Cessna

SALES AND SERVICE

"TAKE YOUR CESSNA HOME FOR SERVICE AT THE SIGN OF THE CESSNA SHIELD".

CESSNA AIRCRAFT COMPANY
WICHITA, KANSAS

Cessna

MO[illegible] BUY AND
FLY [illegible] IRPLANES
[illegible] NY OTHER MAKE

1972

[illegible] S LARGEST PRO-
[illegible] GENERAL
[illegible] TION AIRCRAFT
[illegible] INCE 1956

Cardinal RG

N1876Q

OWNER'S MANUAL

PERFORMANCE - SPECIFICATIONS

*Cardinal RG	
GROSS WEIGHT	2800 lbs
SPEED, BEST POWER MIXTURE:	
Top Speed at Sea Level	180 mph
Cruise, 75% Power at 7000 ft	171 mph
RANGE, NORMAL LEAN MIXTURE:	
Cruise, 75% Power at 7000 ft	785 miles
50 Gal., No Reserve	4.6 hours
	170 mph
Optimum Range at 10,000 ft	1005 miles
50 Gal., No Reserve	7.2 hours
	140 mph
RATE OF CLIMB AT SEA LEVEL	925 fpm
SERVICE CEILING	17,100 ft
TAKE-OFF:	
Ground Run	890 ft
Total Distance Over 50-Foot Obstacle	1585 ft
LANDING:	
Ground Roll	730 ft
Total Distance Over 50-Foot Obstacle	1350 ft
STALL SPEEDS:	
Flaps Up, Power Off	66 mph
Flaps Down, Power Off	57 mph
EMPTY WEIGHT: (Approximate)	1645 lbs
USEFUL LOAD	1155 lbs
BAGGAGE	120 lbs
WING LOADING: Pounds/Sq Foot	16.1
POWER LOADING: Pounds/HP	14.0
FUEL CAPACITY: Total	51.0 gal.
OIL CAPACITY	8 qts.
PROPELLER: Constant Speed (Diameter)	78 inches
ENGINE:	
Lycoming Fuel Injection Engine	IO-360-A1B6
200 rated HP at 2700 RPM	L-9383-51A

177RG0276

* This manual covers operation of the Cardinal RG which is certificated as Model 177RG under FAA Type Certificate No. A20CE. The manual also covers operation of the Reims/Cessna Cardinal RG which is certificated as Model F177RG under French Type Certification.

D905-13-RAND-1500-9/71

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 Cardinal RG. 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:

THE CESSNA WARRANTY -- It is designed to provide you with the most comprehensive coverage possible:

a. No exclusions
b. Coverage includes parts and labor
c. Available at Cessna Dealers world wide
d. Best in the industry

Specific benefits and provisions of the warranty plus other important benefits for you are contained in your Warranty and Owner's Service Policy Booklet supplied with your aircraft. Warranty service is available to you at any authorized Cessna Dealer throughout the world upon presentation of your Warranty and Owner's Service Policy Booklet which establishes your eligibility under the warranty.

FACTORY TRAINED PERSONNEL to provide you with courteous expert service.

FACTORY APPROVED SERVICE EQUIPMENT to provide you with the most efficient and accurate workmanship possible.

A STOCK OF GENUINE CESSNA SERVICE PARTS on hand when you need them.

THE LATEST AUTHORITATIVE INFORMATION FOR SERVICING CESSNA AIRPLANES, since Cessna Dealers have all of the Service Manuals and Parts Catalogs, kept current by Service Letters and Service News Letters, published by Cessna Aircraft Company.

We urge all Cessna owners to use the Cessna Dealer Organization to the fullest.

A current Cessna Dealer Directory accompanies your new airplane. The Directory is revised frequently, and a current copy can be obtained from your Cessna Dealer. Make your Directory one of your cross-country flight planning aids; a warm welcome awaits you at every Cessna Dealer.

PRINCIPAL DIMENSIONS

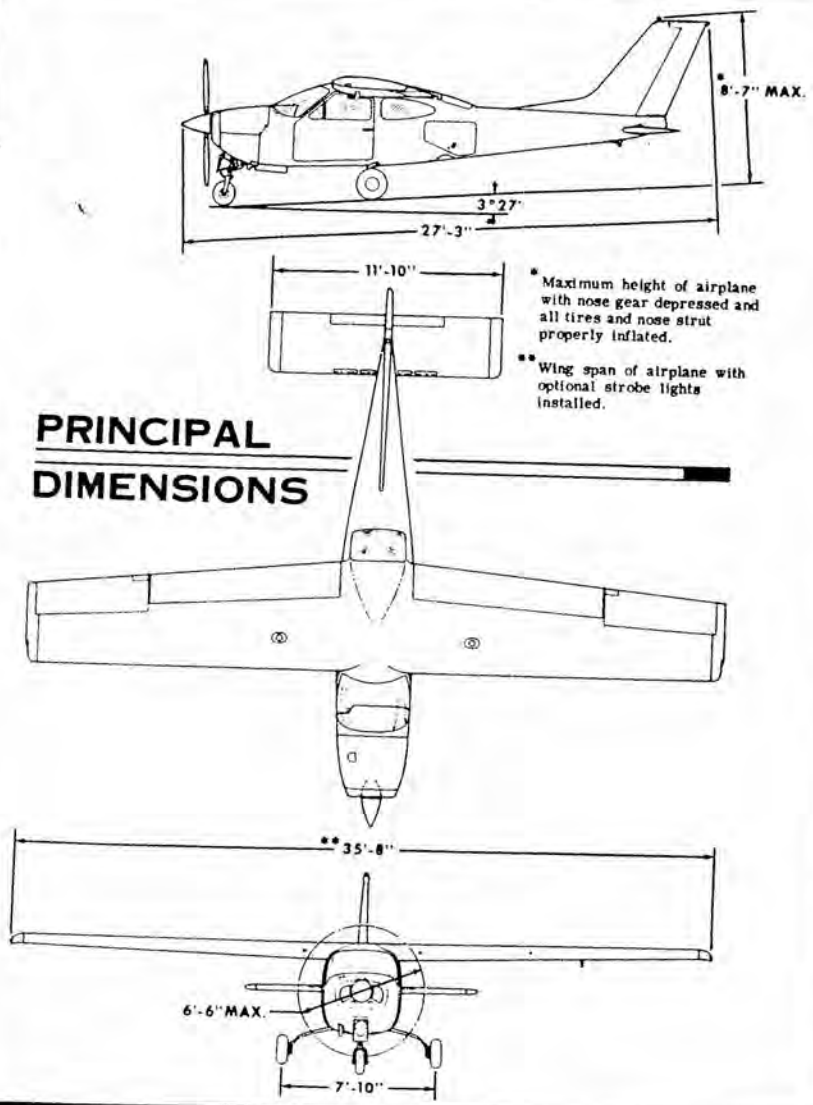


TABLE OF CONTENTS

Section I

OPERATING CHECK LIST

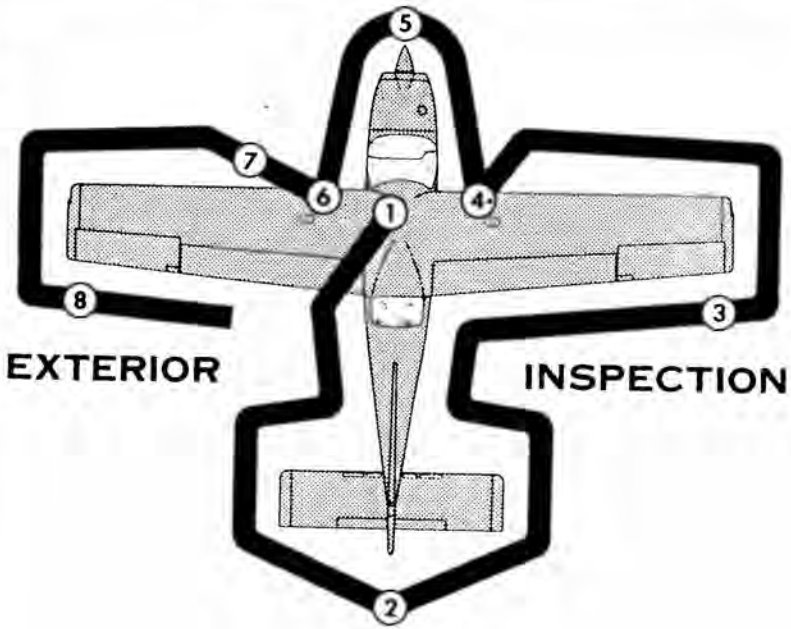
One of the first steps in obtaining the utmost performance, service, and flying enjoyment from your Cessna is to familiarize yourself with your airplane's equipment, systems, and controls. This can best be done by reviewing this equipment while sitting in the airplane. Those items whose function and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

Section I lists, in Pilot's Check List form, the steps necessary to operate your airplane efficiently and safely. It is not a check list 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.

The flight and operational characteristics of your airplane 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.

BEFORE ENTERING THE AIRPLANE.

(1) Make an exterior inspection in accordance with figure 1-1.



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

(1) a. Check landing gear position handle in "DWN" position.
b. Remove control wheel lock.
c. Check ignition switch "OFF."
d. Turn master switch "ON"; check fuel quantity indicators and landing gear "DWN" position indicator light (green) on; then turn master switch "OFF."
e. Check fuel shutoff valve handle in the "ON" position.

Figure 1-1.

f. Before first flight of day and after each refueling, pull out fuel strainer drain knob (under pilot's seat) for about four seconds to clear fuel reservoir of possible water and sediment. Check fuel drain closed. If water is observed, there is a possibility that the fuel bay sumps contain water. Thus, the drain plugs in the fuel bay sumps should be removed to check for the presence of water.
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 bay vent opening (at wing tip trailing edge) for stoppage.

(4) a. Disconnect wing tie-down.
b. Check main wheel tire for proper inflation.
c. Visually check fuel quantity; then check fuel filler cap secure.

(5) a. Check engine oil level. Do not operate with less than six quarts. Fill to eight quarts for extended flight.
b. Check propeller and spinner for nicks and security, and propeller for oil leaks.
c. Check induction air filter for restrictions by dust or other foreign matter.
d. Check landing and taxi lights for condition and cleanliness.
e. Check nose wheel strut and tire for proper inflation; nose wheel doors for security.
f. Disconnect tie-down rope.
g. Inspect flight instrument static source openings on side of fuselage for stoppage (both sides).

(6) a. Check main wheel tire for proper inflation.
b. Visually check fuel quantity, then check fuel filler cap secure.

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

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

BEFORE STARTING THE ENGINE.

(1) Seats, Seat Belts and Shoulder Harnesses -- Adjust and lock.
(2) Fuel Shutoff Valve Handle -- Check "ON" position (forward).
(3) Radios and Electrical Equipment -- "OFF."
(4) Brakes -- Test and set.
(5) Cowl Flaps -- Open (move lever out of locking hole to reposition).
(6) Landing Gear Position Handle -- Check in "DWN" position.
(7) Circuit Breakers -- Check all circuit breakers in.

STARTING THE ENGINE.

(1) Mixture -- Idle cut-off (pulled full out).
(2) Propeller -- High RPM.
(3) Throttle -- Open 1/4 inch.
(4) Master Switch -- "ON."
(5) Auxiliary Fuel Pump -- "ON."
(6) Mixture -- Advance to 4 to 6 gal/hr; then retard to idle cut-off.

NOTE

If the engine is warm, omit priming procedure step 6.

(7) Propeller Area -- Clear.
(8) Ignition Switch -- "START" (release to "BOTH" when engine starts).
(9) Mixture -- Advance smoothly to full rich when engine fires.

NOTE

If engine becomes flooded, open throttle 1/2, turn auxiliary pump off, place mixture in idle cut-off and crank engine. When engine fires, advance mixture control smoothly to full rich and retard throttle promptly.

(10) Throttle -- Reset to desired idle speed.
(11) Oil Pressure -- Check.
(12) Auxiliary Fuel Pump -- "OFF."

BEFORE TAKE-OFF.

(1) Parking Brake -- Set.
(2) Flight Controls -- Check for free and correct movement.
(3) Stabilator and Rudder Trim -- Take-off setting.

(4) Fuel Shutoff Valve Handle -- "ON" (forward).
(5) Throttle Setting -- 1800 RPM.
(6) Engine Instruments and Ammeter -- Check.
(7) Magnetos -- Check (RPM drop should not exceed 150 RPM on either magneto or 50 RPM differential between magnetos).
(8) Propeller -- Cycle from high to low RPM; return to high RPM (full in).
(9) Suction Gage -- Check (4.6 to 5.4 inches of mercury).
(10) Flight Instruments and Radios -- Set.
(11) Navigation Lights, Flashing Beacon and Optional Strobe Lights -- "ON," as required.
(12) Optional Autopilot or Wing Leveler -- "OFF."
(13) Cabin Doors -- Closed and locked.

TAKE-OFF.

NORMAL TAKE-OFF.

(1) Wing Flaps -- 0° to 10° (10° preferred).
(2) Power -- Full throttle (applied smoothly) and 2700 RPM.
(3) Mixture -- Full rich (lean for field elevation per fuel flow placard above 3000 feet).
(4) Aircraft Attitude -- Lift nose wheel at 65 MPH.
(5) Climb Speed -- 75 to 85 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 (applied smoothly) and 2700 RPM.
(4) Mixture -- Lean for field elevation per fuel flow placard above 3000 feet.
(5) Brakes -- Release.
(6) Aircraft Attitude -- Lift nose wheel at 60 MPH.
(7) Climb Speed -- 71 MPH until all obstacles are cleared; then set up climb speed as shown in "MAXIMUM PERFORMANCE CLIMB" check list.
(8) Brakes -- Apply momentarily (when airborne).
(9) Landing Gear -- Retract after obstacles are cleared.
(10) Wing Flaps -- Retract after accelerating to at least 80 MPH.

NOTE

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

ENROUTE CLIMB.

NORMAL CLIMB.

(1) Airspeed -- 100 to 120 MPH.
(2) Power -- 25 inches manifold pressure, and 2500 RPM.
(3) Mixture -- Full rich or leaned to 13 gal/hr.
(4) Cowl Flaps -- "OPEN" as required.

MAXIMUM PERFORMANCE CLIMB.

(1) Airspeed -- 95 MPH at sea level to 91 MPH at 10,000 feet.
(2) Power -- Full throttle and 2700 RPM.
(3) Mixture -- Lean for altitude per fuel flow placard.
(4) Cowl Flaps -- Full "OPEN."

CRUISING.

(1) Power -- 15 to 25 inches of manifold pressure and 2100 to 2500 RPM. Select combination to give no more than 75% power.
(2) Stabilator and Rudder Trim -- Adjust.
(3) Mixture -- Lean for cruise fuel flow per Cessna Power Computer or OPERATIONAL DATA, Section VI.
(4) Cowl Flaps -- "CLOSED."

LET-DOWN.

(1) Mixture -- Rich (or lean for smooth engine operation).
(2) Power -- As desired.

NOTE

With less than 10 inches of manifold pressure, avoid continuous operation between 1400 and 1750 RPM.

(3) Cowl Flaps -- "CLOSED."

BEFORE LANDING.

(1) Seats, Seat Belts and Shoulder Harnesses -- Adjust and lock.
(2) Landing Gear -- Extend (below 140 MPH).
(3) Mixture -- Rich.
(4) Propeller -- High RPM (full-in).
(5) Airspeed -- 80 to 90 MPH (flaps up).
(6) Wing Flaps -- As desired (0° to 10° below 150 MPH, 10° to 30° below 110 MPH).
(7) Airspeed -- 70 to 80 MPH (flaps down).
(8) Stabilator and Rudder Trim -- Adjust.

BALKED LANDING (GO-AROUND).

(1) Power -- Full throttle and 2700 RPM.
(2) Wing Flaps -- Retract to 20°.
(3) Upon reaching an airspeed of approximately 75 MPH, retract flaps slowly.

NORMAL LANDING.

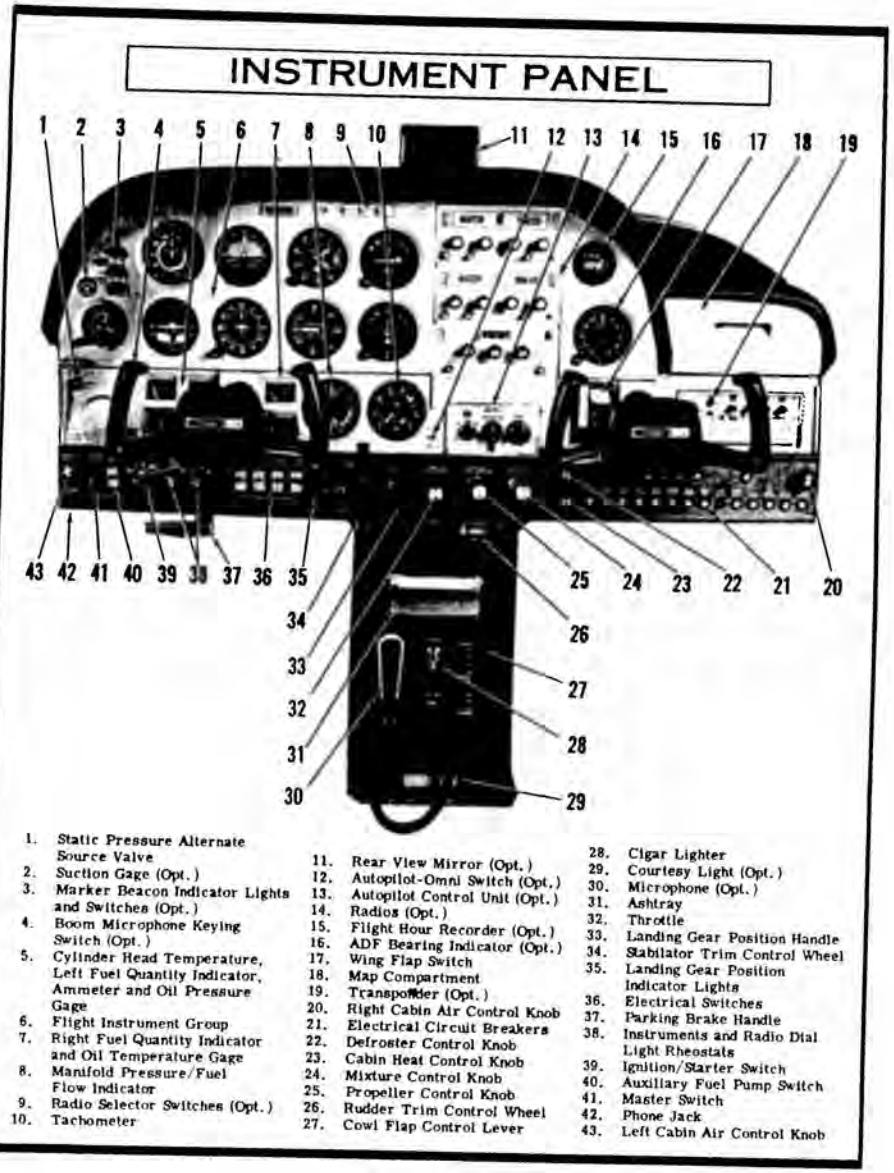
(1) Touchdown -- Main wheels first.
(2) Landing Roll -- Lower nose wheel gently.
(3) Braking -- Minimum required.

AFTER LANDING.

(1) Wing Flaps -- Up.
(2) Cowl Flaps -- "OPEN."

SECURING AIRCRAFT.

(1) Parking Brake -- Set.
(2) Radios and Electrical Equipment -- "OFF."
(3) Mixture -- Idle cut-off (pulled full out).
(4) Ignition and Master Switch -- "OFF."
(5) Control Lock -- Installed.



1. Static Pressure Alternate Source Valve
2. Suction Gage (Opt.)
3. Marker Beacon Indicator Lights and Switches (Opt.)
4. Boom Microphone Keying Switch (Opt.)
5. Cylinder Head Temperature, Left Fuel Quantity Indicator, Ammeter and Oil Pressure Gage
6. Flight Instrument Group
7. Right Fuel Quantity Indicator and Oil Temperature Gage
8. Manifold Pressure/Fuel Flow Indicator
9. Radio Selector Switches (Opt.)
10. Tachometer
11. Rear View Mirror (Opt.)
12. Autopilot-Omni Switch (Opt.)
13. Autopilot Control Unit (Opt.)
14. Radios (Opt.)
15. Flight Hour Recorder (Opt.)
16. ADF Bearing Indicator (Opt.)
17. Wing Flap Switch
18. Map Compartment
19. Transponder (Opt.)
20. Right Cabin Air Control Knob
21. Electrical Circuit Breakers
22. Defroster Control Knob
23. Cabin Heat Control Knob
24. Mixture Control Knob
25. Propeller Control Knob
26. Rudder Trim Control Wheel
27. Cowl Flap Control Lever
28. Cigar Lighter
29. Courtesy Light (Opt.)
30. Microphone (Opt.)
31. Ashtray
32. Throttle
33. Landing Gear Position Handle
34. Stabilator Trim Control Wheel
35. Landing Gear Position Indicator Lights
36. Electrical Switches
37. Parking Brake Handle
38. Instruments and Radio Dial Light Rheostats
39. Ignition/Starter Switch
40. Auxiliary Fuel Pump Switch
41. Master Switch
42. Phone Jack
43. Left Cabin Air Control Knob

Figure 2-1.

Section II

DESCRIPTION AND OPERATING DETAILS

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

FUEL SYSTEM.

Fuel is supplied to the engine from two integral fuel bays, one in each wing. Usable fuel in each bay, for all flight conditions, is 25.0 gallons when completely filled (a 22 gallon marker, in the form of a series of small holes just inside the filler neck, is provided to facilitate fueling to reduced fuel loads). With full cabin loading, it may be necessary to reduce the fuel load to keep the aircraft within the approved weight limits. (Refer to Section IV for weight and balance control procedures.)

Fuel from each wing fuel bay flows through a reservoir tank, auxiliary fuel pump with by-pass, and fuel shutoff valve to the fuel strainer. From there, it is routed to an engine-driven fuel pump which delivers the fuel under pressure to the fuel injection unit. The continuous flow type fuel injector meters the fuel in proportion to consumed air flow, through a vented nozzle at each cylinder intake port. Manual mixture control and idle cut-off functions are provided.

The auxiliary fuel pump is used primarily for priming the engine before starting. Priming is accomplished through the regular injection system.

If the auxiliary fuel pump switch is accidentally turned "ON" (with master switch "ON" and mixture rich) with the engine stopped, the intake manifolds will be flooded.

The auxiliary fuel pump is also used for vapor suppression in hot

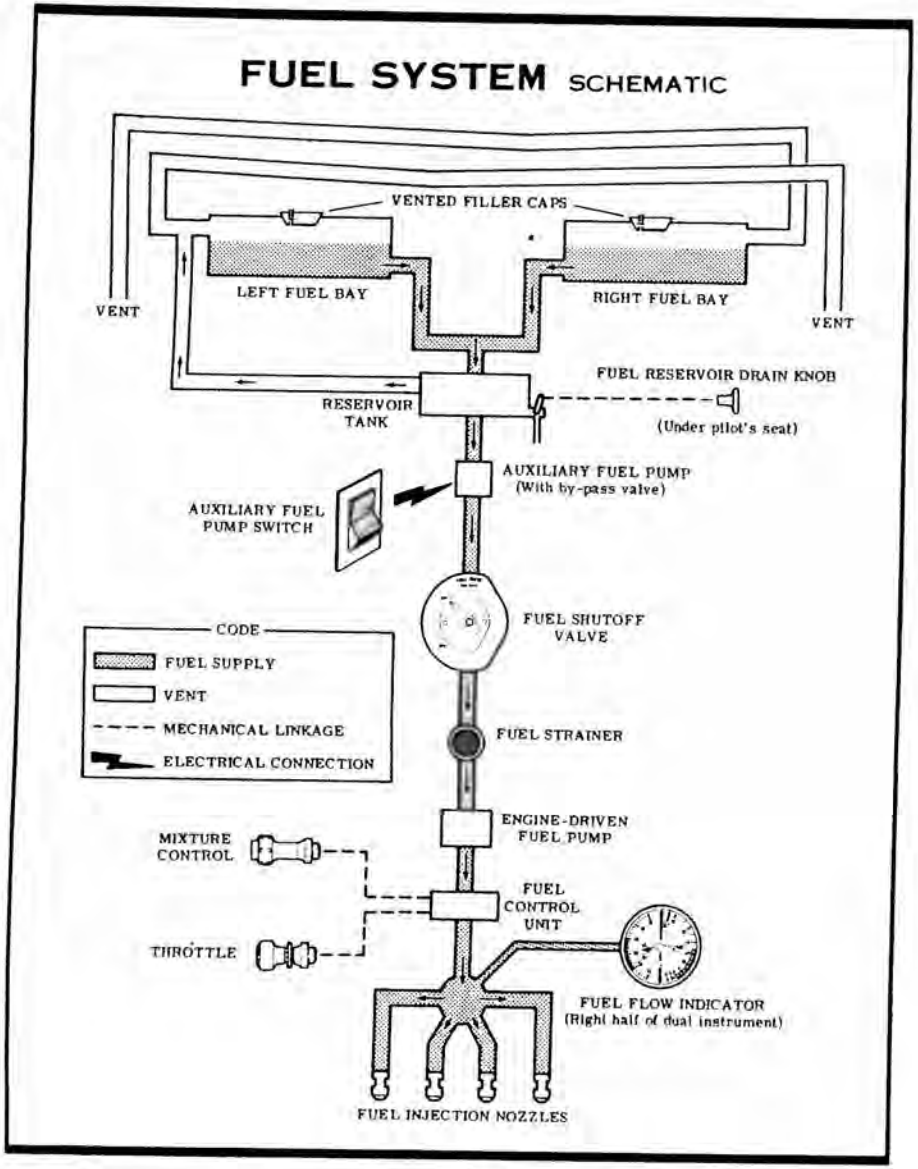


Figure 2-2.

weather. Normally, momentary use will be sufficient for vapor suppression; however, continuous operation is permissible if required. Turning on the auxiliary fuel pump with a normally operating engine pump will result in only a very minor enrichment of the mixture.

It is not necessary to have the auxiliary fuel pump operating during normal take-off and landing, since gravity and the engine-driven pump will supply adequate fuel flow to the fuel injector unit.

In the event of failure of the engine-driven pump, use of the auxiliary fuel pump will provide sufficient fuel to maintain flight at maximum continuous power.

NOTE

With low fuel (1/16th bay or less) a prolonged powered steep descent (1000 feet or more) should be avoided with more than 10° flaps to prevent the possibility of fuel starvation resulting from uncovering the fuel bay outlets. If starvation should occur, leveling the nose and turning on the auxiliary fuel pump should restore engine power within 30 seconds.

For fuel system servicing information, refer to Lubrication and Servicing Procedures in Section V.

ELECTRICAL SYSTEM.

Electrical energy is supplied by a 14-volt, direct-current system powered by an engine-driven alternator (see figure 2-3). The 12-volt battery is located aft of the rear cabin wall. 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 electronic bus. Isolating the electronic circuits in this manner prevents harmful transient voltages from damaging the transistors in the electronic equipment.

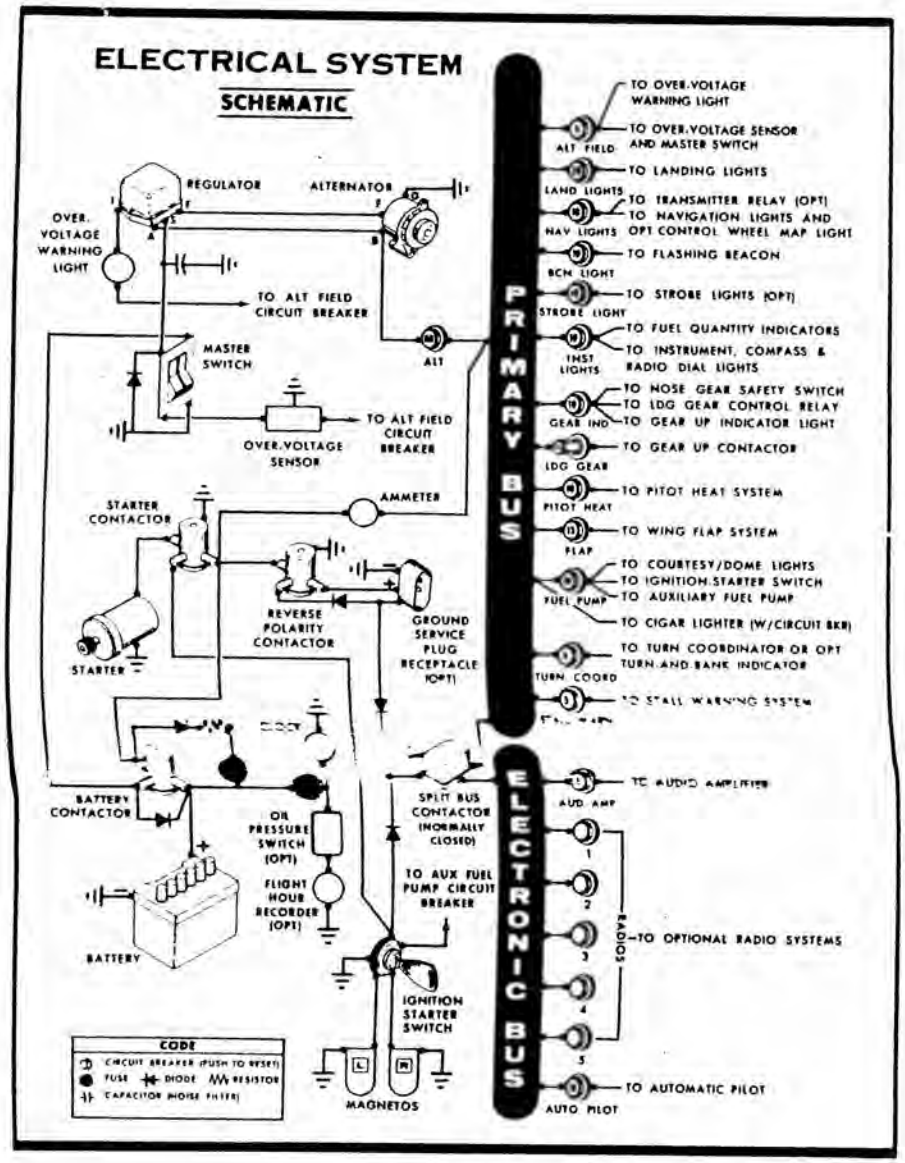


Figure 2-3.

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 airplane. 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, and all non-essential electrical equipment should be turned off for the remainder of the flight.

AMMETER.

The ammeter indicates the flow of current, in amperes, from the alternator 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.

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", near the ammeter.

In the event an over-voltage condition occurs, the over-voltage sensor automatically removes alternator field current and shuts down the alternator. The red warning light will then turn on, indicating to the pilot that the alternator is not operating and the 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 of the electrical circuits in the aircraft are protected by "push-to-reset" circuit breakers mounted on the right side of the instrument panel. Exceptions to this are the battery contactor closing (external power) circuit, clock and optional flight hour recorder circuits all having fuses mounted near the battery. The landing gear circuit is protected by a push-pull type circuit breaker on the right side of the instrument panel, and the cigar lighter has a manually reset type circuit breaker mounted on the back of the lighter socket.

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". If a malfunction in the navigation lights system causes the circuit breaker to open, de-activating the lights and transmitter relay, turn off the navigation light switch and reset the circuit breaker. This will re-activate the transmitter relay and permit its usage. Do not turn the switch on again until the malfunction is corrected.

LIGHTING EQUIPMENT.

EXTERIOR LIGHTING.

Conventional navigation lights are located on the wing tips and top of the rudder. Landing and taxi lights are installed in the nose cap, and a flashing beacon is mounted on top of the vertical fin. Optional lighting includes a strobe light on each wing tip and two courtesy lights, one under each wing, just outboard of the cabin door. The courtesy lights are operated by a switch located on the left rear door post. 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 flight through clouds, fog or haze.

INTERIOR LIGHTING.

Illumination of the instrument panel is provided by four red flood lights on the under side of the anti-glare shield, and a single red flood light in the forward part of the overhead console. The magnetic compass and radio equipment have integral lighting. Two rheostat control knobs on the left switch and control panel operate the interior lights. One knob is labeled "PANEL LIGHTS" and controls the lights in the glare shield, overhead console and compass; the other knob is labeled "RADIO LIGHTS" and controls the integral radio lighting. Both knobs rotate clockwise to increase light intensity.

A cabin dome light is located in the aft part of the overhead console, and is operated by a switch adjacent to the light. To turn the light on, move the switch to the right.

The instrument panel console may be equipped with an optional courtesy light, mounted at its base, which illuminates the forward cabin floor area. This light is controlled by the courtesy light switch on the rear door post.

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

LANDING GEAR SYSTEM.

The retractable tricycle landing gear is extended and retracted by hydraulic actuators powered by an electrically-driven hydraulic power pack. The power pack assembly is located aft of the rear baggage compartment wall. Mechanically-actuated wheel well doors are provided for the nose gear. They are open when the nose gear is down and closed when it is retracted.

An over-center mechanical linkage provides a positive mechanical up

and down lock for the nose wheel. The main gear utilizes electro-mechanical downlocks and hydraulic pressure for positive uplock. Main gear uplock pressure is maintained automatically by the power pack assembly. If pressure drops below that necessary to retain uplock pressure on the main gear, the power pack will automatically compensate.

Two position-indicator lights, mounted to the left of the stabilator trim control wheel, indicate that the gear is either up or down and locked. Both the gear "UP" (amber) and gear "DWN" (green) lights are the press-to-test type, incorporating dimming shutters for night operation. As an additional reminder that the gear is retracted, a warning horn sounds intermittently whenever the throttle is retarded below approximately 12 inches manifold pressure (master switch on) with the gear up or not down and locked.

LANDING GEAR POSITION HANDLE.

The gear position handle, mounted to the left of the engine controls, has two positions (above center for gear up, and below center for gear down) which give a mechanical indication of landing gear position. From either position, the handle must be pulled out slightly to clear a detent before it can be repositioned; operation of the landing gear system will not begin until the handle has been repositioned. After the handle has been repositioned, hydraulic pressure is directed within the system to actuate the gear to the selected position. The gear handle will remain in whichever position has been selected.

During a normal cycle, the gear locks up or down and the position indicator light comes on indicating completion of the cycle. Landing gear extension can be detected by illumination of the gear "DWN" indicator light (green), absence of a gear warning horn with the throttle retarded below approximately 12 inches manifold pressure, and visual inspection of the main gear position. Indication of gear retraction is provided by illumination of the gear "UP" (amber) light. Should a gear indicator light fail to illuminate, the light should be checked for a burned-out bulb by pressing to test. A burned-out bulb can be replaced in flight with the bulb from the compass light.

A safety switch, actuated by the nose gear, electrically prevents inadvertent retraction whenever the nose gear strut is compressed by the weight of the aircraft. Also, a switch type circuit breaker is provided as a maintenance safety feature. With the switch pulled out, landing gear operation is prevented. After maintenance is completed, and prior to flight, the switch should be placed in the on position (pushed in).

EMERGENCY HAND PUMP.

The landing gear emergency hand pump is located on the floor between the front seats and is used to manually extend the gear in the event of hydraulic pump failure. When not in use, the pump handle is retracted and stowed beneath a hinged cover marked with a placard outlining emergency operation procedures. Refer to Section III for emergency operation of the hand pump.

HAND PUMP PRESSURE RELIEF VALVE.

When the emergency hand pump is used to manually extend the landing gear, it activates valves within the hydraulic system to isolate and direct hydraulic pressure for manual extension only. This creates a difference in pressure between the emergency and normal systems. Therefore, a manual pressure relief valve is provided to equalize system pressures after using the emergency hand pump for extension.

The pressure relief valve knob, located directly under the forward end of the hand pump, must be pulled up for approximately 5 seconds to equalize pressure prior to retracting the landing gear.

CABIN HEATING, VENTILATING AND DEFROSTING SYSTEM.

The temperature and volume of airflow into the cabin can be regulated to any degree desired by adjustment of a single "CABIN HEAT" knob and two "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.

Front cabin heat and ventilating air from the main heat and ventilating system is supplied by two manifolds located above and forward of the pilot's and copilot's feet. Rear cabin heat and air is supplied by ducts from both heat manifolds, one extending down each side of the cabin to a floor level outlet at the front door post.

Windshield defrost air is supplied from the left cabin manifold; therefore, the temperature of the defrosting air is the same as heated cabin air. A push-pull control knob labeled "DEFROSTER" regulates the volume of air to the windshield. Pull the knob out as necessary for defrosting.

Four separately adjustable overhead ventilators supply individual air; two are mounted in a console above the pilot and co-pilot, and two optional individual ventilators may be mounted in the rear cabin ceiling.

Additional ground and flight ventilation is available through an openable vent window in each cabin door. These windows can be opened at speeds up to 120 MPH by rotating the crank located below the window.

SHOULDER HARNESSES.

Shoulder harnesses are provided as standard equipment for the pilot and front seat passenger, and as optional for the rear seat passengers.

Each front seat harness is attached to a rear door post just above window line and is stowed above the cabin door. When stowed, the harness is held in place by two retaining clips, one above the door and one at the top of the forward door post. The optional rear seat shoulder harnesses are attached adjacent to the lower corners of the rear window. Each rear seat harness is stowed behind a retaining clip located at the bottom edge of the aft side window.

To use the front and rear seat shoulder harnesses, 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 pulling the harness over the head by pulling up on the release strap.

STARTING ENGINE.

In cold weather, the engine compartment temperature drops off rapidly following engine shutdown and the injector nozzle lines remain nearly

full of fuel. Cold weather starting procedures are therefore relatively simple with highly predictable results. However, in extremely hot weather, engine compartment temperatures increase rapidly following engine shutdown, and fuel in the lines will vaporize and escape into the intake manifold.

Hot weather starting procedures depend considerably on how soon the next engine start is attempted. Within the first 20 to 30 minutes after shutdown, the fuel manifold is adequately primed and the empty injector nozzle lines will fill before the engine dies. However, after approximately 30 minutes, the vaporized fuel in the manifold will have nearly dissipated and some slight "priming" could be required to refill the nozzle lines and keep the engine running after the initial start.

Should the engine tend to die after starting, turn on auxiliary fuel pump temporarily and adjust throttle as necessary to keep the engine running.

Weak intermittent firing followed by puffs of black smoke from the exhaust stack indicate over priming or flooding. In this event, turn the auxiliary fuel pump "OFF," open the throttle from 1/2 to full open and continue cranking with the mixture full lean. When the engine fires, smoothly advance the mixture control to full rich and retard the throttle to desired idle speed.

If the engine is underprimed (most likely in cold weather with a cold engine) it will not fire at all, and additional priming will be necessary.

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

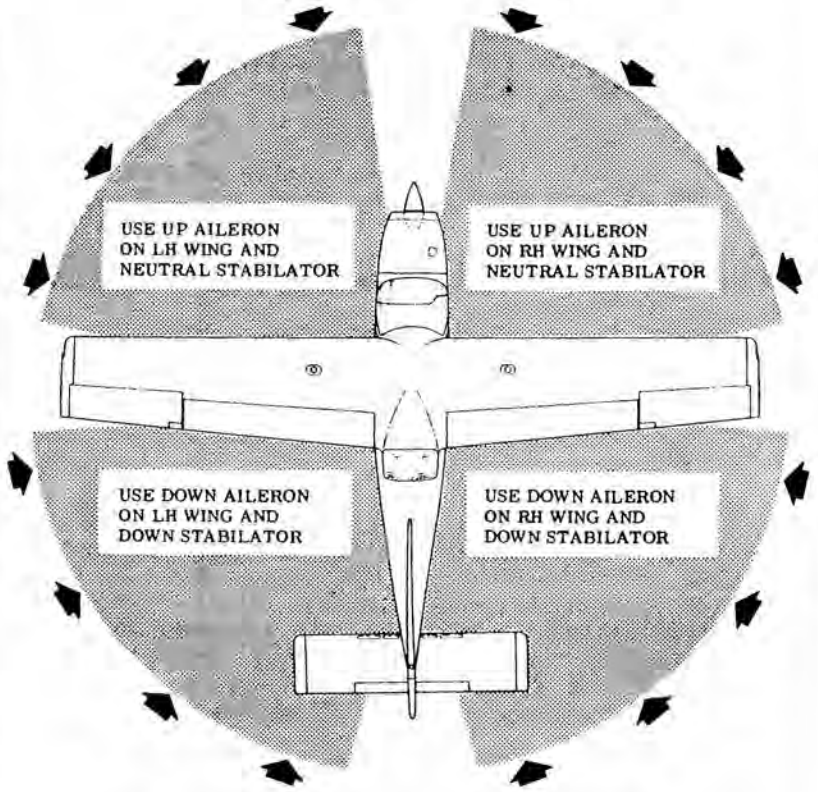
NOTE

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

TAXIING.

When taxiing it is important that speed and use of brakes be held to a minimum and that all controls be utilized (see taxiing diagram, figure 2-4) to maintain directional control and balance. Taxiing over loose gravel or cinders should be done at low engine speed to avoid abrasion and stone damage to the propeller tips.

TAXIING DIAGRAM



CODE	NOTE
WIND DIRECTION ➧	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.

BEFORE TAKE-OFF.

WARM-UP.

Since the engine is closely cowled for efficient in-flight engine cooling, precautions should be taken to avoid overheating during prolonged engine operation on the ground. Also, long periods of idling at low RPM may cause fouled spark plugs. If the engine accelerates smoothly, the airplane is ready for take-off.

MAGNETO CHECK.

The magneto check should be made at 1800 RPM as follows: Move the 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 "L" position, note RPM and return the switch to the "BOTH" position. The RPM drop should not exceed 150 RPM on either magneto or show greater than 50 RPM differential between magnetos. A smooth drop off past normal is usually a sign of a too lean or too rich mixture. If there is a doubt concerning operation of the ignition system, RPM checks at a leaner mixture setting or at higher engine speeds will usually confirm whether a deficiency exists.

An absence of RPM drop may be an indication of faulty grounding of one side of the ignition system or should be cause for suspicion that the magneto timing is set in advance of the setting specified.

ALTERNATOR CHECK.

Prior to flights where verification of proper alternator and voltage regulator operation is essential (such as night or instrument flights), a positive verification can be made by loading the electrical system momentarily (3 to 5 seconds) with the landing light or by operating the wing flaps during the engine runup (1800 RPM). The ammeter will remain within a needle width of zero if the alternator and voltage regulator are operating properly.

TAKE-OFF.

POWER CHECK.

It is important to check full-throttle engine operation early in the

take-off run. Any signs of rough engine operation or sluggish engine acceleration are good cause for discontinuing the take-off.

The auxiliary fuel pump is normally off during take-offs. However, if there is evidence of fuel vapor, as indicated by fluctuation of the fuel flow indicator needle, or rough engine operation, the pump should be turned "ON." It is not necessary to readjust the mixture control when operating with the auxiliary fuel pump "ON" because the mixture is only slightly enrichened.

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 airplane to start rolling before high RPM is developed, and the gravel will be blown back of the propeller rather than pulled into it. When unavoidable small dents appear in the propeller blades, they should be corrected immediately as described in Section V under propeller care.

Prior to take-off from short fields above 3000 feet elevation, the mixture should be leaned in accordance with the maximum power fuel flow placard located on the instrument panel control pedestal.

WING FLAP SETTINGS.

Take-offs are accomplished with the wing flaps set in the 0° to 10° position. The preferred flap setting for normal take-off is 10°. This flap setting (in comparison to flaps up) produces an approximately 15% shorter ground run and total take-off distance over an obstacle. In addition, it provides easier lift-off and increased visibility over the nose in the initial climb-out.

Flap settings of greater than 10° are not recommended at any time for take-off.

LANDING GEAR RETRACTION.

Since the landing gear swings downward approximately one foot as it starts the retraction cycle, retraction should be avoided until well clear of the runway and after a positive climb is established. This is especially important when attempting a short field take-off, where a premature lift-off might result in the airplane settling back onto the ground. On long runways the landing gear retraction can be delayed until reaching the point over the runway where a wheels-down forced landing on that runway would be impractical.

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.

PERFORMANCE CHARTS.

Consult the Take-Off Data chart in Section VI for take-off distances with 10° flaps under various gross weight, altitude, headwind, temperature, and runway surface conditions.

CROSSWIND TAKE-OFFS.

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 airplane is accelerated to a speed slightly higher than normal, and 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.

ENROUTE CLIMB.

Normal climbs are performed at 100 to 120 MPH with landing gear and flaps retracted and reduced power (down to 25 inches of manifold pressure and 2500 RPM) for increased passenger comfort due to lower noise level. The mixture may be left full rich as long as the engine is smooth. For optimum power with 25 inches manifold pressure and 2500 RPM, set the mixture to 13 GPH. With full throttle and 2500 RPM set the mixture to 2 GPH less than shown in the maximum power mixture placard. Maximum rate of climb is achieved with full throttle and 2700 RPM at speeds ranging from 95 MPH at sea level to 91 MPH at 10,000 feet. The mixture should be leaned for altitude in accordance with the maximum power fuel flow placard.

If an enroute obstacle dictates the use of a steep climb angle, an obstacle clearance speed of 80 MPH should be used with landing gear and flaps retracted and full throttle at all altitudes.

CRUISE.

Normal cruising is done between 65% and 75% power. The power settings required to obtain these powers at various altitudes and outside air temperatures and corresponding fuel flow settings can be determined by using your Cessna Power Computer or the OPERATIONAL DATA, Section VI.

The Maximum Cruise Speed Performance table, figure 2-5, shows that cruising can be done most efficiently at higher altitudes because very nearly the same cruising speed can be maintained at much less power. The altitudes in the table reflect the maximum altitudes for each power listed, using 2500 RPM and full throttle. All figures in this chart and in Section VI are based on lean mixture, 50 gallons of fuel (no reserve), zero wind, standard atmospheric conditions, 2800 pounds gross weight, and cowl flaps closed.

For maximum engine service life, the cylinder head temperature should be maintained below 410°F, or approximately three fourths of the normal operating range (green arc).

For greater cruising range at a given throttle setting, select the lowest engine RPM in the green arc range that will give smooth engine operation.

The fuel injection system used on this airplane is considered to be non-icing. In the event the main intake filter becomes blocked, an alternate intake valve opens automatically, supplying unfiltered air from the lower engine compartment and resulting in approximately a 5% power loss at full throttle.

MAXIMUM CRUISE SPEED PERFORMANCE

%BHP	GAL/HR	ALTITUDE	TRUE AIRSPEED	RANGE
75	10.8	7000	170	785
70	10.0	9000	167	835
65	9.4	10,500	165	880

Figure 2-5.

SPINS.

Intentional spins are prohibited in this airplane. Should an inadvertent spin occur, the following recovery technique may 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.

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.

The landing gear is normally 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, the landing gear may be left extended in go-around procedures or traffic patterns for touch-and-go landing.

Landing gear extension can be detected by illumination of the gear "DWN" indicator light (green), absence of a gear warning horn with the throttle retarded below approximately 12 inches of manifold pressure, and visual inspection of the main gear position.

LANDING.

Normal landing approaches can be made with power on or power off at speeds of 80 to 90 MPH with flaps up and 70 to 80 MPH with flaps down. Surface winds and air turbulence are usually the primary factors in determining the most comfortable approach speeds. Slips are permitted with any desired flap setting. Actual touchdown should be made with power off and on the main wheels first. The nose wheel should be lowered smoothly to the runway as speed is diminished.

Full down stabilator (control wheel positioned full forward) should not be used during the ground roll. This reduces the weight on the main wheels which causes poor braking and increases the possibility of sliding the tires.

SHORT FIELD LANDINGS.

For a maximum performance short field landing in smooth air conditions, make an approach at 72 MPH with full flaps using enough power to control the glide path. (Slightly higher approach speeds should be used under turbulent air conditions). After all approach obstacles are cleared, progressively reduce power and maintain 72 MPH by lowering the nose of the airplane. Touchdown should be made with power-off and on the main wheels first. Immediately after touchdown, lower the nose wheel and apply heavy braking as required. For maximum brake effectiveness, retract the flaps, hold the control wheel full back, and apply maximum brake pressure without sliding the tires.

CROSSWIND LANDINGS.

When landing in a strong crosswind, use the minimum flap setting required for the field length. Although the crab or combination method of drift correction may be used, the wing-low method gives the best control. After touchdown, hold a straight course with the steerable nose wheel and occasional braking if necessary.

The maximum allowable crosswind velocity is dependent upon pilot capability rather than airplane limitations. With average pilot technique, direct crosswinds of 15 knots can be handled with safety.

BALKED LANDING (GO-AROUND).

In a balked landing (go-around) climb, apply full throttle and 2700 RPM smoothly, and reduce wing flaps promptly to 20°. Upon reaching

an airspeed of approximately 75 MPH, flaps should be slowly retracted to the full up position.

If obstacles are immediately ahead during the go-around, the landing gear should be left down and the wing flaps should be left at 20° until obstacles are cleared. At field elevations above 3000 feet, the mixture should be leaned for maximum power.

COLD WEATHER OPERATION.

STARTING.

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

NOTE

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

In extremely cold (0°F and lower) weather, the use of an external preheater and an external power source are recommended whenever possible to obtain positive starting and 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.

Cold weather starting procedures are the same as the normal starting procedures in Section I. Use caution to prevent inadvertent forward movement of the airplane during starting when parked on snow or ice.

NOTE

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

During cold weather operations, no indication will be apparent on the oil temperature gage prior to take-off if outside air temperatures are very cold. After a suitable warm-up period (2 to 5 minutes at 1000 RPM), accelerate the engine several times to higher engine RPM. If the engine accelerates smoothly and the oil pressure remains normal and steady, the airplane is ready for take-off.

STATIC PRESSURE ALTERNATE SOURCE VALVE.

A static pressure alternate source valve is installed in the left side of the instrument panel for use when the external static source is malfunctioning. This valve supplies static pressure from inside the rear fuselage instead of the external static ports. An external condensate drain, located in the alternate source line under the pilot's floorboard, is provided for periodic draining of any moisture accumulation.

If erroneous instrument readings are suspected due to water or ice in the pressure lines going to the standard external static pressure source, the alternate static source valve should be pulled on.

Pressures within the rear fuselage will vary with open cabin ventilators and vent windows. With the windows closed, the most adverse vent configuration results in minor airspeed and altimeter variations of less than 5 MPH and 50 feet, respectively. However, opening the vent windows may result in large errors (depending on the sealing effectiveness of the baggage curtain) which increase with increasing airspeed. For example, at the placarded maximum window open speed of 120 MPH, the airspeed indicator and altimeter may read low by as much as 12 MPH and 90 feet, respectively. To avoid the possibility of large errors the windows should not be open when using the alternate static source.

HOT WEATHER OPERATION.

The general warm temperature starting information on page 2-10 is appropriate. Avoid prolonged engine operation on the ground.

Section III

EMERGENCY PROCEDURES

Emergencies caused by aircraft or engine malfunctions are extremely rare if proper pre-flight inspections and maintenance are practiced. Enroute 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.

ELECTRICAL POWER SUPPLY SYSTEM MALFUNCTIONS.

Malfunctions in the electrical power supply system can be detected by periodic monitoring of the ammeter and over-voltage warning light; however, the cause of these malfunctions is usually difficult to determine. A broken alternator drive belt or wiring is most likely the cause of alternator failures, although other factors could cause the problem. A damaged or improperly adjusted voltage regulator can also cause 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 voltage 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 16 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. Power must be conserved for later operation of the landing gear and wing flaps and possible use of the landing light 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.

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 "LEFT" or "RIGHT" 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 "LEFT" or "RIGHT" ignition switch position will identify which magneto is malfunctioning. Select different power settings and enrichen the mixture to determine if continued operation on "BOTH" magnetos is practicable. If not, switch to the good magneto and proceed to the nearest airport for repairs.

LOW OIL PRESSURE.

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

If low, or a total loss of oil pressure is accompanied by a sudden rise in oil temperature, there is 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 the event of possible landing gear retraction or extension malfunctions, there are several general checks that should be made prior to initiating the steps outlined in the following paragraphs.

In analyzing a landing gear malfunction, first check that the master switch is "ON" and the "LDG GEAR" and "GEAR IND" circuit breakers are in; reset if necessary. Also, check both landing gear position indicator lights for operation by "pressing-to-test" the light units and rotating them at the same time to check for open dimming shutters. A burned-out bulb can be replaced in flight by using the bulb from the compass light or 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 gear "UP" indicator light for proper operation and attempt to recycle the landing gear. Place the landing gear handle in the "DWN" position. When the gear "DWN" indicator light comes on, pull the hand pump pressure relief valve up for at least five seconds. Reposition the gear handle in the "UP" position for another retraction attempt. If the gear "UP" indicator light still fails to illuminate, an immediate landing is not necessary. The flight may continue to an airport having maintenance facilities if, after the gear has been apparently retracted, cruise speed appears normal with no abnormal

buffeting, and the landing gear motor is not running. However, if the gear motor does not shut off after retraction, or the gear "UP" light continues to operate intermittently, the landing gear should be extended until maintenance can be obtained.

NOTE

Test for landing gear motor operation as follows: At a safe altitude, cycle landing gear at 75 MPH with low power and listen for the motor to shut off following the normal sound of gear retraction (approximately 12 seconds). Intermittent gear motor operation may also be detected by momentary fluctuations of the ammeter needle.

EXTENSION MALFUNCTIONS.

Normal landing gear extension time is approximately 14 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 air speed of 80 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 under a hinged cover 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 "DWN" position.
(2) Lift cover and extend pump handle.
(3) Pump approximately 40 pressure strokes.
(4) Stop when resistance becomes heavy.
(5) Verify gear is down by observing green "DWN" light on.
(6) With green "DWN" light on, stow handle and pull hand pump pressure relief valve up for approximately five seconds to equalize system pressure and permit subsequent normal retraction, if desired.
(7) If gear "DWN" light fails to illuminate, do not relieve system pressure through the pressure relief valve if a gear down landing is planned. If, after the hand pump has been operated, a gear up emergency landing is preferred, then the pressure relief valve must be pulled up for at least five seconds while the gear handle is in the "DWN" position. This will permit normal retraction when the landing gear handle is repositioned to "UP."

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) Maintain landing gear down pressure with the manual hand pump.
(4) Land tail-low as smoothly as possible and minimize braking in the landing roll.
(5) Taxi slowly to a maintenance area.
(6) Perform a normal engine shut down 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 passenger to rear seat.
(2) Select a hard-surfaced or smooth sod runway.

NOTE

If terrain is rough or soft, plan a wheels up landing as presented under "Forced Landing (Precautionary Landing With Power)" in lieu of the following steps.

(3) Maintain gear down pressure with manual hand pump (gear handle "DWN").
(4) Extend flaps to 30°.
(5) Turn off master switch.
(6) Land in a slightly tail-low attitude.
(7) Pull mixture control knob to idle cut-off (full out.)
(8) Turn ignition-starter switch "OFF."
(9) Turn fuel shutoff valve handle to "OFF."
(10) Hold the nose off the ground as long as possible.
(11) Evacuate the aircraft as soon as it stops.

LANDING WITH PARTIALLY EXTENDED MAIN GEAR.

If the main gears are only partially extended, and all efforts to fully extend them (including manual extension) have failed, plan a wheels-up landing as presented under "Forced Landing-Precautionary Landing With Engine Power." In preparation for landing, pull the hand pump pressure relief valve up for at least five seconds with the gear handle in the "DWN" position. Then reposition the gear handle to "UP" to allow the landing gear to swing into the gear wells at touchdown.

FORCED LANDINGS.

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 "before landing" check.
(2) Drag over selected field with flaps 20° and 75 MPH airspeed, noting the preferred area for touchdown for the next landing approach.
(3) If landing surface is smooth and hard, plan a wheels down landing; if surface is rough or soft, plan a wheels up landing.
(4) On downwind leg turn off all switches except the ignition and master switches.
(5) Unlatch cabin doors prior to final approach.
(6) Approach with flaps 30° at 75 MPH.
(7) Before touchdown, turn ignition and master switches "OFF."
(8) Land in a slightly tail-low attitude.

EMERGENCY LANDING WITHOUT ENGINE POWER.

If an engine stoppage occurs, establish a flaps up glide in accordance with the speeds shown in the Maximum Glide Distance chart, figure 6-6. If time permits, attempt to determine the cause of failure by checking for fuel quantity, proper fuel shutoff valve position, mixture control setting, and fuel flow indication (with auxiliary fuel pump "ON"). Also check ignition switch is properly positioned. If the restart attempt is unsuccessful, prepare for the landing as follows:

(1) Seats, Seat Belts, and Shoulder Harnesses -- Adjust and lock.
(2) Turn auxiliary fuel pump "OFF."

(3) Pull mixture control to idle cut-off position.
(4) Turn fuel shutoff valve handle "OFF."
(5) If selected field is smooth and hard, extend landing gear within gliding distance of field.
(6) Make approach at 85 MPH.
(7) If electrical power is available, extend flaps as necessary within gliding distance of field and approach at 75 MPH.
(8) Turn off master switch.
(9) Unlatch cabin doors prior to final approach.
(10) Make a slightly tail-low landing and apply heavy braking.
(11) If terrain is rough or soft, plan a wheels-up landing as follows:
   a. Make approach at 85 MPH, gear and flaps retracted.
   b. Extend flaps as necessary within gliding distance of field and approach at 75 MPH.
   c. Turn off master switch.
   d. Unlatch cabin doors prior to final approach.
   e. Land in a slightly tail-low attitude.
   f. Attempt to hold tail low throughout slide.

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 the landing gear retracted and flaps 30°, with sufficient power for a 300 ft./min. rate of descent at 70 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 airplane height over a water surface.
(5) Place folded coat or cushion in front of face at time of touchdown.
(6) Expect a second impact for the airplane may skip after touchdown.
(7) Evacuate airplane through cabin doors. If necessary, open vent windows to flood cabin compartment for equalizing pressure so that door can be opened.
(8) Inflate life vests and raft (if available) after evacuation of cabin. The aircraft can not be depended on for flotation for more than a few minutes.

DISORIENTATION IN CLOUDS.

When flying in marginal weather, the pilot should make sure that the Wing Leveler (if installed) control knob is "ON." However, if the airplane is not equipped with this device or gyro horizon and directional gyro instruments, the pilot will have to rely on the turn coordinator (or turn and bank indicator) if he inadvertently flies into clouds. The following instructions assume that only one of the latter two instruments is available.

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 airplane wing opposite the lower left index mark for 60 seconds. Then roll back to level flight by leveling the miniature airplane.
(3) Check accuracy of the turn by observing the compass heading which should be the reciprocal of the original heading.
(4) If necessary, adjust heading primarily with skidding motions rather than rolling motions so that the compass will read more accurately.
(5) Maintain altitude and airspeed by cautious application of stabilator 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) Apply full rich mixture.
(4) Adjust the stabilator and rudder trim control wheels for a stabilized descent at 90 MPH.
(5) Keep hands off the control wheel.
(6) Monitor turn coordinator and make corrections by rudder alone.
(7) Adjust 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.
(2) Stop the turn by using coordinated aileron and rudder control to align the symbolic airplane in the turn coordinator with the horizon reference line.
(3) Cautiously apply stabilator back pressure to slowly reduce the indicated airspeed to 90 MPH.
(4) Adjust the stabilator trim control wheel to maintain a 90 MPH glide.
(5) Keep hands off the control wheel, using rudder control to hold a straight heading. Use 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, resume normal cruising flight.

FIRES.

ENGINE FIRE IN FLIGHT.

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

(1) Pull mixture control to idle cut-off.
(2) Turn fuel shutoff valve handle to "OFF."
(3) Turn master switch "OFF."
(4) Establish a 100 MPH glide.
(5) Close cabin heat and cabin air controls.

NOTE

Open overhead adjustable ventilators or cabin windows to obtain ventilation.

(6) Select a field suitable for a forced landing.
(7) If fire is not extinguished, increase glide speed in an attempt to find an airspeed that will provide an incombustible mixture.
(8) Execute a forced landing as described in paragraph Emergency Landing Without Engine Power. Do not attempt to restart the engine.

ELECTRICAL FIRE IN FLIGHT.

The initial indication of an electrical fire is the odor of burning insulation. The immediate response should be to turn the master switch "OFF." Then close off ventilating air as much as practicable to reduce the chances of a sustained fire.

If electrical power is indispensable for the flight, an attempt may be made to identify and cut off the defective circuit as follows:

(1) Master Switch -- "OFF."
(2) All other switches (except ignition switch) -- "OFF."
(3) Check condition of circuit breakers to identify faulty circuit if possible. Leave faulty circuit deactivated.
(4) Master Switch -- "ON."
(5) Select switches "ON" successively, permitting a short time delay to elapse after each switch is turned on until the short circuit is localized.
(6) Make sure fire is completely extinguished before opening ventilators.

FLIGHT IN ICING CONDITIONS.

Although flying in known icing conditions is prohibited, 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 left cabin air, heater and defroster control knobs full out to obtain windshield defroster airflow.
(4) Increase RPM to minimize ice build-up on propeller blades.

(5) Plan a landing at the nearest airport. With an extremely rapid ice build-up, select a suitable "off airport" landing site.
(6) With an ice accumulation of one quarter inch or more on the wing leading edges, be prepared for significantly higher stall speed.
(7) Extend wing flaps 10° with ice accumulations of one inch or less. With heavier ice accumulations, approach with flaps retracted to ensure adequate stabilator effectiveness in the approach and landing.
(8) Perform a landing approach using a forward slip, if necessary, for improved visibility.
(9) Approach at 85 to 95 MPH, depending upon the amount of ice accumulation.
(10) Perform a landing in level attitude.

Section IV

OPERATING LIMITATIONS

OPERATIONS AUTHORIZED.

Your Cessna exceeds the requirements for airworthiness as set forth by the United States Government, and is certificated under FAA Type Certificate No. A20CE as Cessna Model No. 177RG.

With standard equipment, the airplane is approved for day and night operations under VFR. Additional optional equipment is available to increase its utility and to make it authorized for use under IFR day and night. An owner of a properly equipped Cessna is eligible to obtain approval for its operation on single-engine scheduled airline service. Your Cessna Dealer will be happy to assist you in selecting equipment best suited to your needs.

MANEUVERS-NORMAL CATEGORY.

This airplane is certificated in the normal category. The normal category is applicable to airplanes 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	2800 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.

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

AIRSPEED LIMITATIONS (CAS).

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

Never Exceed Speed (glide or dive, smooth air)	195 MPH
Maximum Structural Cruising Speed	160 MPH
Maximum Speed, Gear Extended	140 MPH
Maximum Speed, Flaps Extended	
Flaps 10°	150 MPH
Flaps 10° to 30°	110 MPH
*Maneuvering Speed	130 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 airplane.

Never Exceed (glide or dive, smooth air)	195 MPH (red line)
Caution Range	160-195 MPH (yellow arc)
Normal Operating Range	70-160 MPH (green arc)
Flap Operating Range (10° to 30°)	60-110 MPH (white arc)

ENGINE OPERATION LIMITATIONS.

Power and Speed	200 BHP at 2700 RPM

ENGINE INSTRUMENT MARKINGS.

OIL TEMPERATURE GAGE.

Normal Operating Range	Green Arc
Maximum Allowable	245°F (red line)

CYLINDER HEAD TEMPERATURE GAGE.

Normal Operating Range	200° to 475°F (green arc)
Maximum Allowable	475°F (red line)

OIL PRESSURE GAGE.

Minimum Idling	25 psi (red line)
Normal Operating Range	60-90 psi (green arc)
Maximum	100 psi (red line)

FUEL FLOW INDICATOR.

Normal Operating Range	6.0-13.0 gal/hr (green arc)
Maximum	10.0 psi (19.0 gal/hr) (red line)

NOTE

A placard, located on the pedestal below the engine controls, defines maximum power take-off/climb mixture settings as follows:

MAXIMUM POWER MIXTURE

ALTITUDE	S. L.	4000	8000	12,000
GAL/HR	17	15	13	10

FUEL QUANTITY INDICATORS.

Empty (0.5 gallons unusable each tank)	E (red line)

TACHOMETER.

Normal Operating Range	2100-2500 RPM (green arc)
Caution Range	1400-1750 RPM (yellow arc)
Maximum Allowable	2700 RPM (red line)

MANIFOLD PRESSURE GAGE.

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

WEIGHT AND BALANCE.

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

Take the "Licensed Empty Weight" and "Moment" from the Weight

TOP PROP, Inc.
#14 Minot International Airport
Minot, ND 58701

AFM Supplement
Cessna ~~XXXB~~ ~~XX~~ 177RG
STC #: SA1557GL

Limitations Section

Propeller

Hartzell

Pitch: High 30.5 +-0.5, Low 9.2 +- 0.1

at 30 inch station

Maximum diameter: 74 inches

Minimum diameter: 73 inches

Power instruments

Tachometer:(normal operating range)

Green Arc: 500 to 2700 rpm

Red Radial:(maximum continuous power)

2700rpm

Placards

Aviod continuous operation below 15"

between 1950 and 2350 rpm.

Procedures Section

no change

Performance Section

no change

FAA Approved - Date: 1/29/91

and Balance Data sheet (or changes noted on FAA Form 337) carried in your airplane, and write them down in the column titled "YOUR AIRPLANE" on the Sample Loading Problem.

NOTE

The Weight and Balance Data sheet is included in the aircraft file. In addition to the licensed empty weight and moment noted on this sheet, the c.g. arm (fuselage station) is shown. The c.g. arm figure need not be used on the Sample Loading Problem. The moment shown on the sheet 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 is based on seats positioned for average occupants and baggage loaded in the center of the baggage area. For other than average loading situations, 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.

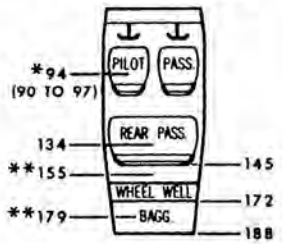
Total the weights and moments/1000 and plot these values on the Center of Gravity Moment Envelope to determine whether the point falls within the envelope, and if the loading is acceptable.

LOADING ARRANGEMENTS

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

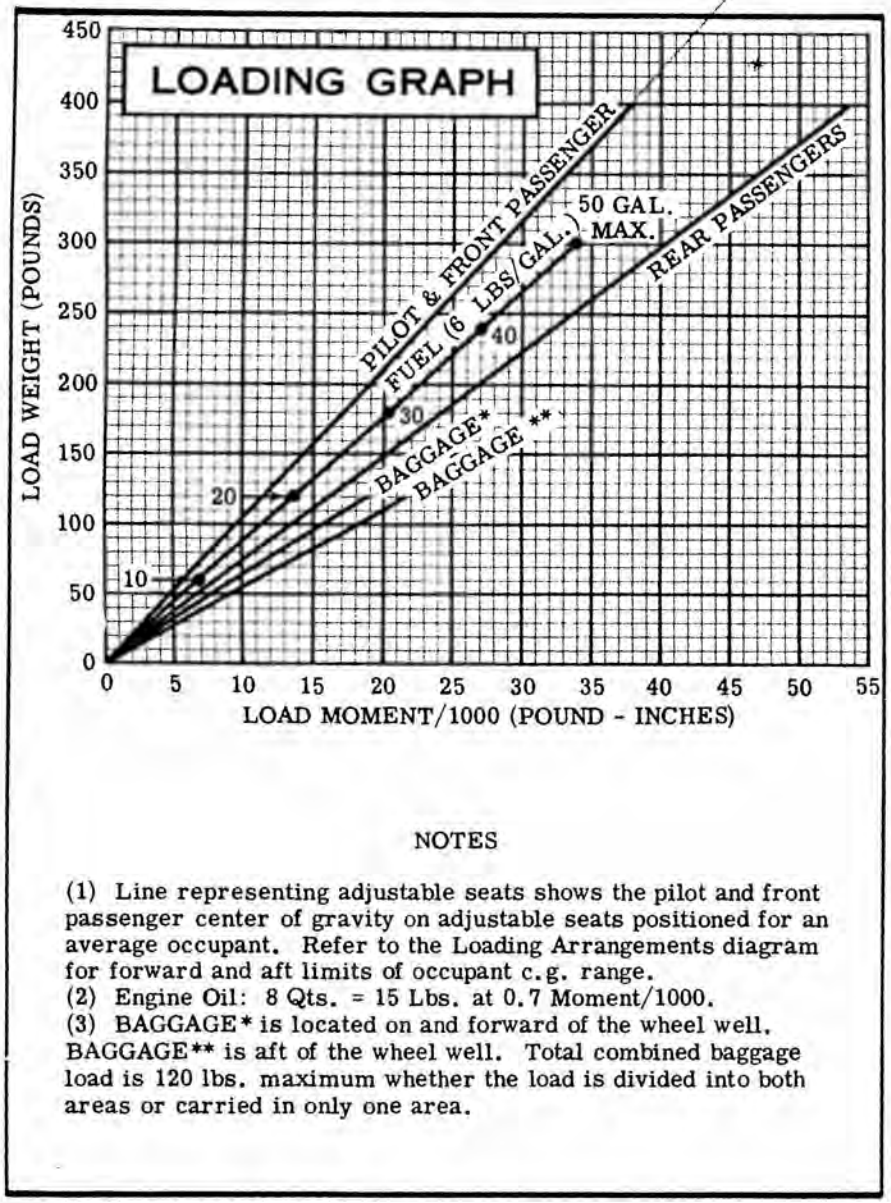
** Arm measured to the center of the area shown.

NOTE: The aft baggage wall (approximate station 188) can be used as a convenient interior reference point for determining the location of baggage area fuselage stations.



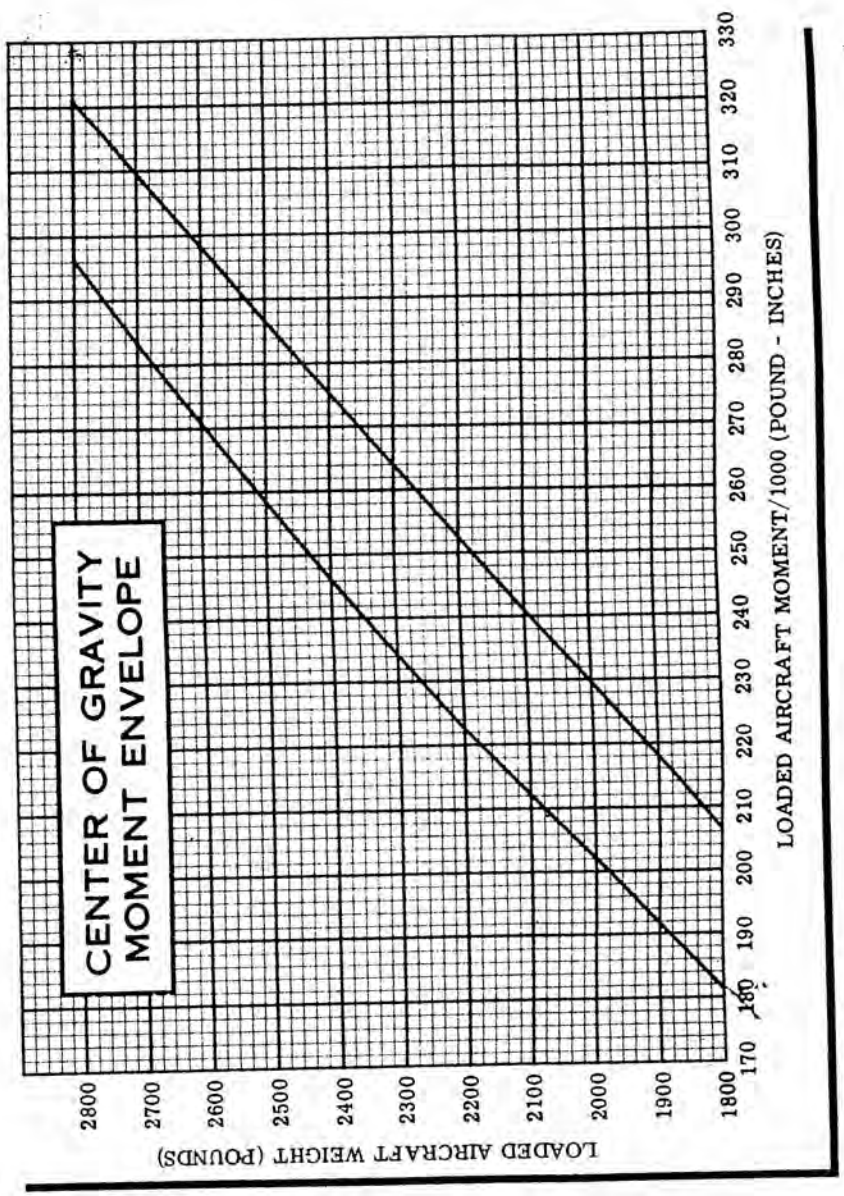
SAMPLE LOADING PROBLEM	SAMPLE AIRPLANE Weight (lbs.)	SAMPLE AIRPLANE Moment (lb.-ins./1000)	YOUR AIRPLANE Weight (lbs.)	YOUR AIRPLANE Moment (lb.-ins./1000)
1. Licensed Empty Weight (Sample Airplane)	1706	182.0	1764.4	188
2. Oil (8 Qts. - Full oil may be assumed for all flights)	15	0.7	15	0.7
3. Fuel (50 Gal. at 6 lbs./Gallon)	300	33.6		
4. Pilot and Front Passenger (Sta. 90 to 97)	340	32.0		
5. Rear Passengers	340	45.6		
6. Baggage (on and forward of wheel well - Sta. 145 to 172)				
7. Baggage (aft of wheel well - Sta. 172 to 188)	99	17.7		
8. TOTAL WEIGHT AND MOMENT	2800	311.6		

9. Locate this point (2800 at 311.6) on the center of gravity moment envelope, and since this point falls within the envelope, the loading is acceptable.



NOTES

(1) Line representing adjustable seats shows the pilot and front passenger center of gravity on adjustable seats positioned for an average occupant. Refer to the Loading Arrangements diagram for forward and aft limits of occupant c.g. range.
(2) Engine Oil: 8 Qts. = 15 Lbs. at 0.7 Moment/1000.
(3) BAGGAGE* is located on and forward of the wheel well. BAGGAGE** is aft of the wheel well. Total combined baggage load is 120 lbs. maximum whether the load is divided into both areas or carried in only one area.



Section V

CARE OF THE AIRPLANE

If your airplane is to retain that new plane performance and dependability, certain inspection and maintenance requirements must be followed. It is wise to follow a planned schedule of lubrication and preventive maintenance based on climatic and flying conditions encountered in your locality.

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

GROUND HANDLING.

The airplane is most easily and safely maneuvered by hand with the tow-bar attached to the nose wheel. When towing with a vehicle, do not exceed the nose gear turning angle of 39° either side of center, or damage to the gear will result. If the airplane is towed or pushed over a rough surface during hangaring, watch that the normal cushioning action of the nose strut does not cause excessive vertical movement of the tail and the resulting contact with low hangar doors or structure. A flat nose tire or deflated strut will also increase tail height.

MOORING YOUR AIRPLANE.

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

(1) Set the parking brake and install the control wheel lock.
(2) Install a surface control lock over the fin and rudder.
(3) Tie sufficiently strong ropes or chains (700 pounds tensile

strength) to the wing and tail tie-down fittings and secure each rope to a ramp tie-down.
(4) Tie a rope (no chains or cables) to the nose gear strut and secure to a ramp tie-down.
(5) Install a pitot tube cover.

WINDSHIELD-WINDOWS.

The plastic windshield and windows should be cleaned with an aircraft windshield cleaner. Apply the cleaner sparingly with soft cloths, and rub with moderate pressure until all dirt, oil scum and bug stains are removed. Allow the cleaner to dry, then wipe it off with soft flannel cloths.

If a windshield cleaner is not available, the plastic can be cleaned with soft cloths moistened with Stoddard solvent to remove oil and grease.

NOTE

Never use gasoline, benzine, alcohol, acetone, carbon tetrachloride, fire extinguisher or anti-ice fluid, lacquer thinner or glass cleaner to clean the plastic. These materials will attack the plastic and may cause it to craze.

Follow by carefully washing with a mild detergent and plenty of water. Rinse thoroughly, then dry with a clean moist chamois. Do not rub the plastic with a dry cloth since this builds up an electrostatic charge which attracts dust. Waxing with a good commercial wax will finish the cleaning job. A thin, even coat of wax, polished out by hand with clean soft flannel cloths, will fill in minor scratches and help prevent further scratching.

Do not use a canvas cover on the windshield unless freezing rain or sleet is anticipated since the cover may scratch the plastic surface.

PAINTED SURFACES.

The painted exterior surfaces of your new Cessna have a durable, long lasting finish and, under normal conditions, require no polishing or buffing. Approximately 15 days are required for the paint to cure completely; in most cases, the curing period will have been completed prior to delivery of the airplane. In the event that polishing or buffing is required within the curing period, it is recommended that the work be done

by someone experienced in handling uncured paint. Any Cessna Dealer can accomplish this work.

Generally, the painted surfaces can be kept bright by washing with water and mild soap, followed by a rinse with water and drying with cloths or a chamois. Harsh or abrasive soaps or detergents which cause corrosion or scratches should never be used. Remove stubborn oil and grease with a cloth moistened with Stoddard solvent.

Waxing is unnecessary to keep the painted surfaces bright. However, if desired, the airplane may be waxed with a good automotive wax. A heavier coating of wax on the leading edges of the wings and tail and on the engine nose cap and propeller spinner will help reduce the abrasion encountered in these areas.

When the airplane is parked outside in cold climates and it is necessary to remove ice before flight, care should be taken to protect the painted surfaces during ice removal with chemical liquids. A 50-50 solution of isopropyl alcohol and water will satisfactorily remove ice accumulations without damaging the paint. A solution with more than 50% alcohol is harmful and should be avoided. While applying the de-icing solution, keep it away from the windshield and cabin windows since the alcohol will attack the plastic and may cause it to craze.

PROPELLER CARE.

Preflight inspection of propeller blades for nicks, and wiping them occasionally with an oily cloth to clean off grass and bug stains will assure long, trouble-free service. Small nicks on the propeller, particularly near the tips and on the leading edges, should be dressed out as soon as possible since these nicks produce stress concentrations, and if ignored, may result in cracks. Never use an alkaline cleaner on the blades; remove grease and dirt with carbon tetrachloride or Stoddard solvent.

LANDING GEAR CARE.

Cessna Dealer's mechanics have been trained in the proper adjustment and rigging procedures on the aircraft hydraulic system. To assure trouble-free gear operation, have your Cessna Dealer check the gear regularly and make any necessary adjustments. Only properly trained mechanics should attempt to repair or adjust the landing gear.

INTERIOR CARE.

To remove dust and loose dirt from the upholstery and carpet, clean the interior regularly with a vacuum cleaner.

Blot up any spilled liquid promptly with cleansing tissue or rags. Don't pat the spot; press the blotting material firmly and hold it for several seconds. Continue blotting until no more liquid is taken up. Scrape off sticky materials with a dull knife, then spot-clean the area.

Oily spots may be cleaned with household spot removers, used sparingly. Before using any solvent, read the instructions on the container and test it on an obscure place on the fabric to be cleaned. Never saturate the fabric with a volatile solvent; it may damage the padding and backing materials.

Soiled upholstery and carpet may be cleaned with foam-type detergent, used according to the manufacturer's instructions. To minimize wetting the fabric, keep the foam as dry as possible and remove it with a vacuum cleaner.

If your airplane is equipped with leather seating, cleaning of the seats is accomplished using a soft cloth or sponge dipped in mild soap suds. The soap suds, used sparingly, will remove traces of dirt and grease. The soap should be removed with a clean damp cloth.

The plastic trim, headliner, instrument panel and control knobs need only be wiped off with a damp cloth. Oil and grease on the control wheel and control knobs can be removed with a cloth moistened with Stoddard solvent. Volatile solvents, such as mentioned in paragraphs on care of the windshield, must never be used since they soften and craze the plastic.

Radio and autopilot faceplates are finished with a suede coating which produces a soft, rich appearance and warm feel comparable to suede. Unlike suede leather, dust and dirt marks can be removed easily with a damp sponge. Remove non-greasy stains with a liquid cleaner such as "Mr. Clean", "Handy Andy", "Lestoil", "Liquid Ajax", or "Cinch". Greasy stains can be removed with a naphtha-dampened sponge, scrub brush or lint-free cloth.

FLYABLE STORAGE.

Aircraft placed in non-operational storage for a maximum of 30 days

or those which receive only intermittent operational use for the first 25 hours are considered in flyable storage status. Every seventh day during these periods, the propeller should be rotated by hand through five revolutions. This action "limbers" the oil and prevents any accumulation of corrosion on engine cylinder walls.

IMPORTANT

For maximum safety, check that the ignition switch is OFF, the throttle is closed and the mixture control is in the idle cut-off position before rotating the propeller by hand. Do not stand within the arc of the propeller blades while turning the propeller.

After 30 days, the aircraft should be flown for 30 minutes or a ground runup should be made just long enough to produce an oil temperature within the lower green arc range. Excessive ground runup should be avoided.

Engine runup also helps to eliminate excessive accumulations of water in the fuel system and other air spaces in the engine. Keep fuel tanks full to minimize condensation in the tanks. Keep the battery fully charged to prevent the electrolyte from freezing in cold weather. If the aircraft is to be stored temporarily, or indefinitely, refer to the Service Manual for proper storage procedures.

INSPECTION SERVICE AND INSPECTION PERIODS.

With your airplane you will receive an Owner's Service Policy. Coupons attached to the policy entitle you to an initial inspection and the first 100-hour inspection at no charge. If you take delivery from your Dealer, he will perform the initial inspection before delivery of the airplane to you. If you pick up the airplane at the factory, plan to take it to your Dealer reasonably soon after you take delivery on it. This will permit him to check it over and to make any minor adjustments that may appear necessary. Also, plan an inspection by your Dealer at 100 hours or 180 days, whichever comes first. This inspection also is performed by your Dealer for you at no charge. While these important inspections will be performed for you by any Cessna Dealer, in most cases you will prefer to have the Dealer from whom you purchased the airplane accomplish this work.

Federal Aviation Regulations require that all airplanes have a periodic (annual) inspection as prescribed by the administrator, and performed by a person designated by the administrator. In addition, 100-

hour periodic inspections made by an "appropriately-rated mechanic" are required if the airplane is flown for hire. The Cessna Aircraft Company recommends the 100-hour periodic inspection for your airplane. The procedure for this 100-hour inspection has been carefully worked out by the factory and is followed by the Cessna Dealer Organization. The complete familiarity of the Cessna Dealer Organization with Cessna equipment and with factory-approved procedures provides the highest type of service possible at lower cost.

AIRCRAFT FILE.

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

A. To be displayed in the aircraft at all times:

(1) Aircraft Airworthiness Certificate (FAA Form 8100-2).
(2) Aircraft Registration Certificate (FAA Form 8050-3).
(3) Aircraft Radio Station License, if transmitter installed (FCC Form 556).

B. To be carried in the aircraft at all times:

(1) Weight and Balance, and associated papers (latest copy of the Repair and Alteration Form, FAA Form 337, if applicable).
(2) Aircraft Equipment List.

C. To be made available upon request:

(1) Aircraft Log Book.
(2) Engine Log Book.

NOTE

Cessna recommends that these items, plus the Owner's Manual, "Cessna Flight Guide" (Flight Computer), and Service Policies, be carried in the aircraft at all times.

Most of the items listed are required by the United States Federal Aviation Regulations. Since the regulations of other nations may require other documents and data, owners of exported aircraft should check with their own aviation officials to determine their individual requirements.

MAA PLATE/FINISH AND TRIM PLATE.

Information concerning the Type Certificate Number (TC), Production Certificate Number (PC), Model Number and Serial Number of your particular aircraft can be found on the MAA (Manufacturers Aircraft Association) plate located on the upper part of the left forward doorpost.

A Finish and Trim plate contains a code describing the interior color scheme and exterior paint combination of the aircraft. The code may be used in conjunction with an applicable Parts Catalog if finish and trim information is needed. This plate is located above the MAA plate on the left forward doorpost.

LUBRICATION AND SERVICING PROCEDURES

Specific servicing information is provided here for items requiring daily attention. A Servicing Intervals Check List is included to inform the pilot when to have other items checked and serviced.

DAILY

FUEL BAY FILLERS:
Service after each flight with 100/130 grade fuel. Fill each bay to top of filler for a total capacity of 25.5 gallons. A 22 gallon marker, in the form of a series of small holes inside the filler neck, is provided to facilitate fueling to reduced fuel loads.

FUEL RESERVOIR DRAIN:
Before the first flight of the day and after each refueling, pull out fuel reservoir drain knob (under pilot's seat) for about four seconds, to clear fuel reservoir of possible water and sediment. Release drain knob, then check that reservoir drain is closed after draining. If water is observed, there is a possibility that the fuel bay sumps contain water. Thus, the fuel bay sump drain plugs and fuel vent line plugs (located in the wing roots just outboard of the cabin doors) should be removed to check for presence of water.

LUBRICATION AND SERVICING PROCEDURES

DAILY (Continued)

OIL DIPSTICK:

Check oil level before each flight. Do not operate on less than 6 quarts. To minimize loss of oil through breather, fill to 7 quart level for normal flights of less than 3 hours. For extended flight, fill to 8 quarts. If an optional oil filter is installed, one additional quart is required when the filter element is changed.

OIL FILLER:

When preflight check shows low oil level, service with aviation grade engine oil; SAE 50 above 60°F, SAE 10W30 or SAE 30 at temperatures from 0° to 70°F, and SAE 10W30 or SAE 20 at temperatures below 10°F. (Multi-viscosity oil with a range of SAE 10W30 is recommended for improved starting and lubrication during warm-up in cold weather.) Detergent or dispersant oil, conforming to Specification No. MIL-L-22851, must be used. Your Cessna Dealer can supply approved brands of oil.

NOTE

Your Cessna was delivered from the factory with a corrosion preventive aircraft engine oil. If oil must be added during the first 25 hours, use only aviation grade straight mineral oil (non-detergent) conforming to Specification No. MIL-L-6082.

SERVICING INTERVALS CHECK LIST

FIRST 25 HOURS

ENGINE OIL SUMP, OIL COOLER AND OIL FILTER -- After first 25 hours of operation, drain engine oil sump and oil cooler and clean both the oil suction strainer and oil pressure screen. If an optional oil filter is installed, change filter element at this time. Refill sump with straight mineral oil (non-detergent) and use until a total of 50 hours have accumulated or oil consumption has stabilized, then change to detergent oil.

EACH 50 HOURS

BATTERY -- Check and service. Check more often (at least every 30 days) if operating in hot weather.
ENGINE OIL SUMP, OIL COOLER AND OIL FILTER -- On airplanes not equipped with an optional oil filter, drain the engine oil sump and oil cooler and clean both the oil suction strainer and oil pressure screen. On airplanes which have an optional oil filter, the oil change interval may be extended to 100-hour intervals providing the oil filter element is changed at 50-hour intervals. Change engine oil at least every four months even though less than 50 hours have accumulated. Reduce intervals for prolonged operation in dusty areas, cold climates, or when short flights and long idle periods result in sludging conditions.
INDUCTION AIR FILTER -- Clean or replace. Under extremely dusty conditions, daily maintenance of the filter is recommended.
NOSE GEAR TORQUE LINKS -- Lubricate. When operating under dusty conditions, more frequent lubrication is recommended.

EACH 100 HOURS

SPARK PLUGS -- Clean, test and regap.
BRAKE MASTER CYLINDERS -- Check and fill.
SHIMMY DAMPENER -- Check and fill.
FUEL STRAINER -- Disassemble and clean.
FUEL BAY SUMP DRAINS -- Drain water and sediment.
FUEL VENT LINE DRAIN PLUGS -- Drain water and sediment.
AUXILIARY FUEL PUMP FILTER -- Remove and clean.
MAIN GEAR BEVEL/SECTOR GEARS -- Inspect and lubricate.

SERVICING INTERVALS CHECK LIST

EACH 100 HOURS (Continued)

SUCTION RELIEF VALVE INLET FILTER (OPT.) -- Clean. Replace at engine overhaul period.
ALTERNATE STATIC SOURCE DRAIN -- Remove cap and drain condensate.
NOSE GEAR PIVOT POINTS -- Lubricate.

EACH 500 HOURS

VACUUM SYSTEM AIR FILTER (OPT.) -- Replace filter element. Replace sooner if suction gage reading drops to 4.6 in. Hg.
WHEEL BEARINGS -- Lubricate at first 100 hours and at 500 hours thereafter. Reduce lubrication interval to 100 hours when operating in dusty or sea coast areas, during periods of extensive taxiing, or when numerous take-offs and landings are made.
MAIN LANDING GEAR PIVOT SHAFT BEARINGS -- Lubricate.
RESTRICTOR VALVE AND SCREEN INSERTS -- Remove and clean in accordance with Service Manual instructions.

AS REQUIRED

NOSE GEAR SHOCK STRUT -- Fill with hydraulic fluid and inflate with air to 38 psi.
FUEL SUMPS AND VENT LINE DRAIN PLUGS -- After prolonged outdoor storage, remove fuel bay sump and vent line drain plugs to remove possible accumulations of moisture.
HYDRAULIC POWER PACK FLUID LEVEL -- Remove vent screw from power pack, clean screen, and check fluid level. Service with MIL-H-5606 hydraulic fluid in accordance with Service Manual instructions.

ADDITIONAL SERVICE AND TEST REGULATIONS

Servicing Intervals of items in the preceding check list are recommended by The Cessna Aircraft Company. Government regulations may require that additional items be inspected, serviced or tested at specific intervals for various types of flight operations. For these regulations, owners should check with aviation officials in the country where the aircraft is being operated.

OWNER FOLLOW-UP SYSTEM

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

PUBLICATIONS

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

- OWNER'S MANUALS FOR YOUR
  AIRCRAFT
  ELECTRONICS AND AUTOPILOT
- CESSNA FLIGHT GUIDE (FLIGHT COMPUTER)
- SALES AND SERVICE DEALER DIRECTORY

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

- SERVICE MANUALS AND PARTS CATALOGS FOR YOUR
  AIRCRAFT
  ENGINE AND ACCESSORIES
  ELECTRONICS AND AUTOPILOT

Your Cessna Dealer has a current catalog of all available Customer Services Supplies, many of which he keeps on hand. If supplies are not in stock, your Cessna Dealer will be happy to order for you.

Section VI

OPERATIONAL DATA

The operational data charts on the following pages are presented for two purposes; first, so that you may know what to expect from your airplane under various conditions, and second, to enable you to plan your flights in detail and with reasonable accuracy.

The data in the charts has been compiled from actual flight tests with the airplane and engine in good condition and using average piloting techniques. Note also that the range charts make no allowances for wind, navigational errors, warm-up, take-off, climb, etc. You must estimate these variables for yourself and make allowances accordingly. Other indeterminate variables such as mixture leaning techniques, fuel metering characteristics, engine and propeller condition, and air turbulence may account for variations of 10% or more in maximum range. Speeds shown in the Cruise Performance charts reflect performance in the standard configuration. Speeds may be 2 to 3 MPH slower with optional radio antennas installed.

Remember that the charts contained herein are based on standard day conditions. In the case of take-off and climb performance, correction factors are included in the footnotes in these charts to show the effect of temperatures hotter than standard. These factors are based on moderate humidity conditions. Under extremely high humidity conditions, these correction factors may be twice as great as those shown. For more precise power, fuel consumption, and endurance information, consult the Cessna Flight Guide (power computer) supplied with your aircraft. With the Flight Guide, you can easily take into account temperature variations from standard at any flight altitude.

AIRSPEED CORRECTION TABLE

FLAPS UP												
IAS-MPH	60	70	80	90	100	110	120	130	140	150	160	170
CAS-MPH	61	71	81	91	100	109	118	127	136	146	156	165
FLAPS 10°												
IAS-MPH	60	70	80	90	100	110	120	130	140	150	---	---
CAS-MPH	62	72	83	93	102	111	120	129	138	147	---	---
FLAPS 30°												
IAS-MPH	50	60	70	80	90	100	110	---	---	---	---	---
CAS-MPH	53	63	73	82	91	100	109	---	---	---	---	---

Figure 6-1.

STALL SPEEDS - MPH CAS

GROSS WEIGHT 2800 LBS / CONDITION	ANGLE OF BANK 0°	20°	40°	60°
FLAPS UP	66	68	75	93
FLAPS 10°	61	63	70	86
FLAPS 30°	57	59	65	81
POWER OFF - GEAR UP OR DOWN - AFT CG				

Figure 6-2.

TAKE-OFF DATA

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

GROSS WEIGHT POUNDS	IAS AT 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
2800	71	0	890	1585	1070	1885	1305	2310	1590	2900
		10	635	1215	775	1460	955	1810	1175	2295
		20	420	890	520	1080	655	1360	825	1755
2400	66	0	620	1180	745	1365	900	1615	1090	1935
		10	430	890	525	1035	640	1240	790	1500
		20	270	635	335	745	425	905	530	1110
2000	60	0	410	875	490	980	590	1135	710	1315
		10	275	650	330	735	405	855	495	995
		20	160	450	200	515	255	605	315	715

NOTES:
1. Increase distance 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 8% of the "total to clear 50 ft. obstacle" figure.
3. Landing gear extended until take-off obstacle is cleared.

MAXIMUM RATE-OF-CLIMB DATA

GROSS WEIGHT POUNDS	AT SEA LEVEL & 59°F IAS MPH	AT SEA LEVEL & 59°F RATE OF CLIMB FT/MIN	AT SEA LEVEL & 59°F GAL. OF FUEL USED	AT 5000 FT. & 41°F IAS MPH	AT 5000 FT. & 41°F RATE OF CLIMB FT/MIN	AT 5000 FT. & 41°F FROM S.L. FUEL USED	AT 10,000 FT. & 23°F IAS MPH	AT 10,000 FT. & 23°F RATE OF CLIMB FT/MIN	AT 10,000 FT. & 23°F FROM S.L. FUEL USED	AT 15,000 FT. & 5°F IAS MPH	AT 15,000 FT. & 5°F RATE OF CLIMB FT/MIN	AT 15,000 FT. & 5°F FROM S.L. FUEL USED
2800	95	925	1.5	93	685	3.1	91	440	5.1	89	200	7.7
2400	93	1170	1.5	91	895	2.8	89	620	4.2	87	350	5.9
2000	90	1490	1.5	89	1175	2.5	87	850	3.6	85	540	4.7

NOTES:
1. Full throttle, 2700 RPM, flaps and gear up, and mixture at recommended leaning schedule.
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

NORMAL LEAN MIXTURE

Standard Conditions — Zero Wind — Gross Weight- 2800 Pounds

2500 FEET

RPM	MP	%BHP	TAS MPH	GAL/ HOUR	50 GAL (NO RESERVE)	
					ENDR. HOURS	RANGE MILES
2500	25	79	167	11.5	4.3	725
	24	75	163	10.8	4.6	755
	23	71	160	10.2	4.9	780
	22	67	156	9.6	5.2	810
2400	25	75	164	10.8	4.6	755
	24	71	160	10.2	4.9	780
	23	67	156	9.7	5.2	805
	22	63	152	9.1	5.5	830
2300	25	72	160	10.3	4.9	780
	24	68	156	9.7	5.1	805
	23	64	153	9.2	5.4	830
	22	60	149	8.7	5.7	850
2200	25	67	156	9.7	5.2	805
	24	64	152	9.2	5.4	830
	23	60	149	8.7	5.7	850
	22	57	145	8.3	6.0	875
2100	25	64	152	9.2	5.4	830
	24	60	149	8.7	5.7	850
	23	57	145	8.3	6.0	875
	22	54	142	7.9	6.3	900
	21	50	138	7.5	6.7	920
	20	47	134	7.1	7.0	945
	19	44	130	6.8	7.4	960
	18	40	124	6.4	7.8	965
	17	37	117	6.1	8.1	955

Figure 6-4 (Sheet 1 of 5).

CRUISE PERFORMANCE

NORMAL LEAN MIXTURE

Standard Conditions — Zero Wind — Gross Weight- 2800 Pounds

5000 FEET

RPM	MP	%BHP	TAS MPH	GAL/ HOUR	50 GAL (NO RESERVE)	
					ENDR. HOURS	RANGE MILES
2500	24	78	169	11.2	4.5	755
	23	74	165	10.6	4.7	785
	22	70	161	10.0	5.0	810
	21	65	157	9.4	5.3	840
2400	25	78	170	11.3	4.4	750
	24	74	166	10.6	4.7	780
	23	70	162	10.0	5.0	805
	22	66	158	9.5	5.3	835
2300	25	74	166	10.6	4.7	780
	24	70	162	10.0	5.0	805
	23	66	158	9.5	5.3	830
	22	62	154	9.0	5.5	855
2200	25	69	161	10.0	5.0	810
	24	66	158	9.5	5.3	835
	23	62	154	9.0	5.5	855
	22	59	151	8.6	5.8	880
2100	25	66	158	9.5	5.3	835
	24	63	155	9.0	5.5	855
	23	59	151	8.6	5.8	880
	22	56	147	8.1	6.1	905
	21	52	144	7.7	6.5	930
	20	49	140	7.3	6.8	950
	19	45	135	6.9	7.2	970
	18	42	129	6.6	7.6	980
	17	38	122	6.3	8.0	975

Figure 6-4 (Sheet 2 of 5).

CRUISE PERFORMANCE

NORMAL LEAN MIXTURE

Standard Conditions — Zero Wind — Gross Weight- 2800 Pounds

7500 FEET

RPM	MP	%BHP	TAS MPH	GAL/ HOUR	50 GAL (NO RESERVE)	
					ENDR. HOURS	RANGE MILES
2500	22.5	74	169	10.6	4.7	800
	21	68	163	9.7	5.1	840
	20	64	159	9.2	5.5	870
	19	59	155	8.6	5.8	895
2400	22.5	70	166	10.1	5.0	820
	21	64	160	9.2	5.4	865
	20	60	155	8.7	5.7	895
	19	56	151	8.2	6.1	925
2300	22.5	66	162	9.5	5.2	850
	21	61	156	8.8	5.7	890
	20	57	152	8.3	6.0	915
	19	53	148	7.8	6.4	945
2200	22.5	63	158	9.1	5.5	875
	21	57	153	8.4	6.0	910
	20	54	149	7.9	6.3	940
	19	50	145	7.5	6.7	965
2100	22.5	59	155	8.6	5.8	895
	21	54	149	8.0	6.3	935
	20	51	145	7.5	6.6	960
	19	47	140	7.2	7.0	980
	18	44	135	6.8	7.4	995
	17	40	127	6.4	7.8	990

Figure 6-4 (Sheet 3 of 5).

CRUISE PERFORMANCE

NORMAL LEAN MIXTURE

Standard Conditions — Zero Wind — Gross Weight- 2800 Pounds

10,000 FEET

RPM	MP	%BHP	TAS MPH	GAL/ HOUR	50 GAL (NO RESERVE)	
					ENDR. HOURS	RANGE MILES
2500	20	66	165	9.5	5.3	870
	19	62	161	8.9	5.6	900
	18	57	156	8.4	6.0	935
	17	53	151	7.8	6.4	970
2400	20	62	161	9.0	5.6	900
	19	58	157	8.4	5.9	930
	18	54	152	7.9	6.3	960
	17	50	147	7.4	6.7	985
2300	20	59	158	8.5	5.9	925
	19	55	153	8.0	6.2	955
	18	51	148	7.6	6.6	980
	17	47	143	7.2	7.0	1000
2200	20	56	155	8.2	6.1	945
	19	52	150	7.7	6.5	975
	18	49	145	7.3	6.8	990
	17	45	139	6.9	7.2	1005
2100	20	52	151	7.7	6.5	970
	19	49	146	7.4	6.8	990
	18	45	140	7.0	7.2	1005
	17	42	133	6.6	7.6	1005
	16	38	123	6.3	8.0	980

Figure 6-4 (Sheet 4 of 5).

CRUISE PERFORMANCE

NORMAL LEAN MIXTURE

Standard Conditions — Zero Wind — Gross Weight- 2800 Pounds

12,500 FEET

RPM	MP	%BHP	TAS MPH	GAL/ HOUR	50 GAL (NO RESERVE)	
					ENDR. HOURS	RANGE MILES
2500	18 17 16 15	60 55 51 46	162 157 151 143	8.6 8.1 7.6 7.0	5.8 6.2 6.6 7.1	940 975 1000 1020
2400	18 17 16 15	56 52 47 43	158 153 146 137	8.2 7.7 7.2 6.7	6.1 6.5 7.0 7.4	970 995 1015 1020
2300	18 17 16	53 49 45	154 149 141	7.8 7.4 6.9	6.4 6.8 7.2	990 1010 1020
2200	18 17 16	50 47 43	151 145 136	7.5 7.1 6.7	6.6 7.0 7.4	1000 1015 1020
2100	18 17 16	47 43 40	145 138 128	7.2 6.8 6.4	7.0 7.4 7.8	1015 1020 995

Figure 6-4 (Sheet 5 of 5).

LANDING DISTANCE TABLE

LANDING DISTANCE WITH FLAPS 30°, POWER OFF, AND NO WIND ON HARD SURFACE RUNWAY

GROSS WEIGHT POUNDS	IAS AT 50' MPH	AT SEA LEVEL & 59°F		AT 2500 FT. & 50°F		AT 5000 FT. & 41°F		AT 7500 FT. & 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.
2800	72	730	1350	775	1430	820	1515	865	1605

NOTES:
1. Reduce landing distance 10% for each 4 knots of headwind.
2. 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.

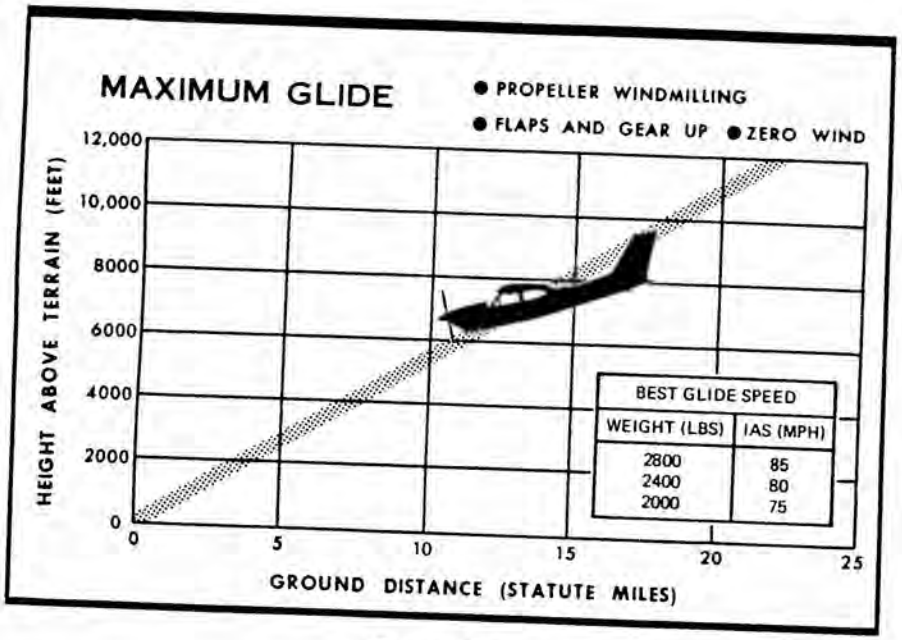


Figure 6-6.

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 airplane. Contact your Cessna Dealer for a complete list of available optional equipment.

COLD WEATHER EQUIPMENT

WINTERIZATION KIT.

For continuous operation in temperatures consistently below 20°F, the Cessna winterization kit should be installed to improve engine operation. The kit consists of two baffles to cover the side inlets of the cowling nose cap, and insulation for the crankcase breather line. Once installed, the crankcase breather insulation is approved for permanent use in both cold and hot 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 airplane electrical system (with the exception of electronic equipment). The receptacle is located under a cover plate, aft of the baggage door on the left side of the tailcone.

NOTE

Electrical power for the airplane 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 airplane. If the plug is accidently connected backwards, no power will flow to the airplane's 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 the master switch "ON" will close the battery contactor.

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. The operation of this switching system is described below.

TRANSMITTER SELECTOR SWITCH.

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

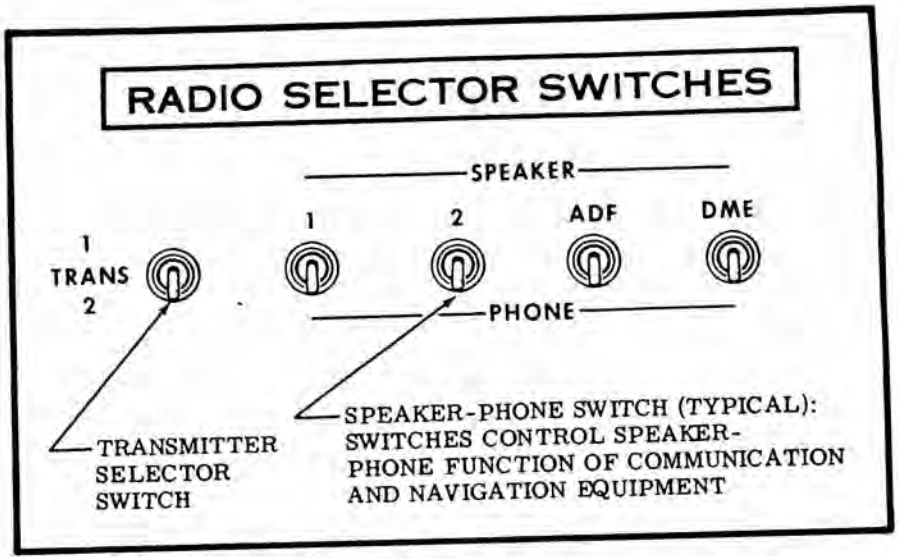


Figure 7-1.

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 is placed in the No. 1 or No. 2 position, 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, place the transmitter selector switch in the other transceiver position. Since an audio amplifier is not utilized for headphones, a malfunctioning amplifier will not affect headphone operation.

SPEAKER-PHONE SWITCHES.

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

AUTOPILOT-OMNI SWITCH.

When a Nav-O-Matic autopilot is installed with two compatible omni receivers, an autopilot-omni switch is utilized. This switch selects the omni receiver to be used for the omni course sensing function of the autopilot. The switch is mounted just to the left of the autopilot control unit located at the bottom of the radio stack in the center of the instrument panel. The switch positions, labeled "OMNI 1" and "OMNI 2", correspond to the omni receivers in the radio panel stack.

BOOM MICROPHONE

A boom microphone may be mounted near the upper left corner of the windshield. Use of the boom microphone allows radio communication without the necessity of releasing any controls to handle the normal hand microphone. The microphone keying switch is a push button located on the left side of the pilot's control wheel.

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, stabilator, 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.

WING LEVELER

A wing leveler may be installed to augment the lateral and directional stability of the airplane. The system uses the Turn Coordinator for roll and yaw sensing. Vacuum pressure, from the engine-driven vacuum pump, is routed from the Turn Coordinator to cylinder-piston servo units attached to the aileron and rudder control systems. As the airplane deviates from a wing level attitude or a given direction, vacuum pressure in the servo units is increased or relieved as needed to actuate the ailerons and rudder to oppose the deviations. The rudder action effectively corrects adverse yaw induced by the ailerons.

A separately mounted push-pull control knob, labeled "WING LVLR," is provided on the left side of the instrument panel to turn the system on and off. A "ROLL TRIM" control knob on the Turn Coordinator is used for manual roll trim control to compensate for asymmetrical loading of fuel and passengers, and to optimize system performance in climb, cruise and let-down.

OPERATING CHECK LIST

TAKE-OFF.

(1) "WING LVLR" Control Knob -- Check in off position (full in).

CLIMB.

(1) Adjust stabilator and rudder trim for climb.
(2) "WING LVLR" Control Knob -- Pull control knob "ON."
(3) "ROLL TRIM" Control Knob -- Adjust for wings level attitude.

CRUISE.

(1) Adjust power, stabilator and rudder trim for level flight.
(2) "ROLL TRIM" Control Knob -- Adjust as desired.

DESCENT.

(1) Adjust power, stabilator and rudder trim for desired speed and rate of descent.
(2) "ROLL TRIM" Control Knob -- Adjust as desired.

LANDING.

(1) Before landing, push "WING LVLR" control knob full in to the off position.

EMERGENCY PROCEDURES

If a malfunction should occur, the system is easily overpowered with pressure on the control wheel. The system should then be turned off. In the event of partial or complete vacuum failure, the wing leveler will automatically become inoperative. However, the Turn Coordinator used with the wing leveler system will not be affected by loss of vacuum since it is designed with a "back-up" system enabling it to operate from either vacuum or electrical power in the event of failure of one of these sources.

OPERATING NOTES

(1) The wing leveler system may be overpowered at any time without damage or wear. However, for extended periods of maneuvering it may be desirable to turn the system off.

(2) It is recommended that the system not be engaged during take-off and landing. Although the system can be easily overpowered, servo forces could significantly alter the manual "feel" of the aileron control, especially should a malfunction occur.

CESSNA ECONOMY MIXTURE INDICATOR

The Cessna Economy Mixture Indicator is an exhaust gas temperature (EGT) sensing device which visually aids the pilot in obtaining either an efficient maximum power mixture or a desired cruise mixture. Exhaust gas temperature varies with cylinder fuel-to-air ratio, power, and RPM.

OPERATING INSTRUCTIONS.

The following chart should be used to establish mixture settings in take-off, climb and cruise.

The climb reference EGT must be known before the EGT indicator can be used for take-off and climb. Determine the reference EGT periodically as follows:

(1) Establish 75% power in level flight at 2500 RPM and part throttle.

FLIGHT CONDITION	POWER SETTING	EGT	REMARKS
TAKE-OFF AND CLIMB	Full throttle and 2700 RPM	150°F richer than REFERENCE EGT	Use FULL RICH mixture below 3000'. Use BEST POWER mixture above 10,000'.
NORMAL CLIMB	Greater than 75%	125°F richer than REFERENCE EGT	Use FULL RICH mixture below 3000'. Use BEST POWER mixture above 10,000'.
	75% or less	Peak minus 100°F (ENRICHEN)	BEST POWER mixture.
NORMAL CRUISE	75% or less	Peak minus 25°F (ENRICHEN)	NORMAL LEAN mixture-Owner's Manual and Power Computer performance.

(2) Carefully lean to peak EGT. This is the climb reference EGT.

NOTE

Operation at peak EGT is not authorized for continuous operation, except to establish peak EGT for reference at 75% power or less. Operation on the lean side of peak EGT or within 25° of peak EGT is not approved.

The yellow index pointer may be set at the reference point, or to a specific point to lean to. It can be positioned manually by turning the screw adjustment on the face of the instrument.

For maximum performance take-off, mixture may be set during static full power runup, if feasible, or during the ground roll.

NOTE

Enrichen mixture during climb if excessive cylinder head temperatures occur.

When leaning the mixture under some cruise conditions, engine roughness may occur before peak EGT is reached. In this case, use the EGT corresponding to the onset of roughness as the reference point instead of peak EGT.

Changes in altitude or power setting require the EGT to be rechecked. Mixture may be controlled in cruise descent by simply enriching to avoid engine roughness. During prolonged descents, maintain sufficient power to keep the EGT needle on scale. In idle descents or landing approaches, use full rich mixture. For idle descents or landing approaches at high elevations, the mixture control may be set in a position to permit smooth engine acceleration to maximum power.

TRUE AIRSPEED INDICATOR

A true airspeed indicator is available to replace the standard airspeed indicator in your airplane. 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.

FUEL BAY QUICK-DRAIN VALVE KIT

Two fuel bay quick-drain valves and a fuel sampler cup are available as a kit to facilitate daily draining and inspection of fuel in the fuel bays for the presence of water and sediment. The valves replace existing fuel bay drain plugs located at the lower inboard area of the wing. The fuel sampler cup, which may be stowed in the map compartment, is used to drain the valves. The sampler cup has a probe in the center of the cup. When the probe is inserted into the hole in the bottom of the drain valve and pushed upward, fuel flows into the cup to facilitate visual inspection of the fuel. As the cup is removed, the drain valve seats, stopping the flow of fuel.

OIL QUICK-DRAIN VALVE

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

SERVICING REQUIREMENTS

UEL:

AVIATION GRADE -- 100/130 Grade
TOTAL CAPACITY EACH BAY -- 25.5 Gal. (25.0 Gal. usable)
REDUCED CAPACITY EACH BAY (INDICATED BY SMALL HOLES INSIDE FILLER NECK) -- 22.0 Gal. (21.5 Gal. usable).

ENGINE OIL:

AVIATION GRADE -- SAE 50 Above 60°F
SAE 10W30 or SAE 30 Between 0° and 70°F
SAE 10W30 or SAE 20 Below 10°F
(Multi-viscosity oil with range of SAE 10W30 is recommended for improved starting and lubrication during warm-up in cold weather. Detergent or dispersant oil, conforming to Specification No. MIL-L-22851, must be used.)
CAPACITY OF ENGINE SUMP -- 8 Quarts
(Do not operate on less than 6 quarts. To minimize loss of oil through breather, fill to 7 quart level for normal flights of less than 3 hours. For extended flight, fill to 8 quarts. If an optional oil filter is installed, one additional quart is required when the filter element is changed.)

HYDRAULIC FLUID:

MIL-H-5606 Hydraulic Fluid

IRE PRESSURES:

OSE WHEEL -- 31 PSI on 5.00-5, 4-Ply Rated Tire
AIN WHEELS -- 68 PSI on 15 x 6.00-6, 6-Ply Rated Tires

NOSE GEAR SHOCK STRUT:

Keep filled with hydraulic fluid and inflated with air to 38 PSI.

Revision No.	Description	Affected Pages	Approval
Original	Complete Flight Manual Supplement for EGT-701	1 thru 4	Mgr. Flt. Test Br. ANM-160L FAA, LA ACO Transport Airplane Directorate Date 11-12-92
A	Added Fuel Flow features & Switch	2 thru 4	Mgr. Flt. Test Br. ANM-160L FAA, LA ACO Transport Airplane Directorate Date 12-13-96
B	Added RPM and Manifold Pressure features	2 thru 4	Mgr. Flt. Test Br. ANM-160L FAA, LA ACO Transport Airplane Directorate Date 6-17-99

J.P.INSTRUMENTS
PO BOX 7033
HUNTINGTON BEACH CA 92646

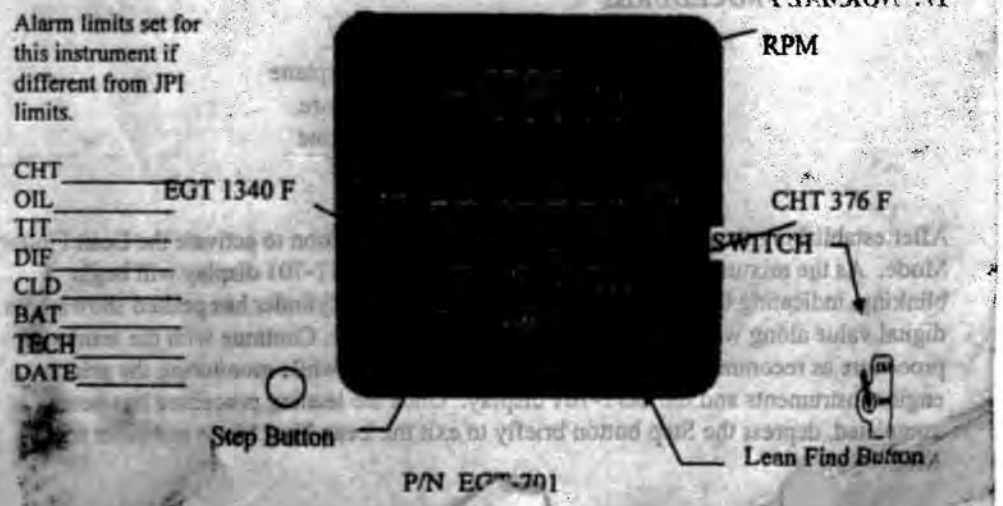
Airplane/Rotorcraft Flight Manual
Supplement No. 1
EGT-701 Rev B

1-GENERAL

The EGT-701 temperature indicator displays temperature digitally and in analog format. The EGT as displayed is based on probes located near the exhaust outlet for each cylinder and the TIT probe, if installed, is adjacent to the turbo charger. These probes are not necessarily collocated with the primary probes therefore, EGT-701 may not indicate the same as the aircraft primary instruments. The analog display is an electronic bar graph (vertical columns, one per cylinder) of EGT & TIT temperatures presented as a percentage of 1650°F. Below the vertical columns the specific value for EGT and CHT are displayed digitally. The dot over the column indicates which cylinder's digital information is presently displayed. The missing bars at the base of the columns indicates the hottest and coldest Cylinder Head temperature trend. During Lean Find mode the leanest cylinder is displayed along with the fuel flow (optional) at that time. Depressing the LF and STEP button simultaneously brings up the adjustable scan rate function, OAT in °C or °F. Depress the LF button will change the value of the rate or OAT in °C or °F. Exit by Depressing STEP.

If the EGT-701 buttons are not depressed for 10 minutes the system will start scanning automatically. Depressing the STEP button will stop the automatic scan and index through all the functions available. During constant power cruise, if the the LF button is depressed for five seconds the bargraph will level at mid scale. The leveled bars represent the peaks of each cylinder. Each bar represents 10 °F and now acts as an EGT & TIT trend monitor, quickly showing an increase or decrease in temperature. Depress again to return to normal; nothing else is affected. With the fuel flow option there is a three position toggle switch. The positions are: 1) EGT, digital and bargraph display of temperatures, 2) FF, digital display of GPH, REM and USED Fuel. Temperature bargraph remains. 3) Both, cycles through everything installed. The data port output, sends RS232 serial data every 6-sec.

Options of Fuel Flow, TIT, OAT, IAT (induction air temp.), OIL, BAT (voltage) and are only displayed digitally with headlines after the number, as "230 OIL" or "14 GPH". A large value (50 +) of "CLD" indicates shock cooling usually associated with rapid descents at low power. Optional functions not installed will not display. RPM is displayed constantly in the upper display with no alarms. MAP is shown in the scan display.



GENERAL (cont.)

An alarm causes the digital function to flash as soon as the particular limit is exceeded. Factory set alarm limits for CHT (450°F) and OIL (230°F) are lower than the actual aircraft limits and can not be set by the pilot. The values may be adjusted to suit individual preference by a qualified technician. Other factory set alarm limits are: "BAT" Voltage 15.5/11.0 or 31.0/22.0 Hi/Lo as appropriate; "DIF" (differential Hi/Lo EGT) 500°F, "TIT" 1650°F Hi; "OIL" Lo 90°F; "CLD" (Rate of change of cylinder head temperature in degrees per minute) -60 degrees/minute. The pilot should be aware of the setting of each alarm for his particular aircraft. An alarm is "Canceled" by holding the step button in for 5 seconds and seeing the word "OFF". Then, only that particular alarm is canceled. Canceled alarms will not appear again until the power has been removed and reapplied to the EGT-701. The entire display dims automatically depending on the ambient lighting.

The Cylinder Head with the Gasket probe and oil temperature will indicate generally higher temperatures than instruments provided by the aircraft manufacturer because the EGT-701 sensing thermocouples are not collocated with the primary instrument sensing probes. Therefore, airplane flight manual limitations based on primary instrument indication take precedence over those of the EGT-701

II OPERATING LIMITATIONS

A. The EGT-701 may not replace any existing instrument or indicator required by the aircraft type design or operating limits.

B. The EGT-701 display may not be used in lieu of, or to supersede, engine operating limitations established by the airframe or engine manufacturer during certification.

III. EMERGENCY PROCEDURES

No change

IV. NORMAL PROCEDURES

CAUTION

Comply with manufacturer's Airplane Flight Manual leaning procedure. Do not exceed applicable engine or aircraft limitations.

After establishing desired cruise power depress the LF button to activate the Lean Find Mode. As the mixture is leaned, one column on the EGT-701 display will begin blinking, indicating the exhaust gas temperature for that cylinder has peaked showing its digital value along with the fuel flow (option) at that time. Continue with the leaning procedure as recommended by the aircraft manufacturer while monitoring the primary engine instruments and the EGT-701 display. Once the leaning procedure has been completed, depress the Step button briefly to exit the Lean Find Mode and enter the Monitor Mode.

J.P.INSTRUMENTS
PO BOX 7033
HUNTINGTON BEACH CA 92646

FAA APPROVED
AIRPLANE/ROTORCRAFT FLIGHT MANUAL SUPPLEMENT OR SUPPLEMENTAL AIRPLANE FLIGHT MANUAL (INCLUDING POH AND FAA AF (FOR THOSE AIRCRAFT WITHOUT A BASIC AIRPLANE FLIGHT MANUAL)

EGT-701 TEMPERATURE INDICATOR FOR

Single and Twin Reciprocating Engine Powered Aircraft as listed on Master Eligibility List of

STC SA2586NM.

REG. NO._____

SER. NO. _____

This Supplement must be attached to the FAA Approved Airplane/Rotorcraft Flight Manual when the J.P. Instruments EGT-701 is installed in accordance with Supplemental Type Certific SA 2586NM. For those airplanes without a basic Airplane Flight Manual, the Supplemental Al must be in the aircraft when the EGT-701 is installed.

The information contained in this Airplane/Rotorcraft Flight Manual Supplement/ Supplemental Aircraft Flight Manual supplements or supersedes the basic manual/ placards only in those areas listed. For limitations, procedures and performance information not containe in this supplement, consult the basic Airplane Flight manual, Markings and Placards.

FAA APPROVED:

Donald A. Armstrong

Manager, Flight Test Branch, ANM-160L
Federal Aviation Administration
Los Angeles Aircraft Certification Office
Transport Airplane Certification Directorate

Date: Nov. 12, 1992