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. 197820 38-789013

AIRPLANE REGISTRATION NO. __

PA-28-181 REPORT: VB-790

FAA APPROVED BY:

Wand Evans

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

DATE OF APPROVAL: JUNE 18, 1976



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

TO THE OF APPROVALL JUNE 18: 1876

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

PIPER AIRCRAFT CORPORATION APPROVAL SIGNATURE AND STAMP____

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AND CONSTITUTES THE APPROVED A RPLANE

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

EPORT: VB-790

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.

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:

Revision pages will replace only pages with the same page number.

Insert all additional pages in proper numerical order within each section.

Page numbers followed by a small letter shall be inserted in direct sequence with the same common numbered page.

Identification of Revised Material II.

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	Revise Pages		FAA Approva Signature and
Rev. 1 - 761 62 (PR760804)	2-1 2-2 6-i 6-41 6-43	Revised "Never Exceed Speed" KIAS value. Revised Airspeed Indicator Markings. Revised report number at bottom of page. Revised Arm and Moment for item 177. Revised items 193, 195 and 197.	Date Ward Evans
Rev. 2 - 761 624 (PR770120)	4 3-4 3-11 4-7 4-8 4-14 4-15 5-4 5-6 5-23 6-4 6-5 6-21 6-35 6-37 6-44 6-48 7-21 10-1 10-2	Revised Open Door procedure. Revised para. 3.27 info. Added Caution to para. 4.9; relocated material to page 4-8. Added relocated material from page 4-7. Added Note to para. 4.31. Revised stall speed in para. 4.35. Revised wording in para. 5.5 (c). Revised fuel quantity figure in para. 5.5 (g). Revised 55% & 75% range figures in Fig. 5-25. Added A & B values to Fig. 5-1. Revised weight and balance formula. Added Weight, Arm and Moment to item 29 a.; added item 29 b.; changed existing item 29 b. to 29 c. Revised item 79 Arm and Moment. Revised item 115 Dwg. 99002-5 to -8 and item 117 Dwg. 99003-5 to -7. Revised footnote. Revised item 257b. Arm and Moment. Added info to para. 7.25. Revised 10.3(c); relocated material to page 10-2. Added relocated material from page 10-1.	August 4, 1976 Ward Evans Jan. 20, 1977
ev. 3 - 761 624 (PR770225)	1-6 3-11 4-4 4-9 6-4 6-49 7-25	Corrected to "Meteorological." Revised NOTE. Revised Hot Start procedure. Revised 4.13 (b). Revised Leveling Diagram illustration. Revised Dwg. Nos. of items 287 and 289.	Sard Evans ard Evans eb. 25, 1977

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and	Revised Pages	Description of Revision	FAA Approva Signature and Date
Code Rev. 4 - 761 624 (PR770712)	1-3 1-11, 1-12, 1-13, 1-14 2-2	Added new propeller to 1.5 and added footnote. Revised section 1.21, Conversion Factors. Added new propeller to 2.7, item (j) and added footnote.	(31000,034g) (31000,034g) (31000,034g)
	4-4 4-9	Revised Starting With External Power Source. Revised item 4.13 (d) Starting Engine With External Power Source.	
and house	4-10 5-9	Added CAUTION. Revised page nos.; revised titles; added pages; added figures.	
	5-19 5-20	Added ser. nos. 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 10-	
	5-22	Relocated Fig. 5-19, added services Relocated Fig. 5-23 to page 5-25; added new chart (Fig. 5-20). Relocated Fig. 5-25 to page 5-27; added re-	
	5-23	located Fig. 5-21; added ser. nos. Relocated Fig. 5-27 to page 5-29; added new	
1	5-24 5-25	chart (Fig. 5-22). Releasted Fig. 5-29 to page 5-30; added re-	
	5-26	located Fig. 5-23; added ser. nos. Relocated Fig. 5-31 to page 5-31; added new	
	5-27	chart (Fig. 5-24). Relocated Fig. 5-33 to page 5-32; added relocated Fig. 5-25; added ser. nos.	
	5-28	Relocated Fig. 5-35 to page 3-35, added new chart (Fig. 5-26).	
d doile City	5-29 5-30	Added page (added relocated Fig. 5-31).	
	5-31 5-32 5-33	Added page (added relocated Fig. 5-35).	C
	5-34 6-17	Added page (int. blank). Added item 3. Added items 76 and 77.	
	6-33 6-45	Added item 223; renumbered items, ie-	
is is	6-46	Added relocated items; renumbered items, added new items; relocated items; removed	,
	6-47	Added relocated items; renumbered items; added new items; relocated items; added footnote.	
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PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
(PR770712) (cont)	6-48a	Added relocated items; renumbered items; added new items; revised item 277; relocated items; added footnotes. Added page (added relocated items and new item).	Date
	6-48b 6-49 6-50	Added page. Renumbered items; revised items 325 and 329.	
	7-1 7-18	Renumbered items; revised item 349. Added new propeller model to para. 7.5. Revised alternate static source description in para. 7.21.	Ward Evans July 12, 1977
	on betala	sero Helocutto Fig. 5-18). shart (Fig. 5-18). s.o. Relocated Fig. 5-21 to page 5-25	3 diy 12, 19//
	won bobby	Relocated Fig. 5-19, stand and mass. 5-25 to page 5-25 chart (Fig. 5-23 to page 5-25)	
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SECTION 2 LIMITATIONS

SECTION 3 EMERGENCY PROCEDURES

SECTION 4 NORMAL PROCEDURES

SECTION 5 PERFORMANCE

SECTION 6 WEIGHT AND BALANCE

SECTION 7 DESCRIPTION AND OPERATION OF THE

AIRPLANE AND ITS SYSTEMS

SECTION 8 AIRPLANE HANDLING, SERVICING AND

MAINTENANCE

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SECTION 10 SAFETY TIPS

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SECTION 1

GENERAL

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SECTION 1

GENERAL

1.1 INTRODUCTION

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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.

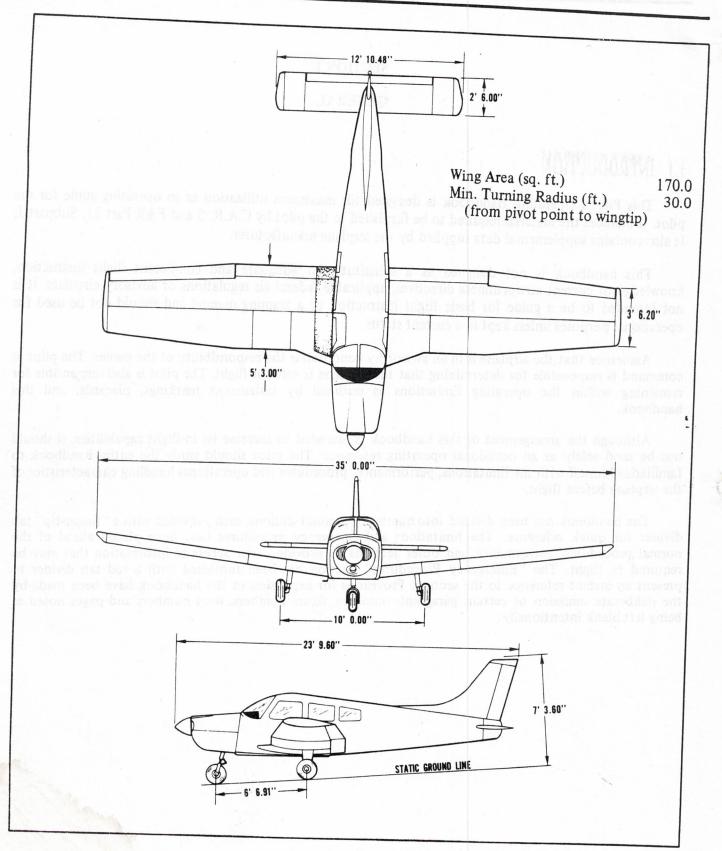
This handbook is not designed as a substitute for adequate and competent flight instruction, knowledge of current airworthiness directives, applicable federal air regulations or advisory circulars. It is not intended to be a guide for basic flight instruction or a training manual and should not be used 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.

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THREE VIEW

Figure 1-1

				WINDSTAM IST
1.3	ENG	INES		
	(b)	Engine Model Number Rated Horsepower Rated Speed (rpm) Bore (inches) Stroke (inches) Displacement (cubic inches) Compression Ratio Engine Type		180 2700 5.125 4.375 361.0 8.5:1 ar Cylinder, Direct Drive, ally Opposed, Air Cooled
1.5	PRO	PELLERS		
	(a) (b) (c)	Number of Propellers Propeller Manufacturer Model		Sensenich 76EM8S5-0-60* or 76EM8S5-0-62 **
	(d) (e) (f)	Number of Blades Propeller Diameter (inches) (1) Maximum (2) Minimum Propeller Type	t (inches) t (inches) Biblios	76 76 Fixed Pitch
1.7	FU	E L		
	(a) (b) (c)	Fuel Capacity (U.S. gal) (total) Usable Fuel (U.S. gal) (total) Fuel Grade, Aviation (1) Minimum Octane (2) Specified Octane (3) Alternate Fuel	Lycom	50 48 100/130 Green 100/130 Green Refer to latest issue of hing Instruction No. 1070
1.9	OII			
	(a) (b)		Lycoming	Refer to latest issue of Service Instruction 1014
	(c)	Oil Viscosity per Average Ambient Temp. for Starting (1) Above 60°F (2) 30°F to 90°F (3) 0°F to 70°F (4) Below 10°F	SINGLE S.A.E. 50 S.A.E. 40 S.A.E. 30 S.A.E. 20	S.A.E. 40 or 50 S.A.E. 40 S.A.E. 40 S.A.E. 20W-30

^{*}Serial nos. 28-7790001 through 28-7790607.

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^{**}Serial nos. 28-7890001 and up.

1.11 MAXIMUM WEIGHTS

(a) (b) (c)	Maximum Landing Weight (lbs)	NORMAL 2550 2550 200	UTILITY 1950 1950 0	
1.13 S	TANDARD AIRPLANE WEIGHTS	Rated Speed (rpm) Bore (inches)		
(a) (b)	standard airplane including unusable fuel, full operating fluids and full oil		1416	
	Standard Empty Weight.		1134	
1.15 BA	AGGAGE SPACE			
(a) (b) (c)	Compartment Volume (cubic feet) Entry Width (inches) Entry Height (inches)		24 22 20	
1.17 SP	ECIFIC LOADINGS			
(a) (b)	Wing Loading (lbs per sq ft) Power Loading (lbs per hp)	Jau	15.0 14.2	THE STATE OF THE S

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^{*}This value is for a standard airplane without optional equipment. Refer to Figure 6-5 for the useful load value to be used for C.G. calculations for the airplane 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

a)	General Airspeed Terminolog	y 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 and the small he small h	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."
		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

 $V_{\mathbf{Y}}$

Best Rate-of-Climb Speed is the airspeed which delivers the greatest gain in altitude in the shortest possible time.

Best Angle-of-Climb Speed is the airspeed which delivers the

greatest gain of altitude in the shortest possible horizontal

airplane is controllable in the landing configuration.

distance.

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(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.

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.

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(c) Power Terminology

Takeoff Power Maximum power permissible for takeoff.

Maximum Continuous Maximum power permissible continuously during flight.

Power

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.

Weight and Balance Terminology (f)

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.

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1.21 CONVERSION FACTORS

MULTIPLY	<u>BY</u>	TO OBTAIN	MULTIPLY	<u>BY</u>	TO OBTAIN
acres	0.4047	ha	cubic inches (cu. in.)	16.39	cm ³
acres	43560	sq. ft.	1000	1.639 x 10 -5	m ³
	0.0015625	sq. mi.		5.787×10^{-4}	cu. ft.
	0.0013023	5 q.	A 170-251	0.5541	fl. oz.
(76	cm Hg	THE REAL PROPERTY.	0.01639	1
atmospheres (atm)	29.92	in. Hg		4.329×10^{-3}	U.S. gal.
	1.0133	bar	district the second	0.01732	U.S. qt.
		kg/cm ²		0.017.02	0.5. 4
	1.033 14.70	lb./sq. in.	cubic meters (m ³)	61024	cu. in.
		lb./sq. ft.	cubic meters (m)	1.308	cu. yd.
	2116	10./54.11.		35.3147	cu. ft.
- Alleria - Alle	0.00602	atm			
bars (bar)	0.98692	atm.	1 Sept. 195	264.2	U.S. gal.
	14.503768	1b./sq. in.	6. 2.0. 103	25 21 45	C. I.
	0.2510050	les sal	cubic meters per	35.3147	cu. ft./min.
British Thermal Unit	0.2519958	kg-cal	minute (m³/min.)		
(BTU)	n .		1.00 300 1 18	07	C
1070	0.2027	all 150 to	cubic yards (cu. yd.)	27	cu. ft.
centimeters (cm)	0.3937	in.	64 11.5 mai	0.7646	
	0.032808	ft.	1 20	202	U.S. gal.
1:	0.01316	atm	degrees (arc)	0.01745	radians
centimeters of	0.3937	in. Hg	degrees (arc)	0.01743	Tautaits
mercury at 0°C	0.1934	lb./sq. in.	degrees per second	0.01745	radians/sec.
(cm Hg)		lb./sq. ft.		0.01743	radians/sec.
	27.85	kg/m ²	(deg./sec.)		
	135.95	Kg/III	drams, fluid (dr. fl.)	0.125	fl. oz.
	0.022000	ft loop	drams, mud (dr. m.)	0.12.3	11. 02.
centimeters per	0.032808	ft./sec.	drama avda	0.0625	oz. avdp.
second (cm/sec.)	1.9685	ft./min.	drams, avdp.	0.0623	oz. avup.
1979 778	0.02237	mph	(dr. avdp.)		
cubic centimeters	0.03381	fl. oz.	feet (ft.)	30.48	cm
(cm ³)	0.06102	cu. in.	1607 (11.)	0.3048	m
(CIII)	3.531 x 10 ⁻⁵	cu. ft.		12	in.
	0.001	1	87	0.33333	yd.
	2.642 x 10 ⁻⁴		1000 500 1500	0.0606061	rod
	2.042 X 10	C.D. gui.		1.894 x 10 ⁻⁴	mi.
cubic feet (cu.ft.)	28317	cm ³		1.645×10^{-4}	NM
cubic feet (cu.ft.)	0.028317	m ³	terest :	1.043 X 10	14141
	1728	cu. in.	feet per minute	0.01136	mph
	0.037037	cu. yd.	(ft./min.)	0.01136	km/hr.
	7.481	U.S. gal.	(11./11111.)	0.508	cm/sec.
	28.32	1	Santa 2	0.00508	m/sec.
	20.32	•	in an di	0.00306	111/500.
cubic feet per minute	0.472	1/sec.	11 (12) (3)		
(cu. ft./min.)	0.028317	m³/min.			
(cu. it./iiiii.)	0.020317	/			

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MULTIPLY				name of the state	and the second second
	BY	TO OBTAIN	MULTIPLY	BY	TO OBTAIN
feet per second (ft./sec.)	0.6818 1.097	mph km/hr.	hectares (ha)	2.471	acres
	30.48 0.5921	cm/sec. kts.	ad tik	107639 10000	sq. ft. m ²
foot-pounds (ftlb.)	0.1383255	m-kg	horsepower (hp)	33000	ftlb./min.
	3.24×10^{-4}	kg-cal		550	ft1b./sec.
foot-pounds per	3.030 x 10		cm Hg	76.04 1.014	m-kg/sec. metric hp
minute (ftlb./min	.)	пр	horsepower, metric	75	•
foot-pounds per	1.818 x 10	5 hp	ni. pa\.di	0.9863	m-kg/sec. hp
second (ftlb./sec.)	R. I		inches (in.)	25.40	mm
gallons, Imperial (Imperial gal.)	277.4 1.201	cu. in. U.S. gal.	203768 Ib/sq or	2.540 0.0254	cm m
	4.546	1	519958 kg-cal	0.08333 0.027777	ft. yd.
gallons, U.S. dry (U.S. gal. dry)	268.8 1.556 x 10 ⁻¹	cu. in.	inches of mercury	0.033421	atm
In and	1.164	cu. ft. U.S. gal.	at 0°C (in. Hg)	0.4912 70.73	lb./sq. in. lb./sq. ft.
	4.405	1		345.3 2.540	kg/m ² cm Hg
gallons, U.S. liquid (U.S. gal.)	23.1 0.1337	cu. in.		25.40	mm Hg
	4.951 x 10 ⁻³ 3785.4	cu. yd. cm ³	inch-pounds (inlb.)	0.011521	m-kg
	3.785×10^{-3} 3.785	m ³	kilograms (kg)	2.204623 35.27	lb. oz. avdp.
	0.83268 128	Imperial gal. fl. oz.		1000	g g
gallons per acre	9.353	1/ha	kilogram-calories (kg-cal)	3.9683	BTU
(gal./acre)		1/11a	(Rg-Cal)	3087 426.9	ftlb. m-kg
grams (g)	0.001 0.3527	kg	kilograms per cubic	0.06243	lb./cu. ft.
	2.205×10^{-3}	oz. avdp. lb.	meter (kg/m ³)	0.001	g/cm ³
grams per centimeter (g/cm)	0.1 6.721 x 10 ⁻²	kg/m	kilograms per hectare (kg/ha)	0.892	lb./acre
1136 mp)	5.601 x 10 ⁻³	lb./ft. lb./in.	kilograms per square	0.9678	atm
grams per cubic centimeter (g/cm ³)	1000 0.03613	kg/m³ lb./cu. in.	centimeter (kg/cm ²)	28.96 14.22 2048	in. Hg lb./sq. in.
	62.43	lb./cu. ft.		O otman ra	lb./sq. ft.

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MULTIPLY	BY	TO OBTAIN	MULTIPLY	BY	TO OBTAIN
kilograms per square meter (kg/m ²)	2.896 x 10 ⁻³ 1.422 x 10 ⁻³	in. Hg lb./sq. in.	meters per minute (m/min.)	0.06	km/hr.
029	0.2048	1b./sq. ft.	meters per second	3.280840	ft./sec.
kilometers (km)	1 x 10 ⁻⁵ 3280.8	cm ft.	(m/sec.)	196.8504 2.237	ft./min. mph
	0.6214	mi.	24 July 201	3.6	km/hr.
	0.53996	NM	microns	3.937 x 10 ⁻⁵	in.
kilometers per hour (km/hr.)	0.9113 58.68 0.53996 0.6214	ft./sec. ft./min. kt mph	miles, statue (mi.)	5280 1.6093 1609.3	ft. km m
	0.0214 0.27778 16.67	m/sec. m/min.	28 10/cu-11;	0.8684	NM
knots (kt)	1 1.689	nautical mph ft./sec.	miles per hour (mph)	44.7041 4.470 x 10 ⁻¹ 1.467	cm/sec. m/sec. ft./sec.
	1.1516 1.852 51.48	statute mph km/hr. m/sec.	25 x 16° atm	88 1.6093 0.8684	ft./min. km/hr. kt
liters (1)	1000 61.02	cm ³ cu. in.	miles per hour square (m/hr. sq.)	2.151	ft./sec. sq.
	0.03531 33.814 0.264172	cu. ft. fl. oz. U.S. gal.	millibars	2.953 x 10 ⁻²	in. Hg
acres	0.200 1.05669	Imperial gal.	millimeters (mm)	0.03937	in.
liters per hectare (1/ha)	13.69 0.107	fl. oz./acre gal./acre	millimeters of mercury at 0°C (mm Hg)	0.03937	in. Hg
liters per second (1/sec.)	2.12	cu. ft./min.	nautical miles (NM)	6080 1.1516 1852	ft. statute mi. m
meters (m)	39.37 3.280840	in. ft.	remites 6	1.852	km
	1.0936 0.198838 6.214 x 10 ⁻⁴	yd. rod mi.	ounces, avdp. (oz. avdp.)	28.35 16	g dr. avdp.
	5.3996 x 10	" NM	ounces, fluid (fl. oz.)	8 29.57	dr. fl.
meter-kilogram (m-kg)	7.23301 86.798	ftlb. inlb.	(11. 02.)	1.805 0.0296 0.0078	cu. in. l U.S. gal.

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MULTIPLY	BY	TO OBTAIN	MULTIPLY	BY	V mo and
ounces, fluid per	0.073	1 /1		DI	TO OBTAIN
acre (fl. oz./	0.073	l/ha	rod	00.114	
acre)			The state of the s	16.5	ft.
,			18 18/35 101 X S	5.5	yd.
nounda (11.)			figetdit 81	5.029	m
pounds (lb.)	0.453592	kg			***
	453.6	8	slug	32.174	All recent was tree
odus.	3.108 x 10	-2 g		32.174	lb.
	3.100 X 10	slug	square centimeters	0.1550	
pounds per acre	1.101		(cm ²)	0.1550	sq. in.
(lb./acre)	1.121	kg/ha	(cm)	0.001076	sq. ft.
(10.7 acre)					
			square feet (sq. ft.)	929	cm ²
pounds per cubic	16.02	kg/m³	mim\.11 8	0.092903	m ²
foot (lb./cu. ft.)	0.6 1	Kg/III	33 966	144	
(1)			riam Bi	0.1111	sq. in.
pounds per cubic	1720		357 m 811		sq. yd.
pounds per cubic	1728	lb./cu. ft.	The state of the s	2.296 x 10 ⁻⁵	acres
inch (lb./cu. in.)	27.68	g/cm ³	square in 1	0.01	
		eni isq esam	square inches	6.4516	cm ²
pounds per square	0.1414	in. Hg	(sq. in.)	6.944×10^{-3}	sq. ft.
foot (lb./sq. ft.)	4.88243	kg/m ²	vasalif 9		•
nim H	4.725 x 10	atm	square kilometers	0.3861	sq. mi.
	06.7	atili	(km²)		4. III.
pounds per square	5.1715	am II-			• •
inch (psi or	2.036	cm Hg	square meters (m ²)	10.76391	sq. ft.
lb./sq. in.)	0.06804	in. Hg		1.196	sq. yd.
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		atm		0.0001	ha
	0.0689476	bar		20.0	II a
	703.1	kg/m ²	square miles (sq. mi.)	2.590	km²
most IIC (-4)	0.0465-	Shoumin 1	fee AII (The	640	
uart, U.S. (qt.)	0.94635	1		040	acres
	57.749	cu. in.	square rods (sq. rods)	20.25	
			square rous (sq. rous)	30.25	sq. yd.
adians	57.30	deg. (arc)	square weeds (
	0.1592	rev.	square yards (sq. yd.)	0.8361	m ²
		figil more		9	sq. ft.
adians per second	57.30	deg./sec.		0.0330579	sq. rods
(radians/sec.)	0.1592	rev./sec.	100 A C 10		
	9.549	rpm	yards (yd.)	0.9144	m
	185	-P		3	ft.
evolutions (rev.)	6.283	radians		36	in.
	3.200	1 autaits			rod
volutions per	0.1047	radians/sec.			
minute (rpm or	0.1017	raurans/sec.			
ev./min.)					
,/		d connect final			
volutions per		4			
volutions per second (rev./sec.)	6.283	radians/sec.			

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SECTION 2

LIMITATIONS

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SECTION 2

LIMITATIONS

2.1 GENERAL

This section provides the "FAA Approved" operating limitations, instrument markings, color coding and basic placards necessary for the 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 ($V_{\mbox{\scriptsize NE}}$) - 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.	(South of the 125 of the received	121
Design Maneuvering Speed (V _A) - Do not make full or abrupt control movements above this speed. At 2550 LBS. G.W.	remote hare Machine of a country of the Machine Machine 113 week and a country of the Country of	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

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2.5 AIRSPEED INDICATOR MARKINGS

MARKING	
---------	--

Red Radial Line (Never Exceed)

Yellow Arc (Caution Range - Smooth Air Only)

Green Arc (Normal Operating Range)

White Arc (Flap Down) (49 KTS to 102 KTS)

2.7 POWER PLANT LIMITATIONS

(a) Number of Engines (b) Engine Manufacturer

(c) Engine Model No.

(d) Engine Operating Limits (1) Maximum Horsepower

(2) Maximum Rotation Speed (RPM)

(3) Maximum Oil Temperature

(e) Oil Pressure

Minimum (red line)

Maximum (red line)

(f) Fuel Pressure

Minimum (red line) Maximum (red line)

(g) Fuel Grade (minimum octane)

(h) Number of Propellers

(i) Propeller Manufacturer

(j) Propeller Model

(k) Propeller Diameter Minimum

Maximum

Propeller Tolerance (static RPM at maximum

permissible throttle setting)

No additional tolerance permitted.

IAS

(154 KTS)

(125 KTS to 154 KTS)

(55 KTS to 125 KTS)

Lycoming

O-360-A4M with carburetor setting 10-3878

PROPERTY AND A CLARENCE SEA SEA SEA

2700 245°F

90 PSI

100/130 - Green

Sensenich

76EM8S5-0-60*

or 76EM8S5-0-62 **

76 IN.

76 IN.

Not above 2425 RPM

Not below 2325 RPM

*Serial nos. 28-7790001 through 28-7790607.

**Serial nos. 28-7890001 and up.

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2.9 POWER PLANT INSTRUMENT MARKINGS

(a)	Tachometer	500 to 2700 RPM
	Green Arc (Normal Operating Range)	
	Red Line (Maximum Continuous Power)	2700 RPM
(b)	Oil Temperature	750 . 24595
. ,	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	UŢILITY
(a)	Maximum Weight	2550 LBS	1950 LBS
` '	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 2050 (and less)	88 6	93.0 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
113 KIAS
113 KIAS
113 KIAS

2.17 FLIGHT LOAD FACTORS

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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.	

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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, the following takeoff and landing check lists will be installed:

TAKEOFF CHECK LIST

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

Mixture set	t
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."

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SECTION 3

EMERGENCY PROCEDURES

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COMBUNED BY MARKET

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### Honergency Procedures Check List Amplified Energency Procedures (Seneral) Engine Fire During Start Engine Power Loss During Takeoff Fire and Chi Landing Fire Lass of Oil Fresaure Lass of Fire Last Pressure High Oil Tamperature High Oil Tamperature Alternator Failure Spin Recovery Ocen Door	

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 occurrence 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.

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Although these emergencies are discussed here, this incommitted is not a tended to replace such freming,

The remainder of the section is devoted to applying emergency procedures containing additional

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ENGINE FIRE DURING START

3.3 EMERGENCY PROCEDURES CHECK LIST

															crank engine
Mixture															. idle cut-off
															open
Electric	fı	ıe	1	pι	ın	np)								OFF
															OFF
Abando	n	if	f	ire	9 (20	n	tiı	าน	le:	s ·				

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

ENGINE POWER LOSS IN FLIGHT

Fuel selector switch to tank
containing fuel
Electric fuel pump
Mixture RICH
Carburetor heat
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 co	mn	ni	tt	ec	1 1	to	1:	an	d	in	g:					
Ignition																OFF
Master sy	vit	ch	1													OFF
Fuel sele	ctc	r							Ļ					I.		OFF
Mixture																idle cut-off
Seat belt	an	d	h	aı	n	es	S						·			tight

FIRE IN FLIGHT

Source of fire	che	ck
Electrical fire (smoke in c	abin):	
Master switch	OF	FF
Vents	op	en
Cabin heat	OF	F
Land as soon as practicab	le.	

Engine fire:	
Fuel selector	FF
Throttle	ED
Mixture idle cut	-off
Electric fuel pump check C	FF
Heater and defroster	FF
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	OPEN DOOR
Electric fuel pump	If both upper and side latches are open, the door will trail slightly open and airspeeds will be reduced slightly.
HIGH OIL TEMPERATURE Land at nearest airport and investigate the problem. Prepare for power off landing.	To close the door in flight: Slow airplane to 87 KIAS Cabin vents
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	If upper latch is open
Reduce electrical load and land as soon as practical.	Carburetor heat
SPIN RECOVERY Throttle idle Ailerons neutral Rudder full opposite to direction of rotation	If roughness continues after one min: Carburetor heat
Control wheel	Magneto switch "L" then "R" then "BOTH"
Control wheel as required to smoothly regain level flight altitude	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.

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BEFORE TAKEOFF	SOFT FIELD
Master switch Flight instruments Check Fuel selector Electric fuel pump Engine gauges Carburetor heat Seat backs Mixture Belts/harness Empty seats Flaps Flaps Trim tab Sect Check ON Check OFF Seat backs Engoyen Set Seat backs Set	Flaps
Controls	CLIMB
Air conditioner OFF	Best rate (flaps up)
TAKEOFF	Electric fuel pump OFF at desired altitude
NORMAL	desired attitude
Flaps	CRUISING Reference performance charts and Avco-Lycoming Operator's Manual. Normal max power
Flaps	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

NORMAL

STOPPING ENGINE

Flaps Electric f																		retra
Electric f Air condi	tion	P	ui •	n	D	•		i										. OF
Air condi Radios .	uoi	10	1	•				•		•	ŀ							. OF
Radios . Throttle	٠.	•	•		•	•	•	•	•	•	٠	٠	•			•		. OF
Magnetos Master swi	itch	•					•	•	•	•	٠	•	•	•	•			. OF
			•	•					•									. OF
																		E.

PARKING

Parking brake										· · · · · set
Control wheel	•	•								secured with helts
Taps										full un
Tie downs	•	•	٠	٠	•	•	٠	•	•	· · · · · · in place
Tie downs	٠	•	•	٠	•	٠	•	٠		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.

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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.

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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 and pressing in. 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 and pressing in. 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 and pressing in. 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.

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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.

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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

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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 seat belts and shoulder harness 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.

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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."

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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.

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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).

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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."

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).

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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.

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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.

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NORMAL PROCEDURES

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		Before Takeoff											
	ES.A.												
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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.

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full power may not be possible; (lerefore, prompt action a required.

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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.

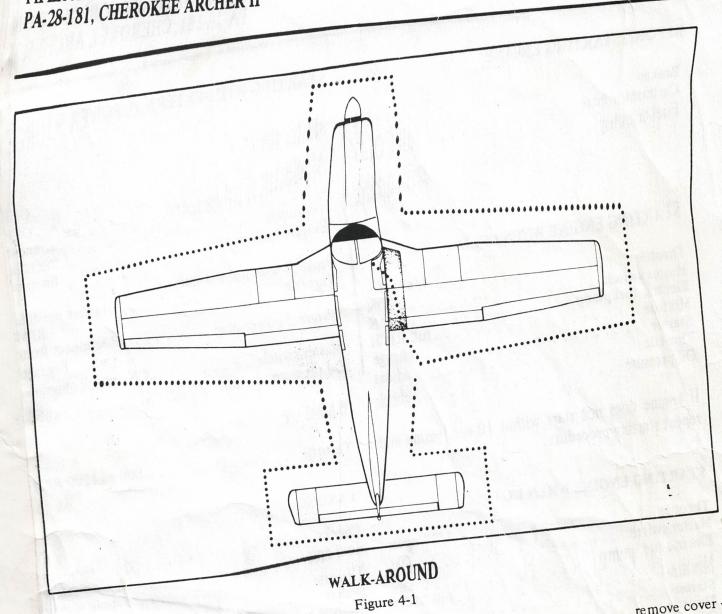
(a)	Best Rate of Climb Speed	76 KIAS
(b)	Best Angle of Climb Speed	64 KIAS
(c)	Turbulent Air Operating Speed (See Subsection 2.3)	113 KIAS
· (d)	Maximum Flap Speed	102 KIAS
(e)	Landing Final Approach Speed (Flaps 40°)	66 KIAS
(f)	Maximum Demonstrated Crosswind Velocity	17 KTS

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procedures given in this section in order to become proficient in the normal operations of the arreland.

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4.5 NORMAL PROCEDURES CHECK LIST

PREFLIGHT CHECK

REFLIGHT CHECK	halts F
	ON C
Control wheel Master switch gauges	check I
Master switch Fuel quantity gauges	CHECK (
Master switch Fuel quantity gauges Master switch	OFF
Fuel quantity gauges Master switch Ignition	.OFF
Master switch Ignition	lamage
Exterior check for interfer Control surfaces free of ice, snow thank for interfer.	erence -
Control surfaces	w, frost
Control surfaces free of ice, sho check for inter	ference
check for	w, frost
Hinges free of fee,	. check
Wings	check
Hinges free of ice, she wings Stall warning Navagation lights check Check the wings of the property of the	k supply
Navagation lights	cure caps
Navagation lights	drain
Fuel tanks visually so	open

4-1	- Tove cover
Pitot head	holes clear
Windshield	check
Windshield	for leaks
Windshield	check level
Fuel and on	properly seated
Oil	secure.
Dipstick	secur
Nose wheel tire Nose gear strut	prop
Air inlets	cle
Air inlets	check tensi
Alternator belt	st
Alternator belt Tow bar and control locks	stowed properl
Tow bar and control locks Baggage Baggage	sec
D-80 0	close and se

Primary flight controls proper oper

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Baggage door . . .

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BEFORE STARTING ENGINE	
	STARTING WITH EXTERNAL POWER SOURCE
Brakes	THE EXTERNAL POWER SOURCE
Carburetor heat Fuel selector Carburetor heat full COLD	1 Master and 1
Fuel selector full COLD desired tank	Master switch All electrical equipment OFF
desired tank	T
	External now
STARTING ENGINE WHEN COLD	Terminals OFF External power plug Connect
THEN COLD	Incont!
Ihrottle	Proceed with normal start Throttle Insert in fuselage
Master switch	Throttle fuselage
Throttle Master switch Electric fuel nump	
Master switch Electric fuel pump Mixture Starter Throttle Oil pressure Master switch I/4" open ON ON Electric fuel pump ON Full RICH Electric fuel pump ON ON Full RICH On	Throttle
Starter (N)	1 Soluti
The full Drag	Dui bind but
I NIOTILE INTI KICH	die Mil
0:1	Master - ulsconnect f
Off Dieschie	Tancol SMITCH
L. COOULE PURC	1 Oil - milli
• • • • • • • • • • • • • • • • • • • •	on pressure ON - check
Throttle Oil pressure If engine does not start within 10 sec. prime and	Master switch Oil pressure WARM-UP Master switch Oil pressure ON - check ammeter check
repeat starting new start within 10 see	check
procedure. prime and	Throttle
	Throttle 800 to 1200 RPM
STARTING ENGINE WHEN HOT	· · · · · 800 to 1200 RPM
THE WHEN HOT	TAXIING
Inrottle	
Throttle Master switch Electric fuel pump Mixture Throttle Master switch ON	Chocks Taxi area Throttle Taxi area
Electric fuel pump Mixture Starter ON Full Rich	Taxi area
Mixture Pump ON	Taxi area Throttle Brakes Steering Taxi area Temoved Clear Apply slowing
StarterON	Throttle removed Brakes clear apply slowly Steering check
Throttle full RICH	Diakes
Dil pressure	Steering
Throttle full RICH engage Oil pressure adjust	Brakes
	ROUND CHECK
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	max. drop 175 RPM
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ture of pump ON Oil	temp 5.0" Hg + 1
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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.

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SECTION 5



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5.5 FLIGHT PLANNING EXAMPLE

(a) Aircraft Loading

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

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

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

After proper utilization of the information provided we have found the following weights for consideration in our flight planning example.

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

(1)	Basic Empty Weight	1400 lbs.
(2)	Occupants (2 x 170 lbs)	340 lbs.
		360 lbs.
(4)	Fuel (6 lb/gal x 50)	300 lbs.
(5)	Takeoff Weight	2400 lbs.
(6)	Landing Weight	
	(a)(5) minus (g)(1), (2400 lbs. minus 136 lbs.)	2264 lbs.

Our takeoff weight is below the maximum of 2550 lbs. and our weight and balance calculations have determined our C.G. position within the approved limits.

(b) Takeoff and Landing

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Now that we have determined our aircraft loading, we must consider all aspects of our takeoff and landing.

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

Apply the departure airport conditions and takeoff weight to the appropriate Takeoff Performance graph (Figure 5-5 or 5-7) to determine the length of runway necessary for the takeoff and/or the barrier distance.

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

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

or flight is to calculate the similane weight and ded by Sortion 6 (Weight and Balance) of this l		Destination Airport
 Pressure Altitude Temperature Wind Component Runway Length Available Runway Required 	2000 ft. 70°F 10 KTS 7000 ft	2300 ft. 70°F 5 KTS 4500 ft. 825**

NOTE

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

(c) Climb

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

The desired cruise pressure altitude and corresponding cruise outside air temperature values are the first variables to be considered in determining the climb components from the Time, Distance, and Fuel to Climb graph (Figure 5-15). After the time, distance and fuel for the cruise pressure altitude and outside air temperature values have been established, apply the existing conditions at the departure field to the graph (Figure 5-15). Now, subtract the values obtained from the graph for the field of departure conditions from those for the cruise pressure altitude.

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

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

(1)	Cruise Pressure Altitude	(000 6
	Cruise OAT	6000 ft.
(3)	Time to Climb (12.5 min. minus 4.5 min.)	55°F
	(12.5 mm: mmas 4.5 mm.)	8 min *

(4) Distance to Climb (17.5 minus 4.5 min.)

8 min.***

11 nautical miles***

2 gal.***

*reference Figure 5-11

**reference Figure 5-35

***reference Figure 5-15

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(d) Descent

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

Utilizing the cruise pressure altitude and OAT we determine the basic time, distance and fuel for descent (Figure 5-29). These figures must be adjusted for the field pressure altitude and temperature at the destination airport. To find the necessary adjustment values, use the existing pressure altitude and temperature conditions at the destination airport as variables to find the time, distance and fuel values from the graph (Figure 5-29). Now, subtract the values obtained from the field conditions from the values obtained from the cruise conditions to find the true time, distance and fuel values needed for the flight plan.

The values obtained by proper utilization of the graphs for the descent segment of our example are shown below. 6.5 min.*

(1) Time to Descend (17 min. minus 10.5 min.)

(2) Distance to Descend (35 minus 22 nautical miles)

13 nautical miles*

(3) Fuel to Descend (1.7 gal. minus 1 gal.)

.7 gal.*

(e) Cruise

Using the total distance to be traveled during the flight, subtract the previously calculated distance to climb and distance to descend to establish the total cruise distance. Refer to the appropriate Avco Lycoming Operator's Manual when selecting the cruise power setting. The established pressure altitude and temperature values and the selected cruise power should now be utilized to determine the true airspeed from the appropriate Speed Power graph (Figure 5-19 or 5-21).

Calculate the cruise fuel flow for the cruise power setting from the information provided by the Avco Lycoming Operator's Manual.

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

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

(1)	Total Distance	314 nautical miles

(2)	Cruise Distance	
	(e)(1) minus (c)(4) minus (d)(2), $(314 \text{ minus } 11 \text{ minus } 13)$	
	G . D	

290 nautical miles 65% rated power (3) Cruise Power 110 KTS TAS** (4) Cruise Speed 7.6 GPH

(5) Cruise Fuel (6) Cruise Time

(e)(2) divided by (e)(4), (290 nautical miles divided by 110 KTS) 2.64 hrs.

(e)(5) multiplied by (e)(6),(7.6 GPH multiplied by 2.64 hrs.) 20 gal.

^{*}reference Figure 5-29

^{**}reference Figure 5-21

Total Flight Time

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

The following flight time is required for our flight planning example.

(1) Total Flight Time

(c)(3) plus (d)(1) plus (e)(6), (.13 hrs. plus .11 hrs. plus 2.64 hrs.)

2.88 hrs.

(g) Total Fuel Required

Determine the total fuel required by adding the fuel to climb, the fuel to descend and the cruise fuel. When the total fuel (in gallons) is determined, multiply this value by 6 lb/gal to determine the total fuel weight used for the flight.

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

(1) Total Fuel Required

(c)(5) plus (d)(3) plus (e)(7), (2 gal. plus .7 gal. plus 20 gal.) (22.7 gal. multiplied by 6 lb/gal.)

22.7 gal. 136 lbs.

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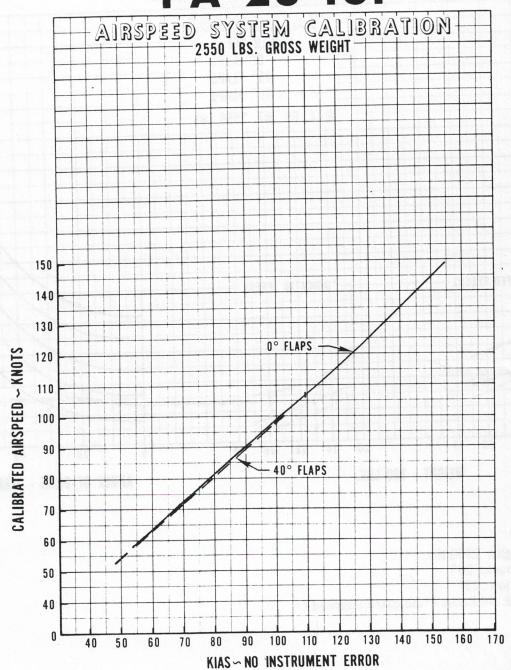
5.7 PERFORMANCE GRAPHS

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Street Power - Economy Caste (Serial Nos 28-7790001 through 7790607)

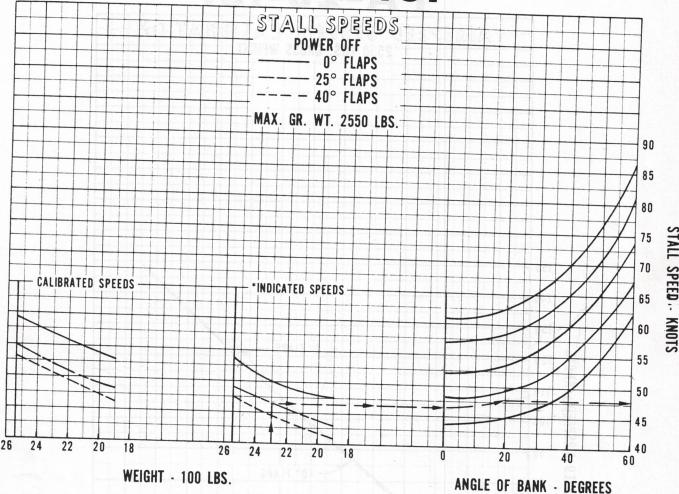


AIRSPEED SYSTEM CALIBRATION

Figure 5-1

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Example:

Gross weight: 2300 lbs. Angle of bank: 20° Flap position: 25°

Stall speed: 46 knots (*indicated airspeed)

*INDICATED AIRSPEED, NO INDICATOR ERROR

STALL SPEEDS

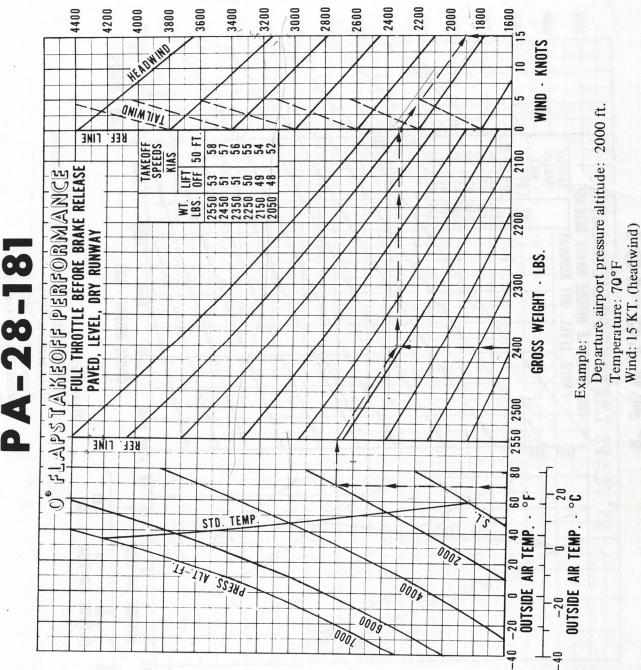
Figure 5-3

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TAKEOFF DISTANCE OVER 50 FT. BARRIER - FEET



FLAPS UP TAKEOFF PERFORMANCE

Figure 5-5

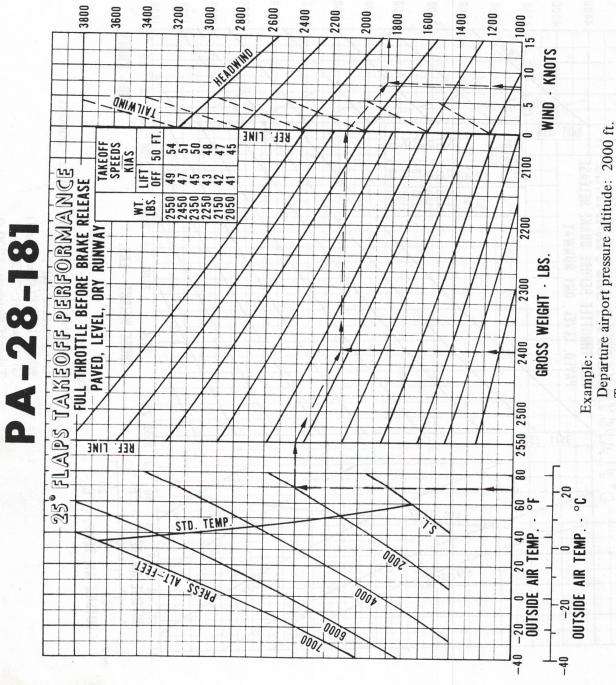
ISSUED: JUNE 18, 1976

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Takeoff distance: 1900 ft.

Gross weight: 2400 lbs.

TAKEOFF DISTANCE OVER 50-FT. BARRIER - FEET



25° FLAPS TAKEOFF PERFORMANCE

Figure 5-7

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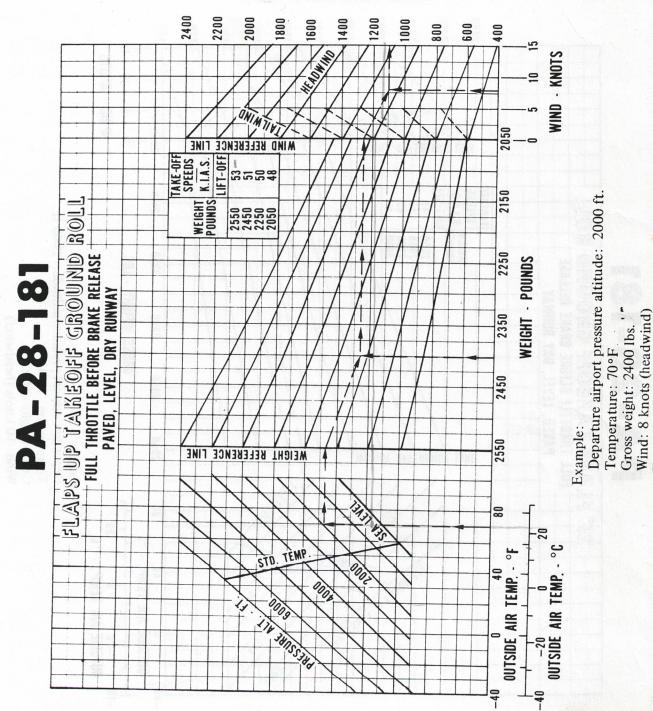
ISSUED: JUNE 18, 1976

Wind: 8 knots (headwind) Takeoff distance: 1860 ft.

Gross weight: 2400 lbs.

Temperature: 70°F

TAKEOFF GROUND ROLL - FEET



FLAPS UP TAKEOFF GROUND ROLL

Figure 5-9

ISSUED: JUNE 18, 1976

REPORT: VB-790

Takeoff ground roll: 1100 ft.

MIND BELEBENCE TINE WEIGHT K.I.A.S. 2150 2550 2450 2250 2050 2250 APS TAKEOFF GROUND FULL THROTTLE BEFORE BRAKE RELEASE GROSS WEIGHT - LBS PAVED, LEVEL, DRY RUNWAY 2350 2450 WEIGHT REFERENCE LINE THE PERSON NAMED IN 25 AIR OUTSIDE OUTSIDE

TAKEOFF GROUND ROLL . FEET

1000

800

009

400

2000

1800

2400

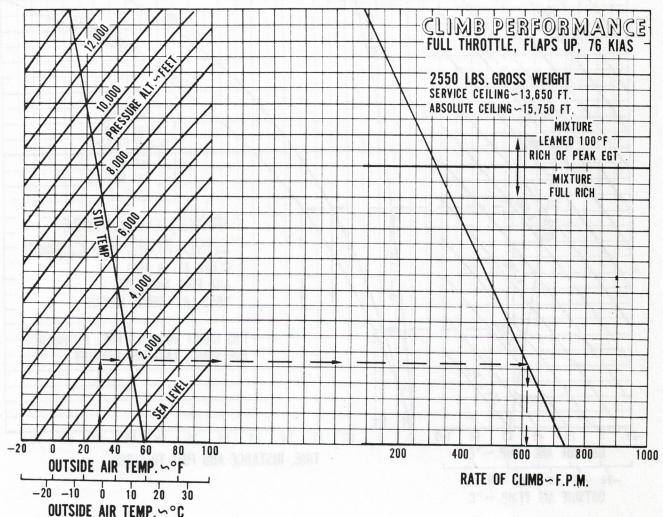
Example:

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



Example:

Climb pressure altitude: 3600 ft.

OAT: 30°F

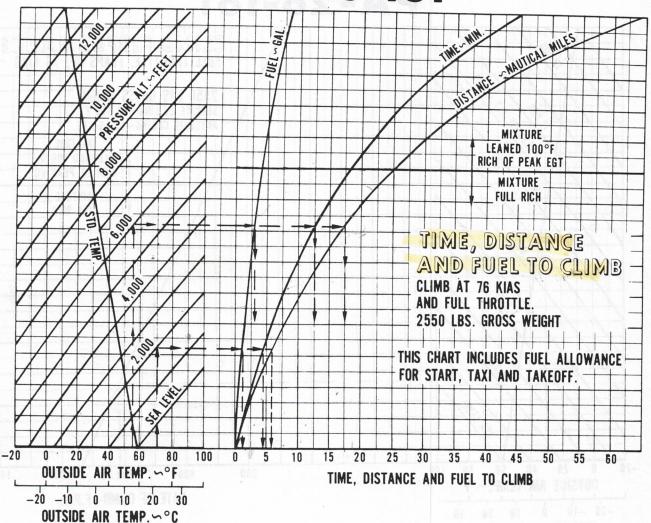
Rate of climb: 620 F.P.M.

CLIMB PERFORMANCE

Figure 5-13

ISSUED: JUNE 18, 1976

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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.

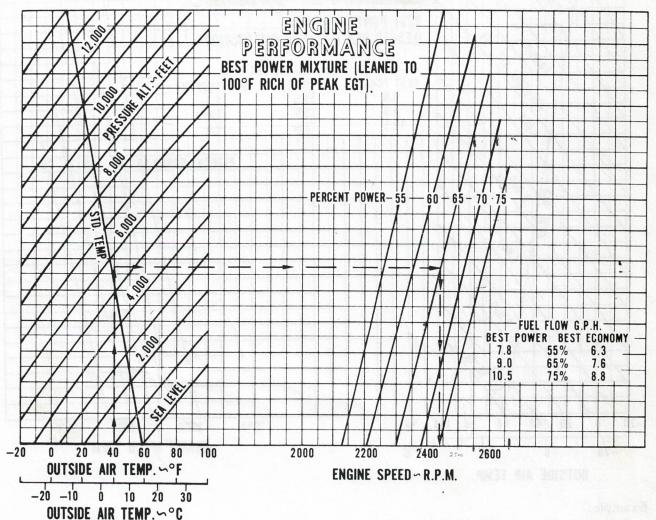
TIME, DISTANCE AND FUEL TO CLIMB

Figure 5-15

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Example:

Cruise pressure altitude: 5500 ft.

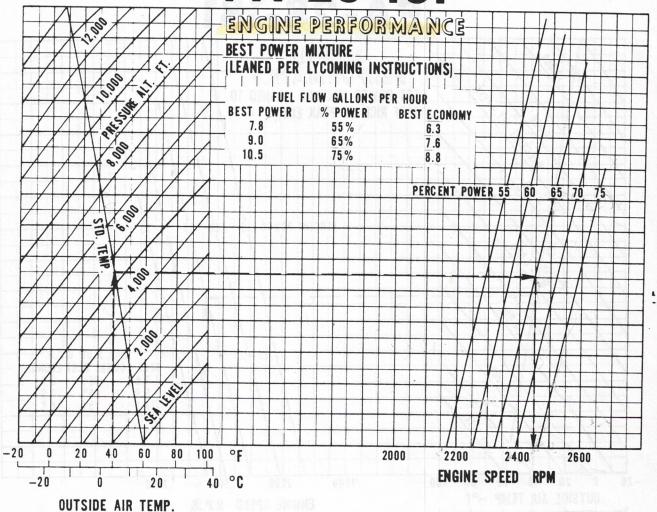
Cruise OAT: 40° F Percent power: 65% Engine RPM: 2440 RPM

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

Figure 5-17

ISSUED: JUNE 18, 1976 REVISED: JULY 12, 1977 REPORT: VB-790

5-19



Example:

Cruise pressure altitude: 5500 ft.

Cruise OAT: 40°F Percent power: 65% Engine RPM: 2450 RPM

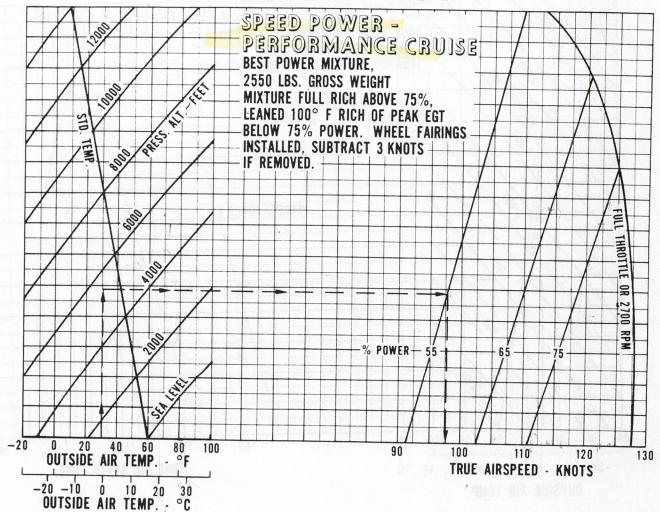
ENGINE PERFORMANCE (SERIAL NOS. 28-7890001 AND UP)

Figure 5-18

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ISSUED: JUNE 18, 1976 REVISED: JULY 12, 1977



Example:

Cruise pressure altitude: 5500 ft.

Cruise OAT: 30°F

Power: 55%

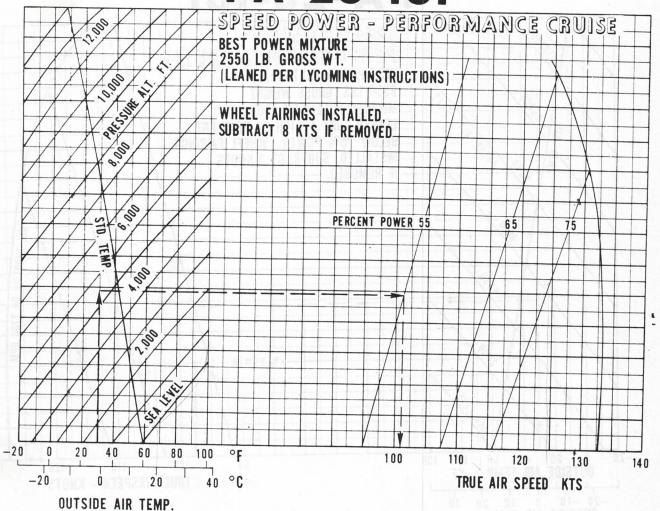
True airspeed: 97.5 knots

SPEED POWER - PERFORMANCE CRUISE (SERIAL NOS. 28-7790001 THROUGH 7790607)
Figure 5-19

ISSUED: JUNE 18, 1976 REVISED: JULY 12, 1977

REPORT: VB-790

5-21



Example:

Cruise pressure altitude: 5500 ft.

Cruise OAT: 30°F Power setting: 55% True airspeed: 101 knots

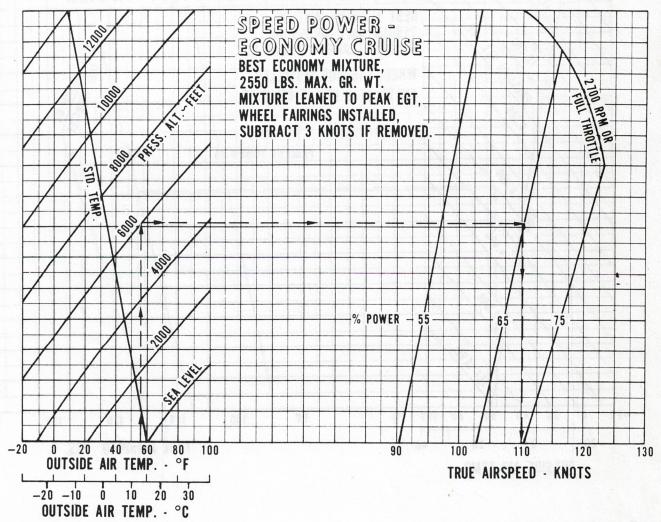
SPEED POWER - PERFORMANCE CRUISE (SERIAL NOS. 28-7890001 AND UP)

Figure 5-20

REPORT: VB-790

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ISSUED: JUNE 18, 1976 REVISED: JULY 12, 1977



Example:

Cruise pressure altitude: 6000 ft.

Cruise OAT: 55°F Power: 65%

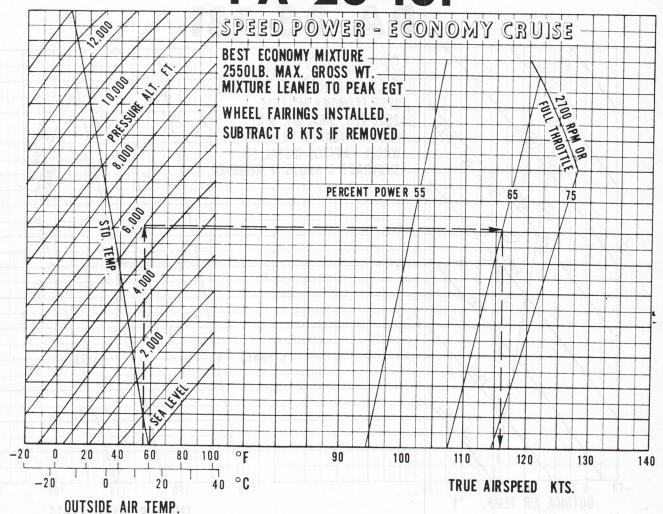
True airspeed: 110 knots

SPEED POWER - ECONOMY CRUISE (SERIAL NOS. 28-7790001 THROUGH 7790607)
Figure 5-21

ISSUED: JUNE 18, 1976 REVISED: JULY 12, 1977

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5-23



Example:

Cruise pressure altitude: 6000 ft.

Cruise OAT: 55° F Power setting: 65% True airspeed: 116 knots

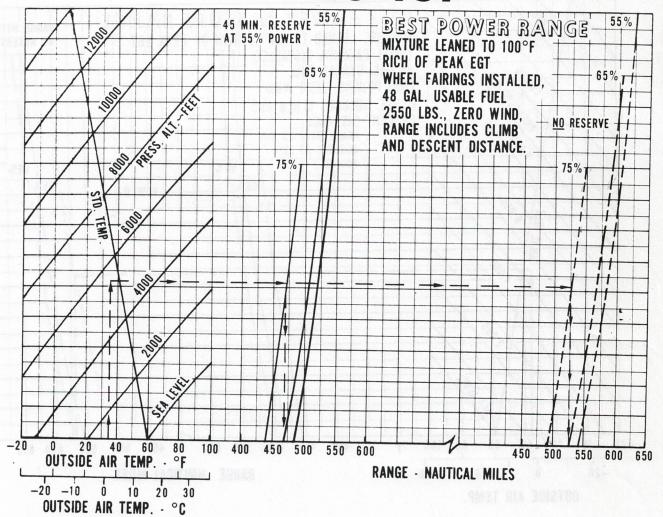
SPEED POWER - ECONOMY CRUISE (SERIAL NOS. 28-7890001 AND UP)

Figure 5-22

REPORT: VB-790

5-24

ISSUED: JUNE 18, 1976 REVISED: JULY 12, 1977



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

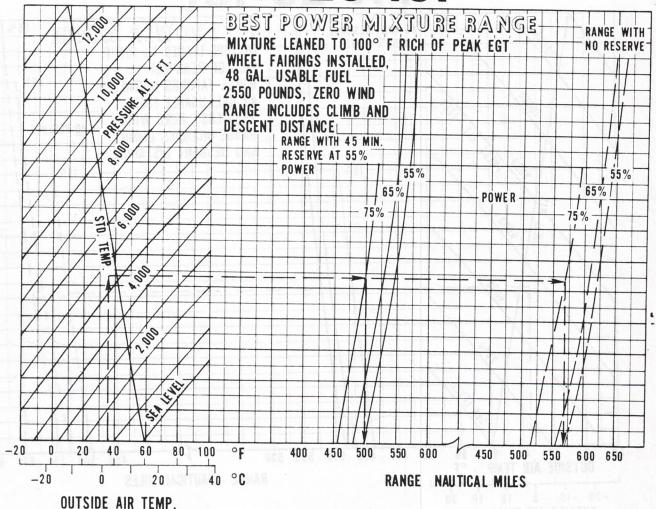
BEST POWER MIXTURE RANGE (SERIAL NOS. 28-7790001 THROUGH 7790607)

Figure 5-23

ISSUED: JUNE 18, 1976 REVISED: JULY 12, 1977

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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

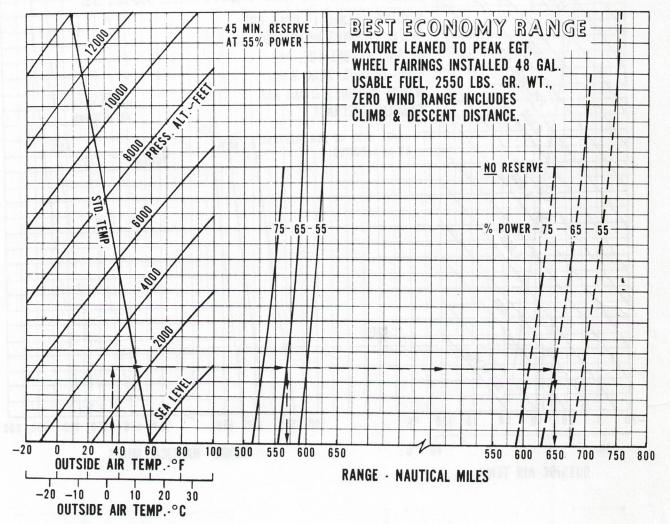
BEST POWER MIXTURE RANGE (SERIAL NOS. 28-7890001 AND UP)

Figure 5-24

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ISSUED: JUNE 18, 1976 REVISED: JULY 12, 1977



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

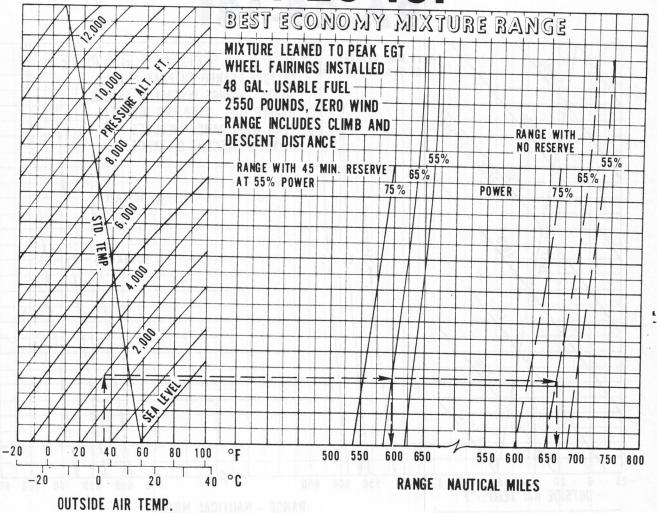
BEST ECONOMY MIXTURE RANGE (SERIAL NOS. 28-7790001 THROUGH 7790607)

Figure 5-25

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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

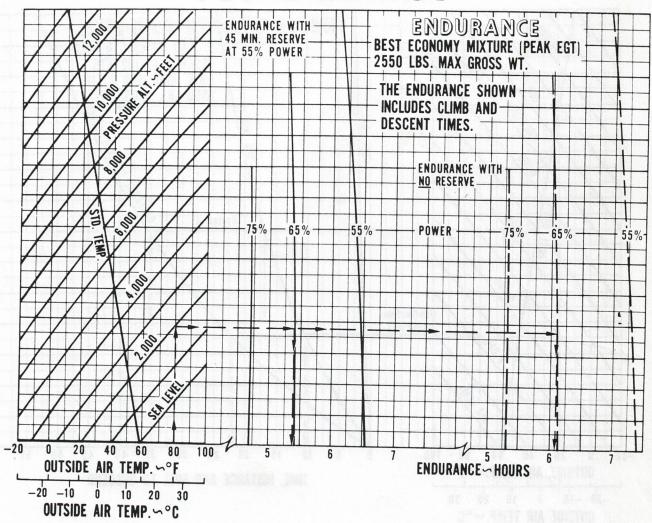
BEST ECONOMY MIXTURE RANGE (SERIAL NOS. 28-7890001 AND UP)

Figure 5-26

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ISSUED: JUNE 18, 1976 REVISED: JULY 12, 1977



Example:

Cruise pressure altitude: 2000 ft.

Cruise OAT: 80°F Power setting: 65%

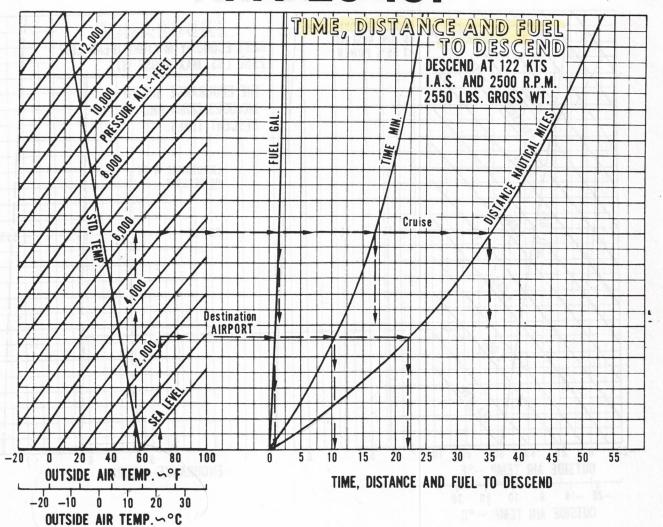
Endurance (with reserve): 5.37 hrs. Endurance (no reserve): 6.1 hrs.

ENDURANCE

Figure 5-27

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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.

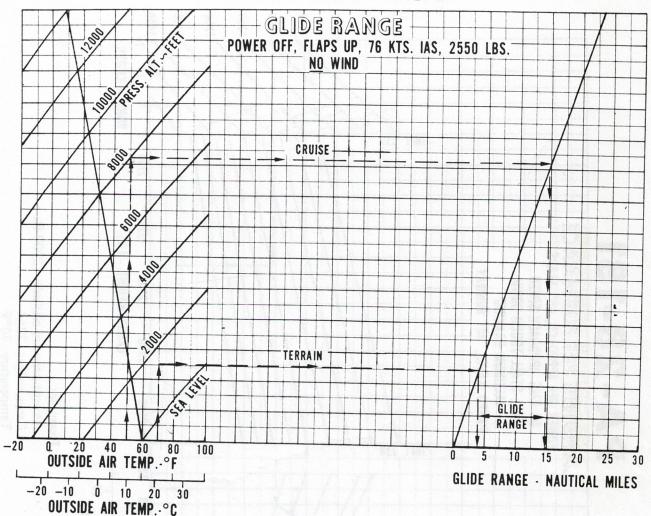
Distance to descend (35 miles minus 22 miles) = 13 nautical miles

TIME, DISTANCE AND FUEL TO DESCEND

Figure 5-29

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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

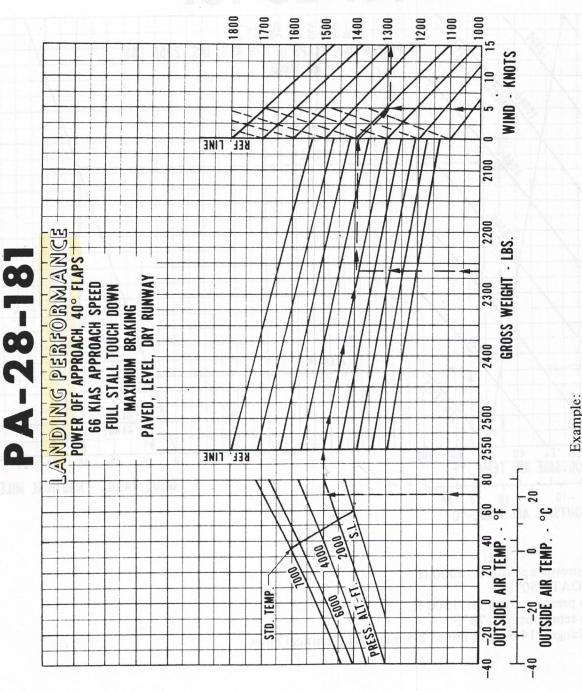
GLIDE RANGE

Figure 5-31

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LANDING DISTANCE OVER 50' BARRIER - FT.



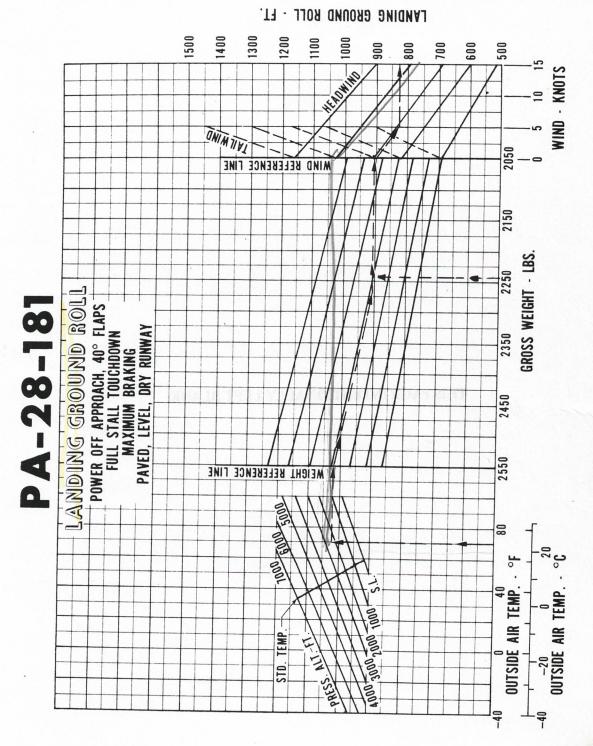
LANDING PERFORMANCE

Figure 5-33

Airport pressure altitude: 2300 ft.

Gross weight: 2264 Temperature: 70°F

Wind: 5 knots (headwind) Landing distance: 1290 ft.



Airport pressure altitude: 2300 ft.

Wind: 5 knots (headwind) Gross weight: 2264 lbs.

Ground roll: 825 ft.

Airport temperature: 70°F Example:

LANDING GROUND ROLL

Figure 5-35

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LAHOING SROUND ROLL - FT.

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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 can be helpful 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.

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location, the pulot can easily determine the weight and C. Specifica for the located similars by computing

always be used. Whenever new equipment added or any medification work is done, the mechanic

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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.

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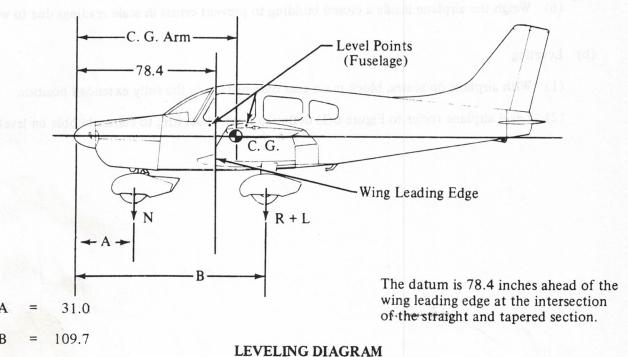
- (c) Weighing Airplane Basic Empty Weight
 - (1) With the airplane level and brakes released, record the weight shown on each scale. Deduct the tare, if any, from each reading.

Scale Position a		Scale Reading	Tare	Net Weight
Nose Wheel	(N)		noitsand	(a) Pro
Right Main Wheel	(R)	rt ni bezbedo amet Ils	He certain that	(1)
Left Main Wheel	(L)			200
Basic Empty Weight,	as Weighed (T)	eighing. —	v syclor_configura	

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).



LEVELING DIAGRA

Figure 6-3

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ISSUED: JUNE 18, 1976 REVISED: FEBRUARY 25, 1977 (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:

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

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MODEL PA-28-181 CHEROKEE ARCHER II

Airplane Serial Number	
Registration Number	
Date	

AIRPLANE BASIC EMPTY WEIGHT

Item	Weight x	C. G. Arm (Inches Aft of Datum)	= Moment (In-Lbs)
Standard Empty Weight* Actual Computed			
Optional Equipment			
Basic Empty Weight 12/11/93	1602.78	87.71	140,586.40

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

AIRPLANE USEFUL LOAD

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

Normal Category (2550 lbs) - ($\frac{169278}{100}$ lbs) = $\frac{947.22}{100}$ lbs.

Utility Category (1950 lbs) - (lbs) = 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

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Hem No. Description of Article or Modification As Delivered Added (+) Removed (-) Empty Weight	PA-28-181	81	Serial Number Re	Registration Number	ın Nuı	nber			Page Number	mber	
As Delivered As		n No.	Description of Article or Modification		Adde	Weight	Chang	е	(-) pa	Runni Empt	ng Basic / Weight
				Wt. (Lb.)	Arm (In.)	Moment /100	Wt. (Lb.)	Arm (In.)	Moment /100	Wt. (Lb.)	Moment /100
			As Delivered								
	-										
	and the										
	++			-			ne pieve				
					i de la composición della comp						
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	4										
			120				e e e e e e e e e e e e e e e e e e e		lance in a second		
						1111			200		
	3007										
			and addition of Nation of the state of the state of								
	-120011000 -120011000			emeder.				4		ill Did	
		Service Servic	200 200 200 200 200 200 200 200 200 200								

WEIGHT AND BALANCE RECORD

Figure 6-7

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PA	PA-28-181	Serial Number R	Registration Number	ın Nuı	nber			Page Number	ımber	
Date	Item No.	Description of Article or Modification		We Added (+)	Weight Change	Chang	e kemov	ge Removed (-)	Runn Empt	Running Basic Empty Weight
	In Out		Wt. (Lb.)	Arm (In.)	Moment /100	Wt. Arm (Lb.) (In.)	Arm (In.)	Moment /100	Wt. (Lb.)	Moment /100
		As Delivered								
						No. Continu				
						project for their				
								30*110		
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	00	and Manager								
-	And the second s			1		1	1	1		

WEIGHT AND BALANCE RECORD (cont)

Figure 6-7 (cont)

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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.

The Basic Emerty Weight C.G. is noted on the wisen and Ballane has been altered, refer to the Weight and Ba	Weight (Lbs)	Arm Aft Datum (Inches)	Moment (In-L _p bs)
Basic Empty Weight	era men 30 rengen	FOR CHARGOS - NO.	12 0 10 PM X 27 M PM
Pilot and Front Passenger	340.0	80.5	27370
Passengers (Rear Seats)*	340.0	118.1	40154
Fuel (48 Gallon Maximum)		95.0	
Baggage*		142.8	
Total Loaded Airplane			

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

SAMPLE LOADING PROBLEM (NORMAL CATEGORY)

Figure 6-9

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

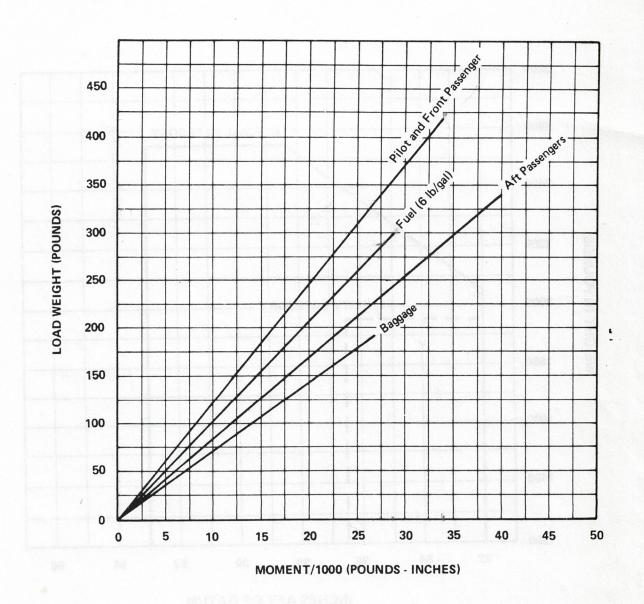
R FLRING bases comply weight.	Weight	Arm Aft Datum (Inches)	Moment (In-Lbs)
Basic Empty Weight	Figure 5-13) to dete	ne Loading Graph	esti (d).
Pilot and Front Passenger	s as last and as stories	80.5	ibba (b)
Passengers (Rear Seats)*	t desemble to the adt such as	118.1	hiving on the
Fuel (48 Gallon Maximum)	sem (a) and item (d) A	95.0	(a) By a
Baggage*	the point falls within t	142.8	igerg
Total Loaded Airplane			

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.

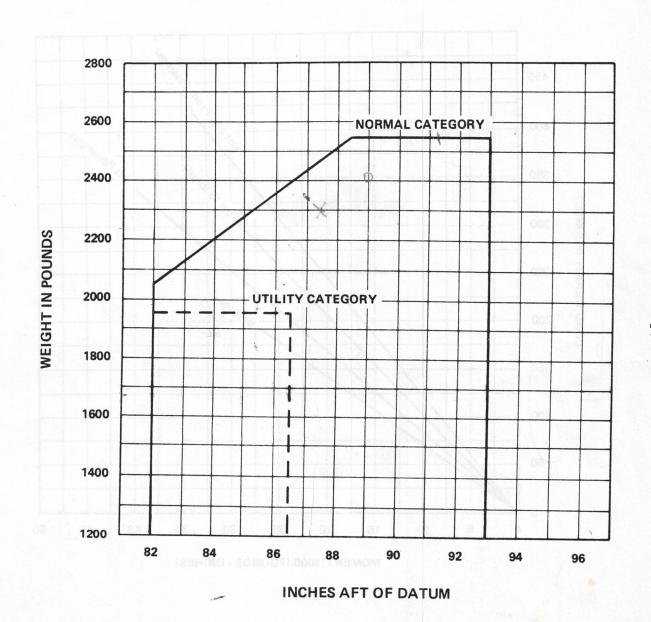
WEIGHT AND BALANCE LOADING FORM

Figure 6-11



LOADING GRAPH

Figure 6-13



C. G. RANGE AND WEIGHT

Figure 6-15

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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 A	AIRCRAFT CORPORATIO	ON	PA-28-	181 CHEROKEE	ARCHER II
SERIAI	_ NO	_ REGISTRATION NO		DATE:	
(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				

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Cert. Basis - TC P4EA

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(b)	Engine	and	Engine	Accessories
(-)	-1151110	uniu	Liighic	110003301103

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		2.8	35.5	99

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/ \		~		
(c)	Landing	Gear	and	Brakes
(-)		Cui	ulla	Dimies

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	(0) 1 (22) (1 3	4.3	31.0	133
	b. McCauley Industrial Corp.Wheel Assy. No. D-30625Cert. Basis - TSO C26b		5.5	31.0	171
	c. One Nose Wheel 4-Ply Rating Tire 6.00-6 with Regular Tube Cert. Basis - TSO C62				

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Wheel Assembly No. 40-76B

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(d) Electrical Equipment

Item No.

Item

Mark if Instl.

Weight (Pounds)

Arm (In.) Aft Datum Moment (Lb-In.)

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(e)	Instruments
(0)	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				

Orth, Bards - TSO C26

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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				

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(g) Engine and Engine Accessories (Optional Equipment)

Item No.

Item

Mark if Instl.

Weight (Pounds)

Arm (In.) Aft Datum

Moment (Lb-In.)

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(h) Propeller and Propeller Accessories (Optional Equipment)

Item No.

Item

Mark if Instl.

Weight (Pounds)

Arm (In.) Aft Datum Moment (Lb-In.)

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(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		10.3	36.3	374
77	Main Wheel Fairings Piper Dwg. 37885-2, -3 Cert. Basis - TC 2A13	TAMOUNTE	20.6	113.6	2340

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(j)	Electrical Equipment	
	(Optional Equipment))

Item No.	Item (1999)	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)		
79	Instrument Panel Lights Cert. Basis - TC 2A13		0.3	62.8	19		
81	Instrument Light Grimes 15-0083-7 Cert. Basis - TC 2A13		0.1	99.0	10		
83	Cabin Light Cert. Basis - TC 2A13		0.3	99.0			
85	Landing Light, G. E. Model 4509		462, 12 Volt		30		
	Cert. Basis - TC 2A13		.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		.2	281.0	56		
91	Rotating Beacon Cert. Basis - TC 2A13		1.5	263.4	395		
93	Anti-Collision Lights (Wing Tip) (Whelen) Cert. Basis - STC SA615EA		5.7	157.9	900		
95	Heated Pitot Head, Piper Dwg. 69041-7 Cert. Basis - TC 2A13		.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		*5.3	168.0	890		

^{*}Weight and moment difference between standard and optional equipment.

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

Item		Mark if	Weight	Arm (In.)	Moment
No.	Item	Instl.	(Pounds)	Aft Datum	(Lb-In.)
	9.65				
101	Auxiliary Power Receptacle,				
	Piper Dwg. 68815				
	Cert. Basis - TC 2A13		2.7	178.5	482
103	External Power Cable,				
	Piper Dwg. 62355				
	Cert. Basis - TC 2A13		4.6	142.8	657
105	Lighter, *200462, 12 Volt				
	Universal				
	Cert. Basis - TC 2A13		.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		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			ndard 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		1.0	65.9	66
125	Alternate Static Source Cert. Basis - TC 2A13	<u> </u>	.4	61.0	24
127	Turn and Slip Indicator, Piper PS50030-2 or -3 Cert. Basis - TSO C3b		2.6	59.7	155
129	Exhaust Gas Temperature, Piper Dwg. 99026 Cert. Basis - TC 2A13		.7	55.4	39
131	Manifold Pressure Gauge Piper Spec. PS50031-3 or -4 Cert. Basis - TC 2A13		0.9	60.8	55

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^{*}Weight and moment difference between standard and optional equipment.

(k) Instruments (Optional Equipment) (cont)

Item No.	(ini) ma mised the litem (ini)	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
133	Engine Hour Meter Piper Dwg. 79548-0				
	Cert. Basis - TC 2A13			61.2	18
135	Clock Cert. Basis - TC 2A13		.40 02	62.4	25
137	Air Temperature Gauge, Piper Dwg. 99479-0 or -2 Cert. Basis - TC 2A13			Dwg, 99003-2 Cen. Basis - T	16
	Colt. Busis TC 2A15		Acrif verten	72.6	15

(1)	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 a. Omni Coupler, #1C388 Cert. Basis - STC SA3065SW-D		9.6 1.0	77.6 59.3	745 59

(m)	Radio Equipment
	(Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
169	Collins VHF-251 Comm Transceiver a. Single b. Dual Cert. Basis - TSO C37b, C38b		3.4 6.8	56.9 56.9	193 387
171	Collins VIR-351 Nav Receiver a. Single b. Dual Cert. Basis - TSO C40a, C36c		2.7 5.4	57.4 57.4	155 310
173	Collins IND-350 VOR/LOC Indicator a. Single b. Dual Cert. Basis - TSO C40a, C36c	· ———	1.0 2.0	60.2 60.2	60 120
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
	Collins AMR-350 Audio/Marker Panel Cert. Basis - TSO C35d, C50b		*3.3	110.0	363

^{*}Weight includes antenna and cable.

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

Item No.	Call track minuted that Item (abanda)	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

^{*}Weight includes antenna.

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

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
187	King KX 170 () VHF Comm/Nav				
	a. Transceiver, Singleb. Transceiver, DualCert. Basis - TC 2A13		7.5 15.0	56.6 56.6	425 849
189	King KX 175 () VHF				
	a. Transceiver,b. King KN 73 Glide Slope		9.4	56.6	532
	Receiver, c. King KN 77 VOR/LOC		3.2	184.3	590
	Converter, d. King KNI 520 VOR/ILS		3.6	183.6	661
	Indicator Cert. Basis - TSO C3bc,	Proceedings of the State of the	2.8	60.5	169
	C37b, C38b, C40a				105
191	King KX 175 () VHF a. Transceiver (2nd), b. King KN 77 VOR/LOC		8.6	56.6	487
	Converter, c. King KNI 520 VOR/ILS		4.2	183.6	771
	Indicator Cert. Basis - TSO C36c, C37b, C38b, C40a		2.8	60.5	169
193	King KI 201 () VOR/ LOC Ind. a. Single		2.5		
	b. Dual Cert. Basis - TC 2A13		2.5 5.0	59.6 59.9	149 300
195	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

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

Item	- 10	Mark if	Weight	Arm (In.)	Moment
No.	Item W (In) MA Item (In)	Instl.	(Pounds)	Aft Datum	(Lb-In.)
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 a. Audio Amplifier Cert. Basis - TSO C41b		8.6 0.8	85.2 51.0	733 41
207	King KR 86 ADF a. First b. Second c. Audio Amplifier Cert. Basis - TC 2A13		6.7 9.7 0.8	91.6 107.0 51.0	614 1038 41
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. Singleb. DualCert. Basis - TC 2A13		3.6 7.1	57.4 57.4	207 408
217	Narco Comm 11B VHF Transceiver			I vert count	715-1
	a. Singleb. Dual		3.9 7.8	57.4 57.4	· 224 - 448
219	Narco Comm 111 VHF Transceiver a. Single b. Dual		3.0 6.0	57.4 57.4	172 344
221	Cert. Basis - TSO C37b, C38b Narco Comm 111B VHF Transceiver a. Single		3.9	57.4	
	b. Dual Cert. Basis - TSO C37b, C38b		7.8	57.4	.224 448
223	Narco Comm 120 VHF Transceiver				
	a. Singleb. DualCert. 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	385
227	Narco Nav 11 VHF Receiver		aco latro	36.6	111
	a. Singleb. DualCert. 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

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

Item No.	(al) miA 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	818 144
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,				217
239	C36c, C34c, C66a Narco Nav 121 VHF Receiver		2.5	57.4	144.
172	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		* 5.1 * 8.6	99.4	507
- 224 448	Cert. Basis - TSO C35d, C36c, C40c, C66a		* 8.6	82.9	713
243	Narco Nav 122A VHF Receiver a. Single b. Dual		* 5.2 * 8.8	98.5 82.2	512 723
273 494	Cert. Basis - TSO C34c, C35d, C36c, C40c, C66a				
245	Narco Nav 124A VHF Receiver a. Single b. Dual		* 6.2 *10.9	92.3 77.2	572 841
	Cert. Basis - TSO C35d, C36c, C40a, C66a				

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^{*}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	N. J. 124 VOD / OG/GG				
247	Narco ID 124 VOR/LOC/GS Indicator				
	a. Singleb. DualCert. Basis - TSO C34c, C35d,		1.2 2.4	60.5 60.5	73 145
	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				" ETT
	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			f Single ADF Cert, Bana - 17	
	Cert. Basis - TSO C50b, C35d		* 3.7	114.3	423
261	Narco DME-190			and a second of	
	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
4117 . 1	0.00				

^{*}Weight includes marker antenna and cable.
**Weight includes antenna and cable.

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

Item No.	(m) ma Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
267	Narco ADF-140 a. Single b. Dual Cert. Basis - TSO C41c		6.0 *17.9	91.2 107.6	547 1926
269	Narco ADF-141 a. Single b. Dual Cert. Basis - TSO C41c		6.0 *17.9	91.2 107.6	547 1926
271	Narco AT50A Transponder Cert. Basis - TSO C74b a. Narco AR-500 Altitude Encoder		** 3.0	57.3 350	172
	Cert. Basis - TSO C88		1.0	51.5	52
273	Narco AT150 Transponder Cert. Basis - TSO C74c a. Narco AR-500 Altitude Encoder		** 3.0	57.3	172
	Cert. Basis - TSO C88		1.0	51.5	52
275	Antenna and Cable a. Nav Receiving b. *1 VHF Comm c. *2 VHF Comm d. Glide Slope (Single) e. Glide Slope (Dual) f. Single ADF Sense Cert. Basis - TC 2A13		1.4 0.7 0.8 0.9 2.8 0.4	195.7 125.7 147.5 120.0 154.0 150.0	274 88 118 108 431 60
277	Anti Static Antenna and Cable				
	a. #1 VHF Comm b. #2 VHF Comm c. Single ADF Sense Cert. Basis - TC 2A13		1.4 1.5 0.5	144.3 170.7 147.5	202 256 74
279	Emergency Locator Transmitter a. Antenna and Coax		1.7	236.2	402
	b. Shelf and Access Hole Cert. Basis - TC 2A13		0.2 0.3	224.4 235.4	45 71

^{*}Weight includes dual antenna and cable.
**Weight includes antenna and cable.

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(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 b. Piper Dwg. 68856-11 c. Piper Dwg. 68856-12 Cert. Basis - TC 2A13		0.3 0.6 0.3	64.9 69.9 64.9	19 42 19
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	OTMATNI SE	0.5	60.0	30

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(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		- 1.1149	Transchasti Pag = Dag	
325	Air Conditioner, Piper Dwg. 99575-3 Cert. Basis - TC 2A13			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				Tag
331	Cert. Basis - TC 2A13 Assist Step,	Establishment	14.9	172.2	2566
331	Piper Dwg. 65384 Cert. Basis - TC 2A13	and the second second	1.8	156.0	281
333	Super Cabin Sound Proofing, Piper Dwg. 79601-3 Cert. Basis - TC 2A13		18.1	86.8	1571
335	Adjustable Front Seat (Left), Piper Dwg. 79591-0/79591-2 Cert. Basis - TC 2A13		*6.6	80.7	533
337	Adjustable Front Seat (Right), Piper Dwg. 79591-1/79591-3 Cert. Basis - TC 2A13		*6.8	80.0	544

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^{*}Weight and moment difference between standard and optional equipment.

(n) Miscellaneous (Optional Equipment) (cont)

	Item					
	No.	(m) HTTA Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
	220					1
1	339	Headrests (2) Front, Piper Dwg. 79337-18				12.5
		Cert. Basis - TC 2A13		2.2	94.5	208
1	341	Headrests (2) Rear,			Cables	208
		Piper Dwg. 79337-18	Access that American		Cert. Basis -	
		Cert. Basis - TC 2A13		2.2	132.1	291
1	343	Inertia Safety Belts (Rear)				
		(2) 0.8 lbs. each, Piper PS50039-4-14				
		Cert. Basis - TC 2A13		1.6	140.3	. 224
1	345	Assist Strap, Piper Dwg. 79455			Cart. Basis	. 224
		Cert. Basis - TC 2A13		0.2	109.5	22
4.	347	Deluxe Carpeting		A CONTRACTOR		
		Cert. Basis - TC 2A13		*2.8	101.9	285
1	349	Fire Extinguisher,				
		a. Piper Dwg. 76167-2b. Piper Dwg. 37872-2		4.6	71.0	327
		Cert. Basis - TC 2A13		5.6	57.9	324
#1				E-1032	Figer Dwg, 7	

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^{*}Weight and moment difference between standard and optional equipment.

Miscellaneous (n) (Optional Equipment) (cont)

Item	
No.	Item
	STAB GA

	Mark if	Weight	Arm (In.)	Moment
Item	Instl.	(Pounds)	Aft Datum	(Lb-In.)
STAB GAD SEALS		602	308	184.8
AILERON GAPSE	ALS	3002	129	38.7
FLAD GAPSEAU	15	27.02	129	34.8
PEAP to FUSICE AGE	SEAL	302	136	40.8
WIME ROOT FAIR	11465	1.8	64.65	116.4
W 1M6 1001 1-1110			766.65	20415.3
	,	6.6		114570
	/	6 62.78		401.9
		1608,78	9345	40328
	/		9751	40586.4
		3049 8181 66	93.45	<u>.</u>

TOTAL OPTIONAL	EQUIPMENT
----------------	-----------

TITTE			0 0				
EX	LE	KI (OR.	H	NI	SH	

Base Color_____ Trim Color _____

Registration No. Color_____ Type Finish _____

Accent Color _____

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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 65₂-415 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.

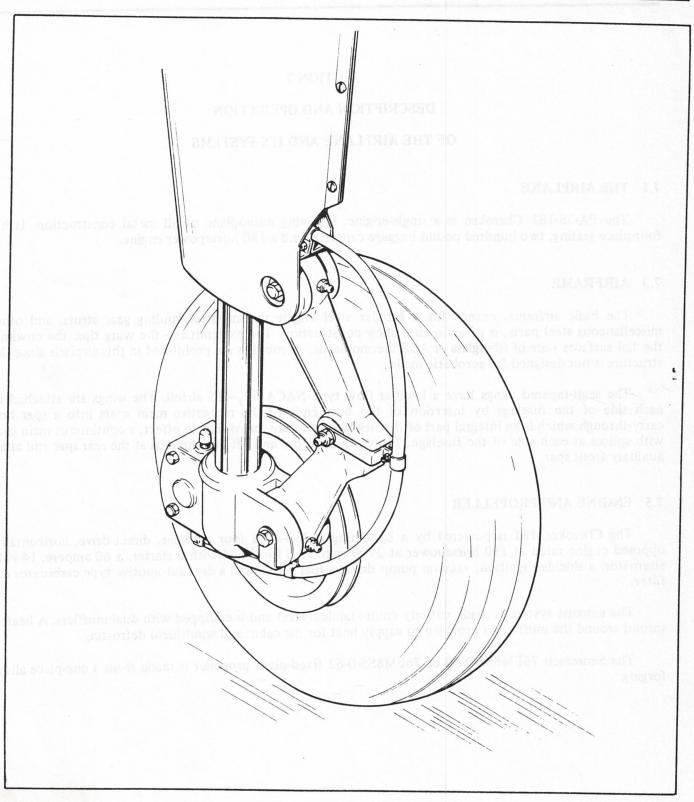
7.5 ENGINE AND PROPELLER

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.

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MAIN WHEEL ASSEMBLY

Figure 7-1

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7.7 LANDING GEAR

The three landing gears use Cleveland 6.00×6 wheels, the main gear wheels (Figure 7-1) being provided with brake drums and Cleveland single disc hydraulic brake assemblies. All three wheels use 6.00×6 , 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).

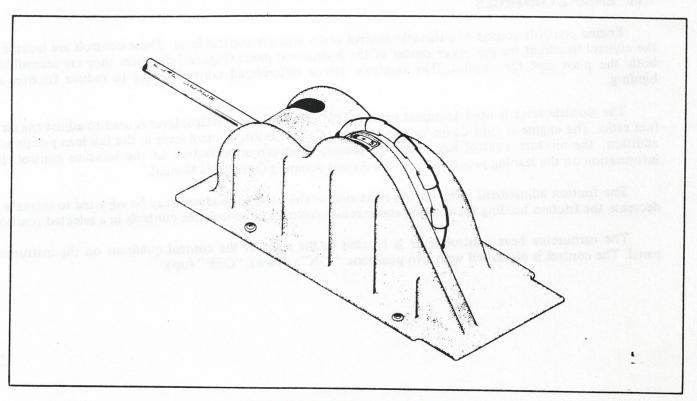
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the left side of the handle, and releasing the brake lever. To release the parking brake pull back on the

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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.

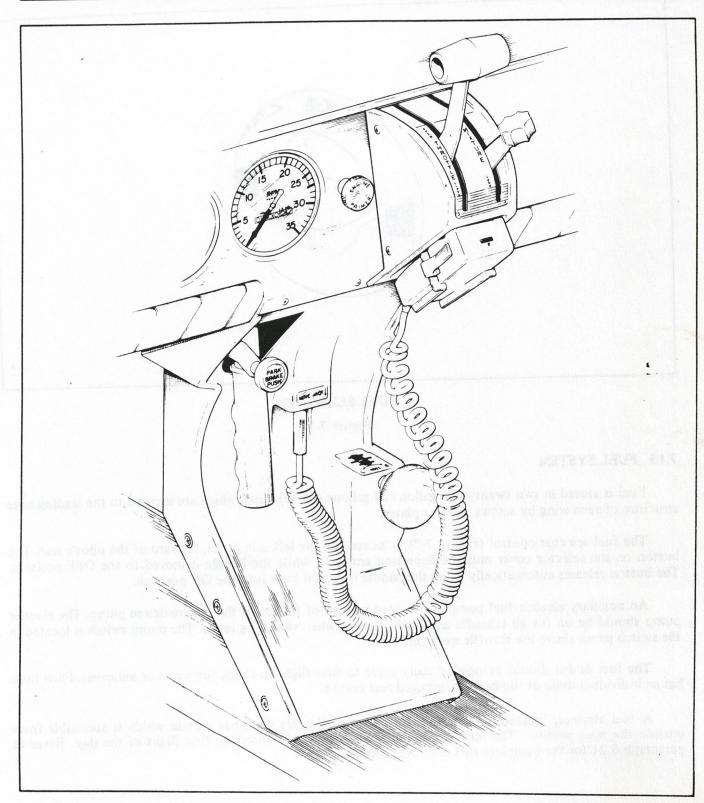
7.11 ENGINE CONTROLS

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.

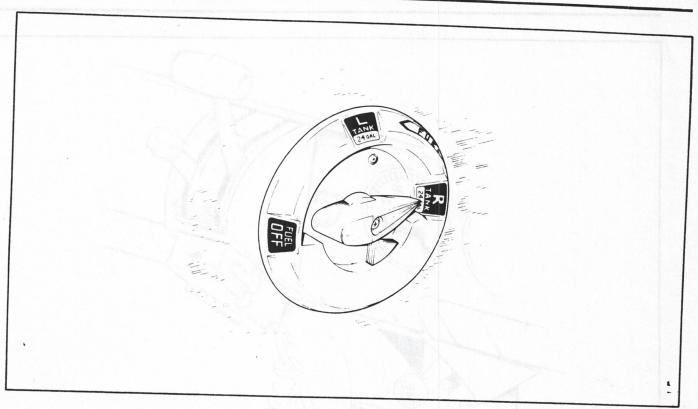
The friction adjustment lever on the right side of the control quadrant may be adjusted to increase or decrease the friction holding the throttle and mixture controls or to lock the controls in a selected position.

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

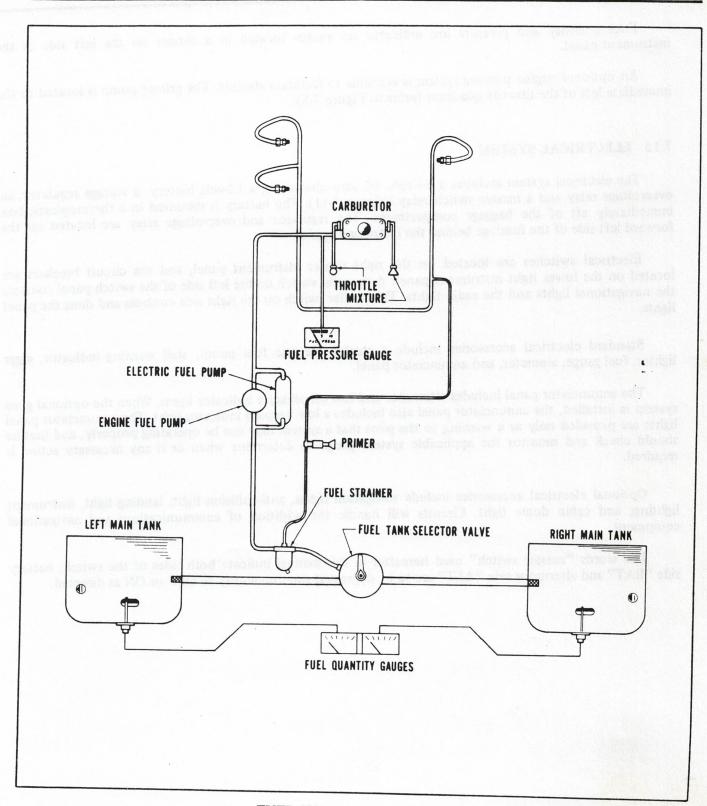
Fuel is stored in two twenty-five gallon (24 gallons usable) tanks which are secured to the leading edge structure of each wing by screws and nut plates.

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

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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.

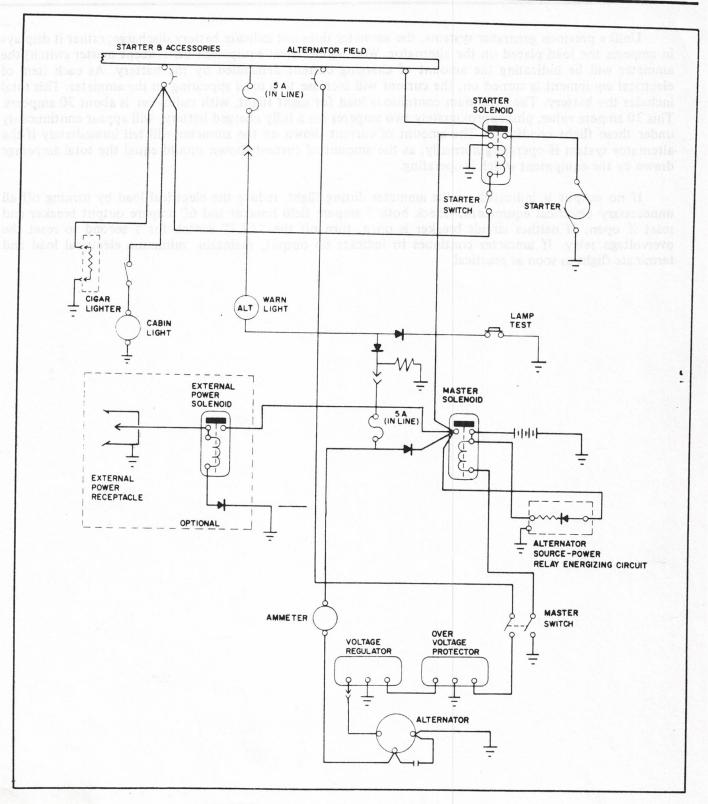
The words "master switch" used hereafter in this manual indicate both sides of the switch; battery side "BAT" and alternator side "ALT" are to be depressed simultaneously to OFF or ON as directed.

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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.

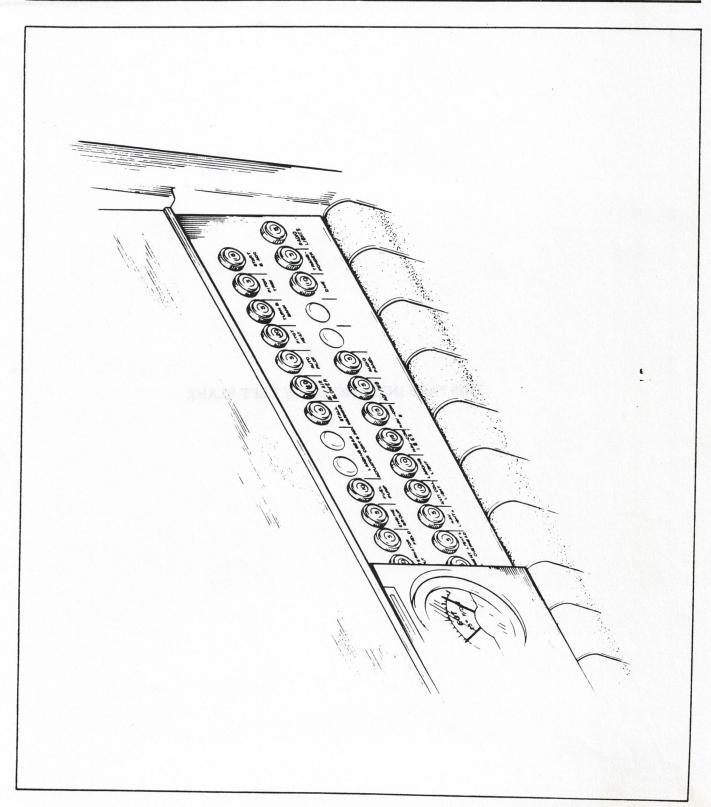
If no output is indicated on the ammeter during flight, reduce the electrical load by turning off all unnecessary electrical equipment. Check both 5 ampere field breaker and 60 ampere output breaker and reset if open. If neither circuit breaker is open, turn off the "ALT" switch for 1 second to reset 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

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CIRCUIT BREAKER PANEL

Figure 7-13

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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 $5.0 \pm .1$ 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.

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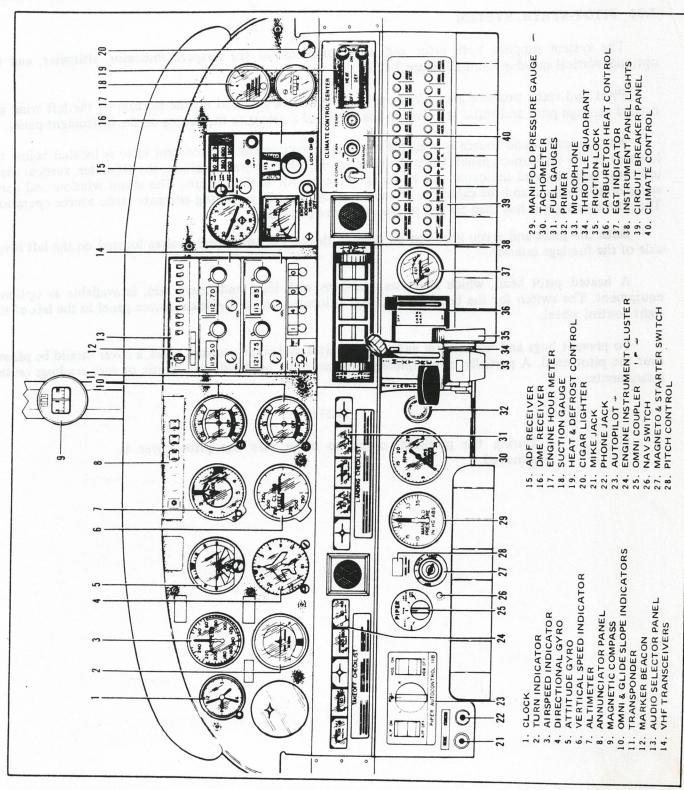
7.19 INSTRUMENT PANEL

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 warm the pilot of a possible malfunction in the alternator, oil pressure, or vacuum systems.

at their rated RPM. Higher settings will dam-se the gyros and with a low setting the evros will be unreliable

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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.

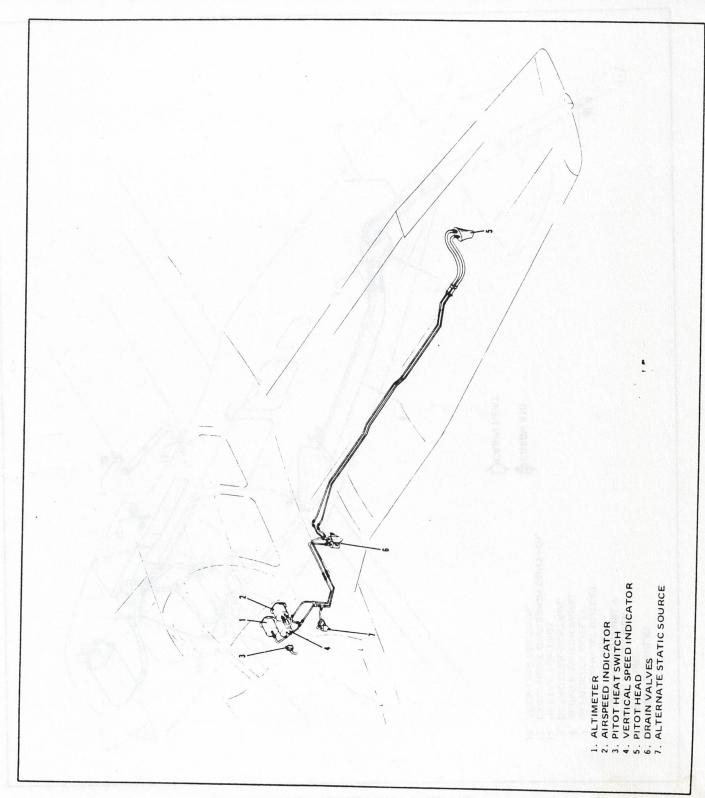
NOTE

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

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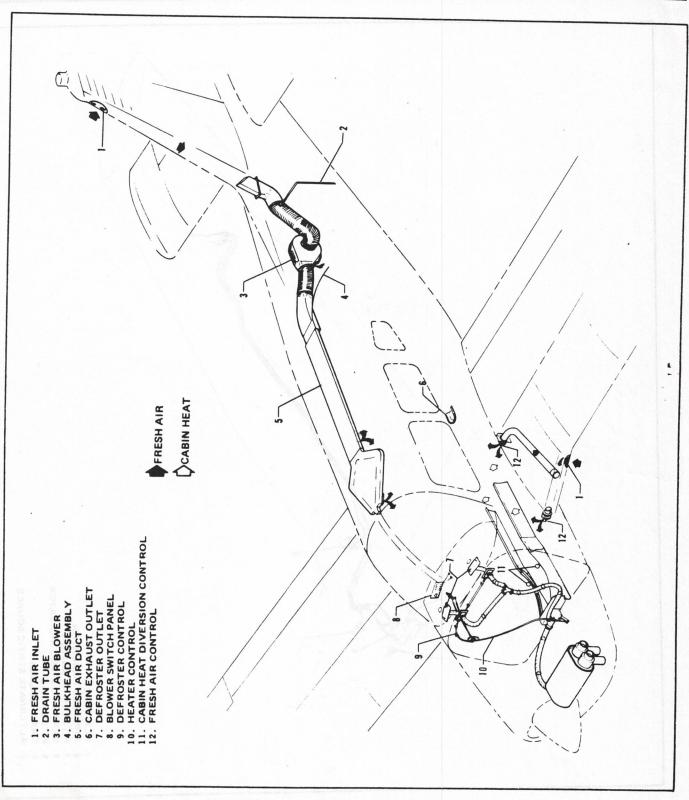
ISSUED: JUNE 18, 1976 REVISED: JULY 12, 1977



PITOT-STATIC SYSTEM

Figure 7-17

ISSUED: JUNE 18, 1976



HEATING AND VENTILATING SYSTEM

Figure 7-19

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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."

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.

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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.

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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.

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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

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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. It is automatically activated by a longitudinal force of 5 g's and transmits a distress signal on both 121.5 MHz and 243.0 MHz for a period of from 48 hours in low temperature areas up to 100 hours in high temperature areas. 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.

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.

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SECTION 8

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SECTION 8

AIRPLANE HANDLING, SERVICING AND MAINTENANCE

8.1 GENERAL

This section provides general guidelines relating to the handling, servicing and maintenance of the Archer II.

Every owner should stay in close contact with his Piper dealer or distributor and Authorized Piper Service Center to obtain the latest information pertaining to his aircraft and to avail himself of the Piper Aircraft Service Back-up.

Piper Aircraft Corporation takes a continuing interest in having the owner get the most efficient use from his aircraft and keeping it in the best mechanical condition. Consequently, Piper Aircraft from time to time issues Service Bulletins, Service Letters and Service Spares Letters relating to the aircraft.

Service Bulletins are of special importance and should be complied with promptly. These are sent to the latest registered owners, distributors and dealers. Depending on the nature of the bulletin, material and labor allowances may apply, and will be addressed in the body of the Bulletin.

Service Letters deal with product improvements and service hints pertaining to the aircraft. They are sent to dealers, distributors and occasionally (at the factory's discretion) to latest registered owners, so they can properly service the aircraft and keep it up to date with the latest changes. Owners should give careful attention to the 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.

If an owner is not having his aircraft serviced by an Authorized Piper Service Center, he should periodically check with a Piper dealer or distributor to find out the latest information to keep his aircraft up to date.

Piper Aircraft Corporation has a Subscription Service for the Service Bulletins, Service Letters and Service Spares Letters. This service is offered to interested persons such as owners, pilots and mechanics at a nominal fee, and may be obtained through Piper dealers and distributors.

A service manual, parts catalog, and revisions to both, are available from your Piper dealer or distributor. Any correspondence regarding the airplane should include the airplane model and serial number to insure proper response.

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8.3 AIRPLANE INSPECTION PERIODS

The Federal Aviation Administration (FAA) occasionally publishes Airworthiness Directives (ADs) that apply to specific groups of aircraft. They are mandatory changes and are to be complied with within a time limit set by the FAA. When an AD is issued, it is sent to the latest registered owner of the affected aircraft and also to subscribers of the service. The owner should periodically check with his Piper dealer or A & P mechanic to see whether he has the latest issued AD against his aircraft.

Piper Aircraft Corporation provides for the initial and first 50-hour inspection, at no charge to the owner. The Owner Service Agreement which the owner receives upon delivery of the aircraft should be kept in the aircraft at all times. This identifies him to authorized Piper dealers and entitles the owner to receive service in accordance with the regular service agreement terms. This agreement also entitles the transient owner full warranty by any Piper dealer in the world.

One hundred hour inspections are required by law if the aircraft is used commercially. Otherwise this inspection is left to the discretion of the owner. This inspection is a complete check of the aircraft and its systems, and should be accomplished by a Piper Authorized Service Center or by a qualified aircraft and power plant mechanic who owns or works for a reputable repair shop. The inspection is listed, in detail, in the inspection report of the appropriate Service Manual.

An annual inspection is required once a year to keep the Airworthiness Certificate in effect. It is the same as a 100-hour inspection except that it must be signed by an Inspection Authorized (IA) mechanic or a General Aviation District Office (GADO) representative. This inspection is required whether the aircraft is operated commercially or for pleasure.

A Progressive Maintenance program is approved by the FAA and is available to the owner. It involves routine and detailed inspections at 50-hour intervals. The purpose of the program is to allow maximum utilization of the aircraft, to reduce maintenance inspection cost and to maintain a maximum standard of continuous airworthiness. Complete details are available from Piper dealers.

A spectographic analysis of the oil is available from several sources. This system, if used intelligently, provides a good check of the internal condition of the engine. For this system to be accurate, oil samples must be sent in at regular intervals, and induction air filters must be cleaned or changed regularly.

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8.5 PREVENTIVE MAINTENANCE

The holder of a Pilot Certificate issued under FAR Part 61 may perform certain preventive maintenance described in FAR Part 43. This maintenance may be performed only on an aircraft which the pilot owns or operates and which is not used in air carrier service. The following is a list of the maintenance which the pilot may perform:

(a) Repair or change tires and tubes.

(b) Service landing gear wheel bearings, such as cleaning, greasing or replacing.

(c) Service landing gear shock struts by adding air, oil or both.

(d) Replace defective safety wire and cotter keys.

(e) Lubrication not requiring disassembly other than removal of non-structural items such as cover plates, cowling or fairings.

(f) Replenish hydraulic fluid in the hydraulic reservoirs.

(g) Refinish the exterior or interior of the aircraft (excluding balanced control surfaces) when removal or disassembly of any primary structure or operating system is not required.

(h) Replace side windows and safety belts.

Replace seats or seat parts with replacement parts approved for the aircraft. (i)

Replace bulbs, reflectors and lenses of position and landing lights. (j)

(k) Replace cowling not requiring removal of the propeller.

Replace, clean or set spark plug clearance.

(m) Replace any hose connection, except hydraulic connections, with replacement hoses.

(n) Replace prefabricated fuel lines.

(o) Replace the battery and check fluid level and specific gravity.

Although the above work is allowed by law, each individual should make a self analysis as to whether he has the ability to perform the work.

If the above work is accomplished, an entry must be made in the appropriate logbook. The entry should contain:

(a) The date the work was accomplished.

(b) Description of the work.

- (c) Number of hours on the aircraft.
- (d) The certificate number of pilot performing the work.

(e) Signature of the individual doing the work.

8.7 AIRPLANE ALTERATIONS

If the owner desires to have his aircraft modified, he must obtain FAA approval for the alteration. Major alterations accomplished in accordance with Advisory Circular 43.13-2, when performed by an A & P mechanic, may be approved by the local FAA office. Major alterations to the basic airframe or systems not covered by AC 43.13-2 require a Supplemental Type Certificate.

The owner or pilot is required to ascertain that the following Aircraft Papers are in order and in the aircraft.

- (a) To be displayed in the aircraft at all times:
 - (1) Aircraft Airworthiness Certificate Form FAA-8100-2.
 - (2) Aircraft Registration Certificate Form FAA-8050-3.
 - (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 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
 - 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:

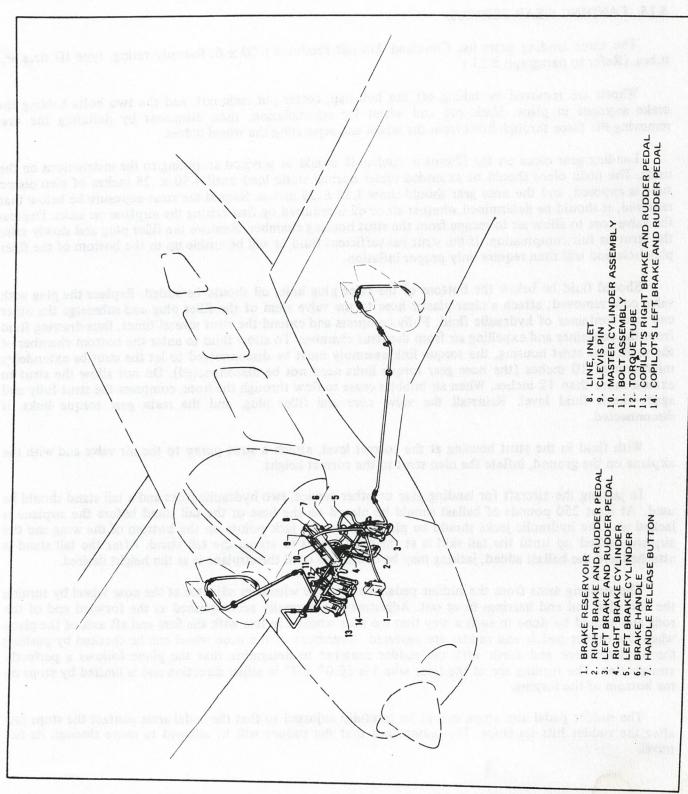
- (1) Tap the filter gently to remove dirt particles, being careful not to damage the filter. DO NOT wash the filter in any liquid. DO NOT attempt to blow out dirt with compressed air.
- (2) If the filter is excessively dirty or shows any damage, replace it immediately.
 - (3) Wipe the filter housing 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

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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 $4.50 \pm .25$ inches of oleo piston tube is exposed, and the nose gear should show $3.25 \pm .25$ 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 $30.0^{\circ} \pm 2^{\circ}$ 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.

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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 Lycoming O-360-A4M series engines is 8 quarts and the minimum safe quantity is 2 quarts. It is recommended that the oil filter element be changed every 50 hours or sooner under unfavorable conditions. Engine oil is normally changed with the filter. However, if the full flow (cartridge type) oil filter is used and changed every 50 hours of operation, the intervals between oil changes may be increased as much as 100 percent. The following grades are recommended for the specified temperatures:

Average Ambient Air Temperature For Starting	Single Viscosity Grade	Multi-Viscosity Grades
Above 60°F	SAE 50	SAE 40 or SAE 50
30° to 90°F	SAE 40	SAE 40
0° to 70°F	SAE 30	SAE 40 or 20W-30
Below 10°F	SAE 20	SAE 20W-30

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.

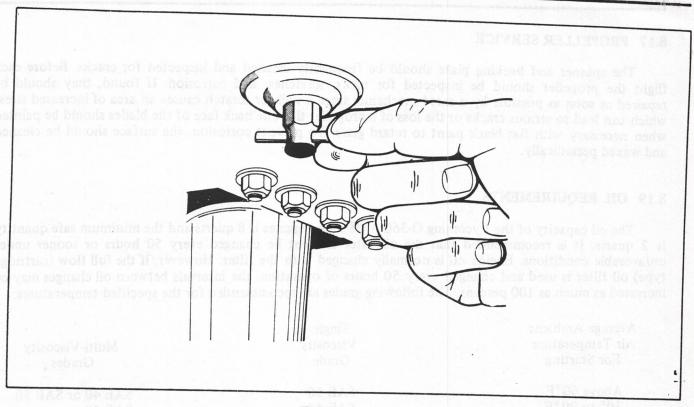
(b) Fuel Requirements

Aviation grade fuel with a minimum octane of 100/130 is specified for use 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.

(c) Filling Fuel Tanks

Observe all required precautions for handling gasoline. Fuel is stored in two twenty-five gallon (24 gal. usable) tanks.

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FUEL DRAIN

Figure 8-3

(d) Draining Fuel Strainer, Sumps and Lines

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.

(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

(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. ery box has a plastic total with his is

(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.

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PIPER AIRCRAFT CORPORATION PA-28-181, CHEROKEE ARCHER II

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SECTION 9

SUPPLEMENTS

9.1 GENERAL

This section provides information in the form of Supplements which are necessary for efficient operation of the airplane when 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.

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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.

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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.

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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.

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- (d) OMNI Tracker
 - (1) Center Turn Command Knob and push IN to engage Tracker.
 - (2) Trim Knob push IN for high sensitivity.

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SECTION 5 - PERFORMANCE

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SUPPLEMENT 3

AUTOCONTROL IIIB AUTOPILOT INSTALLATION

SECTION 1 - GENERAL

This supplement supplies 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 when 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.
- (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 KTS in a descent.
- (d) An autopilot 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 HGD bug right and left. Aircraft control wheel should turn same direction as bug. Grasp control wheel and manually override servo, both directions.

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(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.

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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

ISSUED: JUNE 18, 1976

No changes to the basic performance provided by Section 5 of this Pilot's Operating Handbook are necessary for this supplement.

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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.

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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.

SAFETY TIPS

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ISSUED: JUNE 18, 1976 REVISED: JANUARY 20, 1977



S-TEC CORPORATION RT. 3, BLDG, 946 WOLTERS INDUSTRIAL COMPLEX MINERAL WELLS, TEXAS 76067

FAA APPROVED SUPPLEMENT
TO
PILOT'S OPERATING HANDBOOK AND/OR
FAA APPROVED AIRPLANE FLIGHT MANUAL
FOR

PIPER MODELS PA-28-151, S/N 28-7615001 AND UP PA-28-161, PA-28-181, AND PA-28-236 S-TEC SYSTEM 50 TWO AXIS AUTOMATIC FLIGHT GUIDANCE SYSTEM (14 VOLT SYSTEM)

> REG. NO. <u>N47820</u> SER. NO. <u>28-7890139</u>

This supplement must be attached to the applicable FAA Approved Airplane Flight Manual, Pilot's Operating Handbook, or Pilot's Operating Handbook and FAA Approved Airplane Flight Manual modified by the installation of S-TEC System 50 Autopilot Model ST-175-50 installed in accordance with STC SA5184SW-D. The information contained herein supplements the information of the basic POH and/or AFM; for Limitations, Procedures and Performance information not contained in this Supplement, consult the basic POH and/or AFM.

SECTION I

GENERAL

This manual is to acquaint the pilot with the features and functions of the System 50 Two Axis Autopilot and to provide operating instructions for the system when installed in the above aircraft model(s). The aircraft must be operated within the limitations herein provided when the autopilot is in use.

SECTION II

OPERATING LIMITATIONS

1. Autopilot use prohibited above the following airspeeds:

(a) For Models PA-28-151, PA-28-161, PA-28-181, 140 KIAS (Autopilot Vmo).

(b) For Models PA-28-236, 160 KIAS (Autopilot Wmo).

Autopilot use prohibited with flap extensions greater than
 notch (10°) while operating in altitude hold mode.

3. Autopilot must be off during take-off and landing.

FAA/DAS APPROVED P/N: 89225

DATE: 8-04-83



MINERAL WELLS, TEXAS 76067

FAIR APPROVED SUPPLEMENT

PILOT S OPERATING HANDSOOK ANG/OR.

PIPER MODELS PA-23-151 - S.M. 28-7615001
AND UP FA-28-161, PA-28-181 AND PA-28-2
S-TEC SYSTEM SO. NO AXIS
AUTOMATIC FLIGHT GUIDANCE SYSTEM
(12 VOLT SYSTEM)

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This supplement must be attached to the applicable FAA Approved Airplane Flig Manual, Pilot's Operating Handbook, or Pilot's Operating Handbook, ER Approved Airplane Sticks (FAA App roved Airplane Flight Manual modified by the Anstallation of SATE System 50 Autopilot Model ST- 175-50 installed in accordance with STC SA5184SW-D. The mation contained herein supplements the information of the basis FOH EBByor AFM: or Limitations, Procedures and Performance information not contained in this supplement, consult the pasic POH and/or AEM.

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 Autopilot use prohibited with flap extensions with the control of the



SECTION III

EMERGENCY OPERATING PROCEDURES

In the event of an autopilot malfunction, or any time the autopilot is not performing as expected or commanded, do not attempt to identify the system. problem. Immediately regain control of the aircraft by overpowering the autopilot as necessary and then disconnect the autopilot. Do not reengage the autopilot until the problem has been identified and corrected.

- Autopilot may be disconnected by:
 - Depressing the "AP Disconnect" Switch on the left horn of the pilot's control wheel (if installed).
 - Depressing the "ON-OFF" Switch on the autopilot programmer unit.
 - Moving autopilot master switch to "OFF" position.
 - Pulling the autopilot circuit breaker.
- 2. Altitude loss during a malfunction and recovery.
 - The following altitude losses and bank angles were recorded after a malfunction with a 3 second recovery delay:

Configuration	Bank Angle/Altitude Loss
Climb	50 ⁰ / -20'
Cruise	55° / -160' 55° / -320'
Descent	550 / -320'

The following altitude losses and bank angles were recorded after a malfunction with a 1 second recovery delay:

Configuration	Bank Angle/Altitude Loss
Maneuvering Approach (coupled or uncoupled)	18° / -60' 20° / -20'

The above values are the worst case for all the models covered by this document.

SECTION IV

NORMAL OPERATING PROCEDURES

4-1 SYSTEM DESCRIPTION

The System 50 is a pure rate autopilot which uses an inclined rate gyro in the Turn Coordinator instrument as the primary roll and turn rate sensor and an accelerometer and an absolute pressure transducer as pitch rate sensors. The turn coordinator includes an autopilot pick-off, a gyro RPM detector and an instrument power monitor. Low electrical power will cause the instrument "flag" to appear while low RPM will cause the autopilot to disconnect. The autopilot includes an automatic pre-flight test feature that allows a visual check of all the annunciator lamps and checks critical elements of the accelerometer system. The test feature will not enable autopilot function unless the automatic test sequence is satisfactorly completed.

FAA/DAS APPROVED 89225

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SECTION III

EMERSIADY OPERATING PROCEDURES

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 b. Pepressing the "ON-OFF" Switch on the autopilot
 - programmer unit.
 - c. Moving autopilos master switch to "OFF" position
 - 2. Altitude loss during a malfunction and recovery.
- a. The following altitude losses and bank angles were recorded after a malfunction with a 3 second recovery delay:

The following altitude losses and bank angles were recorded after a malfunction with a 1 second recovery delay:

Configuration Bank Angle/Alsitude Loss
Maseuvering
Approach (coupled 20 / -20 cm uncoupled)

The above values are the worst case for all the models covered by this document.

VI MOITORE

NORMAL OPERATING PROCEDURES

4-1 SYSTEM DESCRIPTION

The System 50 is a pure rate autopilot which uses an inclined rate gyro in the Turn Coordinator instrument as the primary roll and turn rate sensor and an accelerometer and an absolute pressure transdises as autopilot pick-off, a gyro RPM sensors. The turn coordinator includes an autopilot pick-off, a gyro RPM detector and an instrument power monitor. Low electrics is swelling cause the instrument "flag" to appear while low RPM will cause the autopilot to disconnect. The autopilot includes an automatic pre-flight test feature that allows a visual check of all the annunciator lamps and checks critical elements of the accelerometer system. The test feature will not enable autopilot runction unless the automatic test sequence is satisfactorly completed autopilot runction unless the automatic test sequence is satisfactorly completed

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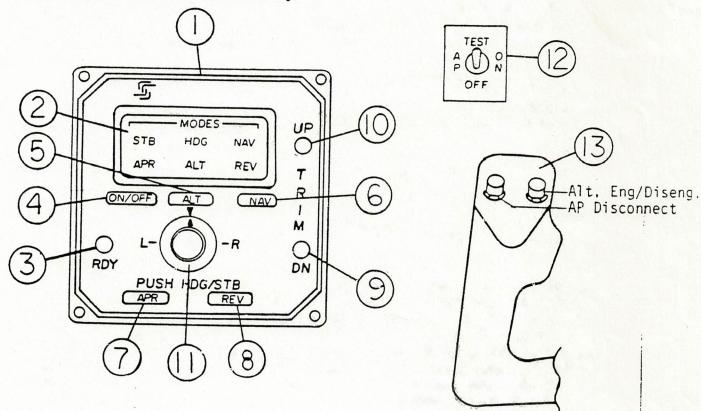
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When the pre-flight test is satisfactorily completed and when the rate gyro RPM is correct, the green "RDY" light will illuminate indicating the autopilot is ready for the functional check and operation. The autopilot cannot be engaged unless the "RDY" light is illuminated. When the system is equipped with the optional 3" Air Driven Directional Gyro (D.G.) or a compass system, directional information is provided to the autopilot by a heading bug in the instrument.

Pitch axis control is provided for the altitude hold function by use of the accelerometer and the pressure transducer. When the altitude hold mode is engaged an elevator trim sensor in the pitch servo will detect the elevator trim condition. When elevator trim is necessary to re-establish a trimmed condition, trim indicator lights on the programmer unit will illuminate to indicate the direction to trim to restore a trimmed condition.

The indicator and annunciator lamp brilliance is controlled through the aircraft instrument light rheostat, except for the "trim" indicators which always illuminate at full intensity.



- 1. Mode Programmer and Annunciator Unit Provides mode switches and annunciation for the system.
- 2. Mode Annunciation Window Displays mode in use.

FAA / BAS APPROVED

P/N 89225 DATE: 8-04-83

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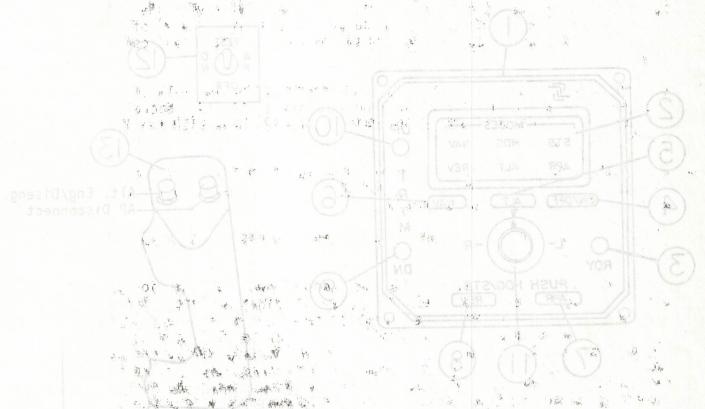
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When the pre-flight test is satisfactorily completed and when the rate gyro RPM is correct, the green "PDY" light will all universe, when the autorilot cannot pilot is ready for the functional check and operation. The autorilot cannot be engaged unless the "RDY" light is illuminated, when the system is equipped with the optional 3" Air Driven Directional Gyro (D.G.) or a compass system, directional information is provided to the autorilot by a heading bug in the instrument.

Pitch axis control is provided for the altitude hold function by use of the acceleromater and the pressure transducer. The actitude Mold mode is engaged an elevator trimisels of the pitch servo will detect the elevator trimisels of the pitch servo will detect the elevator trimisels of the programmer unit will illuminate to condition, trimindicator lights of the programmer unit will illuminate to indicate the direction to trim to restore a trimmed condition.

The indicator and annunciator lamp Evilliance is controlled through the aircraft instrument light rhepstat, except for the "trim" indicators which always illuminate at full intensity.

1.40



1. Mode Programmer and Annum avor buit - Provides mode switches and annum-

Mode Annunciation Window - Displays mode in use

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- 3. Ready Light (RDY) Green RDY lamp illuminates when autopilot is ready for engagement.
- 4. ON-OFF Stabilizer Mode Switch Momentary actuation engages roll system in stabilizer (STB) Mode and allows use of the turn knob (Item 11) to command turn rate desired. When the system is operating a momentary actuation will disengage the system and cancel all annunciations.
- 5. Altitude Mode Switch (ALT) Momentary actuation will engage altitude hold mode or disengage altitude mode if previously engaged. This function is also available by use of an optional control wheel mounted altitude engage/disengage switch, for added convenience.
- 6. Navigation Mode Switch (NAV) Momentary activation will engage the VOR Tracking Mode. This mode provides low system gain for comfortable cross country tracking.
- 7. Approach Mode Switch (APR) Momentary actuation will engage the VOR or Localizer Tracking Mode. This mode provides a higher level of system gain for more active tracking of VOR or Localizer front course signals.
- 8. Reverse Approach Mode Switch (REV) Momentary activation will engage the reverse tracking mode for use when tracking a localizer backcourse. This mode provides the same system gain as the APR Mode with reverse needle sensing.
- 9. Down TRIM Light (DN) This light illuminates to indicate the need for nose <u>down</u> trim. When both the <u>UP</u> and <u>DN</u> lights are not lighted, the <u>aircraft</u> is in trim longitudinally.
- 10. UP Trim Light (UP) This light illuminates to indicate the need for nose UP trim.
- 11. Turn Knob and Heading Switch The turn knob allows the selection of turn rates up to standard rate(30/sec.) either right or left. Turning the knob to the right or left will cause a turn that is proportional to the displacement of the knob from center. For level flight the electronics provide a small dead zone of approximately 100 at the center indice. To actuate heading mode, momentarily depress the turn knob. To return to STB Mode from HDG, depress the turn knob. When the system is operating in any radio mode and the system is equipped with a D.G., depressing the turn knob will return the system to HDG Mode directly.
- 12. Autopilot Master ON-OFF Test Switch Refer to Pre-Flight Procedures for operating details.

FAA/DAS APPROVED P/N 89225 DATE: 8-04-83



- Ready Light (RDY) Green RDY Tamp illuminates when succeilot is ready for engagement.
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- 11. Surn knot and Heading Switch The turn knot afford the celection of turn rates up to standard rate(30/sec.) sither Mydethold left. Turn ing the knot to the right or lift was cause a turn that is proportional to the displacement of the knot from center. For level flight the electronics provide a smith dead zone of approximately 100 was center in section. To actuate heading mode; momentarily deposition the turn knot from 106, depress the turnsknote bien the system is equipped with a D.G. depressing the turn knot will return the system to HOG Mode directly.
- 12. Autopilot Master OM-OFF Test Switch Refer to Prinfiled: Procedures for operating details.

FAA/DAS APPROVED PLM S9228 DATE: 8-04-83



- 13. Optional remote AP disconnect switch and/or remote altitude hold engagedisengage switch.
- 4-2 PRE-FLIGHT PROCEDURES

NOTE: During system functional checks the system must be provided adequate DC voltage (12 or 24 VDC minimum as appropriate)

MANDATORY PRE-FLIGHT TEST

- 1. AP Master Switch Move to TEST position.
 - a. Observe all lights and annunciators illuminate.
 - Observe the following light sequence of the trim indicators: (Sequence requires 9 seconds)
 - 1. Initially both trim UP & DN lights are illuminated.
 - 2. Up light extinguishes momentarily and relights.
 - 3. DN light then extinguishes and will remain off.
- 2. AP Master Switch Move to ON position, observe ready (RDY) light illuminates. Autopilot can be engaged and disengaged repeatedly without repeating the test sequence until electrical power is removed. Once power is interrupted the test must be reconducted to get a ready indication. If the ready light does not illuminate after the test a failure to pass the test is indicated and the system will require service.

SYSTEM FUNCTIONAL TEST

- 3. Depress ON-OFF Switch STB Annunciator illuminates. Rotate turn knob left and right, observe control wheel moves in corresponding direction. Center turn knob.
- 4. Set D.G. and place bug under lubber line (if installed) push turn knob to engage HDG mode. Observe HDG annunciator. Move HDG bug left and right observe proper control wheel motion.
- 5. Overpower Test Grasp control wheel and overpower roll servo left and right. Overpower action should be smooth with no noise or jerky feel. If unusual sounds or excessive play is detected, have the servo installation inspected prior to flight.
- 6. Radio Check A. Turn on NAV Radio, with valid NAV signal, engage NAV Mode and move VOR OBS so that VOR needle moves left and right control wheel should follow the direction of needle movement.

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S. TEC CORPORATION

13. Optional remote AP disconnect switch and/or remote altitude hold engage-

NOTE: During system functional checks the system must be provided adequate DC voltage (12 or 24 VDC minimum

MANDATORY PRE-FLIGHT TEST

- AP Master Switch Move to TEST position.
- 1. Initially both trim UP & DN lights are illuminated. : .
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- AP Master Switch Move to ON position, observe ready (RDV) Fitght illdication. If the meady light does not fill uninate after the test a failure to pass the test is smallated and the system will require service.

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- 5. Wikadio Check A. .. Turn sty NAV Radio, with-valid MAV, signal, engage, NAV The Communication of the contract of the contr

APPROVED 89225.



- B. Select REV Mode the control wheel should rotate in opposite direction of the NAV needle.
- C. Select APR Mode the control wheel should again follow radio needle movement and with more authority than produced by NAV Mode.
- 7. Move control wheel to level flight position Engage ALT Mode. Move control wheel fore and aft to overpower pitch servo clutch. Overpower action should be smooth with no noise or jerky feel. If unusual sounds or excessive play is detected, have the servo installation inspected prior to flight.
- 8. Trim Check Manually apply back pressure to control wheel for 2-3 seconds observe the <u>DN</u> trim light illuminates. Apply forward pressure to the control wheel for 2-3 seconds, observe the <u>UP</u> trim light illuminates. Move the control wheel to center observe both UP/DN lights extinguish.
- 9. Hold control wheel and depress ON-OFF Switch note that roll and pitch servo release. Move control wheel to confirm roll and pitch motions are free, with no control restriction or binding. If the optional disconnect switch is installed it may be used to effect the disconnect for this check.

4-3 IN-FLIGHT PROCEDURES

NOTE: The required pre-flight test can be conducted in the air if necessary. It should be noted, however, that when the UP/DN lights are flashing the pitch servo will momentarily engage and disengage. This alternate engage-disengage sequence is part of the test function. Because of the engage-disengage sequence the test should not be conducted while maneuvering.

- 1. Check RDY light on.
- 2. Trim aircraft for existing flight condition.
- 3. Center turn-knob depress ON-OFF Switch.
- 4. Set turn knob to level or turning flight, as desired.
- 5. Set HDG bug to desired heading (if installed) and depress turn knob to engage heading mode, select headings as desired.
- 6. At desired altitude, depress ALT Mode Switch. Trim aircraft as necessary to establish cruise condition disengage ALT Mode to climb or descend.

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Sereet REV Mode - the control wheel should rotate in opposite direction of the MAV needle.

C. Select APR Mode - the control wheel should again follow radio needle movement and with more authority than produced by NAV Mode.

- Move control wheel to level flight position Engage ALT Mode. Move control wheel fore and aft to overpower pitch servo clutch. Overpower action should be smooth with no noise or jerky feel. If unusual sounds or excessive play is detected, have the servo installation inspected prior to flight.
- 8. Trim Check Manually apply back pressure to control wheel for 2-3 seconds observe the DN trim light filluminates. Apply forward pressure to the control wheel for 2-3 seconds, observe the UP trim light illuminates. Move the control wheel to center observe both UF/DN lights extinguish.
- 9. Hold control wheel and depress 'ON-OFF Switch note that roll and pitch servo release. Move control wheel to confirm roll and pitch motions are free, with no control restriction or binding. If the optional disconnect switch is installed it may be used to effect the disconnect for this check.

-3 IN-FLIGHT PROCEDURES

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FAA/DAS APPROVED P/N 89225 DATE: 8-04-83

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VOR TRACKING AND VOR-LOC APPROACH

- 1. Tune NAV receiver and select radial.
- 2. Maneuver aircraft to selected radial (or localizer) within $^{\pm}$ l needle width and within 10^{0} of the course heading.
- 3. Engage NAV Mode for VOR tracking.
- 4. Engage APR Mode for VOR or LOC approach.

To track the localizer front course outbound to the procedure turn area, maneuver to the localizer center and, when on the outbound heading, select REV Mode. To track the localizer back course inbound, maneuver to the localizer back course center and, when on the inbound heading, select REV Mode.

Approach Mode may be used to track VOR radials cross country, if desired. Use of APR Mode for cross country tracking may result in some course scalloping if the VOR signal is weak or otherwise "noisey". In areas of poor signal quality NAV Mode may provide more accurate tracking even with reduced gain.

SECTION V

OPERATIONAL DATA

Text of this Section not affected by installation of this equipment.

SECTION VI

REQUIRED OPERATING EQUIPMENT

Text of this Section not affected by installation of this equipment.

SECTION VII

WEIGHT AND BALANCE

Text of this Section not affected by installation of this equipment.

APPROVED BY

James L. Irwin

S-TEC CORPORATION

DAS 5 SW

P/N 89225 -

DATE: 8-04-83



VOR TRACKING AND VOR-LOC APPRIACH

- 1. Tune NAV receiver and select radial
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 - 3. Engage NAV Mode for VOR tracking.
 - 4. Engage APR Mode for VOR or LOC approach.

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SECTION VI

REQUIRED OPERATING COUIPMENT

Text of this Section not affected by installation of this equipment.

SECTION VII

WEIGHT AND BALANCE

fext of this Section not affected by installation of this equipment.

APPROVED BY

James Linwin

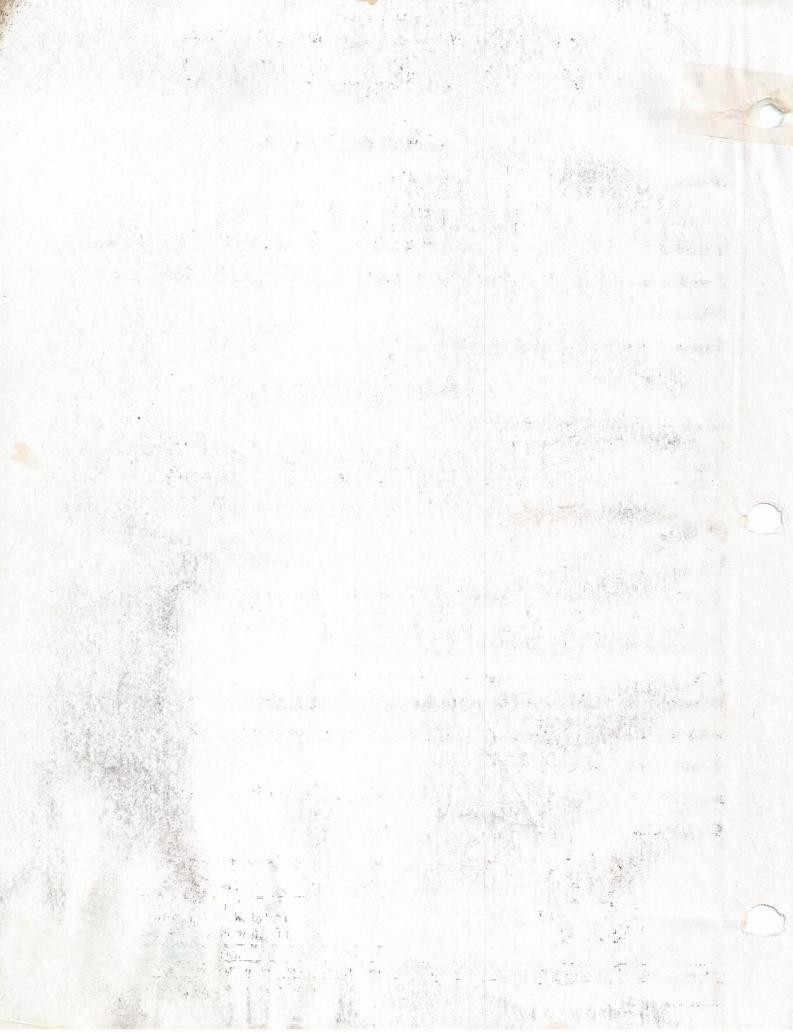
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Page 7 of 7





Himred States of America

Department of Transportation—federal Aviation Administration

Supplemental Type Certificate

Number SA5184SW-D

This certificale, would be

S-TEC Corporation Rt. 4, Bldg. 946

Wolters Industrial Complex Mineral Wells, TX 76067

cortifies 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 3 of the Civil Air

Regulations

Conginal Product - Type Certificater Number:

2A13

Make: PIPER

Model:

PA-28-151, PA-28-161, PA-28-181,

PA-28-236 AND PA-28-201T

Description of Type Design Change:

Installation of S-TEC 40/50 Single and Two Axis Automatic Flight Guidance Systems, Model ST-175-40/50, according to Bulletin No. 275, Revision 1, dated 3-14-84 and Master Drawing List No. 92203, Revision A, dated 3-14-84, and/or later FAA Approved revisions of the above data, (14 Volt System).

Limitations and Conditions:

1. FAA Approved Supplement to Pilot's Operating Handbook and/or FAA Approved Airplane Flight Manual, P/N 89222, dated 8-04-83 is required for Piper Models PA-28-151 S/N 28-7515449 and below for S-TEC System 40 and/or later FAA Approved revisions of the above supplement.

(See Continuation Sheet, Page 2, a part of this STC).

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 :

7-06-83

Date ressured: 5-4-84, Revision 1

Tale of issuance :

8-04-83

Dale amended:



By direction of the Administrator

(Signature)
Harold W. Holdeman

DAS Staff Coordinator, DAS 5 SW

(Title)

Stephen Stephen

Installation of S-TEC, 40/50 S ngle and Two Axis Automatic Fight Guidance Systems, Model ST-1/5-40/50, according to Bulletin No. 275, Revision 1, date; 5-14-84 and Master Drawing List No. 92203 Kevision A, dateo.3-14-84, and/or later FAA Approved

1 4 1 3 3

1.5 FAA Approved Supplement to Piket's Operating Mandbook and/or FAA Approved Approved Aftrology and Finght Manual, R/N 89222, dated 8-01-83 is required for Piper Models PAA-28-151:8/N:28-7515448 and below for S-TEC System 40 and/or later FAA

(See Continuation Sheet, Page 2, a park of this

United States of America

Department of Transportation—federal Aviation Administration

Supplemental Type Certificate

(Continuation Sheet)

Number SA5184SW-D, Revision 1

Limitations and Conditions (con't)

- 2. FAA Approved Supplement to Pilot's Operating Handbook and/or FAA Approved Airplane Flight Manual, P/N 89223, dated 8-04-83 is required for Piper Models PA-28-151, S/N 28-7615001 and up, PA-28-161, PA-28-181, and PA-28-236 for S-TEC System 40 and/or later FAA Approved revisions of the above supplement.
- 3. FAA Approved Supplement to Pilot's Operating Handbook and/or FAA Approved Airplane Flight Manual, P/N 89224, dated 8-04-83 is required for Piper Model PA-28-151, S/N 28-7515449 and below for S-TEC System 50 and/or later FAA Approved revisions of the above supplement.
- 4. FAA Approved Supplement to Pilot's Operating Handbook and/or FAA Approved Airplane Flight Manual, P/N 89225, dated 8-04-83 is required for Piper Models PA-28-151, S/N 28-7615001 and up, PA-28-161, PA-28-181 and PA-28-236 for S-TEC System 50 and/or later FAA Approved revisions of the above supplement.
- 5. FAA Approved Supplement to Pilot's Operating Handbook and/or FAA Approved Airplane Flight Manual, P/N 89434, dated 5-4-84 is required for Piper Model PA-28-201T for S-TEC System 40, and/or later FAA Approved revisions of the above supplement.
- 6. FAA Approved Supplement to Pilot's Operating Handbook and/or FAA Approved Airplane Flight Manual, P/N 89435, dated 5-4-84 is required for Piper Model PA-28-201T for S-TEC System 50, and/or later FAA Approved revisions of the above supplement.
- 7 Compatability of this modification with other previously approved modifications must be determined by the installer.

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Limitations and Conditions (con)t) FAA Approved Supplement to Pilot's Operating Mandbook and/or FAA Approved Supplement to Pilot's Operating Mandbook and/or FAA Approved Mandbook and Mandbook Balling Mandbook Mandbook

Airplane Flight Manual: P/M 89224, cated 8-04-83 is required for Piper Mozaris.

PA-Z0-151, S/N 28-/bisadg and below for S-TEC System 90 and/or later FAA Approved revisions of the soust approved revisions of the soust approved Supplement to Priot's Operating Handbook and/or Sun Additional Airplane Filant Hands PAN 89225, dather Size is growing for Serial Mod PA-28-151, S/N 28-7612001 and Jup. PA-28-152 PA-28-151, S/N 28-7612001 and Jup. PA-28-153 PA-28-161 and Supplement to Pilot's Operating Handbook and/or FAALApproved Marglane Filant Maxwell PAN 89438 PAN 894

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FAA Approved Supplement to Pilot's (persting Bardopak sad/or EAA, Apundvad Airclane Flight Natural, P/N 189415, dited = 464 is sequesad for Files 29945, PA 28-2011 for AIEC Aystem 10 applications of 178 along supplement, and the compatability of aims madification with discretions were reviously Phonoved modifications must be determined by the installer

AUTOPILOT RF INTERFERENCE

Due to the variety and hi-power of radio equipment often found in today's general aviation aircraft, there exists a potential radio transmission interference problem with other equipment in the aircraft. Because of this potential, the autopilot system is designed and constructed with if shielding to prevent interference, however, installation combinations can occur wherein minor interference is possible.

Rf interference from radio transmissions usually manifest itself in one of two ways, either by interference with the VOR deviation needle display or by causing the autopilot flight path to be displaced during transmissions.

The most common interference causes the VOR deviation needle to jump or swing while the transmitter is being keyed. This type of interference affects the autopilot only in radio coupled modes as the autopilot is coupled to the VOR indicator meter movement and therefore, sees any needle movement as a command. VOR needle interference is sometimes found to be wholly within the NAV-COM set, that is, radiation conduction of transmission energy from the transmitter to the VOR receiver internally. When this is the case, there is little the installation technician can do to overcome the condition other than contact the field representative of the company involved for advice.

A much less common type of interference is one in which radio transmissions affect the roll or pitch axis of the autopilot directly. This occurrence is caused by rf energy being radiated into the autopilot system and there being detected and fed as a signal to one or more of the autopilot command channels. This problem is usually found only in aircraft equipped with high output power transmitters and varies with antenna and mounting locations. The reflected power or standing waves on the antenna cable is probably the greatest single source of this trouble, however, a antenna located so it radiates into the cabin can also cause the problem. The effect of this interference on the aircraft flight path is usually an initial displacement and then resumption of the programmed flight path. The response is similar in both roll and pitch.

Often, due to the wave form of radio frequency energy and the wave length, (frequency) an interference problem will only be found on one or two isolated frequencies. In these cases simply moving the autopilot component suspected or the radio source by a few inches will correct the problem.

Occasionally a new autopilot installation will cause a deterioration in ADF, receiver operation quality. This is reverse of the previous problem wherein "noise" from the autopilot is transmitted to the radio. One source of "noise" in the autopilot is the 5 kHz excitation in the computer. 5 kHz excitation can get into the ADF, system by both induction and radiation. A power buss common to both the autopilot and ADF receiver is a good path for this type of interference. If a separate power source corrects the problem then a filter may be necessary in one or both A+ leads. Radiation from autopilot cable and terminal ends, although very weak, can sometimes interfere with the ADF receiver by radiation into the sense antenna, loop, or both. Cable routing providing additional distance between these items and additional shielding of the autopilot leads is usually best in these cases. Since the autopilot leads are already shielded, the most productive solution is usually re-routing.

An important area, often overlooked, is the ground and ground path. It has been found in many aircraft that a considerable resistance builds up between adjacent sections of skin paneling and structure due to paint, primer, etc. This increases the resistance in the ground path for some equipment, which lowers the equipment tolerance to RFI. Sometimes it is advisable to add a braided ground strap to the equipment to assure a good ground.

Ground loops developed in cable shielding and the aircraft structure due to the existence of a ground potential difference can also cause problems. An effort has been made to eliminate this in the S-TEC systems by providing only one central ground point.

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in summary, if an interference between the autopilot system and one or more of the radios is determined to exist, then one or more of the following cures should be tried in an effort to eliminate the interference.

- 1. Check antenna for proper installation, good ground, etc.
- 2. Re-route antenna leads.
- 3. Re-route autopilot leads and cabling.
- 4. Relocate antenna.
- 5. Relocate autopilot component Consult GADO office concerning approval of installation deviation.
- 6. Add ground straps to affected component(s).
- 7. Install a filter in one or all involved A+ leads.

A cumman, if an interference between the supplied system of the or more of the factors as designing ourse should be tried in an effort to eliminate the underence.

- 1. Chack anienna for proper installation, pook orogind, etc.
 - 2 Reveute enterne leads
 - 3. Re-route autopliot leads and cabling
 - Landelnis etapoleR J
- 5. Relocate autopliot component Comult CADO office concerning approval of installation deviation.
 - (a)triand cround strate to attended component(a).
 - Install a filter in one or all involved A- leads: