fluid to enter the bottom chamber of the main gear strut housing, the torque link assembly must be disconnected to let the strut be extended a minimum of 10 inches (the nose gear torque links need not be disconnected). Do not allow the strut to extend more than 12 inches. When air bubbles cease to flow through the hose, compress the strut fully and again check fluid level. Reinstall the valve core and filler plug, and the main gear torque links, if disconnected.

With fluid in the strut housing at the correct level, attach a strut pump to the air valve and with the airplane on the ground, inflate the oleo strut to the correct height.

In jacking the aircraft for landing gear or other service, two hydraulic jacks and a tail stand should be used. At least 250 pounds of ballast should be placed on the base of the tail stand before the airplane is jacked up. The hydraulic jacks should be placed under the jack points on the bottom of the wing and the airplane jacked up until the tail skid is at the right height to attach the tail stand. After the tail stand is attached and the ballast added, jacking may be continued until the airplane is at the height desired.

The steering arms from the rudder pedals to the nose wheel are adjusted at the nose wheel by turning the threaded rod end bearings in or out. Adjustment is normally accomplished at the forward end of the rods and should be done in such a way that the nose wheel is in line with the fore and aft axis of the plane when the rudder pedals and rudder are centered. Alignment of the nose wheel can be checked by pushing the airplane back and forth with the rudder centered to determine that the plane follows a perfectly straight line. The turning arc of the nose wheel is 30.0° ± 2° in either direction and is limited by stops on the bottom of the forging.

The rudder pedal arm stops should be carefully adjusted so that the pedal arms contact the stops just after the rudder hits its stops. This guarantees that the rudder will be allowed to move through its full travel.

8.17 PROPELLER SERVICE

The spinner and backing plate should be frequently cleaned and inspected for cracks. Before each flight the propeller should be inspected for nicks, scratches, and 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, the surface should be cleaned and waxed periodically.

8.19 OIL REQUIREMENTS

The oil capacity of the engine is 8 quarts and the minimum safe quantity is 2 quarts. It is recommended that engine oil be drained and renewed every 50 hours. The oil filter element should be changed every 50 hours of operation. The interval between oil and oil filter changes should not exceed a total of four (4) months. Under unfavorable dusty conditions, the oil and oil filter should be changed more frequently.

It is recommended that single or multi viscosity aviation grade oils in accordance with latest issue of Textron Lycoming Service Instruction 1014 be used. The following seasonal aviation oil grades and seasonal ambient temperature ranges are recommended:

Average Ambient Air Temperature For Starting	MIL-L-6082B Mineral SAE Grade	MIL-L-22851 Ashless Dispersant SAE Grades
All Temperatures	--	15W-50 or 20W-50
Above 80°F	60	60
Above 60°F	50	40 or 50
30°F to 90°F	40	40
0°F to 70°F	30	30, 40 or 20W-40
0°F to 90°F	20W-50	20W-50 or 15W-50
Below 10°F	20	30 or 20W-30

When operating temperatures overlap indicated ranges, use the lighter grade oil.

NOTE

Refer to the latest issue of Textron Lycoming Service Instruction 1014 (Lubricating Oil Recommendations) for further information.

8.21 FUEL SYSTEM

(a) Servicing Fuel System

Refer to the PA-28 Cherokee Service Manual and Periodic Inspection Report for fuel system servicing and inspection.

(b) Fuel Requirements (AVGAS ONLY)

Aviation grade fuel with a minimum octane of 100/130 must be used in this airplane. Since the use of lower grades can cause serious damage in a short period of time, the engine warranty is invalidated by the use of lower octanes. Refer to the latest issue of Lycoming Service Instruction No. 1070 for alternate fuels and additional information.

A summary of the 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-5572F)		
Grade	Color	Max. TEL ml/U.S. gal.	Grade	Color	Max. TEL ml/U.S. gal.	Grade	Color	Max. TEL ml/U.S. gal.
80/87	red	0.5	80	red	0.5	80/87	red	0.5
91/96	blue	2.0	*100LL	blue	2.0	none	none	none
100/130	green	3.0	100	green	**3.0	100/130	blue	2.0
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 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 reflect the specification MIL-I 27686, must be uniformally blended with the fuel while refueling, must not exceed .15% by volume of the refueled quantity, and to ensure its effectiveness must be blended at not less than .10% by volume. One and one half liquid ozs. per ten gallons of fuel would fall within this range. A blender supplied by the additive manufacturer should be used. Except for the information contained in this section, the manufacturer's mixing or blending instructions should be carefully followed.

CAUTIONS

Assure that the additive is directed into the flowing fuel stream. The additive flow should start after the stop before the fuel flow. Do not permit the concentrated additive to come in contact with the aircraft painted surfaces or the interior surfaces of the fuel tanks.

Some fuels have anti-icing additives preblended in the fuel at the refinery, so no further blending should be performed.

(e) Draining Fuel System

The bulk of the fuel may be drained from the system by opening the valve at the inboard end of each fuel tank. Push up on the arms of the drain valve and turn counterclockwise to hold the drain open. The remaining fuel in the system may be drained through the filter bowl. Any individual tank may be drained by closing the selector valve and then draining the desired tank.

8.23 TIRE INFLATION

For maximum service from the tires, keep them inflated to the proper pressures - 18 psi for the nose gear and 24 psi for the main gear. All wheels and tires are balanced before original installation, and the relationship of tire, tube and wheel should be maintained upon reinstallation. Unbalanced wheels can cause extreme vibration in the landing gear; therefore, in the installation of new components, it may be necessary to rebalance the wheels with the tires mounted. When checking tire pressure, examine the tires for wear, cuts, bruises, and slippage.

8.25 BATTERY SERVICE

Access to the 12-volt battery is through an access panel at the right rear side of the baggage compartment. The battery box has a plastic tube which is normally closed off with a cap and which should be opened occasionally to drain off any accumulation of liquid. The battery should be checked for proper fluid level. DO NOT fill the battery above the baffle plates. DO NOT fill the battery with acid - use water only. A hydrometer check will determine the percent of charge in the battery.

If the battery is not up to charge, recharge starting at a 4 amp rate and finishing with a 2 amp rate. Quick charges are not recommended.

8.27 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.

(2) With the engine cowling removed, spray or brush the engine with solvent or a mixture of solvent and degreaser. In order to remove especially heavy dirt and grease deposits, it may be necessary to brush areas that were sprayed.

CAUTION

Do not spray solvent into the alternator, vacuum pump, starter, or air intakes.

(3) Allow the solvent to remain on the engine from five to ten minutes. Then rinse the engine clean with additional solvent and allow it to dry.

CAUTION

Do not operate the engine until excess solvent has evaporated or otherwise been removed.

(4) Remove the protective tape from the magnetos.
(5) Lubricate the controls, bearing surfaces, etc., in accordance with the Lubrication Chart.

(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.

(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 tetrachoride, 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 Carpets

To clean carpets, first remove loose dirt with a whisk broom or vacuum. For soiled spots and stubborn stains use a noninflammable dry cleaning fluid. Floor carpets may be removed and cleaned like any household carpet.

8.29 COLD WEATHER OPERATION

For cold weather operation a winterization plate is installed on the inlet opening of the oil cooler duct on the right rear engine baffle. This plate should be installed whenever the ambient temperature reaches 50° F or less. The plate should be removed and stored in the cockpit when the ambient temperature exceeds 50° F

It is recommended that an optional Engine Breather Tube Winterization Kit be installed for cold weather operation. This kit is available through your Piper Dealer/Distributor.

SECTION 9 - SUPPLEMENTS

TABLE OF CONTENTS

SECTION 9

SUPPLEMENTS

SECTION 9

SUPPLEMENTS

9.1 GENERAL

This section provides information in the form of Supplements which are necessary for efficient operation of the airplane when equipped with one or more of the various optional systems and equipment not provided with the standard airplane.

All of the Supplements provided by this section are "FAA Approved" and consecutively numbered as a permanent part of this Handbook. The information contained in each Supplement applies only when the related equipment is installed in the airplane.

SUPPLEMENT 1

AIR CONDITIONING INSTALLATION

SECTION 1 - GENERAL

This supplement supplies information necessary for the efficient operation of the airplane when the optional air conditioning system is installed. The information contained within this supplement is to be used "as described" in conjunction with the complete handbook.

This supplement has been "FAA Approved" as a permanent part of this handbook and must remain in this handbook at all times when the optional air conditioning system is installed.

SECTION 2 - LIMITATIONS

(a) To insure 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 TO INSURE
NORMAL TAKEOFF CLIMB PERFORMANCE."

In full view of the pilot, to the right of the engine gauges (condenser door light):

"AIR COND DOOR
OPEN"

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 master 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" warning light will turn on, thereby indicating proper air conditioner condenser door actuation.

(c) Turn the air conditioner control switch to "OFF" - the "AIR COND DOOR OPEN" warning light will go out, thereby indicating the air conditioner condenser door is in the up position.

(d) If the "AIR COND DOOR OPEN" 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 in flight failure is suspected.

The condenser door light is located to the right of the engine instrument cluster in front of the pilot. The door light illuminates when the door is open and is off 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 insure 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.

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 32 nautical miles for the 48 gallon capacity.

The climb performance is not compromised measurably with the air conditioner operating since the compressor is declutched and the condenser door is retracted, both automatically, when a full throttle position is selected. When the full throttle position is not used or in the event of a malfunction which would cause the compressor to operate and the condenser door to be extended, a decrease in rate of climb of as much as 100 fpm can be expected. Should a malfunction occur which prevents condenser door retraction when the compressor is turned off, a decrease in rate of climb of as much as 50 fpm can be expected.

SUPPLEMENT 2

AUTOFLITE II AUTOPILOT INSTALLATION

SECTION 1 - GENERAL

This supplement supplies information necessary for the operation of the airplane when the optional AutoFlite II Autopilot is installed. The information contained within this supplement is to be used "as described" in conjunction with the complete handbook.

This supplement has been "FAA Approved" as a permanent part of this handbook and must remain in this handbook at all times when the optional AutoFlite II Autopilot is installed.

SECTION 2 - LIMITATIONS

(a) Autopilot use prohibited above 149 KIAS.
(b) Autopilot "OFF" during takeoff and landing.

SECTION 3 - EMERGENCY PROCEDURES

(a) In case of malfunction DEPRESS and hold Disconnect switch on pilot's control wheel.
(b) Rocker switch on instrument panel "OFF."
(c) Unit may be overpowered manually.
(d) In climb, cruise or descent configuration a malfunction with a 3 second delay in recovery initiation may result in 45° bank and 180' altitude loss. Maximum altitude loss measured at 149 KIAS in a descent.
(e) In approach configuration a malfunction with a 1 second delay in recovery initiation results in 18° bank and 10' altitude loss.

SECTION 4 - NORMAL PROCEDURES

(a) Engagement
  (1) Rocker Switch on instrument panel - ON.
  (2) Disconnect Switch on left hand side of pilot's control wheel - RELEASED.

(b) Disengagement
  (1) Depress Disconnect Switch on pilot's control wheel (or)
  (2) Rocker Switch on instrument panel - OFF.

(c) Heading Changes
  (1) Depress Disconnect Switch, make Heading Change, release Disconnect Switch.
  (2) Move Trim Knob on instrument for Drift Correction from a constant heading.
  (3) Move Turn Command Knob on instrument for right or left banked turns.

(d) OMNI Tracker
  (1) Center Turn Command Knob and push IN to engage Tracker.
  (2) Trim Knob - push IN for high sensitivity.

SECTION 5 - PERFORMANCE

No changes to the basic performance provided by Section 5 of this Pilot's Operating Handbook are necessary for this supplement.

SUPPLEMENT 3

AUTOCONTROL IIIB AUTOPILOT INSTALLATION

SECTION 1 - GENERAL

This supplement cupplies information necessary for the operation of the airplane when the optional Piper AutoControl IIIB Autopilot is installed. The information contained within this supplement is to be used "as described" in conjunction with the complete handbook.

This supplement has been "FAA Approved" as a permanent part of this handbook and must remain in this handbook at all times with the optional Piper AutoControl IIIB Autopilot is installed.

SECTION 2 - LIMITATIONS

(a) Autopilot use prohibited above 149 KIAS.
(b) Autopilot "OFF" during takeoff and landing.

SECTION 3 - EMERGENCY OPERATION

(a) In an emergency the AutoControl IIIB can be disconnected by:
  (1) Pushing the roll ON-OFF Rocker Switch "OFF."
  (2) Pulling the Autopilot Circuit Breaker (aircraft serial nos. 28-7790001 through 28-7890475 only)
(b) The autopilot can be overpowered at either control wheel.
(c) An autopilot runaway, with a 3 second delay in the initiation of recovery while operating in a climb, cruise or descending flight, could result in a 45° bank and 180' altitude loss. Maximum altitude loss measured at 149 KIAS in a descent.
(d) An autpilot runaway, with a 1 second delay in the initiation of recovery, during an approach operation, coupled or uncoupled, could result in a 18° bank and 10' altitude loss.

SECTION 4 - NORMAL PROCEDURES

PREFLIGHT

(a) AUTOPILOT
  (1) Place Radio Coupler in "HDG" Mode (if installed) and place the AP "ON-OFF" switch to the "ON" position to engage roll section. Rotate roll command knob left and right and observe that control wheel describes a corresponding left and right turn, then center knob.
  (2) Set correct compass heading on D.G. and turn HDG bug to aircraft heading. Engage "HDG" mode rocker switch and rotate HDG bug left and right. Aircraft control wheel should turn same direction as bug. Grasp control wheel and manually override servo, both directions.

(b) RADIO COUPLER - (OPTIONAL)

(1) Tune and identify VOR or VOT station. Position Radio Coupler to OMNI Mode. Engage Autopilot ROLL and HDG switches. Set HDG bug to aircraft heading and rotate O.B.S. to cause OMNI indicator Needle to swing left and right slowly. Observe that control wheel rotates in direction of needle movement.

(2) Disengage AP "ON-OFF" Switch. Reset Radio Coupler control to HDG.

IN FLIGHT

(a) Trim airplane (ball centered).

(b) Check air pressure vacuum to ascertain that the directional gyro and attitude gyro are receiving sufficient air.

(c) Roll Section.

(1) To engage, center ROLL knob, push AP "ON-OFF" switch to "ON" position. To turn, rotate console ROLL knob in desired direction. (Maximum angle of bank should not exceed 30°.)

(2) For heading mode, set directional gyro with magnetic compass. Push directional gyro HDG knob in, rotate bug to aircraft heading. Push console heading rocker (HDG) switch to "ON" position. To select a new aircraft heading, push D.G. heading knob "IN" and rotate, in desired direction of turn, to the desired heading.

(d) Radio Coupling — VOR/ILS with Standard directional gyro. (Optional)

(1) For VOR Intercepts and Tracking:

Select the desired VOR course and set the HDG bug to the same heading. Select OMNI mode on the coupler and HDG Mode on the autopilot console.

(2) For ILS Front Course Intercepts and Tracking:

Tune the localizer frequency and place the HDG bug on the inbound, front course heading. Select LOC-NORM mode on the coupler and HDG mode on the autopilot console.

(3) For LOC Back Course Intercepts and Tracking:

Tune the localizer frequency and place the HDG bug on the inbound course heading to the airport. Select LOC-REV mode with coupler and HDG mode on the autopilot console.

SECTION 5 - PERFORMANCE

No changes to the basic performance provided by Section 5 of this Pilot's Operating Handbook are necessary for this supplement.

SUPPLEMENT 4

PIPER ELECTRIC PITCH TRIM

SECTION 1 - GENERAL

This supplement supplies information necessary for the operation of the airplane when the optional Piper Electric Pitch Trim is installed. The information contained within this supplement is to be used "as described" in conjunction with the complete handbook.

This supplement has been "FAA Approved" as a permanent part of this handbook and must remain in this handbook at all times when the optional Piper Electric Pitch Trim is installed.

SECTION 2 - LIMITATIONS

No changes of the basic limitations provided by Section 2 of this Pilot's Operating Handbook are necessary for this supplement.

SECTION 3 - EMERGENCY PROCEDURES

(a) In case of malfunction, PRESS disconnect switch located above the ignition switch.
(b) In case of malfunction, overpower the electric trim at either control wheel.
(c) Maximum altitude change with a 4 second delay in recovery initiation is 800 feet and occurs in the descent configuration. Maximum altitude change in the approach configuration with a 4 second recovery delay is 100 feet.

SECTION 4 - NORMAL PROCEDURES

The electric trim system may be turned ON or OFF by a switch located above the ignition switch. The pitch trim may be changed when the electric trim system is turned on either by moving the manual pitch trim control wheel or by operating the trim control switch on the pilot's control yoke. To prevent excessive speed increase in the event of an electric trim run-away malfunction, the system incorporates an automatic disconnect feature which renders the system inoperative above approximately 143 KIAS. The disconnected condition does not affect the manual trim system.

SECTION 5 - PERFORMANCE

No changes to the basic performance provided by Section 5 of this Pilot's Operating Handbook are necessary for this supplement.

SECTION 10 - SAFETY TIPS

TABLE OF CONTENTS

SECTION 10

SAFETY TIPS

SECTION 10

SAFETY TIPS

10.1 GENERAL

This section provides safety tips of particular value in the operation of the Cherokee Archer II.

10.3 SAFETY TIPS

(a) Learn to trim for takeoff so that only a very light back pressure on the control wheel is required to lift the airplane off the ground.

(b) The best speed for takeoff is about 53 KIAS under normal conditions. Trying to pull the airplane off the ground at too low an airspeed decreases the controllability of the airplane in the event of engine failure.

(c) Flaps may be lowered at airspeeds up to 102 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) Before starting the engine, check that all radio switches, light switches and the pitot heat switch are in the off position so as not to create an overloaded condition when the starter is engaged.

(f) Strobe lights should not be operating when flying through overcast and clouds, since reflected light can produce spacial disorientation. Do not operate strobe lights when taxiing in the vicinity of other aircraft.

(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) In an effort to avoid accidents, pilots should obtain and study the safety related information made available in FAA publications such as regulations, advisory circulars, Aviation News, AIM and safety aids.

(i) 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.

Extreme running turning takeoffs should be avoided as fuel flow interruption may occur.

Prolonged slips or skids which result in excess of 2000 ft. 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 tank being used is not full.