**TABLE OF CONTENTS**

**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.
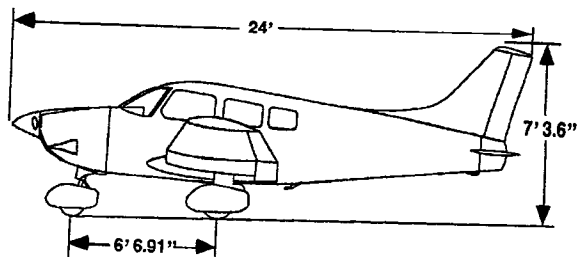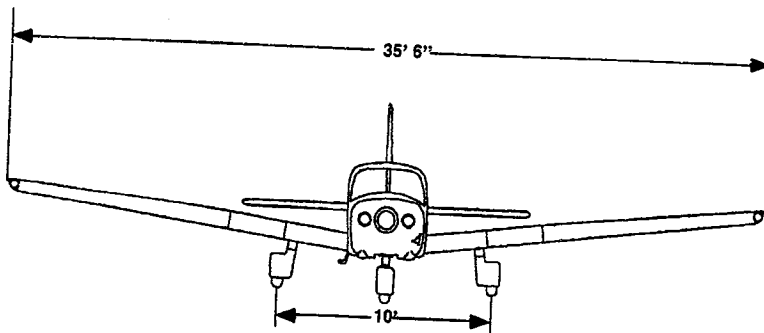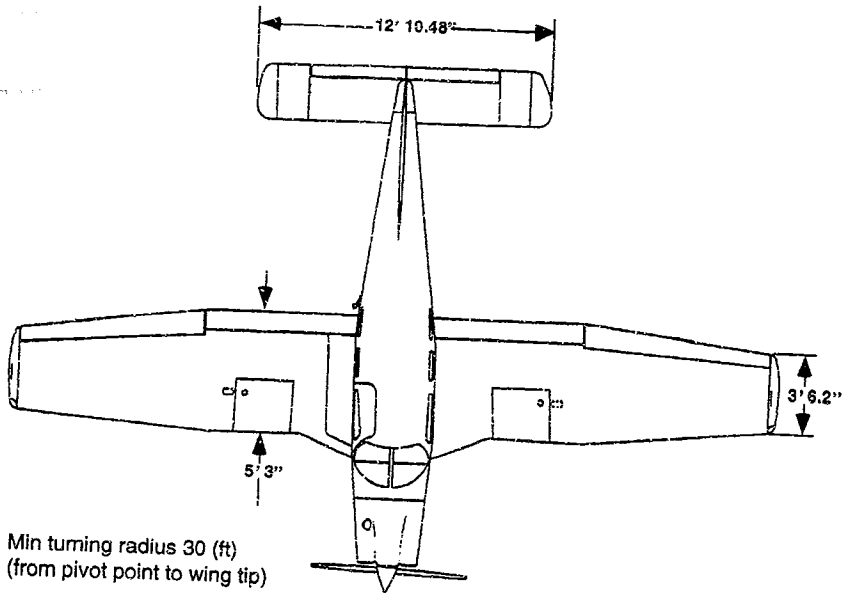
Assurance that the airplane is in an airworthy condition is the responsibility of the owner. The pilot in command is responsible for determining that the airplane is safe for flight. The pilot is also responsible for remaining within the operating limitations as outlined by instrument markings, placards, 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 procedures, performance and other sections to provide easier access to information that may be required in flight. The ``Emergency Procedures'' Section has been furnished with a red tab divider to present an instant reference to the section. Provisions for expansion of the handbook have been made by the deliberate omission of certain paragraph numbers, figure numbers, item numbers and pages noted as being intentionally left blank.

12' 10.48"

3' 6.2"

5' 3"

Min turning radius 30 (ft)
(from pivot point to wing tip)

35' 6"

10'

24'

7' 3.6"

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)

(b) Oil Specification

8

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. |
| VA | Maneuvering Speed is the maximum speed at which application of full available aerodynamic control will not overstress the airplane. |
| VFE | 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 (cm Hg) | 13.3322 | hectopascals (hPa) |
| | .3937 | inches of mercury (in. Hg) |
| | 27.85 | pounds / sq. foot (lbf./ft$^2$) |
| cubic centimeters (cm$^3$) | 0.1934 | pounds / sq. inch (lbf./in$^2$) |
| | 3.531x10$^{-5}$ | cubic feet (ft$^3$) |
| | 0.06102 | cubic inches (in$^3$) |
| | 0.001 | Liters (1) |
| | 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 (1) |
| | 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 (1) |
| | 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 (1) |
| degrees arc. (deg) | 0.01745 | radians |
| degrees arc per second (deg / sec) | 0.01745 | radians per second |
| | 0.166667 | revolutions per second (rpm) |

| MULTIPLY | BY | TO OBTAIN |
|---|---|---|
| drams, fluid (dr. fl.) | $3.697 \times 10^{-3}$ | liters (1) |
| | $3.697 \times 10^{-6}$ | cubic meters ($m^3$) |
| | 0.125 | fluid ounces (fl. oz) |
| feet (ft) | 30.48 | centimeters (cm) |
| | 12 | inches |
| | 0.3048 | meters (m) |
| | $1.8939 \times 10^{-4}$ | miles (mi) |
| | 1.6458 | nautical miles (NM) |
| | 0.0606061 | rods |
| feet per minute (ft / min) | 0.01829 | kilometers per hour (km / hr) |
| | $9.8716 \times 10^{-3}$ | 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.) | $3.2383 \times 10^{-4}$ | kilocalorie (kcal) |
| | 1.3558 | joules (j) |
| | 14.5939 | newton-meters (n-m) |
| foot-pound per minute (ft-lbs/ min) | $3.03 \times 10^{-5}$ | horse power (hp) |
| | 81.348 | joules per minute (j / min) |
| foot-pound per second (ft-lbs/ sec) | $1.818 \times 10^{-5}$ | horse power (hp) |
| | 1.3558 | joules per second (j / sec) |
| gallons, imperial (imperial gal) | $4.546 \times 10^{-3}$ | 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) | $4.405 \times 10^{-3}$ | 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 (1) |
| | 3.785x10$^{-3}$ | 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) |
| | 8.026x10$^3$ | newton-meters per second (n-m / sec) |
| horsepower, metric | 0.9863 | horsepower (hp) |
| | 735.484 | joules per second (j / sec) |
| | 8.138x10$^3$ | 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 (lbf / ft$^2$) |
| | 0.4912 | pounds per square inch lbf / in$^2$) |
| | 25.4 | millimeters mercury (mm Hg) |

| MULTIPLY | BY | TO OBTAIN |
|---|---|---|
| kilometers (km) | $1 \times 10^{-5}$ | 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 (l / sec) | 2.12 | cubic feet per minute (ft$^3$ / min) |
| meters (m) | 3.28084 | feet |
| | 39.37 | inches |
| | $6.214 \times 10^{-4}$ | miles (mi) |
| | $5.3996 \times 10^{-4}$ | 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 at 0° C (mm Hg) | 1.3332 | hectopascals (hPa) |
| | 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 (1) |
| | 2.9574x10$^{-5}$ | cubic meters (m$^3$) |
| pounds per square foot (psf or lbs / ft$^2$) | 0.1414 | inches of mercury (in Hg) |
| | 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 (1) |
| | 9.46353x10$^{-4}$ | 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$^2$) |
| | 6.4516x10$^{-4}$ | 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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