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SECTION 1

GENERAL

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SECTION 1

GENERAL

1.1 INTRODUCTION

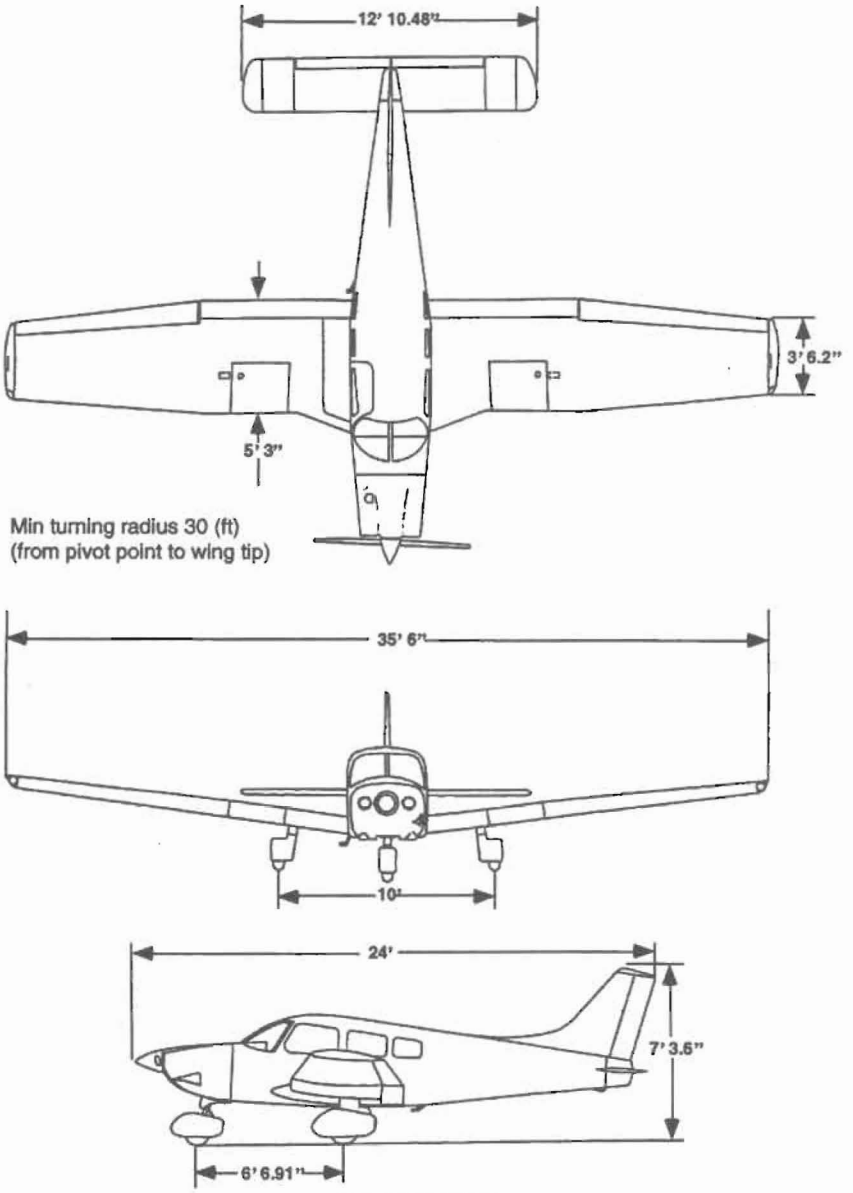
This Pilot's Operating Handbook is designed for maximum utilization as an operating guide for the pilot. It includes the material required to be furnished to the pilot by F.A.R./C.A.R. It also contains supplemental data supplied by the airplane manufacturer.

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 proce-dures, performance and other sections to provide easier access to informa-tion that may be required in flight. The ``Emergency Procedures'' Section has been furnished with a red tab divider to present an instant reference to the section. Provisions for expansion of the handbook have been made by the deliberate omission of certain paragraph numbers, figure numbers, item numbers and pages noted as being intentionally left blank.


12' 10.48"
3' 6.2"
5' 3"
Min turning radius 30 (ft)
(from pivot point to wing tip)
35' 6"
10'
24'
7' 3.5"
6' 6.91"

THREE VIEW

1.3 ENGINES

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

1.5 PROPELLERS

(a) Number of Propellers	1
(b) Propeller Manufacturer	Sensenich
(c) Model	76EM8S14-0-62
(d) Number of Blades	2
(e) Propeller Diameter (inches)	
(1) Maximum	76
(2) Minimum	76
(f) Propeller Type	Fixed Pitch

1.7 FUEL

AVGAS ONLY

(a) Fuel Capacity (U.S. gal.) (total)	50
(b) Usable Fuel (U.S. gal.) (total)	48
(c) Fuel	
(1) Minimum Octane	100 Green or 100LL Blue Aviation Grade
(2) Alternate Fuel	Refer to latest issue of Lycoming Instruction No. 1070.

1.9 OIL

(a) Oil Capacity (U.S. quarts)		8
(b) Oil Specification		Refer to latest issue of Lycoming Service Instruction 1014.
(c) Oil Viscosity per Average Ambient Temp. for Starting		
	Single	Multi
(1) Above 60°F	S.A.E. 50	S.A.E. 40 or 50
(2) 30°F to 90°F	S.A.E. 40	S.A.E. 40
(3) 0°F to 70°F	S.A.E. 30	S.A.E. 40 or 20W-30
(4) Below 10°F	S.A.E. 20	S.A.E. 20W-30

1.11 MAXIMUM WEIGHTS

	Normal	Utility
(a) Maximum Ramp Weight (lbs.)	2558	2138
(b) Maximum Takeoff Weight (lbs.)	2550	2130
(c) Maximum Landing Weight (lbs.)	2550	2130
(d) Maximum Weights in Baggage Compartment (lbs.)	200	0

1.13 STANDARD AIRPLANE WEIGHTS

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

1.15 BAGGAGE SPACE

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

1.17 SPECIFIC LOADINGS

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

1.19 SYMBOLS, ABBREVIATIONS AND TERMINOLOGY

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

(a) General Airspeed Terminology and Symbols

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

Vne/Mne	Never Exceed Speed or Mach Number is the speed limit that may not be exceeded at any time.
Vno	Maximum Structural Cruising Speed is the speed that should not be exceeded except in smooth air and then only with caution.
Vs	Stalling Speed or the minimum steady flight speed at which the airplane is controllable.
Vso	Stalling Speed or the minimum steady flight speed at which the airplane is con- trollable in the landing configuration.
Vx	Best Angle-of-Climb Speed is the airspeed which delivers the greatest gain of altitude in the shortest possible horizontal distance.
Vy	Best Rate-of-Climb Speed is the airspeed which delivers the greatest gain in altitude in the shortest possible time.
(b)	Meteorological Terminology
ISA	International Standard Atmosphere in which: The air is a dry perfect gas; The temperature at sea level is 15° Celsius (59° Fahrenheit); The pressure at sea level is 29.92 inches Hg (1013.2 mb); The temperature gradient from sea level to the altitude at which the temperature is -56.5°C (-69.7°F) is -0.00198C (-0.003564°F) per foot and zero above that altitude.
OAT	Outside Air Temperature is the free air static temperature, obtained either from inflight temperature indications or ground meteorological sources, adjusted for instrument error and compressibility effects.

Indicated Pressure Altitude	The number actually read from an altimeter when the barometric subscale has been set to 29.92 inches of mercury (1013.2 millibars).
Pressure Altitude	Altitude measured from standard sea-level pressure (29.92 in. Hg) by a pressure or barometric altimeter. It is the indicated pressure altitude corrected for position and instrument error. In this handbook, altimeter instrument errors are assumed to be zero.
Station Pressure	Actual atmospheric pressure at field elevation.
Wind	The wind velocities recorded as variables on the charts of this handbook are to be understood as the headwind or tailwind components of the reported winds.

(c) Power Terminology

Takeoff Power	Maximum power permissible for takeoff.
Maximum Continuous Power	Maximum power permissible continuously during flight.

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

(f) Weight and Balance Terminology

Reference Datum	An imaginary vertical plane from which all horizontal distances are measured for balance purposes.
Station	A location along the airplane fuselage usually given in terms of distance 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 is applicable, and basic empty weight.
Maximum Ramp Weight	Maximum weight approved for ground maneuver. (It includes weight of start, taxi and run up fuel.)

Maximum Takeoff Weight	Maximum weight approved for the start of the takeoff run.
Maximum Landing Weight	Maximum weight approved for the landing touchdown.
Maximum Zero Fuel Weight	Maximum weight exclusive of usable fuel.

1.21 CONVERSION FACTORS

MULTIPLY	BY	TO OBTAIN
centimeters (cm)	0.032808	feet (ft.)
	0.3937	inches (in.)
	0.01	meters (m)
centimeters of mercury at 0° C	13.3322	hectopascals (hPa)
Hg)	.3937	inches of mercury (in.
(cm Hg)	27.85	pounds / sq. foot (lbf./ft^2)
	0.1934	pounds / sq. inch
(lbf./in^2)		
cubic centimeters (cm^3)	3.531x10^{-5}	cubic feet (ft^3)
	0.06102	cubic inches (in^3)
	0.001	Liters (l)
	0.03381	fluid ounces (fl. oz)
	2.642x10^{-4}	U.S. gallons (U.S. gal)
cubic feet (ft^3)	28317	cubic centimeters (cm^3)
	7.481	U.S. gallons (U.S. gal)
	1728	cubic inches (in^3)
	28.32	liters (l)
	0.028317	cubic meters (m^3)
cubic inches (in^3)	16.39	cubic centimeters (cm^3)
	5.787x10^{-4}	cubic feet (ft^3)
	4.329x10^{-3}	U.S. gallons (U.S. gal)
	0.01639	liters (l)
	1.639x10^{-5}	cubic meters (m^3)
	0.5541	fluid ounces (fl. oz)
	0.01732	U.S. quarts (U.S. qt)
cubic meters (m^3)	35.3147	cubic feet (ft^3)
	264.2	U.S. gallons (U.S. gal)
	61024	cubic inches (in^3)
	1000000	liters (l)
degrees arc. (deg)	0.01745	radians
degrees arc per second	0.01745	radians per second
(deg / sec)	0.166667	revolutions per second
(rpm)		

MULTIPLY	BY	TO OBTAIN
drams, fluid (dr. fl.)	3.697×10^{-3}	liters (l)
	3.697×10^{-6}	cubic meters (m^3)
	0.125	fluid ounces (fl. oz)
feet (ft)	30.48	centimeters (cm)
	12	inches
	0.3048	meters (m)
	1.8939×10^{-4}	miles (mi)
	1.6458	nautical miles (NM)
	0.0606061	rods
feet per minute (ft / min)	0.01829	kilometers per hour (km / hr)
	9.8716×10^{-3}	knots (kt)
	0.00508	meters per second (m / s)
	0.01136	miles per hour (mph)
feet per second (ft / sec)	1.097	kilometers per hour (km / hr)
	0.5921	knots (kt)
	0.3048	meters per second (m / s)
	0.6818	miles per hour (mph)
foot-pounds (ft.-lbs.)	3.2383×10^{-4}	kilocalorie (kcal)
	1.3558	joules (j)
	14.5939	newton-meters (n-m)
foot-pound per minute (ft-lbs/ min)	3.03×10^{-5}	horse power (hp)
	81.348	joules per minute (j / min)
foot-pound per second (ft-lbs/ sec)	1.818×10^{-5}	horse power (hp)
	1.3558	joules per second (j / sec)
gallons, imperial (imperial gal)	4.546×10^{-3}	cubic centimeters (cm^3)
	1.201	U.S. gallon (U.S. gal)
	277.4	cubic inches (in^3)
	4.546	liters (l)
gallons, U.S. dry (U.S. gal dry)	4.405×10^{-3}	cubic meters (m^3)
	0.1556	cubic feet (ft^3)
	1.164	U.S. gallon (U.S. gal)
	268.8	cubic inches (in^3)
	4.405	liters (l)

MULTIPLY	BY	TO OBTAIN
gallons, U.S. Liquid (U.S. gal)	3785.4	cubic centimeters (cm^3)
	0.1337	cubic feet (ft^3)
	0.83268	imperial gallons (imperial gal)
	231	cubic inches (in^3)
	3.785	liters (l)
	3.785×10^{-3}	cubic meters (m^3)
	128	fluid ounces (fl. oz)
hectares (ha)	2.471	acres
	107639	square feet (ft^2)
	10000	square meters (m^2)
horsepower (hp)	33000	foot-pound per minute (ft-lbs / min)
	550	foot-pound per second (ft-lbs / sec)
	745.7	joules per second (j / sec)
	1.014	metric horsepower (metric hp)
	8.026×10^3	newton-meters per second (n-m / sec)
horsepower, metric	0.9863	horsepower (hp)
	735.484	joules per second (j / sec)
	8.138×10^3	newton-meters per second (n-m / sec)
inches (in)	2.54	centimeters (cm)
	0.08333	feet (ft)
	0.0254	meters (m)
	25.4	millimeters (mm)
inches of mercury	0.033421	atmospheres (atm)
	2.54	centimeters of mercury (cm Hg)
	33.8639	hectopascals (hPa)
	70.73	pounds per square foot (Ibf / ft^2)
	0.4912	pounds per square inch Ibf / in^2)
	25.4	millimeters mercury (mm Hg)

MULTIPLY	BY	TO OBTAIN
kilometers (km)	$1x10^{-5}$	centimeter (cm)
	3280.8	feet (ft)
	0.6214	miles (mi)
	0.53996	nautical miles (nm)
kilometers per hour	58.68	feet per minute (ft / min)
	0.9113	feet per second (ft / sec)
	0.53996	knots (kt)
	16.67	meters per minute (m / min)
	0.27778	meters per second (m / sec)
	0.6214	miles per hour (mph)
knots (kt)	1.689	feet per second (ft / sec)
	1.852	kilometer per hour (km / hr)
	51.48	meter per second (m / sec)
	1	nautical mile per hour (nautical mph)
		statute mile per hour (statute mph)
liters (l)	1000	cubic centimeter (cm^3)
	0.03531	cubic feet (ft^3)
	0.22	imperial gallons (imperial gal)
	0.264172	U.S. gallons (U.S. gal)
	61.02	cubic inches (in^3)
	0.001	cubic meter (m^3)
	33.814	fluid ounces (fl. oz.)
	1.05669	U. S. quart (qt)
liters per second (1 / sec)	2.12	cubic feet per minute (ft^3 / min)
meters (m)	3.28084	feet
	39.37	inches
	$6.214x10^{-4}$	miles (mi)
	$5.3996x10^{-4}$	nautical mile (nm)
	0.198838	rod
meters per minute (m / min)	0.06	kilometers per hour (km / hr)
	116.6307	knots (kt)

MULTIPLY	BY	TO OBTAIN
meters per second (m/sec)	196.8504	feet per minute (ft / min)
	3.280840	feet per second (ft / sec)
	3.6	kilometers per hour (km / hr)
	1.94384	knots (kt)
	2.237	miles per hour (mph)
miles, statute(mi)	5280	feet (ft)
	1609.3	meters (m)
	1.6093	kilometers (km)
	0.8684	nautical miles (nm)
miles per hour (mph)	88	feet per minute (ft / min)
	1.467	feet per second (ft / sec)
	0.8684	knots (kt)
	0.447	meters per second (m / sec)
	1.6093	kilometer per hour
miles per hour squared (mi / hr^2)	2.151	feet per second squared (ft / sec^2)
	0.44704	meter per second squared (m / sec^2)
millibars	1.0	hectopascals (hPa)
	0.02953	inches of mercury (in Hg)
millimeters of mercury	1.3332	hectopascals (hPa)
at 0° C (mm Hg)	0.03937	inches of mercury (in Hg)
nautical miles (nm)	6080	feet (ft)
	1.852	kilometers (km)
	1852	meters (m)
	1.1516	statute miles (mi)
fluid ounces (fl. oz)	29.57	cubic centimeters (cm^3)
	8	fluid drams (fl dr)
	0.0078	U.S. gallons (U.S. gal)
	1.805	cubic inches (in^3)
	0.0296	liters (l)
	2.9574×10^{-5}	cubic meters (m^3)
pounds per square foot	0.1414	inches of mercury (in Hg)
(psf or lbs / ft^2)	47.880	newtons per square meter (n / m^2)

MULTIPLY	BY	TO OBTAIN
pounds per square inch (lbs/ in^2)	68.9475	millibar (mb)
	5.1715	centimeter of mercury (cm Hg)
	2.036	inches of mercury (in Hg)
quart, U.S. (qt)	57.749	cubic inches (in^3)
	0.94635	liters (l)
	9.46353×10^{-4}	cubic meters (m^3)
radians	57.3	degrees arc (deg)
	0.1592	revolutions (rev)
radians per second	57.3	degrees per second (deg /sec)
	9.549	revolutions per minute (rpm)
revolutions	360	degrees (deg)
	6.283	radians
revolutions per minute (rpm)	6	deg per second (deg / sec)
	0.1047	radians per second (r / sec)
rod	16.5	feet (ft)
	5.029	meters (m)
square centimeters (cm^2)	0.001076	square feet (ft^2)
	0.155	square inches (in^2)
	0.0001	square meters (m^2)
square feet (ft^2)	929	square centimeters (cm^2)
	144	square inches (in^2)
	0.092903	square meters (m^2)
square inches (in^2)	6.4516	square centimeters (cm^2)
	0.006944	square feet (ft^2)
	6.4516×10^{-4}	square meters (m^2)
square kilometers (km^2)	1000000	square meters (m^2)
	0.3861	square miles (mi^2)
square meters (m^2)	10.76391	square feet (ft^2)
	0.0001	hectors (ha)
square miles (mi^2)	2589988	square meters (m^2)
	2.59	square kilometers (km^2)

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