

# **CESSNA 182**

## *Training Manual*

*By*  
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Other aircraft presently available in the Cessna Training Manual series are:

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Note: ENGLISH SPELLING has been used in this text, which differs slightly from that used by Cessna. Differences in spelling have no bearing on interpretation.

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## Terminology

<b>Airspeed</b>		
KIAS	<b>Knots Indicated Airspeed</b>	Speed in knots as indicated on the airspeed indicator.
KCAS	<b>Knots Calibrated Airspeed</b>	KIAS corrected for instrument error. Note this error is often negligible and CAS may be omitted from calculations.
KTAS	<b>Knots True Airspeed</b>	KCAS corrected for density (altitude and temperature) error.
Va	<b>Maximum Manoeuvring Speed</b>	The maximum speed for full or abrupt control inputs.
Vfe	<b>Maximum Flap Extended Speed</b>	The highest speed permitted with flap extended. Indicated by the top of the white arc.
Vno	<b>Maximum Structural Cruising Speed</b>	Sometimes referred to as "Normal operating range" Should not be exceeded except in smooth conditions and only with caution. Indicated by the green arc.
Vne	<b>Never Exceed Speed</b>	Maximum speed permitted, exceeding will cause structural damage. Indicated by the upper red line.
Vs	<b>Stall Speed</b>	The minimum speed before loss of control in the normal cruise configuration. Indicated by the bottom of the green arc. Sometimes referred to as minimum 'steady flight' speed.
Vso	<b>Stall Speed Landing Configuration</b>	The minimum speed before loss of control in the landing configuration, at the most forward C of G*. Indicated by the bottom of the white arc.
Vx	<b>Best Angle of Climb Speed</b>	The speed which results in the maximum gain in altitude for a given horizontal distance.
Vy	<b>Best Rate of Climb Speed</b>	The speed which results in the maximum gain in altitude for a given time, indicated by the maximum rate of climb for the conditions on the VSI.
Vref	<b>Reference Speed</b>	The minimum safe approach speed, calculated as $1.3 \times V_{so}$ .
Vr	<b>Rotation Speed</b>	The speed which rotation should be initiated.
Vat	<b>Barrier Speed</b>	The speed nominated to reach before the 50ft barrier or on reaching 50ft above the runway.
	<b>Maximum Demonstrated Crosswind</b>	The maximum demonstrated crosswind during testing.

\*forward centre of gravity gives a higher stall speed and so is used for certification

<b>Meteorological Terms</b>		
OAT	<b>Outside Air Temperature</b>	Free outside air temperature, or indicated outside air temperature corrected for gauge, position and ram air errors.
IOAT	<b>Indicated Outside Air Temperature</b>	Temperature indicated on the temperature gauge.
	<b>Standard Temperature</b>	The temperature in the International Standard atmosphere for the associated level, and is 15 degrees Celsius at sea level decreased by two degrees every 1000ft.
	<b>Pressure Altitude</b>	The altitude in the International Standard Atmosphere with a sea level pressure of 1013 and a standard reduction of 1mb per 30ft. Pressure Altitude would be observed with the altimeter subscale set to 1013.
	<b>Density Altitude</b>	The altitude that the prevailing density would occur in the International Standard Atmosphere, and can be found by correcting Pressure Altitude for temperature deviations.
<b>Engine Terms</b>		
BHP	<b>Brake Horse Power</b>	The power developed by the engine (actual power available will have some transmission losses).
RPM	<b>Revolutions per Minute</b>	Engine drive and propeller speed.
	<b>Static RPM</b>	The maximum RPM obtained during stationery full throttle operation
<b>Weight and Balance Terms</b>		
	<b>Arm (moment arm)</b>	The horizontal distance in inches from reference datum line to the centre of gravity of the item.
C of G	<b>Centre of Gravity</b>	The point about which an aeroplane would balance if it were possible to suspend it at that point. It is the mass centre of the aeroplane, or the theoretical point at which entire weight of the aeroplane is assumed to be concentrated. It may be expressed in percent of MAC (mean aerodynamic chord) or in inches from the reference datum.
	<b>Centre of Gravity Limit</b>	The specified forward and aft point beyond which the CG must not be located. The forward limit defines the controllability of aircraft and aft limits – stability of the aircraft.

	<b>Datum (reference datum)</b>	An imaginary vertical plane or line from which all measurements of arm are taken. The datum is established by the manufacturer.
	<b>Moment</b>	The product of the weight of an item multiplied by its arm and expressed in inch-pounds. The total moment is the weight of the aeroplane multiplied by distance between the datum and the CG.
MZFW	<b>Maximum Zero Fuel Weight</b>	The maximum permissible weight to prevent exceeding the wing bending limits. This limit is not always applicable for aircraft with small fuel loads.
BEW	<b>Basic Empty Weight</b>	The weight of an empty aeroplane, including permanently installed equipment, fixed ballast, full oil and unusable fuel, and is that specified on the aircraft mass and balance documentation for each individual aircraft.
SEW	<b>Standard Empty Weight</b>	The basic empty weight of a standard aeroplane, specified in the POH, and is an average weight given for performance considerations and calculations.
OEW	<b>Operating Empty Weight</b>	The weight of the aircraft with crew, unusable fuel, and operational items (galley etc).
	<b>Payload</b>	The weight the aircraft can carry with the pilot and fuel on board.
MRW	<b>Maximum Ramp Weight</b>	The maximum weight for ramp manoeuvring, the maximum takeoff weight plus additional fuel for start taxi and runup.
MTOW	<b>Maximum Takeoff Weight</b>	The maximum permissible takeoff weight and sometimes called the maximum all up weight, landing weight is normally lower as allows for burn off and carries shock loads on touchdown.
MLW	<b>Maximum Landing Weight</b>	Maximum permissible weight for landing. Sometimes this is the same as the takeoff weight for smaller aircraft.
<b>Other</b>		
AFM	<b>Aircraft Flight Manual</b>	These terms are inter-changeable and refer to the approved manufacturers handbook. Cessna most often uses the term Pilot's Operating Handbook, early manuals were called Owners Manual and legal texts often use the term AFM.
POH	<b>Pilot's Operating Handbook</b>	
	<b>Pilot Information Manual</b>	A Pilot Information Manual is a new term, coined to refer to a POH or AFM which is not issued to a specific aircraft.



## Conversion Factors

lbs to kg	1kg = 2.204lbs	kgs to lbs	1lb = .454kgs
USG to lt	1USG = 3.785Lt	lt to USG	1lt = 0.264USG
lt to Imp Gal	1lt = 0.22 Imp G	Imp.Gal to lt	1Imp G = 4.55lt
nm to km	1nm = 1.852km	km to nm	1km = 0.54nm
nm to St.m to ft	1nm = 1.15stm 1nm = 6080ft	St.m to nm to ft	1 st.m = 0.87nm 1 st.m = 5280ft
feet to meters	1 FT = 0.3048 m	meters to feet	1 m = 3.281 FT
inches to cm	1 inch = 2.54cm	cm to inches	1cm = 0.394"
Hpa(mb) to "Hg	1mb = .029536"	" Hg to Hpa (mb)	1" = 33.8mb

### AVGAS FUEL Volume / weight SG = 0.72

Litres	Lt/kg	kgs	Litres	lbs/lts	Lbs
1.39	1	0.72	0.631	1	1.58

### Wind Component per 10kts of Wind

deg	10	20	30	40	50	60	70	80
kts	2	3	5	6	8	9	9	10

## Useful Formulas

Celsius (C) to Fahrenheit (F)	$C = 5/9 \times (F-32),$ $F = C \times 9/5 + 32$
Pressure altitude (PA)	$PA = \text{Altitude AMSL} + 30 \times (QNH-1013)$ Memory aid – Subscale up/down altitude up/down
Standard Temperature (ST)	$ST = 15 - 2 \times PA/1000$ ie. 2 degrees cooler per 1000ft altitude
Density altitude (DA)	$DA = PA + (-) 120\text{ft/deg above (below) ST}$ i.e. 120Ft higher for every degree hotter than standard
Specific Gravity	$SG \times \text{volume in litres} = \text{weight in kgs}$

One in 60 rule	1 degree of arc $\cong$ 1nm at a radius of 60nm i.e degrees of arc approximately equal length of arc at a radius of 60nm
Rate 1 Turn Radius	$R = GS/60/\pi \cong GS/20$
Rate 1 Turn Bank Angle (Rule of Thumb)	Degrees of Bank $\cong G/S/10+7$
Percent to fpm	$fpm \cong \% \times G/S$ Or $fpm = \% \times G/S \times 1.013$
Percent to Degrees	TANGENT (degrees in radians) $\times 100 =$ Gradient in % INVERSE TANGENT (gradient in $\%/100$ ) = Angle in Radians
Degrees to Radians	Degrees $\times \pi / 180 =$ radians
Approximate Cosine factors for angle in degrees	Cosine 60 = 0.5 (HWC); Sine 60 $\cong$ 0.9 (XWC) Cosine 45 $\cong$ 0.7 = Sine 45 $\cong$ 0.7 (HWC&XWC) Cosine 30 $\cong$ 0.9 (HWC); Sine 30 = 0.5 (XWC) Memory Aid = Think about the sides of the triangle made from the wind vector and the forward/aft and side components to determine which factor to use.
Gust factor (Rule of Thumb)	$V_{at} = V_{ref} + 1/2HWC + Gust$ eg. Wind 20kts gusting 25 at 30 degrees to Runway: $V_{at} = V_{ref} + 0.5 \times 18 + 5 = V_{ref} + 14,$ If the $V_{ref}$ is 65kts, $V_{at}$ should be $65 + 14 = 79$ kts

## Pilot's Operating Handbook Information

The approved manufacturer's handbook, normally termed Pilot's Operating Handbook (POH), Aircraft Flight Manual (AFM), or Owners Manual, is issued to a specific model and serial number, and includes all applicable supplements and modifications. It is legally required to be on board the aircraft during flight, and is the master document for all flight information.

In 1975, the US General Aviation Manufacturer's Association introduced the 'GAMA Specification No. 1' format for the 'Pilot's Operating Handbook' (POH). This format was later adopted by ICAO in their Guidance Document 9516 in 1991, and is now required for all newly certified light aircraft by ICAO member states. Most light aircraft listed as built in 1976 or later, have provided Pilot's Operating Handbooks (POHs) in this format.

This format was designed for ergonomic purposes to enhance safety. It is recommended that pilots become familiar with the order and contents of each section, as summarised in the table below.

Section 1	General	Definitions and abbreviations
Section 2	Limitations	Specific operating limits, placards and specifications
Section 3	Emergencies	Complete descriptions of action in the event of any emergency or non-normal situation
Section 4	Normal Operations	Complete descriptions of required actions for all normal situations
Section 5	Performance	Performance graphs, typically for stall speeds, airspeed calibration, cross wind calculation, takeoff, climb, cruise, and landing
Section 6	Weight and Balance	Loading specifications, limitations and loading graphs or tables
Section 7	Systems Descriptions	Technical descriptions of aircraft systems, airframe, controls, fuel, engine, instruments, avionics and lights etc.
Section 8	Servicing and Maintenance	Maintenance requirements, inspections, stowing, oil requirements etc.
Section 9	Supplements	Supplement sections follow the format above for additional equipment or modification.
Section 10	Safety Information	General safety information and helpful operational recommendations which the manufacturer feels are pertinent to the operation of the aircraft

For use in ground training, or reference prior to flight, this text should be read in conjunction with the POH from on board the aircraft you are going to be flying. Even if you have a copy of a POH for the same model C182, the aircraft you are flying may have supplements for modifications and optional equipment which affect the operational performance.

Early owners manuals for the C182 contain very little information, and it is recommended for purposes of type transition training ground courses, to also review manuals from a later models.

## Introduction

This training manual provides technical and operational descriptions for the Cessna 182 aircraft.

The information is intended as an instructional aid to assist with conversion training in conjunction with an approved training organisation and the POH from the aircraft you will be flying. The text is arranged according to standard training syllabi for ease of use and assimilation with training programs, rather than following the order of a POH which is designed for ergonomic reference and in-flight use.

This material does not supersede, nor is it meant to substitute any of the manufacturer's operation manuals. The material presented has been prepared from the basic design data obtained in the pilot's operating handbook and from operational experience.

## History

The Cessna aircraft company has a long and rich history. Founder Clyde Cessna built his first aeroplane in 1911, and taught himself to fly it! He went on to build a number of innovative aeroplanes, including several race and award winning designs.

In 1934, Clyde's nephew, Dwane Wallace, fresh out of college, took over as head of the company. During the depression years Dwane acted as everything from floor sweeper to CEO, even personally flying company planes in air races (several of which he won!).

Under Wallace's leadership, the Cessna Aircraft Company eventually became the most successful general aviation company of all time.

## Development of the C182

Due to its versatility, load, and range, the Cessna 182 is one of the most popular 4 seat light aircraft in the private and recreational market.

Approximately 23,000 C182s have been built to date, with the C182 still in production at the time of writing. The production began in 1965, spanning 50 years with a brief break between 1987 and 1996. It is the second most popular Cessna built, after the Cessna 172 which dominates the training market.

The C182 began its life as the tricycle conversion of the popular C180 tail wheel model, the first model very nearly resembling a C180 with the tail wheel removed. The name Skylane was first given to the C182A with deluxe options, and became the standard name later. Major changes to the airframe were made with the C182C and C182E, both bringing about the transformation in appearance to the resemble

the modern day shape. Further changes throughout the series were mainly related to improvements in structure, systems, and fittings.

The Cessna 182 can be one of the safest and most rewarding aircraft that you may fly, providing you receive proper training, know the aircraft well, and operate according to the manufacturers recommendations. In this respect, make sure you understand the systems thoroughly, abide by the limitations, and never attempt to operate on or near the boundary of the aircraft's or your own limitation.



## Models and Differences

As detailed on the previous page, the Cessna 182 model had a number of type variants during its production history. Additionally there are a number of post-manufacture modifications available for the airframe, instruments/avionics equipment and electrics.

Speeds often vary between models by one or two knots, sometimes more for significant type variants. Whenever maximum performance is required the speeds will also vary with weight, and density altitude. For simplification the speeds have been provided for the model C182 Skylane, which was produced in the largest numbers.

All speeds have been converted to knots and rounded up to the nearest 5kts. Generally multiple provision of figures can lead to confusion for memory items and this application is safer for practical use during conversion training.

During practical training reference should be made to the flight manual of the aeroplane you will be flying to ensure that the limitations applicable for that aeroplane are adhered to. Likewise when flying different models it should always be remembered that MAUW, flap limitations, engine limitations and speeds may vary from model to model. Before flying different models, particularly if maximum performance is required, the AFM should be consulted to verify differences.

## Model History

We provide the following information to outline significant differences from an operational perspective. A detailed history is provided in the table following and in subsequent chapters.

### C182

The early model C182 had the same fuselage as the C180 ("straight back"), without the rear window.

The main operational differences of the C182 are summarised here:

- manual flap lever and the limitation of 100mph (87kts) for all flap selections
- lower maximum all up weight (2550lbs)

Various minor airframe changes were made to gradually bring about the more commonly known version of the C182 including:

- C182A Weight increased to 2650lbs;
- C182C Third window on cabin, swept tail;
- C182E Wrap around rear window, re-profiled cowlings, improved fairings, electric flaps, weight increased to 2800lbs, flap limits increased to 110mph (95kts), optional 8-USGal fuel tanks;

The addition of the rear window, and swept tail, and later cowling and fairing modifications were mainly responsible for the present appearance of the C182.

- C182L Preselect flap control, first 10 degrees increased to 160mph (140kts);
- C182N Maximum takeoff weight increased to 2950lbs;
- C182P Tubular steel undercarriage increasing landing weight to 2950lbs, enlarged fin;
- C182Q Maximum rpm reduced to 2400 with O-470U designed for 100/130 fuel, vernier mixture control standard, electrical system changed to 28V and bladder tanks replaced with integral tanks with a higher standard fuel capacity of 88USGal;

- C182R Takeoff weight increased to 3100, 20 degrees flap limit increased to 120kts;
- C182S Fuel injection, first 10 degrees increased to 100kts, annunciator panel, or optional G1000 avionics;
- C182T G1000 avionics now standard equipment.

Major performance options were offered in the late 1970's including:

#### C182RG (R182), 1977-1986

Retractable version of the Skylane, improved speed but added responsibility.

#### T182RG and T182, 1979-1986

235hp turbo charged version, service ceiling 20,000 (with oxygen!), added power, added maintenance, increase in MAUW to 3100lbs.

When Cessna resumed production of it's single engine range in the 90's, a new and improved C182S was available.

#### C182S, C182T, T182T 1997 on

If you are lucky enough to find one of these it is really a dream to operate. After the recovery from public liability suits and the 80's recession, the C182 received upgraded systems and equipment to produce the same proven design with the latest accessories and support.

Significant differences include:

- IO540 fuel injected engine, providing 230hp at 2400rpm;
- Full IFR avionics as standard installation including auto pilot;
- Warning and caution annunciator panel indications or optional G1000 avionics suite;

The S and T have slightly lower load carrying capacity than earlier models due mainly to avionics installations, and the fuel injected system, although alleviating carburettor problems, can be quite complicated for the inexperienced pilot and differences training is highly recommended.

#### Reims F182

Like all Reims productions we have to admit this model is also an excellent version. Only 169 aircraft were produced.

Significant differences include:

- Lower stall speeds, similar to STOL equipped C182s;
- Slightly higher cruise speeds;
- Different airframe manufacturing processes.

#### Robertson STOL kits

Additions of Robertson STOL Kits (Sierra Industries) to the C182 produce remarkable short field performance and stall speeds that approach that of a 152, however without any significant increase drag in the cruise. It is an impressive

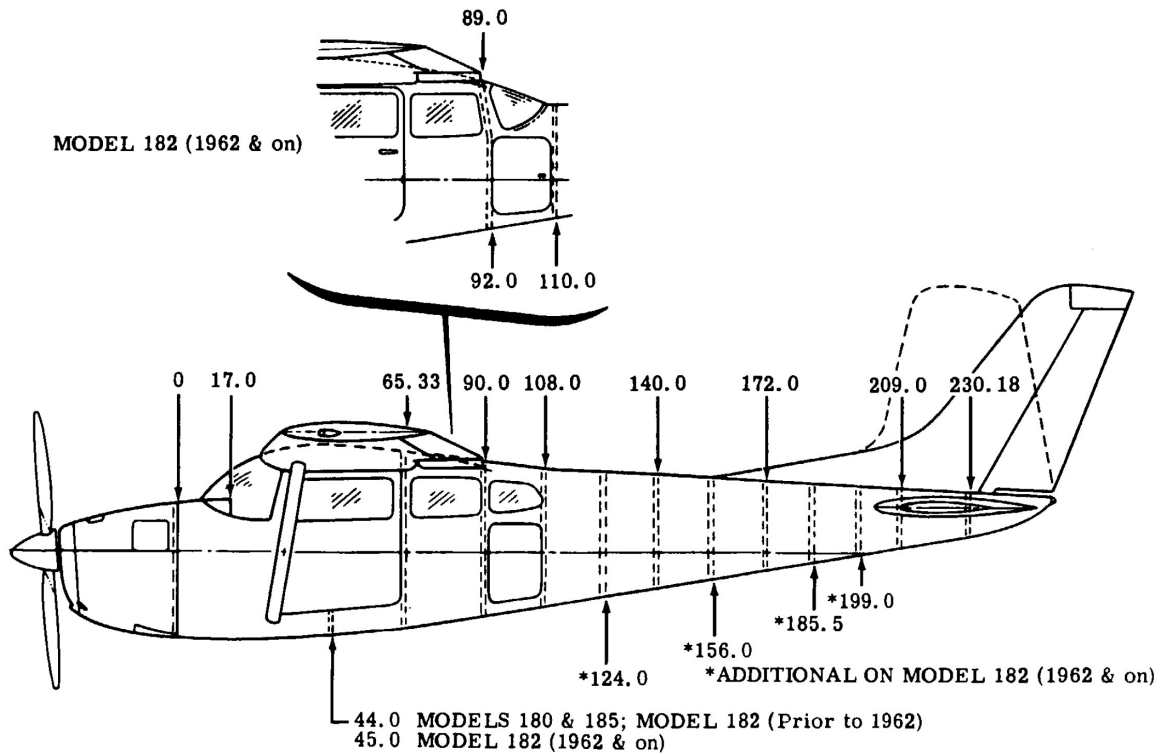
modification, however must be taken carefully if you wish to use it to its limits. Care should be taken at low speed where operating near the wrong side of the drag curve, particularly when at MAUW and with high density altitudes.

### Model History Versus Serial Number

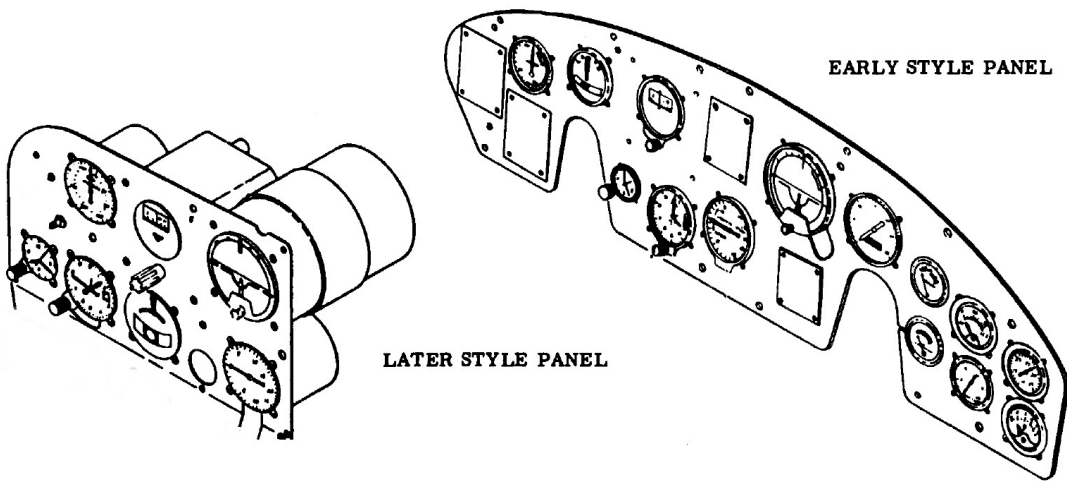
Model	Name	Year	Starting Serial Number	Significant Changes
C182		1956	18233000	2550lbs maximum weight, Continental 0470-L engine developing 230hp at 2600rpm, 14V electrical system.
C182A	Skylane for deluxe version only	1957	18233843	2650lbs maximum weight, increase from 60 to 65USgal fuel capacity, useable fuel remains at 55USgal. Some minor improvements to the airframe and fittings including modified instrument panel layout. Electrical fuel gagues and low voltage warning light standard.
		1958	18234754-34999	Skylane name introduced for deluxe model. Exhaust moved for improved cooling, rudder linkages changed to bungee type, and improved instrument lighting.
			18251001	
C182B		1959	18251557	Cowl flaps added.
C182C		1960	18252359	Tail fin and rudder changed to a swept tail shape and third cabin side window added on each side. Flush caps replaced with standard raised grip fuel caps. Minor interior changes including plastic control wheel grip, and major changes to fuselage and cowling designs to improve maintenance.



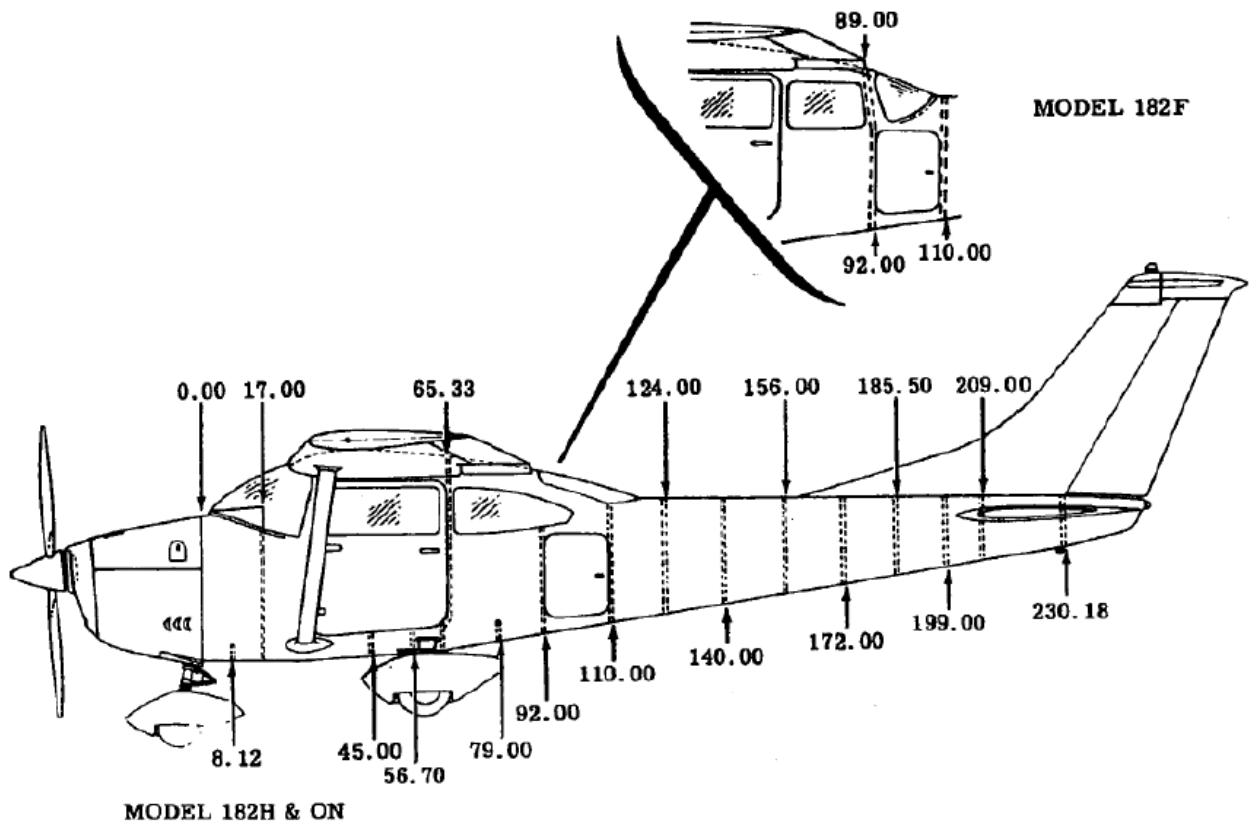
Model	Name	Year	Starting Serial Number	Significant Changes
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C182D		1961	18253008*	The last of the 'straight back' models. The instrument panel layout improved, with the artificial horizon in a more direct line of sight from the left seat. Cowling fastenings changed to quick release type. Pull starter replaced by key starter.
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Model	Name	Year	Starting Serial Number	Significant Changes
C182E		1962	18253599	Maximum weight increased to 2800lbs Optional 84 USG tank (80 USG useable) Cut down rear fuselage and added "omni-vision" wraparound rear window, flap limit increased on all stages from 100mph to 110mph (95kts), manual flap replaced by electric flap with a toggle switch and indicator. Pull contactor master switch change to a rocker type. Engine changed to 0470-R.



C182F	C182 or Skylane	1963	18254424	Optional autopilot available. Improved overhead instrument lighting.
C182G		1964	18255059	One piece rear window fitted, aft cabin windows enlarged.
C182H		1965	55845	Pointed spinner replaces rounded shape. Horizontal stabiliser and elevator width increased. One piece front windshield.
C182J		1966	56685	Rotary door latches fitted, larger cowl access panel provided for easier maintenance.

<b>Model</b>	<b>Name</b>	<b>Year</b>	<b>Starting Serial Number</b>	<b>Significant Changes</b>
C182K		1967	57626	An alternator replaces the generator for electrical power supply.
C182L		1968	58506	Flap toggle switch replaced by a "pre-select" lever and floating arm indicator, flap limiting speed on first 10 degrees increased to 160mph (140kts). AH moved to central position, to resemble later more ergonomic instrument panel configurations. Sump fuel stainer control moved from instrument panel to beside oil dipstick.
A182J	Argentine C182	1966	A182-001	Argentinian built C182.
A182K		1967	A182-057	
A182L		1968	A182-097 on	
C182M	C182 or Skylane	1969	18259306	Generator output increased to 60 Amps.
C182N		1970	18260056	Maximum takeoff weight increased to 2950lbs, landing weight remains 2800lbs. Split rocker master switch installed to isolate battery from alternator.
C182N		1971	18260446	Shoulder harnesses standard in front seats, 80lbs baggage permitted in aft compartment, total still 120lbs.
C182P	C182 or Skylane	1972	18260826	Flat spring steel main landing gear struts replaced with tubular steel. Landing weight increased to 2950lbs to match takeoff weight. Baggage in aft compartment now total 200lbs (120 in forward part and 80 in aft part of compartment). Landing lights shifted from wing to nose cowling. Engine gauge markings relabelled with arcs for improved ergonomics. High voltage sensor and 'High Voltage' warning light replaces the generator warning light.
		1973	18261426	Factory installed avionics upgraded from 100 channel to 200 channel.
		1974	18262466	Door handles now close flush with armrest in locked position.

<b>Model</b>	<b>Name</b>	<b>Year</b>	<b>Starting Serial Number</b>	<b>Significant Changes</b>
		1975	18263476	Engine changed to O-470-S. Improved cowling and fairing design increases reported cruise speed approximately 5kts. Lower profile glareshield.
C182	Skylane only	1976	18264296	Airspeed indicator changed from mph to kts, flap limit placards converted from 110mph to 95kts. Optional electric trim.
F182P	Reims	1976	F1820001-F1820025	Built by Reims in France
A182M	Argentine C182	1969	Not assigned	Argentinian models.
A182N		1970	A1820117-A182136	
A182N		1971	Not assigned	
A182N		1972	Not assigned	
A182N	AMC182	1973	A1820137-A182146	
A182N		1974-1976	Not assigned	
C182Q	Skylane or Skylane II	1977	18265176-18265965	Changed to Avgas 100/130 engine design with Continental O-470-U, developing 230hp at 2400rpm, maximum rpm reduced primarily for noise, but also a reported improved climb performance. Vernier mixture control now standard.
C182Q		1978	18265966-18266590 & 18263479	Electrical system changed from 14 to 28 Volts, battery capacity 24V, 12.75 or 15.5 amp-hr. Engine configured for Avgas 100LL/100. Avionics master switch installed. Window latch redesigned to sit flush with window indent.
C182Q		1979	18266591-18267300	Integral fuel tank replaces bladder tank and capacity increased to 92USgal, 88USgal usable. Alternator control unit changed to integral unit, and 'HIGH VOLTAGE' warning light relabelled 'LOW VOLTAGE'.

Model	Name	Year	Starting Serial Number	Significant Changes
C182Q		1980	18267301, 18267302- 18267715	New audio panel with marker beacons. A pull type alternator circuit breaker fitted.
F182P	Reims/ Cessna Skylane/II	1977	F18200026- F18200064	Built by Reims in France.
F182Q	F Skylane	1978	F18200065- F18200094	
F182Q	F Skylane II	1979	F18200095- F18200129	
F182Q		1980	F18200130- F18200169	
C182R /T182	Skylane or Turbo Skylane/ Skylane II or Turbo Skylane II/ Skylane or Turbo Skylane -With Value Group A	1981	18267716- 18268055 &18267302	Maximum weight increased to 3100lbs for takeoff, landing weight remains 2950lbs. Introduction of optional turbo-charged engine with designator T182. Door latch redesigned to include an upper latching pin.
		1982	118268056	
		1983	18268294	Low Vacuum warning light fitted, flap speed for 20 degrees increased to 120kts.
		1984	18268369	Rear shoulder harnesses standard.
		1985	18268434	
		1986	18268542- 18268586	
R182/ TR182	Skylane RG	1978- 1986	R18200002- R18202039	Retractable version and turbo retractable version, with Lycoming O-540-J3C5D, 235hp at 2400rpm.

*Note 1: Unlike most Cessna's which have the suffix RG to designate retractable, Cessna termed the retractable version of the Cessna 182 "R182", unfortunately this is easily confused with the C182R and also can be confused with terminology used to designate the C172 military and Hawk XP version - "R172" which is not retractable. In this text the term C182RG has been used to refer to the retractable version to avoid confusion.*

<b>Model</b>	<b>Name</b>	<b>Year</b>	<b>Starting Serial Number</b>	<b>Significant Changes</b>
182S	Skylane	1997-2001	18280001	Engine changed to Lycoming IO-540-AB1A5, fuel injected, 230hp at 2400rpm, dual vacuum system, annunciator panel or optional G1000 avionics. Maximum ramp weight increased to 3110Lbs, takeoff and landing remain unchanged. First 10 degrees flap limit increased to 100kts.
182T	Skylane	2001 on	18280945	Minor modifications to engine cowling, wheel fairings and step. G1000 avionics now standard equipment.
T182T	Skylane TC	2001 on	T18208001	Lycoming TIO540-AK1A, turbo, fuel injected, 235hp at 2400rpm, 4 place oxygen system.

*Note 2: The designator T182/TR182 was given to models from 1978 on which were fitted with a turbocharger, again this should not be confused with the later design C182T which is normally aspirated.*

### Common Modifications Table

There are over 500 STCs on the C182, it would not be useful to list them all here. This table attempts to identify a few of the more commonly used and more widely beneficial modifications available.

<b>TYPE</b>	<b>NAME and MANUFACTURER</b>	<b>DIFFERENCES and FEATURES</b>
Any	Air Research Technology Inc STOL kit	Increases weight to 2950, useful on older models, extends the wing by 37 inches, which also increases performance.
Any	Ski's/Floats (Various)	C182s (unlike the less suitable C172) unfortunately never had a factory float plane option available, however a number of STC's are available for full conversion to seaplane operation.
	Flight Bonus speed kit (available from Horton STOLcraft)	Reported to improve cruise speed 12-18kts.
Any	Drag reduction kits (Various)	Various – normally involving speed fairings to reduce form drag, there are various drag reduction kits available to improve cruise speeds.

<b>TYPE</b>	<b>NAME and MANUFACTURER</b>	<b>DIFFERENCES and FEATURES</b>
	Engine Modifications, (Various)	Various engine refits are available, the most common being the IO470, IO520, and IO550 engines, for improved performance. All these also being fuel injected, additionally address carburettor and carb-ice issues.
Any	Horton STOL	Tip and wing surface modifications to permit lower stall speed, take-off and landing speeds and thus lower distances.
Any	Robertson STOL	Increased lift, more speed, added stability, and lower stall speed, take-off and landing speeds and distances.
Any	Vortex Generators (Micro Aerodynamics)	Reduction in surface drag and induced drag, improving boundary layer adherence, and decreasing stall speed, improved performance.
<p><i>Note: All manufacturers of performance related modifications will have full information available on the increases projected from the kit, in terms of speed, takeoff and landing, fuel burn, and climb enhancements. It is recommended that these figures be reviewed carefully in terms of desire attributes.</i></p> <p><i>Aircraft fitted with performance modifications must have POH supplements indicating difference – these supplements must referred to in the relevant main sections of the POH where applicable.</i></p>		
Any	Low Fuel Warning System, O & N Aircraft Modifications	Warns when fuel remaining is less than approximately 7USGal for older models (restarts have a low fuel warning system).
Any	Fuel Cap Monarch Air	Umbrella style fuel caps which fix problems with leaks, predominantly occurring in older flush mounted caps, (available for most Cessna types)
1956-76 engines only	Autogas modification, Various	Engine modification to permit operation on autogas (available to engines were certified for operation with 80/87 octane, 1976 and prior). There is an increased tendency for carb icing and fuel vaporisation, and a slight power reduction, but Autogas can provide much lower costs and convenience in many countries



Early Model Straight-back/no Swept Tail C182



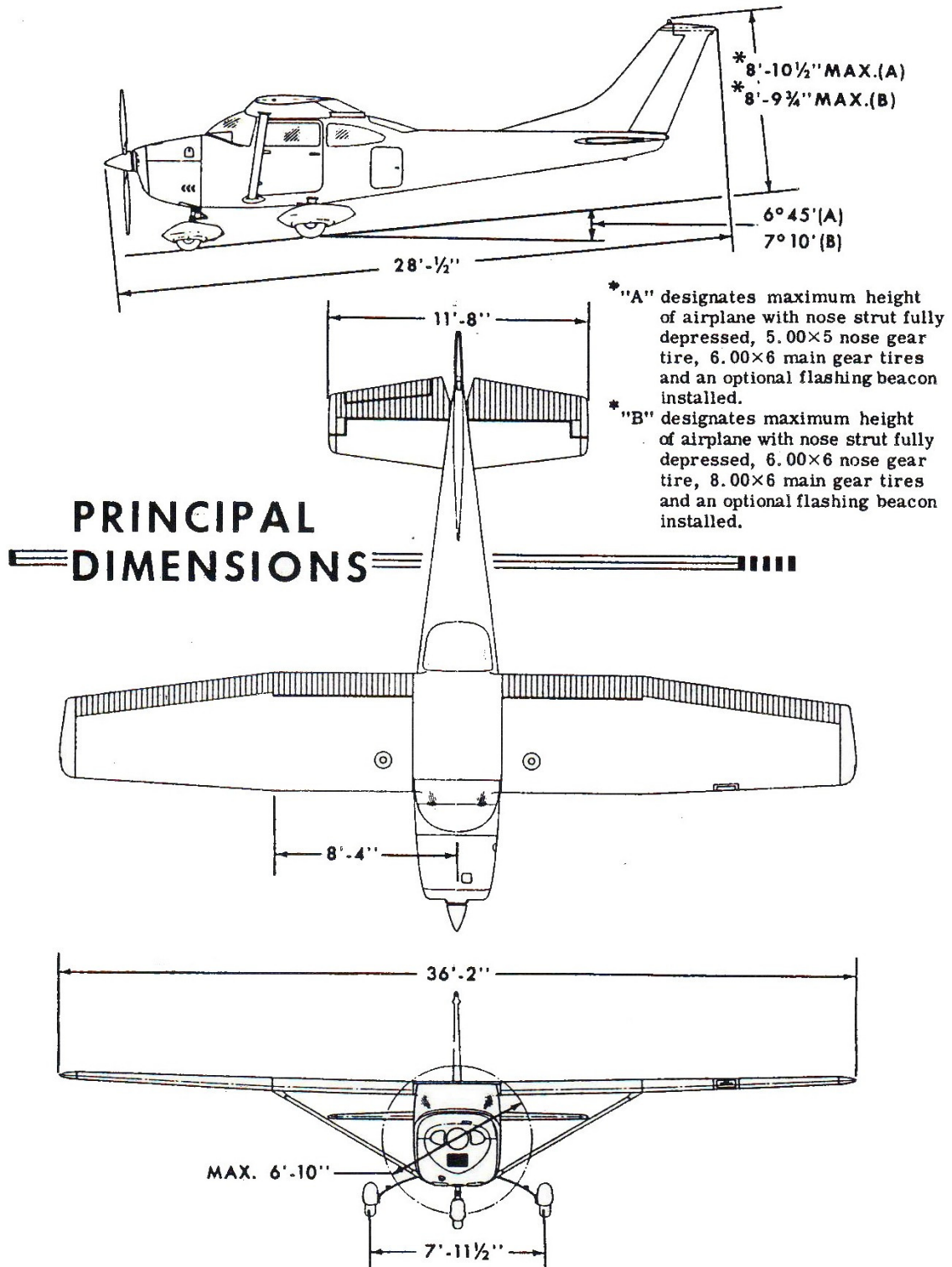
C182RG Skylane with Rear Window



# AIRCRAFT TECHNICAL INFORMATION

## General

The Cessna 182 aeroplane is a single engine, four seat, high wing monoplane aircraft, equipped with tricycle landing gear, and is designed for general utility purposes.



## Airframe

The airframe is a conventional design similar to other Cessna aircraft you may have flown (for example the C152, C172).

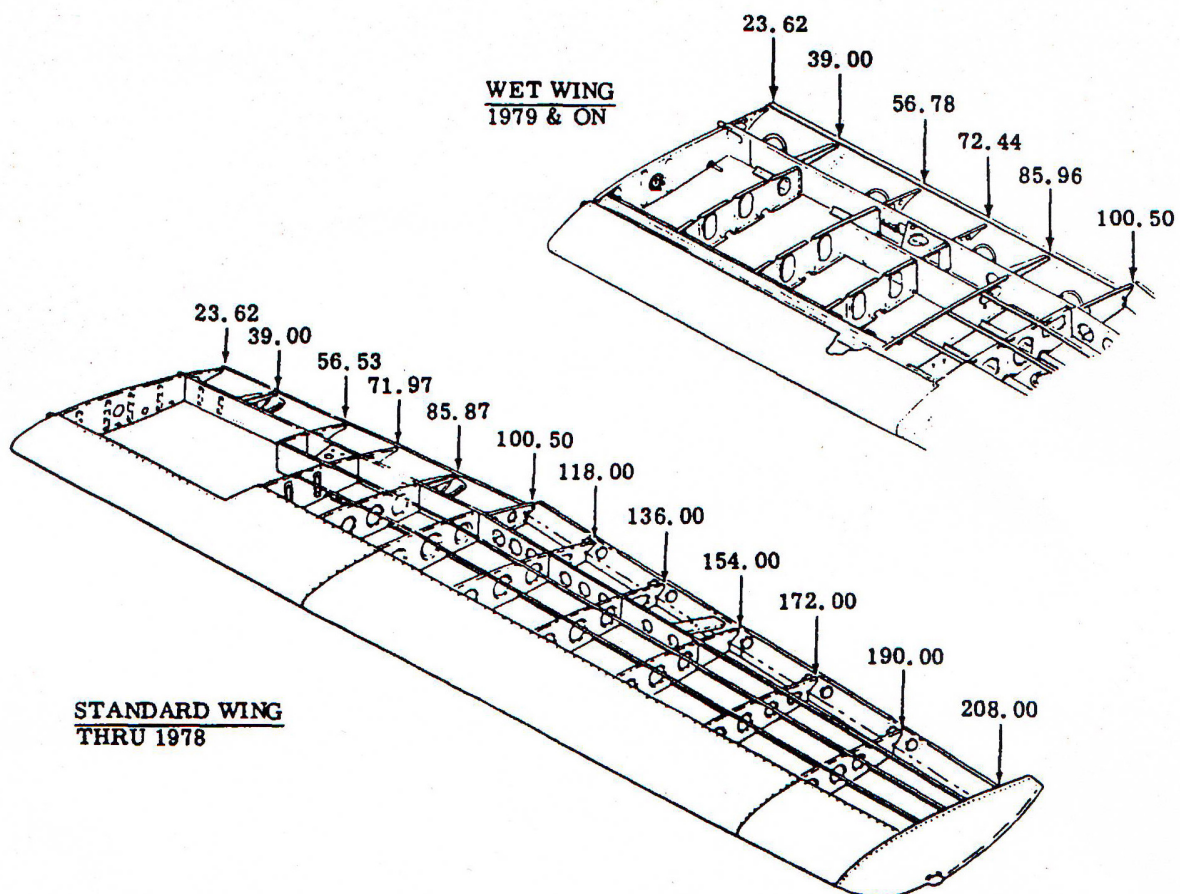
The construction is a semi-monocoque type consisting of formed sheet metal bulkheads, stringers and stressed skin.

Semi-monocoque construction is a light framework covered by skin that carries much of the stress. It is a combination of the best features of a strut-type structure, in which the internal framework carries almost all of the stress, and the pure monocoque where all stress is carried by the skin.

The fuselage forms the main body of the aircraft to which the wings, tail section and undercarriage are attached. The main structural features are:

- Front and rear carry through spars for wing attachment;
- A bulkhead and forgings for landing gear attachment;
- A bulkhead and attaching plates for strut mounting;
- Four stringers for engine mounting attached to the forward door posts.

The wings are all metal, semi-cantilever type with struts spanning the inner section of the wing. The wings contain either bladder or integral ie. non bladder type fuel tanks depending on the model as detailed in the picture below.



## Engine & Engine Controls

The aeroplane is powered by a flat 6 cylinder horizontally opposed piston engine.

C182 models prior to 1977 are equipped with the 230hp Continental O-470 Series (L, R, S), carburettor equipped, normally aspirated engine, producing at sea level maximum continuous power of 230hp at 2600rpm.

The C182Q was fitted with a Continental O-470-U developing 230hp at 2400rpm, with the change to 100 Octane Avgas (100/130, and later 100LL/100).

The R182 (Skylane RG) retractable version was fitted with a Lycoming O-540 (J,L), developing 235hp at 2400rpm.

After beginning production in 1996 later models were fitted with fuel injected Lycoming IO-540-A engine, developing 230hp at 2400rpm.

The propeller is a two-bladed, constant speed, aluminium alloy McCauley propeller. The propeller is approximately 2m (6'10" metres) in diameter. Optional three blade installations are available for some models.



## Engine Controls

The engine control and monitoring consists of:

- Throttle control;
- Propeller pitch control;
- Mixture control;
- Carb. Heat selector;
- Fuel flow indicators (Fuel injected models – C182S on);
- Engine monitoring gauges:
  - Manifold pressure gauge;
  - Tachometer;
  - Oil temperature and pressure;
  - Cylinder Head Temperature;
  - Annunciator panel (C182S);
- Some optional equipment includes:
  - Carburettor heat indicator;
  - Exhaust Gas Temperature;
  - Individual cylinder CHT/EGT indicators;
  - G1000 engine instrumentation (C182S on).



## Throttle

Engine power is controlled by a throttle, located on the lower centre portion of the instrument panel.

The throttle controls a throttle valve (or butterfly) – an oval metal disc pivoted on a central spindle that is perpendicular to the axis of the carburettor's manifold. The closed position of the valve is when the disc is rotated to an angle of about 70° to the axis of the manifold, preventing all but enough fuel/air for idling to pass through the manifold. When the valve is rotated to a position parallel to the axis of the manifold it offers very little restriction to airflow. This is the fully open position of the valve providing maximum fuel/air mixture to the manifold. The picture below shows a carburettor in the open and closed positions of the throttle butterfly.

**Throttle in Open Position**



**Throttle in Closed Position**



## Fuel System

Fuel is supplied to the engine from two wing fuel tanks.

The approximate usable fuel capacity in the C182 series is:

- C182 to C182D - 55 US gallon (225 litres) standard bladder wing tanks;
- C182E to C182Q - 60 US gallon (225 litres) standard bladder wing tanks;
- C182E-C182Q - 75 or 80 US gallon (285 or 300 litres) optional long range bladder wing tanks.
- C182Q on - 88 US gallon (330 litres) standard integral tanks

From these tanks, fuel flows by gravity feed through to the four position fuel shut-off valve and the fuel strainer, manual primer to the carburettor.

The amount of fuel we can put into fuel tanks is limited by the volume of the tanks, and therefore usable fuel is always provided in volume, such as gallons and litres. However, the carburettor and engine are only sensitive to the mass of fuel, and not to the volume. The engine will consume a certain mass (lbs or kgs) of fuel per hour. Fuel has a wide variation in specific gravity (weight of fuel per volume) mostly depending on temperature and type of fuel. For practical purposes the specific gravity of Avgas is taken as 0.72 kgs/lt or 6 lbs/US gallon, but in reality this figure is only accurate for a limited range of temperatures, the density at -40 °C is 0.77 kgs/lt 6.40 lbs/US gallon and thereafter decreases by approximately 0.5% per 5 °C (9 °F) increase in temperature.

The change in density can have a noticeable affect when fueling, tanks subjected to a temperature change after being filled can be found overflowing or not quite full, depending on whether there was an increase or decrease in temperature.

The variations in specific gravity of fuel will have a significant effect on the mass of fuel in the tanks for a specific volume, and therefore also on the range and endurance. For these reasons it is of vital importance to always include a contingency calculation when working out the fuel required.

## Fuel Selector

The fuel valve is located on the floor of the cockpit between the pilot and co-pilot seats. The valve has four positions: LEFT, BOTH, RIGHT and OFF. With the valve in the BOTH position, fuel flows from both left and right tanks, through a strainer to the carburettor.

The BOTH position must be selected for takeoff and landing as this ensures the fuel supply is not interrupted if one tank sump is uncovered during manoeuvring.

LEFT or RIGHT may be selected during level flight to restore imbalances. Uneven draining normally occurs regardless of aircraft balance because of the venting system, more fuel being used from the vented tank, see more below on fuel venting.

When parked the fuel should be selected to OFF or the lower tank. If the fuel is left on BOTH fuel will drain by gravity through the fuel selector or vent line to the lower tank resulting in imbalance, and a possible loss of fuel, see more below under fuel vents.

## **Fuel Tanks and Fuel Caps**

Some of the early model C182's, 1978 and earlier, are fitted with bladder tanks. That is the tank consists of a rubber bladder, glued fitted inside with wing, instead of the later integral type, which are a solid construction and incorporated into the wing structure.

The disadvantage with bladder tanks it they have a tendency to develop wrinkles and trap water in folds as the glue perishes with time. If this occurs even though the tanks have been drained there may be still water present. Shaking the wings to ensure water is dislodged from creases and draining again after settling is recommended, especially if the aeroplane has been standing outside overnight in moist or wet weather. Bladder tanks are also subject to perishing over time, and may develop leaks – evident by coloured stains from the fuel dye (blue or green) around the wing root, or small pieces of black rubber may appear in the fuel sample. These symptoms can also be caused by dislodged or perishing fuel drain seals. Both situations need to be checked out by an approved maintenance organisation.

The 1956-1959 models are additionally more susceptible to moisture intake due to their retaining the original flush style fuel caps. These caps have a small indent where water may collect and seep through the vent. Although these caps were originally fitted by Cessna, it is recommended they are replaced with the umbrella style caps which are less susceptible to fuel leakage, and many aircraft have had them replaced. Be aware if you are operating an aircraft with the flush type of cap fitted, especially if the aircraft has been standing or subject to wet conditions.

## **Fuel Measuring and Indication**

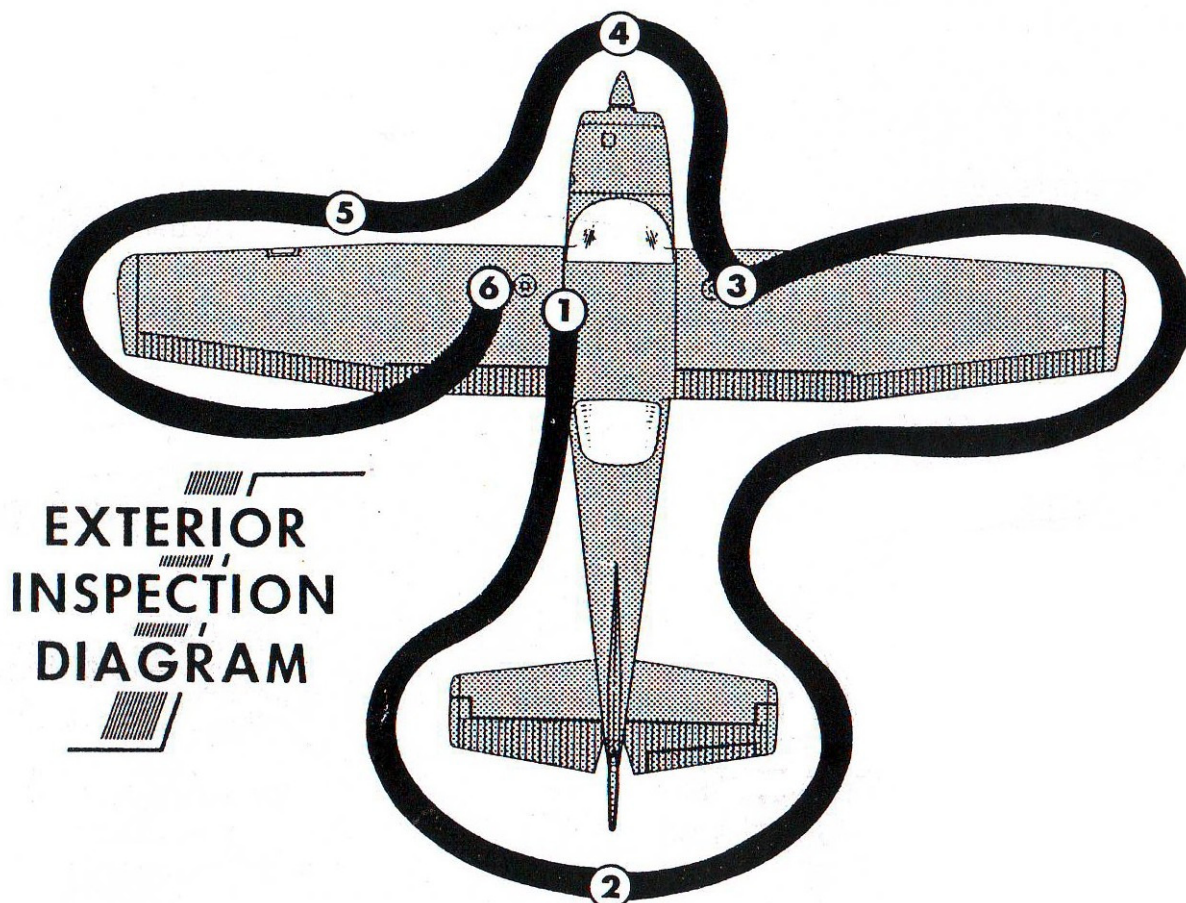
Fuel quantity is measured by two float-type fuel quantity transmitters (one in each tank), and indicated by two electrically-operated fuel quantity indicators on the lower left portion of the instrument panel.

The full position of float produces a minimum resistance through transmitter, permitting maximum current flow through the fuel quantity indicator and maximum pointer deflection.

## NORMAL PROCEDURES

### Pre-Flight Check

The preflight inspection should be done in anticlockwise direction as indicated in the flight manual, beginning with the interior inspection.



#### (1) Cabin

Ensure the required documents (certificate of airworthiness, maintenance release, radio license, weight and balance, flight folio, flight manual, and any other flight specific) are on board and valid. Perform a visual inspection of the panel from right to left to ensure all instruments and equipment are in order.

If night flight is planned ensure internal lights are operational.

## Exterior Inspection

Visually check the aircraft for general condition during the walk-around inspection, ensuring all surfaces are sound and no signs of structural damage, worked rivets, missing screws, lock wires or loose connections.

If night flight is planned ensure all required lights are operational and crew torch is carried by each crew member.



### (2) Tail Section

Check top, bottom, and side surfaces for any damage, balance weights secure.

Rudder, elevator, and elevator trim secure and undamaged, linkages free, full and free movement of control.

Linkage and turnbuckles secure, free of obstruction, lock wires in place. Elevator and horn balance weights secure.

Beacon, aerials and rear navigation light undamaged and secure.

### (3) Right Wing

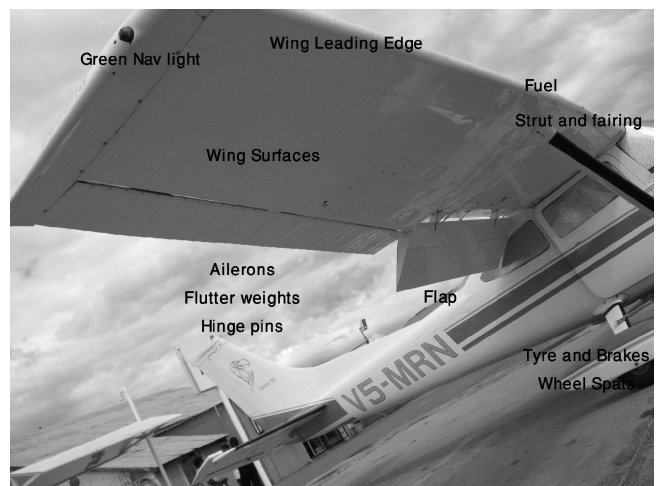
Check top, bottom, and side surfaces for any damage.

Ensure flap does not retract if pushed, flap rollers allow small amount of play in down position.

Check for damage to surface and flap tracks, freedom of operating linkage and security of all fastenings.

Check for damage to aileron surface and security of all hinges, lock-wires and flutter weights. Check condition, security and colour of navigation light.

Check condition and security of fairing and strut.

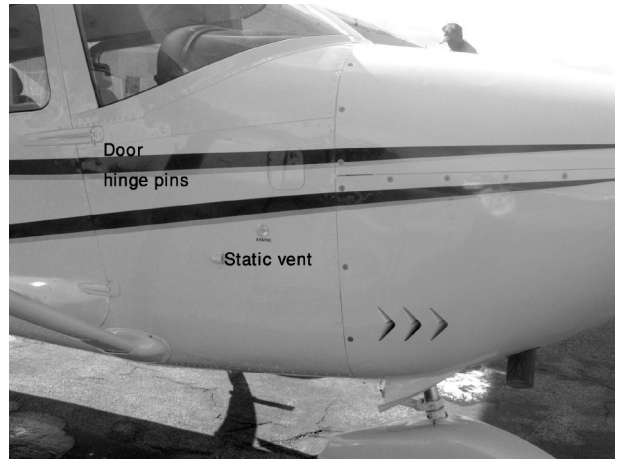




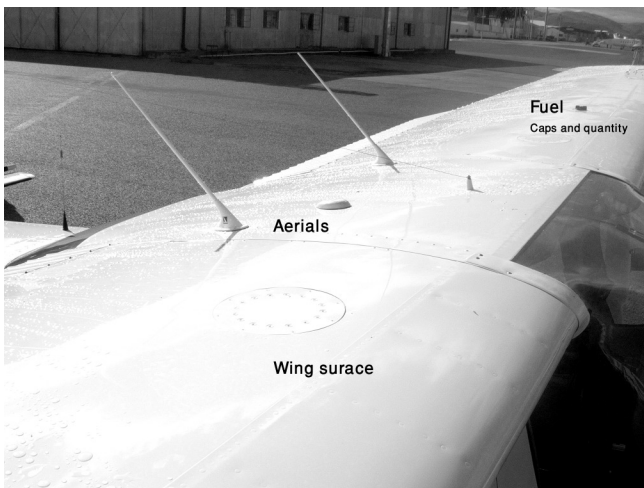
Check static vent clear and free of any blockage (dual fitted).

Check for security, condition of strut and tyre. Check tyre for wear, cuts, bruises, and slippage. Recommended tyre pressure should be maintained. Remember, that any drop in temperature of air inside a tyre causes a corresponding drop in air pressure.

Check for security, condition of hydraulic lines, disc brake and all nuts.



Use sampler cup and drain a small quantity of fuel from tank sump quick-drain valve to check for water, sediment and proper fuel grade.

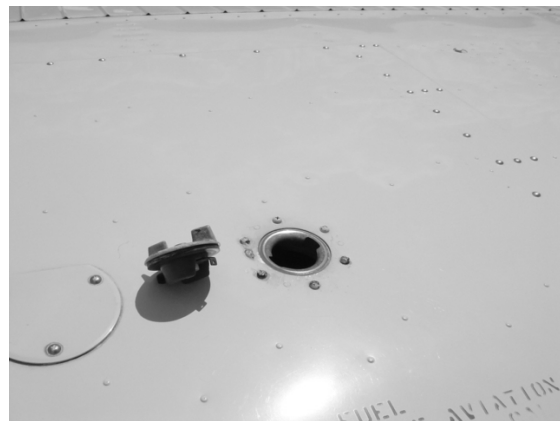


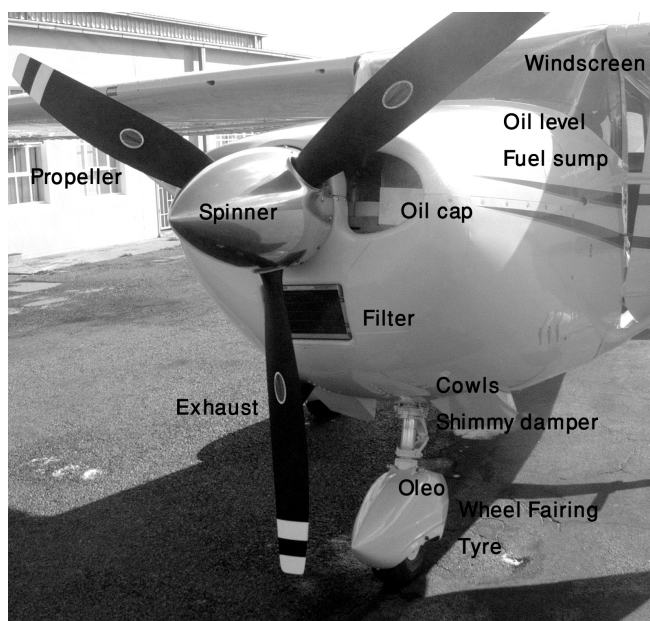
Check top and bottom wing surfaces for any damage or accumulations on wing. Ice or excessive dirt must be removed before flight.

Ensure all aerials are secure and undamaged.

Check the desired fuel level visually using a suitable calibrated dipstick.

After checking the fuel. Ensure that fuel cap is secure. For the type illustrated the ridge should be parallel to the axis of flight.





#### (4) Nose

Check propeller and spinner for nicks and security. Ensure propeller blades and spinner cover is secure. When engine is cold the propeller may be turned through to assist with pre-start lubrication. *Always treat the propeller as live.*

Check condition and cleanliness of landing light (on some models may be on left wing).

Check condition and security of air filter, air filter should be clear of any dust or other foreign matter.

Visually check exhaust for signs of wear, on first flight or is engine is cool check exhaust is secure.

Check nose gear of operating linkages, security and state of shimmy damper, and oleo for proper extension and damping.

Check cowl flaps for rigidity and operation.

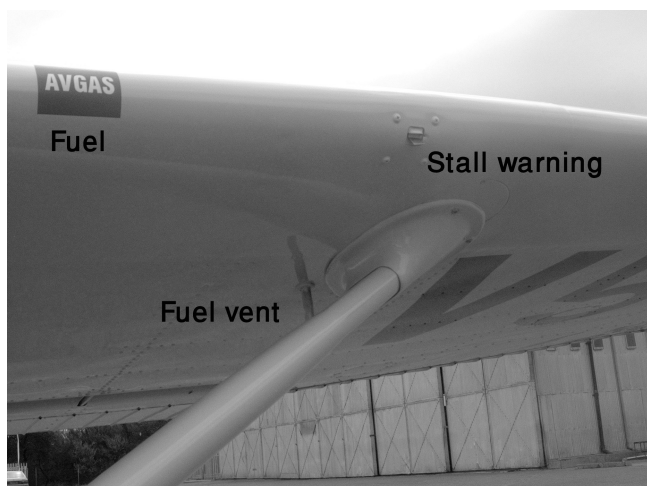
Check security of nuts and split pins, the state and inflation of tyre, and state of wheel fairing.

Open inspection cover, check oil level. Minimum oil 9 quarts (see oil system).

Check oil cap secure through nose cowl opening.

Before the first flight of the day and after each refueling, pull out fuel strainer to check the fuel sample. Check strainer drain closed.

Check the security and condition of the engine cowling.



#### (5) Differences on the Left Side

Check all required items as described on the right wing, and additionally: Check static vent clear and free of any blockage (dual fitted).

Remove the pitot tube cover, and check the pitot tube for cleanliness, security and clear opening passage. Check the fuel tank vent for security and clear opening passage.

## PERFORMANCE SPECIFICATIONS

*Performance figures given at MAUW and speeds in KIAS unless specified otherwise. Figures provided are averages and rounded to the safer side, they may not correspond to the exact figures for your particular model.*

### Structural Limitations

Gross weight (take-off and landing)	2500lbs - 3100lbs
Maximum landing weight	2500lbs -2950lbs
Standard empty weight	1620lbs-1880lbs
Max Baggage allowance in aft compartment	120lbs
Flight load factor (flaps up)	+3.8g – 1.52g
Flight load factor (flaps down)	+3.5g – 0

### Engine Specifications

Engine (Lycoming O-470 series) power	230 BHP at 2600 rpm
Oil capacity	12Qts maximum, 9Qts minimum, 10 for normal operations*

*\*Engineers recommendation to operate on the low side of the minimum oil requirements.*

### Fuel

Usable fuel	Standard tanks	56 USG (225 litres)
	Long range tanks	75 USG (300 litres)
	Wet Wing	88 USG (300 litres)

### Tyre Pressures

Main wheel tyre pressure	42 psi
Nose wheel tyre pressure	49 psi

### Maximum Speeds

Never Exceed Speed, (Vne)	167kts (193mph) (top red line)
Maximum structural cruise speed (Vno)*	140kts (160mph) (top of green arc)
Maximum demonstrated crosswind component**	15kts
Maximum maneuvering speed (Va)	111kts (128mph)

*\*May not be exceeded unless in smooth air conditions*

*\*\*May not apply to early models*

An example of a navigation worksheet is shown below.

FM	TO	Alt	Temp	W/V	IAS	TAS	Trk T	V	Trk M	G/S	Dist	EET
<b>TOTALS</b>												

Note: a flight log will only contain the information needed in flight, typically magnetic track, distance, elapsed time, wind velocity and altitude.

## **Cruise Performance**

The next step in ground planning after completion of the navigation log or determination of the flight time, is to calculate the fuel required. How much load you can carry is dependent on the required fuel.

On the following page you will find example of CRUISE PERFORMANCE table from a C182 POH (Figure 5-4). The table is a sample only and should be not used for flight planing.

For the flight we will use an outside temperature of 20°C above standard temperature, or -1 degrees Celsius at 7500ft. At 65% power setting, using 2300rpm and 21" manifold pressure, for this particular model of C182, we obtain 135kts (156mph) and a fuel consumption of 12.2 gallons per hour.

Using the conversion factors given in the beginning of this manual 1USG = 3.785Lt, we will in theory achieve 46 litres per hour fuel consumption. This figure is however in ideal conditions with the engine and airframe producing exactly the performance it achieved during testing.

To allow for power variations in climb and provide a more conservative approach a "block" figure of 55 litres per hour and 125kts may be used for planning purposes. Using this figure for a 1.5 hour of flight we will require 82.5 litres of fuel.