Cessna 182

Training Manual

Red Sky Ventures/Memel CATS

---

http://www.redskyventures.org
Cessna 182 Training Manual

CESSNA 182

Training Manual

By
Oleg Roud and Danielle Bruckert

Red Sky Ventures and Memel CATS

Published by Red Sky Ventures and Memel CATS
CreateSpace Paperback ISBN-13: 978-1463524128
CreateSpace Paperback ISBN-10: 1463524129
Lulu Paperback - ISBN 978-0-557-04524-2
First Edition © 2008, This Edition © 2011

More information about these books and online orders available at:
http://www.redskyventures.org
Other aircraft presently available in the Cessna Training Manual series are:
Cessna 152, Cessna 172, Cessna 206, Cessna 210.

Contact the Authors:

D Bruckert
redskyventures@gmail.com
PO Box 11288 Windhoek, Namibia
Red Sky Ventures

O Roud
roudoleg@yahoo.com
PO Box 30421 Windhoek, Namibia
Memel CATS

COPYRIGHT & DISCLAIMER

This Training Manual is intended to supplement information you receive from your flight instructor during your type conversion training. It should be used for training and reference use only, and is not part of the Civil Aviation Authority or FAA approved Aircraft Operating Manual or Pilot's Operating Handbook. While every effort has been made to ensure completeness and accuracy, should any conflict arise between this training manual and other operating handbooks, the approved aircraft flight manuals or pilot's operating handbook should be used as final reference. Information in this document is subject to change without notice and does not represent a commitment on the part of the authors, nor is it a complete and accurate specification of this product. The authors cannot accept responsibility of any kind from the use of this material.

ACKNOWLEDGEMENTS:

Peter Hartmann, Aviation Center, Windhoek: Supply of technical information, maintenance manuals and CD's for authors research

Brenda Whittaker, Auckland New Zealand: Editor, Non Technical

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.

Table of Contents

Terminology

Airspeed		
KIAS	**Knots Indicated Airspeed**	Speed in knots as indicated on the airspeed indicator.
KCAS	**Knots Calibrated Airspeed**	KIAS corrected for instrument error. Note this error is often negligible and CAS may be omitted from calculations.
KTAS	**Knots True Airspeed**	KCAS corrected for density (altitude and temperature) error.
Va	**Maximum Manoeuvering Speed**	The maximum speed for full or abrupt control inputs.
Vfe	**Maximum Flap Extended Speed**	The highest speed permitted with flap extended. Indicated by the top of the white arc.
Vno	**Maximum Structural Cruising Speed**	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	**Never Exceed Speed**	Maximum speed permitted, exceeding will cause structural damage. Indicated by the upper red line.
Vs	**Stall Speed**	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	**Stall Speed Landing Configuration**	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	**Best Angle of Climb Speed**	The speed which results in the maximum gain in altitude for a given horizontal distance.
Vy	**Best Rate of Climb Speed**	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	**Reference Speed**	The minimum safe approach speed, calculated as 1.3 x Vso.
Vr	**Rotation Speed**	The speed which rotation should be initiated.
Vat	**Barrier Speed**	The speed nominated to reach before the 50ft barrier or on reaching 50ft above the runway.
	Maximum Demonstrated Crosswind	The maximum demonstrated crosswind during testing.
*forward centre of gravity gives a higher stall speed and so is used for certification		

Meteorological Terms		
OAT	**Outside Air Temperature**	Free outside air temperature, or indicated outside air temperature corrected for gauge, position and ram air errors.
IOAT	**Indicated Outside Air Temperature**	Temperature indicated on the temperature gauge.
	Standard Temperature	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.
	Pressure Altitude	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.
	Density Altitude	The altitude that the prevailing density would occur in the International Standard Atmosphere, and can be found by correcting Pressure Altitude for temperature deviations.
Engine Terms		
BHP	**Brake Horse Power**	The power developed by the engine (actual power available will have some transmission losses).
RPM	**Revolutions per Minute**	Engine drive and propeller speed.
	Static RPM	The maximum RPM obtained during stationery full throttle operation
Weight and Balance Terms		
	Arm (moment arm)	The horizontal distance in inches from reference datum line to the centre of gravity of the item.
C of G	**Centre of Gravity**	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.
	Centre of Gravity Limit	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.

	Datum (reference datum)	An imaginary vertical plane or line from which all measurements of arm are taken. The datum is established by the manufacturer.
	Moment	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	**Maximum Zero Fuel Weight**	The maximum permissible weight to prevent exceeding the wing bending limits. This limit is not always applicable for aircraft with small fuel loads.
BEW	**Basic Empty Weight**	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	**Standard Empty Weight**	The basic empty weight of a standard aeroplane, specified in the POH, and is an average weight given for performance considerations and calculations.
OEW	**Operating Empty Weight**	The weight of the aircraft with crew, unusable fuel, and operational items (galley etc).
	Payload	The weight the aircraft can carry with the pilot and fuel on board.
MRW	**Maximum Ramp Weight**	The maximum weight for ramp maneouvering, the maximum takeoff weight plus additional fuel for start taxi and runup.
MTOW	**Maximum Takeoff Weight**	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	**Maximum Landing Weight**	Maximum permissible weight for landing. Sometimes this is the same as the takeoff weight for smaller aircraft.
Other		
AFM	**Aircraft Flight Manual**	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	**Pilot's Operating Handbook**	
	Pilot Information Manual	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 x(F-32), F = Cx9/5+32
Pressure altitude (PA)	PA = Altitude AMSL + 30 x (QNH-1013) Memory aid – Subscale up/down altitude up/down
Standard Temperature (ST)	ST = 15 – 2 x PA/1000 ie. 2 degrees cooler per 1000ft altitude
Density altitude (DA)	DA = PA +(-) 120ft/deg above (below) ST i.e. 120Ft higher for every degree hotter than standard
Specific Gravity	SG x volume in litres = weight in kgs

One in 60 rule	1 degree of arc ≅ 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/π ≅ GS/20
Rate 1 Turn Bank Angle (Rule of Thumb)	Degrees of Bank ≅ G/S/10+7
Percent to fpm	fpm ≅ % x G/S Or fpm = % x G/S x 1.013
Percent to Degrees	TANGENT (degrees in radians) x100 = Gradient in % INVERSE TANGENT (gradient in %/100) = Angle in Radians
Degrees to Radians	Degrees x π / 180 = radians
Approximate Cosine factors for angle in degrees	Cosine 60 = 0.5 (HWC); Sine 60 ≅ 0.9 (XWC) Cosine 45 ≅ 0.7 = Sine 45 ≅ 0.7 (HWC&XWC) Cosine 30 ≅ 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)	Vat = Vref+1/2HWC + Gust eg. Wind 20kts gusting 25 at 30 degrees to Runway: Vat = Vref +0.5x18+5 = Vref+14, If the Vref is 65kts, Vat should be 65+14 = 79kts

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 it's 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 it's 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 thouroughly, 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.