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MODEL 152 II

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AIRPLANE & SYSTEMS DESCRIPTION

INTRODUCTION

This section provides description and operation of the airplane and its systems. Some equipment described herein is optional and may not be installed in the airplane.

AIRFRAME

The airplane is an all-metal, two-place, high-wing, single-engine airplane equipped with tricycle landing gear, and is designed for general utility purposes.

The construction of the fuselage is a conventional formed sheet metal bulkhead, stringer, and skin design referred to as semimonocoque. Major items of structure are the front and rear carry-through spars to which the wings are attached, a bulkhead and forgings for main landing gear attachment at the base of the rear door posts, and a bulkhead with attaching plates at the base of the forward door posts for the lower attachment of the wing struts. Four engine mount stringers are also attached to the forward door posts and extend forward to the firewall.

The externally braced wings, containing the fuel tanks, are constructed of a front and rear spar with formed sheet metal ribs, doublers, and stringers. The entire structure is covered with aluminium skin. The front spars are equipped with wing-to-fuselage and wing-to-strut attach fittings. The aft spars are equipped with wing-to-fuselage attach fittings, and are partial span spars. Conventional hinged ailerons and single-slotted flaps are attached to the trailing edge of the wings. The ailerons are constructed of a forward spar containing balance weights, formed sheet metal ribs and "V" type corrugated aluminium skin joined together at the trailing edge. The flaps are constructed basically the same as the ailerons, with the exception of the balance weights and the addition of a formed sheet metal leading edge section.

The empennage (tail assembly) consists of a conventional vertical stabilizer, rudder, horizontal stabilizer, and elevator. The vertical stabilizer consists of a spar, formed sheet metal ribs and reinforcements, a wraparound skin panel, formed leading edge skin and a dorsal. The rudder is constructed of a formed leading edge skin containing hinge halves, a wraparound skin panel and ribs, and a formed trailing edge skin with a ground adjustable trim tab at its base. The top of the rudder incorporates a leading edge extension which contains a balance weight. The horizontal stabilizer is constructed of a forward spar, main spar, formed sheet metal ribs and stiffeners, a wrap-around skin panel, and formed leading edge skins. The horizontal stabilizer also contains the elevator trim tab actuator. Construction of the elevator consists of a main spar and belicrank, left and right wrap-around skin panels, and a formed trailing edge skin on the left half of the elevator; the entire trailing edge of the right half is hinged and forms the elevator trim tab. The leading edge of both left and right elevator tips incorporate extensions which contain balance weights.

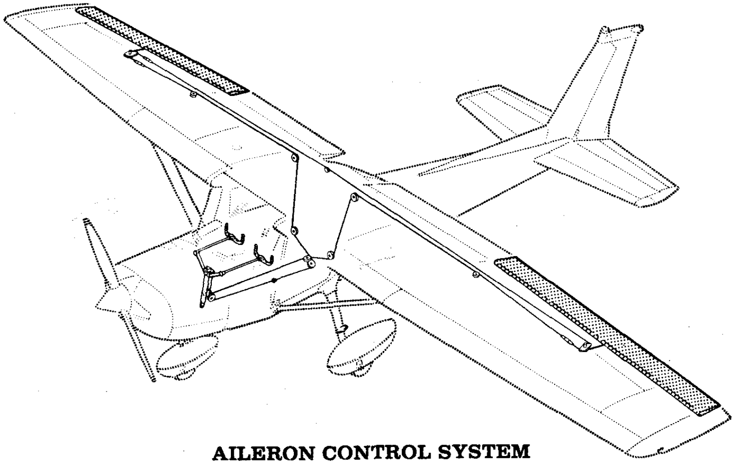
FLIGHT CONTROLS

The airplane's flight control system (see figure 7-1) consists of conventional aileron, rudder, and elevator control surfaces. The control surfaces are manually operated through mechanical linkage using a control wheel for the ailerons and elevator, and rudder/brake pedals for the rudder.

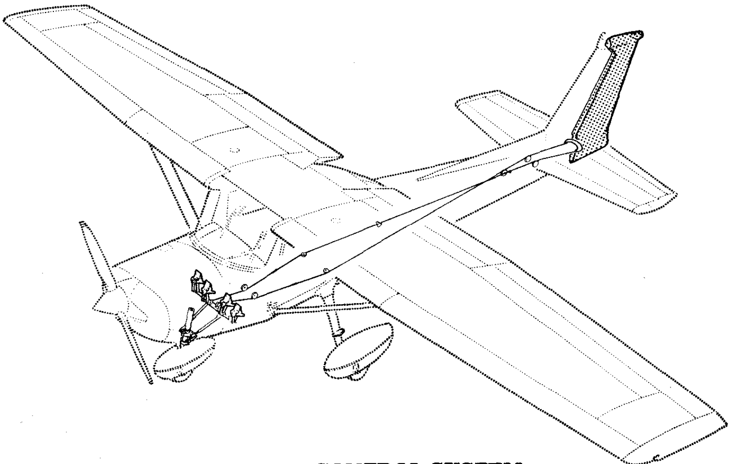
Extensions are available for the rudder/brake pedals. They consist of a rudder pedal face, two spacers and two spring clips. To install an extension, place the clip on the bottom of the extension under the bottom of the rudder pedal and snap the top clip over the top of the rudder pedal. Check that the extension is firmly in place. To remove the extensions, reverse the above procedures.

TRIM SYSTEM

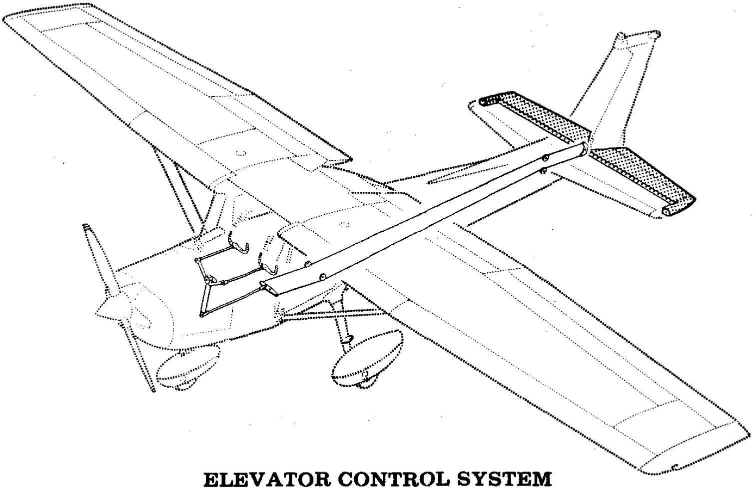
A manually-operated elevator trim tab is provided. Elevator trimming is accomplished through the elevator trim tab by utilizing the vertically mounted trim control wheel. Forward rotation of the trim wheel will trim nose-down; conversely, aft rotation will trim nose-up.



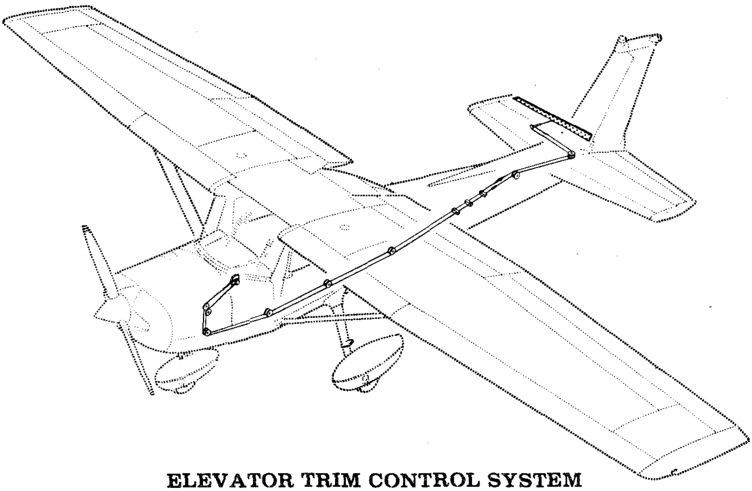
AILERON CONTROL SYSTEM



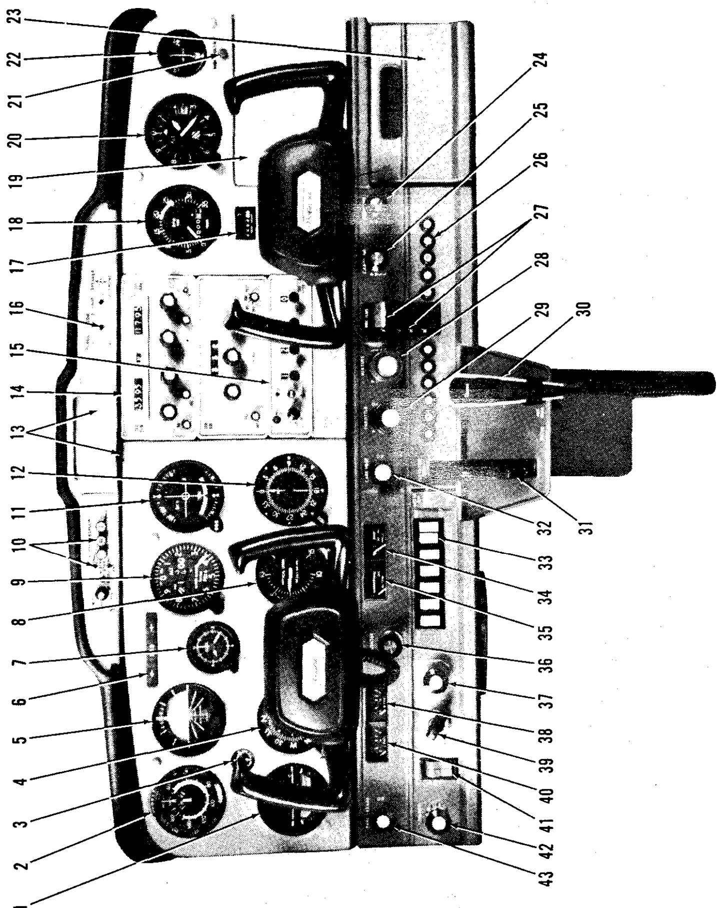
RUDDER CONTROL SYSTEM



ELEVATOR CONTROL SYSTEM



ELEVATOR TRIM CONTROL SYSTEM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1. Turn Coordinator
2. Airspeed Indicator
3. Suction Gage
4. Directional Indicator
5. Attitude Indicator
6. Airplane Registration Number
7. Clock
8. Rate-of-Climb Indicator
9. Encoding Altimeter
10. Marker Beacon Indicator Lights and Switches
11. Omni Course Indicator
12. ADF Bearing Indicator
13. Rear View Mirror and Control
14. Radios
15. Transponder
16. Audio Control Panel
17. Flight Hour Recorder
18. Tachometer
19. Additional Instrument and Radio Space
20. Secondary Altimeter
21. Over-Voltage Warning Light
22. Ammeter
23. Map Compartment
24. Cabin Heat Control Knob
25. Cabin Air Control Knob
26. Circuit Breakers
27. Wing Flap Switch and Position Indicator
28. Mixture Control Knob
29. Throttle (With Friction Lock)
30. Microphone
31. Elevator Trim Control Wheel
32. Carburetor Heat Control Knob
33. Electrical Switches
34. Oil Pressure Gage
35. Oil Temperature Gage
36. Cigar Lighter
37. Instrument Panel and Radio Dial Lights Rheostat
38. Right Tank Fuel Quantity Indicator
39. Ignition Switch
40. Left Tank Fuel Quantity Indicator
41. Master Switch
42. Primer
43. Parking Brake Knob

INSTRUMENT PANEL

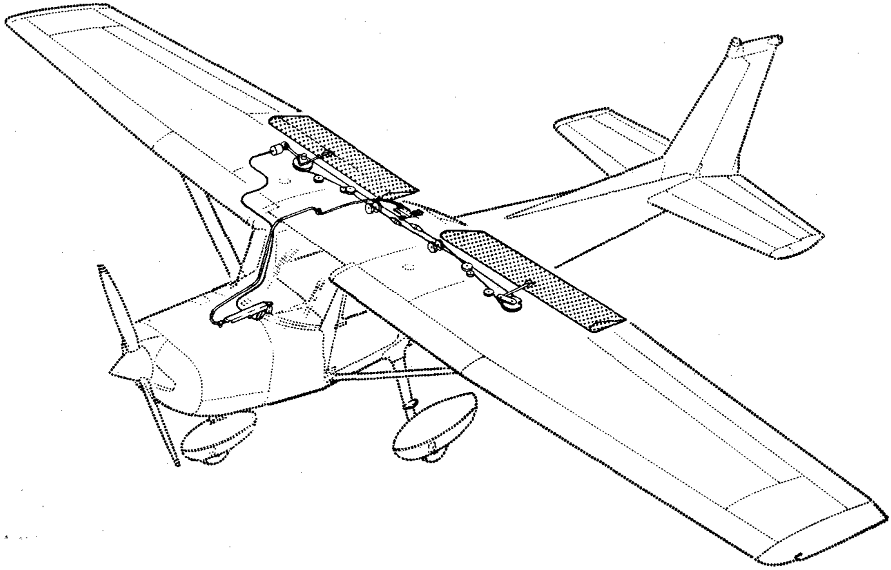
The instrument panel (see figure 7-2) is designed to place the primary flight instruments directly in front of the pilot. The gyro-operated flight instruments are arranged one above the other, slightly to the left of the control column. To the left of these instruments are the airspeed indicator, turn coordinator, and suction gage. The clock, altimeter, rate-of-climb indicator, and navigation instruments are above and/or to the right of the control column. Avionics equipment is stacked approximately on the centerline of the panel, with space for additional equipment on the lower right side of the instrument panel. The right side of the panel also contains the tachometer, ammeter, over-voltage light, and additional instruments such as a flight hour recorder. A sub-panel, under the primary instrument panel, contains the fuel quantity indicators, cigar lighter, and engine instruments positioned below the pilot's control wheel. The electrical switches, panel and radio light rheostat knob, ignition and master switches, primer, and parking brake control are located around these instruments. The engine controls, wing flap switch, and cabin air and heat control knobs are to the right of the pilot, along the upper edge of the sub-panel. Directly below these controls are the elevator trim control wheel, trim position indicator, microphone, and circuit breakers. A map compartment is on the extreme right side of the sub-panel.

For details concerning the instruments, switches, circuit breakers, and controls on this panel, refer in this section to the description of the systems to which these items are related.

GROUND CONTROL

Effective ground control while taxiing is accomplished through nose wheel steering by using the rudder pedals; left rudder pedal to steer left and right rudder pedal to steer right. When a rudder pedal is depressed, a spring-loaded steering bungee (which is connected to the nose gear and to the rudder bars) will turn the nose wheel through an arc of approximately 8.5° each side of center. By applying either left or right brake, the degree of turn may be increased up to 30^0 each side of center.

Moving the airplane by hand is most easily accomplished by attaching a tow bar to the nose gear strut. If a tow bar is not available, or pushing is required, use the wing struts as push points. Do not use the vertical or horizontal surfaces to move the airplane. If the airplane is to be towed by vehicle, never turn the nose wheel more than 30° ei ther side of center or structural damage to the nose gear could result.



The minimum turning radius of the airplane, using differential braking and nose wheel steering during taxi, is approximately 24 feet 8 inches. To obtain a minimum radius turn during ground handling, the airplane may be rotated around either main landing gear by pressing down on the tail cone just forward of the vertical stabilizer to raise the nose wheel off the ground.

WING FLAP SYSTEM

The wing flaps are of the single-slot type (see figure 7-3), and are extended or retracted by positioning the wing flap switch lever on the instrument panel to the desired flap deflection position. The switch lever is moved up or down in a slot in the instrument panel that provides mechanical stops at the 10° and 20° positions. For flap settings greate r than 10°, move the switch lever to the right to clear the stop and position it as desired. A scale and pointer on the left side of the switch lever indicates flap travel in degrees. The wing flap system circuit is protected by a 15- ampere circuit breaker, labelled FLAP, on the right side of the instrument panel.

LANDING GEAR SYSTEM

The landing gear is of the tricycle type with a steer able nose wheel and two main wheels. The landing gear may be equipped with wheel fairings. Shock absorption is provided by the tubular spring-steel main landing gear struts and the air/oil nose gear shock strut. Each main gear wheel is equipped with a hydraulically actuated disc-type brake on the inboard side of each wheel. When wheel fairings are installed an aerodynamic fairing covers each brake.

BAGGAGE COMPARTMENT

The baggage compartment consists of the area from the back of the pilot and passenger's seats to the aft cabin bulkhead. Access to the baggage compartment is gained from within the airplane cabin. A baggage net with six tie-down straps is provided for securing baggage and is attached by tying the straps to tie-down rings provided in the airplane. When loading the airplane, children should not be placed or permitted in the baggage compartment, unless a child's seat is installed, and any material that might be hazardous to the airplane or occupants should not be placed anywhere in the airplane. For baggage area dimensions, refer to Section 6.

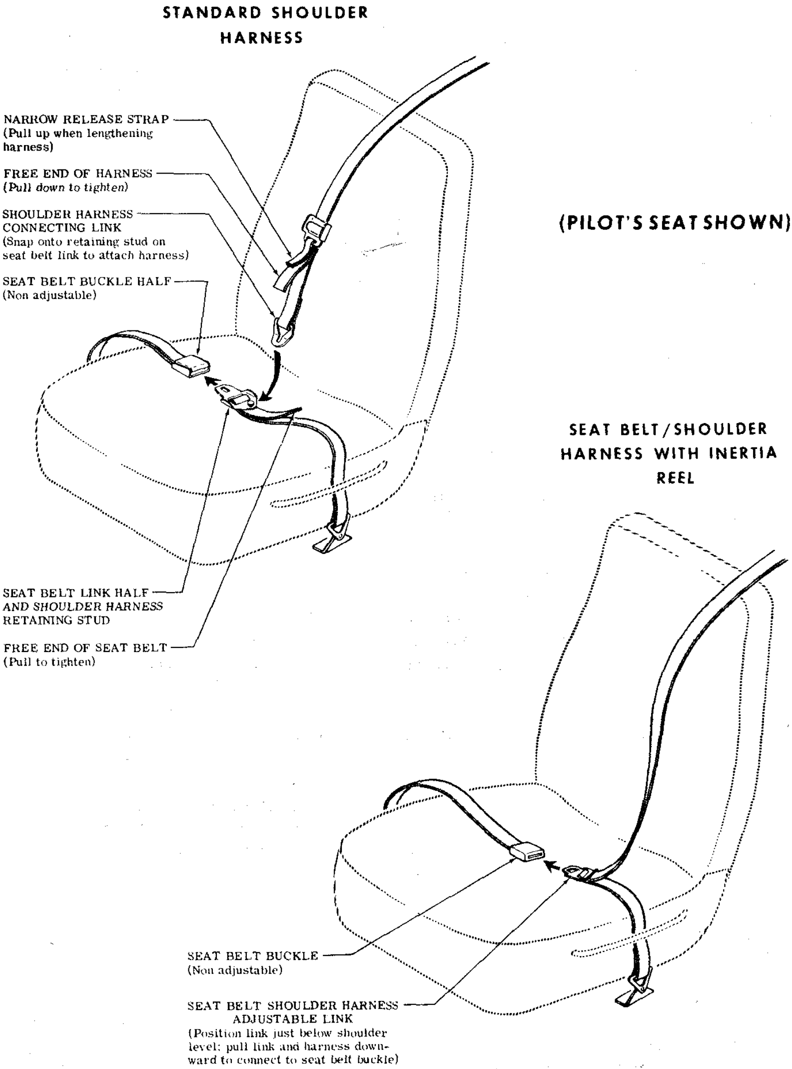
SEATS

The seating arrangement consists of two separate adjustable seats for the pilot and passenger and, if installed, a child's seat in the rear cabin area. The pilot's and passenger's seats are available in two designs: four- way and six-way adjustable.

Four-way seats may be moved forward or aft, and the seat back angle changed. To position either seat, lift the lever under the inboard corner of the seat, slide the seat into position, release the lever, and check that the seat is locked in place. To adjust the seat back, pull forward on the knob under the center of the seat and apply pressure to the back. To return the seat back to the upright position, pull forward on the exposed portion of the seat back frame. Both seat backs will also fold full forward.

The six-way seats may be moved forward or aft, adjusted for height, and the seat back angle changed. Position either seat by lifting the tubular handle under the inboard front corner of the seat bottom and slide the seat to the desired position. Release the lever and check that the seat is locked in place. The seats may be raised or lowered two inches, in one inch steps, and should be adjusted prior to flight. To raise or lower either seat, pull forward on a "T" handle under the seat near the inboard corner, force the seat down against spring tension or allow spring tension to raise it to the desired position, release the "T" handle, and then allow the seat to move until it locks in place. Seat back angle is adjustable by rotating a lever on the rear inboard corner of each seat. To adjust either seat back, rotate the lever aft and apply pressure against the back until it stops moving; then release the lever. The seat back may be returned to the upright position by pulling forward on the exposed portion of the lower seat back frame. Check that the release lever has returned to its vertical position. Both seat backs will fold full forward.

A child's seat is available for installation in the rear of the cabin. The seat back is secured to the cabin sidewalls, and the seat bottom is attached to brackets on the floor. This seat is non-adjustable.


STANDARD SHOULDER HARNESS
NARROW RELEASE STRAP (Pull up when lengthening harness)
FREE END OF HARNESS (Pull down to tighten)
SHOULDER HARNESS CONNECTING LINK (Snap onto retaining stud on seat belt link to attach harness)
SEAT BELT BUCKLE HALF (Non adjustable)
SEAT BELT LINK HALF AND SHOULDER HARNESS RETAINING STUD
FREE END OF SEAT BELT (Pull to tighten)
(PILOT'S SEAT SHOWN)
SEAT BELT/SHOULDER HARNESS WITH INERTIA REEL
SEAT BELT BUCKLE (Non adjustable)
SEAT BELT SHOULDER HARNESS ADJUSTABLE LINK (Position link just below shoulder level; pull link and harness downward to connect to seat belt buckle)

SEAT BELTS AND SHOULDER HARNESSES

All seat positions are equipped with seat belts (see figure 7-4). The pilot's and passenger's seats are also equipped with separate shoulder harnesses. Integrated seat belt/shoulder harnesses with inertia reels can be furnished for the pilot's and passenger's seat positions if desired.

SEAT BELTS

The seat belts used with the pilot's seat, passenger's seat, and the child's seat (if installed) are attached to fittings on the floorboard. The buckle half of the seat belt is inboard of each seat and has a fixed length; the link half of the belt is outboard and is the adjustable part of the belt.

To use the seat belts for the pilot's and passenger's seats, position the seat as desired, and then lengthen the link half of the belt as needed by grasping the sides of the link and pulling against the belt. Insert and lock the belt link into the buckle. Tighten the belt to a snug fit by pulling the free end of the belt. The seat belt for the child's seat (if installed) is used in the same manner as the belts for the pilot's and passenger seats. To release the seat belts, grasp the top of the buckle opposite the link and pull upward.

SHOULDER HARNESSES

Each shoulder harness is attached to a rear doorpost above the window line and is stowed behind a stowage sheath above the cabin door. To stow the harness, fold it and place it behind the sheath. No harness is available for the child's seat.

The shoulder harnesses are used by fastening and adjusting the seat belt first. Then, lengthen the harness as required by pulling on the connecting link on the end of the harness and the narrow release strap. Snap the connecting link firmly onto the retaining stud on the seat belt link half. Then adjust to length. Removing the harness is accomplished by pulling upward on the narrow release strap and removing the harness connecting link from the stud on the seat belt link. In an emergency. the shoulder harness may be removed by releasing the seat belt first and allowing the harness, still attached to the link half of the seat belt, to drop to the side of the seat.

Adjustment of the shoulder harness is important. A properly adjusted harness will permit the occupant to lean forward enough to sit completely erect, but prevent excessive forward movement arid contact with objects during sudden deceleration. Also, the pilot will want the freedom to reach all controls easily.

The mixture control, mounted above the right corner of the control pedestal, is a red knob with raised points around the circumference and is equipped with a lock button in the end of the knob. The rich position is full forward, and full aft is the idle cut-off position. For small adjustments, the control may be moved forward by rotating the knob clockwise, and aft by rotating the knob counter clockwise. For rapid or large adjustments, the knob may be moved forward or aft by depressing the lock button in the end of the control, and then positioning the control as desired.

ENGINE INSTRUMENTS

Engine operation is monitored by the following instruments: oil pressure gage. oil temperature gage. and a tachometer.

The oil pressure gage, located on the sub panel, is operated by oil pressure. A direct pressure oil line from the engine delivers oil at engine operating pressure to the oil pressure gage. Gage markings indicate that minimum idling pressure is 25 PSI (red line), the normal operating range is 60 to 90 PSI (green arc), and maximum pressure is 100 PSI (red line).

Oil temperature is indicated by a gage located on the sub panel. The gage is operated by an electrical-resistance type temperature sensor which receives power from the airplane electrical system. Oil temperature limitations are the normal operating range (green arc) which is 38℃ (100℉) to 118℃ (245℉), and the maximum (red line) which is 118℃ (245℉).

The engine-driven mechanical tachometer is located near the upper center portion of the instrument panel. The instrument is calibrated in increments of 100 RPM and indicates both engine and propeller speed. An hour meter below the center of the tachometer dial records elapsed engine time in hours and tenths. Instrument markings include a normal operating range (green arc) of 1900 to 2550 RPM, and a maximum (red line) of 2550 RPM.

NEW ENGINE BREAK-IN AND OPERATION

The engine underwent a run-in at the factory and is ready for the full range of use. It is, however, suggested that cruising be accomplished at 65% to 75% power until a total of 50 hours has accumulated or oil consumption has stabilized. This will ensure proper seating of the rings.

The airplane is delivered from the factory with corrosion preventive oil in the engine. If, during the first 25 hours, oil must be added, use only aviation grade straight mineral oil conforming to Specification No. MIL L-6082.

ENGINE OIL SYSTEM

Oil for engine lubrication is supplied from a sump on the bottom of the engine. The capacity of the engine sump is six quarts (one additional quart is required if a full flow oil filter is installed). Oil is drawn from the sump through an oil suction strainer screen into the engine-driven oil pump. From the pump, oil is routed to a bypass valve. If the oil is cold, the bypass valve allows the oil to bypass the oil cooler and go directly from the pump to the oil pressure screen (full flow oil filter, if installed). If the oil is hot, the bypass valve routes the oil out of the accessory housing and into a flexible hose leading to the oil cooler on the front side of the left forward engine baffle. Pressure oil from the cooler returns to the accessory housing where it passes through the pressure strainer screen (full flow oil filter, if installed). The filter oil then enters a pressure relief valve which regulates engine oil pressure by allowing excessive oil to return to the sump, while the balance of the pressure oil is circulated to various engine parts for lubrication. Residual oil is returned to the sump by gravity flow.

An oil filler cap/oil dipstick is located at the rear of the engine on the right side. The filler cap/dipstick is accessible through an access door in the engine cowling. The engine should not be operated on less than four quarts of oil. To minimize loss of oil through the breather, fill to five quarts for normal flights of less than three hours. For extended flight, fill to six quarts (dipstick indication only). For engine oil grade and specifications, refer to Section 8 of this handbook.

An oil quick-drain valve is available to replace the drain plug in the oil sump drain port, and provides quicker, cleaner draining of the engine oil. To drain the oil with this valve installed, slip a hose over the end of the valve and push upward on the end of the valve until it snaps into the open position. Spring clips will hold the valve open. After draining, use a suitable tool to snap the valve into the extended (closed) position and remove the drain hose.

IGNITION-STARTER SYSTEM

Engine ignition is provided by two engine-driven magnetos, and two spark plugs in each cylinder. The right magneto fires the lower right and the upper left spark plugs, and the left magneto fires the lower left and upper right spark plugs. Normal operation is conducted with both magnetos due to the more complete burning of the fuel-air mixture with dual ignition.

Ignition and starter operation is controlled by a rotary type switch located on the left sub panel. The switch is labelled clockwise, OFF, R, L, BOTH, and STARTS. The engine should be operated on both magnetos (BOTH position) except for magneto checks. The R and L positions are for checking purposes and emergency use only. When the switch is rotated to the spring-loaded START position, (with the master switch in the ON position), the starter contactor is energized and the starter will crank the engine. When the switch is released, it will automatically return to the BOTH position.

AIR INDUCTION SYSTEM

The engine air induction system receives ram air through an intake in the lower portion of the engine cowling. The intake is covered by an air filter which removes dust and other foreign matter from the induction air. Airflow passing through the filter enters an air box. After passing through the air box, induction air enters the inlet in the carburettor which is under the engine, and is then ducted to the engine cylinders through intake manifold tubes. In the event carburettor ice is encountered or the intake filter becomes blocked, alternate heated air can be obtained from the muffler shroud through a duct to a valve, in the air box, operated by the carburettor heat control on the instrument panel. Heated air from the muffler shroud is obtained from an unfiltered outside source. Use of full carburettor heat at full throttle will result in a loss of approximately 150 to 200 RPM.

EXHAUST SYSTEM

Exhaust gas from each cylinder passes through riser assemblies to a muffler and tailpipe on the right side of the engine. The muffler is constructed with a shroud around the outside which forms a heating chamber for carburettor heat and cabin heater air.

CARBURETTOR AND PRIMING SYSTEM

The engine is equipped with an up-draft, float-type, fixed jet carburettor mounted on the bottom of the engine. The carburettor has an idle cut-off mechanism and a manual mixture control. Fuel is delivered to the carburettor by gravity flow from the fuel system. In the carburettor, fuel is atomised, proportionally mixed with intake air, and delivered to the cylinders through intake manifold tubes. The proportion of atomised fuel to air is controlled, within limits, by the mixture control on the instrument panel.

For starting, the engine is equipped with a manual priming system. The primer is actually a small pump which draws fuel from the fuel strainer when the plunger is pulled out, and injects it into the cylinder intake ports when the plunger is pushed back in. The plunger knob, on the instrument panel, is equipped with a lock and, after being pushed full in, must be rotated either left or right until the knob cannot be pulled out.

COOLING SYSTEM

Ham air for engine cooling enters through two intake openings in the front of the engine cowling. The cooling air is directed around the cylinders and other areas of the engine by baffling, and is then exhausted through an opening at the bottom aft edge of the cowling. No manual cooling system control is provided.

A winterisation kit is available for the airplane. The kit consists of two cover plates to partially cover the cowl nose cap opening, two placards to be installed on the cover plates, insulation for the engine crankcase breather line, and a placard to be installed on the map compartment door. This equipment should be installed for operations in temperatures consistently below -7℃ (20℉). Once installed, the crankcase br eather insulation is approved for permanent use regardless of temperature.

PROPELLER

The airplane is equipped with a two-bladed, fixed-pitch, one-piece forged aluminium alloy propeller which is anodised to retard corrosion. The propeller is 69 inches in diameter.

FUEL SYSTEM

The airplane may be equipped with either a standard fuel system or long range system (see figure 7-6). Both systems consist of two vented fuel tanks (one in each wing), a fuel shutoff valve, fuel strainer, manual primer, and carburettor. Refer to figure 7-5 for fuel quantity data for both systems.

FUEL QUANTITY DATA (U. S. GALLONS)			
TANKS	TOTAL USABLE FUEL ALL FLIGHT CONDITIONS	TOTAL UNUSABLE FUEL	TOTAL FUEL VOLUME
STANDARD (13 Gal. Each)	24.5	1.5	26.0
LONG RANGE (19.5 Gal. Each)	37.5	1.5	39.0

Fuel flows by gravity from the two wing tanks to a fuel shutoff valve. With the valve in the ON position, fuel flows through a strainer to the carburettor. From the carburettor, mixed fuel and air flows to the cylinders through intake manifold tubes. The manual primer draws its fuel from the fuel strainer and injects it into the cylinder intake ports.

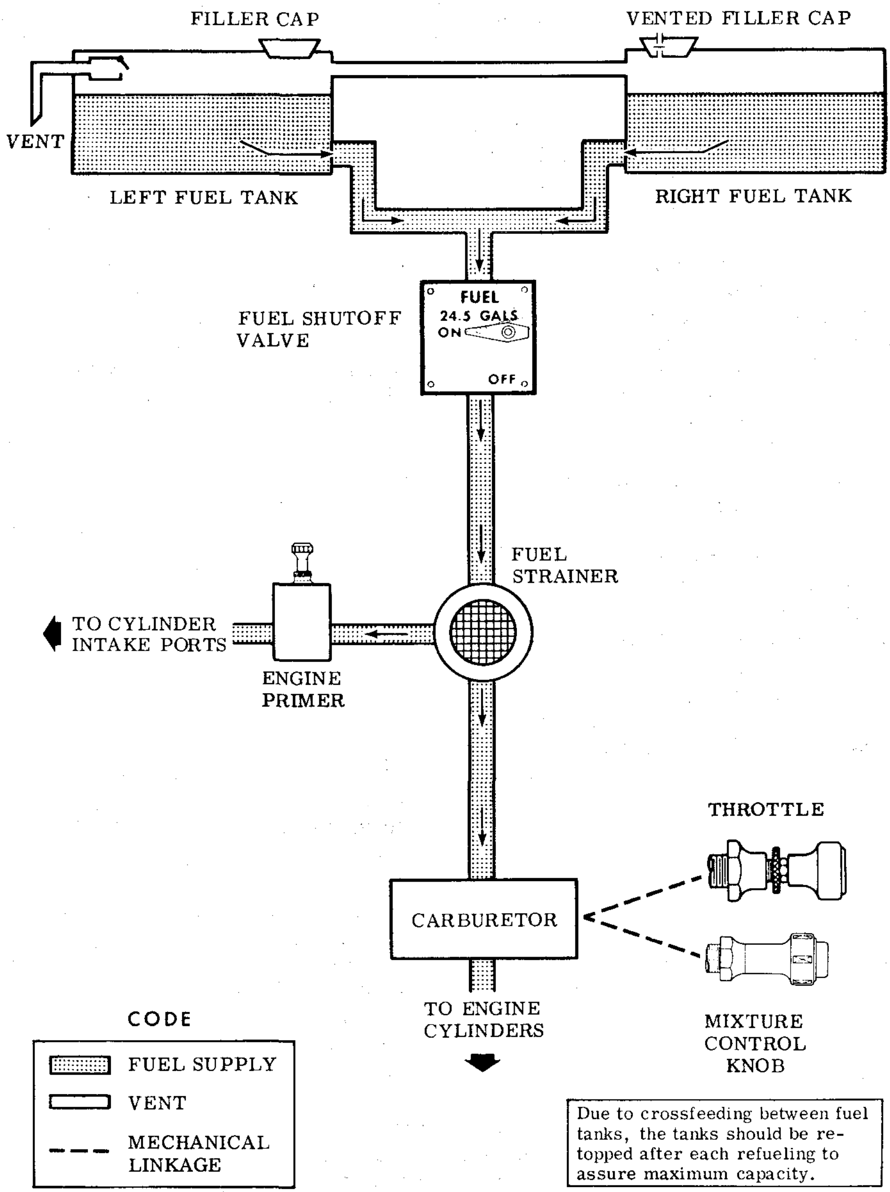
Fuel system venting is essential to system operation. Blockage of the venting system will result in a decreasing fuel flow and eventual engine stoppage. Venting is accomplished by an interconnecting line from the right fuel tank to the left tank. The left tank is vented overboard through a vent line which is equipped with a check valve, and protrudes from the bottom surface of the left wing near the wing strut attach point. The right fuel tank filler cap is also vented.

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. An empty tank is indicated by a red line and the letter E. When an indicator shows an empty tank, approximately .75 gallon remains in either a standard or long range tank as unusable fuel. The indicators cannot be relied upon for accurate readings during skids, slips, or unusual attitudes.

The amount of unusable fuel is relatively small due to the dual outlets at each tank. The maximum unusable fuel quantity, as determined from the most critical flight condition, is about 1.5 gallons total. This quantity was not exceeded by any other reasonable flight condition, including pro longed 30 second full-rudder sideslips in the landing configuration. Takeoffs have not been demonstrated with less than 2 gallons total fuel (1 gallon per tank).

The fuel system is equipped with drain valves to provide a means for the examination of fuel in the system for contamination and grade. The system should be examined before the first flight of every day and after each refuelling, by using the sampler cup provided to drain fuel from the wing tank sumps, and by utilizing the fuel strainer drain under an access panel on the right side of the engine cowling. The fuel tanks should be filled after each flight to prevent condensation.

When the airplane is equipped with long range tanks, it may be serviced to a reduced fuel capacity to permit heavier cabin loadings. This is accomplished by filling each tank to the bottom of the indicator on the fuel filler neck. When filled to this level, the tank contains 13 gallons (12.25 usable in all flight conditions).


FILLER CAP
VENTED FILLER CAP
VENT
LEFT FUEL TANK
RIGHT FUEL TANK
FUEL SHUTOFF VALVE
FUEL
24.5 GALS
ON
OFF
FUEL STRAINER
TO CYLINDER INTAKE PORTS
ENGINE PRIMER
THROTTLE
CARBURETOR
TO ENGINE CYLINDERS
MIXTURE CONTROL KNOB
CODE
FUEL SUPPLY
VENT
MECHANICAL LINKAGE
Due to crossfeeding between fuel tanks, the tanks should be re-topped after each refueling to assure maximum capacity.

BRAKE SYSTEM

The airplane has a single-disc, hydraulically-actuated brake on each main landing gear wheel. Each brake is connected, by a hydraulic line, to a master cylinder attached to each of the pilot's rudder pedals. The brakes are operated by applying pressure to the top of either the left (pilot's) or right (co-pilot's) set of rudder pedals, which are interconnected. When the airplane is parked, both main wheel brakes may be set by utilizing the parking brake which is operated by a knob on the lower left side of the instrument panel.

For maximum brake life, keep the brake system properly maintained, and minimize brake usage during taxi operations and landings.

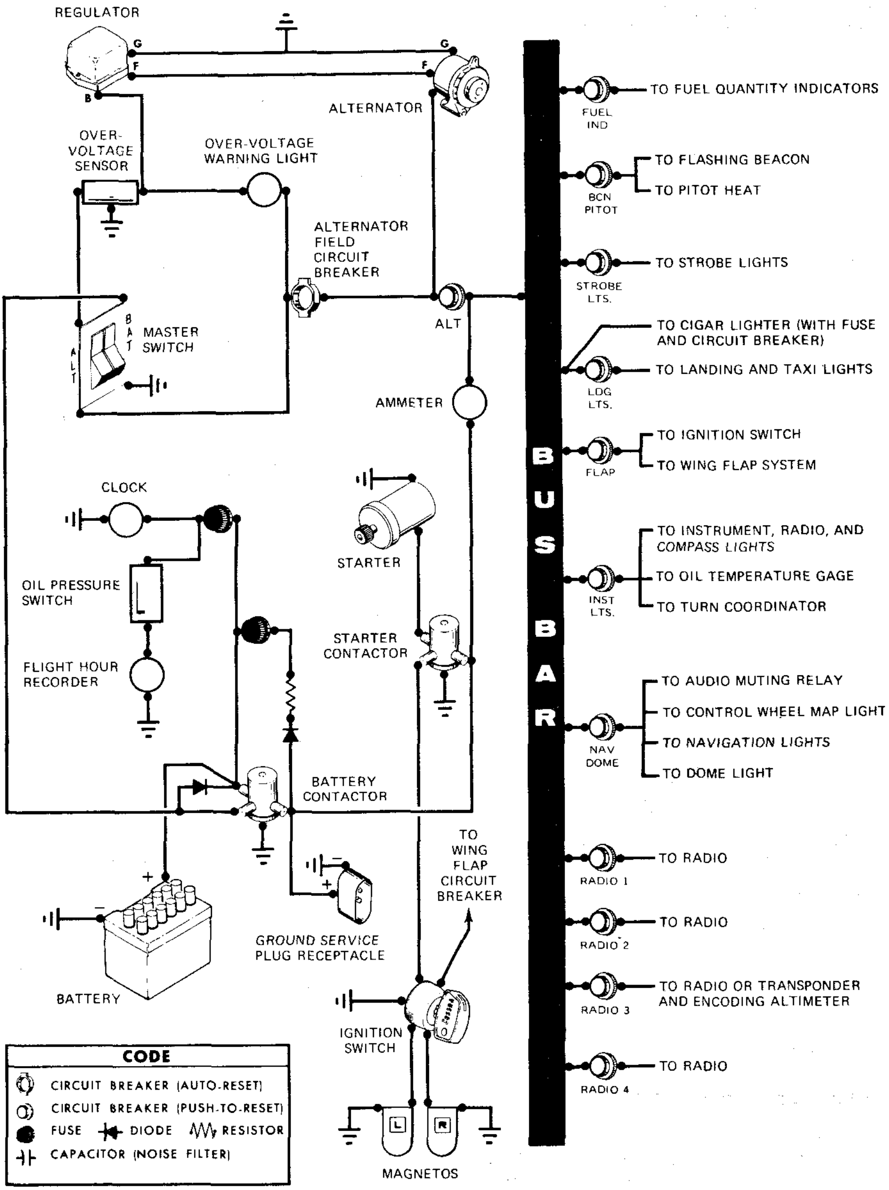
Some of the symptoms of impending brake failure are: gradual decrease in braking action after brake application, noisy or dragging brakes, soft or spongy pedals, and excessive travel and weak braking action. If any of these symptoms appear, the brake system is in need of immediate attention. If, during taxi or landing roll, braking action de creases, let up on the pedals and then re-apply the brakes with heavy pressure. If the brakes become spongy or pedal travel increases, pumping the pedals should build braking pressure. If one brake becomes weak or fails, use the other brake sparingly while using opposite rudder, as required, to offset the good brake.

ELECTRICAL SYSTEM

Electrical energy (see figure 7-7) is supplied by a 28-volt, direct- current system powered by an engine-driven, 60-amp alternator and a 24- volt, 14-amp hour battery (or 17-amp hour battery, if installed) located on the right forward side of the firewall. Power is supplied through a single bus bar; a master switch controls this power to all circuits, except the engine ignition system, clock, or flight hour recorder (if installed). The flight hour recorder receives power through activation of an oil pressure switch whenever the engine is operating, and the clock is supplied with current at all times. All avionics equipment should be turned off prior to starting the engine or using an external power source to prevent harmful transient voltages from damaging the transistors in this equipment.

MASTER SWITCH

The master switch is a split-rocker type switch labelled MASTER, and is ON in the up position and OFF in the down position. The right half of the switch, labelled BAT, controls all electrical power to the airplane. The left half, labelled ALT, controls the alternator.


REGULATOR
G
F
B
ALTERNATOR
OVER-VOLTAGE SENSOR
OVER-VOLTAGE WARNING LIGHT
ALTERNATOR FIELD CIRCUIT BREAKER
ALT
MASTER SWITCH
B A T
A L T
AMMETER
CLOCK
OIL PRESSURE SWITCH
FLIGHT HOUR RECORDER
STARTER
STARTER CONTACTOR
BATTERY CONTACTOR
BATTERY
GROUND SERVICE PLUG RECEPTACLE
TO WING FLAP CIRCUIT BREAKER
IGNITION SWITCH
MAGNETOS
L
R
BUS BAR
TO FUEL QUANTITY INDICATORS
FUEL IND
TO FLASHING BEACON
TO PITOT HEAT
BCN PITOT
TO STROBE LIGHTS
STROBE LTS.
TO CIGAR LIGHTER (WITH FUSE AND CIRCUIT BREAKER)
TO LANDING AND TAXI LIGHTS
LDG LTS.
TO IGNITION SWITCH
TO WING FLAP SYSTEM
FLAP
TO INSTRUMENT, RADIO, AND COMPASS LIGHTS
TO OIL TEMPERATURE GAGE
TO TURN COORDINATOR
INST LTS.
TO AUDIO MUTING RELAY
TO CONTROL WHEEL MAP LIGHT
TO NAVIGATION LIGHTS
TO DOME LIGHT
NAV DOME
TO RADIO
RADIO 1
TO RADIO
RADIO 2
TO RADIO OR TRANSPONDER AND ENCODING ALTIMETER
RADIO 3
TO RADIO
RADIO 4
CODE
CIRCUIT BREAKER (AUTO-RESET)
CIRCUIT BREAKER (PUSH-TO-RESET)
FUSE
DIODE
RESISTOR
CAPACITOR (NOISE FILTER)

Normally, both sides of the master switch should be used simultaneously; however, the BAT side of the switch could be turned ON separately to check equipment while on the ground. The ALT side of the switch, when placed in the OFF position, removes the alternator from the electrical system. With this switch in the OFF position, the entire electrical load is placed on the battery. Continued operation with the alternator switch in the OFF position will reduce battery power low enough to open the battery contactor, remove power from the alternator field, and prevent alternator restart.

AMMETER

The ammeter indicates the flow of current, in amperes, from the alternator to the battery or from the battery to the airplane electrical system. When the engine is operating and the master switch is turned on, the ammeter indicates the charging rate applied to the battery. In the event the alternator is not functioning or the electrical load exceeds the output of the alternator, the ammeter indicates the battery discharge rate.

OVER-VOLTAGE SENSOR AND WARNING LIGHT

The airplane is equipped with an automatic over-voltage protection system consisting of an over-voltage sensor behind the instrument panel and a red warning light, labelled HIGH VOLTAGE, under the ammeter.

In the event an over-voltage condition occurs, the over-voltage sensor automatically removes alternator field current and shuts down the alternator. The red warning light will then turn on, indicating to the pilot that the alternator is not operating and the battery is supplying all electrical power.

The over-voltage sensor may be reset by turning the master switch off and back on again. If the warning light does not illuminate, normal alternator charging has resumed; however, if the light does illuminate again, a malfunction has occurred, and the flight should be terminated as soon as practical.

The warning light may be tested by momentarily turning off the ALT portion of the master switch and leaving the BAT portion turned on.

CIRCUIT BREAKERS AND FUSES

Most of the electrical circuits in the airplane are protected by “push-to reset” circuit breakers mounted under the engine controls on the instrument panel. The cigar lighter is equipped with a manually-reset type circuit breaker located on the back of the lighter and a fuse behind the instrument panel. The control wheel map light (if installed) is protected by the NAV/DOME circuit breaker, and a fuse behind the instrument panel. Electrical circuits which are not protected by circuit breakers are the battery contactor closing (external power) circuit, clock circuit, and flight hour recorder circuit. These circuits are protected by fuses mounted adjacent to the battery.

GROUND SERVICE PLUG RECEPTACLE

A ground service plug receptacle may be installed to permit the use of an external power source for cold weather starting and during lengthy maintenance work on the electrical and electronic equipment. The receptacle is located behind a door on the left side of the fuselage near the aft edge of the cowling.

Just before connecting an external power source (generator type or battery cart), the master switch should be turned ON. This is especially important since it will enable the battery to absorb transient voltages which otherwise might damage the transistors in the electronic equipment.

The battery and external power circuits have been designed to completely eliminate the need to ‘jumper” across the battery contactor to close it for charging a completely “dead” battery. A special fused circuit in the external power system supplies the needed “jumper” across the contacts so that with a “dead” battery and an external power source applied, turning the master switch ON will close the battery contactor.

LIGHTING SYSTEMS

EXTERIOR LIGHTING

Conventional navigation lights are located on the wing tips and top of the rudder, a single landing light is installed in the cowl nose cap, and a flashing beacon is mounted on top of the vertical fin. Additional lighting is available and includes dual landing/taxi lights in the cowl nose cap and a strobe light on each wing tip. All exterior lights are controlled by rocker type switches on the lower left side of the instrument panel. The switches are ON in the up position and OFF in the down position.

The flashing beacon should not be used when flying through clouds or overcast: the flashing light reflected from water droplets or particles in the atmosphere, particularly at night, can produce vertigo and loss of orientation.

The high intensity strobe lights will enhance anti-collision protection.

However, the lights should be turned off when taxiing in the vicinity of other airplanes, or during night flight through clouds, fog or haze.

INTERIOR LIGHTING

Instrument and control panel lighting is provided by flood lighting and integral lighting. Two concentric rheostat control knobs on the lower left side of the instrument panel, labelled PANEL LT, and RADIO LT, control the intensity of both flood and integral lighting.

Instrument and control panel flood lighting consists of a single red flood light in the forward part of the overhead console. To use the flood lighting, rotate the PANEL LT rheostat control knob clockwise to the desired intensity.

The radio equipment and magnetic compass have integral lighting. The light intensity of all integral lighting is controlled by the RADIO LT rheostat control knob.

A cabin dome light is located in the aft part of the overhead console, and is operated by a switch on the lower portion of the instrument panel. To turn the light on, place the switch in the ON position.

A control wheel map light is available and is mounted on the bottom of the pilot’s control wheel. The light illuminates the lower portion of the cabin just forward of the pilot and is helpful when checking maps and other flight data during night operations. To operate the light, first turn on the NAV LIGHTS switch; then adjust the map light’s intensity with the knurled disk type rheostat control located at the bottom of the control wheel.

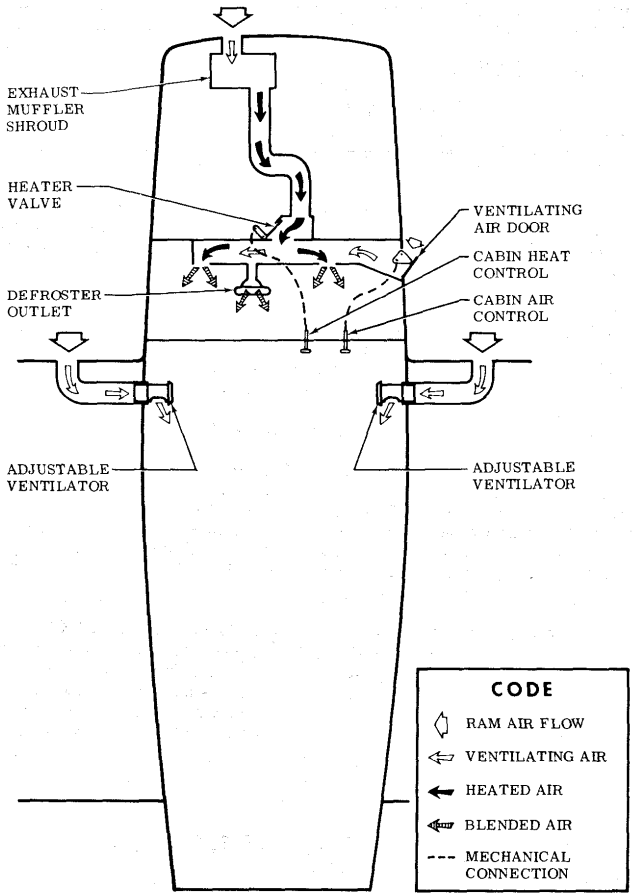
The most probable cause of a light failure is a burned out bulb; however, in the event any of the lighting systems fail to illuminate when turned on, check the appropriate circuit breaker. If the circuit breaker has opened (white button popped out), and there is no obvious indication of a short circuit (smoke or odour), turn off the light switch of the affected lights, reset the breaker, and turn the switch on again. If the breaker opens again, do not reset it.

CABIN HEATING, VENTILATING AND DEFROSTING SYSTEM

The temperature and volume of airflow into the cabin can be regulated to any degree desired by manipulation of the push-pull CABIN HT and CABIN AIR control knobs

Heated fresh air and outside air are blended in a cabin manifold just aft of the firewall by adjustment of the heat and air controls; this air is then vented into the cabin from outlets in the cabin manifold near the pilot’s and passenger's feet. Windshield defrost air is also supplied by a duct leading from the manifold.

Full ventilation air may be obtained by utilization of the adjustable ventilators near the upper left and right corners of the windshield, and by pulling the CABIN AIR control knob out. The CABIN HT control knob must be pushed full in.



PITOT-STATIC SYSTEM AND INSTRUMENTS

The pitot-static system supplies ram air pressure to the airspeed indicator and static pressure to the airspeed indicator, rate-of-climb indicator and altimeter. The system is composed of either an unheated or heated pitot tube mounted on the lower surface of the left wing, an external static port on the lower left side of the forward fuselage, and the associated plumbing necessary to connect the instruments to the sources.

The heated pitot system consists of a heating element in the pitot tube, a rocker-type switch labelled PITOT HT on the lower left side of the instrument panel, a 15-amp circuit breaker under the engine controls on the instrument panel, and associated wiring. When the pitot heat switch is turned on, the element in the pitot tube is heated electrically to maintain proper operation in possible icing conditions. Pitot heat should be used only as required.

AIRSPEED INDICATOR

The airspeed indicator is calibrated in knots and miles per hour. Limitation and range markings include the white arc (35 to 85 knots), green arc (40 to 111 knots), yellow arc (111 to 149 knots), and a red line (149 knots).

If a true airspeed indicator is installed, it is equipped with a rotatable ring which works in conjunction with the airspeed indicator dial in a manner similar to the operation of a flight computer. To operate the indicator, first rotate the ring until pressure altitude is aligned with outside air temperature in degrees Fahrenheit. Pressure altitude should not be confused with indicated altitude. To obtain pressure altitude, momentarily set the barometric scale on the altimeter to 29.92 and read pressure altitude on the altimeter. Be sure to return the altimeter barometric scale to the original barometric setting after pressure altitude has been obtained. Having set the ring to correct for altitude and temperature, read the true airspeed shown on the rotatable ring by the indicator pointer. For best accuracy, the indicated airspeed should be corrected to calibrated airspeed by referring to the Airspeed Calibration chart in Section 5. Knowing the calibrated airspeed, read true airspeed on the ring opposite the calibrated airspeed.

RATE-OF-CLIMB INDICATOR

The rate-of-climb indicator depicts airplane rate of climb or descent in feet per minute. The pointer is actuated by atmospheric pressure changes resulting from changes of altitude as supplied by the static source.

ALTIMETER

Airplane altitude is depicted by a barometric type altimeter. A knob near the lower left portion of the indicator provides adjustment of the instrument's barometric scale to the current altimeter setting.

VACUUM SYSTEM AND INSTRUMENTS

An engine-driven vacuum system (see figure 7-9) is available and provides the suction necessary to operate the attitude indicator and directional indicator. The system consists of a vacuum pump mounted on the engine, a vacuum relief valve and vacuum system air filter on the aft side of the firewall below the instrument panel, and instruments (including a suction gage) on the left side of the instrument panel.

ATTITUDE INDICATOR

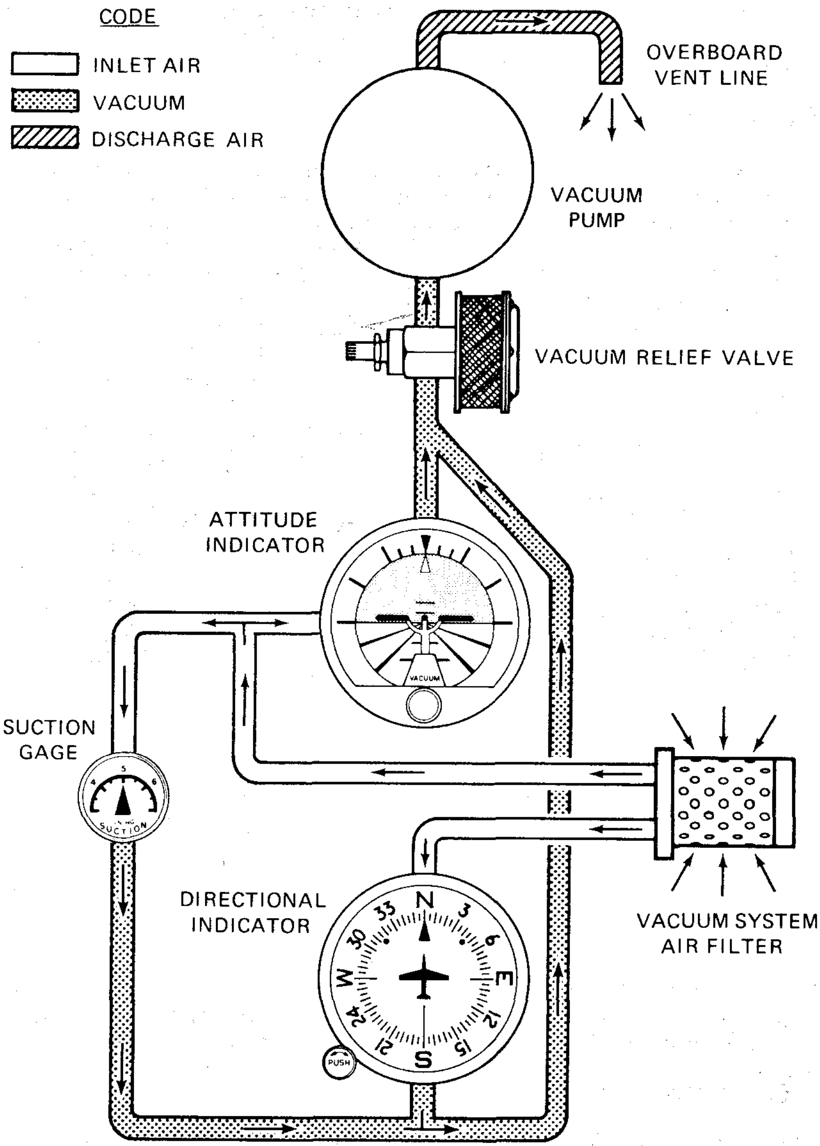
An attitude indicator is available and gives a visual indication of flight attitude. Bank attitude is presented by a pointer at the top of the indicator relative to the bank scale which has index marks at 10^0, 20°, 30^0,60^0, and 90° either side of the center mark. Pitch and roll attitudes are presented by a miniature airplane in relation to the horizon bar. A knob at the bottom of the instrument is provided for in-flight adjustment of the miniature airplane to the horizon bar for a more accurate flight attitude indication.

DIRECTIONAL INDICATOR

A directional indicator is available and displays airplane heading on a compass card in relation to a fixed simulated airplane image and index. The directional indicator will precess slightly over a period of time. Therefore, the compass card should be set in accordance with the magnetic compass just prior to takeoff, and occasionally re-adjusted on extended flights. A knob on the lower left edge of the instrument is used to adjust the compass card to correct for any precession.

SUCTION GAGE

A suction gage is located on the left side of the instrument panel when the airplane is equipped with a vacuum system. Suction available for operation of the attitude indicator and directional indicator is shown by this gage, which is calibrated in inches of mercury. The desired suction range is 4.6 to 5.4 inches of mercury. A suction reading below this range may indicate a system malfunction or improper adjustment, and in this case, the indicators should not be considered reliable.


CODE
INLET AIR
VACUUM
DISCHARGE AIR
OVERBOARD VENT LINE
VACUUM PUMP
VACUUM RELIEF VALVE
ATTITUDE INDICATOR
SUCTION GAGE
VACUUM SYSTEM AIR FILTER
DIRECTIONAL INDICATOR
VACUUM
SUCTION
PUSH

STALL WARNING SYSTEM

The airplane is equipped with a pneumatic-type stall warning system consisting of an inlet in the leading edge of the left wing, an air-operated horn near the upper left corner of the windshield, and associated plumbing. As the airplane approaches a stall, the low pressure on the upper surface of the wings moves forward around the leading edge of the wings. This low pressure creates a differential pressure in the stall warning system which draws air through the warning horn, resulting in an audible warning at 5 to 10 knots above stall in all flight conditions.

The stall warning system should be checked during the pre-flight inspection by placing a clean handkerchief over the vent opening and applying suction. A sound from the warning horn will confirm that the system is operative.

AVIONICS SUPPORT EQUIPMENT

The airplane may, at the owner's discretion, be equipped with various types of avionics support equipment such as an audio control panel and static dischargers. The following paragraphs discuss these items.

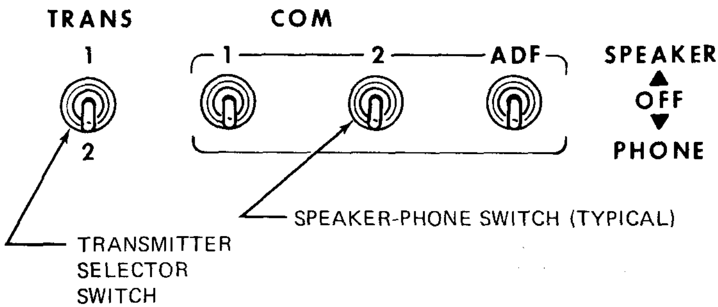
AUDIO CONTROL PANEL

Operation of radio equipment is covered in Section 9 of this handbook. When one or more radios is installed, a transmitter/audio switching system is provided (see figure 7-10). The operation of this switching system is described in the following paragraphs.

The transmitter selector switch is labelled TRANS, and has two positions. When two transmitters are installed, it is necessary to switch the microphone to the radio unit the pilot desires to use for transmission. This is accomplished by placing the transmitter selector switch in the position corresponding to the radio unit which is to be used. The up position selects, the upper transmitter and the down position selects the lower transmitter.

The installation of Cessna radio equipment provides certain audio back-up capabilities and transmitter selector switch functions that the pilot should be familiar with. The audio amplifier in the NAV/ COM radio is required for speaker and transmitter operation. The amplifier is automatically selected, along with the transmitter, by the transmitter selector switch. As an example, if the number 1 transmitter is selected, the audio amplifier in the associated NAV/COM receiver is also selected, and functions as the amplifier for ALL speaker audio. In the event the audio amplifier in use fails, as evidenced by loss of all speaker audio and transmitting capability of the selected transmitter, select the other transmitter. This should re-establish speaker audio and transmitter operation. Since headset audio is not affected by audio amplifier operation, the pilot should be aware that, while utilizing a headset, the only indication of audio amplifier failure is loss of the selected transmitter. This can be verified by switching to the speaker function.

The speaker-phone switches determine whether the output of the receiver in use is fed to the headphones or through the audio amplifier to the speaker. Place the switch for the desired receiving system either in the up position for speaker operation or in the down position for headphones. The center OFF position will remove receiver output to either headphones or the speaker.



STATIC DISCHARGERS

If frequent IFR flights are planned, installation of wick-type static dischargers is recommended to improve radio communications during flight through dust or various forms of precipitation (rain, snow or ice crystals). Under these conditions, the build-up and discharge of static electricity from the trailing edges of the wings, rudder, elevator, propeller tips, and radio antennas can result in loss of usable radio signals on all communications and navigation radio equipment. Usually the ADF is first to be affected and VHF communication equipment is the last to be affected.

Installation of static dischargers reduces interference from precipitation static, but it is possible to encounter severe precipitation static conditions which might cause the loss of radio signals, even with static dischargers installed. Whenever possible, avoid known severe precipitation areas to prevent loss of dependable radio signals. If avoidance is impractical, minimize airspeed and anticipate temporary loss of radio signals while in these areas.

NORMAL PROCEDURES

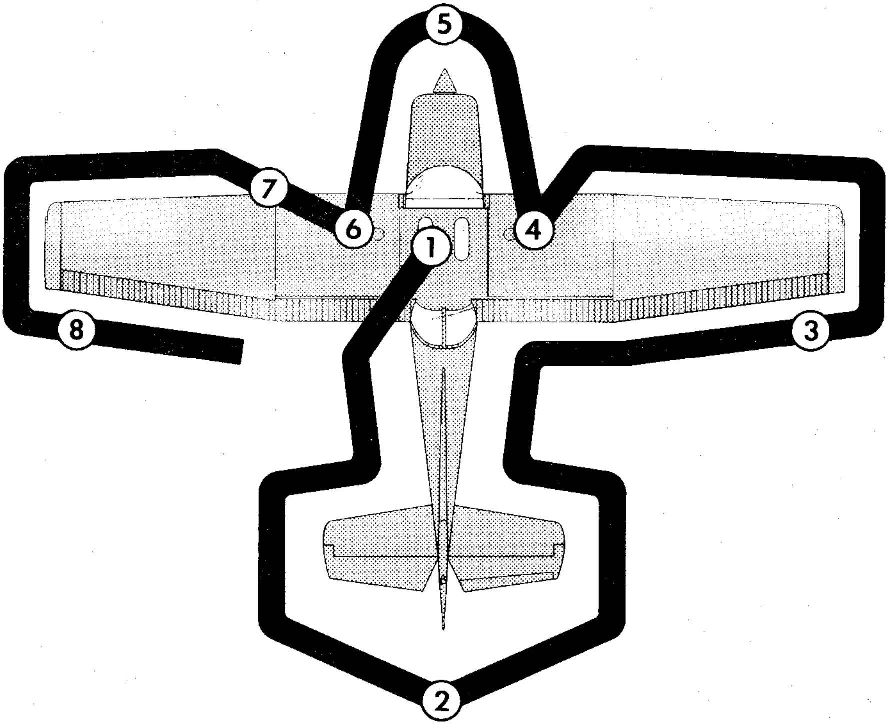
INTRODUCTION

Section provides checklist and amplified procedures for the conduct of normal operation.

SPEEDS FOR NORMAL OPERATION

Unless otherwise noted, the following speeds are based on a maximum weight of 1670 pounds and may be used for any lesser weight.

Takeoff:	
Normal Climb Out:	65-75 KIAS
Short Field Takeoff, Flaps 10^0, Speed at 50 Feet	54 KIAS
Climb, Flaps Up:	
Normal	70 – 80 KIAS
Best Rate of Climb, Sea Level	67 KIAS
Best Rate of Climb, 10,000 Feet	61 KIAS
Best Angle of Climb, Sea Level thru 10,000 Feet	55 KIAS
Landing Approach:	
Normal Approach, Flaps Up	60-70 KIAS
Normal Approach, Flaps 30°	55-65 KIAS
Short Field Approach, Flaps 30°	54 KIAS
Balked Landing:	
Maximum Power, Flaps 20°	55 KIAS
Maximum Recommended Turbulent Air Penetration Speed:	
1670 Lbs	104 KIAS
1500 Lbs	98 KIAS
1350 Lbs	93 KIAS
Maximum Demonstrated Crosswind Velocity	12 KNOTS



NOTE

Visually check airplane for general condition during walk-around inspection. In cold weather, remove even small accumulations of frost, ice or snow from wing, tail and control surfaces. Also, make sure that control surfaces contain no internal accumulations of ice or debris. Prior to flight, check that pitot heater (if installed) is warm to touch within 30 seconds with battery and pitot heat switches on. If a night flight is planned, check operation of all lights, and make sure a flashlight is available.

PRE-FLIGHT INSPECTION

(1) INSIDE CABIN

1. Control Wheel Lock -- REMOVE.
2. Ignition Switch -- OFF.
3. Master Switch -- ON.
4. Fuel Quantity Indicators -- CHECK QUANTITY.
5. Master Switch -- OFF.
6. Fuel Shutoff Valve -- ON.

(2) EMPENNAGE

1. Rudder Gust Lock -- REMOVE.
2. Tail Tie-Down - - DISCONNECT.
3. Control Surfaces - - CHECK freedom of movement and security.

(3) RIGHT WING Trailing Edge

1. Aileron -- CHECK freedom of movement and security.

(4) RIGHT WING

1. Wing Tie-Down -- DISCONNECT.
2. Main Wheel Tire -- CHECK for proper inflation.
3. Before first flight of the day and after each refuelling, use sampler cup and drain small quantity of fuel from fuel tank sump quick-drain valve to check for water, sediment, and proper fuel grade.
4. Fuel Quantity -- CHECK VISUALLY for desired level.
5. Fuel Filler Cap -- SECURE.

(5) NOSE

1. Engine Oil Level - - CHECK, do not operate with less than four quarts. Fill to six quarts for extended flight.
2. Before first flight of the day and after each refueling, pull out strainer drain knob for about four seconds to clear fuel strainer of possible water and sediment. Check strainer drain closed. If water is observed, the fuel system may contain additional water, and further draining of the system at the strainer, fuel tank sumps, and fuel line drain plug will be necessary.
3. Propeller and Spinner - - CHECK for nicks and security.
4. Carburetor Air Filter - - CHECK for restrictions by dust or other foreign matter.
5. Landing Light(s) -- CHECK for condition and cleanliness.
6. Nose Wheel Strut and Tire -- CHECK for proper inflation.

7. Nose Tie-Down -- DISCONNECT.
8. Static Source Opening (left side of fuselage) -- CHECK for stoppage.

6 LEFT WING

1. Main Wheel Tire -- CHECK for proper inflation.
2. Before first flight of day and after each refueling, use sampler cup and drain small quantity of fuel from fuel tank sump quick-drain valve to check for water, sediment and proper fuel grade.
3. Fuel Quantity - - CHECK VISUALLY for desired level.
4. Fuel Filler Cap -- SECURE.

7 LEFT WING Leading Edge

1. Pitot Tube Cover -- REMOVE and check opening for stoppage.
2. Stall Warning Opening -- CHECK for stoppage. To check the system, place a clean handkerchief over the vent opening and apply suction; a sound from the warning horn will confirm system operation.
3. Fuel Tank Vent Opening -- CHECK for stoppage.
4. Wing Tie-Down -- DISCONNECT.

8 LEFT WING Trailing Edge

1. Aileron -- CHECK freedom of movement and security.

BEFORE STARTING ENGINE

1. Pre-flight Inspection -- COMPLETE.
2. Seats, Belts, Shoulder Harnesses -- ADJUST and LOCK.
3. Fuel Shutoff Valve - - ON.
4. Radios, Electrical Equipment -- OFF.
5. Brakes -. TEST and SET.
6. Circuit Breakers -- CHECK IN.

STARTING ENGINE

1. Mixture -- RICH.
2. Carburettor Heat - COLD.
3. Master Switch -- ON.
4. Prime -- AS REQUIRED (2 to 6 strokes; none if engine is warm).
5. Throttle -- OPEN 1/8 INCH.
6. Propeller Area -- CLEAR.
7. Ignition Switch -- START (release when engine starts).
8. 8. Oil Pressure -- CHECK.

BEFORE TAKEOFF

1. Parking Brake -- SET.
2. Cabin Doors -- CLOSED and LATCHED.
3. Flight Controls -- FREE and CORRECT.
4. Flight Instruments -- SET.
5. Fuel Shutoff Valve -- ON.
6. Mixture - - RICH (below 3000 feet).
7. Elevator Trim - - TAKEOFF.
8. Throttle - - 1700 RPM.
   a. Magnetos - - CHECK (RPM drop should not exceed 125 RPM on either magneto or 50 RPM differential between magnetos).
   b. Carburetor Heat - - CHECK (for RPM drop).
   c. Engine Instruments and Ammeter -- CHECK.
   d. Suction Gage -- CHECK.
9. 9. Radios - - SET.
10. 10. Flashing Beacon, Navigation Lights and! or Strobe Lights - - ON as required.
11. 11. Throttle Friction Lock -- ADJUST.
12. 12. Brakes -- RELEASE.

TAKEOFF

NORMAL TAKEOFF

1. Wing Flaps -- 0°- 100.
2. Carburetor Heat -- COLD.
3. Throttle - - FULL OPEN.
4. Elevator Control -- LIFT NOSE WHEEL at 50 KIAS.
5. Climb Speed -- 65-75 KIAS.

SHORT FIELD TAKEOFF

1. Wing Flaps -- 100.
2. Carburetor Heat - - COLD.
3. Brakes - - APPLY.
4. Throttle - - FULL OPEN.
5. Mixture-- RICH (above3
6. Brakes - - RELEASE.
7. Elevator Control - - SLIGHTLY TAIL LOW.
8. Climb Speed -- 54 KIAS (until all obstacles are cleared).
9. Wing Flaps - - RETRACT slowly after reaching 60 KIAS.

EN ROUTE CLIMB

1. Airspeed -- 70-80 KIAS.

NOTE

If a maximum performance climb is necessary, use speeds shown in the Rate of Climb chart in Section 5.

2. Throttle -- FULL OPEN.
3. Mixture -- RICH below 3000 feet, LEAN for maximum RPM above 3000 feet.

CRUISE

1. Power - - 1900-2550 RPM (no more than 75
2. Elevator Trim - - ADJUST.
3. Mixture -- LEAN.

BEFORE LANDING

1. Seats, Belts, Harnesses -- ADJUST and LOCK.
2. Mixture -- RICH.
3. Carburettor Heat - ON (apply full heat before closing throttle).

<u>LANDING</u>

NORMAL LANDING

1. Airspeed - - 60-70 KIAS (flaps UP).
2. Wing Flaps -- AS DESIRED (below 85 KIAS).
3. Airspeed -- 55-65 KIAS (flaps DOWN).
4. Touchdown - - MAIN WHEELS FIRST.
5. Landing Roll -- LOWER NOSE WHEEL GENTLY.
6. Braking - - MINIMUM REQUIRED.

SHORT FIELD LANDING

1. Airspeed -- 60-70 KIAS (flaps UP).
2. Wing Flaps - - 300 (below 85 KIAS).
3. Airspeed -- MAINTAIN 54 KIAS.
4. Power--REDUCE to idle as obstacle is cleared.
5. Touchdown -- MAIN WHEELS FIRST.
6. Brakes -- APPLY HEAVILY.
7. Wing Flaps - - RETRACT.

BALKED LANDING

1. Throttle - - FULL OPEN.
2. Carburettor Heat - - COLD.
3. Wing Flaps -- RETRACT to 200.
4. Airspeed -- 55 KIAS.
5. Wing Flaps -- RETRACT (slowly).

AFTER LANDING

1. Wing Flaps - - UP.
2. Carburettor Heat - - COLD.
3. Trim - - TAKE-OFF

SECURING AIRPLANE

1. Parking Brake - - SET.
2. Radios, Electrical Equipment -- OFF.
3. Mixture -- IDLE CUT-OFF (pull full out).
4. Ignition Switch -- OFF.
5. Master Switch -- OFF.
6. Control Lock -- INSTALL.

AMPLIFIED PROCEDURES

STARTING ENGINE

During engine starting, open the throttle approximately 1/8 inch. In warm temperatures one or two strokes of the primer should be sufficient. In cold weather, up to eight strokes of the primer may be necessary. If the engine is warm, no priming will be required. In extremely cold temperatures, it may be necessary to continue priming while cranking the engine and after it starts until it is running smoothly. The carburettor is not equipped with an accelerator pump and therefore pumping the throttle does not enrich the mixture for starting.

Weak intermittent firing followed by puffs of black smoke from the exhaust stack indicates over priming or flooding. Excess fuel can be cleared from the combustion chambers by the following procedures: Set mixture control in the idle cut-off position, throttle full open, and crank the engine through several revolutions with the starter. Repeat the starting procedure without any additional priming.

If the engine is under-primed (most likely in cold weather with a cold engine) it will not fire at all, and additional priming will be necessary. As soon as the cylinders begin to fire, open the throttle slightly to keep it running.

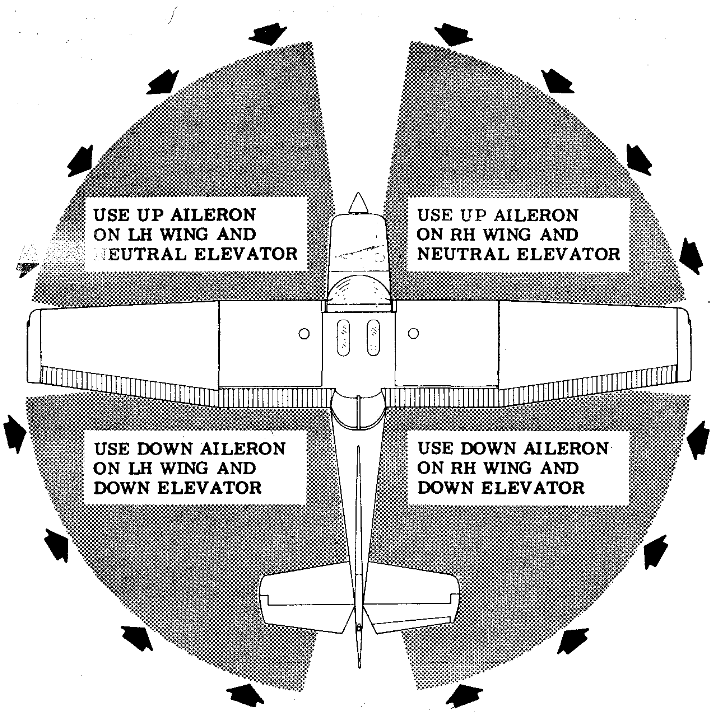
After starting, if the oil gage does not begin to show pressure **within 30 seconds** in the summertime and about twice that long in very cold weather, stop engine and investigate. Lack of oil pressure can cause serious engine damage. After starting, avoid the use of carburettor heat unless icing conditions prevail.

NOTE

> Additional details concerning cold weather starting and operation may be found under COLD WEATHER OPERATION paragraphs in this section.

TAXIING

When taxiing, it is important that speed and use of brakes be held to a minimum and that all controls be utilized (see Taxiing Diagram below) to maintain directional control and balance.



CODE

WIND DIRECTION ➧

NOTE

Strong quartering tail winds require caution. Avoid sudden bursts of the throttle and sharp braking when the airplane is in this attitude. Use the steerable nose wheel and rudder to maintain direction.

The carburettor heat control knob should be pushed full in during all ground operations unless heat is absolutely necessary. When the knob is pulled out to the heat position, air entering the engine is not filtered.

Taxiing over loose gravel or cinders should be done at low engine speed to avoid abrasion and stone damage to the propeller tips.

The nose wheel is designed to automatically center straight ahead when the nose strut is fully extended. In the event the nose strut is over- inflated and the airplane is loaded to a rearward center of gravity position, it may be necessary to partially compress the strut to permit steering. This can be accomplished prior to taxiing by depressing the airplane nose (by hand) or during taxi by sharply applying brakes.

BEFORE TAKEOFF

WARM-UP

Most of the warm-up will have been conducted during taxi, and additional warm-up before takeoff should be restricted to the checklist procedures. Since the engine is closely cowled for efficient in-flight cooling, precautions should be taken to avoid overheating on the ground.

MAGNETO CHECK

The magneto check should be made at 1700 RPM as follows. Move ignition switch first to R position and note RPM. Next move switch back to BOTH to clear the other set of plugs. Then move switch to the L position, note RPM and return the switch to the BOTH position. RPM drop should not exceed 125 RPM on either magneto or show greater than 50 RPM differen tial between magnetos. If there is a doubt concerning operation of the ignition system, RPM checks at higher engine speeds will usually confirm whether a deficiency exists.

An absence of RPM drop may be an indication of faulty grounding of

one side of the ignition system or should be cause for suspicion that the

magneto timing is set in advance of the setting specified.

ALTERNATOR CHECK

Prior to flights where verification of proper alternator and voltage regulator operation is essential (such as night or instrument flights), a positive verification can be made by loading the electrical system momentarily (3 to 5 seconds) with the landing light, or by operating the wing flaps during the engine runup (1700 RPM). The ammeter will remain within a needle width of its initial position if the alternator and voltage regulator are operating properly.

TAKEOFF

POWER CHECK

It is important to check full-throttle engine operation early in the takeoff run. Any sign of rough engine operation or sluggish engine acceleration is good cause for discontinuing the takeoff. If this occurs, you are justified in making a thorough full-throttle static runup before another takeoff is attempted. The engine should run smoothly and turn approxi mately 2280 to 2380 RPM with carburetor heat off and mixture leaned to maximum RPM.

Full throttle runups over loose gravel are especially harmful to propeller tips. When takeoffs must be made over a gravel surface, it is very important that the throttle be advanced slowly. This allows the airplane to start rolling before high RPM is developed, and the gravel will be blown back of the propeller rather than pulled into it. When unavoidable small dents appear in the propeller blades, they should be immediately corrected as described in Section 8 under Propeller Care.

Prior to takeoff from fields above 3000 feet elevation, the mixture should be leaned to give maximum RPM in a full-throttle, static runup.

After full throttle is applied, adjust the throttle friction lock clockwise to prevent the throttle from creeping back from a maximum power position. Similar friction lock adjustment should be made as required in other flight conditions to maintain a fixed throttle setting.

WING FLAP SETtINGS

Normal takeoffs are accomplished with wing flaps Ø0 100. Using 10° wing flaps reduces the total distance over an obstacle by approximately 10%. Flap deulections greater than 10° are not approved for takeoff. If 10° wing flaps are used for takeoff, they should be left down until all obstacles are cleared and a safe flap retraction speed of 60 KIAS is reached.

On a short field, 10° wing flaps and an obstacle cl earance speed of 54 KIAS should be used. This speed provides the best overall climb speed to clear obstacles when taking into account turbulence often found near ground level.

Soft or rough field takeoffs are performed with 10° wing flaps by lifting the airplane off the ground as soon as practical in a ta4I attitude. If no obstacles are ahead, the airplane should be leveled off immediately to accelerate to a higher climb speed.

Takeoffs into strong crosswinds normally are performed with the minimum flap setting necessary for the field length, to minimize the drift angle immediately after takeoff. The airplane is accelerated to a speed slightly higher than normal, then pulled off abruptly to prevent possible settling back to the runway while drifting. When clear of the ground, make a coordinated turn into the wind to correct for drift.

EN ROUTE CLIMB

Normal climbs are performed with flaps up and full throttle and at speeds 5 to 10 knots higher than best rate-of-climb speeds for the best combination of performance, visibility and engine cooling. The mixture should be full rich below 3000 feet and may be leaned above 3000 feet for smoother operation or to obtain maximum RPM. For maximum rate of climb, use the best rate-of-climb speeds shown in the Rate Of Climb chart in Section 5. If an obstruction dictates the use of a steep climb angle, the best angle-of-climb speed should be used with flaps up and maximum power. Climbs at speeds lower than the best rate-of-climb speed should be of short duration to improve engine cooling.

CRUISE

Normal cruising is performed between 55% and 75% power. The engine RPM and corresponding fuel consumption for various altitudes can be determined by using your Cessna Power Computer or the data in Section 5.

NOTE

Cruising should be done at 65% to 75% power until a total of 50 hours has accumulated or oil consumption has stabil ized. This is to ensure proper seating of the rings and is applicable to new engines, and engines in service follow ing cylinder replacement or top overhaul of one or more cylinders.

The data in Performance shows the increased range and improved fuel economy that is obtainable when operating at lower power settings. The use of lower power settings and the selection of cruise altitude on the basis of the most favorable wind conditions are significant factors that should be considered on every trip to reduce fuel consumption.

	75% POWER		65% POWER		55% POWER	
ALTITUDE	KTAS	NMPG	KTAS	NMPG	KTAS	NMPG
Sea Level	100	16.4	94	17.8	87	19.3
4000 Feet	103	17.0	97	18.4	89	19.8
8000 Feet	107	17.6	100	18.9	91	20.4
Standard Conditions					Zero Wind	

Figure 4-3. Cruise Performance Table

The Cruise Performance Table, figure 4-3, shows the true airspeed and nautical miles per gallon during cruise for various altitudes and percent powers. This table should be used as a guide, along with the available winds aloft information, to determine the most favorable altitude and power setting for a given trip.

To achieve the recommended lean mixture fuel consumption figures shown in Section 5, the mixture should be leaned until engine RPM peaks and drops 25-50 RPM. At lower powers it may be necessary to enrichen the mixture slightly to obtain smooth operation.

Carburetor ice, as evidenced by an unexplained drop in RPM, can be removed by application of full carburetor heat. Upon regaining the original RPM (with heat off), use the minimum amount of heat (by trial and error) to prevent ice from forming. Since the heated air causes a richer mixture, readjust the mixture setting when carburetor heat is to be used continuously in cruise flight.

The use of full carburetor heat is recommended during flight in very heavy rain to avoid the possibility of engine stoppage due to excessive water ingestion. The mixture setting should be readjusted for smoothest operation.

FUEL SAVINGS PROCEDURES FOR FLIGHT TRAINING OPERATIONS

For best fuel economy during flight training operations, the following procedures are recommended.

1. Use 55% to 60% power while transitioning to and from the practice area (approximately 2200-2250 RPM).

2. Lean the mixture for maximum RPM during climbs above 3000 feet. The mixture may be left leaned for practicing such maneuvers as stalls.

3. Lean the mixture for maximum RPM during all operations at any altitude, including those below 3000 feet, when using 75% or less power.

NOTE

When cruising at 75% or less power, the mixture may be further leaned until the RPM peaks and drops 25-50 RPM. This is especially applicable to cross-country training flights, but may also be practiced during transition flights to and from the practice area.

Using the above recommended procedures can provide fuel savings of up to 13% when compared to typical training operations at a full rich mixture.

STALLS

The stall characteristics are conventional for the flaps up and flaps down condition. The stall warning horn produces a steady signal 5 to 10 knots before the actual stall is reached and remains on until the airplane flight attitude is changed. Stall speeds for various combinations of flap setting and bank angle are summarized in Section 5.

SPINS

Intentional spins are approved in this airplane (see Section 2). Before attempting to perform spins, however, several items should be carefully considered to assure a safe flight. No spins should be attempted without first having received dual instruction in both spin entries and spin recoveries from a qualified instructor who is familiar with the spin characteristics of the Cessna 152.

The cabin should be clean and all loose equipment (including the microphone) should be stowed. For a solo flight in which spins will be conducted, the copilot's seat belt and shoulder harness should be secured. Spins with baggage loadings or occupied child's seat are not approved.

The seat belts and shoulder harnesses should be adjusted to provide

proper restraint during all anticipated flight conditions. However, care should be taken to ensure that the pilot can easily reach the flight controls and produce maximum control travels.

It is recommended that, where feasible, entries be accomplished at high enough altitude that recoveries are completed 4000 feet or more above ground level. At least 1000 feet of altitude loss should be allowed for a 1-turn spin and recovery, while a 6-turn spin and recovery may require somewhat more than twice that amount. For example, the recommended entry altitude for a 6-turn spin would be 6000 feet above ground level. In any case, entries should be planned so that recoveries are completed well above the minimum 1500 feet above ground level required by FAR 91.71. Another reason for using high altitudes for practicing spins is that a greater field of view is provided which will assist in maintaining pilot orientation.

The normal entry is made from a power-off stall. As the stall is approached, the elevator control should be smoothly pulled to the full aft position. Just prior to reaching the stall “break”, rudder control in the desired direction of the spin rotation should be applied so that full rudder deflection is reached almost simultaneously with reaching full aft eleva tor. A slightly greater rate of deceleration than for normal stall entries or the use of partial power at the entry will assure more consistent and positive entries to the spin. Both elevator and rudder controls should be held full with the spin until the spin recovery is initiated. An inadvertent relaxation of either of these controls could result in the development of a nose-down spiral.

NOTE

Careful attention should be taken to assure that the aileron control is neutral during all phases of the spin since any aileron deflection in the direction of the spin may alter the spin characteristics by increasing the rotation rate and changing the pitch attitude.

For the purpose of training in spins and spin recoveries, a 1 to 2-turn spin is adequate and should be used. Up to 2 turns, the spin will progress to a fairly rapid rate of rotation and a steep attitude. Application of recovery controls will produce prompt recoveries of from 1/4 to 1/2 of a turn.

If the spin is continued beyond the 2 to 3-turn range, some change in character of the spin may be noted. Rotation rates may vary and some additional sideslip may be felt. Normal recoveries from such extended spins may take up to a full turn or more.

Regardless of how many turns the spin is held or how it is entered, the

following recovery technique should be used:

1. VERIFY THAT AILERONS ARE NEUTRAL AND THROTTLE IS IN IDLE POSITION.

2. APPLY AND HOLD FULL RUDDER OPPOSITE TO THE DIREC TION OF ROTATION.

3. JUST AFTER THE RUDDER REACHES THE STOP, MOVE THE CONTROL WHEEL BRISKLY FORWARD FAR ENOUGH TO BREAK THE STALL. Full down elevator may be required at aft center of gravity loadings to assure optimum recoveries.

4. HOLD THESE CONTROL INPUTS UNTIL ROTATION STOPS.

Premature relaxation of the control inputs may extend the recov ery.

5. AS ROTATION STOPS, NEUTRALIZE RUDDER, AND MAKE A SMOOTH RECOVERY FROM THE RESULTING DIVE.

NOTE

If disorientation precludes a visual determination of the direction of rotation, the symbolic airplane in the turn coordinator may be referred to for this information.

Variations in basic airplane rigging or in weight and balance due to installed equipment or cockpit occupancy can cause differences in behav ior, particularly in extended spins. These differences are normal and will result in variations in the spin characteristics and in the recovery lengths for spins of more than 3 turns. However, the above recovery procedure should always be used and will result in the most expeditious recovery from any spin.

Intentional spins with flaps extended are prohibited, since the high speeds which may occur during recovery are potentially damaging to the flap! wing structure.

LANDING

Normal landing approaches can be made with power-on or power-off at speeds of 60 to 70 KIAS with flaps up, and 55 to 65 KIAS with flaps down. Surface winds and air turbulence are usually the primary factors in determining the most comfortable approach speeds.

Actual touchdown should be made with power-off and on the main wheels first. The nose wheel should be lowered smoothly to the runway as speed is diminished.

SHORT FIELD LANDING

For a short field landing in smooth air conditions, make an approach at 54 KIAS with 30° flaps using enough power to control the glide path. After all approach obstacles are cleared, progressively reduce power and maintain 54 KIAS by lowering the nose of the airplane. Touchdown should be made with power-off and on the main wheels first. Immediately after touchdown, lower the nose wheel and apply heavy braking as required. For maximum brake effectiveness, retract the flaps, hold full nose-up elevator, and apply maximum brake pressure without sliding the tires.

Slightly higher approach speeds should be used under turbulent air conditions.

CROSSWIND LANDING

When landing in a strong crosswind, use the minimum flap setting required for the field length. Use a wing low, crab, or a combination method of drift correction and land in a nearly level attitude.

BALKED LANDING

In a balked landing (go-around) climb, the wing flap setting should be reduced to 20° immediately after full power is applied. Upon reaching a safe airspeed, the flaps should be slowly retracted to the full up position.

COLD WEATHER OPERATION

Prior to starting on cold mornings, it is advisable to pull the propeller through several times by hand to “break loose” or “limber” the oil, thus conserving battery energy.

NOTE

When pulling the propeller through by hand, treat it as if the ignition switch is turned on. A loose or broken ground wire on either magneto could cause the engine to fire.

In extremely cold (-18℃ and lower) weather, the use of an external preheater is recommended whenever possible to reduce wear and abuse to the engine and electrical system.

Cold weather starting procedures are as follows:

With Preheat:

1. With ignition switch OFF and throttle closed, prime the engine four to eight strokes as the propeller is being turned over by hand.

NOTE

Use heavy strokes of primer for best atomization of fuel. Leave primer charged and ready for a stroke.

2. Propeller Area -- CLEAR.
3. Master Switch -- ON.
4. Mixture -- FULL RICH.
5. Throttle -- OPEN 1/8 INCH.
6. Ignition Switch -- START.
7. Release ignition switch to BOTH when engine starts.
8. Continue to prime the engine using the manual primer if required until the engine runs smoothly.
9. Oil Pressure -- CHECK.
10. Primer -- LOCK.

Without Preheat:

1. Prime the engine six to eight strokes while the propeller is being turned by hand with the throttle closed. Leave the primer charged and ready for a stroke.
2. Propeller Area -- CLEAR.
3. Master Switch -- ON.
4. Mixture -- FULL RICH.
5. Throf,tle -- OPEN 1/8 INCH.
6. Ignition Switch -- START.
7. Release ignition switch to BOTH when engine starts.
8. Continue to prime engine until it is running smoothly.
9. Oil Pressure -- CHECK.
10. Pull carburetor heat knob full on after engine has started. Leave on until engine is running smoothly.
11. Primer -- LOCK.

NOTE

If the engine does not start during the first few attempts, or if engine firing diminishes in strength, it is probable that the spark plugs have been frosted over. Preheat must be used before another start is attempted.

During cold weather operations no indication will be apparent on the oil temperature gage prior to takeoff if outside air temperatures are very cold.

After a suitable warm-up period (2 to 5 minutes at 1000 RPM), accelerate the engine several times to higher engine RPM. If the engine accelerates smoothly and the oil pressure remains normal and steady, the airplane is ready for takeoff.

When operating in temperatures below -18° C, avoid using partial carburetor heat. Partial heat may increase the carburetor air temperature to the 0° to 21℃ range, where icing is critical under certain atmospheric conditions.

NOISE ABATEMENT

Increased emphasis on improving the quality of our environment requires renewed effort on the part of all pilots to minimize the effect of airplane noise on the public. _-

We, as pilots, can demonstrate our concern for environmental improvement, by application of the following suggested procedures, and thereby tend to build public support for aviation:

1. Pilots operating aircraft under VFR over outdoor assemblies of persons, recreational and park areas, and other noise-sensitive areas should make every effort to fly not less than 2000 feet above the surface, weather permitting, even though flight at a lower level may be consistent with the provisions of government regulations.
2. During departure from or approach to an airport, climb after takeoff and descent for landing should be made so as to avoid prolonged flight at low altitude near noise-sensitive areas.

NOTE

The above recommended procedures do not apply where they would conflict with Air Traffic Control clearances or instructions, or where, in the pilot's judgment, an altitude of less than 2000 feet is necessary for him to adequately exercise his duty to see and avoid other aircraft.

The certificated noise level for the Model 152 at 1670 pounds maximum weight is 65.OdB(A). No determination has been made by the Federal Aviation Administration that the noise levels of this airplane are or should be acceptable or unacceptable for operation at, into or out of, any airport.

PERFORMANCE

INTRODUCTION

Performance data charts on the following pages are presented so that you may know what to expect from the airplane under various conditions, and also, to facilitate the planning of flights in detail and with reasonable accuracy. The data in the charts has been computed from actual flight tests with the airplane and engine in good condition and using average piloting techniques.

It should be noted that the performance information presented in the range and endurance profile charts allows for 45 minutes reserve fuel based on 45% power. Fuel flow data fOr cruise is based on the recommended lean mixture setting. Some indeterminate variables such as mixture leaning technique, fuel metering characteristics, engine and propeller condition, and air turbulence may account for variations of 10% or more in range and endurance. Therefore, it is important to utilize all available information to estimate the fuel required for the particular flight.

USE OF PERFORMANCE CHARTS

Performance data is presented in tabular or graphical form to illus trate the effect of different variables. Sufficiently detailed information is provided in the tables so that conservative values can be selected and used to determine the particular performance figure with reasonable accuracy.

SAMPLE PROBLEM

The following sample flight problem utilizes information from the various charts to determine the predicted performance data for a typical flight. The following information is known:

AIRPLANE CONFIGURATION

Takeoff weight	1610 Pounds
Usable fuel	24.5 Gallons

TAKEOFF CONDITIONS

Field pressure altitude	1500 Feet
Temperature	28°C (16°C above standard)
Wind component along runway	12 Knot Headwind
Field length	3500 Feet

CRUISE CONDITIONS

Total distance	320 Nautical Miles
Pressure altitude	5500 Feet
Temperature	20°C (16°C above standard)
Expected wind enroute	10 Knot Headwind

LANDING CONDITIONS

Field pressure altitude	2000 Feet
Temperature	25°C
Field length	3000 Feet

TAKE OF F

The takeoff distance chart, figure 5-4, should be consulted, keeping in mind that the distances shown are based on the short field technique. Conservative distances can be established by reading the chart at the next higher value of altitude and temperature. For example, in this particular sample problem, the takeoff distance information presented for a pressure altitude of 2000 feet and a temperature of 30℃ sho uld be used and results in the following:

Ground roll	980 Feet
Total distance to clear a 50-foot obstacle	1820 Feet

These distances are well within the available takeoff field length. Howev er, a correction for the effect of wind may be made based on Note 3 of the takeoff chart. The correction for a 12 knot headwind is:

$$\frac{12 \text{ Knots}}{9 \text{ Knots}} \times 10\% = 13\% \text{ Decrease}$$

This results in the following distances, corrected for wind:

Ground roll, zero wind	980
Decrease in ground roll (980 feet × 13%)	127
Corrected ground roll	853 Feet

Total distance to clear a 50-foot obstacle, zero wind	1820
Decrease in total distance (1820 feet × 13%)	237
Corrected total distance to clear 50-foot obstacle	1583 Feet

CRUISE

The cruising altitude should be selected based on a consideration of trip length, winds aloft, and the airplane's performance. A typical cruising altitude and the expected wind enroute have been given for this sample problem. However, the power setting selection for cruise must be deter mined based on several considerations. These include the cruise perfor mance characteristics presented in figure 5-7, the range profile chart presented in figure 5-8, and the endurance profile chart presented in figure 5-9.

The relationship between power and range is illustrated by the range profile chart. Considerable fuel savings and longer range result when lower power settings are used.

The range profile chart indicates that use of 65% power at 5500 feet yields a predicted range of 375 nautical miles under no wind conditions. The endurance profile chart, figure 5-9, shows a corresponding 3.9 hours.

The range figure of 375 nautical miles is corrected to account for the expected 10 knot headwind at 5500 feet.

Range, zero wind	375
Decrease in range due to wind (3.9 hours × 10 knot headwind)	39
Corrected range	336 Nautical Miles

This indicates that the trip can be made without a fuel stop using approximately 65% power.

The cruise performance chart, figure 5-7, is entered at 6000 feet altitude and 20℃ above standard temperature. These values m ost nearly corres pond to the planned altitude and expected temperature conditions. The engine speed chosen is 2400 RPM, which results in the following:

Power	64%
True airspeed	99 Knots
Cruise fuel flow	5.2 GPH

The power computer may be used to determine power and fuel consump tion more accurately during the flight.

FUEL REQUIRED

The total fuel requirement for the flight may be estimated using the performance information in figures 5-6 and 5-7. For this sample problem, figure 5-6 shows that a climb from 2000 feet to 6000 feet requires 1 gallon of fuel. The corresponding distance during the climb is 9 nautical miles. These values are for a standard temperature (as shown on the climb chart) and are sufficiently accurate for most flight planning purposes. However, a further correction for the effect of temperature may be made as noted on the climb chart. The approximate effect of a non-standard temperature is to increase the time, fuel, and distance by 10% for each 10℃ above standard temperature, due to the lower rate of climb. In this case, assuming a temperature 16℃ above standard, the correction wou ld be:

$$\frac{16°C}{10°C} \times 10\% = 16\% \text{ Increase}$$

With this factor included, the fuel estimate would be calculated as follows:

Fuel to climb, standard temperature	1.0
Increase due to non-standard temperature (1.0 × 16%)	0.2
Corrected fuel to climb	1.2 Gallons

Using a similar procedure for the distance to climb results in 10 nautical miles.

The resultant cruise distance is:

Total distance	320
Climb distance	-10
Cruise distance	310 Nautical Miles

With an expected 10 knot headwind, the ground speed for cruise is predicted to be:

99
-10
89 Knots

Therefore, the time required for the cruise portion of the trip is:

$$\frac{310 \text{ Nautical Miles}}{89 \text{ Knots}} = 3.5 \text{ Hours}$$

The fuel required for cruise is:

3.5 hours × 5.2 gallons/hour = 18.2 Gallons

The total estimated fuel required is as follows:

Engine start, taxi, and takeoff	0.8
Climb	1.2
Cruise	18.2
Total fuel required	**20.2 Gallons**

This will leave a fuel reserve of:

24.5
-20.2
4.3 Gallons

Once the flight is underway, ground speed checks will provide a more accurate basis for estimating the time enroute and the corresponding fuel required to complete the trip with ample reserve.

LANDING

A procedure similar to takeoff should be used for estimating the landing distance at the destination airport. Figure 5-10 presents landing distances for various airport altitude and temperature combinations using the short field technique. The distances corresponding to 2000 feet and 30℃ are as follows:

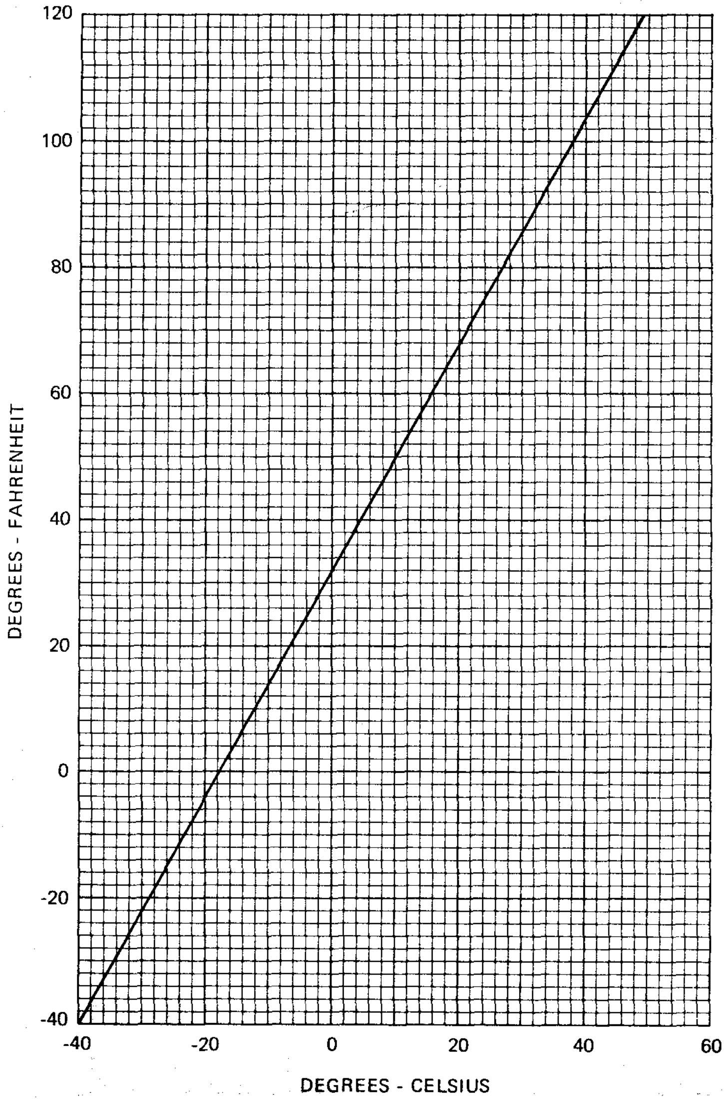
Ground roll	535 Feet
Total distance to clear a 50-foot obstacle	1300 Feet

A correction for the effect of wind may be made based on Note 2 of the landing chart using the same procedure as outlined for takeoff.

CONDITION:
Power required for level flight or maximum rated RPM dive.

FLAPS UP											
KIAS	40	50	60	70	80	90	100	110	120	130	140
KCAS	46	53	60	69	78	88	97	107	117	127	136
FLAPS 10°											
KIAS	40	50	60	70	80	85	---	---	---	---	---
KCAS	44	52	61	70	80	84	---	---	---	---	---
FLAPS 30°											
KIAS	40	50	60	70	80	85	---	---	---	---	---
KCAS	43	51	61	71	82	87	---	---	---	---	---

TEMPERATURE CONVERSION CHART



STALL SPEEDS

CONDITIONS:

Power Off

NOTE:

1. Altitude loss during a stall recovery may be as much as 160 feet.
2. KIAS values are approximate and are based on airspeed calibration data with power off.

MOST REARWARD CENTER OF GRAVITY

WEIGHT LBS	FLAP DEFLECTION	ANGLE OF BANK							
		0°		30°		45°		60°	
		KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
1670	UP	36	46	39	49	43	55	51	65
	10°	36	43	39	46	43	51	51	61
	30°	31	41	33	44	37	49	44	58

MOST FORWARD CENTER OF GRAVITY

WEIGHT LBS	FLAP DEFLECTION	ANGLE OF BANK							
		0°		30°		45°		60°	
		KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
1670	UP	40	48	43	52	48	57	57	68
	10°	40	46	43	49	48	55	57	65
	30°	35	43	38	46	42	51	49	61

TAKEOFF DISTANCE

SHORT FIELD

CONDITION:
Flaps 10°
Full Throttle Prior to Brake Release
Paved, Level, Dry Runway
Zero Wind

NOTES:
1. Short field technique as specified in Section 4.
2. Prior to takeoff from fields above 3000 feet elevation, the mixture should be leaned to give maximum RPM in a full throttle, static runup.
3. Decrease distances 10% for each 9 knots headwind. For operation with tailwinds up to 10 knots, increase distances by 10% for each 2 knots.
4. For operation on a dry, grass runway, increase distances by 15% of the "ground roll" figure.

WEIGHT LBS	TAKEOFF SPEED KIAS		PRESS ALT FT	0°C		10°C		20°C		30°C		40°C	
	LIFT OFF	AT 50 FT		GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS
1670	50	54	S.L.	640	1190	695	1290	755	1390	810	1495	875	1605
			1000	705	1310	765	1420	825	1530	890	1645	960	1770
			2000	775	1445	840	1565	910	1690	980	1820	1055	1960
			3000	855	1600	925	1730	1000	1870	1080	2020	1165	2185
			4000	940	1775	1020	1920	1100	2080	1190	2250	1285	2440
			5000	1040	1970	1125	2140	1215	2320	1315	2525	1420	2750
			6000	1145	2200	1245	2395	1345	2610	1455	2855	1570	3125
			7000	1270	2470	1375	2705	1490	2960	1615	3255	1745	3590
			8000	1405	2800	1525	3080	1655	3395	1795	3765	1940	4195

RATE OF CLIMB

MAXIMUM

CONDITIONS:
Flaps Up
Full Throttle
NOTE:
Mixture leaned above 3000 feet for maximum RPM.

WEIGHT LBS	PRESS ALT FT	CLIMB SPEED KIAS	RATE OF CLIMB - FPM			
			-20°C	0°C	20°C	40°C
1670	S.L.	67	835	765	700	630
	2000	66	735	670	600	535
	4000	65	635	570	505	445
	6000	63	535	475	415	355
	8000	62	440	380	320	265
	10,000	61	340	285	230	175
	12,000	60	245	190	135	85

TIME, FUEL, AND DISTANCE TO CLIMB

MAXIMUM RATE OF CLIMB

CONDITIONS:
Flaps Up
Full Throttle
Standard Temperature

NOTES:
1. Add 0.8 of a gallon of fuel for engine start, taxi and takeoff allowance.
2. Mixture leaned above 3000 feet for maximum RPM.
3. Increase time, fuel and distance by 10% for each 10℃ above standard temperature.
4. Distances shown are based on zero wind.

WEIGHT LBS	PRESSURE ALTITUDE FT	TEMP °C	CLIMB SPEED KIAS	RATE OF CLIMB FPM	FROM SEA LEVEL		
					TIME MIN	FUEL USED GALLONS	DISTANCE NM
1670	S.L.	15	67	715	0	0	0
	1000	13	66	675	1	0.2	2
	2000	11	66	630	3	0.4	3
	3000	9	65	590	5	0.7	5
	4000	7	65	550	6	0.9	7
	5000	5	64	505	8	1.2	9
	6000	3	63	465	10	1.4	12
	7000	1	63	425	13	1.7	14
	8000	-1	62	380	15	2.0	17
	9000	-3	62	340	18	2.3	21
	10,000	-5	61	300	21	2.6	25
	11,000	-7	61	255	25	3.0	29
	12,000	-9	60	215	29	3.4	34

CRUISE PERFORMANCE

CONDITIONS:
1670 Pounds
Recommended Lean Mixture (See Section 4, Cruise)

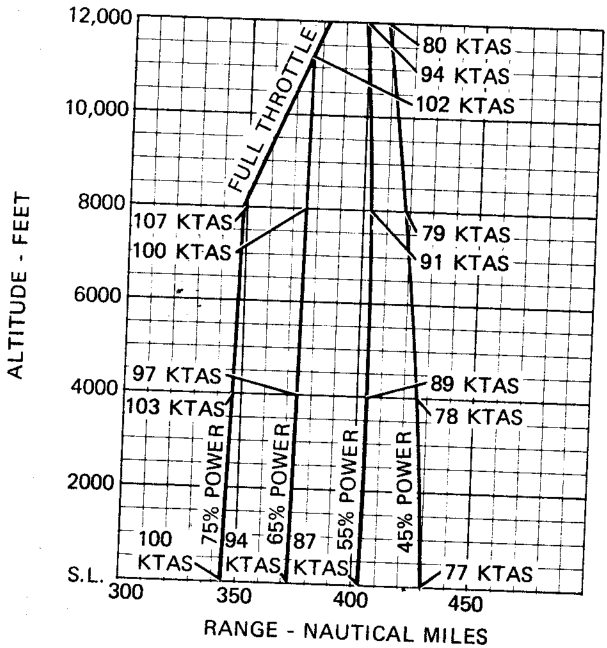
NOTE:
Cruise speeds are shown for an airplane equipped with speed fairings which increase the speeds by approximately two knots.

PRESSURE ALTITUDE FT	RPM	20°C BELOW STANDARD TEMP			STANDARD TEMPERATURE			20°C ABOVE STANDARD TEMP		
		% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2000	2400	---	---	---	75	101	6.1	70	101	5.7
	2300	71	97	5.7	66	96	5.4	63	95	5.1
	2200	62	92	5.1	59	91	4.8	56	90	4.6
	2100	55	87	4.5	53	86	4.3	51	85	4.2
	2000	49	81	4.1	47	80	3.9	46	79	3.8
4000	2450	---	---	---	75	103	6.1	70	102	5.7
	2400	76	102	6.1	71	101	5.7	67	100	5.4
	2300	67	96	5.4	63	95	5.1	60	95	4.9
	2200	60	91	4.8	56	90	4.6	54	89	4.4
	2100	53	86	4.4	51	85	4.2	49	84	4.0
	2000	48	81	3.9	46	80	3.8	45	78	3.7
6000	2500	---	---	---	75	105	6.1	71	104	5.7
	2400	72	101	5.8	67	100	5.4	64	99	5.2
	2300	64	96	5.2	60	95	4.9	57	94	4.7
	2200	57	90	4.6	54	89	4.4	52	88	4.3
	2100	51	85	4.2	49	84	4.0	48	83	3.9
	2000	46	80	3.8	45	79	3.7	44	77	3.6
8000	2550	---	---	---	75	107	6.1	71	106	5.7
	2500	76	105	6.2	71	104	5.8	67	103	5.4
	2400	68	100	5.5	64	99	5.2	61	98	4.9
	2300	61	95	5.0	58	94	4.7	55	93	4.5
	2200	55	90	4.5	52	89	4.3	51	87	4.2
	2100	49	84	4.1	48	83	3.9	46	82	3.8
10,000	2500	72	105	5.8	68	103	5.5	64	103	5.2
	2400	65	99	5.3	61	98	5.0	58	97	4.8
	2300	58	94	4.7	56	93	4.5	53	92	4.4
	2200	53	89	4.3	51	88	4.2	49	86	4.0
	2100	48	83	4.0	46	82	3.9	45	81	3.8
12,000	2450	65	101	5.3	62	100	5.0	59	99	4.8
	2400	62	99	5.0	59	97	4.8	56	96	4.6
	2300	56	93	4.6	54	92	4.4	52	91	4.3
	2200	51	88	4.2	49	87	4.1	48	85	4.0
	2100	47	82	3.9	45	81	3.8	44	79	3.7

RANGE PROFILE
45 MINUTES RESERVE
24.5 GALLONS USABLE FUEL

CONDITIONS:
1670 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature
Zero Wind

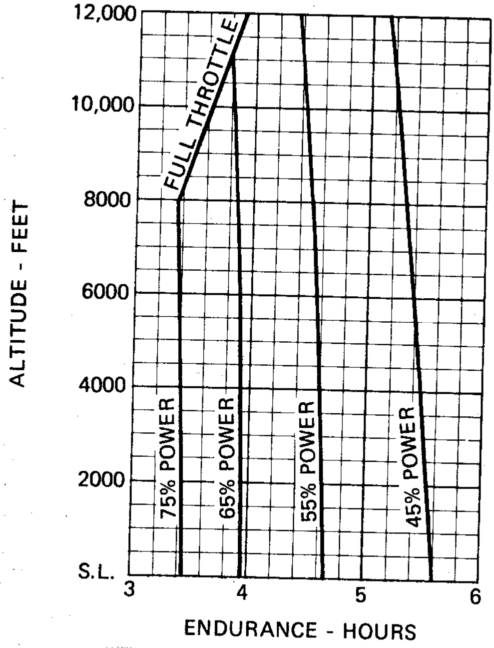
NOTES:
1. This chart allows for the fuel used for engine start, taxi, takeoff and climb, and the distance during climb as shown in figure 5-6.
2. Reserve fuel is based on 45 minutes at 45% BHP and is 2.8 gallons.
3. Performance is shown for an airplane equipped with speed fairings which increase the cruise speeds by approximately two knots.



ENDURANCE PROFILE
45 MINUTES RESERVE
24.5 GALLONS USABLE FUEL

CONDITIONS:
1670 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature

NOTES:
1. This chart allows for the fuel used for engine start, taxi, takeoff and climb, and the time during climb as shown in figure 5-6.
2. Reserve fuel is based on 45 minutes at 45% BHP and is 2.8 gallons.



LANDING DISTANCE

SHORT FIELD

CONDITIONS:

Flaps 300

Power Off

Maximum Braking

Paved, Level, Dry Runway

Zero Wind

NOTES:

1. Short field technique as specified in Section 4.
2. Decrease distances 10% for each 9 knots headwind. For operation with tailwinds up to 10 knots, increase distances by 10% for each 2 knots.
3. For operation on a dry, grass runway, increase distances by 45% of the “ground roll” figure.

WEIGHT LBS	SPEED AT 50 FT KIAS	PRESS ALT FT	0°C		10°C		20°C		30°C		40°C	
			GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS
1670	54	S.L.	450	1160	465	1185	485	1215	500	1240	515	1265
		1000	465	1185	485	1215	500	1240	520	1270	535	1295
		2000	485	1215	500	1240	520	1270	535	1300	555	1330
		3000	500	1240	520	1275	540	1305	560	1335	575	1360
		4000	520	1275	540	1305	560	1335	580	1370	600	1400
		5000	540	1305	560	1335	580	1370	600	1400	620	1435
		6000	560	1340	580	1370	605	1410	625	1440	645	1475
		7000	585	1375	605	1410	625	1440	650	1480	670	1515
		8000	605	1410	630	1450	650	1480	675	1520	695	1555

WEIGHT AND BALANCE

The following information will enable you to operate your Cessna within the prescribed weight and center of gravity limitations. To figure weight and balance, use the Sample Problem, Loading Graph, and Center of Gravity Moment Envelope as follows:

Take the basic empty weight and moment from appropriate weight and balance records carried in your airplane, and enter them in the column titled YOUR AIRPLANE on the Sample Loading Problem.

NOTE

In addition to the basic empty weight and moment noted on these records, the C.G. arm (fuselage station) is also shown, but need not be used on the Sample Loading Problem. The moment which is shown must be divided by 1000 and this value used as the moment! 1000 on the loading problem.

Use the Loading Graph to determine the moment/1000 for each additional item to be carried; then list these on the loading problem.

NOTE

Loading Graph information for the pilot, passengers and baggage is based on seats positioned for average occu pants and baggage loaded in the center of the baggage areas as shown on the Loading Arrangements diagram. For loadings which may differ from these, the Sample Loading Problem lists fuselage stations for these items to indicate their forward and aft C.G. range limitation (seat travel and baggage area limitation). Additional moment calculations, based on the actual weight and C.G. arm (fuselage station) of the item being loaded, must be made if the position of the load is different from that shown on the Loading Graph.

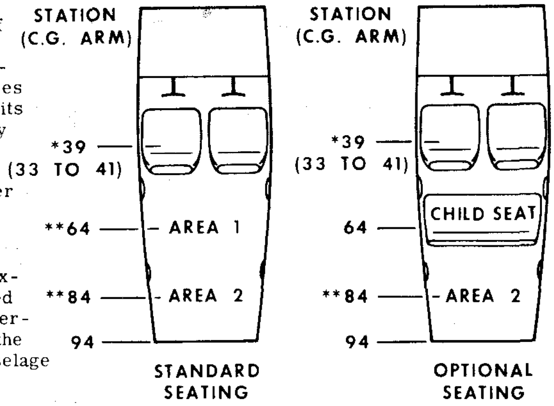
Total the weights and moments/bOO and plot these values on the Center of Gravity Moment Envelope to determine whether the point falls within the envelope, and if the loading is acceptable.

LOADING ARRANGEMENTS

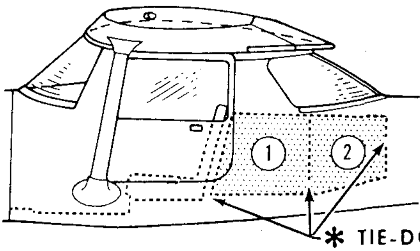
* Pilot or passenger center of gravity on adjustable seats positioned for average occupant. Numbers in parentheses indicate forward and aft limits of occupant center of gravity range.

** Arms measured to the center of the areas shown.

NOTE
The aft baggage wall (approximate station 94) can be used as a convenient interior reference point for determining the location of baggage area fuselage stations.



BAGGAGE LOADING AND TIE-DOWN



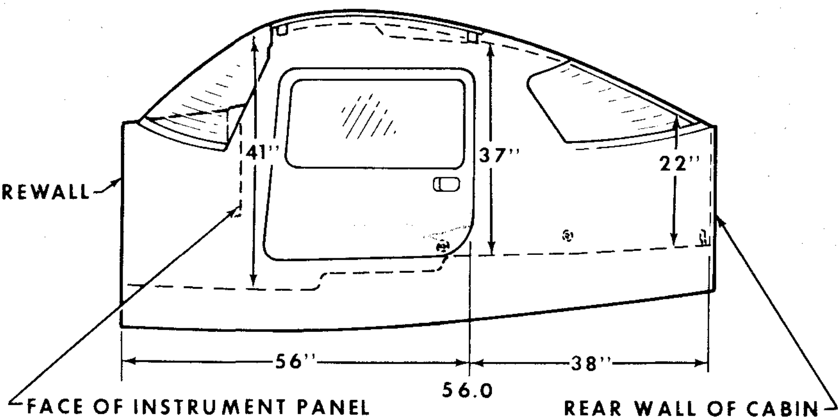
BAGGAGE AREA
MAXIMUM ALLOWABLE LOADS

AREA (1) = 120 POUNDS
AREA (2) = 40 POUNDS
AREAS (1) + (2) = 120 POUNDS

* TIE-DOWN NET ATTACH POINTS

* A cargo tie-down net is provided to secure baggage in the baggage area. The net attaches to six tie-down rings. Two rings are located on the floor just aft of the seat backs and one ring is located two inches above the floor on each cabin wall at the aft end of area (1). Two additional rings are located at the top, aft end of area (2). At least four rings should be used to restrain the maximum baggage load of 120#.

CABIN HEIGHT MEASUREMENTS

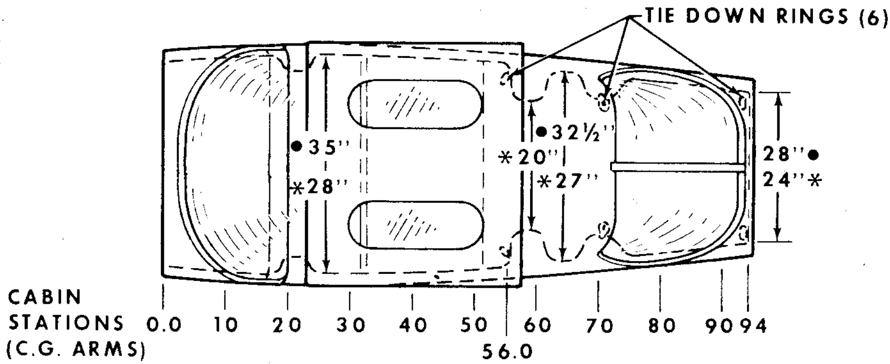


DOOR OPENING DIMENSIONS

WIDTH (TOP)	WIDTH (BOTTOM)	HEIGHT (FRONT)	HEIGHT (REAR)
31"	33¼"	31½	31"

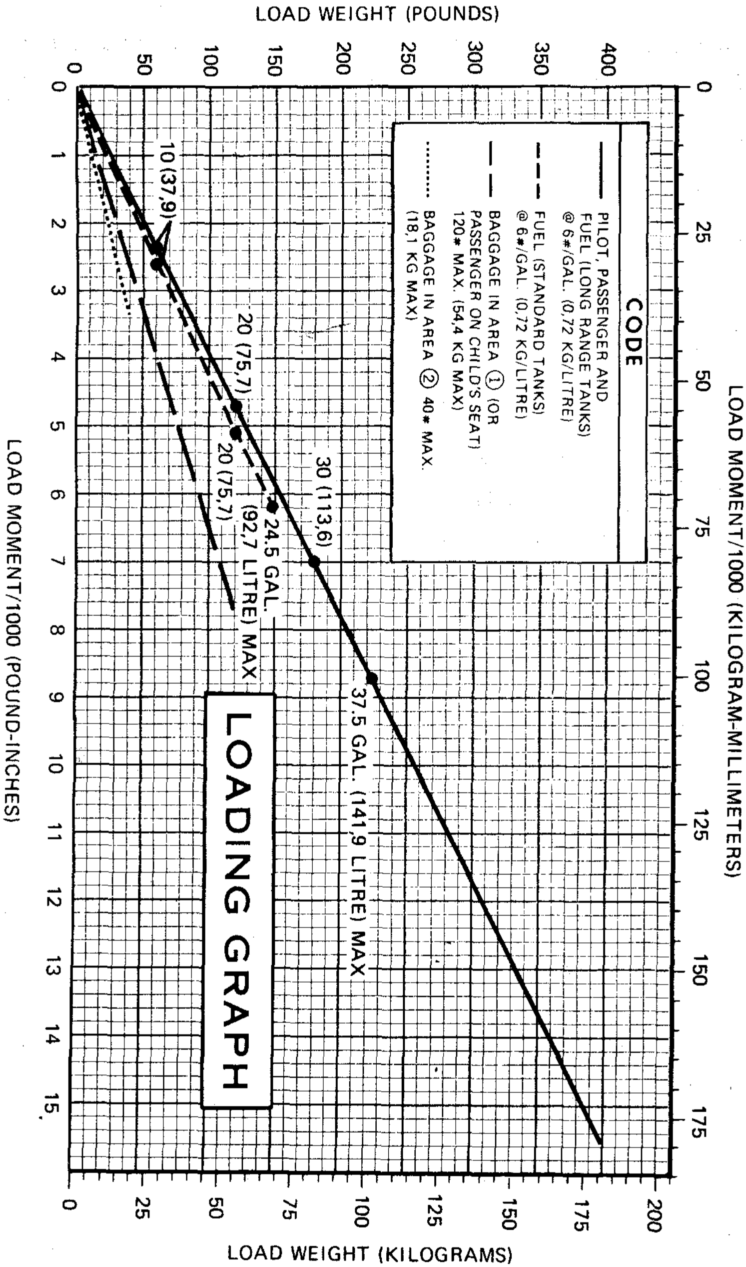
WIDTH
● LWR WINDOW LINE
✻ CABIN FLOOR

CABIN WIDTH MEASUREMENTS

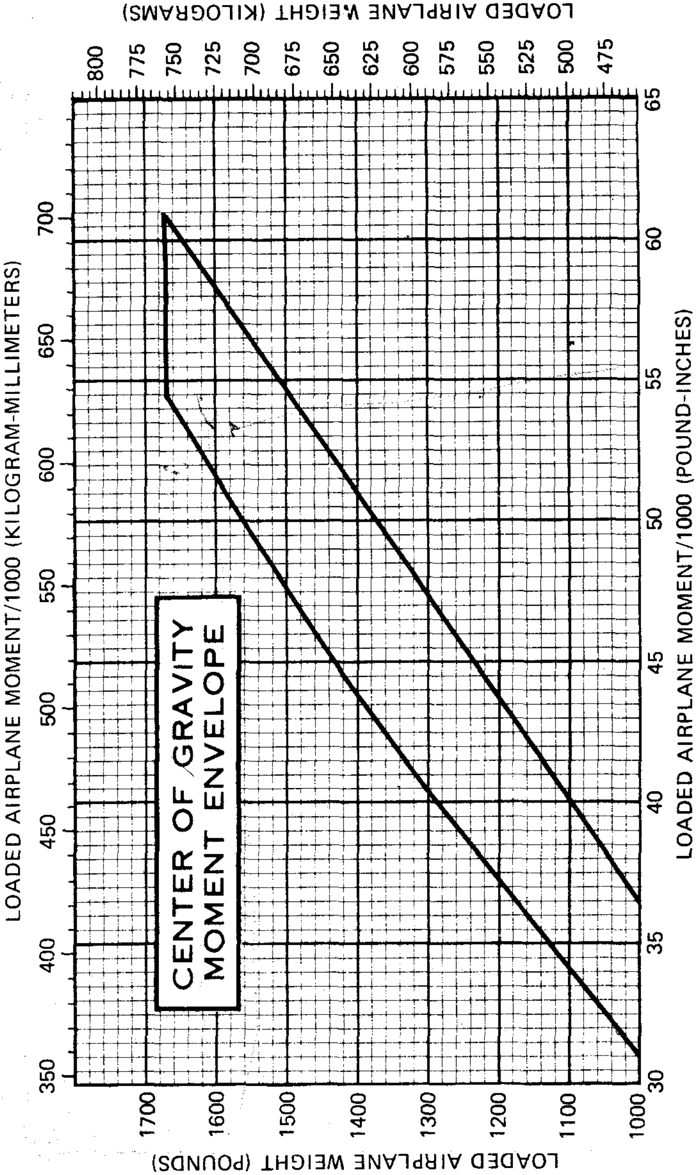


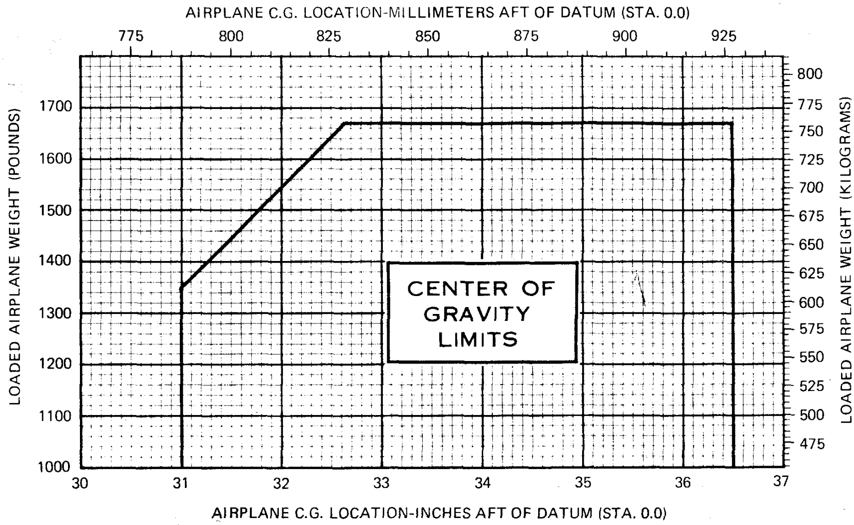
SAMPLE LOADING PROBLEM	SAMPLE AIRPLANE		YOUR AIRPLANE	
	Weight (lbs.)	Moment (lb.-ins. /1000)	Weight (lbs.)	Moment (lb.-ins. /1000)
1. Basic Empty Weight (Use the data pertaining to your airplane as it is presently equipped. Includes unusable fuel and full oil)	1136	34.0		
2. Usable Fuel (At 6 Lbs./Gal.) Standard Tanks (**24.5** Gal. Maximum)	147	6.2		
Long Range Tanks (**37.5** Gal. Maximum)				
Reduced Fuel (As limited by maximum weight)				
3. Pilot and Passenger (Station 33 to 41)	340	13.3		
4. Baggage - Area 1 (Or passenger on child's seat) (Station 50 to 76, 120 Lbs. Max.)	47	3.0		
5. Baggage - Area 2 (Station 76 to **94**, 40 Lbs. Max.)				
6. TOTAL WEIGHT AND MOMENT	1670	56.5		

7. Locate this point (**1670 at 56.5**) on the Center of Gravity Moment Envelope, and since this point falls within the envelope, the loading is acceptable.



NOTES: Line representing adjustable seats shows the pilot or passenger center of gravity on adjustable seats positioned for an average occupant. Refer to the Loading Arrangements Diagram for forward and aft limits of occupant C.G. range.


CENTER OF GRAVITY
MOMENT ENVELOPE
LOADED AIRPLANE WEIGHT (KILOGRAMS)
800
775
750
725
700
675
650
625
600
575
550
525
500
475
LOADED AIRPLANE MOMENT/1000 (KILOGRAM-MILLIMETERS)
350
400
450
500
550
600
650
700
LOADED AIRPLANE MOMENT/1000 (POUND-INCHES)
30
35
40
45
50
55
60
65
LOADED AIRPLANE WEIGHT (POUNDS)
1700
1600
1500
1400
1300
1200
1100
1000


AIRPLANE C.G. LOCATION-MILLIMETERS AFT OF DATUM (STA. 0.0)
775
800
825
850
875
900
925
LOADED AIRPLANE WEIGHT (POUNDS)
1700
1600
1500
1400
1300
1200
1100
1000
800
775
750
725
700
675
650
625
600
575
550
525
500
475
LOADED AIRPLANE WEIGHT (KILOGRAMS)
CENTER OF GRAVITY LIMITS
30
31
32
33
34
35
36
37
AIRPLANE C.G. LOCATION-INCHES AFT OF DATUM (STA. 0.0)

LIMITATIONS

INTRODUCTION

Section includes operating limitations, instrument markings, and basic placards necessary for the safe operation of the airplane, its engine, standard systems and standard equipment. The limitations included in this section have been approved by the Federal Aviation Administration. When applicable, limitations associated with optional systems or equip ment are included in Section 9.

Your Cessna is certificated under FAA Type Certificate No. 3A19 as Cessna Model No. 152.

AIRSPEED LIMITATIONS

Airspeed limitations and their operational significance are shown in figure 2-1.

	SPEED	KCAS	KIAS	REMARKS
V_{NE}	Never Exceed Speed	145	149	Do not exceed this speed in any operation.
V_{NO}	Maximum Structural Cruising Speed	108	111	Do not exceed this speed except in smooth air, and then only with caution.
V_A	Maneuvering Speed: 1670 Pounds 1500 Pounds 1350 Pounds	 101 96 91	 104 98 93	Do not make full or abrupt control movements above this speed.
V_{FE}	Maximum Flap Extended Speed	87	85	Do not exceed this speed with flaps down.
	Maximum Window Open Speed	139	143	Do not exceed this speed with windows open.

AIRSPEED INDICATOR MARKINGS

Airspeed indicator markings and their color code significance are shown in figure 2-2.

MARKING	KIAS VALUE OR RANGE	SIGNIFICANCE
White Arc	35 - 85	Full Flap Operating Range. Lower limit is maximum weight V_{S_0} in landing configuration. Upper limit is maximum speed permissible with flaps extended.
Green Arc	40 - 111	Normal Operating Range. Lower limit is maximum weight V_S at most forward C.G. with flaps retracted. Upper limit is maximum structural cruising speed.
Yellow Arc	111 - 149	Operations must be conducted with caution and only in smooth air.
Red Line	149	Maximum speed for all operations.

Figure 2-2. Airspeed Indicator Markings

POWER PLANT LIMITATIONS
Engine Manufacturer: Avco Lycoming.
Engine Model Number: O-235-L2C.
Engine Operating Limits for Takeoff and Continuous Operations:
Maximum Power: 110 BHP.
Maximum Engine Speed: 2550 RPM.

NOTE

The static RPM range at full throttle (carburetor heat off and mixture leaned to maximum RPM) is 2280 to 2380 RPM.

Maximum Oil Temperature: 118°C (245°F).
Oil Pressure, Minimum: 25 psi.
Maximum: 100 psi.
Propeller Manufacturer: McCauley Accessory Division.
Propeller Model Number: 1A103/TCM6958.
Propeller Diameter, Maximum: 69 inches.
Minimum: 67.5 inches.

POWER PLANT INSTRUMENT MARKINGS

Power plant instrument markings and their color code significance are shown in figure 2-3.

INSTRUMENT	RED LINE	GREEN ARC	RED LINE
	MINIMUM LIMIT	NORMAL OPERATING	MAXIMUM LIMIT
Tachometer	- - -	1900 - 2550 RPM	2550 RPM
Oil Temperature	- - -	100° - 245°F	245°F
Oil Pressure	25 psi	60 - 90 psi	100 psi

Figure 2-3. Power Plant Instrument Markings

WEIGHT LIMITS

Maximum Takeoff Weight: 1670 lbs.
Maximum Landing Weight: 1670 lbs.
Maximum Weight in Baggage Compartment:
Baggage Area 1 (or passenger on child's seat) - Station 50 to 76: 120 lbs. See note below.
Baggage Area 2 - Station 76 to 94: 40 lbs. See note below,

NOTE

The maximum combined weight capacity for baggage areas 1 and 2 is 120 lbs.

CENTER OF GRAVITY LIMITS

Center of Gravity Range:
Forward: 31.0 inches aft of datum at 1350 lbs. or less, with straight line variation to 32.65 inches aft of datum at 1670 lbs.
Aft: 36.5 inches aft of datum at all weights.
Reference Datum: Front face of firewall.

MANEUVER LIMITS

This airplane is certificated in the utility category and is designed for limited aerobatic flight. In the acquisition of various certificates such as commercial pilot, instrument pilot and flight instructor, certain maneuv ers are required. All of these maneuvers are permitted in this airplane.

No aerobatic maneuvers are approved except those listed below:

MANEUVER	MAXIMUM ENTRY SPEED*
Chandelles	95 knots
Lazy Eights	95 knots
Steep Turns	95 knots
Spins	Use Slow Deceleration
Stalls (Except Whip Stalls)	Use Slow Deceleration

Higher speeds can be used if abrupt use of the controls is avoided.

Aerobatics that may impose high loads should not be attempted. The important thing to bear in mind in flight maneuvers is that the airplane is clean in aerodynamic design and will build up speed quickly with the nose down. Proper speed control is an essential requirement for execution of any maneuver, and care should always be exercised to avoid excessive speed which in turn can impose excessive loads. In the execution of all maneuvers, avoid abrupt use of controls.

FLIGHT LOAD FACTOR LIMITS

Flight Load Factors:

*Flaps Up: +4.4g. -1.76g

*Flaps Down: ÷3.5g

*The design load factors are 150% of the above, and in all cases, the structure meets or exceeds design loads.

KINDS OF OPERATION LIMITS

The airplane is equipped for day VFR and may be equipped for night VFR and/or IFR operations. FAR Part 91 establishes the minimum required instrumentation and equipment for these operations. The reference to types of flight operations on the operating limitations placard reflects equipment installed at the time of Airworthiness Certificate issuance.

Flight into known icing conditions is prohibited.

FUEL LIMITATIONS

Standard Tanks: 13 U.S. gallons each.
Total Fuel: 26 U.S. gallons.
Usable Fuel (all flight conditions): 24.5 U.S. gallons.
Unusable Fuel: 1.5 U.S. gallons.

NOTE

Due to cross-feeding between fuel tanks, the tanks should be re-topped after each refueling to assure maximum capacity.

NOTE

Takeoffs have not been demonstrated with less than 2 gallons total fuel (1 gallon per tank).

Approved Fuel Grades (and Colors):
100LL Grade Aviation Fuel (Blue).
100 (Formerly 100/130) Grade Aviation Fuel (Green).

PLACARDS

The following information is displayed in the form of composite or individual placards.

1. In full view of the pilot: (The "DAY-NIGHT-VFR-IFR" entry, shown on the example below, will vary as the airplane is equipped.)

This airplane is approved in the utility category and must be operated in compliance with the operating limitations as stated in the form of placards, markings and manuals.

MAXIMUMS

MANEUVERING SPEED (IAS) . . . . 104 knots
GROSS WEIGHT . . . . 1670 lbs
FLIGHT LOAD FACTOR Flaps Up . . . +4.4, -1.76
Flaps Down . . . . . +3.5

NO ACROBATIC MANEUVERS APPROVED EXCEPT THOSE LISTED BELOW

Maneuver	Recm. Entry Speed	Maneuver	Recm. Entry Speed
Chandelles	95 knots	Spins	Slow Deceleration
Lazy Eights	95 knots	Stalls (except whip stalls).	Slow Deceleration
Steep Turns	95 knots		

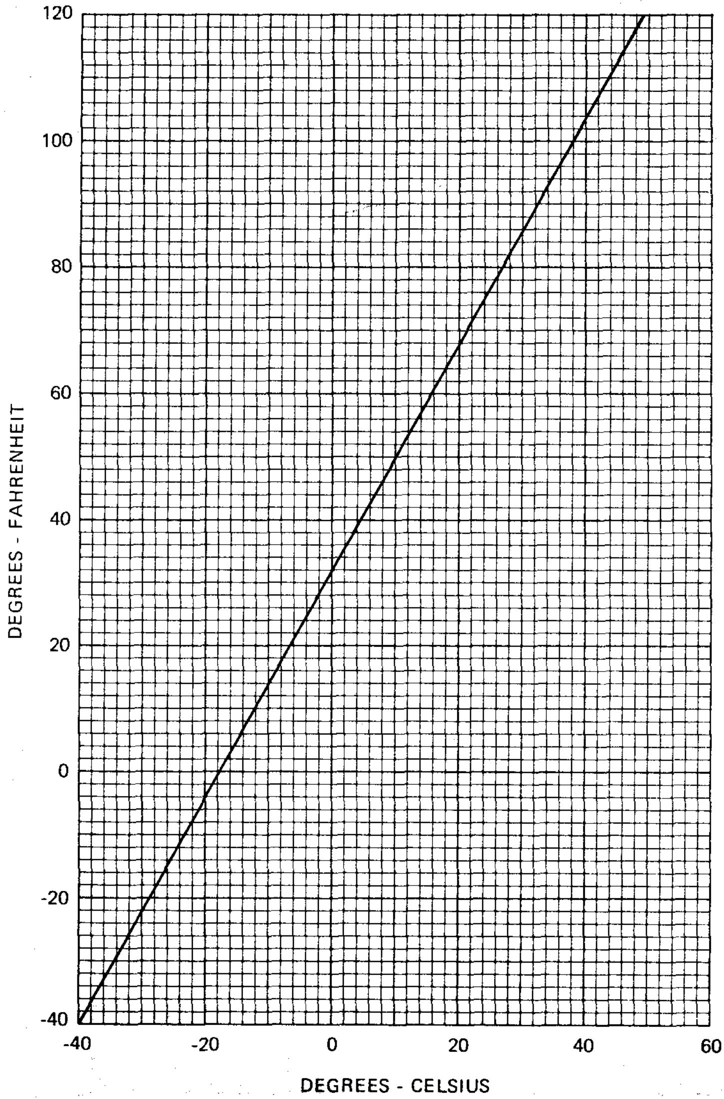
Abrupt use of controls prohibited above 104 knots. Intentional spins with flaps extended are prohibited. Altitude loss in stall recovery - 160 ft. Flight into known icing conditions prohibited. This airplane is certified for the following flight operations as of date of original airworthiness certificate:
DAY - NIGHT - VFR - IFR

2. In the baggage compartment:

120 lbs. maximum baggage and/or auxiliary seat passenger. For additional loading instructions see Weight and Balance Data.

PERFORMANCE

TEMPERATURE CONVERSION CHART



STALL SPEEDS
CONDITIONS:
Power Off
NOTE:
KIAS values are approximate and are based on airspeed calibration data with power off.

MOST REARWARD CENTER OF GRAVITY

WEIGHT LBS	FLAP DEFLECTION	ANGLE OF BANK							
		0°		30°		45°		60°	
		KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
1670	UP	36	46	39	49	43	55	51	65
	10°	36	43	39	46	43	51	51	61
	30°	31	41	33	44	37	49	44	58

MOST FORWARD CENTER OF GRAVITY

WEIGHT LBS	FLAP DEFLECTION	ANGLE OF BANK							
		0°		30°		45°		60°	
		KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
1670	UP	40	48	43	52	48	57	57	68
	10°	40	46	43	49	48	55	57	65
	30°	35	43	38	46	42	51	49	61

TAKEOFF DISTANCE

SHORT FIELD

CONDITION:
Flaps 10°
Full Throttle Prior to Brake Release
Paved, Level, Dry Runway
Zero Wind

NOTES:
1. Short field technique as specified in Section 4.
2. Prior to takeoff from fields above 3000 feet elevation, the mixture should be leaned to give maximum RPM in a full throttle, static runup.
3. Decrease distances 10% for each 9 knots headwind. For operation with tailwinds up to 10 knots, increase distances by 10% for each 2 knots.
4. For operation on a dry, grass runway, increase distances by 15% of the "ground roll" figure.

WEIGHT LBS	TAKEOFF SPEED KIAS		PRESS ALT FT	0°C		10°C		20°C		30°C		40°C	
	LIFT OFF	AT 50 FT		GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS
1670	50	54	S.L.	640	1190	695	1290	755	1390	810	1495	875	1605
			1000	705	1310	765	1420	825	1530	890	1645	960	1770
			2000	775	1445	840	1565	910	1690	980	1820	1055	1960
			3000	855	1600	925	1730	1000	1870	1080	2020	1165	2185
			4000	940	1775	1020	1920	1100	2080	1190	2250	1285	2440
			5000	1040	1970	1125	2140	1215	2320	1315	2525	1420	2750
			6000	1145	2200	1245	2395	1345	2610	1455	2855	1570	3125
			7000	1270	2470	1375	2705	1490	2960	1615	3255	1745	3590
			8000	1405	2800	1525	3080	1655	3395	1795	3765	1940	4195

RATE OF CLIMB

MAXIMUM

CONDITIONS:
Flaps Up
Full Throttle
NOTE:
Mixture leaned above 3000 feet for maximum RPM.

WEIGHT LBS	PRESS ALT FT	CLIMB SPEED KIAS	RATE OF CLIMB - FPM			
			-20°C	0°C	20°C	40°C
1670	S.L.	67	835	765	700	630
	2000	66	735	670	600	535
	4000	65	635	570	505	445
	6000	63	535	475	415	355
	8000	62	440	380	320	265
	10,000	61	340	285	230	175
	12,000	60	245	190	135	85

CONDITIONS:
Flaps Up
Full Throttle
Standard Temperature
NOTES:

1. Add 0.8 of a gallon of fuel for engine start, taxi and takeoff allowance.
2. Mixture leaned above 3000 feet for maximum RPM.
3. Increase time, fuel and distance by 10% for each 10℃ above standard temperature.
4. Distances shown are based on zero wind.

WEIGHT LBS	PRESSURE ALTITUDE FT	TEMP °C	CLIMB SPEED KIAS	RATE OF CLIMB FPM	FROM SEA LEVEL		
					TIME MIN	FUEL USED GALLONS	DISTANCE NM
1670	S.L.	15	67	715	0	0	0
	1000	13	66	675	1	0.2	2
	2000	11	66	630	3	0.4	3
	3000	9	65	590	5	0.7	5
	4000	7	65	550	6	0.9	7
	5000	5	64	505	8	1.2	9
	6000	3	63	465	10	1.4	12
	7000	1	63	425	13	1.7	14
	8000	-1	62	380	15	2.0	17
	9000	-3	62	340	18	2.3	21
	10,000	-5	61	300	21	2.6	25
	11,000	-7	61	255	25	3.0	29
	12,000	-9	60	215	29	3.4	34

CRUISE PERFORMANCE

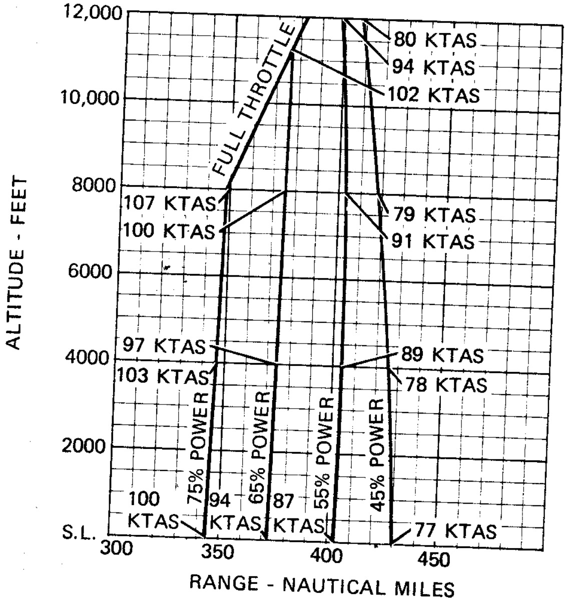
CONDITIONS:
1670 Pounds
Recommended Lean Mixture (See Section 4, Cruise)

NOTE:
Cruise speeds are shown for an airplane equipped with speed fairings which increase the speeds by approximately two knots.

PRESSURE ALTITUDE FT	RPM	20°C BELOW STANDARD TEMP			STANDARD TEMPERATURE			20°C ABOVE STANDARD TEMP		
		% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2000	2400	---	---	---	75	101	6.1	70	101	5.7
	2300	71	97	5.7	66	96	5.4	63	95	5.1
	2200	62	92	5.1	59	91	4.8	56	90	4.6
	2100	55	87	4.5	53	86	4.3	51	85	4.2
	2000	49	81	4.1	47	80	3.9	46	79	3.8
4000	2450	---	---	---	75	103	6.1	70	102	5.7
	2400	76	102	6.1	71	101	5.7	67	100	5.4
	2300	67	96	5.4	63	95	5.1	60	95	4.9
	2200	60	91	4.8	56	90	4.6	54	89	4.4
	2100	53	86	4.4	51	85	4.2	49	84	4.0
	2000	48	81	3.9	46	80	3.8	45	78	3.7
6000	2500	---	---	---	75	105	6.1	71	104	5.7
	2400	72	101	5.8	67	100	5.4	64	99	5.2
	2300	64	96	5.2	60	95	4.9	57	94	4.7
	2200	57	90	4.6	54	89	4.4	52	88	4.3
	2100	51	85	4.2	49	84	4.0	48	83	3.9
	2000	46	80	3.8	45	79	3.7	44	77	3.6
8000	2550	---	---	---	75	107	6.1	71	106	5.7
	2500	76	105	6.2	71	104	5.8	67	103	5.4
	2400	68	100	5.5	64	99	5.2	61	98	4.9
	2300	61	95	5.0	58	94	4.7	55	93	4.5
	2200	55	90	4.5	52	89	4.3	51	87	4.2
	2100	49	84	4.1	48	83	3.9	46	82	3.8
10,000	2500	72	105	5.8	68	103	5.5	64	103	5.2
	2400	65	99	5.3	61	98	5.0	58	97	4.8
	2300	58	94	4.7	56	93	4.5	53	92	4.4
	2200	53	89	4.3	51	88	4.2	49	86	4.0
	2100	48	83	4.0	46	82	3.9	45	81	3.8
12,000	2450	65	101	5.3	62	100	5.0	59	99	4.8
	2400	62	99	5.0	59	97	4.8	56	96	4.6
	2300	56	93	4.6	54	92	4.4	52	91	4.3
	2200	51	88	4.2	49	87	4.1	48	85	4.0
	2100	47	82	3.9	45	81	3.8	44	79	3.7

RANGE PROFILE 45 MINUTES RESERVE
24.5 GALLONS USABLE FUEL

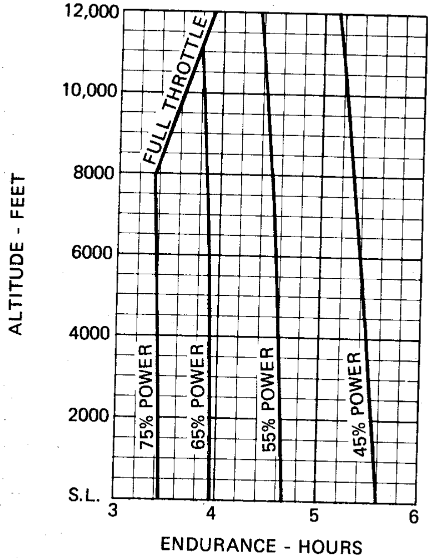
CONDITIONS:
1670 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature
Zero Wind
NOTES:
1. This chart allows for the fuel used for engine start, taxi, takeoff and climb, and the distance during climb as shown in figure 5-6.
2. Reserve fuel is based on 45 minutes at 45% BHP and is 2.8 gallons.
3. Performance is shown for an airplane equipped with speed fairings which increase the cruise speeds by approximately two knots.



CONDITIONS:
1670 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature
ENDURANCE PROFILE
45 MINUTES RESERVE
24.5 GALLONS USABLE FUEL
2.
NOTES:

1. This chart allows for the fuel used for engine start, taxi, takeoff and climb, and the time during climb as shown in figure 5-6.

Reserve fuel is based on 45 minutes at 45% BHP and is 2.8 gallons.



LANDING DISTANCE

SHORT FIELD

CONDITIONS:
Flaps 30°
Power Off
Maximum Braking
Paved, Level, Dry Runway
Zero Wind

NOTES:
1. Short field technique as specified in Section 4.
2. Decrease distances 10% for each 9 knots headwind. For operation with tailwinds up to 10 knots, increase distances by 10% for each 2 knots.
3. For operation on a dry, grass runway, increase distances by 45% of the "ground roll" figure.

72.

WEIGHT LBS	SPEED AT 50 FT KIAS	PRESS ALT FT	0°C		10°C		20°C		30°C		40°C	
			GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS
1670	54	S.L.	450	1160	465	1185	485	1215	500	1240	515	1265
		1000	465	1185	485	1215	500	1240	520	1270	535	1295
		2000	485	1215	500	1240	520	1270	535	1300	555	1330
		3000	500	1240	520	1275	540	1305	560	1335	575	1360
		4000	520	1275	540	1305	560	1335	580	1370	600	1400
		5000	540	1305	560	1335	580	1370	600	1400	620	1435
		6000	560	1340	580	1370	605	1410	625	1440	645	1475
		7000	585	1375	605	1410	625	1440	650	1480	670	1515
		8000	605	1410	630	1450	650	1480	675	1520	695	1555

WEIGHT & BALANCE EQUIPMENT LIST

WEIGHT AND BALANCE

The following information will enable you to operate your Cessna within the prescribed weight and center of gravity limitations. To figure weight and balance, use the Sample Problem, Loading Graph, and Center of Gravity Moment Envelope as follows:

Take the basic empty weight and moment from appropriate weight and balance records carried in your airplane, and enter them in the column titled YOUR AIRPLANE on the Sample Loading Problem.

NOTE

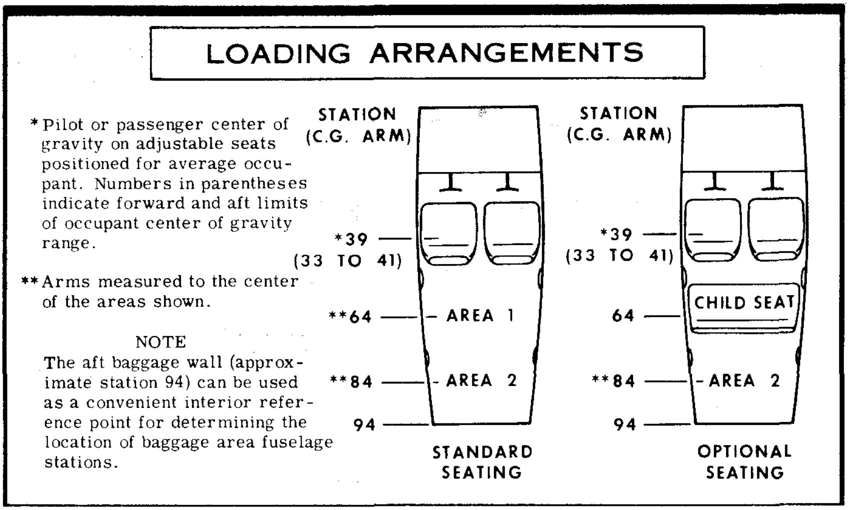
In addition to the basic empty weight and moment noted on these records, the C.G. arm (fuselage station) is also shown, but need not be used on the Sample Loading Problem. The moment which is shown must be divided by 1000 and this value used as the moment 1000 on the loading problem.

Use the Loading Graph to determine the moment/1000 for each additional item to be carried; then list these on the loading problem.

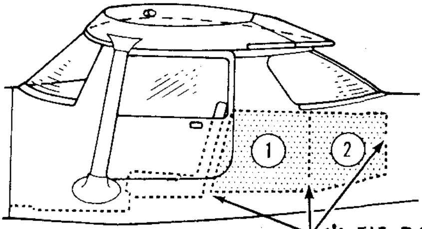
NOTE

Loading Graph information for the pilot, passengers and baggage is based on seats positioned for average occupants and baggage loaded in the center of the baggage areas as shown on the Loading Arrangements diagram. For loadings which may differ from these, the Sample Loading Problem lists fuselage stations for these items to indicate their forward and

aft C.G. range limitation (seat travel and baggage area limitation). Additional moment calculations, based on the actual weight and C.G. arm (fuselage station) of the item being loaded, must be made if the position of the load is different from that shown on the Loading Graph.
Total the weights and moments/1000 and plot these values on the Center of Gravity Moment Envelope to determine whether the point falls within the envelope, and if the loading is acceptable.



BAGGAGE LOADING AND TIE-DOWN



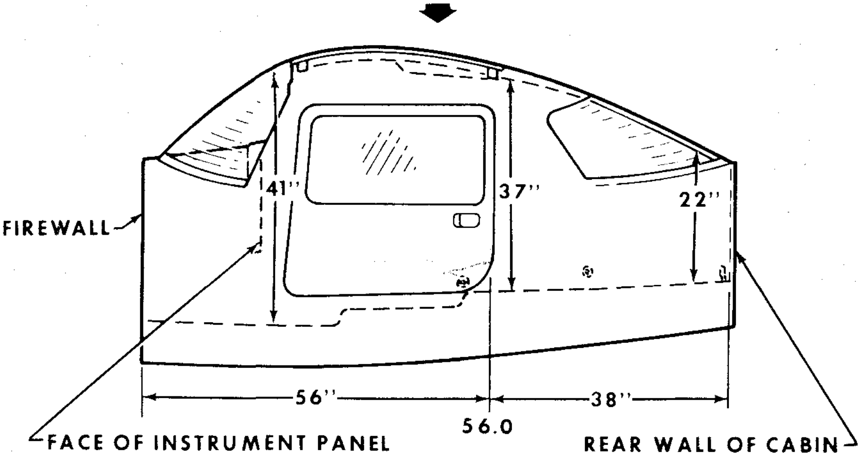
BAGGAGE AREA
MAXIMUM ALLOWABLE LOADS

AREA (1) = 120 POUNDS
AREA (2) = 40 POUNDS
AREAS (1) + (2) = 120 POUNDS

* TIE-DOWN NET ATTACH POINTS

* A cargo tie-down net is provided to secure baggage in the baggage area. The net attaches to six tie-down rings. Two rings are located on the floor just aft of the seat backs and one ring is located two inches above the floor on each cabin wall at the aft end of area (1). Two additional rings are located at the top, aft end of area (2). At least four rings should be used to restrain the maximum baggage load of 120#.

CABIN HEIGHT MEASUREMENTS

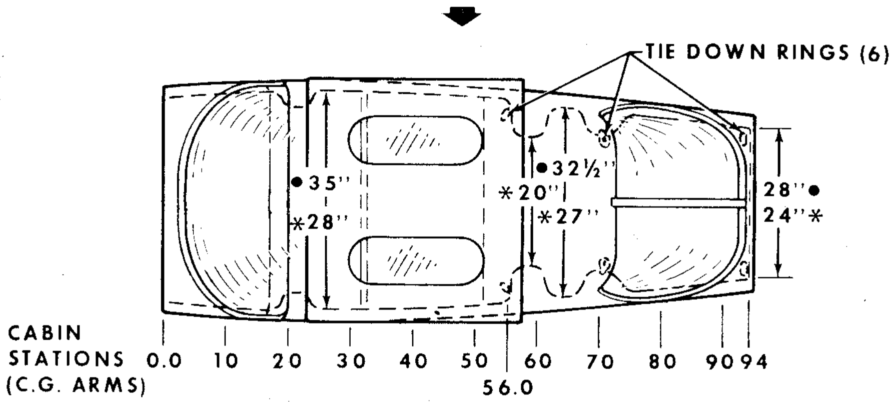


DOOR OPENING DIMENSIONS

WIDTH (TOP)	WIDTH (BOTTOM)	HEIGHT (FRONT)	HEIGHT (REAR)
31''	33¼''	31½	31''

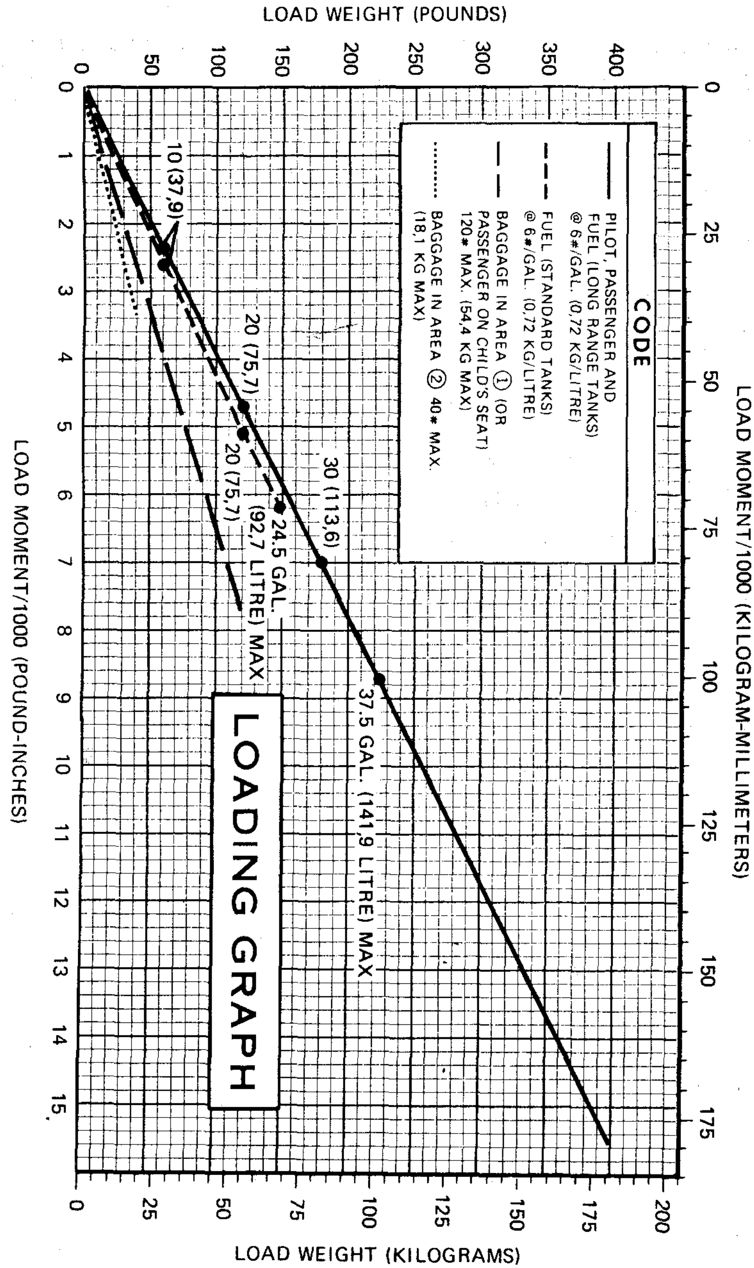
═ WIDTH ═
● LWR WINDOW LINE
* CABIN FLOOR

CABIN WIDTH MEASUREMENTS

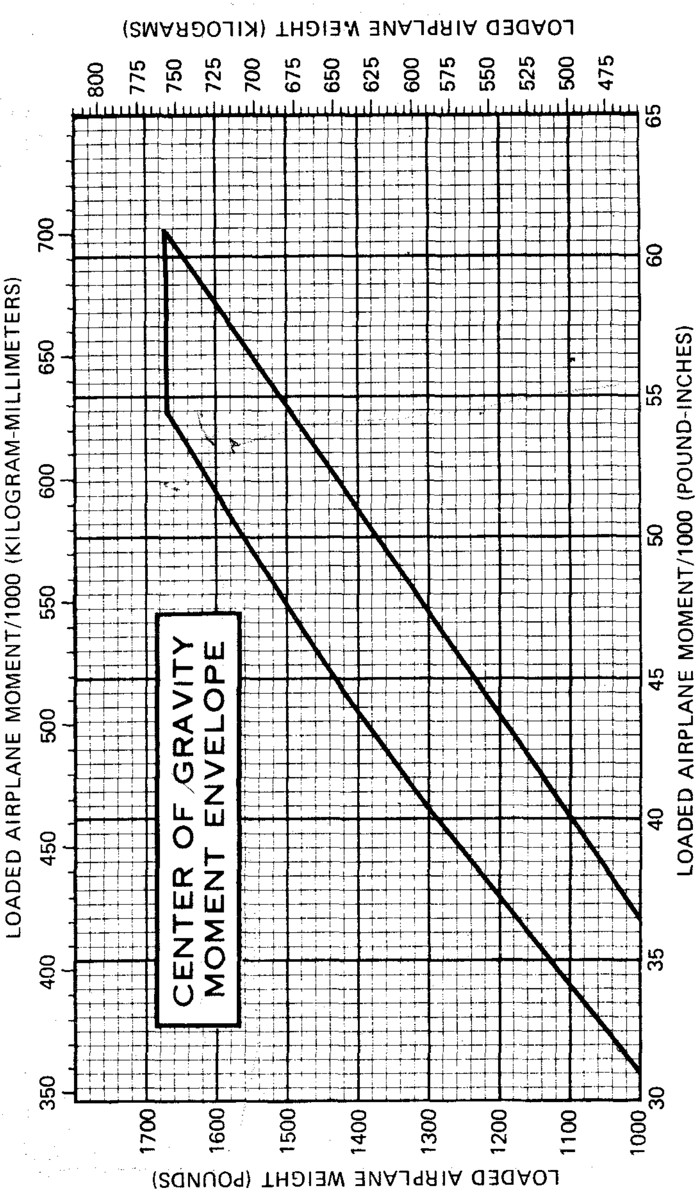


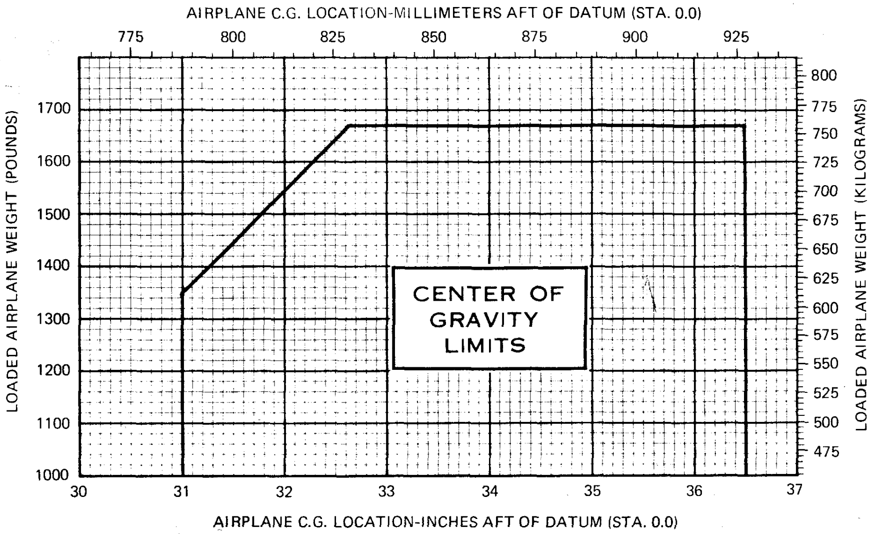
SAMPLE LOADING PROBLEM	SAMPLE AIRPLANE		YOUR AIRPLANE	
	Weight (lbs.)	Moment (lb.-ins. /1000)	Weight (lbs.)	Moment (lb.-ins. /1000)
1. Basic Empty Weight (Use the data pertaining to your airplane as it is presently equipped. Includes unusable fuel and full oil)	1136	34.0		
2. Usable Fuel (At 6 Lbs./Gal.) Standard Tanks (**24.5** Gal. Maximum)	147	6.2		
Long Range Tanks (**37.5** Gal. Maximum)				
Reduced Fuel (As limited by maximum weight)				
3. Pilot and Passenger (Station 33 to 41)	340	13.3		
4. Baggage - Area 1 (Or passenger on child's seat) (Station 50 to 76, 120 Lbs. Max.)	47	3.0		
5. Baggage - Area 2 (Station 76 to **94**, 40 Lbs. Max.)				
6. TOTAL WEIGHT AND MOMENT	1670	56.5		

7. Locate this point (**1670 at 56.5**) on the Center of Gravity Moment Envelope, and since this point falls within the envelope, the loading is acceptable.



NOTES: Line representing adjustable seats shows the pilot or passenger center of gravity on adjustable seats positioned for an average occupant. Refer to the Loading Arrangements Diagram for forward and aft limits of occupant C.G. range.


CENTER OF GRAVITY MOMENT ENVELOPE
LOADED AIRPLANE WEIGHT (KILOGRAMS)
800
775
750
725
700
675
650
625
600
575
550
525
500
475
LOADED AIRPLANE MOMENT/1000 (KILOGRAM-MILLIMETERS)
350
400
450
500
550
600
650
700
LOADED AIRPLANE MOMENT/1000 (POUND-INCHES)
30
35
40
45
50
55
60
65
LOADED AIRPLANE WEIGHT (POUNDS)
1700
1600
1500
1400
1300
1200
1100
1000



LIMITATIONS

INTRODUCTION

Section includes operating limitations, instrument markings, and basic placards necessary for the safe operation of the airplane, its engine, standard systems and standard equipment. The limitations included in this section have been approved by the Federal Aviation Administration. When applicable, limitations associated with optional systems or equipment are included in Section 9.

Your Cessna is certificated under FAA Type Certificate No. 3A19 as Cessna Model No. 152.

AIRSPEED LIMITATIONS

Airspeed limitations and their operational significance are shown in figure 2-1.

	SPEED	KCAS	KIAS	REMARKS
V_{NE}	Never Exceed Speed	145	149	Do not exceed this speed in any operation.
V_{NO}	Maximum Structural Cruising Speed	108	111	Do not exceed this speed except in smooth air, and then only with caution.
V_A	Maneuvering Speed: 1670 Pounds 1500 Pounds 1350 Pounds	 101 96 91	 104 98 93	Do not make full or abrupt control movements above this speed.
V_{FE}	Maximum Flap Extended Speed	87	85	Do not exceed this speed with flaps down.
	Maximum Window Open Speed	139	143	Do not exceed this speed with windows open.

AIRSPEED INDICATOR MARKINGS

Airspeed indicator markings and their color code significance are shown in figure 2-2.

MARKING	KIAS VALUE OR RANGE	SIGNIFICANCE
White Arc	**35 - 85**	Full Flap Operating Range. Lower limit is maximum weight V_{S_O} in landing configuration. Upper limit is maximum speed permissible with flaps extended.
Green Arc	**40 - 111**	Normal Operating Range. Lower limit is maximum weight V_S at most forward C.G. with flaps retracted. Upper limit is maximum structural cruising speed.
Yellow Arc	**111 - 149**	Operations must be conducted with caution and only in smooth air.
Red Line	**149**	Maximum speed for all operations.

POWER PLANT LIMITATIONS

Engine Manufacturer: Avco Lycoming.

Engine Model Number: O-235-L2C.

Engine Operating Limits for Takeoff and Continuous Operations:
Maximum Power: 110 BHP.
Maximum Engine Speed: 2550 RPM.
NOTE
The static RPM range at full throttle (carburetor heat off and mixture leaned to maximum RPM) is 2280 to 2380 RPM.
Maximum Oil Temperature: 118°C (245°F).
Oil Pressure, Minimum: 25 psi.
Maximum: 100 psi.
Propeller Manufacturer: McCauley Accessory Division.
Propeller Model Number: 1A103/TCM6958.
Propeller Diameter, Maximum: 69 inches.
Minimum: 67.5 inches.

POWER PLANT INSTRUMENT MARKINGS
Power plant instrument markings and their color code significance are shown in figure 2-3.

INSTRUMENT	RED LINE MINIMUM LIMIT	GREEN ARC NORMAL OPERATING	RED LINE MAXIMUM LIMIT
Tachometer	- - -	1900 - 2550 RPM	2550 RPM
Oil Temperature	- - -	100° - 245°F	245°F
Oil Pressure	25 psi	60 - 90 psi	100 psi

Figure 2-3. Power Plant Instrument Markings

WEIGHT LIMITS
Maximum Takeoff Weight: 1670 lbs.
Maximum Landing Weight: 1670 lbs.
Maximum Weight in Baggage Compartment:
Baggage Area 1 (or passenger on child's seat) - Station 50 to 76: 120 lbs. See note below.
Baggage Area 2 - Station 76 to 94: 40 lbs. See note below,
NOTE
The maximum combined weight capacity for baggage areas 1 and 2 is 120 lbs.

CENTER OF GRAVITY LIMITS

Center of Gravity Range:
Forward: 31.0 inches aft of datum at 1350 lbs. or less, with straight line variation to 32.65 inches aft of datum at 1670 lbs.
Aft: 36.5 inches aft of datum at all weights. Reference Datum: Front face of firewall.

MANEUVER LIMITS
This airplane is certificated in the utility category and is designed for limited aerobatic flight. In the acquisition of various certificates such as commercial pilot, instrument pilot and flight instructor, certain maneuv ers are required. All of these maneuvers are permitted in this airplane.
No aerobatic maneuvers are approved except those listed below:

MANEUVER	MAXIMUM ENTRY SPEED*
Chandelles	95 knots
Lazy Eights	95 knots
Steep Turns	95 knots
Spins	Use Slow Deceleration
Stalls (Except Whip Stalls)	Use Slow Deceleration

*Higher speeds can be used if abrupt use of the controls is avoided.

Aerobatics that may impose high loads should not be attempted. The important thing to bear in mind in flight maneuvers is that the airplane is clean in aerodynamic design and will build up speed quickly with the nose down. Proper speed control is an essential requirement for execution of any maneuver, and care should always be exercised to avoid excessive speed which in turn can impose excessive loads. In the execution of all maneuvers, avoid abrupt use of controls.

FLIGHT LOAD FACTOR LIMITS
Flight Load Factors:
*Flaps Up: +4.4g. -1.76g
*Flaps Down: ÷3.5g
*The design load factors are 150% of the above, and in all cases, the structure meets or exceeds design loads.

KINDS OF OPERATION LIMITS
The airplane is equipped for day VFR and may be equipped for night VFR and/or IFR operations. FAR Part 91 establishes the minimum required instrumentation and equipment for these operations. The reference to

types of flight operations on the operating limitations placard reflects equipment installed at the time of Airworthiness Certificate issuance.
Flight into known icing conditions is prohibited.

FUEL LIMITATIONS
2 Standard Tanks: 13 U.S. gallons each.
Total Fuel: 26 U.S. gallons.
Usable Fuel (all flight conditions): 24.5 U.S. gallons.
Unusable Fuel: 1.5 U.S. gallons.

NOTE
Due to cross-feeding between fuel tanks, the tanks should be re-topped after each refueling to assure maximum capacity.
NOTE
Takeoffs have not been demonstrated with less than 2 gallons total fuel (1 gallon per tank).
Approved Fuel Grades (and Colors):
100LL Grade Aviation Fuel (Blue).
100 (Formerly 100/130) Grade Aviation Fuel (Green).

PLACARDS
The following information is displayed in the form of composite or individual placards.
1. In full view of the pilot: (The “DAY-NIGHT-VFR-IFR” entry, shown on the example below, will vary as the airplane is equipped.)

This airplane is approved in the utility category and must be operated in compliance with the operating limitations as stated in the form of placards, markings and manuals.

MAXIMUMS

MANEUVERING SPEED (IAS) . . . . 104 knots
GROSS WEIGHT . . . . 1670 lbs
FLIGHT LOAD FACTOR Flaps Up . . . +4.4, -1.76
Flaps Down . . . . . +3.5

NO ACROBATIC MANEUVERS APPROVED EXCEPT THOSE LISTED BELOW

Maneuver	Recm. Entry Speed	Maneuver	Recm. Entry Speed
Chandelles	95 knots	Spins . . .	Slow Deceleration
Lazy Eights	95 knots	Stalls (except whip stalls).	Slow Deceleration
Steep Turns	95 knots		

Abrupt use of controls prohibited above 104 knots. Intentional spins with flaps extended are prohibited. Altitude loss in stall recovery - 160 ft. Flight into known icing conditions prohibited. This airplane is certified for the following flight operations as of date of original airworthiness certificate:

DAY - NIGHT - VFR - IFR

2. In the baggage compartment:

120 lbs. maximum baggage and/or auxiliary seat passenger. For additional loading instructions see Weight and Balance Data.

3. Near fuel shutoff valve (standard tanks):

FUEL - 24.5 GALS - ON-OFF

Near fuel shutoff valve (long range tanks):

FUEL - 37.5 GALS - ON-OFF

4. Near fuel tank filler cap (standard tanks):

FUEL 100LL/100 MIN. GRADE AVIATION GASOLINE CAP. 13 U.S. GAL.

Near fuel tank filler cap (long range tanks):

FUEL 100LL/100 MIN. GRADE AVIATION GASOLINE CAP. 19.5 U.S. GAL. CAP 13.0 U.S. GAL. TO BOTTOM OF FILLER COLLAR

5. On the instrument panel near the altimeter:

SPIN RECOVERY 1. VERIFY AILERONS NEUTRAL AND THROTTLE CLOSED 2. APPLY FULL OPPOSITE RUDDER 3. MOVE CONTROL WHEEL BRISKLY FORWARD TO BREAK STALL 4. NEUTRALIZE RUDDER AND RECOVER FROM DIVE

EMERGENCY PROCEDURES

INTRODUCTION

Section provides checklist and amplified procedures for coping with emergencies that may occur. Emergencies caused by airplane or engine malfunctions are extremely rare if proper preflight inspections and maintenance are practiced. Enroute weather emergencies can be minim ized or eliminated by careful flight planning and good judgment when unexpected weather is encountered. However, should an emergency arise, the basic guidelines described in this section should be considered and applied as necessary to correct the problem. Emergency procedures associated with ELT and other optional systems can be found in Section 9.

AIRSPEEDS FOR EMERGENCY OPERATION

Engine Failure After Takeoff	60 KIAS
Maneuvering Speed:	
1670 Lbs	104 KIAS
1500 Lbs	98 KIAS
1350 Lbs	93 KIAS
Maximum Glide	60 KIAS
Precautionary Landing With Engine Power	55 KIAS
Landing Without Engine Power:	
Wing Flaps Up	65 KIAS
Wing Flaps Down	60 KIAS

OPERATIONAL CHECKLISTS

ENGINE FAILURES

ENGINE FAILURE DURING TAKEOFF RUN

1. Throttle -- IDLE.
2. Brakes -- APPLY.
3. Wing Flaps -- RETRACT.
4. Mixture - - IDLE CUT-OFF.
5. Ignition Switch - - OFF.
6. Master Switch - - OFF.

ENGINE FAILURE IMMEDIATELY AFTER TAKEOFF

1. Airspeed -- 60 KIAS.
2. Mixture - - IDLE CUT-OFF.
3. Fuel Shutoff Valve - - OFF.
4. Ignition Switch -- OFF.
5. Wing Flaps -- AS REQUIRED.
6. Master Switch -- OFF.

ENGINE FAILURE DURING FLIGHT

1. Airspeed -- 60 KIAS.

2. Carburetor Heat -- ON.
3. Primer -- IN and LOCKED.
4. Fuel Shutoff Valve -- ON.
5. Mixture - - RICH.
6. Ignition Switch -- BOTH (or START if propeller is stopped).

ENGINE FAILURE DURING FLIGHT

1. Airspeed -- 60 KIAS.
2. Carburetor Heat -- ON.
3. Primer -- IN and LOCKED.
4. Fuel Shutoff Valve -- ON.
5. Mixture - - RICH.
6. Ignition Switch -- BOTH (or START if propeller is stopped).

FORCED LANDINGS

EMERGENCY LANDING WITHOUT ENGINE POWER

1. Airspeed -- 65 KIAS (flaps UP).
60 KIAS (flaps DOWN).
2. Mixture -- IDLE CUT-OFF.
3. Fuel Shutoff Valve -- OFF.
4. Ignition Switch - - OFF.
5. Wing Flaps - - AS REQUIRED (30° recommended).
6. Master Switch -- OFF.
7. Doors -- UNLATCH PRIOR TO TOUCHDOWN.
8. Touchdown -- SLIGHTLY TAIL LOW.
9. Brakes -- APPLY HEAVILY.

PRECAUTIONARY LANDING WITH ENGINE POWER

1. Airspeed -- 60 KIAS.
2. Wing Flaps -- 20°.
3. Selected Field - - FLY OVER, noting terrain and obstructions, then retract flaps upon reaching a safe altitude and airspeed.
4. Radio and Electrical Switches - - OFF.
5. Wing Flaps - - 30° (on final approach).
6. Airspeed -- 55 KIAS.
7. Master Switch - - OFF.
8. Doors -- UNLATCH PRIOR TO TOUCHDOWN.
9. Touchdown - - SLIGHTLY TAIL LOW.
10. Ignition Switch -- OFF.
11. Brakes -- APPLY HEAVILY.

DITCHING

1. Radio - - TRANSMIT MAYDAY on 121.5 MHz, giving location and intentions.
2. Heavy Objects (in baggage area) - - SECURE OR JETTISON.

3. Approach - - High Winds, Heavy Seas - - INTO THE WIND. Light Winds, Heavy Swells -- PARALLEL TO
SWELLS.
4. Wing Flaps -- 30°.
5. Power - - ESTABLISH 300 FT/MIN DESCENT AT 55 KIAS.
6. Cabin Doors -- UNLATCH.
7. Touchdown -- LEVEL ATTITUDE AT 300 FT/MIN DESCENT.
8. Face -- CUSHION at touchdown with folded coat.
9. Airplane - - EVACUATE through cabin doors. If necessary, open windows and flood cabin to equalize pressure so doors can be opened.
10. Life Vests and Raft -- INFLATE.

FIRES

DURING START ON GROUND

1. Cranking-- CONTINUE, to get a start which would suck the flames and accumulated fuel through the carburetor and into the engine.

If engine starts:

2. Power - - 1700 RPM for a few minutes.
3. Engine - - SHUTDOWN and inspect for damage.

If engine fails to start:

4. Cranking - - CONTINUE in an effort to obtain a start.
5. Fire Extinguisher--OBTAIN (have ground attendants obtain if not installed).
6. Engine -- SECURE.
a. Master Switch -- OFF.
b. Ignition Switch - - OFF.
c. Fuel Shutoff Valve - - OFF.
7. Fire - - EXTINGUISH using fire extinguisher, wool blanket, or dirt.
8. Fire Damage - - INSPECT, repair damage or replace damaged components or wiring before conducting another flight.

ENGINE FIRE IN FLIGHT

1. Mixture -- IDLE CUT-OFF.
2. Fuel Shutoff Valve -- OFF.
3. Master Switch -- OFF.
4. Cabin Heat and Air -- OFF (except wing root vents).
5. Airspeed -- 85 KIAS (If fire is not extinguished, increase glide speed to find an airspeed which will provide an incombustible mixture).
6. Forced Landing - - EXECUTE (as described in Emergency Landing Without Engine Power).

ELECTRICAL FIRE IN FLIGHT

1. Master Switch - - OFF.
2. All Other Switches (except ignition switch) - - OFF.
3. Vents/Cabin Air/Heat -- CLOSED.
4. Fire Extinguisher -- ACTIVATE (if available).

WARNING

After discharging an extinguisher within a closed cabin, ventilate the cabin.

If fire appears out and electrical power is necessary for continuance of flight:

5. Master Switch -- ON.
6. Circuit Breakers -- CHECK for faulty circuit, do not reset.
7. Radio/Electrical Switches -- ON one at a time, with delay after each until short circuit is localized.
8. Vents/Cabin Air/Heat -- OPEN when it is ascertained that fire is completely extinguished.

CABIN FIRE

1. Master Switch -- OFF.
2. Vents/Cabin Air/Heat -- CLOSED (to avoid drafts).
3. Fire Extinguisher -- ACTIVATE (if available).

WARNING

After discharging an extinguisher within a closed cabin, ventilate the cabin.

4. Land the airplane as soon as possible to inspect for damage.

WING FIRE

1. Navigation Light Switch -- OFF.
2. Pitot Heat -- OFF.

NOTE

Perform a side slip to keep the flames away from the fuel tank and cabin, and land as soon as possible, with flaps retracted.

ICING

INADVERTENT ICING ENCOUNTER

1. Turn pitot heat switch ON (if installed).
2. Turn back or change altitude to obtain an outside air temperature that is less conducive to icing.
3. Pull cabin heat control full out to obtain maximum defroster air temperature. For greater air flow at reduced temperatures, adjust the cabin air control as required.
4. Open the throttle to increase engine speed and minimize ice build-up on propeller blades.
5. Watch for signs of carburetor air filter ice and apply carburetor heat as required. An unexpected loss in engine speed could be caused by carburetor ice or air intake filter ice. Lean the mixture for maximum RPM if carburetor heat is used continuously
6. Plan a landing at the nearest airport. With an extremely rapid ice build up select a suitable off airport landing site

7 With an ice accumulation of 1/4 inch or more on the wing leading edges be prepared for significantly higher stall speed

8 Leave wing flaps retracted With a severe ice build up on the horizontal tail the change in wing wake airflow direction caused by wing flap extension could result in a loss of elevator effective ness

9 Open left window and if practical scrape ice from a portion of the windshield for visibility in the landing approach

10 Perform a landing approach using a forward shp if necessary for improved visibility

11 Approach at 65 to 75 KIAS depending upon the amount of ice accumulation

12 Perform a landing in level attitude

LANDING WITH A FLAT MAIN TIRE

1. Wing Flaps -- AS DESIRED.

3. Touchdown --GOOD TIRE FIRST, hold airplane off flat tire as long as possible with aileron control.

ELECTRICAL POWER SUPPLY SYSTEM MALFUNCTIONS

OVER-VOLTAGE LIGHT ILLUMINATES

1. Master Switch -- OFF (both sides).
2. Master Switch -- ON.
3. Over-Voltage Light -- OFF.

If over-voltage light illuminates again:

4. Flight -- TERMINATE as soon as practical.

AMMETER SHOWS DISCHARGE

1. Alternator -- OFF.
2. Nonessential Electrical Equipment -- OFF.
3. Flight - - TERMINATE as soon as practical.

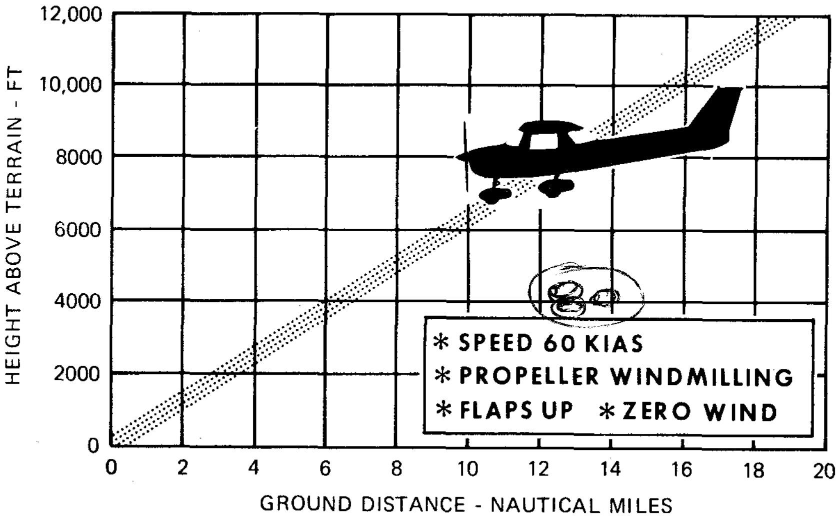
AMPLIFIED PROCEDURES

ENGINE FAILURE

If an engine failure occurs during the takeoff run, the most important thing to do is stop the airplane on the remaining runway. Those extra items on the checklist will provide added safety after a failure of this type.

Prompt lowering of the nose to maintain airspeed and establish a glide attitude is the first response to an engine failure after takeoff. In most cases, the landing should be planned straight ahead with only small changes in direction to avoid obstructions. Altitude and airspeed are seldom sufficient to execute a 1800 gliding turn necessary to return to the runway. The checklist procedures assume that adequate time exists to secure the fuel and ignition systems prior to touchdown.

After an engine failure in flight, the best glide speed as shown in figure 3-1 should be established as quickly as possible. While gliding toward a suitable landing area, an effort should be made to identify the cause of the failure. If time permits, an engine restart should be attempted as shown in the checklist. If the engine cannot be restarted, a forced landing without power must be completed.



FORCED LANDINGS

If all attempts to restart the engine fail and a forced landing is imminent, select a suitable field and prepare for the landing as discussed under the Emergency Landing Without Engine Power checklist.

Before attempting an “off airport” landing with engine power available, one should fly over the landing area at a safe but low altitude to inspect the

terrain for obstructions and surface conditions, proceeding as discussed under the Precautionary Landing With Engine Power checklist.
Prepare for ditching by securing or jettisoning heavy objects located in the baggage area and collect folded coats for protection of occupants' face at touchdown. Transmit Mayday message on 121.5 MHz giving location and intentions.
LANDING WITHOUT ELEVATOR CONTROL
Trim for horizontal flight (with an airspeed of approximately 55 KIAS and flaps lowered to 200) by using throttle and elevator trim controls. Then do not change the elevator trim control setting; control the glide angle by adjusting power exclusively.
At flareout, the nose-down moment resulting from power reduction is an adverse factor and the airplane may hit on the nose wheel. Consequent ly, at flareout, the trim control should be set at the full nose-up position and the power adjusted so that the airplane will rotate to the horizontal attitude for touchdown. Close the throttle at touchdown.
FIRES
Although engine fires are extremely rare in flight, the steps of the appropriate checklist should be followed if one is encountered. After completion of this procedure, execute a forced landing. Do not attempt to restart the engine.
The initial indication of an electrical fire is usually the odor of burning insulation. The checklist for this problem should result in elimination of the fire.
EMERGENCY OPERATION IN CLOUDS (Vacuum System Failure)
In the event of a vacuum system failure during flight in marginal weather, the directional indicator and attitude indicator will be disabled, and the pilot will have to rely on the turn coordinator if he inadvertently flies into clouds. The following instructions assume that only the electrically-powered turn coordinator is operative, and that the pilot is not completely proficient in instrument flying.
EXECUTING A 180 TURN IN CLOUDS
Upon inadvertently entering the clouds, an immediate plan should be made to turn back as follows:
1. Note the time of the minute hand and observe the position of the sweep second hand on the clock.
2. When the sweep second hand indicates the nearest half-minute, initiate a standard rate left turn, holding the turn coordinator symbolic airplane wing opposite the lower left index mark for 60 seconds. Then roll back to level flight by leveling the miniature airplane.
3. Check accuracy of the turn by observing the compass heading which should be the reciprocal of the original heading.

4. If necessary, adjust heading primarily with skidding motions rather than rolling motions so that the compass will read more accurately.
5. Maintain altitude and airspeed by cautious application of elevator control. Avoid over controlling by keeping the hands off the control wheel as much as possible and steering only with rudder.

EMERGENCY DESCENT THROUGH CLOUDS

If conditions preclude reestablishment of VFR flight by a 1800 turn, a descent through a cloud deck to VFR conditions may be appropriate. If possible, obtain radio clearance for an emergency descent through clouds. To guard against a spiral dive, choose an easterly or westerly heading to minimize compass card swings due to changing bank angles. In addition, keep hands off the control wheel and steer a straight course with rudder control by monitoring the turn coordinator. Occasionally check the compass heading and make minor corrections to hold an approximate course. Before descending into the clouds, set up a stabilized let-down condition as follows:

1. Apply full rich mixture.
2. Use full carburetor heat.
3. Reduce power to set up a 500 to 800 ft/mm rate of descent.
4. Adjust the elevator trim for a stabilized descent at 70 KIAS.
5. Keep hands off control wheel.
6. Monitor turn coordinator and make corrections by rudder alone.
7. Check trend of compass card movement and make cautious corrections with rudder to stop turn.
8. Upon breaking out of clouds, resume normal cruising flight.

RECOVERY FROM A SPIRAL DIVE

If a spiral is encountered, proceed as follows:

1. Close the throttle.
2. Stop the turn by using coordinated aileron and rudder control to align the symbolic airplane in the turn coordinator with the horizon reference line.
3. Cautiously apply elevator back pressure to slowly reduce the airspeed to 70 KIAS.
4. Adjust the elevator trim control to maintain a 70 KIAS glide.
5. Keep hands off the control wheel, using rudder control to hold a straight heading.
6. Apply carburetor heat.
7. Clear engine occasionally, but avoid using enough power to disturb the trimmed glide.
8. Upon breaking out of clouds, resume normal cruising flight.

FLIGHT IN ICING CONDITIONS

Flight into icing conditions is prohibited. An inadvertent encounter with these conditions can best be handled using the checklist procedures. The best procedure, of course, is to turn back or change altitude to escape icing conditions.

SPINS

Should an inadvertent spin occur, the following recovery procedure should be used:

1. PLACE AILERONS IN NEUTRAL POSITION.
2. RETARD THROTTLE TO IDLE POSITION.
3. APPLY AND HOLD FULL RUDDER OPPOSITE TO THE DIRECTION OF ROTATION.
4. JUST AFTER THE RUDDER REACHES THE STOP, MOVE THE CONTROL WHEEL BRISKLY FORWARD FAR ENOUGH TO BREAK THE STALL. Full down elevator may be required at aft center of gravity loadings to assure optimum recoveries.
5. HOLD THESE CONTROL INPUTS UNTIL ROTATION STOPS. Premature relaxation of the control inputs may extend the recov ery.
6. AS ROTATION STOPS, NEUTRALIZE RUDDER, AND MAKE A SMOOTH RECOVERY FROM THE RESULTING DIVE.

NOTE

If disorientation precludes a visual determination of the direction of rotation, the symbolic airplane in the turn coordinator may be referred to for this information.

For additional information on spins and spin recovery, see the discus sion under SPINS in Normal Procedures.

ROUGH ENGINE OPERATION OR LOSS OF POWER

CARBURETOR ICING

A gradual loss of RPM and eventual engine roughness may result from the formation of carburetor ice. To clear the ice, apply full throttle and pull the carburetor heat knob full out until the engine runs smoothly; then remove carburetor heat and readjust the throttle. If conditions require the continued use of carburetor heat in cruise flight, use the minimum amount of heat necessary to prevent ice from forming and lean the mixture slightly for smoothest engine operation.

SPARK PLUG FOULING

A slight engine roughness in flight may be caused by one or more spark plugs becoming fouled by carbon or lead deposits. This may be verified by turning the ignition switch momentarily from BOTH to either L or R position. An obvious power loss in single ignition operation is evidence of spark plug or magneto trouble. Assuming that spark plugs are the more likely cause, lean the mixture to the recommended lean setting for cruising flight. If the problem does not clear up in several minutes. determine if a richer mixture setting will produce smoother operation. If not, proceed to the nearest airport for repairs using the BOTH position of the ignition switch unless extreme roughness dictates the use of a single ignition position.

MAGNETO MALFUNCTION

A sudden engine roughness or misfiring is usually evidence of magneto problems. Switching from BOTH to either L or R ignition switch position will identify which magneto is malfunctioning. Select different power settings and enrichen the mixture to determine if continued operation on BOTH magnetos is practicable. If not, switch to the good magneto and proceed to the nearest airport for repairs.

LOW OIL PRESSURE

If low oil pressure is accompanied by normal oil temperature, there is a possibility the oil pressure gage or relief valve is malfunctioning. A leak in the line to the gage is not necessarily cause for an immediate precautionary landing because an orifice in this line will prevent a sudden loss of oil from the engine sump. However, a landing at the nearest airport would be advisable to inspect the source of trouble.

If a total loss of oil pressure is accompanied by a rise in oil temperature, there is good reason to suspect an engine failure is imminent. Reduce engine power immediately and select a suitable forced landing field. Use only the minimum power required to reach the desired touchdown spot.

ELECTRICAL POWER SUPPLY SYSTEM MALFUNCTIONS

Malfunctions in the electrical power supply system can be detected by periodic monitoring of the ammeter and over-voltage warning light; however, the cause of these malfunctions is usually difficult to determine. A broken alternator drive belt or wiring is most likely the cause of alternator failures, although other factors could cause the problem. A
damaged or improperly adjusted voltage regulator can also cause mal functions. Problems of this nature constitute an electrical emergency and
should be dealt with immediately. Electrical power malfunctions usually fall into two categories: excessive rate of charge and insufficient rate of charge. The paragraphs below describe the recommended remedy for each situation.

EXCESSIVE RATE OF CHARGE

After engine starting and heavy electrical usage at low engine speeds (such as extended taxiing) the battery condition will be low enough to accept above normal charging during the initial part of a flight. However, after thirty minutes of cruising flight, the ammeter should be indicating less than two needle widths of charging current. If the charging rate were to remain above this value on a long flight, the battery would overheat and evaporate the electrolyte at an excessive rate. Electronic components in the electrical system could be adversely affected by higher than normal voltage if a faulty voltage regulator setting is causing the overcharging. To preclude these possibilites, an over-voltage sensor will automatically shut down the alternator and the over-voltage warning light will illumi nate if the charge voltage reaches approximately 31.5 volts. Assuming that the malfunction was only momentary, an attempt should be made to reactivate the alternator system. To do this, turn both sides of the master switch off and then on again. If the problem no longer exists, normal alternator charging will resume and the warning light will go off. If the light illuminates again, a malfunction is confirmed. In this event, the flight should be terminated and/or the current drain on the battery minimized because the battery can supply the electrical system for only a limited period of time. If the emergency occurs at night, power must be conserved for later use of the landing light and flaps during landing.

INSUFFICIENT RATE OF CHARGE

If the ammeter indicates a continuous discharge rate in flight, the alternator is not supplying power to the system and should be shut down since the alternator field circuit may be placing an unnecessary load on the system. All nonessential equipment should be turned off and the flight terminated as soon as practical.

HANDLING, SERVICE & MAINTENANCE

INTRODUCTION

This section contains factory-recommended procedures for proper ground handling and routine care and servicing of your Cessna. It also identifies certain inspection and maintenance requirements which must be followed if your airplane is to retain that new-plane performance and dependability. It is wise to follow a planned schedule of lubrication and preventive maintenance based on climatic and flying conditions encountered in your locality.

Keep in touch with your Cessna Dealer and take advantage of his knowledge and experience. He knows your airplane and how to maintain it. He will remind you when lubrications and oil changes are necessary, and about other seasonal and periodic services.

IDENTIFICATION PLATE

All correspondence regarding your airplane should include the SERIAL NUMBER. The Serial Number, Model Number, Production Certificate Number (PC) and Type Certificate Number (TC) can be found on the Identification Plate, located on the cabin floor below the left rear corner of the pilot’s seat. The plate is accessible by sliding the seat forward and lifting the carpet in this area. Located adjacent to the Identification Plate is a Finish and Trim Plate which contains a code describing the interior color scheme and exterior paint combination of the airplane. The code may be used in conjunction with an applicable Parts Catalog if finish and trim information is needed.

OWNER FOLLOW-UP SYSTEM

Your Cessna Dealer has an Owner Follow-Up System to notify you when he receives information that applies to your Cessna. In addition, if you wish, you may choose to receive similar notification, in the form of Service Letters, directly from the Cessna Customer Services Department. A subscription form is supplied in your Customer Care Program book for your use, should you choose to request this service. Your Cessna Dealer will be glad to supply you with details concerning these follow-up programs, and stands ready, through his Service Department. to supply you with fast, efficient, low-cost service.

PUBLICATIONS

Various publications and flight operation aids are furnished in the airplane when delivered from the factory. These items are listed below.

• CUSTOMER CARE PROGRAM BOOK
• PILOT'S OPERATING HANDBOOK/SUPPLEMENTS FOR YOUR AIRPLANE
AVIONICS
• PILOT'S CHECKLISTS
• POWER COMPUTER
• SALES AND SERVICE DEALER DIRECTORY

The following additional publications, plus many other supplies that are applicable to your airplane, are available from your Cessna Dealer.

SERVICE MANUALS AND PARTS CATALOGS FOR YOUR AIRPLANE
ENGINE AND ACCESSORIES AVIONICS

Your Cessna Dealer has a Customer Care Supplies Catalog covering all available items, many of which he keeps on hand. He will be happy to place an order for any item which is not in stock.

AIRPLANE FILE

There are miscellaneous data, information and licenses that are a part of the airplane file. The following is a checklist for that file. In addition, a periodic check should be made of the latest Federal Aviation Regulations to ensure that all data requirements are met.

A. To be displayed in the airplane at all times:
1. Aircraft Airworthiness Certificate (FAA Form 8100- 2).
2. Aircraft Registration Certificate (FAA Form 8050-3).
3. Aircraft Radio Station License, if transmitter installed (FCC Form 556).

B. To be carried in the airplane at all times:
1. Weight and Balance, and associated papers (latest copy of the Repair and Alteration Form, FAA Form 337, if applicable).
2. Equipment List.

C. To be made available upon request:
1. Airplane Log Book.
2. Engine Log Book.

Most of the items listed are required by the United States Federal Aviation Regulations. Since the Regulations of other nations may require other documents and data, owners of airplanes not registered in the United States should check with their own aviation officials to determine their individual requirements.

Cessna recommends that these items, plus the Pilot's Operating Handbook, Pilot's Checklists, Power Computer, Customer Care Program book and Customer Care Card, be carried in the airplane at all times.

AIRPLANE INSPECTION PERIODS

FAA REQUIRED INSPECTIONS

As required by Federal Aviation Regulations, all civil aircraft of U.S. registry must undergo a complete inspection (annual) each twelve calendar months. In addition to the required ANNUAL inspection, aircraft operated commercially (for hire) must have a complete inspection every 100 hours of operation.

The FAA may require other inspections by the issuance of airworthiness directives applicable to the airplane, engine, propeller and components. It is the responsibility of the owner! operator to ensure compliance with all applicable airworthiness directives and, when the inspections are repetitive, to take appropriate steps to prevent inadvertent noncompliance.

In lieu of the 100 HOUR and ANNUAL inspection requirements, an airplane may be inspected in accordance with a progressive inspection schedule, which allows the work load to be divided into smaller operations that can be accomplished in shorter time periods.

The CESSNA PROGRESSIVE CARE PROGRAM has been developed to provide a modern progressive inspection schedule that satisfies the complete airplane inspection requirements of both the 100 HOUR and ANNUAL inspections as applicable to Cessna airplanes. The program assists the owner in his responsibility to comply with all FAA inspection requirements, while ensuring timely replacement of life-limited parts and adherence to factory-recommended inspection intervals and maintenance procedures.

CESSNA PROGRESSIVE CARE

The Cessna Progressive Care Program has been designed to help you realize maximum utilization of your airplane at a minimum cost and downtime. Under this program, your airplane is inspected and maintained in four operations at 50-hour intervals during a 200-hour period. The operations are recycled each 200 hours and are recorded in a specially provided Aircraft Inspection Log as each operation is conducted.

The Cessna Aircraft Company recommends Progressive Care for airplanes that are being flown 200 hours or more per year, and the 100-hour inspection for all other airplanes. The procedures for the Progressive Care Program and the 100-hour inspection have been carefully worked out by the factory and are followed by the Cessna Dealer Organization. The complete familiarity of Cessna Dealers with Cessna equipment and factory-approved procedures provides the highest level of service possi ble at lower cost to Cessna owners.

Regardless of the inspection method selected by the owner, he should keep in mind that FAR Part 43 and FAR Part 91 establishes the requirement that properly certified agencies or personnel accomplish all required FAA inspections and most of the manufacturer recommended inspections.

CESSNA CUSTOMER CARE PROGRAM

Specific benefits and provisions of the CESSNA WARRANTY plus other important benefits for you are contained in your CUSTOMER CARE PROGRAM book supplied with your airplane. You will want to thoroughly review your Customer Care Program book and keep it in your airplane at all times.

Coupons attached to the Program book entitle you to an initial inspection and either a Progressive Care Operation No. 1 or the first 100- hour inspection within the first 6 months of ownership at no charge to you. If you take delivery from your Dealer, the initial inspection will have been performed before delivery of the airplane to you. If you pick up your airplane at the factory, plan to take it to your Dealer reasonably soon after you take delivery, so the initial inspection may be performed allowing the Dealer to make any minor adjustments which may be necessary.

You will also want to return to your Dealer either at 50 hours for your first Progressive Care Operation, or at 100 hours for your first 100-hour inspection depending on which program you choose to establish for your airplane. While these important inspections will be performed for you by any Cessna Dealer, in most cases you will prefer to have the Dealer from whom you purchased the airplane accomplish this work.

PILOT CONDUCTED PREVENTIVE MAINTENANCE

A certified pilot who owns or operates an airplane not used as an air carrier is authorized by FAR Part 43 to perform limited maintenance on his airplane. Refer to FAR Part 43 for a list of the specific maintenance operations which are allowed.

NOTE

Pilots operating airplanes of other than U.S. registry should refer to the regulations of the country of certifica tion for information on preventive maintenance that may be performed by pilots.

A Service Manual should be obtained prior to performing any preven tive maintenance to ensure that proper procedures are followed. Your Cessna Dealer should be contacted for further information or for required maintenance which must be accomplished by appropriately licensed personnel.

ALTERATIONS OR REPAIRS

It is essential that the FAA be contacted prior to any alterations on the airplane to ensure that airworthiness of the airplane is not violated. Alterations or repairs to the airplane must be accomplished by licensed personnel.

GROUND HANDLING

TOWING

The airplane is most easily and safely maneuvered by hand with the tow-bar attached to the nose wheel. When towing with a vehicle, do not exceed the nose gear turning angle of 30° either side of c enter, or damage to the gear will result. If the airplane is towed or pushed over a rough surface during hangaring, watch that the normal cushioning action of the nose strut does not cause excessive vertical movement of the tail and the resulting contact with low hangar doors or structure. A flat nose tire or deflated strut will also increase tail height.

PARKING

When parking the airplane, head into the wind and set the parking brakes. Do not set the parking brakes during cold weather when accumulated moisture may freeze the brakes, or when the brakes are overheated. Install the control wheel lock and chock the wheels. In severe weather and high wind conditions, tie the airplane down as outlined in the following paragraph.

TIE-DOWN

Proper tie-down procedure is the best precaution against damage to the parked airplane by gusty or strong winds. To tie-down the airplane securely, proceed as follows:

1. Set the parking brake and install the control wheel lock.
2. Install a surface control lock between each aileron and flap.
3. Tie sufficiently strong ropes or chains (700 pounds tensile strength) to the wing and tail tie-down fittings and secure each rope to a ramp tie-down.
4. Install a surface control lock over the fin and rudder.
5. Tie a rope (no chains or cables) to an exposed portion of the engine mount and secure to a ramp tie-down.
6. Install a pitot tube cover.

JACKING

When a requirement exists to jack the entire airplane off the ground, or when wing jack points are used in the jacking operation, refer to the Service Manual for specific procedures and equipment required.

Individual main gear may be jacked by using the jack pad which is incorporated in the main landing gear strut step bracket. When using the individual gear strut jack pad, flexibility of the gear strut will cause the main wheel to slide inboard as the wheel is raised, tilting the jack. The jack must

then be lowered for a second jacking operation. Do not jack both main wheels simultaneously using the individual main gear jack pads.
If nose gear maintenance is required, the nose wheel may be raised off the ground by pressing down on a tailcone bulkhead, just forward of the horizontal stabilizer, and allowing the tail to rest on the tail tie-down ring.
NOTE
Do not apply pressure on the elevator or outboard stabiliz er surfaces. When pushing on the tailcone, always apply pressure at a bulkhead to avoid buckling the skin.
To assist in raising and holding the nose wheel off the ground, weight down the tail by placing sand-bags, or suitable weight, on each side of the horizontal stabilizer, next to the fuselage. If ground anchors are available,

SERVICING
In addition to the PREFLIGHT INSPECTION covered in Section 4, COMPLETE servicing, inspection, and test requirements for your airplane are detailed in the Service Manual. The Service Manual outlines all items which require attention at 50, 100, and 200 hour intervals plus those items which require servicing, inspection, and/or testing at special intervals.
Since Cessna Dealers conduct all service, inspection, and test proce dures in accordance with applicable Service Manuals, it is recommended that you contact your Cessna Dealer concerning these requirements and begin scheduling your airplane for service at the recommended intervals.
Cessna Progressive Care ensures that these requirements are accomp lished at the required intervals to comply with the 100-hour or ANNUAL inspection as previously covered.
Depending on various flight operations, your local Government Aviation Agency may require additional service, inspections, or tests. For these regulatory requirements, owners should check with local aviation officials where the airplane is being operated.

For quick and ready reference, quantities, materials, and specifica tions for frequently used service items are as follows.
ENGINE OIL
GRADE AND VISCOSITY FOR TEMPERATURE RANGE --
The airplane was delivered from the factory with a corrosion preven tive aircraft engine oil. This oil should be drained after the first 25 hours of operation, and the following oils used as specified for the average ambient air temperature in the operating area.
MIL-L-6082 Aviation Grade Straight Mineral Oil: Use to replenish supply during the first 25 hours and at the first 25-hour oil change. Continue to use until a total of 50 hours has accumulated or oil consumption has stabilized.
SAE 50 above 16℃ (60℉).

SAE 40 between -1℃ (30℉) and 32℃ (90℉).
SAE 30 between -18℃ (0℉) and 21℃ (70℉).
SAE 20 below -12°C (10℉).
MIL-L-22851 Ashless Dispersant Oil: This oil must be used after the first 50 hours or oil consumption has stabilized.
SAE 40 or SAE 50 above 16℃ (60℉).
SAE 40 between -1℃ (30℉) and 32℃ (90℉).
SAE 30 or SAE 40 between -18℃ (0℉) and 21℃ (70℉).
SAE 30 below -12℃ (10℉).
CAPACITY OF ENGINE SUMP -- 6 Quarts.
Do not operate on less than 4 quarts. To minimize loss of oil through breather, fill to 5 quart level for normal flights of less than 3 hours. For extended flight, fill to 6 quarts. These quantities refer to oil dipstick level readings. During oil and oil filter changes, one additional quart is required when the filter is changed.
OIL AND OIL FILTER CHANGE --
After the first 25 hours of operation, drain engine oil sump and and oil cooler and clean the oil pressure screen. If an oil filter is installed, change filter at this time. Refill sump with straight mineral oil and use until a total of 50 hours has accumulated or oil consumption has stabilized; then change to dispersant oil. On airplanes not equipped with an oil filter, drain the engine oil sump and oil cooler and clean the oil pressure screen each 50 hours thereafter. On airplanes which have an oil filter, the oil change interval may be extended to 100-hour intervals, providing the oil filter is changed at 50-hour intervals. Change engine oil at least every 6 months even though less than the recommended hours have accumulated. Reduce intervals for pro longed operation in dusty areas, cold climates, or when short flights and long idle periods result in sludging conditions.
FUEL
APPROVED FUEL GRADES (AND COLORS) --
100LL Grade Aviation Fuel (Blue).
100 (Formerly 100/130) Grade Aviation Fuel (Green). CAPACITY EACH STANDARD TANK -- 13 Gallons.
CAPACITY EACH LONG RANGE TANK - - 19.5 Gallons.

NOTE
Due to cross-feeding between fuel tanks, the tanks should be re-topped after each refueling to assure maximum capacity.

LANDING GEAR
NOSE WHEEL TIRE PRESSURE - - 30 PSI on 5.00-5, 4-Ply Rated Tire.
MAIN WHEEL TIRE PRESSURE -- 21 PSI on 6.00-6, 4-Ply Rated Tires.
NOSE GEAR SHOCK STRUT --

Keep filled with MIL-H-5606 hydraulic fluid and inflated with air to 20 PSI. Do not over-inflate.

QUICK REFERENCE – PERFORMANCE SPECIFICATIONS

*SPEED:		
Maximum at Sea Level		110 KNOTS
Cruise, 75% Power at 8000 Ft		107 KNOTS
CRUISE: Recommended lean mixture with fuel allowance for engine start, taxi, takeoff, climb and 45 minutes reserve at 45% power.		
75% Power at 8000 Ft	Range	350 NM
24.5 Gallons Usable Fuel	Time	3.4 HRS
75% Power at 8000 Ft	Range	580 NM
37.5 Gallons Usable Fuel	Time	5.5 HRS
Maximum Range at 10,000 Ft	Range	415 NM
24.5 Gallons Usable Fuel	Time	5.2 HRS
Maximum Range at 10,000 Ft	Range	690 NM
37.5 Gallons Usable Fuel	Time	8.7 HRS
RATE OF CLIMB AT SEA LEVEL		715 FPM
SERVICE CEILING		14,700 FT
TAKEOFF PERFORMANCE:		
Ground Roll		725 FT
Total Distance Over 50-Ft Obstacle		1340 FT
LANDING PERFORMANCE:		
Ground Roll		475 FT
Total Distance Over 50-Ft Obstacle		1200 FT
STALL SPEED (CAS):		
Flaps Up, Power Off		48 KNOTS
Flaps Down, Power Off		43 KNOTS
MAXIMUM WEIGHT		1670 LBS
STANDARD EMPTY WEIGHT:		
152		1081 LBS
152 II		1118 LBS
MAXIMUM USEFUL LOAD:		
152		589 LBS
152 II		552 LBS
BAGGAGE ALLOWANCE		120 LBS
WING LOADING: Pounds/Sq Ft		10.5
POWER LOADING: Pounds/HP		15.2
FUEL CAPACITY: Total		
Standard Tanks		26 GAL.
Long Range Tanks		39 GAL.
OIL CAPACITY		6 QTS
ENGINE: Avco Lycoming		O-235-L2C
110 BHP at 2550 RPM		
PROPELLER: Fixed Pitch, Diameter		69 IN.

*Speed performance is shown for an airplane equipped with optional speed fairings, which increase the speeds by approximately 2 knots. There is a corresponding difference in range, while all other performance figures are unchanged when speed fairings are installed.