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**GENERAL**

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**SECTION 1**

**GENERAL**

**1.1 INTRODUCTION**

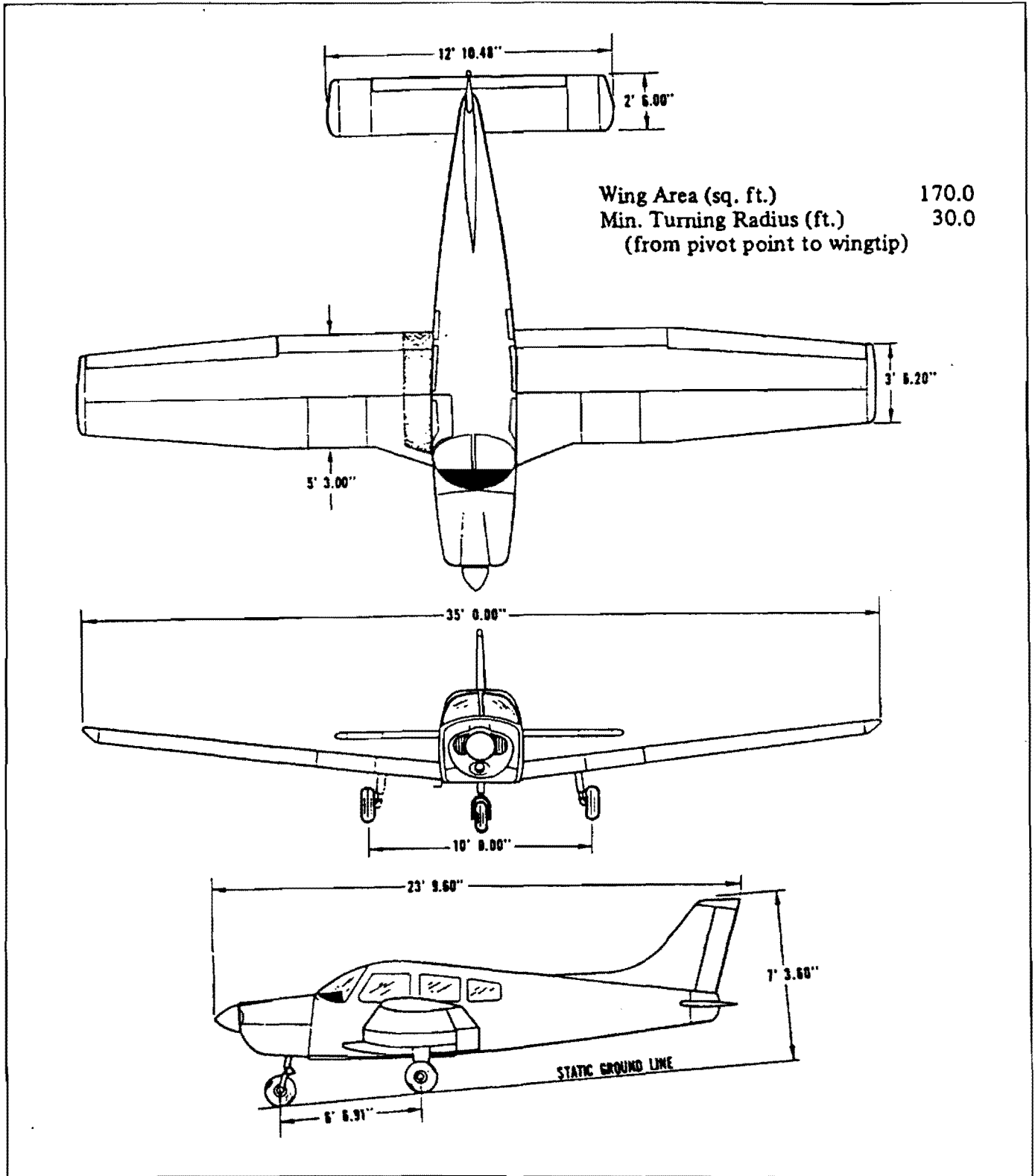
This Pilot's Operating Handbook is designed for maximum utilization as an operating guide for the pilot. It includes the material required to be furnished to the pilot by C.A.R. 3 and FAR Part 21, Subpart J. It also contains supplemental data supplied by the airplane manufacturer.

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

Assurance that the airplane is in an airworthy condition is the responsibility of the owner. The pilot in command is responsible for determining that the airplane is safe for flight. The pilot is also responsible for remaining within the operating limitations as outlined by instrument markings, placards, and this handbook.

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

The handbook has been divided into numbered (arabic) sections, each provided with a "finger-tip" tab divider for quick reference. The limitations and emergency procedures have been placed ahead of the normal procedures, performance and other sections to provide easier access to information that may be required in flight. The "Emergency Procedures" Section has been furnished with a red tab divider to present an instant reference to the section. Provisions for expansion of the handbook have been made by the deliberate omission of certain paragraph numbers, figure numbers, item numbers and pages noted as being left blank intentionally.



THREE VIEW

Figure 1-1

**1.3 ENGINES**

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

**1.5 PROPELLERS**

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

**1.7 FUEL  
AVGAS ONLY**

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

**1.9 OIL**

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

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

**ISSUED: JUNE 18, 1976  
REVISED: JUNE 8, 1990**

**REPORT: VB-790  
1-3**

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

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

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

**1.11 MAXIMUM WEIGHTS**

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

**1.13 STANDARD AIRPLANE WEIGHTS\***

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

**1.15 BAGGAGE SPACE**

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

**1.17 SPECIFIC LOADINGS**

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

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

## 1.19 SYMBOLS, ABBREVIATIONS AND TERMINOLOGY

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

### (a) General Airspeed Terminology and Symbols

CAS	Calibrated Airspeed means the indicated speed of an aircraft, corrected for position and instrument error. Calibrated airspeed is equal to true airspeed in standard atmosphere at sea level.
KCAS	Calibrated Airspeed expressed in "Knots."
GS	Ground Speed is the speed of an airplane relative to the ground.
IAS	Indicated Airspeed is the speed of an aircraft as shown on the airspeed indicator when corrected for instrument error. IAS values published in this handbook assume zero instrument error.
KIAS	Indicated Airspeed expressed in "Knots."
M	Mach Number is the ratio of true airspeed to the speed of sound.
TAS	True Airspeed is the airspeed of an airplane relative to undisturbed air which is the CAS corrected for altitude, temperature and compressability.
V <sub>A</sub>	Maneuvering Speed is the maximum speed at which application of full available aerodynamic control will not overstress the airplane.
V <sub>FE</sub>	Maximum Flap Extended Speed is the highest speed permissible with wing flaps in a prescribed extended position.
V <sub>NE</sub> /M <sub>NE</sub>	Never Exceed Speed or Mach Number is the speed limit that may not be exceeded at any time.
V <sub>NO</sub>	Maximum Structural Cruising Speed is the speed that should not be exceeded except in smooth air and then only with caution.
V <sub>S</sub>	Stalling Speed or the minimum steady flight speed at which the airplane is controllable.
V <sub>SO</sub>	Stalling Speed or the minimum steady flight speed at which the airplane is controllable in the landing configuration.
V <sub>X</sub>	Best Angle-of-Climb Speed is the airspeed which delivers the greatest gain of altitude in the shortest possible horizontal distance.
V <sub>Y</sub>	Best Rate-of-Climb Speed is the airspeed which delivers the greatest gain in altitude in the shortest possible time.

**(b) Meteorological Terminology**

<b>ISA</b>	<b>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. (1013.2 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 (-0.003564° F) per foot and zero above that altitude.</b>
<b>OAT</b>	<b>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.</b>
<b>Indicated Pressure Altitude</b>	<b>The number actually read from an altimeter when the barometric subscales has been set to 29.92 inches of mercury (1013.2 millibars).</b>
<b>Pressure Altitude</b>	<b>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.</b>
<b>Station Pressure</b>	<b>Actual atmospheric pressure at field elevation.</b>
<b>Wind</b>	<b>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.</b>



**(c) Power Terminology**

<b>Takeoff Power</b>	<b>Maximum power permissible for takeoff.</b>
<b>Maximum Continuous Power</b>	<b>Maximum power permissible continuously during flight.</b>
<b>Maximum Climb Power</b>	<b>Maximum power permissible during climb.</b>
<b>Maximum Cruise Power</b>	<b>Maximum power permissible during cruise.</b>

**(d) Engine Instruments**

<b>EGT Gauge</b>	<b>Exhaust Gas Temperature Gauge</b>
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**(e) Airplane Performance and Flight Planning Terminology**

<b>Climb Gradient</b>	<b>The demonstrated ratio of the change in height during a portion of a climb, to the horizontal distance traversed in the same time interval.</b>
<b>Demonstrated Crosswind Velocity</b>	<b>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.</b>
<b>Accelerate-Stop Distance</b>	<b>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.</b>
<b>Route Segment</b>	<b>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.</b>

(f) **Weight and Balance Terminology**

Reference Datum	An imaginary vertical plane from which all horizontal distances are measured for balance purposes.
Station	A location along the airplane fuselage usually given in terms of distance from the reference datum.
Arm	The horizontal distance from the reference datum to the center of gravity (C.G.) of an item.
Moment	The product of the weight of an item multiplied by its arm. (Moment divided by a constant is used to simplify balance calculations by reducing the number of digits.)
Center of Gravity (C.G.)	The point at which an airplane would balance if suspended. Its distance from the reference datum is found by dividing the total moment by the total weight of the airplane.
C.G. Arm	The arm obtained by adding the airplane's individual moments and dividing the sum by the total weight.
C.G. Limits	The extreme center of gravity locations within which the airplane must be operated at a given weight.
Usable Fuel	Fuel available for flight planning.
Unusable Fuel	Fuel remaining after a runout test has been completed in accordance with governmental regulations.
Standard Empty Weight	Weight of a standard airplane including unusable fuel, full operating fluids and full oil.
Basic Empty Weight	Standard empty weight plus optional equipment.
Payload	Weight of occupants, cargo and baggage.
Useful Load	Difference between takeoff weight, or ramp weight if applicable, and basic empty weight.
Maximum Ramp Weight	Maximum weight approved for ground maneuver. (It includes weight of start, taxi and run up fuel.)
Maximum Takeoff Weight	Maximum weight approved for the start of the takeoff run.
Maximum Landing Weight	Maximum weight approved for the landing touchdown.
Maximum Zero Fuel Weight	Maximum weight exclusive of usable fuel.

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1.21 CONVERSION FACTORS

<u>MULTIPLY</u>	<u>BY</u>	<u>TO OBTAIN</u>	<u>MULTIPLY</u>	<u>BY</u>	<u>TO OBTAIN</u>
acres	0.4047 43560 0.0015625	ha sq. ft. sq. mi.	cubic inches (cu. in.)	16.39 $1.639 \times 10^{-5}$ $5.787 \times 10^{-4}$ 0.5541 0.01639 $4.329 \times 10^{-3}$ 0.01732	cm <sup>3</sup> m <sup>3</sup> cu. ft. fl. oz. l U.S. gal. U.S. qt.
atmospheres (atm)	76 29.92 1.0133 1.033 14.70 2116	cm Hg in. Hg bar kg/cm <sup>2</sup> lb./sq. in. lb./sq. ft.	cubic meters (m <sup>3</sup> )	61024 1.308 35.3147 264.2	cu. in. cu. yd. cu. ft. U.S. gal.
bars (bar)	0.98692 14.503768	atm. lb./sq. in.	cubic meters per minute (m <sup>3</sup> /min.)	35.3147	cu. ft./min.
British Thermal Unit (BTU)	0.2519958	kg-cal	cubic yards (cu. yd.)	27 0.7646 202	cu. ft. m <sup>3</sup> U.S. gal.
centimeters (cm)	0.3937 0.032808	in. ft.	degrees (arc)	0.01745	radians
centimeters of mercury at 0°C (cm Hg)	0.01316 0.3937 0.1934 27.85 135.95	atm in. Hg lb./sq. in. lb./sq. ft. kg/m <sup>2</sup>	degrees per second (deg./sec.)	0.01745	radians/sec.
centimeters per second (cm/sec.)	0.032808 1.9685 0.02237	ft./sec. ft./min. mph	drams, fluid (dr. fl.)	0.125	fl. oz.
cubic centimeters (cm <sup>3</sup> )	0.03381 0.06102 $3.531 \times 10^{-5}$ 0.001 $2.642 \times 10^{-4}$	fl. oz. cu. in. cu. ft. l U.S. gal.	drams, avdp. (dr. avdp.)	0.0625	oz. avdp.
cubic feet (cu.ft.)	28317 0.028317 1728 0.037037 7.481 28.32	cm <sup>3</sup> m <sup>3</sup> cu. in. cu. yd. U.S. gal. l	feet (ft.)	30.48 0.3048 12 0.33333 0.0606061 $1.894 \times 10^{-4}$ $1.645 \times 10^{-4}$	cm m in. yd. rod mi. NM
cubic feet per minute (cu. ft./min.)	0.472 0.028317	l/sec. m <sup>3</sup> /min.	feet per minute (ft./min.)	0.01136 0.01829 0.508 0.00508	mph km/hr. cm/sec. m/sec.

**SECTION 1  
GENERAL**

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

<u>MULTIPLY</u>	<u>BY</u>	<u>TO OBTAIN</u>	<u>MULTIPLY</u>	<u>BY</u>	<u>TO OBTAIN</u>
feet per second (ft./sec.)	0.6818 1.097 30.48 0.5921	mph km/hr. cm/sec. kts.	hectares (ha)	2.471 107639 10000	acres sq. ft. m <sup>2</sup>
foot-pounds (ft.-lb.)	0.138255 3.24 x 10 <sup>-4</sup>	m-kg kg-cal	horsepower (hp)	33000 550 76.04 1.014	ft.-lb./min. ft.-lb./sec. m-kg/sec. metric hp
foot-pounds per minute (ft.-lb./min.)	3.030 x 10 <sup>-5</sup>	hp	horsepower, metric	75 0.9863	m-kg sec. hp
foot-pounds per second (ft.-lb./sec.)	1.818 x 10 <sup>-5</sup>	hp	inches (in.)	25.40 2.540 0.0254 0.08333 0.027777	mm cm m ft. yd.
gallons, Imperial (Imperial gal.)	277.4 1.201 4.546	cu. in. U.S. gal. l	inches of mercury at 0°C (in. Hg)	0.033421 0.4912 70.73 345.3 2.540 25.40	atm lb. sq. in. lb. sq. ft. kg-m <sup>2</sup> cm Hg mm Hg
gallons, U.S. dry (U.S. gal. dry)	268.8 1.556 x 10 <sup>-1</sup> 1.164 4.405	cu. in. cu. ft. U.S. gal. l	inch-pounds (in.-lb.)	0.011521	m-kg
gallons, U.S. liquid (U.S. gal.)	231 0.1337 4.951 x 10 <sup>-3</sup> 3785.4 3.785 x 10 <sup>-3</sup> 3.785 0.83268 128	cu. in. cu. ft. cu. yd. cm <sup>3</sup> m <sup>3</sup> l Imperial gal. fl. oz.	kilograms (kg)	2.204622 35.27 1000	lb. oz. avdp. g
gallons per acre (gal./acre)	9.353	l ha	kilogram-calories (kg-cal)	3.9683 3087 426.9	BTU ft.-lb. m-kg
grams (g)	0.001 0.3527 2.205 x 10 <sup>-3</sup>	kg oz. avdp. lb.	kilograms per cubic meter (kg/m <sup>3</sup> )	0.06243 0.001	lb. cu. ft. g cm <sup>3</sup>
grams per centimeter (g/cm)	0.1 6.721 x 10 <sup>-2</sup> 5.601 x 10 <sup>-3</sup>	kg m lb. ft. lb./in.	kilograms per hectare (kg/ha)	0.892	lb. acre
grams per cubic centimeter (g/cm <sup>3</sup> )	1000 0.03613 62.43	kg m <sup>3</sup> lb. cu. in. lb. cu. ft.	kilograms per square centimeter (kg/cm <sup>2</sup> )	0.9678 28.96 14.22 2048	atm in. Hg lb. sq. in. lb. sq. ft.

<u>MULTIPLY</u>	<u>BY</u>	<u>TO OBTAIN</u>	<u>MULTIPLY</u>	<u>BY</u>	<u>TO OBTAIN</u>
kilograms per square meter (kg/m <sup>2</sup> )	2.896 x 10 <sup>-3</sup> 1.422 x 10 <sup>-3</sup> 0.2048	in. Hg lb./sq. in. lb./sq. ft.	meters per minute (m/min.)	0.06	km/hr.
kilometers (km)	1 x 10 <sup>-5</sup> 3280.8 0.6214 0.53996	cm ft. mi. NM	meters per second (m/sec.)	3.280840 196.8504 2.237 3.6	ft./sec. ft./min. mph km/hr.
kilometers per hour (km/hr.)	0.9113 58.68 0.53996 0.6214 0.27778 16.67	ft./sec. ft./min. kt mph m/sec. m/min.	microns	3.937 x 10 <sup>-5</sup>	in.
knots (kt)	1 1.689 1.1516 1.852 51.48	nautical mph ft./sec. statute mph km/hr. m/sec.	miles, statute (mi.)	5280 1.6093 1609.3 0.8684	ft. km m NM
liters (l)	1000 61.02 0.03531 33.814 0.264172 0.2200 1.05669	cm <sup>3</sup> cu. in. cu. ft. fl. oz. U.S. gal. Imperial gal. qt.	miles per hour (mph)	44.7041 4.470 x 10 <sup>-1</sup> 1.467 88 1.6093 0.8684	cm/sec. m/sec. ft./sec. ft./min. km/hr. kt
liters per hectare (l/ha)	13.69 0.107	fl. oz./acre gal./acre	miles per hour square (m/hr. sq.)	2.151	ft./sec. sq.
liters per second (l/sec.)	2.12	cu. ft./min.	millibars	2.953 x 10 <sup>-2</sup>	in. Hg
meters (m)	39.37 3.280840 1.0936 0.198838 6.214 x 10 <sup>-4</sup> 5.3996 x 10 <sup>-4</sup>	in. ft. yd. rod mi. NM	millimeters (mm)	0.03937	in.
meter-kilogram (m-kg)	7.23301 86.798	ft.-lb. in.-lb.	millimeters of mercury at 0°C (mm Hg)	0.03937	in. Hg
			nautical miles (NM)	6080 1.1516 1852 1.852	ft. statute mi. m km
			ounces, avdp. (oz. avdp.)	28.35 16	g dr. avdp.
			ounces, fluid (fl. oz.)	8 29.57 1.805 0.0296 0.0078	dr. fl. cm <sup>3</sup> cu. in. l U.S. gal.

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

<u>MULTIPLY</u>	<u>BY</u>	<u>TO OBTAIN</u>	<u>MULTIPLY</u>	<u>BY</u>	<u>TO OBTAIN</u>
ounces, fluid per acre (fl. oz./acre)	0.073	l/ha	rod	16.5 5.5 5.029	ft. yd. m
pounds (lb.)	0.453592 453.6 3.108 x 10 <sup>-2</sup>	kg g slug	slug	32.174	lb.
pounds per acre (lb./acre)	1.121	kg/ha	square centimeters (cm <sup>2</sup> )	0.1550 0.001076	sq. in. sq. ft.
pounds per cubic foot (lb./cu. ft.)	16.02	kg m <sup>3</sup>	square feet (sq. ft.)	929 0.092903 144	cm <sup>2</sup> m <sup>2</sup> sq. in.
pounds per cubic inch (lb./cu. in.)	1728 27.68	lb./cu. ft. g cm <sup>3</sup>	square inches (sq. in.)	0.1111 2.296 x 10 <sup>-5</sup>	sq. yd. acres
pounds per square foot (lb./sq. ft.)	0.1414 4.88243 4.725 x 10 <sup>-4</sup>	in. Hg kg m <sup>-2</sup> atm	square kilometers (km <sup>2</sup> )	0.3861	sq. mi.
pounds per square inch (psi or lb./sq. in.)	5.1715 2.036 0.06804 0.0689476 703.1	cm Hg in. Hg atm bar kg m <sup>-2</sup>	square meters (m <sup>2</sup> )	10.76391 1.196 0.0001	sq. ft. sq. yd. ha
quart, U.S. (qt.)	0.94635 57.749	l cu. in.	square miles (sq. mi.)	2.590 640	km <sup>2</sup> acres
radians	57.30 0.1592	deg. (arc) rev.	square rods (sq. rods)	30.25	sq. yd.
radians per second (radians/sec.)	57.30 0.1592 9.549	deg./sec. rev./sec. rpm	square yards (sq. yd.)	0.8361 9 0.0330579	m <sup>2</sup> sq. ft. sq. rods
revolutions (rev.)	6.283	radians	yards (yd.)	0.9144 3 36 0.181818	m ft. in. rod
revolutions per minute (rpm or rev./min.)	0.1047	radians/sec.			
revolutions per second (rev./sec.)	6.283	radians/sec.			