Peter Shikongo

OPERATOR'S MANUAL

CESSNA 210

PERFORMANCE - SPECIFICATIONS

	Centurion *	
GROSS WEIGHT	3800 lbs	3400 lbs
SPEED, BEST POWER MIXTURE:		
Top Speed at Sea Level	200 mph	200 mph
Cruise, 75% Power at 7500 ft	188 mph	190 mph
RANGE, EXTENDED RANGE MIXTURE:		
Cruise, 75% Power at 7500 ft 384 Pounds Fuel, No Reserve	765 mi 4.1 hrs 187 mph	775 mi 4.1 hrs 189 mph
Cruise, 75% Power at 7500 ft 534 Pounds Fuel, No Reserve	1065 mi 5.7 hrs 187 mph	1080 mi 5.7 hrs 189 mph
Maximum Range at 10,000 ft 384 Pounds Fuel, No Reserve	900 mi 5.8 hrs 154 mph	980 mi 6.7 hrs 146 mph
Maximum Range at 10,000 ft 534 Pounds Fuel, No Reserve	1250 mi 8.1 hrs 154 mph	1360 mi 9.3 hrs 146 mph
RATE OF CLIMB AT SEA LEVEL	860 fpm	1025 fpm
SERVICE CEILING	15,500 ft	18,000 ft
TAKE-OFF:		
Ground Run	1100 ft	850 ft
Total Distance Over 50-Foot Obstacle	1900 ft	1505 ft
LANDING:		
Ground Run	765 ft	765 ft
Total Distance Over 50-Foot Obstacle	1500 ft	1500 ft
STALL SPEED:		
Flaps Up, Power Off	75 mph	72 mph
Flaps Down, Power Off	65 mph	62 mph
EMPTY WEIGHT: (Approximate)		
Centurion	2150 lbs	2150 lbs
Centurion II	2220 lbs	2220 lbs
USEFUL LOAD:		
Centurion	1650 lbs	1250 lbs
Centurion II	1580 lbs	1180 lbs
WING LOADING: Pounds/Sq Foot	21.7	19.4
POWER LOADING: Pounds/HP	12.7	11.3
FUEL CAPACITY: Total	90 gal.	
OIL CAPACITY: Total	10 qts.	
PROPELLER: 3-Bladed Constant Speed, Diameter	80 inches	
ENGINE:		
Continental Fuel Injection Engine	IO-520-L	
300 rated BHP at 2850 RPM (5 Minute Take-Off Rating)		
285 rated BHP at 2700 RPM (Maximum Continuous Rating)		

* This manual covers operation of the Centurion/Centurion II which is certificated as Model 210L under FAA Type Certificate No. 3A21.

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CONGRATULATIONS . . . .

Welcome to the ranks of Cessna owners! Your Cessna has been designed and constructed to give you the most in performance, economy, and comfort. It is our desire that you will find flying it, either for business or pleasure, a pleasant and profitable experience.

This Owner's Manual has been prepared as a guide to help you get the most pleasure and utility from your Centurion/Centurion II. It contains information about your Cessna's equipment, operating procedures, and performance; and suggestions for its servicing and care. We urge you to read it from cover to cover, and to refer to it frequently.

Our interest in your flying pleasure has not ceased with your purchase of a Cessna. World-wide, the Cessna Dealer Organization backed by the Cessna Service Department stands ready to serve you. The following services are offered by most Cessna Dealers:

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b. Coverage includes parts and labor
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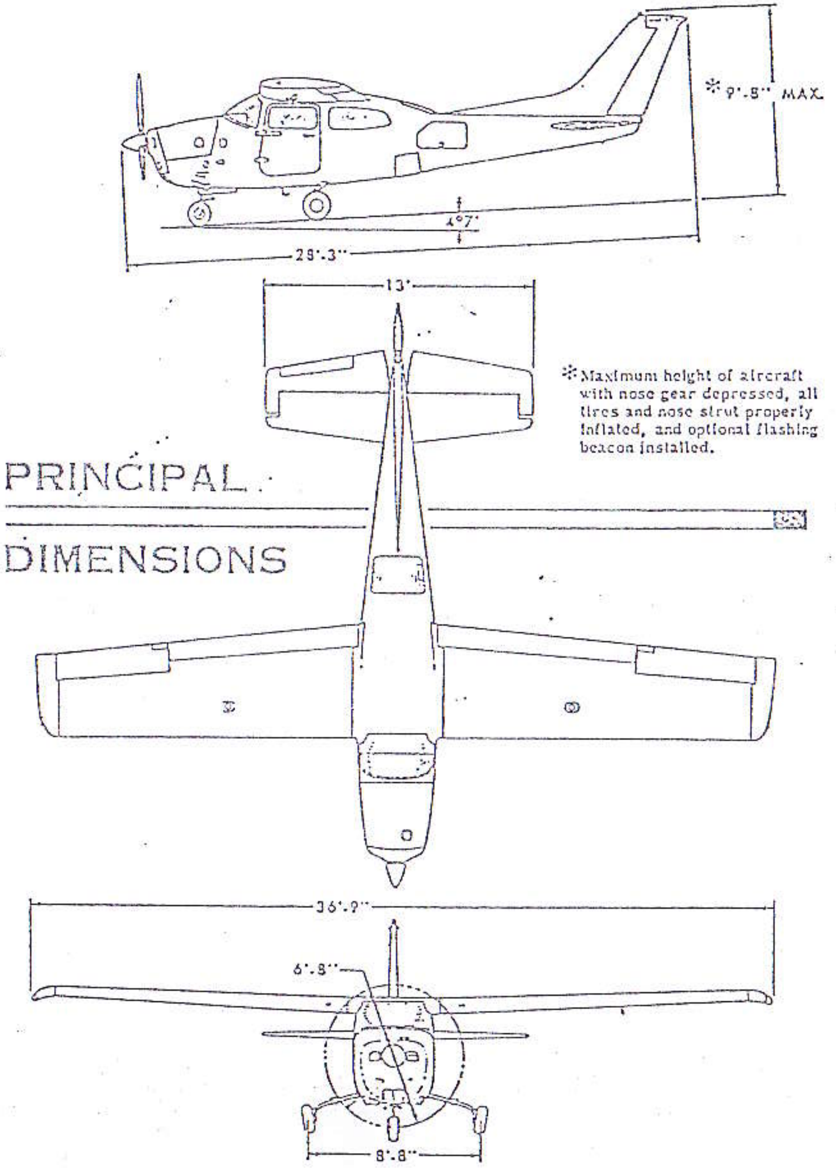
PRINCIPAL DIMENSIONS



*Maximum height of aircraft with nose gear depressed, all tires and nose strut properly inflated, and optional flashing beacon installed.

TABLE OF CONTENTS

This manual describes the operation and performance of the Centurion and Centurion II. Equipment described as "Optional" denotes that the subject equipment is optional on the Centurion. Much of this equipment is standard on the Centurion II.

Section I

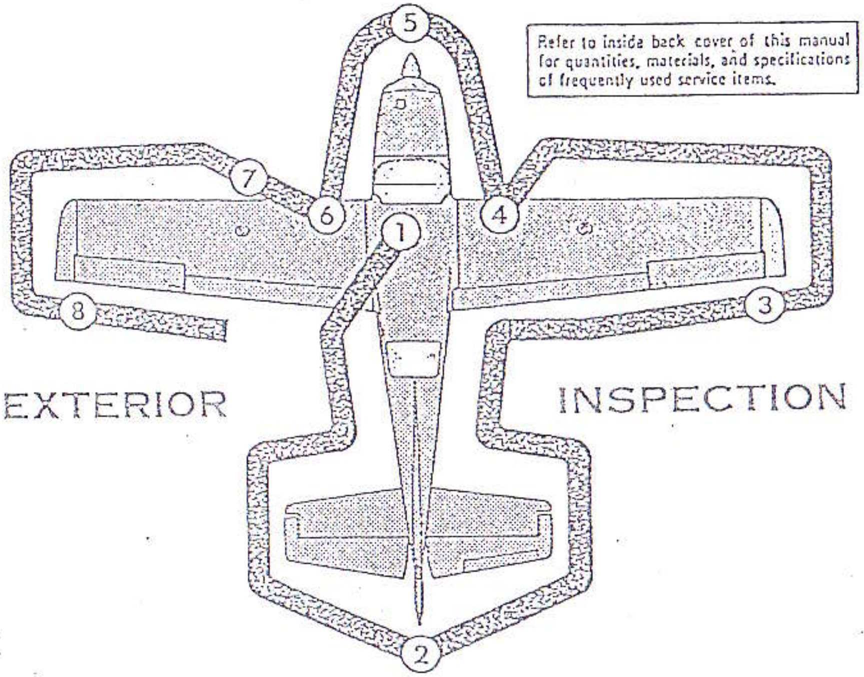
OPERATING CHECKLIST

One of the first steps in obtaining the utmost performance, service, and flying enjoyment from your Cessna is to familiarize yourself with your aircraft's equipment, systems, and controls. This can best be done by reviewing this equipment while sitting in the aircraft. Those items whose function and operation are not obvious are covered in Section II.

Section I lists, in Pilot's Checklist form, the steps necessary to operate your aircraft efficiently and safely. It is not a checklist in its true form as it is considerably longer, but it does cover briefly all of the points that you should know for a typical flight. A more convenient plastic enclosed checklist, stowed in the map compartment, is available for quickly checking that all important procedures have been performed. Since vigilance for other traffic is so important in crowded terminal areas, it is important that preoccupation with checklists be avoided in flight. Procedures should be carefully memorized and performed from memory. Then the checklist should be quickly scanned to ensure that nothing has been missed.

The flight and operational characteristics of your aircraft are normal in all respects. There are no "unconventional" characteristics or operations that need to be mastered. All controls respond in the normal way within the entire range of operation. All airspeeds mentioned in Sections I, II and III are indicated airspeeds. Corresponding calibrated airspeed may be obtained from the Airspeed Correction Table in Section VI.

EXTERIOR INSPECTION



Note

Visually check aircraft 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. If night flight is planned, check operation of all lights, and make sure a flashlight is available.

(1)
a. Remove control wheel lock.
b. Check ignition switch OFF.
c. Check landing gear handle in GEAR DOWN position.
d. Turn on master switch and check fuel quantity indicators; then turn off master switch.
e. Check fuel selector valve handle on fuller tank.
f. Inspect flight instrument static source opening on side of fuselage for stoppage (both sides).
g. Check baggage door for security.

(2)
a. Remove rudder gust lock, if installed.
b. Disconnect tail tie-down.
c. Check control surfaces for freedom of movement and security.

(3)
a. Check aileron for freedom of movement and security.
b. Check fuel tank vent at wing tip trailing edge for stoppage.

(4)
a. Disconnect wing tie-down.
b. Check main wheel tire for proper inflation.
c Check cabin step for security and cleanliness, and retraction well for cleanliness.
d. 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.
e. Visually check fuel quantity for desired level; then check fuel filler cap secure and vent unobstructed.

(5)
a. Check propeller and spinner for nicks and security, and propeller for oil leaks.
b. Check nose wheel strut and tire for proper inflation.
c. Disconnect nose tie-down.
d. Check oil level. Do not operate with less than seven quarts. Fill to 10 quarts for extended flight.
e. 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 reservoir drain valves will be necessary.

(6)
a. Check main wheel tire for proper inflation.
b. 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.
c. Visually check fuel quantity for desired level; then check fuel filler cap secure and vent unobstructed.

(7)
a. Remove pitot tube cover, if installed, and check pitot tube opening for stoppage.
b. Disconnect wing tie-down.

(8)
a. Check fuel tank vent at wing tip trailing edge for stoppage.
b. Check aileron for freedom of movement and security.

Figure 1-1.

BEFORE STARTING ENGINE.

(1) Exterior Preflight -- COMPLETE.
(2) Seats, Belts, Shoulder Harnesses -- ADJUST and LOCK.
(3) Brakes -- TEST and SET.
(4) Cowl Flaps -- OPEN (move lever out of locking hole to reposition).
(5) Fuel Selector Valve -- FULLER TANK.
(6) Radios, Autopilot, Electrical Equipment -- OFF.
(7) Landing Gear Handle -- GEAR DOWN.
(8) Master Switch -- ON.
(9) Landing Gear Lights and Horn -- PRESS TO TEST.

STARTING ENGINE.

(1) Mixture -- RICH.
(2) Propeller -- HIGH RPM.
(3) Throttle -- CLOSED.
(4) Auxiliary Fuel Pump Switch -- ON.
(5) Throttle -- ADVANCE to obtain 50-60 lbs./hr. fuel flow; then RETURN to IDLE POSITION.
(6) Auxiliary Fuel Pump Switch -- OFF.
(7) Propeller Area -- CLEAR.
(8) Ignition Switch -- START.
(9) Throttle -- ADVANCE slowly.
(10) Ignition Switch -- RELEASE when engine starts.

NOTE

The engine should start in two to three revolutions. If it does not continue running, start again at Step (3) above. If the engine does not start, leave auxiliary fuel pump switch off, set mixture to idle cut-off, open throttle, and crank until engine fires (or for approximately 15 seconds). If still unsuccessful, start again using the normal starting procedure after allowing the starter motor to cool.

(11) Throttle -- RESET to desired idle speed.
(12) Oil Pressure -- CHECK.

BEFORE TAKE-OFF.

(1) Parking Brake -- SET.

(2) Cowl Flaps -- CHECK FULL OPEN.
(3) Flight Controls -- FREE and CORRECT.
(4) Elevator and Rudder Trim -- TAKE-OFF.
(5) Mixture -- RICH (below 3000 feet).
(6) Throttle -- 1700 RPM.
 a. Magnetos -- CHECK (RPM drop should not exceed 150 RPM on either magneto or 50 RPM differential between magnetos).
 b. Propeller -- CYCLE from high to low RPM; return to high RPM (full forward).
 c. Engine Instruments and Ammeter -- CHECK.
 d. Suction Gage -- CHECK in green arc.
(7) Cabin Doors and Window -- CLOSED and LOCKED.
(8) Flight Instruments and Radios -- SET.
(9) Optional Autopilot -- OFF.
(10) Throttle Friction Lock -- ADJUST.
(11) Wing Flaps -- 0° - 10°.

TAKE-OFF.

NORMAL TAKE-OFF.

(1) Wing Flaps -- 0° - 10°.
(2) Power -- FULL THROTTLE and 2850 RPM.
(3) Mixture -- RICH (lean for field elevation per fuel flow placard above 3000 feet).
(4) Aircraft Attitude -- LIFT NOSE WHEEL at 70 to 80 MPH.
(5) Climb Speed -- 100 - 110 MPH.
(6) Brakes -- APPLY momentarily when airborne.
(7) Landing Gear -- RETRACT in climb out.
(8) Wing Flaps -- RETRACT (if extended).

MAXIMUM PERFORMANCE TAKE-OFF.

(1) Wing Flaps -- 10°.
(2) Brakes -- APPLY.
(3) Power -- FULL THROTTLE and 2850 RPM.
(4) Mixture -- RICH (lean for field elevation per fuel flow placard above 3000 feet).
(5) Brakes -- RELEASE.
(6) Aircraft Attitude -- SLIGHTLY TAIL-LOW.
(7) Climb Speed -- 82 MPH until all obstacles are cleared.
(8) Landing Gear -- RETRACT after obstacles are cleared.
(9) Wing Flaps -- RETRACT after reaching 90 MPH.

NOTE

Do not reduce power until wing flaps and landing gear have been retracted.

ENROUTE CLIMB.

NORMAL CLIMB.

(1) Airspeed -- 120 - 140 MPH.
(2) Power -- 25 INCHES Hg and 2550 RPM.
(3) Mixture -- LEAN to 108 lbs./hr.
(4) Cowl Flaps -- OPEN as required.

MAXIMUM PERFORMANCE CLIMB.

(1) Airspeed -- 109 MPH at sea level to 102 MPH at 10,000 feet.
(2) Power -- FULL THROTTLE and 2700 RPM.
(3) Mixture -- LEAN per fuel flow placard.
(4) Cowl Flaps -- FULL OPEN.

CRUISE.

(1) Power -- 15 to 25 INCHES Hg., 2200 to 2550 RPM (no more than 75%).
(2) Elevator and Rudder Trim -- ADJUST.
(3) Mixture -- LEAN per Cessna Power Computer or Operational Data, Section VI.
(4) Cowl Flaps -- CLOSED (open if required).

LET-DOWN.

(1) Power -- AS DESIRED.
(2) Mixture -- ADJUST for smooth operation (full rich for idle power).
(3) Cowl Flaps -- CLOSED.

BEFORE LANDING.

(1) Fuel Selector Valve -- FULLER TANK.
(2) Landing Gear -- EXTEND (below 160 MPH).

(3) Landing Gear -- CHECK (observe main gear down and green indicator light on).
(4) Mixture -- RICH.
(5) Propeller -- HIGH RPM.
(6) Airspeed -- 95 to 105 MPH (flaps UP).
(7) Wing Flaps -- AS DESIRED (0° to 10° below 160 MPH, 10° to 30° below 120 MPH).
(8) Airspeed -- 85 to 95 MPH (flaps DOWN).
(9) Elevator Trim -- ADJUST.
(10) Optional Autopilot -- OFF.

BALKED LANDING.

(1) Power -- FULL THROTTLE and 2850 RPM.
(2) Wing Flaps -- RETRACT to 20°.
(3) Airspeed -- 90 MPH.
(4) Wing Flaps -- RETRACT slowly.
(5) Cowl Flaps -- OPEN.

NORMAL LANDING.

(1) Touchdown -- MAIN WHEELS FIRST.
(2) Landing Roll -- LOWER NOSE WHEEL GENTLY.
(3) Braking -- MINIMUM REQUIRED.

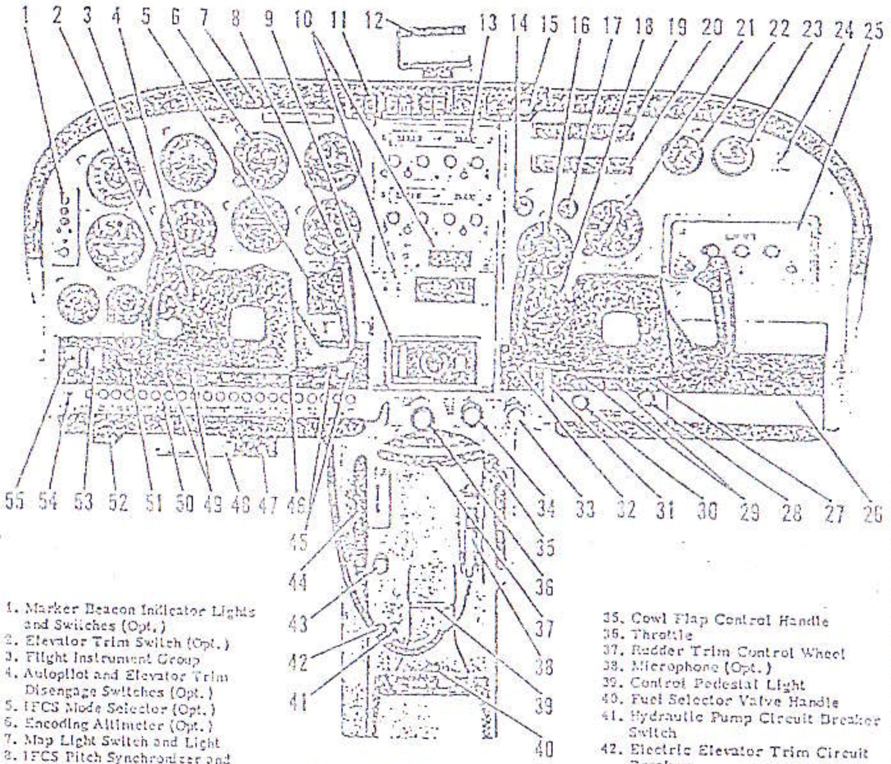
AFTER LANDING.

(1) Cowl Flaps -- OPEN.
(2) Wing Flaps -- RETRACT.

SECURING AIRCRAFT.

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

INSTRUMENT PANEL



1. Marker Beacon Indicator Lights and Switches (Opt.)
2. Elevator Trim Switch (Opt.)
3. Flight Instrument Group
4. Autopilot and Elevator Trim Disengage Switches (Opt.)
5. IFCS Mode Selector (Opt.)
6. Encoding Altimeter (Opt.)
7. Map Light Switch and Light
8. IFCS Pitch Synchronizer and Co-Around Switches (Opt.)
9. Autopilot Control Unit (Opt.)
10. Transponder and DME (Opt.)
11. Radio Selector Switches (Opt.)
12. Rear View Mirror (Opt.)
13. Radios (Opt.)
14. Gyro Slaving Indicator (Opt.)
15. Radio Selector Switch Light Rheostat Control Knob (Opt.)
16. Manifold Pressure/Fuel Flow Indicator
17. Propeller Anti-Ice Ammeter (Opt.)
18. Tachometer
19. Fuel Quantity Indicators and Ammeter
20. Cylinder Head Temperature, Oil Temperature, and Oil Pressure Gages
21. Secondary Altimeter
22. Suction Gage (Opt.)
23. Flight Hour Recorder (Opt.)
24. Over-Voltage Warning Light
25. Optional Radio or Instrument Space
26. Map Compartment
27. Defroster Control Knob
28. Auxiliary Cabin Air Control Knob
29. Cabin Heat and Cabin Air Control Knobs
30. Cigar Lighter
31. Wing Flap Switch and Indicator
32. Wing De-Ice Switch and Light (Opt.)
33. Mixture Control Knob
34. Propeller Control Knob
35. Cowl Flap Control Handle
36. Throttle
37. Rudder Trim Control Wheel
38. Microphone (Opt.)
39. Control Pedestal Light
40. Fuel Selector Valve Handle
41. Hydraulic Pump Circuit Breaker Switch
42. Electric Elevator Trim Circuit Breaker
43. Engine Primer (Opt.)
44. Elevator Trim Control Wheel
45. Landing Gear Control Handle and Position Lights
46. Electrical Switches
47. Alternate Static Source Valve (Opt.)
48. Parking Brake Handle
49. Radio and Instrument Panel Light Rheostat Control Knobs
50. Circuit Breakers
51. Ignition Switch
52. Phone and Auxiliary Mike Jack Locations
53. Auxiliary Fuel Pump Switch
54. Ice Detector Light Switch (Opt.)
55. Master Switch

Figure 2-1.

DESCRIPTION AND OPERATING DETAILS

The following paragraphs describe the systems and equipment whose function and operation is not obvious when sitting in the aircraft. This section also covers in somewhat greater detail some of the items listed in Checklist form in Section I that require further explanation.

FUEL SYSTEM.

Fuel is supplied to the engine from two integral fuel tanks, one in each wing. Usable fuel in each tank, for all flight conditions, is 267 lbs when completely filled (534 lbs total usable in both tanks).

The fuel capacity of this aircraft has been designed to provide the owner with a choice of long range capability with partial cabin loading or reduced range with full cabin loading. For example, with full cabin loading, it normally will be necessary to reduce the fuel load to keep the aircraft within approved weight and balance limits. (Refer to Section IV for weight and balance control procedures.) For a reduced fuel load of 192 lbs of usable fuel in each tank, fill each tank to the bottom edge of the fuel filler collar, thus giving a total usable reduced fuel load of 384 lbs.

NOTE

> Unusable fuel is at a minimum due to the design of the fuel system. However, when the fuel tanks are 1/4 full or less, prolonged uncoordinated flight such as slips or skids can uncover the fuel tank outlets, causing fuel starvation and engine stoppage. Therefore, with low fuel reserves, do not allow the aircraft to remain in uncoordinated flight for periods in excess of one minute.

Fuel from each wing fuel tank flows through a reservoir tank to the fuel selector valve. Depending upon the setting of the selector valve, fuel

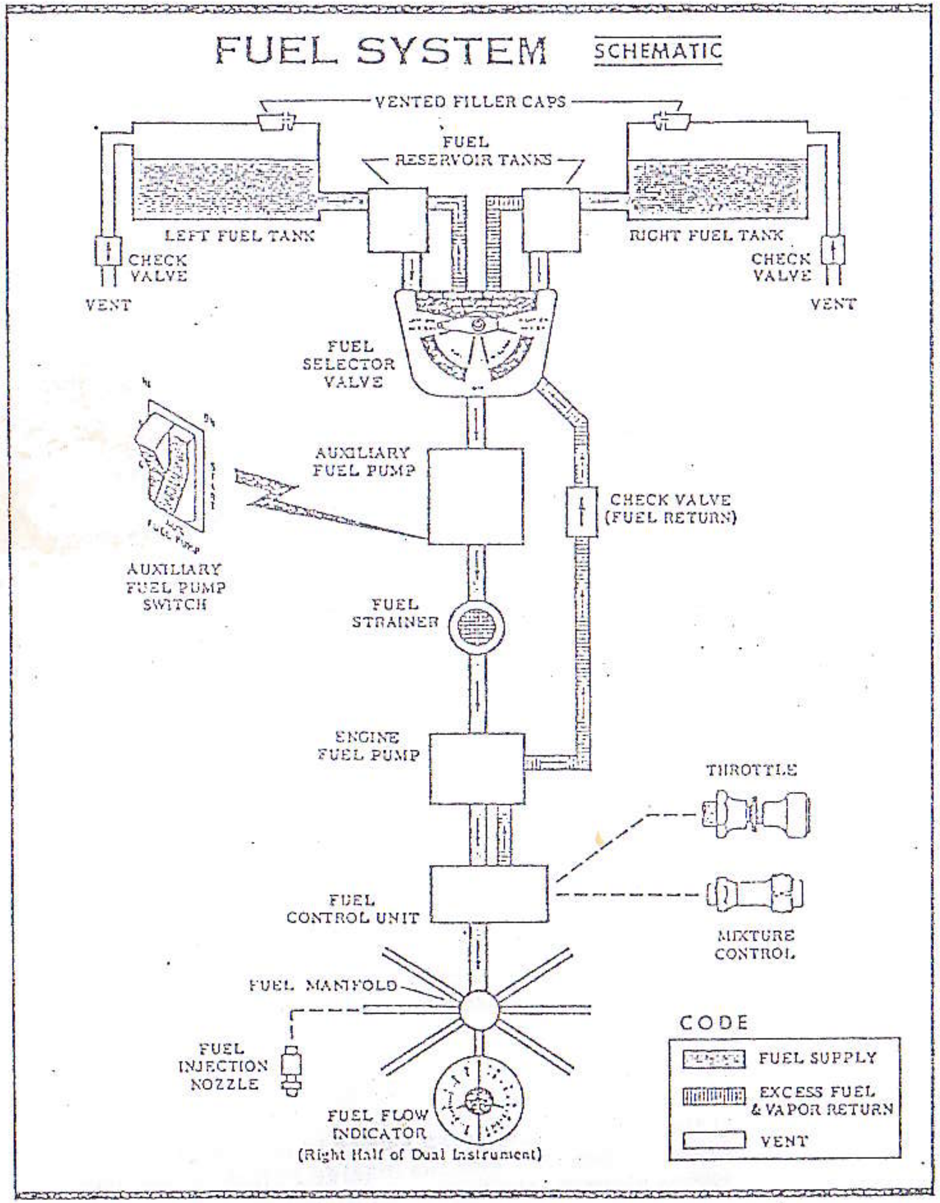


Figure 2-2.

from the left or right fuel tank and reservoir tank flows through a by-p in the electric auxiliary fuel pump (when it is not operating) and the fu strainer to the engine-driven fuel pump. From here fuel is distributec to the engine cylinders via a control unit and manifold.

NOTE

Fuel cannot be used from both fuel tanks simultaneously.

Vapor and excess fuel from the engine-driven fuel pump and fuel contr unit are returned by way of the selector valve to the reservoir tank of wing fuel tank system being used.

AUXILIARY FUEL PUMP SWITCH.

The auxiliary fuel pump switch is located on the left side of the in-strument panel and is a yellow and red split-rocker type switch.

The yellow right half of the switch is labeled START, and its uppe ON position is used for normal starting, minor vapor purging and con-tinued engine operation in the event of an engine-driven fuel pump fail With the right half of the switch in the ON position, the pump operates one of two flow rates that are dependent upon the setting of the throttle With the throttle open to a cruise setting, the pump operates at a high enough capacity to supply sufficient fuel flow to maintain flight with an inoperative engine-driven fuel pump. When the throttle is moved tow the closed position (as during letdown, landing, and taxiing), the fuel pump flow rate is automatically reduced, preventing an excessively ri mixture during these periods of reduced engine speed.

NOTE

If the engine-driven fuel pump is functioning and the auxiliary fuel pump switch is placed in the ON posi-tion, a fuel/air ratio considerably richer than best power is produced unless the mixture is leaned. Therefore, this switch should be turned off during take-off.

NOTE

If the auxiliary fuel pump switch is accidentally placed in the ON position with the master switch on and the engine stopped, the intake manifolds will be flooded.

The red left half of the switch is labeled EMERG, and its upper HI position is used in the event of an engine-driven fuel pump failure during take-off or high power operation. The HI position may also be used for extreme vapor purging. Maximum fuel flow is produced when the left half of the switch is held in the spring-loaded HI position. In this position, an interlock within the switch automatically trips the right half of the switch to the ON position. When the spring-loaded left half of the switch is released, the right half will remain in the ON position until manually returned to the off position.

If it is desired to completely exhaust a fuel tank quantity in flight, the auxiliary fuel pump will be needed to assist in restarting the engine when fuel exhaustion occurs. Therefore, it is recommended that proper operation of the auxiliary fuel pump be verified prior to running a fuel tank dry by turning the auxiliary fuel pump ON momentarily and checking for a slight rise in fuel flow indication.

To ensure a prompt engine restart in flight after running a fuel tank dry, immediately switch to the tank containing fuel at the first indication of fuel pressure fluctuation and/or power loss. Then place the right half of the auxiliary fuel pump switch in the ON position momentarily (3 to 5 seconds) with the throttle at least 1/2 open. Excessive use of the ON position at high altitude and full rich mixture can cause flooding of the engine as indicated by a short (1 to 2 seconds) period of power followed by a loss of power. This can later be detected by a fuel flow indication accompanied by a lack of power. If flooding does occur, turn off the auxiliary fuel pump switch, and normal propeller windmilling should start the engine in 1 to 2 seconds.

If the propeller should stop (possible at very low airspeeds) before the tank containing fuel is selected, place the auxiliary fuel pump switch in the ON position and advance the throttle promptly until the fuel flow indicator registers approximately 1/2 way into the green arc for 1 to 2 seconds duration. Then retard the throttle, turn off the auxiliary fuel pump, and use the starter to turn the engine over until a start is obtained.

FUEL SYSTEM QUICK-DRAIN VALVES.

Each fuel tank sump is equipped with a fuel quick-drain valve to facilitate draining and/or examination of fuel for contamination and grade. The valve extends through the lower surface of the wing just outboard of the cabin door. A sampler cup stored in the aircraft is used to examine the fuel. Insert the probe in the sampler cup into the center of the quick-drain valve and push. Fuel will drain from the tank sump into the sampler cup

until pressure on the valve is released.

The fuel reservoir tanks, located under the floorboards near the fr[illegible] of the cabin doors, are also equipped with quick-drain valves. The val[illegible] are located under plug buttons in the aircraft belly skin; and are used to facilitate purging of the fuel system in the event water is discovered during the preflight fuel system inspection.

ELECTRICAL SYSTEM.

Electrical energy is supplied by a 28-volt, direct-current system powered by an engine-driven alternator (see figure 2-3). The 24-volt battery is located on the upper left-hand forward portion of the firewall. Power is supplied to all electrical circuits through a split bus bar, one side containing electronic system circuits and the other side having general electrical system circuits. Both sides of the bus are on at all times except when either an external power source is connected or the starter switch is turned on; then a power contactor is automatically activated to open the circuit to the electronics bus. Isolating the electronic circuits in this manner prevents harmful transient voltages from damaging the transistors in the electronics equipment.

MASTER SWITCH.

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

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 turned off 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 flow of current, in amperes, from the alterna-

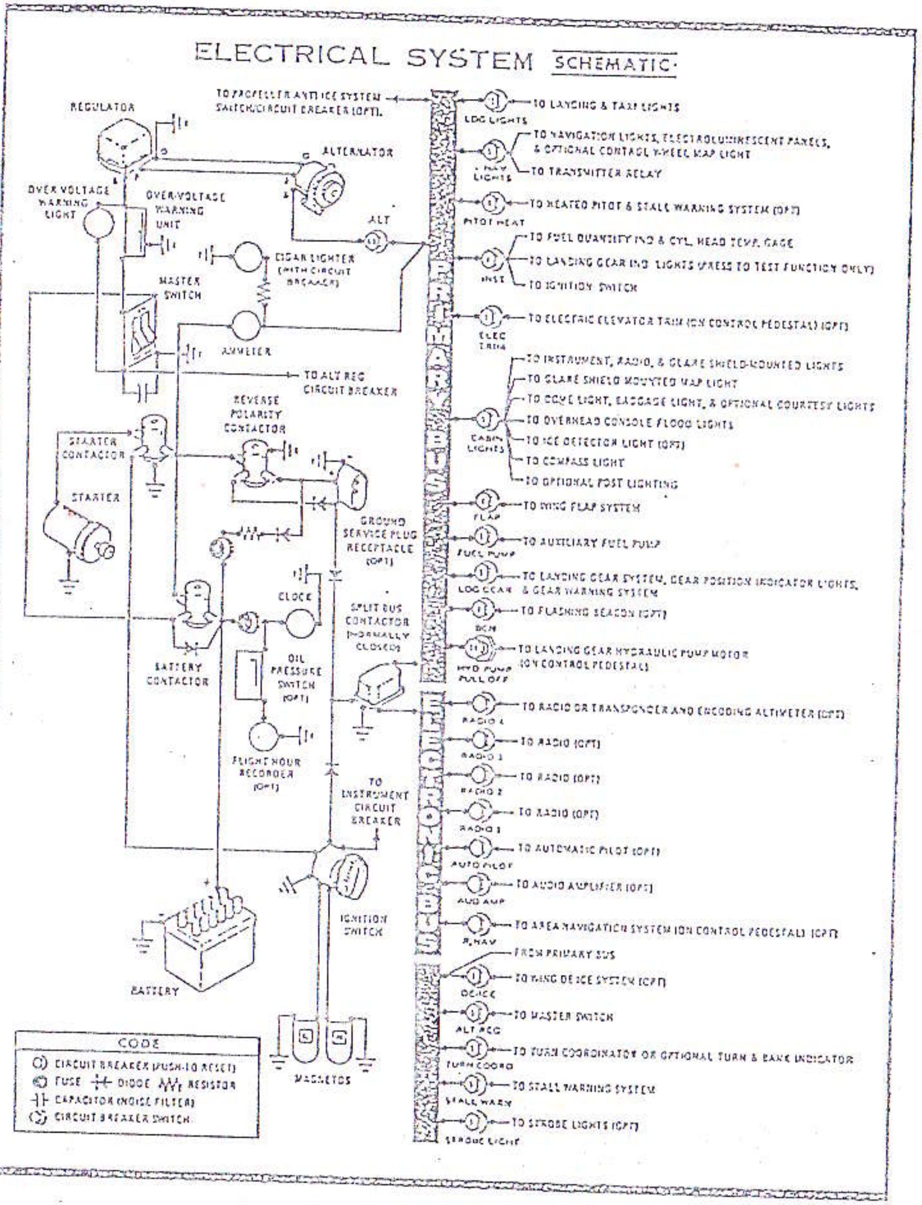


Figure 2-3.

tor to the battery or from the battery to the aircraft electrical system. When the engine is operating and the master switch is 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 discharge rate of the battery.

NB

OVER-VOLTAGE SENSOR AND WARNING LIGHT.

The aircraft is equipped with an automatic over-voltage protection system consisting of an over-voltage sensor behind the instrument panel and a red warning light, labeled HIGH VOLTAGE, located on the upper right side of the instrument panel.

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 aircraft 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 over-voltage 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 electrical circuits in the aircraft are protected by "push-to-reset" circuit breakers mounted on the left side of the instrument panel. Exceptions to this are the battery contactor closing (external power) circuit which has a fuse mounted near the ground service plug receptacle, and the clock and optional flight hour recorder circuits which have a fuse mounted near the battery. Also, the cigar lighter is protected by a manually-reset type circuit breaker mounted directly on the back of the lighter behind the instrument panel. The hydraulic pump for the landing gear system is protected by a switch type circuit breaker mounted on the control pedestal. The optional electric elevator trim system is protected by a push-to-reset circuit breaker on the control pedestal. A push-to-reset circuit breaker, mounted on the control pedestal, protects the optional area navigation system. Optional propeller anti-icing circuitry is protected by an automatic resetting circuit breaker built into the back of the anti-ice switch on the instrument panel.

When more than one radio is installed, the radio transmitter relay (which is a part of the radio installation) is protected by the navigation lights circuit breaker labeled NAV LIGHTS. It is important to remember that any malfunction in the navigation lights system which causes the circuit breaker to open will de-activate both the navigation lights and the transmitter relay. In this event, the navigation light switch should be turned off to isolate the circuit; then reset the circuit breaker to re-activate the transmitter relay and permit its usage. Do not turn on the navigation lights switch until the malfunction has been corrected.

LIGHTING EQUIPMENT.

EXTERIOR LIGHTING.

Standard exterior lighting consists of navigation lights on the wing tips and stinger, and landing and taxi lights mounted in the nose cap. Optional lighting includes a strobe light on each wing tip, a flashing beacon on top of the vertical fin, and a courtesy light under each wing just outboard of the cabin. The courtesy lights are operated by a switch, labeled UTILITY LIGHTS, on the aft side of the left rear door post. To turn on the courtesy lights, push up on the switch. All exterior lights, except the courtesy lights, are controlled by rocker type switches on the left switch and control 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 two high intensity strobe lights will enhance anti-collision protection. However, the lights should be turned off when taxiing in the vicinity of other aircraft, or during night flight through clouds, fog or haze.

INTERIOR LIGHTING.

Instrument and control panel lighting is provided by electroluminescent lighting, flood lighting, optional post lighting, and integral lighting. Two concentric rheostat control knobs, labeled LWR PANEL, ENG-RADIO, and a rheostat control knob labeled INSTRUMENTS control the intensity of instrument and control panel lighting. A rocker-type switch labeled POST-FLOOD LIGHTS is used to select either standard flood lighting or optional post lighting. These controls are located on the left switch and control panel.

Switches and controls on the lower part of the instrument panel are lighted by electroluminescent panels which do not require light bulbs for illumination. To operate this lighting, turn on the NAV LIGHTS switch and adjust light intensity with the inner control knob labeled LWR PANEL.

Instrument panel flood lighting consists of four lights located in the glare shield above the instrument panel and two lights in the overhead console. To use flood lighting, place the POST-FLOOD LIGHTS selector switch in the FLOOD LIGHTS position and adjust light intensity with the INSTRUMENTS control knob.

The instrument panel may be equipped with optional post lights which are mounted at the edge of each instrument or control and provide direct lighting. The lights are operated by placing the POST-FLOOD LIGHTS selector switch in the POST position and adjusting intensity with the INSTRUMENTS control knob. Switching to post lights will automatically turn off flood lighting.

The magnetic compass, engine instrument cluster, radios and radio selector switches have integral lighting and operate independently of post or flood lighting. Compass light intensity is controlled by the INSTRUMENTS control knob. Integral lighting in the engine instrument cluster, and radios, is controlled by the ENG-RADIO control knob. For information concerning radio selector switch lighting, refer to Section VII.

The control pedestal has two integral lights and the optional overhead oxygen console is equipped with post lights. This lighting is controlled by the ENG-RADIO control knob.

Map lighting may be provided by three different sources: standard overhead console map lights, a standard glare shield mounted map light, and an optional control wheel map light. The console map lights operate in conjunction with instrument panel flood lighting and consist of two additional openings just aft of the overhead flood light openings. These openings have sliding covers controlled by small round knobs. To use the map lights, slide the covers open by moving the two knobs toward each other. Close the covers when the map lights are no longer required. A map light, mounted in the lower surface of the glare shield, is used for illuminating approach plates or other charts when using a control wheel mounted approach plate clip. The map light switch, labeled MAP LIGHT is located adjacent to the light. To use the light, turn on the MAP LIGHT switch and adjust intensity with the INSTRUMENTS control knob. The optional map light mounted on the bottom of the pilot's control wheel illuminates the lower portion of the cabin in front of the pilot, and is used when checking maps and other flight data during night operation. To operate the light, turn on the NAV LIGHTS switch and adjust map light intensity with the rheostat control knob on the bottom of the control wheel pad on the right side.

The cabin interior is lighted by a dome light in the ceiling of the cabin area and a baggage compartment light above the baggage area as an aid to loading the aircraft during night operations. The lights are operated by a switch adjacent to the dome light.

LANDING GEAR SYSTEM.

The retractable tricycle landing gear is retracted and extended by hydraulic actuators, powered by an electrically-driven hydraulic pump. The nose gear hydraulic actuator also operates a mechanical down lock upon extension of the nose gear. A positive mechanical uplock is actuated by a separate hydraulic actuator when the nose gear is retracted. The main gear has positive mechanical up and down locks, operated by separate hydraulic actuators.

Two position-indicator lights show that the gear is either up or down and locked. The lights are the press-to-test type. The gear-down indicator light (green) has two test positions; with the light pushed in half-way (throttle pulled out) the gear warning horn should sound intermittently, and with the light pushed full in, the light should illuminate. The gear-up indicator light (amber) has only one test position; with the light pushed full in, it should illuminate. The indicator lights contain dimming shutters for night operation.

As an additional reminder that the gear is retracted, a warning horn sounds intermittently whenever the throttle is retarded with the gear up.

The hydraulic system fluid level should be checked at 25 hour intervals. To facilitate checking and filling the system, a dipstick and filler are located on the right side of the hydraulic pump behind a snap-out cover panel on the right side of the pedestal. The top (cap end) of the dipstick employs an over-center locking device, and serves as the cap for the filler. When the fluid level is at or below the line marked ADD on the dipstick, hydraulic fluid (MIL-H-5606) should be added to the system.

LANDING GEAR POSITION HANDLE.

The gear position handle has two positions: gear up and gear down, which give a mechanical indication of the gear position selected. From the up or down position, the handle must be pulled out to clear a detent before it can be repositioned. Operation of the gear and doors will not begin until the handle has been repositioned.

To retract or extend the landing gear, pull out on the gear handle and move it to the desired position. Pressure is created in the system by the electrically-driven hydraulic pump and the gear is actuated to the selected position.

IMPORTANT

If for any reason the hydraulic pump continues to run after gear cycle completion (up or down), the 30 amp circuit breaker switch labeled HYD PUMP should be pulled out. This will shut off the hydraulic system and prevent damage to the hydraulic pump and motor. Refer to Section III for complete emergency procedures.

During a normal cycle, the gear locks up or down and the position indicator light comes on. When the light illuminates, hydraulic pressure is switched from the gear actuators to the door actuators to close the gear doors. When the doors are closed, pressure will continue to build until a pressure switch in the door closing system turns off the hydraulic pump. The gear doors are held in the closed position by hydraulic pressure.

The landing gear safety switch, actuated by the nose gear strut, prevents inadvertent retraction whenever the nose gear strut is compressed by the weight of the aircraft. A switch type circuit breaker, mounted on the control pedestal, should be used for safety during maintenance. With the switch pulled out, landing gear operation cannot occur. After maintenance is completed, and prior to flight, the switch should be pushed back in.

EMERGENCY HAND PUMP.

A hand-operated hydraulic pump, located between the pilot and copilot seats, is provided for extension of the landing gear in the event of a hydraulic system failure. Refer to Section III for emergency use of the hand pump.

For practice manual gear extensions, pull out the HYD PUMP circuit breaker before placing the landing gear handle in the GEAR DOWN position. After the practice manual extension is completed, push the circuit breaker in to restore normal gear operation.

OPERATION OF LANDING GEAR DOORS (AIRCRAFT ON GROUND).

For inspection purposes, the landing gear doors may be opened and closed while the aircraft is on the ground with the engine stopped. Operate the doors with the landing gear handle in the down position. To open the doors, turn off the master switch, pull out the hydraulic motor circuit breaker switch, and operate the hand pump until the doors open. To close the doors, check that the landing gear handle is down, push the hydraulic motor circuit breaker switch in, and turn on the master switch.

IMPORTANT

Safety placards are installed on each wheel well door to warn against any maintenance in the wheel well areas with the circuit breaker switch pushed in.

NOTE

The position of the master switch for gear door operation is easily remembered by the following rule:

OPEN circuit = OPEN doors .
CLOSED circuit = CLOSED doors

RETRACTABLE CABIN ENTRY STEP.

The aircraft is equipped with a retractable cabin entry step located on the right side of the aircraft below the cabin door. The step cycles directly with the landing gear, and is spring loaded to the extended position. A cable attached to the nose gear hydraulic actuator thru-bolt retracts the step as the nose gear is retracted.

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 HEAT and CABIN AIR knobs. When partial cabin heat is desired, blending warm and cold air will result in improved ventilation and heat distribution throughout the cabin. Additional outside air for summer ventilation is provided through the heat and vent system by operation of the push-pull AUX CABIN AIR knob. The rotary type DEFROST knob regulates the airflow for windshield defrosting.

Front cabin heat and ventilating air is supplied by outlet holes spaced across a cabin manifold just forward of the pilot's and copilot's feet. Rear cabin heat and air is supplied by two ducts from the manifold, one extending down each side of the cabin to an outlet at the front door post at floor level. Windshield defrost air is also supplied by a duct leading from the cabin manifold.

Additional cabin air is supplied by two fully adjustable ventilators mounted in the forward and aft overhead consoles, and one ventilator in each console located above the rear side windows. Each ventilator outlet can be adjusted in any desired direction by moving the entire outlet to direct the airflow forward or aft, and by moving a tab, protruding from the center of the vent, left or right to obtain left or right air flow. The outlets may be closed off completely, or partially closed according to the amount of airflow desired, by rotating an adjustment wheel near the vent.

SHOULDER HARNESSES AND SEAT BELTS.

Shoulder harnesses are provided as standard equipment for the pilot and front seat passenger, and as optional equipment for the center and aft seat passengers. Seat belts are standard equipment for all passengers.

Each standard front seat harness is attached to a rear door post just above window line and is stowed behind a stowage sheath above each cabin door. The optional center and aft seat shoulder harnesses are attached above and aft of the side windows. Each harness is stowed behind a stowage sheath above the side windows.

To use a standard front or optional rear seat shoulder harness, fasten and adjust the seat belt first. Remove the harness from the stowed position, and lengthen as required by pulling on the end of the harness and the narrow release strap. Snap the harness metal stud firmly into the retaining slot adjacent to the seat belt buckle. Then adjust to length by pulling down on the free end of the harness. A properly adjusted harness will permit the occupant to lean forward enough to sit completely erect but is tight enough to prevent excessive forward movement and contact with objects during sudden deceleration. Also, the pilot will want the freedom to reach all controls easily.

Releasing and removing the shoulder harness is accomplished by pulling upward on the narrow release strap, and removing the harness stud from the slot in the seat belt buckle. In an emergency, the shoulder harness may be removed by releasing the seat belt first, and then pulling the harness over the head by pulling up on the release strap.

INTEGRATED SEAT BELT/SHOULDER HARNESSES WITH INERTIA REELS.

Optional integrated seat belt/shoulder harnesses with inertia reels are available for the pilot and front seat passenger. The seat belt/shoulder harnesses extend from inertia reels in the cabin ceiling to attach points inboard of the two front seats. A separate seat belt half and buckle is located outboard of the seats. The inertia reels are located in the aft overhead console, and are labeled PILOT and COPILOT. Inertia reels allow complete freedom of body movement. However, in the event of a sudden deceleration, they will lock up automatically to protect the occupants.

To use the seat belt/shoulder harness, adjust the metal buckle half on the harness up far enough to allow it to be drawn across the lap of the occupant and be fastened into the outboard seat belt buckle. Adjust seat belt tension by pulling up on the shoulder harness. To remove the seat belt/shoulder harness, release the seat belt buckle and allow the inertia reel to draw the harness to the inboard side of the seat.

STARTING ENGINE.

Proper fuel management and throttle adjustments are the determining factors in securing an easy start from your continuous-flow fuel-injection engine. The procedure outlined in Section I should be followed closely as it is effective under nearly all operating conditions.

Conventional full rich mixture and high RPM propeller settings are used for starting; the throttle, however, should be fully closed initially. When ready to start, place the auxiliary fuel pump switch in the ON position and advance the throttle to obtain 50-60 lbs./hr fuel flow. Then, promptly return the throttle to idle and turn off the auxiliary fuel pump. Place the ignition switch in the START position. While cranking, slowly advance the throttle until the engine starts. Slow throttle advancement is essential since the engine will start readily when the correct fuel/air ratio is obtained. When the engine has started, reset the throttle to the desired idle speed.

When the engine is hot or outside air temperatures are high, the engine may die after running several seconds because the mixture became either too lean due to fuel vapor, or too rich due to excessive prime fuel. The following procedure will prevent over-priming and alleviate fuel vapor in the system:

(1) Set the throttle 1/3 to 1/2 open.
(2) When the ignition key is in the BOTH position and you are ready to engage the starter, place the right half of the auxiliary fuel pump switch in the ON position until the indicated fuel flow comes up to 25 to 35 lbs./hr.; then turn the switch off.

NOTE

During a restart after a brief shutdown in extremely hot weather, the presence of fuel vapor may require the use of the auxiliary fuel pump switch in the ON position for up to 1 minute or more before the vapor is cleared sufficiently to obtain 25 to 35 lbs./hr. for starting. If the above procedure does not obtain sufficient fuel flow, fully depress and hold the left half of the switch in the HI position to obtain additional fuel pump capability.

(3) Without hesitation, engage the starter and the engine should start in 3 to 5 revolutions. Adjust throttle for 1200 to 1400 RPM.
(4) If there is fuel vapor in the lines, it will pass into the injector nozzles in 2 to 3 seconds and the engine will gradually slow down and stop. When engine speed starts to decrease, hold the left half of the auxiliary fuel pump switch in the HI position for approximately one second to clear out the vapor. Intermittent use of the HI position of the switch is necessary since prolonged use of the HI position after vapor is cleared will flood out the engine during a starting operation.
(5) Let the engine run at 1200 to 1400 RPM until the vapor is eliminated and the engine idles normally.

If prolonged cranking is necessary, allow the starter motor to cool at frequent intervals, since excessive heat may damage the armature.

After starting, if the oil pressure gage does not begin to show pressure within 30 seconds in normal temperatures and 60 seconds in very cold weather, shut off the engine and investigate. Lack of oil pressure can cause serious engine damage.

TAXIING.

Taxiing over loose gravel or cinders should be done at low engine speed to avoid abrasion and stone damage to the propeller tips. Refer to figure 2-4 for additional taxiing instructions.

BEFORE TAKE-OFF.

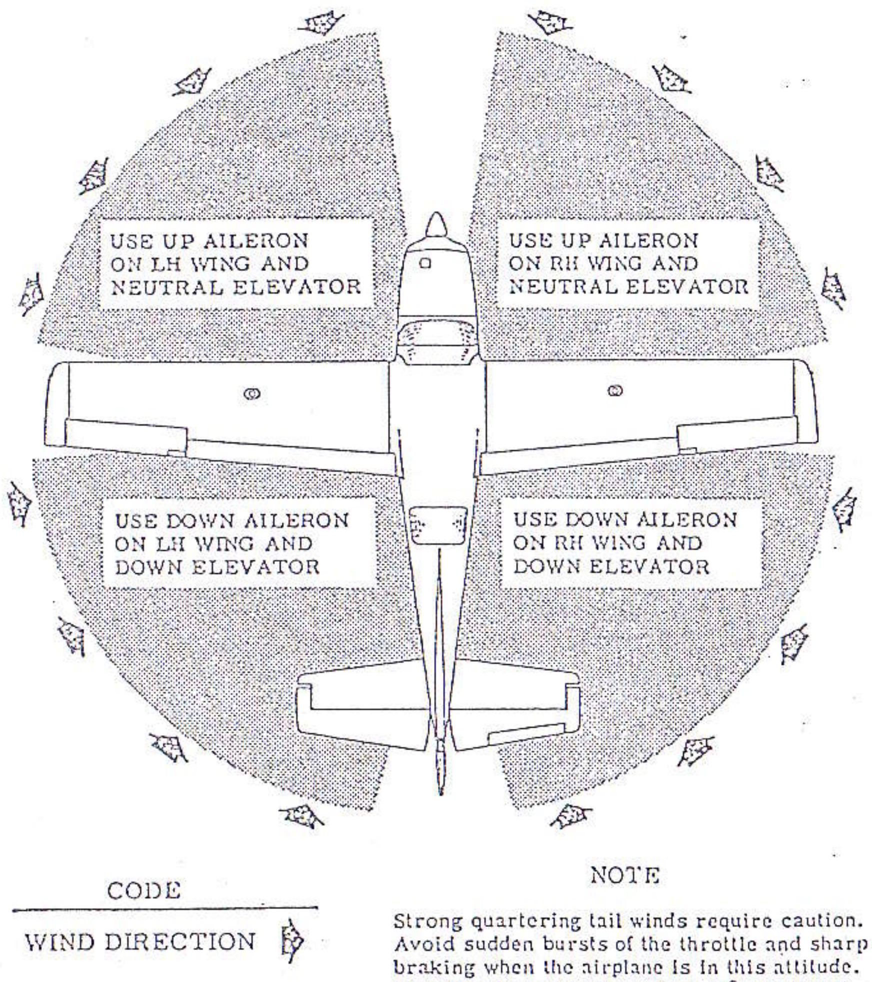
Since the engine is closely cowled for efficient in-flight cooling, precautions should be taken to avoid overheating on the ground. Full throttle checks on the ground are not recommended unless the pilot has good reason to suspect that the engine is not turning up properly.

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 150 RPM on either magneto or show greater than 50 RPM differential 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.

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 during the engine runup (1700 RPM). The ammeter will remain within a needle width of zero if the alternator and voltage regulator are operating properly.

TAXIING DIAGRAM



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.

Figure 2-4.

TAKE-OFF.

It is important to check full-throttle engine operation early in the take-off run. Any sign of rough engine operation or sluggish engine acceleration is good cause for discontinuing the take-off.

Full throttle runups over loose gravel are especially harmful to propeller tips. When take-offs must be made over a gravel surface, it is very important that the throttle be advanced slowly. This allows the aircraft to start rolling before high RPM is developed, and the gravel will be blown back of the propeller rather than pulled into it.

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 adjustments should be made as required in other flight conditions to maintain a fixed throttle setting.

For maximum engine power, the mixture should be adjusted during the initial take-off roll to the fuel flow corresponding to the field elevation. (Refer to Maximum Performance Take-Off and Climb Settings placard located adjacent to fuel flow indicator.) The power increase is significant above 3000 feet and this procedure always should be employed for field elevations greater than 5000 feet above sea level.

Using 10° flaps reduces the ground run and total distance over the obstacle by approximately 10 percent. Soft field take-offs are performed with 10° flaps by lifting the nose wheel off the ground as soon as practical and leaving the ground in a slightly tail-low attitude. However, the aircraft should be leveled off immediately to accelerate to a safe climb speed.

Take-offs into strong crosswinds normally are performed with the minimum flap setting necessary for the field length, to minimize the drift angle immediately after take-off. The aircraft is accelerated to a speed 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.

Landing gear retraction normally is started after reaching the point over the runway where a wheels-down, forced landing on that runway would become impractical. Since the landing gear swings downward approximately two feet as it starts the retraction cycle, damage can result by retracting it before obtaining at least that much ground clearance.

Before retracting the landing gear, the brakes should be applied momentarily to stop wheel rotation. Centrifugal force caused by the rapidly-spinning wheel expands the diameter of the tire. If there is an accumulation of mud or ice in the wheel wells, the rotating wheel may rub as it is retracted into the wheel well.

ENROUTE CLIMB.

A cruising climb at 25 inches of manifold pressure, 2550 RPM (approximately 75% power) and 120 to 140 MPH is recommended to save time and fuel for the overall trip. In addition, this type of climb provides better engine cooling, less engine wear, and more passenger comfort due to lower noise level.

Cruising climbs should be conducted at approximately 108 lbs/hr up to 5000 feet and at 6 lbs/hr more than the fuel flow shown on the Cessna Power Computer at higher altitudes and lower power.

If it is necessary to climb rapidly to clear mountains or reach favorable winds at high altitudes, the best rate-of-climb speed should be used with maximum continuous power. This speed is 109 MPH at sea level, decreasing to 102 MPH at an altitude of 10,000 feet. The mixture should be leaned as shown by the Maximum Performance Take-Off and Climb Settings placard located adjacent to the fuel flow indicator.

If an obstruction dictates the use of a steep climb angle, climb with flaps retracted and maximum continuous power at 85 MPH at sea level, to 90 MPH at 10,000 ft.

CRUISE.

Normal cruising is performed between 55% and 75% power. The corresponding power settings and fuel consumption for various altitudes can be determined by using your Cessna Power Computer or the Operational Data in Section VI.

NOTE

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

The Cruise Performance table shown below illustrates the advantage of higher altitude on both true airspeed and miles per gallon. In addition, the beneficial effect of lower cruise power on miles per gallon at a given altitude can be observed. 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. The selection of cruise altitude on the basis of the most favorable wind conditions and the use of low power settings are significant factors that should be considered on every trip to reduce fuel consumption.

For reduced noise levels, it is desirable to select the lowest RPM in the green arc range for a given percent power that will provide smooth engine operation. The cowl flaps should be opened, if necessary, to maintain the cylinder head temperature at approximately two-thirds of the normal operating range (green arc).

Cruise performance data in this manual and on the power computer is based on an extended range mixture setting which is approximately six pounds per hour less than the best power mixture setting. This extended

CRUISE PERFORMANCE

	75% POWER		65% POWER		55% POWER	
ALTITUDE	TAS	MPG	TAS	MPG	TAS	MPG
4000 Feet	178	11.3	167	12.3	153	13.1
7500 Feet	187	11.9	175	12.9	159	13.6
11000 Feet	---	----	183	13.5	165	14.1
Standard Conditions						Zero Wind

Figure 2-5.

range mixture setting results in a one MPH speed loss and an average increase of 6% in range compared to a best power mixture setting.

For best fuel economy at 55% power or less, the engine may be operated at six pounds per hour leaner than shown in this manual and on the power computer. This will result in approximately 6% greater range than shown in the cruise tables of this manual accompanied by approximately 5 MPH decrease in speed.

The fuel injection system employed on this engine is considered to be non-icing. In the event that unusual conditions cause both intake air filters to become clogged or iced over, an alternate intake air valve opens automatically. Due to a one to two inch decrease in manifold pressure and a significant increase in intake air temperature when the filters are blocked, power at full throttle decreases approximately 10%.

LEANING WITH A CESSNA ECONOMY MIXTURE INDICATOR (EGT).

Exhaust gas temperature (EGT) as shown on the optional Cessna Economy Mixture Indicator may be used as an aid for mixture leaning in cruising flight at 75% power or less. To adjust the mixture, using this indicator, lean to establish the peak EGT as a reference point and then enrichen the mixture by a desired increment based on the table below.

Continuous operation at peak EGT is authorized only at 55% power or less. This best economy mixture setting results in approximately 6%

MIXTURE DESCRIPTION	EXHAUST GAS TEMPERATURE	RANGE INCREASE FROM BEST POWER
BEST POWER	Peak EGT Minus 75°F (Enrichen)	0%
EXTENDED RANGE (Owner's Manual and Computer Performance)	Peak EGT Minus 25°F (Enrichen)	6%
BEST ECONOMY (55% Power or Less)	Peak EGT	12%

greater range than shown in the cruise tables of this manual accompanied by approximately 5 MPH decrease in speed.

NOTE

Operation on the lean side of peak EGT is not approved.

When leaning the mixture, if a distinct peak is not obtained, use the corresponding maximum EGT as a reference point for enrichening the mixture to the desired cruise setting. Any change in altitude or power will require a recheck of the EGT indication.

STALLS.

The stall characteristics are conventional and aural warning is provided by a stall warning horn which sounds between 5 and 10 MPH above the stall in all configurations.

Power-off stall speeds at maximum gross weight and aft c.g. position are presented on page 6-2 as calibrated airspeeds since indicated airspeeds are unreliable near the stall.

BEFORE LANDING.

In view of the relatively low drag of the extended landing gear and the high allowable gear-down speed (160 MPH), the landing gear should be extended before entering the traffic pattern. This practice will allow more time to confirm that the landing gear is down and locked. As a further precaution, leave the landing gear extended in go-around procedures or traffic patterns for touch-and-go landing.

Landing gear extension can be detected by illumination of the gear down indicator light (green), absence of a gear warning horn with the throttle retarded below 12 inches of manifold pressure, and visual inspection of the main gear position. Should the gear indicator light fail to illuminate, the light should be checked for a burned-out bulb by pushing to test. A burned-out bulb can be replaced in flight with the landing gear up (amber) indicator light.

LANDINGS.

Landings should be made on the main wheels first to reduce the landing speed and subsequent need for braking in the landing roll. The nose wheel is lowered to the runway after the speed has diminished to avoid unnecessary nose gear load. This procedure is especially important in rough field landings.

SHORT FIELD LANDINGS.

For short field landings, make a power approach at 82 MPH with full flaps. After all approach obstacles are cleared, progressively reduce power. Maintain 82 MPH approach speed by lowering the nose of the aircraft. Touchdown should be made with the throttle closed, and on the main wheels first. Immediately after touchdown, lower the nose gear and apply heavy braking as required. For maximum brake effectiveness after all three wheels are on the ground, retract the flaps, hold full nose up elevator and apply maximum possible brake pressure without sliding the tires.

At light operating weights, during ground roll with full flaps, hold the control wheel full back to ensure maximum weight on the main wheels for braking. Under these conditions, full nose down elevator (control wheel full forward) will raise the main wheels off the ground.

BALKED LANDING.

In a balked landing (go-around) climb, the wing flap setting should be reduced to 20° immediately after full power is applied. After all obstacles are cleared and a safe altitude and airspeed are obtained, the wing flaps should be retracted.

COLD WEATHER OPERATION.

The use of an external pre-heater and an external power source is recommended whenever possible to reduce wear and abuse to the engine and the electrical system. Pre-heat will thaw the oil trapped in the oil cooler, which probably will be congealed prior to starting in extremely cold temperatures. When using an external power source, the position of the master switch is important. Refer to Section VII, paragraph Ground Service Plug Receptacle, for operating details.

In very cold weather, no oil temperature indication need be apparent before take-off. After a suitable warm-up period (2 to 5 minutes at 1000 RPM), the engine is ready for take-off if it accelerates smoothly and the oil pressure is normal and steady.

During let-down, observe engine temperatures closely and carry sufficient power to maintain them in the recommended operating range.

Refer to Section VII for discussion of additional cold weather equipment.

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 aircraft 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 2, 000 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 take-off 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 2, 000 feet is necessary for him to adequately exercise his duty to see and avoid other aircraft.

Section III

EMERGENCY PROCEDURES

Emergencies caused by aircraft or engine malfunctions are extremely rare if proper pre-flight inspections and maintenance are practiced. En-route weather emergencies can be minimized or eliminated by careful flight planning and good judgement 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.

ENGINE FAILURE.

ENGINE FAILURE AFTER TAKE-OFF.

Prompt lowering of the nose to maintain airspeed and establish a glide attitude is the first response to an engine failure after take-off. 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 180° gliding turn necessary to return to the runway. The following procedures assume that adequate time exists to secure the fuel and ignition systems prior to touchdown.

(1) Airspeed -- 100 MPH.
(2) Mixture -- IDLE CUT-OFF.
(3) Fuel Selector Valve -- OFF.
(4) Ignition Switch -- OFF.
(5) Wing Flaps -- AS REQUIRED (30° recommended).
(6) Master Switch -- OFF.

ENGINE FAILURE DURING FLIGHT.

While gliding toward a suitable landing area, an effort should be made to identify the cause of the failure. If time permits, and an engine restart is feasible, proceed as follows:

(1) Airspeed -- 100 MPH.

(2) Fuel Quantity -- CHECK.
(3) Fuel Selector Valve -- FULLER TANK.
(4) Mixture -- RICH.
(5) Auxiliary Fuel Pump -- ON for 3 - 5 seconds with throttle 1/2 open; then OFF.
(6) Ignition Switch -- BOTH (or START if propeller is not windmilling).
(7) Throttle -- SLOWLY ADVANCE.

If the engine cannot be restarted, a forced landing without power must be executed. A recommended procedure for this is given in the following paragraph.

FORCED LANDINGS.

EMERGENCY LANDING WITHOUT ENGINE POWER.

If all attempts to restart the engine fail and a forced landing is imminent, select a suitable field and prepare for the landing as follows:

(1) Airspeed -- 100 MPH (flaps UP).
90 MPH (flaps DOWN).
(2) Mixture -- IDLE CUT-OFF.
(3) Fuel Selector Valve -- OFF.
(4) Ignition Switch -- OFF.
(5) Landing Gear -- DOWN (UP if terrain is rough or soft).
(6) Wing Flaps -- AS REQUIRED (30° recommended).
(7) Master Switch -- OFF.
(8) Doors -- UNLATCH PRIOR TO TOUCHDOWN.
(9) Touchdown -- SLIGHTLY TAIL LOW.
(10) Brakes -- APPLY HEAVILY.

PRECAUTIONARY LANDING WITH ENGINE POWER.

Before attempting an "off airport" landing, one should drag the landing area at a safe but low altitude to inspect the terrain for obstructions and surface conditions, proceeding as follows:

(1) Perform the Before Landing checklist.
(2) Drag over selected field with flaps 10° and 100 MPH airspeed, noting the preferred area for touchdown for the next landing approach. Then retract flaps upon reaching a safe altitude and airspeed.

(3) Landing Gear -- DOWN (UP if terrain is rough or soft).
(4) Wing Flaps -- 30°.
(5) Airspeed -- 90 MPH.
(6) Master Switch -- OFF.
(7) Doors -- UNLATCH PRIOR TO TOUCHDOWN.
(8) Touchdown -- SLIGHTLY TAIL LOW.
(9) Ignition Switch -- OFF.
(10) Brakes -- APPLY HEAVILY.

DITCHING.

Prepare for ditching by securing or jettisoning heavy objects located in the baggage area, and collect folded coats or cushions for protection of occupant's face at touchdown. Transmit Mayday message on 121.5 MHz giving location and intentions.

(1) Plan approach into wind if winds are high and seas are heavy. With heavy swells and light wind, land parallel to swells.
(2) Approach with landing gear retracted, flaps 30°, and sufficient power for a 300 ft/min rate of descent at 90 MPH.
(3) Unlatch the cabin doors.
(4) Maintain a continuous descent until touchdown in level attitude. Avoid a landing flare because of difficulty in judging aircraft height over a water surface.
(5) Place folded coat or cushion in front of face at time of touchdown.
(6) Evacuate aircraft through cabin doors. If necessary, open window to flood cabin compartment for equalizing pressure so that door can be opened.
(7) Inflate life vests and raft (if available) after evacuation of cabin. The aircraft cannot be depended on for flotation for more than a few minutes.

FIRES.

ENGINE FIRE IN FLIGHT.

Although engine fires are extremely rare in flight, the following steps should be taken if one is encountered:

(1) Mixture -- IDLE CUT-OFF.
(2) Fuel Selector Valve -- OFF.
(3) Master Switch -- OFF.

(4) Cabin Heat and Air -- OFF (except overhead vents).
(5) Airspeed -- 140 MPH. If fire is not extinguished, increase glide speed to find an airspeed which will provide an incombustible mixture.

Execute a forced landing as outlined in preceding paragraphs.

ELECTRICAL FIRE IN FLIGHT.

The initial indication of an electrical fire is usually the odor of burning insulation. The following procedure should then be used:

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

NOTE

If an oxygen system is available and breathing is difficult, occupants should use oxygen masks until smoke and discharged dry powder clears.

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 and 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.

DISORIENTATION IN CLOUDS.

In the event of a vacuum system failure during flight in marginal weather, the directional gyro and gyro horizon will be disabled, and the pilot will have to rely on the turn coordinator or the turn and bank indicator if he inadvertently flies into clouds. The following instructions assume that only the electrically-powered turn coordinator or the turn and bank indicator is operative, and that the pilot is not completely proficient in partial panel instrument flying.

EXECUTING A 180° TURN IN CLOUDS.

Upon 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 aircraft wing opposite the lower left index mark for 60 seconds. Then roll back to level flight by leveling the miniature aircraft.
(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 overcontrolling by keeping the hands off the control wheel and steering only with rudder.

EMERGENCY LET-DOWNS THROUGH CLOUDS.

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) Extend landing gear.
(2) Reduce power to set up a 500 to 800 ft/min rate of descent.
(3) Adjust mixture for smooth operation.
(4) Adjust the elevator and rudder trim for a stabilized descent at 120 MPH.
(5) Keep hands off the control wheel.
(6) Monitor turn coordinator and make corrections by rudder alone.
(7) Readjust rudder trim to relieve unbalanced rudder force if present.
(8) Check trend of compass card movement and make cautious corrections with rudder to stop the turn.
(9) 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 and place propeller control in high RPM.
(2) Stop the turn by using coordinated aileron and rudder control to align the symbolic aircraft in the turn coordinator with the horizon reference line.
(3) Cautiously apply control wheel back pressure to slowly reduce the indicated airspeed to 120 MPH.
(4) Adjust the elevator trim control to maintain a 120 MPH glide.
(5) Keep hands off the control wheel, using rudder control to hold a straight heading. Adjust rudder trim to relieve unbalanced rudder force, if present.
(6) Clear engine occasionally, but avoid using enough power to disturb the trimmed glide.
(7) Upon breaking out of clouds, apply normal cruising power and resume flight.

SPINS.

Intentional spins are prohibited in this aircraft. Should an inadvertent spin occur, the following recovery technique should be used:

(1) Retard throttle to idle position.
(2) Apply full rudder opposite to the direction of rotation.
(3) After one-fourth turn, move the control wheel forward of neutral in a brisk motion.
(4) As rotation stops, neutralize rudder, and make a smooth recovery from the resulting dive.

FLIGHT IN ICING CONDITIONS.

The procedures listed below are for aircraft not equipped with optional ice protection equipment or aircraft which have experienced a failure of their ice protection equipment. Although known icing conditions should be avoided, an unexpected icing encounter should be handled as follows:

(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 and rotate defrost knob clockwise to obtain maximum windshield defroster effectiveness.
(4) Increase engine speed to minimize ice build-up on propeller blades. If excessive vibration is noted, momentarily reduce engine speed to 2200 RPM with the propeller control, and then rapidly move the control full forward.

NOTE

Cycling the RPM flexes the propeller blades and high RPM increases centrifugal force, causing ice to shed more readily.

(5) Watch for signs of induction air filter ice and regain manifold pressure by increasing the throttle setting.

NOTE

If ice accumulates on the intake filters (causing the alternate air valve to open), a decrease of 1 to 2 inches of full throttle manifold pressure will be experienced.

(6) If icing conditions are unavoidable, 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 a significantly higher power requirement, approach speed, stall speed, and landing roll.
(8) Open the window and, if practical, scrape ice from a portion of the windshield for visibility in the landing approach.
(9) Use a 10° to 20° landing flap setting for ice accumulations of 1 inch or less. With heavier ice formations, approach with flaps retracted to ensure adequate elevator effectiveness in the approach and landing.
(10) Approach at 100 to 110 MPH with 20° flaps and 110 to 120 MPH with 0° to 10° flaps, depending upon the amount of ice accumulation. If ice accumulation is unusually large, decelerate to the planned approach speed while in the approach configuration (landing gear and flaps down) at a high enough altitude which would permit recovery in the event that a stall buffet is encountered.
(11) Land on the main wheels first, avoiding the slow and high type of flare-out.

(12) Missed approaches should be avoided wherever possible because of severely reduced climb capability. However, if a go-around is mandatory, make the decision much earlier in the approach than normal. Apply maximum power and maintain 110 MPH while retracting the flaps slowly in 10° increments. Retract the landing gear after immediate obstacles are cleared.

ROUGH ENGINE OPERATION OR LOSS OF POWER.

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 normal 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.

ENGINE-DRIVEN FUEL PUMP FAILURE.

Failure of the engine-driven fuel pump will be evidenced by a sudden reduction in the fuel flow indication prior to a loss of power, while operating from a fuel tank containing adequate fuel.

In the event of an engine-driven fuel pump failure during take-off, immediately hold the left half of the auxiliary fuel pump switch in the HI position until the aircraft is well clear of obstacles. Upon reaching a safe altitude, and reducing the power to a cruise setting, release the HI

side of the switch. The ON position will then provide sufficient fuel flow to maintain engine operation while maneuvering for a landing.

If an engine-driven fuel pump failure occurs during cruising flight, apply full rich mixture and hold the left half of the auxiliary fuel pump switch in the HI position to re-establish fuel flow. Then the normal ON position (the right half of the fuel pump switch) may be used to sustain level flight. If necessary, additional fuel flow is obtainable by holding the left half of the pump switch in the HI position.

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. Leave the engine running at low power during the approach, using only the minimum power required to reach the desired touchdown spot.

LANDING GEAR MALFUNCTION PROCEDURES.

In analyzing a landing gear malfunction, first check that the master switch is turned on and the LDG GEAR and HYD PUMP circuit breakers are in; reset if necessary. Also, check both landing gear position indicator lights for operation by utilizing the press-to-test feature of the light units. Rotate the lights while they are depressed to check for open dimming shutters. A burned out bulb can be replaced in flight by using the bulb from the remaining gear position indicator light.

RETRACTION MALFUNCTIONS.

If the landing gear fails to retract normally or an intermittent GEAR UP indicator light is present, check the indicator light for proper operation and attempt to recycle the landing gear. Place the landing gear handle in the GEAR DOWN position. When the GEAR DOWN light comes on, reposition the gear handle in the GEAR UP position for another retraction attempt. If the GEAR UP light still fails to illuminate, the flight may be continued to an airport having maintenance facilities, if practical. If gear motor operation is audible after a period of one minute following gear handle retraction actuation, pull the hydraulic pump circuit breaker to prevent the electric motor from overheating. In this event, remember to re-engage the circuit breaker just prior to landing.

EXTENSION MALFUNCTIONS.

Normal landing gear extension time is approximately 8 seconds. If the landing gear will not extend normally, perform the general checks of circuit breakers and master switch and repeat the normal extension procedures at a reduced airspeed of 100 MPH. If efforts to extend and lock the gear through the normal landing gear system fail, the gear can be manually extended (as long as hydraulic system fluid has not been completely lost) by use of the emergency hand pump. The hand pump is located between the front seats.

MANUAL LANDING GEAR EXTENSION.

The following procedures are necessary for manual landing gear extension:

(1) Place landing gear handle in the GEAR DOWN position.
(2) Extend pump handle forward.
(3) Pump vertically approximately 70 cycles (140 strokes).

NOTE

After the gear down light illuminates, approximately 16 cycles are required to close the gear doors.

(4) Stop when resistance becomes very heavy.
(5) Verify that gear is down by observing green GEAR DOWN light on and that the main gear is in the normal down and locked position.

LANDING WITHOUT POSITIVE INDICATION OF GEAR LOCKING.

After performing the checks listed under Extension Malfunctions and observation indicates the gear is down and apparently locked, proceed as follows:

(1) Perform the Before Landing checklist.
(2) Make a normal full flap approach.
(3) Check that the hydraulic pump circuit breaker is pushed in so that landing gear down hydraulic pressure will be maintained until the landing is complete and the aircraft is parked.

NOTE

The electrically-operated hydraulic pump should not be operated for more than one minute. The pump should be turned on by engaging the circuit breaker just prior to landing, and turned off by pulling the circuit breaker after the aircraft is parked and the propeller has stopped turning.

(4) Land tail-low as smoothly as possible and minimize braking in the landing roll.
(5) Perform a normal engine shutdown prior to inspection of the landing gear.

LANDING WITH DEFECTIVE NOSE GEAR.

If the nose gear does not extend, or only partially extends, and observers verify that it is not down, prepare for a wheels-down landing as follows:

(1) Transfer movable load to baggage area, and passengers to rear seats.
(2) Select a hard-surfaced or smooth sod runway.

NOTE

If sod runway is soft or rough, plan a wheels-up landing.

(3) Extend flaps to 30°.
(4) Turn off master switch.
(5) Unlatch cabin doors.
(6) Land in a slightly tail-low attitude.

(7) Pull mixture control knob to idle cut-off (full out).
(8) Turn off ignition switch.
(9) Turn fuel selector valve handle to OFF.
(10) Hold nose off ground as long as possible.
(11) Evacuate aircraft as soon as it stops.

LANDING WITH PARTIALLY EXTENDED MAIN GEAR.

If the main gear are only partially extended, and all efforts to fully extend them (including manual extension) have failed, plan a wheels-up landing as follows:

(1) Select longest, hard-surfaced or smooth sod runway available.
(2) Place landing gear handle in GEAR UP position.
(3) Extend full flaps.
(4) Turn off master switch.
(5) Land in a slightly tail-low attitude.
(6) Pull mixture control knob to idle cut-off (full out).
(7) Turn fuel selector valve handle to OFF.
(8) Turn off ignition switch.
(9) Evacuate aircraft as soon as possible.

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 the most likely cause of alternator failures, although other factors could cause the problem. A damaged or improperly adjusted voltage regulator can also cause malfunctions. 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 regulator setting is causing the overcharging. To preclude these possibilities, an over-voltage sensor will automatically shut down the alternator, and the over-voltage warning light will illuminate if the charge voltage reaches approximately 30 to 31 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 comes on 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 operation of the landing gear and wing flaps and possible use of the landing lights during landing.

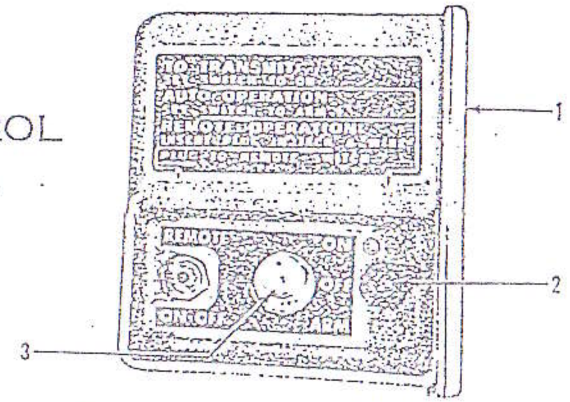
INSUFFICIENT RATE OF CHARGE.

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 non-essential equipment should be turned OFF and the flight terminated as soon as practical.

EMERGENCY LOCATOR TRANSMITTER (ELT).

The ELT consists of a self-contained dual-frequency radio transmitter and battery power supply, and is activated by an impact of 5 g or more as may be experienced in a crash landing. The ELT emits an omni-directional signal on the international distress frequencies of 121.5 and 243.0 MHz. General aviation and commercial aircraft, the FAA, and CAP monitor 121.5 MHz, and 243.0 MHz is monitored by the military. Following a crash landing, the ELT will provide line-of-sight transmission up to 100 miles at 10,000 feet. The duration of ELT transmissions is affected by

ELT
CONTROL
PANEL



1. COVER - Removable for access to battery.
2. FUNCTION SELECTOR SWITCH (3-position toggle switch):

   ON - Activates transmitter instantly. Used for test purposes and if "g" switch is inoperative.

   OFF - Deactivates transmitter. Used during shipping, storage and following rescue.

   ARM - Activates transmitter only when "g" switch receives 5g or more impact.
3. ANTENNA RECEPTACLE - Connection to antenna mounted on top of the tailcone.

Figure 3-1.

ambient temperature. At temperatures of +70° to +130°F, continuous transmission for 115 hours can be expected; a temperature of -40°F will shorten the duration to 70 hours.

The ELT is readily identified as a bright orange unit mounted behind the baggage compartment wall on the right side of the fuselage. To gain access to the unit, remove the baggage wall cover by grasping the edge and pulling. After the cover is removed, open the baggage wall access door. The ELT is operated by a control panel at the forward facing end

of the unit (see figure 3-1).

ELT OPERATION.

(1) NORMAL OPERATION: As long as the function selector switch remains in the ARM position, the ELT automatically activates following an impact of 5 g or more over a short time period.

(2) ELT FAILURE: If "g" switch actuation is questioned following a minor crash landing, gain access to the ELT and place the function selector switch in the ON position.

(3) PRIOR TO SIGHTING RESCUE AIRCRAFT: Conserve aircraft battery. Do not activate radio transceiver.

(4) AFTER SIGHTING RESCUE AIRCRAFT: Place ELT function selector switch in the OFF position, preventing radio interference. Attempt contact with rescue aircraft with the radio transceiver set to a frequency of 121.5 MHz. If no contact is established, return the function selector switch to ON immediately.

(5) FOLLOWING RESCUE: Place ELT function selector switch in the OFF position, terminating emergency transmissions.

(6) INADVERTENT ACTIVATION: Following a lightning strike or an exceptionally hard landing, the ELT may activate although no emergency exists. Select 121.5 MHz on your radio transceiver. If the ELT can be heard transmitting, place the function selector switch in the OFF position; then immediately return the switch to ARM.

Section IV

OPERATING LIMITATIONS

OPERATIONS AUTHORIZED.

Your Cessna exceeds the requirements of airworthiness as set forth by the United States Government, and is certificated under FAA Type Certificate No. 3A21 as Cessna Model No. 210L.

The aircraft may be equipped for day, night, VFR, or IFR operation. Your Cessna Dealer will be happy to assist you in selecting equipment best suited to your needs.

Your aircraft must be operated in accordance with all FAA-approved markings and placards in the aircraft. If there is any information in this section which contradicts the FAA-approved markings and placards, it is to be disregarded.

MANEUVERS — NORMAL CATEGORY.

The aircraft is certificated in the normal category. The normal category is applicable to aircraft intended for non-aerobatic operations. These include any maneuvers incidental to normal flying, stalls (except whip stalls) and turns in which the angle of bank is not more than 60°. In connection with the foregoing, the following gross weight and flight load factors apply:

Gross Weight	3800 lbs	
Flight Load Factor		
*Flaps Up	+3.8	-1.52
*Flaps Down	+2.0	

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

AIRSPEED LIMITATIONS (CAS).

The following is a list of the certificated calibrated airspeed (CAS) limitations for the aircraft.

Never Exceed Speed (Glide or dive, smooth air)	225 MPH
Maximum Structural Cruising Speed	190 MPH
Maximum Speed, Gear Extended	160 MPH
Maximum Speed, Flaps Extended	
Flaps 10°	160 MPH
Flaps 10° - 30°	120 MPH
*Maneuvering Speed	135 MPH

*The maximum speed at which you may use abrupt control travel.

AIRSPEED INDICATOR MARKINGS.

The following is a list of the certificated calibrated airspeed markings (CAS) for the aircraft.

Never Exceed (Glide or dive, smooth air)	225 MPH (red line)
Caution Range	190-225 MPH (yellow arc)
Normal Operating Range	79-190 MPH (green arc)
Flap Operating Range	70-120 MPH (white arc)

ENGINE OPERATION LIMITATIONS.

Power and Speed . . . . . 300 BHP at 2850 RPM (5-Minute Take-Off)
285 BHP at 2700 RPM (Maximum Continuous)

ENGINE INSTRUMENT MARKINGS.

FUEL QUANTITY INDICATORS.

Empty (3 lbs. unusable each fuel tank) . . . . . Red Line

CYLINDER HEAD TEMPERATURE GAGE.

Normal Operating Range	200-460°F (green arc)
Do Not Exceed	460°F (red line)

OIL TEMPERATURE GAGE.

Normal Operating Range	Green Arc
Do Not Exceed	240°F (red line)

OIL PRESSURE GAGE.

Idling Pressure	10 psi (red line)
Normal Operating Range	30-60 psi (green arc)
Maximum Pressure	100 psi (red line)

TACHOMETER.

Normal Operating Range	2200-2550 RPM (green arc)
Caution Range	2700-2850 RPM (yellow arc)
Maximum (Engine rated speed)	2850 RPM (red line)

MANIFOLD PRESSURE GAGE.

Normal Operating Range . . . . . 15-25 in. Hg (green arc)

FUEL FLOW INDICATOR.

Normal Operating Range	42-102 lbs/hr (green arc)
Minimum and Maximum	3.5 and 19.5 psi (151 lbs/hr) (red lines)

NOTE

A placard, located adjacent to the fuel flow indicator, provides maximum performance take-off/climb fuel flow settings at altitude. These settings, as called out on the placard, are as follows:

FUEL FLOW AT FULL THROTTLE

	2700 RPM	2850 RPM
S.L.	138 lbs/hr	144 lbs/hr
4000 Ft.	126 lbs/hr	132 lbs/hr
8000 Ft.	114 lbs/hr	120 lbs/hr

SUCTION GAGE (GYRO SYSTEM).

Normal Operating Range . . . . . 4.6 to 5.4 in. Hg (green arc)

WEIGHT AND BALANCE.

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

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

NOTE

The licensed empty weight and moment are recorded on the Weight and Balance and Installed Equipment Data sheet, or on revised weight and balance records, and are included in the aircraft file. In addition to the licensed 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 or 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 TIE-DOWN

A nylon baggage net having six tie-down straps is provided to secure baggage in the area aft of the wheel well and on the backs of the fifth and sixth seats when they are used for stowing baggage.

When using the baggage net to secure baggage stowed aft of the wheel well, only four of the net tie-down straps are usually used. They are fastened to the two tie-down rings located on the forward edge of the wheel well and two rings at the bottom edge of the rear cabin window. If the fifth and sixth seats are not occupied, the seat backs may be folded forward to create more baggage area. If this area is used, all six tie-down straps must be used. Tie the front straps of the net to the front legs of the fifth and sixth seats and the remaining four straps to the tie-down rings provided.

Weight and balance calculations for baggage forward of the wheel well and stowed on the backs of the fifth and sixth seats can be figured on the AFT PASSENGERS line of the Loading Graph. Note that baggage load in this area is limited to 120 lbs. A separate line is provided for computing weight and balance of baggage in baggage area aft of the wheel well.

SAMPLE LOADING PROBLEM

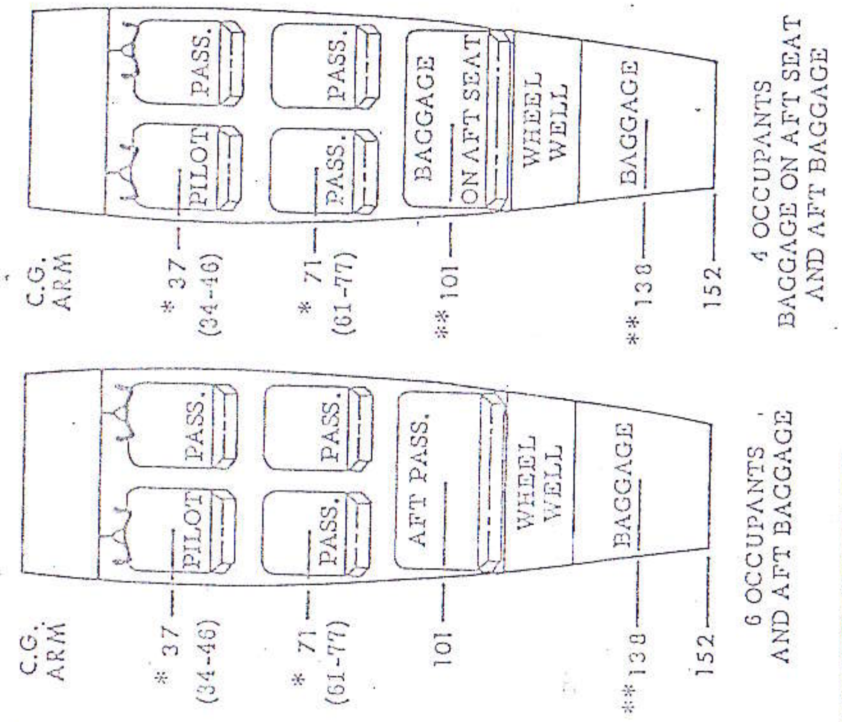
SAMPLE LOADING PROBLEM	SAMPLE AIRPLANE		YOUR AIRPLANE	
	Weight (lbs.)	Moment (lb.-ins. /1000)	Weight (lbs.)	Moment (lb.-ins. /1000)
1. Licensed Empty Weight (Use the data pertaining to your airplane as it is presently equipped. Includes unusable fuel)	2257	93.1		
2. Oil (The weight of full oil may be used for all calculations) No Oil Filter: 10 Qts. = 19 Lbs. @-0.2 Moment/1000 . . .	19	-0.2	19	-0.2
With Opt. Oil Filter: 11 Qts. = 21 Lbs. @-0.3 Moment/1000 . . .				
3. Usable Fuel (At 6 Lbs./Gal.) Standard Tanks (89 Gal. Maximum)				
Reduced Fuel (64 Gal.)	384	16.5		
4. Pilot and Front Passenger (Station 34 to 46) . .	340	12.6		
5. Center Passengers (Station 61 to 77)	340	24.1		
6. Aft Passengers	340	34.3		
7. Baggage - Forward of wheel well on folded down aft seat (Station 89 to 110) (120 lbs. max.) . . .				
8. Baggage - On and aft of wheel well (Station 110 to 152) (120 lbs. max.)	120	16.6		
9. TOTAL WEIGHT AND MOMENT	3800	197.0		

10. Locate this point (3800 at 197.0) on the Center of Gravity Moment Envelope. Since this loading falls within the shaded area of the moment envelope, proceed with steps 11, 12 and 13. If the computed loading point falls within the clear area of the moment envelope, no further steps are required and the loading is assumed satisfactory for take-off and landing.

	Weight (lbs.)	Moment (lb.-ins. /1000)	Weight (lbs.)	Moment (lb.-ins. /1000)
11. Estimated Fuel Burn-Off (Climb and Cruise) (38 gallons at 6 lbs./gal.)	-228	-9.8		
12. Subtract step 11 from step 9 for estimated aircraft landing weight	3572	187.2		

13. Locate this point (3572 at 187.2) on the Center of Gravity Moment Envelope. Since this point falls within the overall envelope, the loading may be assumed acceptable for landing.

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.

**Baggage area center of gravity.

NOTE:
The aft baggage wall (approximate station 152) can be used as a convenient interior reference point for determining the location of baggage area fuselage station.

STALL SPEEDS - MPH CAS

	CONDITION	ANGLE OF BANK 0°	20°	40°	60°
3800 LBS GROSS WEIGHT	FLAPS UP	75	77	85	106
	FLAPS 10°	73	74	82	103
	FLAPS 30°	65	66	73	92
POWER OFF - GEAR UP OR DOWN - AFT CG					

Figure 6-2.

TAKE-OFF DATA

TAKE-OFF DISTANCE WITH 10° FLAPS FROM HARD SURFACE RUNWAY

GROSS WEIGHT POUNDS	IAS (50' MPH	HEAD WIND KNOTS	AT SEA LEVEL & 59°F GROUND RUN	AT SEA LEVEL & 59°F TOTAL TO CLEAR 50 FT OBS	AT 2500 FT & 50°F GROUND RUN	AT 2500 FT & 50°F TOTAL TO CLEAR 50 FT OBS	AT 5000 FT & 41°F GROUND RUN	AT 5000 FT & 41°F TOTAL TO CLEAR 50 FT OBS	AT 7500 FT & 32°F GROUND RUN	AT 7500 FT & 32°F TOTAL TO CLEAR 50 FT OBS
3800	82	0	1100	1900	1325	2305	1500	2855	1955	3790
		10	820	1505	1000	1840	1215	2305	1505	3110
		20	575	1150	715	1425	885	1810	1110	2480
3400	77	0	850	1505	1020	1780	1225	2130	1495	2655
		10	620	1175	755	1400	920	1695	1130	2135
		20	425	880	525	1065	650	1300	815	1665
3000	72	0	640	1190	765	1380	915	1610	1110	1940
		10	455	920	555	1070	675	1265	825	1535
		20	305	675	375	800	465	950	580	1170

NOTES: 1. Increase distances 10% for each 20°F above standard temperature for particular altitude.
2. For operation on a dry, grass runway, increase distances (both "ground run" and "total to clear 50 ft. obstacle") by 5% of the "total to clear 50 ft. obstacle" figure.

MAXIMUM RATE-OF-CLIMB DATA

GROSS WEIGHT POUNDS	AT SEA LEVEL & 59°F IAS MPH	RATE OF CLIMB FT/MIN.	LBS. OF FUEL USED	AT 5000 FT & 41°F IAS MPH	RATE OF CLIMB FT/MIN.	FROM S.L. FUEL USED	AT 10,000 FT & 23°F IAS MPH	RATE OF CLIMB FT/MIN.	FROM S.L. FUEL USED	AT 15,000 FT & 5°F IAS MPH	RATE OF CLIMB FT/MIN.	FROM S.L. FUEL USED
3800	109	860	12	105	610	26	102	365	46	98	120	84
3400	106	1025	12	102	770	24	99	505	39	95	250	62
3000	103	1230	12	99	950	22	96	670	34	92	395	49

NOTES: 1. Full throttle, 2700 RPM, mixture at recommended leaning schedule, flaps up.
2. Fuel used includes warm-up and take-off allowance.
3. For hot weather, decrease rate of climb 30 ft./min. for each 10°F above standard day temperature for particular altitude.

Figure 6-3.

CRUISE PERFORMANCE

EXTENDED RANGE MIXTURE

Standard Conditions \ Zero Wind \ Gross Weight- 3800 Pounds

2500 FEET

RPM	MP	% BHP	TAS MPH	LBS./ HOUR	384 LBS. (NO RESERVE) ENDR. HOURS	384 LBS. (NO RESERVE) RANGE MILES	534 LBS. (NO RESERVE) ENDR. HOURS	534 LBS. (NO RESERVE) RANGE MILES
2550	25	79	178	98	3.9	695	5.4	965
	24	74	174	93	4.1	720	5.7	1000
	23	70	170	88	4.4	740	6.1	1030
	22	66	166	83	4.6	765	6.4	1065
2500	25	76	176	95	4.0	710	5.6	985
	24	72	172	91	4.2	730	5.9	1015
	23	68	168	86	4.5	755	6.2	1050
	22	64	163	81	4.8	775	6.6	1080
2400	25	71	171	89	4.3	735	6.0	1025
	24	67	167	85	4.5	755	6.3	1055
	23	64	163	80	4.8	780	6.7	1080
	22	60	157	76	5.1	800	7.1	1110
2300	25	67	166	84	4.6	760	6.4	1060
	24	63	162	80	4.8	780	6.7	1085
	23	60	157	76	5.1	800	7.1	1115
	22	56	152	71	5.4	815	7.5	1135
2200	25	62	160	78	4.9	790	6.9	1100
	24	58	155	74	5.2	805	7.2	1120
	23	55	150	70	5.5	820	7.6	1140
	22	52	145	67	5.8	835	8.0	1160
	21	48	138	62	6.1	845	8.5	1175
	20	45	130	59	6.5	845	9.1	1175
	19	42	120	55	7.0	835	9.7	1160

Figure 6-4 (Sheet 1 of 6).

CRUISE PERFORMANCE

EXTENDED RANGE MIXTURE

Standard Conditions \ Zero Wind \ Gross Weight- 3800 Pounds

5000 FEET

RPM	MP	% BHP	TAS MPH	LBS./ HOUR	384 LBS. (NO RESERVE) ENDR. HOURS	384 LBS. (NO RESERVE) RANGE MILES	534 LBS. (NO RESERVE) ENDR. HOURS	534 LBS. (NO RESERVE) RANGE MILES
2550	25	81	187	101	3.8	705	5.3	985
	24	77	183	96	4.0	730	5.5	1015
	23	73	179	91	4.2	755	5.9	1050
	22	68	174	86	4.5	775	6.2	1080
2500	25	78	184	98	3.9	720	5.4	1000
	24	74	181	94	4.1	740	5.7	1030
	23	70	176	88	4.3	765	6.0	1065
	22	66	172	83	4.6	790	6.4	1095
2400	25	73	179	92	4.2	750	5.8	1045
	24	69	175	87	4.4	770	6.1	1075
	23	66	171	83	4.6	790	6.5	1100
	22	62	165	78	4.9	810	6.8	1130
2300	25	69	174	86	4.4	775	6.2	1080
	24	65	170	82	4.7	795	6.5	1105
	23	62	165	78	4.9	815	6.9	1130
	22	58	160	74	5.2	830	7.3	1155
2200	25	63	167	80	4.8	805	6.7	1120
	24	60	163	76	5.0	820	7.0	1140
	23	57	158	73	5.3	835	7.4	1165
	22	54	152	68	5.6	850	7.8	1185
	21	50	146	65	5.9	860	8.2	1200
	20	47	138	61	6.3	865	8.7	1200
	19	44	128	58	6.7	855	9.3	1190

Figure 6-4 (Sheet 2 of 6).

CRUISE PERFORMANCE

EXTENDED RANGE MIXTURE

Standard Conditions ⟍ Zero Wind ⟍ Gross Weight- 3800 Pounds

7500 FEET

RPM	MP	% BHP	TAS MPH	LBS./ HOUR	384 LBS. (NO RESERVE) ENDR. HOURS	384 LBS. (NO RESERVE) RANGE MILES	534 LBS. (NO RESERVE) ENDR. HOURS	534 LBS. (NO RESERVE) RANGE MILES
2550	23	75	187	94	4.1	765	5.7	1065
	22	71	183	89	4.3	790	6.0	1095
	21	67	178	84	4.6	810	6.4	1130
	20	63	172	79	4.9	835	6.8	1160
2500	23	73	185	91	4.2	780	5.8	1080
	22	69	180	86	4.4	800	6.2	1115
	21	65	175	82	4.7	820	6.5	1145
	20	61	168	77	5.0	845	7.0	1175
2400	23	68	179	85	4.5	805	6.3	1120
	22	64	174	81	4.8	825	6.6	1150
	21	60	168	76	5.0	845	7.0	1175
	20	57	162	72	5.3	865	7.4	1200
2300	23	64	173	80	4.8	830	6.6	1150
	22	60	168	76	5.0	845	7.0	1175
	21	57	162	72	5.3	865	7.4	1200
	20	53	155	68	5.7	875	7.9	1220
2200	23	59	166	74	5.1	855	7.2	1185
	22	56	160	71	5.4	870	7.5	1205
	21	52	154	67	5.7	880	7.9	1220
	20	49	146	64	6.1	880	8.4	1225
	19	46	136	59	6.4	875	9.0	1220

Figure 6-4 (Sheet 3 of 6).

CRUISE PERFORMANCE

EXTENDED RANGE MIXTURE

Standard Conditions ⟍ Zero Wind ⟍ Gross Weight- 3800 Pounds

10,000 FEET

RPM	MP	% BHP	TAS MPH	LBS./ HOUR	384 LBS. (NO RESERVE) ENDR. HOURS	384 LBS. (NO RESERVE) RANGE MILES	534 LBS. (NO RESERVE) ENDR. HOURS	534 LBS. (NO RESERVE) RANGE MILES
2550	21	69	187	87	4.4	825	6.1	1145
	20	65	181	82	4.7	845	6.5	1175
	19	61	174	77	5.0	870	6.9	1210
	18	56	166	72	5.3	890	7.4	1235
2500	21	67	184	85	4.5	835	6.3	1160
	20	63	177	80	4.8	855	6.7	1190
	19	59	171	74	5.1	880	7.2	1220
	18	55	163	70	5.5	895	7.7	1245
2400	21	63	177	79	4.9	860	6.8	1195
	20	59	171	74	5.1	880	7.2	1220
	19	55	163	70	5.5	895	7.6	1245
	18	51	154	66	5.8	900	8.1	1250
2300	21	59	170	74	5.2	860	7.2	1225
	20	55	163	70	5.5	895	7.6	1245
	19	51	155	66	5.8	900	8.1	1250
	18	48	144	62	6.2	895	8.6	1245
2200	21	54	162	70	5.5	895	7.7	1245
	20	51	154	66	5.8	900	8.1	1250
	19	48	144	62	6.2	895	8.6	1245
	18	44	134	58	6.6	885	9.2	1230

Figure 6-4 (Sheet 4 of 6).

CRUISE PERFORMANCE

EXTENDED RANGE MIXTURE

Standard Conditions \ Zero Wind \ Gross Weight- 3800 Pounds

12,500 FEET

					384 LBS. (NO RESERVE)		534 LBS. (NO RESERVE)	
RPM	MP	% BHP	TAS MPH	LBS./ HOUR	ENDR. HOURS	RANGE MILES	ENDR. HOURS	RANGE MILES
2550	19	63	183	80	4.8	880	6.7	1225
	18	59	176	74	5.1	905	7.2	1255
	17	55	166	70	5.5	920	7.7	1275
	16	50	154	65	5.9	915	8.3	1275
2500	19	61	180	77	5.0	895	6.9	1240
	18	57	172	73	5.3	910	7.4	1270
	17	53	161	68	5.7	920	7.9	1275
	16	48	149	62	6.1	910	8.5	1270
2400	19	57	173	73	5.3	910	7.3	1265
	18	53	163	68	5.6	920	7.8	1275
	17	49	152	64	6.0	915	8.4	1270
	16	45	139	59	6.5	900	9.0	1250
2300	19	54	164	68	5.6	920	7.8	1275
	18	50	153	64	6.0	915	8.3	1270
	17	46	141	60	6.4	905	8.9	1260
2200	19	50	153	64	6.0	915	8.3	1270
	18	46	142	60	6.4	905	8.9	1260

Figure 6-4 (Sheet 5 of 6).

CRUISE PERFORMANCE

EXTENDED RANGE MIXTURE

Standard Conditions \ Zero Wind \ Gross Weight- 3800 Pounds

15,000 FEET

					384 LBS. (NO RESERVE)		534 LBS. (NO RESERVE)	
RPM	MP	% BHP	TAS MPH	LBS./ HOUR	ENDR. HOURS	RANGE MILES	ENDR. HOURS	RANGE MILES
2550	17	57	176	73	5.3	935	7.4	1300
	16	52	164	67	5.7	935	8.0	1300
	15	48	149	62	6.2	925	8.6	1285
2500	17	55	171	70	5.5	935	7.6	1300
	16	51	158	65	5.9	930	8.2	1295
	15	46	143	60	6.4	915	8.9	1275
2400	17	52	161	67	5.8	935	8.1	1300
	16	47	143	62	6.2	925	8.7	1285
2300	17	48	150	62	6.2	925	8.6	1290
	16	44	136	58	6.6	900	9.2	1255
2200	17	45	138	58	6.6	905	9.1	1260

Figure 6-4 (Sheet 6 of 6).

LANDING DISTANCE TABLE

LANDING DISTANCE WITH 30° FLAPS ON HARD SURFACED RUNWAY

GROSS WEIGHT POUNDS	APPROACH IAS MPH	@ SEA LEVEL & 59°F		@ 2500 FEET & 50°F		@ 5000 FEET & 41°F		@ 7500 FEET & 32°F	
		GROUND ROLL	TOTAL TO CLEAR 50 FT. OBS.	GROUND ROLL	TOTAL TO CLEAR 50 FT. OBS.	GROUND ROLL	TOTAL TO CLEAR 50 FT. OBS.	GROUND ROLL	TOTAL TO CLEAR 50 FT. OBS.
3800	82	765	1500	815	1595	865	1695	920	1805

NOTES:
1. Distances shown are based on zero wind, power off, and heavy braking.
2. Reduce landing distances 10% for each 5 knots headwind.
3. For operation on a dry, grass runway, increase distances (both "ground roll" and "total to clear 50 ft. obstacle") by 20% of the "total to clear 50 ft. obstacle" figure.

Figure 6-5.

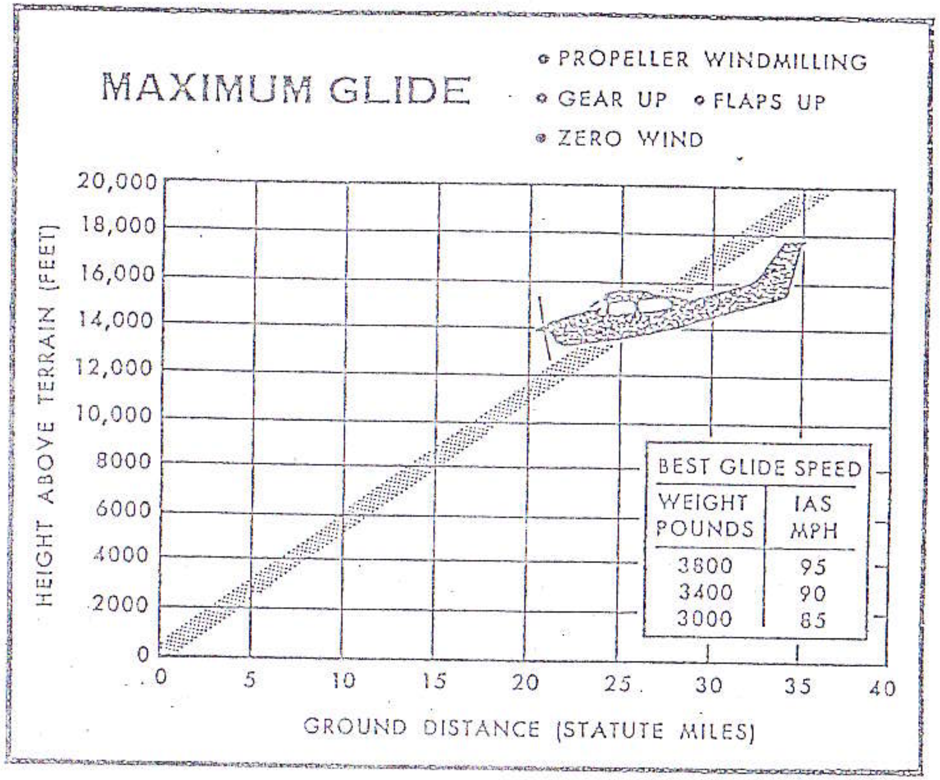


Figure 6-6.

Section VII

OPTIONAL SYSTEMS

This section contains a description, operating procedures, and performance data (when applicable) for some of the optional equipment which may be installed in your Cessna. Owner's Manual Supplements are provided to cover operation of other optional equipment systems when installed in your aircraft. Contact your Cessna Dealer for a complete list of available optional equipment.

COLD WEATHER EQUIPMENT

WINTERIZATION KIT AND NON-CONGEALING OIL COOLER.

For continuous operation in temperatures consistently below 20°F, the Cessna winterization kit and non-congealing oil cooler should be installed to improve engine operation. The winterization kit consists of two shields to partially cover the cowl nose cap opening, and insulation for the crankcase breather line. Once installed, the crankcase breather insulation is approved for permanent use in both cold and hot weather. The non-congealing oil cooler replaces the standard oil cooler and provides improved oil flow through the cooler in cold weather.

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 aircraft electrical system (with the exception of electronic equipment).

NOTE

Electrical power for the aircraft electrical circuits is provided through a split bus bar having all electronic circuits on one side of the bus and other electrical circuits on the other side of the bus. When an external power source is connected, a contactor automatically opens the circuit to the electronic portion of the split bus bar as a protection against damage to the transistors in the electronic equipment by transient voltages from the power source. Therefore, the external power source can not be used as a source of power when checking electronic components.

Just before connecting an external power source (generator type or battery cart), the master switch should be turned on.

The ground service plug receptacle circuit incorporates a polarity reversal protection. Power from the external power source will flow only if the ground service plug is correctly connected to the aircraft. If the plug is accidently connected backwards, no power will flow to the aircraft electrical system, thereby preventing any damage to electrical 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 on the master switch will close the battery contactor.

ENGINE PRIMER SYSTEM.

A manually-operated, plunger-type engine primer may be installed in the control pedestal.

For quick smooth engine starts in zero degree temperatures, use six strokes of the primer before cranking, with an additional one or two strokes as the engine starts. In colder temperatures, use additional priming before cranking, and place the auxiliary fuel pump switch in the ON position while cranking. After priming, make sure the primer is full in and locked.

STATIC PRESSURE ALTERNATE SOURCE VALVE.

A static pressure alternate source valve provides continued operati of the airspeed indicator, altimeter and vertical speed indicator in the event that the static system ports or lines become obstructed. If erron ous instrument readings are suspected due to water or ice in the static system ports or lines, the static pressure alternate source valve shoul be opened, venting the static system to the cabin. Cabin pressures will be affected by open ventilators or windows and varying airspeeds, and this will affect the readings. Since open windows will cause large erro it is recommended that they be closed whenever the alternate static sys tem is used.

When using the alternate static source, the airspeed and altimeter readings will be higher than corresponding readings when using the primary static source. In cruising flight, the airspeed indicator and altimeter will read approximately 7 MPH and 150 feet higher, respectively In the climb and approach speed range, the variations are 8 MPH and 3 feet.

If the alternate static source must be used for landing, use an indicated approach speed 8 MPH higher than normal.

DE-ICING SYSTEM

Pneumatic de-icing boots are available as optional equipment for i stallation on the leading edges of the wings and horizontal stabilizer. Controls for the de-icing system consist of a three-position switch on t right switch and control panel, a pressure indicator light adjacent to t switch, and a 5-amp circuit breaker on the left switch and control pan

BEFORE ENTERING AIRPLANE.

Make an exterior inspection to check de-icing boots for tears, abr sions, and cleanliness. Boots must be cleaned and damage repaired p to flight.

DURING ENGINE RUNUP.

(1) Move de-icing switch to ON position and check inflation and deflation cycle. The pressure indicator light should come on within four seconds after the cycle is initiated and remain on for two to three seconds if the system is operating properly. The system should be checked through several cycles.

NOTE

The de-icing switch is a three-position switch spring-loaded to the normal off (center) position. When pushed to the ON (up) position and released, it will activate one de-icing cycle. Each time a cycle is desired, the switch must be pushed to the ON position and released. When pushed to the OFF (down) position and released, the switch will stop the system at any point in its cycle.

(2) Check boots visually for complete deflation to the vacuum hold-down condition.

IN FLIGHT.

Flight into known or forecast icing conditions should be avoided whenever possible. If unexpected icing conditions are encountered, the following procedure is recommended.

(1) When ice has accumulated to approximately 1/2 inch thick on the leading edges, push de-icing switch to the ON position and release. The switch must be pushed again if additional cycles are required.

NOTE

The de-icing system will operate up to a maximum altitude of 14,500 feet; however, at or near this altitude, engine RPM must be a minimum of 2500 RPM.

AFTER LANDING.

Check de-icing boots for damage and cleanliness. Remove any accum-

ulations of engine oil or grease.

OPERATING DETAILS

Cycling the de-icing boots produces no adverse aerodynamic effects in any attitude within the allowable flight limitations.

De-icing boots are intended for removal of ice after it has accumulated rather than prevent its formation. If ice accumulation is slow, best results can be obtained by not using the de-ice system until approximately 1/2 inch of ice has accumulated. Clear the accumulation with one or two cycles of operation. Do not repeat de-icing procedure until ice has again accumulated.

Continual cycling of the de-ice system is not recommended as this may cause ice to form outside the contour of the inflated boots, preventing its removal.

NOTE

Since wing and horizontal stabilizer de-icer boots alone do not provide adequate protection for the entire aircraft, known icing conditions should be avoided whenever possible. If icing is encountered, close attention should be given to the pitot-static system, propeller, induction system and other components subject to icing.

DE-ICER BOOT CARE

De-icing boots have a special electrically-conductive coating to bleed off static electricity which causes radio interference and could perforate the boots. Fueling and other servicing should be done carefully to avoid damage to the conductive coating or tearing of the boot.

Keep boots clean and free from oil and grease which can swell the rubber. Wash boots with mild soap and water, using benzol or unleaded gasoline to remove stubborn grease. Do not scrub boots and be sure to wipe off all solvent before it dries.

Small tears and abrasions can be repaired temporarily and the conductive coating can be renewed, without removing the boots. Your Cessna Dealer has the proper materials and know-how to do this correctly.

ICE DETECTOR LIGHT

An ice detector light may be installed to facilitate the detection of wing ice at night or during reduced visibility.

The ice detector light system consists of a light installed on the left side of the cowl deck forward of the windshield which is positioned to illuminate the leading edge of the wing, and a momentary push-button type switch located to the left of the circuit breakers. The switch button must be held in as long as the light is required.

PROPELLER ANTI-ICE SYSTEM

A propeller anti-ice system is available to improve all-weather performance. The system is operated by a toggle switch located above the right hand switch and control panel. When the switch is placed in the ON position, current flows to an anti-ice timer which supplies electric power in cycles every 30 seconds to elements in the anti-icing boots located on the propeller blades. Operation of the anti-ice system can be checked by a propeller anti-ice ammeter located adjacent to the manifold pressure/fuel flow indicator. The system is protected by an automatic resetting circuit breaker built into the back of the anti-ice switch.

NORMAL OPERATION.

(1) Master Switch -- ON.
(2) Propeller Anti-Ice Switch -- ON.

(3) Propeller Anti-Ice Ammeter -- CHECK in green arc range (14 to 18 amps).

NOTE

To check the heating elements and anti-ice timer for one complete cycle, the system must be left on for approximately 1-1/2 minutes. Ammeter readings must remain in the green arc except during momentary change.

NOTE

While using the anti-ice system, limit the use of other electrical equipment so that the aircraft system ammeter maintains a slight charge indication, assuring that the electrical system is not overloaded.

IMPORTANT

If the ammeter indicates unusually high or low amperage during the 30-second cycle of operation, a malfunction has occurred and it is imperative that the system be turned off. Uneven anti-icing may result, causing propeller unbalance and engine roughness.

(4) When anti-icing is no longer needed, move propeller anti-ice switch to the OFF position.

RADIO SELECTOR SWITCHES

RADIO SELECTOR SWITCH OPERATION.

Operation of the radio equipment is normal as covered in the respective radio manuals. When more than one radio is installed, an audio switching system is necessary. Audio switching is accomplished by a series of radio selector switches located at the top-center of the instrument panel. They are rectangular in shape, internally lighted, and the face of each switch is labeled to define the system it controls. The selector switches have one function when depressed and another function when extended. They are designed to lock when pushed in to the depressed position; they can be extended by pressing full in and allowing them to release to the extended position. Certain combinations of switches are interlocked to prevent more than one system from being utilized at the same time. Depressing one interlocked switch automatically disengages the others. All of the selector switches are lighted anytime the master switch is turned on. When a switch is depressed, its light becomes brighter. The light intensity of a depressed switch can be controlled with the rheostat control knob labeled AUDIO SW BRT adjacent to the selector switches. The following information describes the various selector switch functions.

TRANSMITTER SELECTOR SWITCHES.

When two transmitters are installed, the microphone must be switched to the transmitter the pilot has selected for use. To accomplish this, interlocking transmitter selector switches labeled TR 1 and TR 2 are provided. TR 1 selects the upper transmitter and TR 2 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. When the transmitter selector switch labeled TR 1 or TR 2 is depressed, the audio amplifier of the corresponding transceiver is utilized to provide the speaker audio for all radios. If the audio amplifier in the selected transceiver fails, as evidenced by loss of speaker audio for all radios, depress the transmitter selector switch for the transceiver not in use. Since an audio amplifier is not utilized for headphones, a malfunctioning amplifier will not affect headphone operation.

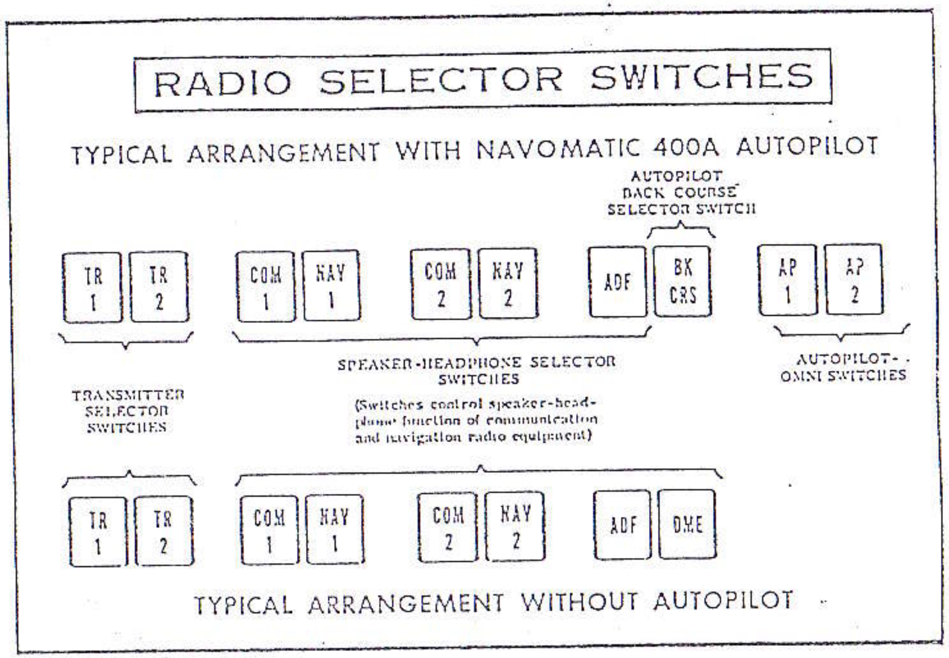


Figure 7-1.

SPEAKER-PHONE SWITCHES.

The speaker-phone switches such as COM 1, NAV 1 (400 series radios), or REC 1, REC 2 (300 series radios) determine whether the output of the receiver in use is fed to the headphones or through the audio amplifier to the speaker. Depress the switch for the desired receiver to obtain speaker operation, or release it if headphone operation is desired.

AUTOPILOT-OMNI SWITCHES.

When a Navomatic 400 or 400A autopilot is installed with two compatible omni receivers, two autopilot-omni switches labeled AP 1 and AP 2 are utilized. These switches select the omni receiver to be used for the omni course sensing function of the autopilot. This is accomplished by depressing the selector switch corresponding to the receiver which is to be used.

MICROPHONE-HEADSET

A microphone-headset combination is offered as optional equipment. Using the microphone-headset and a microphone keying switch on the left side of the pilot's control wheel, the pilot can conduct radio communications without interrupting other control operations to handle a hand-held microphone. Also, passengers need not listen to all communications. The microphone and headset jacks are located near the lower left corner of the instrument panel.

STATIC DISCHARGERS

If frequent IFR flights are planned, installation of optional wick-type static dischargers is recommended to improve radio communications during flight through dust or various forms of precipitation (rain, freezing rain, snow or ice crystals). Under these conditions, the build-up and discharge of static electricity from the trailing edges of the wings, rudder, elevators, 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.

OXYGEN SYSTEM

Four oxygen cylinders, located in the fuselage cabin top, supply oxygen for the system. Cylinder pressure is reduced to an operating pressure of 70 PSI by a pressure regulator/shut-off valve assembly attached to the left front cylinder. An oxygen cylinder filler valve is located on the bottom of the right wing just outboard of the rear door post under a round cover plate. Cylinder pressure is indicated by a pressure gage located in the overhead console above the pilot and front passenger's seats.

Six oxygen outlets are provided; two each in consoles above the front seats and center passenger seats, and one each in two separate consoles near the aft passenger seats. One permanent, microphone equipped mask is provided for the pilot, and five disposable type masks are provided for the passengers. All masks are the partial rebreathing type, equipped with vinyl plastic hoses and flow indicators.

A remote shut-off valve control in the overhead console above the pilot and front passenger's seat is used to shut off the supply of oxygen to the system when not in use. The control is mechanically connected to the shut-off valve at the cylinder. With the exception of the shut-off function, the system is completely automatic and requires no manual regulation for change of altitude.

OXYGEN SYSTEM OPERATION.

Prior to flight, check to be sure that there is an adequate oxygen supply for the trip, by noting the oxygen pressure gage reading. Refer to paragraph OXYGEN DURATION CALCULATION, and to the Oxygen Duration Chart (figure 7-2). Also, check that the face masks and hoses are accessible and in good condition.

Supplemental oxygen should be used by all occupants when cruising above 10,000 feet. As described in the Cessna booklet "Man At Altitude," it is often advisable to use oxygen at altitudes lower than 10,000 feet under conditions of night flying, fatigue, or periods of physiological or emotional disturbances. Also, the habitual and excessive use of tobacco or alcohol will usually necessitate the use of oxygen at less than 10,000 feet.

NOTE

For safety reasons, no smoking should be allowed in the aircraft while oxygen is being used.

When ready to use the oxygen system, proceed as follows:

(1) Select mask and hose.

NOTE

The hose provided for the pilot is of a higher flow rate than those for the passengers; it is color-coded with an orange band adjacent to the plug-in fitting. The passenger hoses are color-coded with a green band. If the aircraft owner prefers, he may provide higher flow hoses for all passengers. In any case, it is recommended that the pilot use the larger capacity hose. The pilot's mask is equipped with a microphone to facilitate use of the radio while using oxygen. An adapter cord is furnished with the microphone-equipped mask to mate the mask microphone lead to the AUX MIKE JACK located under the left side of the instrument panel. To connect the oxygen mask microphone, connect the mask lead to the adapter cord and plug the cord into the AUX MIKE JACK. (If an optional microphone-headset combination has been in use, the microphone lead from this equipment is already plugged into the AUX MIKE JACK. It will be necessary to disconnect this lead from the AUX MIKE JACK so that the adapter cord from the oxygen mask microphone can be plugged into the jack.) A switch is incorporated on the left hand control wheel to operate the microphone.

(2) Attach mask to face and adjust metallic nose strap for snug fit.
(3) Select oxygen outlet located nearest to the seat you are occupying, and plug delivery hose into it. When the oxygen supply is turned on, oxygen will flow continuously at the proper rate of flow for any altitude without any manual adjustments.
(4) Position oxygen supply control knob ON.
(5) Check the flow indicator in the face mask hose. Oxygen is flowing if the indicator is being forced toward the mask.
(6) Unplug the delivery hose from the outlet coupling when discontinuing use of oxygen system. This automatically stops the flow of oxygen.
(7) Position oxygen supply control knob OFF.

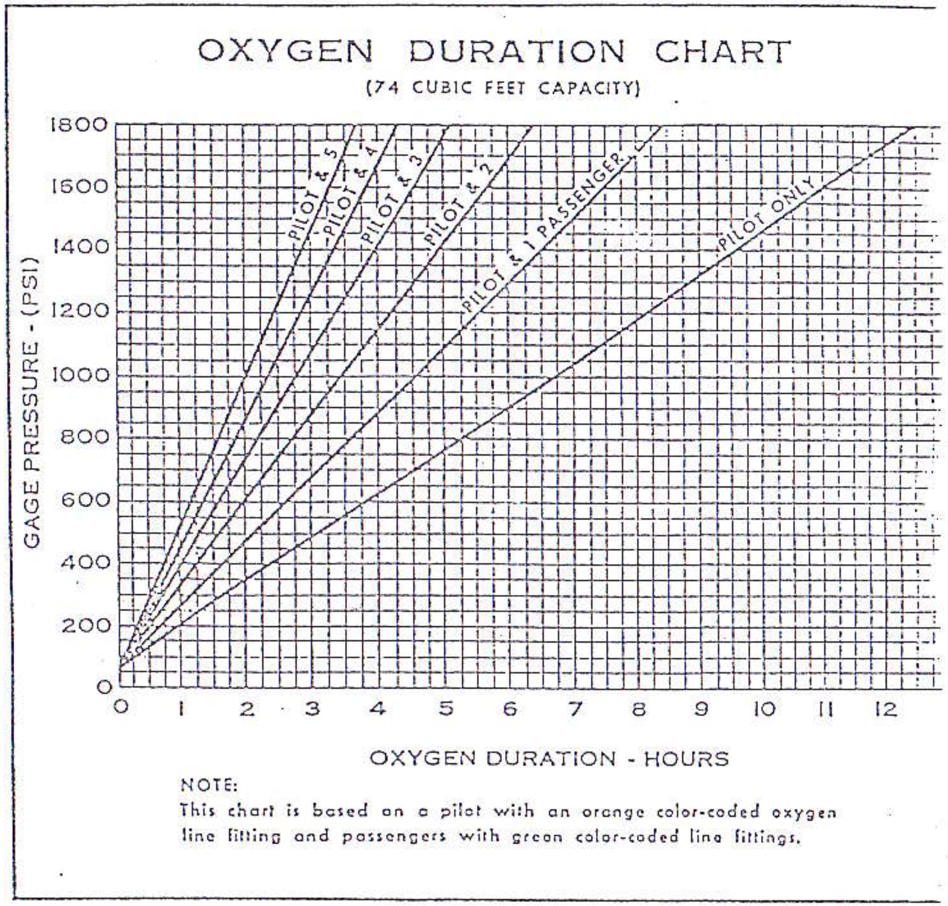


Figure 7-2.

OXYGEN DURATION CALCULATION.

The Oxygen Duration Chart (figure 7-2) should be used in determining the usable duration (in hours) of the oxygen supply in your airplane. The following procedure outlines the method of finding the duration from the chart.

(1) Note the available oxygen pressure shown on the pressure gage.

(2) Locate this pressure on the scale on the left side of the chart, then go across the chart horizontally to the right until you intersect the line representing the number of persons making the flight. After intersecting the line, drop down vertically to the bottom of the chart and read the duration in hours given on the scale.

(3) As an example of the above procedure, 1200 psi of pressure will safely sustain the pilot only for nearly 8 hours and 10 minutes. The same pressure will sustain the pilot and three passengers for approximately 3 hours and 20 minutes.

NOTE

The Oxygen Duration Chart is based on a standard configuration oxygen system having one orange color-coded hose assembly for the pilot and green color-coded hoses for the passengers. If orange color-coded hoses are provided for pilot and passengers, it will be necessary to compute new oxygen duration figures due to the greater consumption of oxygen with these hoses. This is accomplished by computing the total duration available to the pilot only (from PILOT ONLY line on chart), then dividing this duration by the number of persons (pilot and passengers) using oxygen.

OXYGEN SYSTEM SERVICING.

The oxygen cylinders, when fully charged, contain a total of approximately 74 cubic feet of oxygen under a pressure of 1800 psi at 70°F. Filling pressures will vary, however, due to the ambient temperature

AMBIENT TEMPERATURE °F	FILLING PRESSURE PSIG	AMBIENT TEMPERATURE °F	FILLING PRESSURE PSIG
0	1600	50	1825
10	1650	60	1875
20	1700	70	1925
30	1725	80	1975
40	1775	90	2000

in the filling area, and because of the temperature rise resulting from compression of the oxygen. Because of this, merely filling to 1800 psi will not result in properly filled cylinders. Fill to the pressures indicated in the table on the preceding page for ambient temperature.

IMPORTANT

Oil, grease, or other lubricants in contact with oxygen create a serious fire hazard, and such contact must be avoided when handling oxygen equipment.

STOWABLE RUDDER PEDALS

Stowable right-hand rudder pedals are available as part of the optional right-hand flight controls installation. The pedals fold forward and stow against the firewall, thereby permitting the right front passenger to extend his feet forward for greater comfort.

NOTE

When the rudder pedals are in the stowed position, the toe brakes will still operate.

A push-pull control on the instrument panel actuates the pedal unlocking mechanism. The pedals are stowed simply by squeezing the double buttons of the control knob and pulling the knob out to release the pedals; the pedals can then be pushed forward against the firewall where they are retained by spring clips within a bracket. The pedals are restored to their operating positions by pushing the control knob full in, and inserting the toe of the shoe underneath each pedal and pulling each pedal aft until it snaps into position. The pedals are again ready for flight use by the right front passenger.

CESSNA ECONOMY MIXTURE INDICATOR

The Cessna Economy Mixture Indicator is an exhaust gas temperature (EGT) sensing device which visually aids the pilot in adjusting the cruise mixture. Exhaust gas temperature varies with fuel-to-air ratio, power and RPM. However, the difference between the peak EGT and the EGT at the cruise mixture setting is essentially constant and this provides a useful leaning aid. Operating instructions are included in Section II.

TRUE AIRSPEED INDICATOR

A true airspeed indicator is available to replace the standard airspeed indicator in your aircraft. The true airspeed indicator has a calibrated rotatable ring which works in conjunction with the airspeed indicator dial in a manner similar to the operation of a flight computer.

TO OBTAIN TRUE AIRSPEED, rotate ring until pressure altitude is aligned with outside air temperature in degrees Fahrenheit. Then read true airspeed on rotatable ring opposite airspeed needle.

NOTE

Pressure altitude should not be confused with indicated altitude. To obtain pressure altitude, set barometric scale on altimeter to 29.92 and read pressure altitude on altimeter. Be sure to return altimeter barometric scale to original barometric setting after pressure altitude has been obtained.

ELECTRIC ELEVATOR TRIM SYSTEM

An electric trim system is available to facilitate trimming the aircraft. The system is controlled by a slide-type trim switch on the top of the left control wheel grip and a disengage switch located on the left side of the control wheel pad adjacent to the autopilot disengage switch. Pushing the trim switch to the forward position, labeled DN, moves the elevator trim tab in the nose down direction; conversely, pulling the switch aft to the UP position moves the tab in the nose up direction. When the switch is released, it automatically returns to the center off position, and elevator trim tab motion stops. The disengage switch, labeled ELEC TRIM DISENGAGE, removes all electrical power from the system when placed in the DISENGAGE position.

A servo unit (which includes a motor and chain-driven, solenoid-operated clutch) actuates the trim tab to the selected position. When the clutch is not energized (trim switch off) the electric portion of the trim system freewheels so that manual operation is not affected. The electric trim system can be overridden at any time by manually rotating the trim wheel, thus overriding the servo that drives the trim tab.

NORMAL OPERATION.

To operate the electric elevator trim system, proceed as follows:

(1) Master Switch -- ON.
(2) Elevator Trim Disengage Switch -- ON.
(3) Trim Switch -- ACTUATE as desired.
(4) Elevator Trim Position Indicator -- CHECK.

NOTE

To check the operation of the disengage switch, actuate the elevator trim switch with the disengage switch in the DISENGAGE position. Observe that the manual trim wheel and indicator do not rotate when the elevator trim switch is activated.

EMERGENCY OPERATION.

(1) Elevator Trim Disengage Switch -- DISENGAGE.
(2) Manual Trim -- AS REQUIRED.

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