CESSNA 210

Training Manual

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This Training Manual is intended to supplement information you receive from your flight instructor during your type conversion training, and the information in the approved manufacturer's operating handbook from the aircraft you are flying. 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 manufacturer's operating handbook, from on board the aircraft, must be used as a final reference. Information in this document is subject to change without notice and does not represent a commitment on the part of the authors. The authors cannot accept responsibility of any kind from the use of this material.

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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.

FACTS AT A GLANCE

Common Name: Cessna 210
ICAO Designator: C210
Type: High performance four to six seat light single engine aircraft

Powerplants	
210L	One 225kW (300hp) Continental IO-520-L fuel injected flat six piston engine driving a three blade constant speed McCauley prop.
T210M	One 230kW (310hp) fuel injected and turbocharged TSIO-520-R, driving a constant speed three blade prop.
P210R	One 240kW (325hp) turbocharged and fuel injected TSIO-520-CE.
Performance	
210L	Max speed 324km/h (175kt)
	Max cruising speed 317km/h (171kt)
	Long range cruising speed 249km/h (134kt)
	Initial rate of climb 950ft/min
	Service ceiling 17,300ft
	Max range with reserves 1972km (1065nm)
T210M -	Max speed 380km/h (205kt)
	Max cruising speed 367km/h (198kt)
	Long range cruising speed 260km/h (140kt)
	Initial rate of climb 1030ft/min
	Service ceiling 28,500ft
	Range at long range cruising speed 1455km (785nm)
P210R	Max speed 417km/h (225kt) at 20,000ft
	Max cruising speed 394km/h (213kt) at 23,000ft
	Initial rate of climb 1150ft/min
	Service ceiling 25,000ft
	Range with reserves and optional fuel 2205km (1190nm)
Weights	
210L	Empty 1015kg (2238lb); Max takeoff 1725kg (3800lb)
T210M	Empty 1022kg (2250lb; Max takeoff 1725kg (3800lb
P210R	Empty 1120kg (2470lb); Max takeoff 1860kg (4100lb)

Dimensions	
210	Wing span 11.15m (36ft 9in), length 8.59m (28ft 2in). Wing area 16.3m2 (175.5sq ft)
T210M	Wing span 11.21m (36ft 9in), length 8.59m (28ft 2in), height 2.87m (9ft 5in). Wing area 16.3sqm, (175.5sq ft)
P210R	Wing span 11.84m (38ft 10in), length 8.59m (28ft 2in), height 2.95m (9ft 8in). Wing area 17.2m (185.5sq ft)
Capacity	
Typical seating for four with optional seating for extra two children in some models, or seating for six adults in later versions.	
Production	
Total 210, T210 and P210 production 9240 (including 843 P210s).	

Table of Contents

Introduction

This training manual provides technical and operational descriptions of the Cessna Centurion, Centurion II, and Turbo Centurion aircraft model range.

The information is intended as an instructional aid to assist with conversion and or ab-initio training in conjunction with an approved training organisation and use of the manufacturer's operating handbook. The text is arranged according the progression typically followed during training to allow easier use by students and assimilation with training programmes. This layout differs from the Pilot's Operating Handbook, which is laid out for easy operational 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, engineering manuals 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.

During its production life the Cessna 210 was at the top of Cessna's single engine piston models, positioned between the 182 and the 310 twin in terms of performance. The first flight of the 210 occurred in January 1957. This new aircraft featured, for the first time on a Cessna aircraft, a retractable undercarriage and swept back vertical tail surfaces. The 210 entered production in late 1959, and from that time the type was constantly updated.

Notable early upgrades include the 210B which introduced the wrap around rear windows, the 210D with a more powerful (210kW/285hp) engine which introduced the Centurion name, and the turbocharged T210F. The 210G introduced a new strutless cantilever wing, increased fuel capacity, restyled rear windows and enlarged tail surfaces. Continual development of the 210 and T210 range continued through until production ceased in 1985.

A significant development made possible by the T210, was the pressurised P210 which first appeared in 1978. The pressurisation system meant that the cabin's internal altitude was equivalent to 8000ft when flying at altitudes up to 17,350ft, providing maximum benefit from the turbo engine.

In 1998 Cessna was considering resuming production of the 210, as they have done with the other popular models. At the time of writing no progress has been made on this decision.

Models and Differences

As detailed on the previous page, the Cessna 210 model had a number of type variants during its production history. Additionally there are a number of modifications provided for the airframe, instruments/avionics equipment and electrics.

Speeds often vary between models by a few knots, some more significant type variants have speed differences up to 40kts. 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 C210 Centurion most commonly used, 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 uses.

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.

A Brief outline of the models by year with major changes is outlined in the table below:

TYPE	***NAME***	***YEAR***	***MODEL***	***DIFFERENCES***
C210		1960	21057001-21057575	40 degrees hydraulic flap, wing with strut, 4 seat capacity, 260hp IO-470 engine, maximum gross weight 2900lbs
C210A		1961	21057576-21057840	
C210B		1962	21057841-21058085	Rear window added and larger cabin, rear child seat added, maximum weight increased to 3000lbs
C210C		1963	21058086-21058220	
C210D	Centurion	1964	21058221-21058510	Electric flap Introduced, engine power increased from 260hp to 285hp, maximum weight increased to 3100lbs

TYPE	*NAME*	*YEAR*	*MODEL*	*DIFFERENCES*
C210E	Centurion	1965	21058511-	Alternator replaces Generator
C210F T210F	Centurion/ Turbo Centurion	1966	21058716-21058818 T210-0001-T210-0197	Maximum weight increased to 3300lbs
C210G T210G	Centurion/ Turbo Centurion	1967	21058819-21058936 T210-0198-T210-0307	Flap Reduced to 30 Degrees, full Cantilever Wing Introduced, fuel capacity increased from 65USG to 90USG, maximum weight increased to 3400lbs
C210H T210H	Centurion/ Turbo Centurion	1968	21058937 T210-0308	Improved gear saddle to address cracking problems
C210J T210J	Centurion/ Turbo Centurion	1969	21059062	Modification to nose wheel cowling, and increase in engine TBO
C210K T210K	Centurion II/ Turbo Centurion II	1970-71	21059200-21059502	Larger cabin, rear child seat now a full seat, MAUW increased to 3800lbs, and takeoff power increased to 300bhp (5minutes only)
C210L T210L	Centurion/II/ Turbo Centurion/II	1972-76	21059503 21061573	24 Volt electrical system introduced (1972), electric pump replaces engine driven pump for hydraulics, 3 bladed prop (1975) and aerodynamic improvements increased cruise speed by approx 8kts (1976)
C210M T210M	Centurion II/ Turbo Centurion II	1977-1980	21061574-21064135	Engine increased to 310hp in turbo model, maximum weight increased to 4000lbs on turbo model
C210N T210N	Centurion II/ Turbo Centurion II	1981-1984	21064136-21064897	Gear doors removed, resulting in higher gear speed (165kts)*, nose gear doors don't close on ground, flap limit for 20 degrees increased to 130kts
*Many earlier models in operation have now had modifications to remove the gear				

TYPE	NAME	YEAR	MODEL	DIFFERENCES
doors because they are prone failure and easily damaged				
P210N	Pressurized Centurion/II	1978-1983	P21000001-P21000834	First pressurised model
P210R	Pressurized Centurion/ with Value Groups A & B	1985-86	P21000835 - P21000874	Improvements in engine and instrument systems, maximum weight increased to 4100lbs
C210R T210R	Centurion II/ Turbo Centurion II	1985-86	21064898-21065009	Fuel selector has BOTH position and manual primer is installed (close to fuel selector on centre console). Optional 115USG fuel tanks, maximum weight increased to 4100lbs on turbo

Modifications and Optional Extras

TYPE	NAME and MANUFACTURER	DIFFERENCES and FEATURES
P210R	Silver Eagle, O & N Aircraft Modifications	Turbine Engine Installation, 450 HP Allison250-B-17F/2 turbine, includes new Garmin panel
	Engine Conversion, Bonaire	300hp maximum continuous, IO550 Engine Installation (modification not available any more)
	Engine Conversion, Atlantic Aero	Continental IO-550 Engine Installation
T-210	Engine Conversion, Ram Aircraft Corp.	Increases engine to 310 HP, including new 402 Prop
C210	Turbo Conversion, Ram Aircraft Corp.	Replaces standard engine with TSIO-520
P210	P210 Intercoolers, TurboPlus	Increases power available at altitude
	Wing Tip Tanks, Flint Aero	Two Auxillary tip tanks of 16.5USG in each, used with an electrical transfer pump to each main tank. Higher MTOW is permitted if tanks are half full. Wing length is also increased by 26 inches
	Additional Fuel Tank, O & N Aircraft Modifications	Additional 18, 28 or 29.7 USG fuel tank in baggage area

TYPE	***NAME and MANUFACTURER***	***DIFFERENCES and FEATURES***
	Low Fuel Warning System, O & N Aircraft Modifications	Warns when fuel remaining is less than approximately 7USG
	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)
	Maximum Weight Extensions, various	Take-off weight extended to 4000lb (often included with tip-tank installation)
	Hoerner Wingtips, Met-Co-Aire	Increased lift, more speed, added stability
	Speedbrakes (electric), Precise Flight	Increased descent rates, reduced chances of shock-cooling or structural damage by mishandling
	Flight Control Flutter Margin Increase, O & N Aircraft Modifications	Additional structure, 100% mass balancing
	Horton STOL	Tip and wing surface modifications to permit lower stall speed, take-off and landing speeds and distances
	Robertson STOL	Increased lift, more speed, added stability, and lower stall speed, take-off and landing speeds and distances. *NOTE:* The very low flap speed with this STOL kit (85kts) often causes engine mishandling leading to increased instances of cracked cylinders
C210 G -N	Bush STOL Conversions	Lower stall speed, lower take-off and landing speeds and distances
	Gear Door Removal, Sierra Industries	Remove 19 lbs from empty weight, reduces instances of gear or gear door failure, and reduces maintenance costs

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.

Useful Factors and Formulas

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

Crosswind component per 10 kts of wind								
Kts	10	20	30	40	50	60	70	80
10	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 $\cong$ 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/π, $\cong$ GS/20
Rate 1 Turn Bank Angle (Rule of Thumb)	Degrees of Bank $\cong$ G/S/10+7
Percent to fpm	fpm $\cong$ % 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 $\pi / 180 =$ radians
Gust factor (Rule of Thumb)	Vat = Vref+1/2HWC + Gust eg. Wind 20kts gusting 25 at 30 degrees to Runway: Vat = Vref +.7x10+5 = Vref+12, If the Vref is 75kts, Vat should be 75+12 = 87kts

Pilot's Operating Handbook Information

The approved manufacturer's handbook, Pilot's Operating Handbook (POH) or Aircraft Flight Manual (AFM), is issued for the 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 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 therefore 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

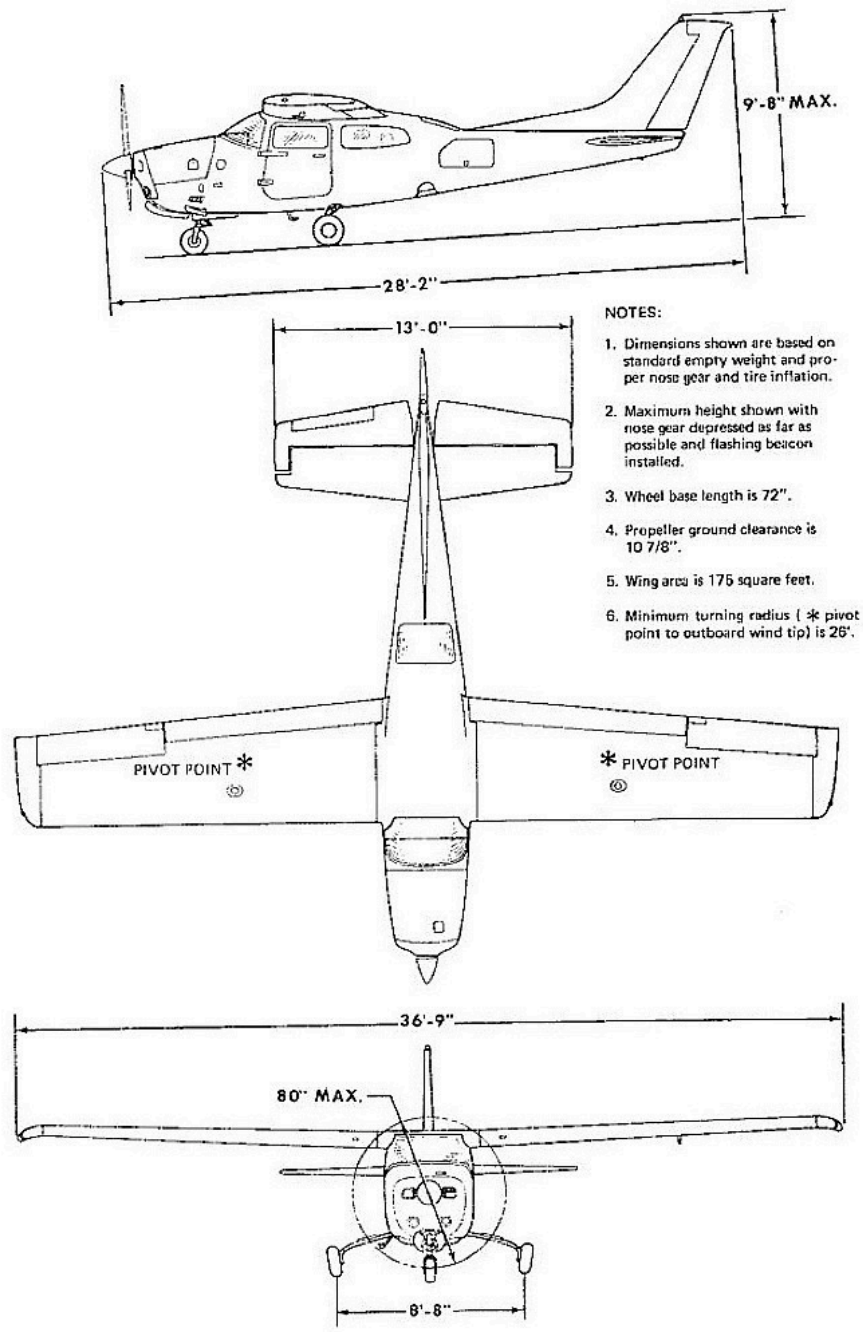
For use in training this text should be read in conjunction with the POH from on board the aircraft you are going to be flying. Even if you have a copy of a POH for the same model C206, the aircraft you are flying may have supplements for modifications and optional equipment which affect the operational performance.

AIRCRAFT TECHNICAL INFORMATION

General

The Cessna 210 aircraft is a single-engine, high-wing monoplane of an all metal, semi-monocoque construction. Wings are full cantilever, with sealed sections forming fuel bays.

The fully-retractable tricycle landing gear consists of tubular spring-steel main gear struts and a steerable nose wheel with an air-hydraulic fluid shock strut.



The four or six place seating arrangement is a conventional forward facing type.

The standard power plant installation is a horizontally-opposed, air-cooled, six-cylinder, fuel injected engine driving an all-metal, constant-speed propeller, The engine is typically normally aspirated, however higher performance is offered in the turbocharged version of the Model 210.

Airframe

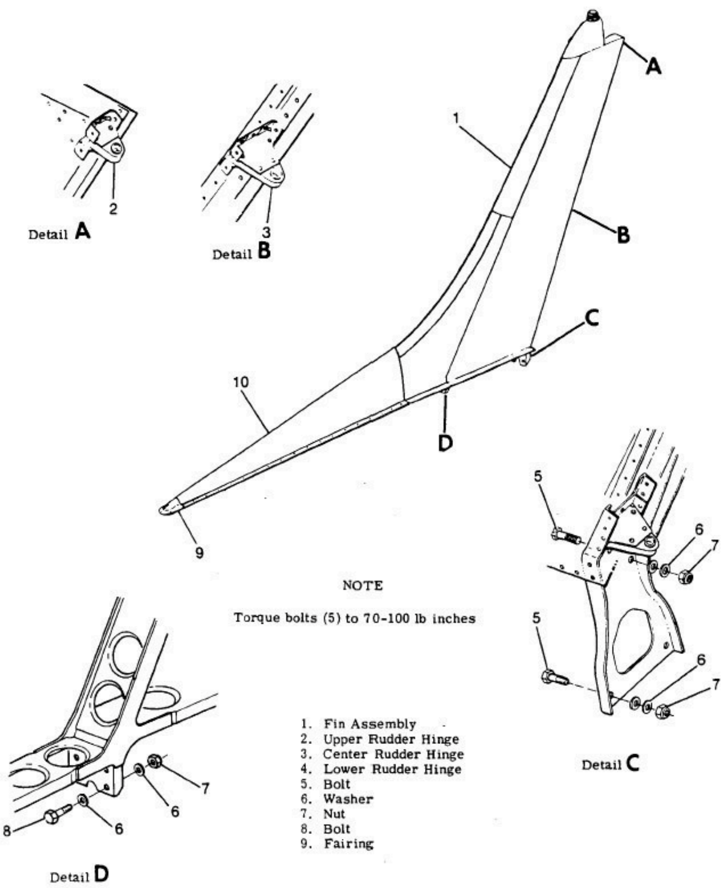
The airframe is a conventional design similar to other Cessna aircraft you may have flown (for example the C152, C172).

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
- four stringers for engine mounting attached to the forward door posts

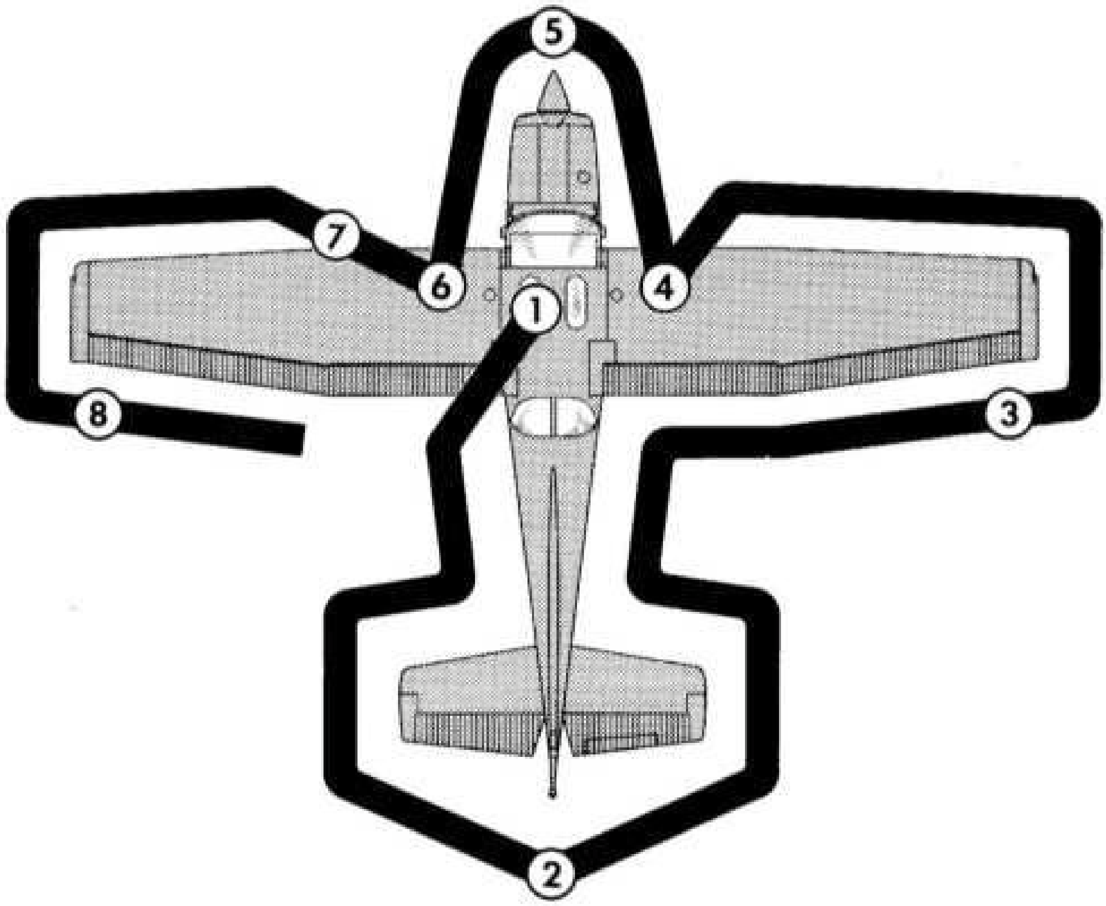


Each all-metal wing panel is a full cantilever type, with a single main spar, two fuel spars, formed ribs and stringers. The front fuel spar also serves as an auxiliary spar and provides the forward attachment point for the wing. An inboard section of the wing, forward of the main spar, is sealed to form an integral (i.e. non-bladder) fuel bay area. Stressed skin is riveted to the spars, ribs

PRE-FLIGHT INSPECTION

General

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



Cabin

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

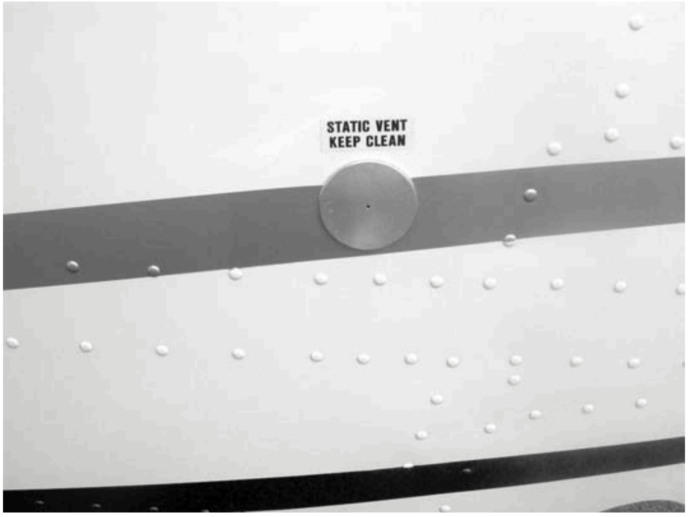
Control lock – REMOVE
Ignition switch – OFF
Lights - OFF except beacon
Gear Level – ENSURE DOWN!
Master switch – ON
Fuel quantity – CHECK

Flaps level – DOWN
External Electrical Equipment – check if required (lights, pitot,)
Master switch – OFF
Fuel shutoff valve – Select fullest tank (or the tank desired to be used for start).

Exterior Inspection

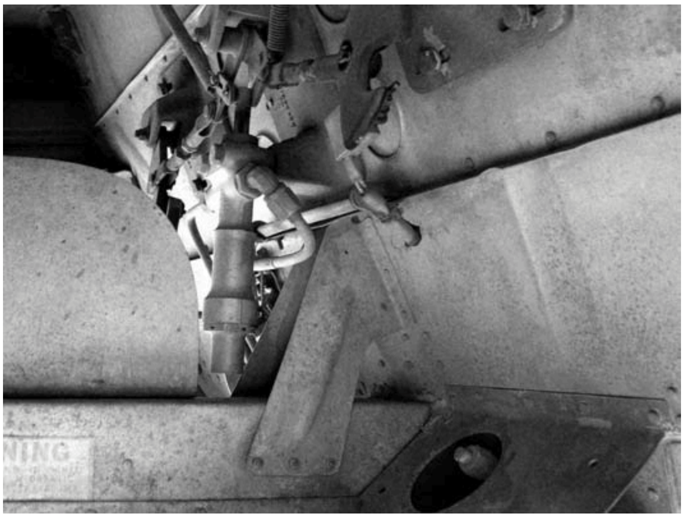
Visually check the aeroplane for general condition during the walk-around inspection, ensuring all surfaces are sound and no signs of structural damage, worked rivets, missing screws, lock wires or loose connections.

Aft Fuselage



Check left static port for blockage.


Once loading is complete, ensure the baggage and the cargo door are secure.

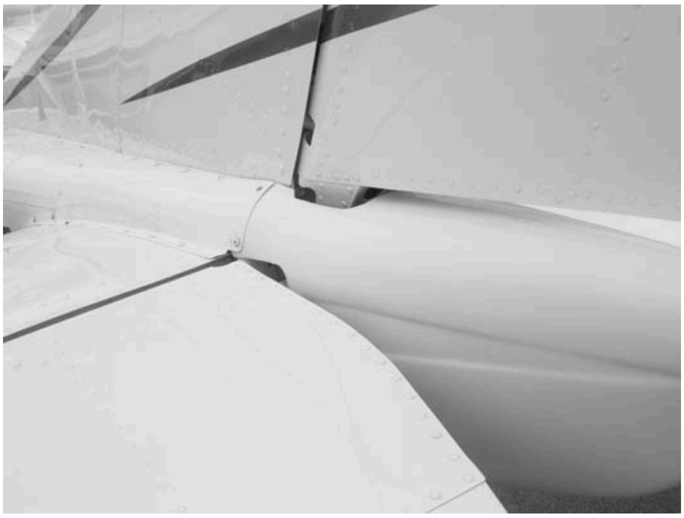


Check wheel well for obstructions.
Ensure gear locks and microswitches undamaged.
(If gear doors installed they may be pumped open for thorough inspection)

Tail Section

Check top, bottom, and side surfaces for any damage.
Ensure balance weights secure.
Remove rudder gust lock and tie-downs if installed.

Ensure Elevator secure and undamaged.
Check all linkages free, lock pins in place.
Check full and free movement of control.
Check trim is undamaged and in neutral position.



Rudder linkage and turnbuckles secure, free, and full and free movement, lock wires and pins in place.

Beacon, aerials and rear navigation light undamaged and secure.
Check right static vent for blockage.

Right Wing

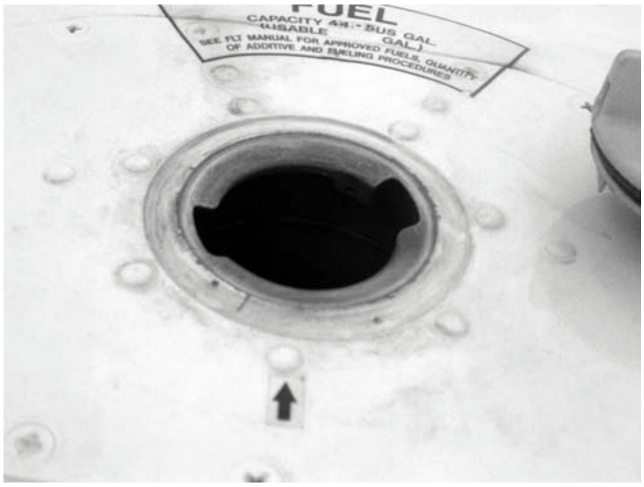
Ensure all aerials are undamaged and secure. Check top and bottom wing surfaces for any damage or accumulations on wing. *Ice or excessive dirt must be removed before flight.*

Check the flaps do not retract if pushed, and flap rollers allow small amount of play in down position.

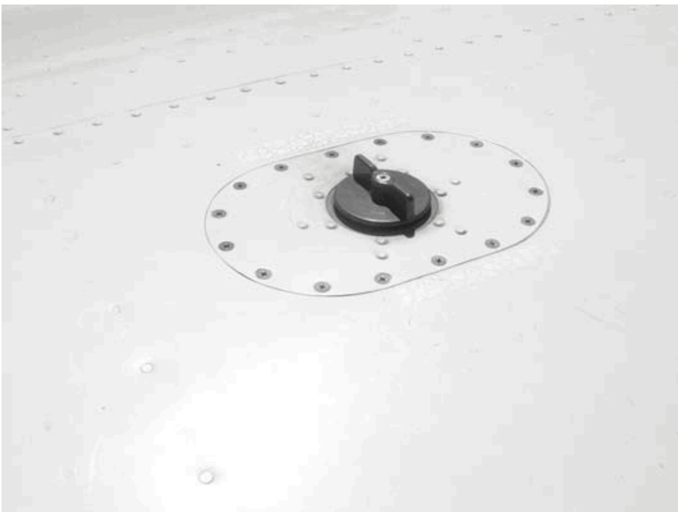
Check for damage to surface and flap tracks, operating linkage free movement, adequate grease and security of all nuts and lock pins.

Check aileron surface for damage, security of hinge point, and ensure full and free movement. Check wing tip vent unobstructed.

Check condition, security and colour of navigation light.



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



Check that fuel cap is secure, and vent is unobstructed.

Remove wing tie down and vent covers if installed.

Check for security, condition of strut and tyre. Check tyre for wear, cuts or abrasions, 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 operation and security of retractable step and retraction well, if installed.

Check for security, condition of hydraulic lines. From the right side door check the level of oil in the hydraulic reservoir.
Note: the hydraulic oil should be checked every 25hours, however it is considered good airmanship to check if you have not personally flown the aircraft recently.

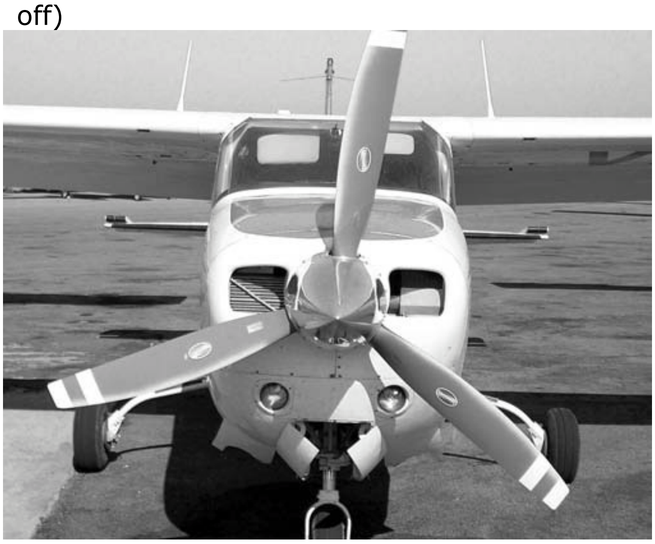
Use sampler cup and drain a small quantity of fuel from tank sump quick-drain valves, on the wing and underneath the cabin, to check for water, sediment and proper fuel grade
(first flight of the day and after refueling).

Nose

Check security of nuts and split pins, operating linkages, and security and state of shimmy damper.
Check cowl flaps for rigidity and operation.

Ensure the squat switch is unobstructed and check nose oleo for proper inflation and damping.
(Warning: do not press squat switch or extend nose oleo fully unless first making sure the gear lever is down and master switch off)

Check condition and cleanliness of landing light, condition and security of oil filter.
Check nose gear linkages and hydraulic lines (if doors are closed they will need to be pumped open).
Visually check exhaust for signs of wear, on first flight, if engine is cool check exhaust is secure.

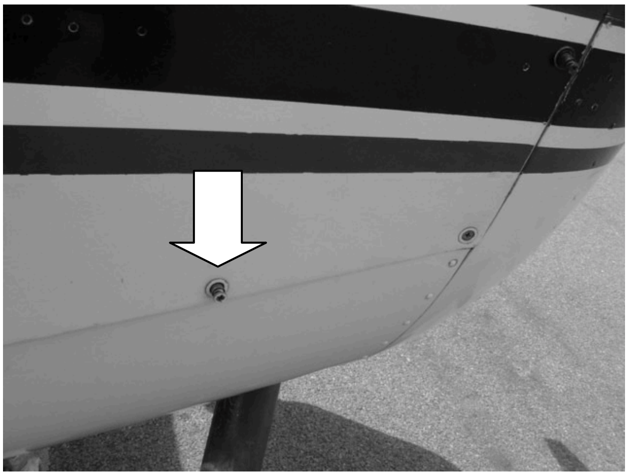


Check propeller and spinner for nicks and security. Ensure propeller blades and spinner cover is secure. When engine is cold the propeller may be turned through to assist with pre-start lubrication. *Always treat the propeller as live.*
Check oil cooler secure and unobstructed, and alternator belt secure.

Check oil cap is secure (by opening the top oil filler panel, or through front cowl opening), and ensure oil filler panel is closed securely.

Open inspection cover, check oil level. Minimum oil 7 quarts, fill to 10 for extended flights. Check oil cap secure.

Before first flight of the day and after each refueling, pull out fuel strainer to check the fuel sample. Check strainer drain is fully closed.
Note: the model above has the external power receptacle mounted inside the oil/fuel access panel, the receptacle is mounted into the cowling on some models.



Security and condition of engine cowling.
On the picture nut on the left is unsecured.

Differences on the Left Side

Check operation of stall warning.
Remove the pitot tube cover, and check the pitot tube for cleanliness, security and clear opening passage.
Check that aileron trim is secure in its position.
Conduct the check of the left wing in the same manner as the right.

Final Inspection

Just before climbing in and starting the engines, complete a final walk around, to save embarrassing, costly or even dangerous oversights.
Check all chocks and covers are removed, fuel/oil caps and door latches are secure, and the aircraft is in a position to safely taxi without excessive manoeuvering or power application.

Passenger Briefing

After completion of the preflight inspection and preferably before boarding the aircraft, take some time to explain to the passengers safety equipment, safety harnesses and seat belts and operation of the doors/windows.

The following items should be included:
Location and use of the Fire Extinguisher,
Location and use of the Axe,
Location of the First Aid Kit
Location of emergency and normal water and any other emergency equipment
Latching, unlatching and fastening of safety harnesses
When harnesses should be worn, and when they must be worn
Opening, Closing and Locking of doors and windows
Actions in the event of a forced landing or ditching
Cockpit safety procedures (front seat passenger) and critical phases of flight

NORMAL OPERATIONS

Starting

Before engine start or priming, all controls should be set in the appropriate positions and the panel pre-start scan completed.

The throttle should be advanced approximately ¼ inch to provide the correct amount of fuel for starting. If the throttle is advanced too much flooding or backfiring can occur, which can lead to an induction fire.

For a normal start the mixture should be full rich at all altitudes. After successful starting, above 3000ft density altitude, leaning is required to prevent spark plug fouling during ground handling at low power settings.

Note: Before engaging the propeller, it is vital to check that the propeller area is clear.

The engine is started by turning the ignition key into START position, to turn over the engine. The key is sprung loaded back to the BOTH and can be released once the engine starts.

On starting, engine RPM should be kept to a minimum until the engine oil pressure has begun rising. If the throttle has been advanced during starting it is important to ensure it is *immediately* reduced as the engine begins to run. In no circumstances should the engine RPM be allowed to over-rev on start up.

Once the engine is started and the oil pressure has begun to rise, the throttle should be adjusted to idle at approximately 1000RPM.

After starting, if the oil gauge does not begin to show pressure within 30 seconds, the engine should be stopped and the fault reported to the maintenance before any further starts should be attempted. Running an engine without oil pressure can cause serious engine damage.

Priming, Purging and Flooded Starts

A fuel injected engine requires different priming techniques to a carburettor fuel system, and also suffers from starting problems caused by "fuel vapour locks". These items often lead to confusion resulting in starting faults. The terms and requirements for the C210 are explained fully in the following paragraphs, as well as flooded starts which may occur after over-priming or incorrect purging of the vapour locks.

Priming
When the engine is cold, it must be primed or starting is very difficult. The amount of priming required to achieve effective starting will depend on the ambient and engine temperatures.
Note, if no heat was felt from the engine area during the preflight, the engine may be assumed cold.
Warm engine starts do not normally require priming, although a small amount may assist starting.

Priming is achieved by use of the high pressure fuel pump (selecting both sides of the fuel pump switch). Once ready for start select the fuel pump on and advance the throttle to the desired setting. For a cold engine typically full throttle is used and a fuel flow of approximately 130lbs should be noted on the fuel flow gauge. An intermediate throttle setting may be used if less priming is desired, for example on a warm day or after recent operation.

Purging Fuel Vapour
Purging is required to clear the vapour locks that fuel injected engines frequently suffer from. This refers to a situation where the fuel in the lines has vaporised and the trapped gasses cause a blockage in the fuel lines preventing adequate supply of fuel getting to the engine. The vaporising is caused either by engine heat or high outside temperatures and if not cleared make it extremely difficult to start. To clear or "purge" fuel vapour locks, high pressure fuel is "cycled" through the fuel lines by using the high pressure fuel from the auxiliary pump.

Flooded Starts
Engine Flooding is caused by over priming, and means there is excess fuel in the engine. The excess fuel will make starting very difficult as the mixture is much less combustible and ignition may be hampered by wet plugs, thus an engine clearing procedure is required. To remove the excess fuel from the engine, the engine is turned over with the mixture at idle cut-off. As the engine is turned over without fuel supply, the air entering the cylinder during the cycle clears out the excess fuel. To ensure maximum air flow the throttle should be fully open. With the Mixture Idles Cut-Off no fuel will be permitted to enter the engine, however always cross check to ensure the mixture is completely closed by checking the fuel flow gauge. The fuel selector may be selected off if it is suspected there is fuel leaking through at Idle-Cut-Off position.
If continuous cranking is required, ensure starter limits, not more than 30 seconds without cooling, are observed.

Flooded Starting combines engine clearing with engine starting. With the mixture control at idle-cut-off and the throttle fully open, and fuel selector ON, the fuel lines should be purged to ensure fuel is in the lines (Fuel pump selected on for 10-15 seconds). Thereafter starting is initiated, the engine is turned over, and as it fires the mixture is advanced and the throttle retarded to maintain idle RPM.