



# *Section I*

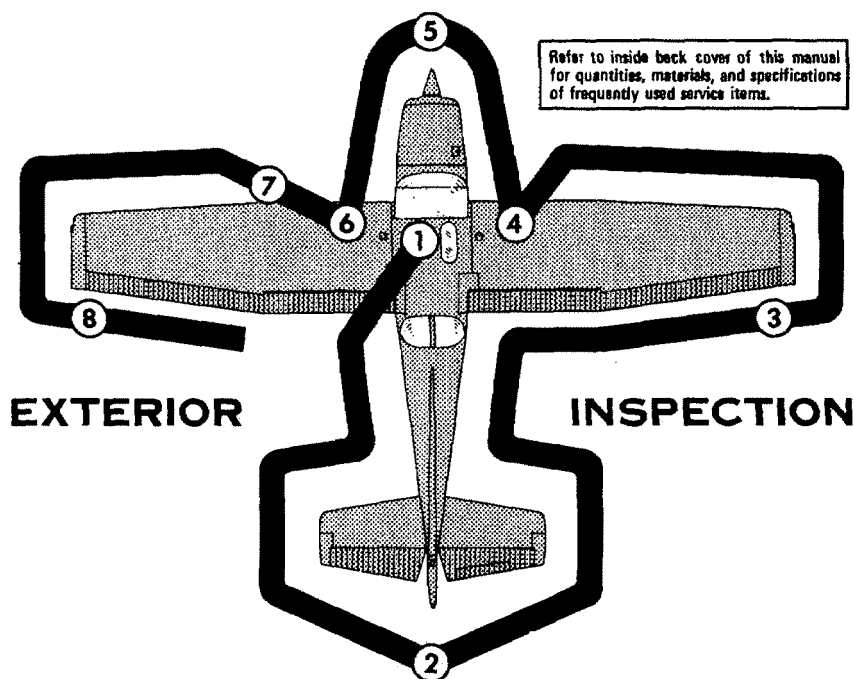
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## OPERATING CHECKLIST

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

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

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



### Note

Visually check aircraft for general condition during walk-around inspection. In cold weather, remove even small accumulations of frost, ice or snow from wing, tail and control surfaces. Also, make sure that control surfaces contain no internal accumulations of ice or debris. If night flight is planned, check operation of all lights, and make sure a flashlight is available.

- ①
  - a. Remove control wheel lock.
  - b. Check ignition switch OFF.
  - c. Turn on master switch and check fuel quantity indicators; then turn off master switch.
  - d. Check fuel selector valve handle on BOTH.
  - e. Check baggage door for security. Lock with key if children are to occupy child's seat.

Figure

- 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.
- ④
  - a. Disconnect wing tie-down.
  - b. Check main wheel tire for proper inflation.
  - c. Before first flight of the day and after each refueling, use sampler cup and drain small quantity of fuel from fuel tank sump quick-drain valve to check for water, sediment, and proper fuel grade.
  - d. Visually check fuel quantity; then check fuel filler cap secure.
- ⑤
  - a. Check oil level. Do not operate with less than six quarts. Fill to eight quarts for extended flights.
  - b. Before first flight of the day and after each refueling, pull out strainer drain knob for about four seconds to clear fuel strainer of possible water and sediment. Check strainer drain closed. If water is observed, the fuel system may contain additional water, and further draining of the system at the strainer, fuel tank sumps, and fuel selector valve drain plug will be necessary.
  - c. Check propeller and spinner for nicks and security.
  - d. Check landing light(s) for condition and cleanliness.
  - e. Check carburetor air filter for restrictions by dust or other foreign matter.
  - f. Check nose wheel strut and tire for proper inflation.
  - g. Disconnect tie-down rope.
  - h. Inspect flight instrument static source opening on side of fuselage for stoppage (left side only).
- ⑥
  - a. Check main wheel tire for proper inflation.
  - b. Before first flight of the day and after each refueling, use sampler cup and drain small quantity of fuel from fuel tank sump quick-drain valve to check for water, sediment, and proper fuel grade.
  - c. Visually check fuel quantity, then check fuel filler cap secure.
- ⑦
  - a. Remove pitot tube cover, if installed, and check pitot tube opening for stoppage.
  - b. Check fuel tank vent opening for stoppage.
  - c. Check stall warning vent opening for stoppage.
  - d. Disconnect wing tie-down.
- ⑧
  - a. Check aileron for freedom of movement and security.

## **BEFORE STARTING ENGINE.**

- (1) Exterior Preflight -- COMPLETE.
- (2) Seats, Belts, Shoulder Harnesses -- ADJUST and LOCK.
- (3) Fuel Selector Valve -- BOTH.
- (4) Radios, Autopilot, Electrical Equipment -- OFF.
- (5) Brakes -- TEST and SET.

## **STARTING ENGINE.**

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

## **BEFORE TAKE-OFF.**

- (1) Parking Brake -- SET.
- (2) Cabin Doors and Window -- CLOSED and LOCKED.
- (3) Flight Controls -- FREE and CORRECT.
- (4) Elevator Trim -- TAKE-OFF.
- (5) Fuel Selector Valve -- BOTH.
- (6) Mixture -- RICH (below 3000 ft.).
- (7) Throttle -- 1700 RPM.
  - a. Magnetos -- CHECK (RPM drop should not exceed 125 RPM on either magneto or 50 RPM differential between magnetos).
  - b. Carburetor Heat -- CHECK (for RPM drop).
  - c. Engine Instruments and Ammeter -- CHECK.
  - d. Suction Gage -- CHECK.
- (8) Flight Instruments and Radios -- SET.
- (9) Optional Autopilot -- OFF.
- (10) Throttle Friction Lock -- ADJUST.
- (11) Wing Flaps -- UP.

## **TAKE-OFF.**

### **NORMAL TAKE-OFF.**

- (1) Wing Flaps -- UP.
- (2) Carburetor Heat -- COLD.
- (3) Throttle -- FULL.
- (4) Elevator Control -- LIFT NOSE WHEEL (at 60 MPH).
- (5) Climb Speed -- 75 to 85 MPH.

### **MAXIMUM PERFORMANCE TAKE-OFF.**

- (1) Wing Flaps -- UP.
- (2) Carburetor Heat -- COLD.
- (3) Brakes -- APPLY.
- (4) Throttle -- FULL.
- (5) Brakes -- RELEASE.
- (6) Airplane Attitude -- SLIGHTLY TAIL LOW.
- (7) Climb Speed -- 68 MPH (until all obstacles are cleared).

## **ENROUTE CLIMB.**

- (1) Airspeed -- 80 to 90 MPH.

### **NOTE**

If a maximum performance climb is necessary, use speeds shown in the Maximum Rate-Of-Climb Data chart in Section VI.

- (2) Throttle -- FULL.
- (3) Mixture -- FULL RICH (mixture may be leaned above 3000 feet).

## **CRUISE.**

- (1) Power -- 2200 to 2700 RPM (no more than 75%).
- (2) Elevator Trim -- ADJUST.
- (3) Mixture -- LEAN.

## **LET-DOWN.**

- (1) Mixture -- RICH.
- (2) Power -- AS DESIRED.
- (3) Carburetor Heat -- AS REQUIRED (to prevent carburetor icing).

## **BEFORE LANDING.**

- (1) Fuel Selector Valve -- BOTH.
- (2) Mixture -- RICH.
- (3) Carburetor Heat -- ON (apply full heat before closing throttle).
- (4) Airspeed -- 70 - 80 MPH (flaps UP).
- (5) Wing Flaps -- AS DESIRED.
- (6) Airspeed -- 65 - 75 MPH (flaps DOWN).

## **BALKED LANDING.**

- (1) Throttle -- FULL.
- (2) Carburetor Heat -- COLD.
- (3) Wing Flaps -- 20°.
- (4) Airspeed -- 65 MPH.
- (5) Wing Flaps -- RETRACT (slowly).

## **NORMAL LANDING.**

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

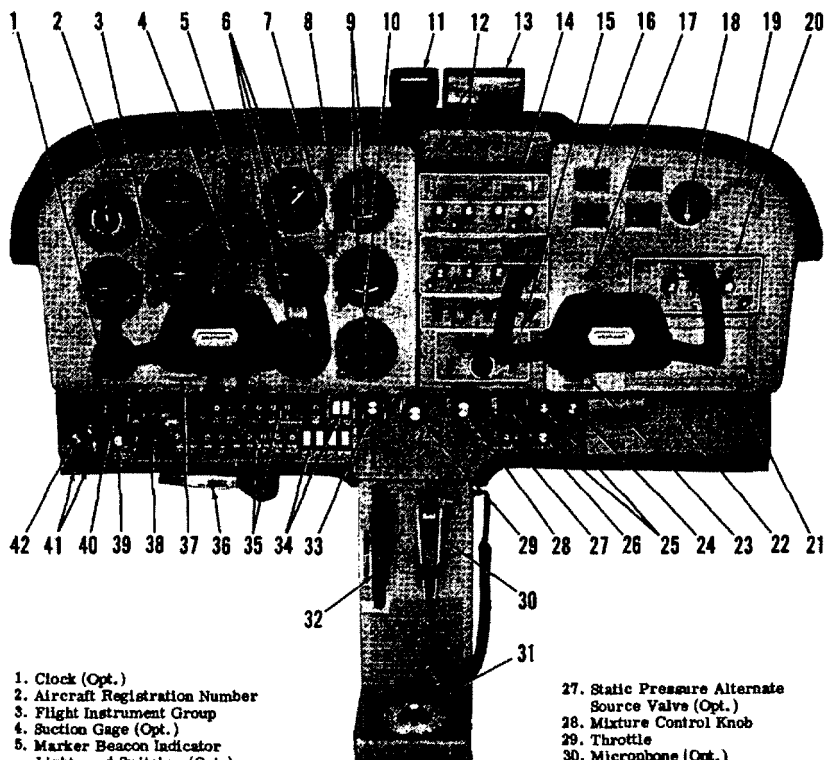
## **AFTER LANDING.**

- (1) Wing Flaps -- UP.
- (2) Carburetor Heat -- COLD.

## **SECURING AIRCRAFT.**

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

# INSTRUMENT PANEL



1. Clock (Opt.)
2. Aircraft Registration Number
3. Flight Instrument Group
4. Suction Gage (Opt.)
5. Marker Beacon Indicator Lights and Switches (Opt.)
6. Altimeter, Vertical Speed Indicator (Opt.) and Tachometer
7. No. 2 LOC Reversed Indicator Light (Opt.)
8. No. 1 LOC Reversed Indicator Light (Opt.)
9. Omni Course Indicators (Opt.)
10. ADF Bearing Indicator (Opt.)
11. Magnetic Compass
12. Radio Selector Switches (Opt.)
13. Rear View Mirror (Opt.)
14. Radios and Transponder (Opt.)
15. Autopilot Control Unit (Opt.)

16. Fuel and Oil Gages
17. Over-Voltage Warning Light
18. Ammeter
19. Optional Instrument Space
20. ADF (Opt.)
21. Optional Radio Space
22. Map Compartment
23. Wing Flap Position Indicator
24. Cigar Lighter
25. Cabin Air/Heat Control Knobs
26. Wing Flap Switch

27. Static Pressure Alternate Source Valve (Opt.)
28. Mixture Control Knob
29. Throttle
30. Microphone (Opt.)
31. Fuel Selector Valve Handle
32. Elevator Trim Control Wheel
33. Carburetor Heat Control Knob
34. Electrical Switches
35. Circuit Breakers
36. Parking Brake Handle
37. Optional Instrument Space
38. Ignition Switch
39. Instrument and Radio Dial Light Rheostats
40. Master Switch
41. Auxiliary Mike and Phone Jacks (Opt.)
42. Primer

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 aircraft. This section also covers in somewhat greater detail some of the items listed in Checklist form in Section I that require further explanation.

### FUEL SYSTEM.

Fuel is supplied to the engine from two tanks, one in each wing. With the fuel selector valve on BOTH, the total usable fuel for all flight conditions is 38 gallons for the standard tanks.

Fuel from each wing tank flows by gravity to a selector valve. Depending upon the setting of the selector valve, fuel from the left, right, or both tanks flows through a fuel strainer and carburetor to the engine induction system.

The fuel selector valve should be in the BOTH position for take-off, climb, landing, and maneuvers that involve prolonged slips or skids. Operation from either LEFT or RIGHT tank is reserved for cruising flight.

#### NOTE

With low fuel (1/8th tank or less), a prolonged steep descent (1500 feet or more) with partial power, full flaps, and 80 MPH or greater should be avoided due to the possibility of the fuel tank outlets being uncovered, causing temporary fuel starvation. If starvation occurs, leveling the nose should restore power within 20 seconds.

#### NOTE

When the fuel selector valve handle is in the BOTH position in cruising flight, unequal fuel flow from each

# FUEL SYSTEM SCHEMATIC

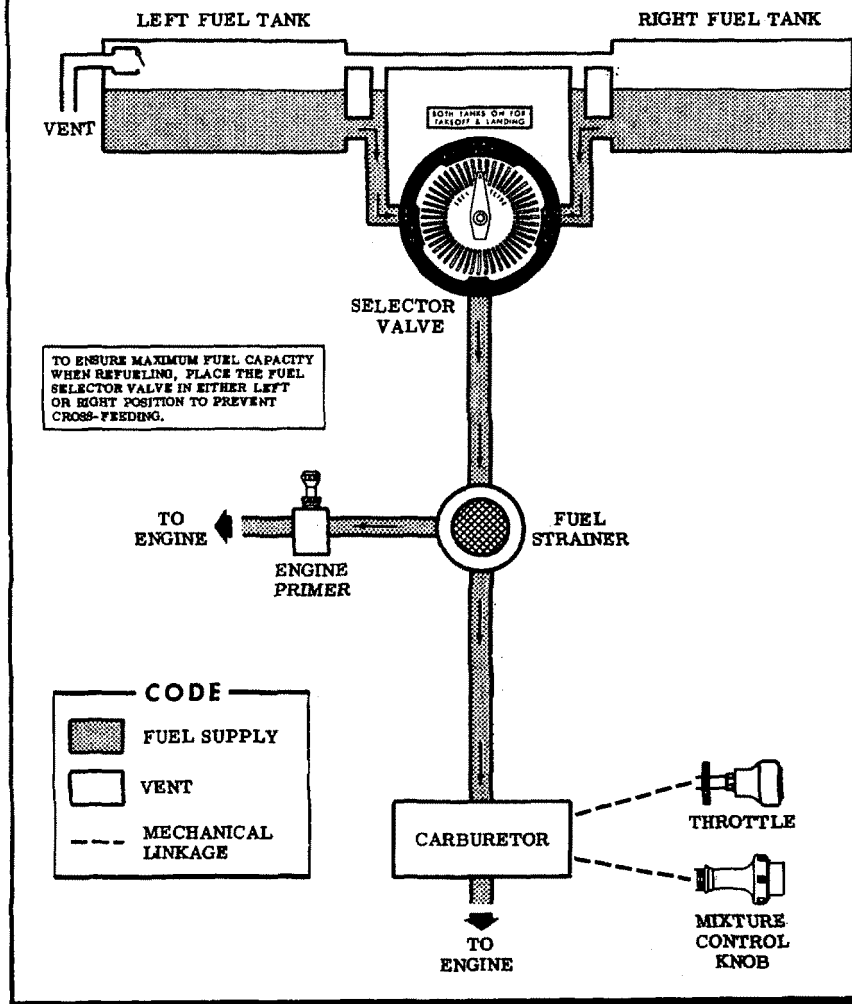


Figure 2-2.

tank may occur if the wings are not maintained exactly level. Resulting wing heaviness can be alleviated gradually by turning the selector valve handle to the tank in the "heavy" wing.

#### **NOTE**

It is not practical to measure the time required to consume all of the fuel in one tank, and, after switching to the opposite tank, expect an equal duration from the remaining fuel. The airspace in both fuel tanks is interconnected by a vent line (figure 2-2) and, therefore, some sloshing of fuel between tanks can be expected when the tanks are nearly full and the wings are not level.

For fuel system servicing information, refer to Servicing Requirements on the inside back cover.

#### **FUEL TANK SUMP QUICK-DRAIN VALVES.**

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

#### **LONG RANGE FUEL TANKS.**

Special wings with long range fuel tanks are available to replace the standard wings and fuel tanks for greater endurance and range. When these tanks are installed, the total usable fuel for all flight conditions is 48 gallons.

#### **ELECTRICAL SYSTEM.**

Electrical energy is supplied by a 14-volt, direct-current system powered by an engine-driven alternator (see figure 2-3). A 12-volt battery is located on the left-hand forward portion of the firewall. Power is supplied to all electrical circuits through a split bus bar, one side con-

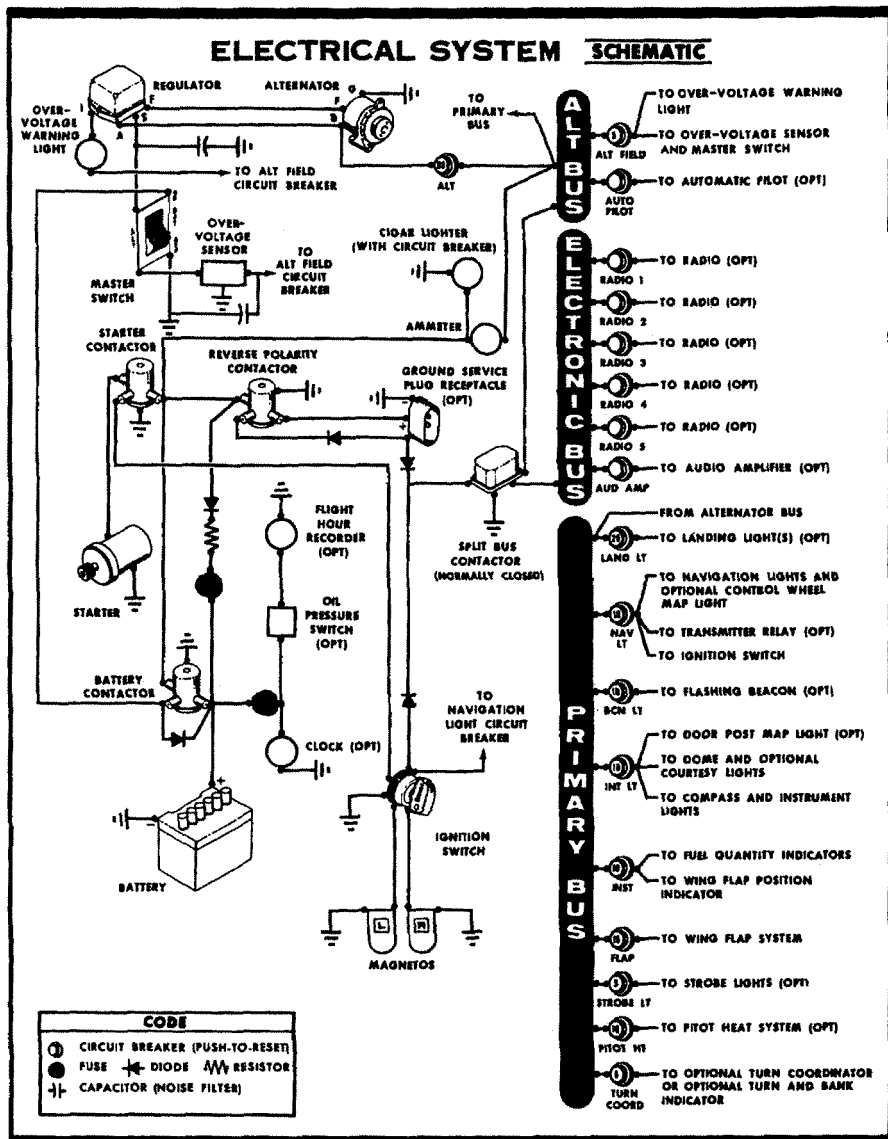


Figure 2-3.

taining electronic systems and the other side having general electrical systems. Both sides of the bus are on at all times except when either an external power source is connected or the ignition/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.

## **MASTER SWITCH.**

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

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

## **AMMETER.**

The ammeter indicates the flow of current, in amperes, from the alternator to the battery or from the battery to the 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, under the oil temperature and pressure gages.

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.**

The majority of electrical circuits in the aircraft are protected by "push-to-reset" circuit breakers mounted on the instrument panel. Exceptions to this are the optional clock and flight hour recorder circuits, and the battery contactor closing (external power) circuit which have fuses mounted adjacent to the battery. Also, the cigar lighter is protected by a manually reset type circuit breaker mounted directly on the back of the lighter behind the instrument panel.

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 LT. It is important to remember that any malfunction in the navigation lights system which causes the circuit breaker to open will de-activate both the navigation lights and the transmitter relay. In this event, the navigation light switch should be turned off to isolate the circuit; then reset the circuit breaker to re-activate the transmitter relay and permit its usage. Do not turn on the navigation lights switch until the malfunction has been corrected.

## **LIGHTING EQUIPMENT.**

### **EXTERIOR LIGHTING.**

Conventional navigation lights are located on the wing tips and top of the rudder. Optional lighting includes a single landing light or dual landing/taxi lights in the cowl nose cap, a flashing beacon on the top of

the vertical fin, 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 controlled by the dome light switch located on the overhead console. All other exterior lights are controlled by rocker type switches located 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 red flood lighting in the forward portion of the overhead console. The magnetic compass and radio equipment have integral lighting. A dual rheostat control on the left switch and control panel operates these lights. The inner knob, labeled PANEL, operates the instrument panel and compass lighting. The outer knob, labeled RADIO, controls all radio lighting.

A cabin dome light is located in the overhead console, and is operated by a switch adjacent to the light. To turn the light on, move the switch to the right. This will also operate the optional courtesy lights.

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 LT switch, then adjust the map light's intensity with the disk type rheostat control located on the bottom of the control wheel.

A doorpost map light is also offered as optional equipment, and is located at the top of the left forward doorpost. The light contains both red and white bulbs, and may be positioned to illuminate any area desired by the pilot. A switch on the left forward doorpost is labeled RED, OFF, and WHITE. Placing the switch in the top position will provide a red light. In the bottom position, standard white lighting is provided. The center position is OFF.

## **WING FLAP SYSTEM.**

The wing flaps are electrically operated by a flap motor located in the right wing. Flap position is controlled by a switch, labeled WING FLAPS on the lower center portion of the instrument panel. Flap position is shown by an indicator on the lower right portion of the instrument panel below the right control wheel position.

To extend the wing flaps, the flap switch must be depressed and held in the DOWN position until the desired degree of extension is reached. Releasing the switch allows it to return to the center off position. Normal full flap extension in flight will require approximately 9 seconds. After the flaps reach maximum extension or retraction, limit switches will automatically shut off the flap motor.

To retract the flaps, place the flap switch in the UP position. The switch will remain in the UP position without manual assistance due to an over-center design of the switch. Full flap retraction in flight requires approximately 7 seconds. More gradual flap retraction can be accomplished by intermittent operation of the flap switch to the UP position. After full retraction, the switch is normally returned to the center off position.

## **CABIN HEATING, VENTILATING AND DEFROSTING SYSTEM.**

For cabin ventilation, pull the CABIN AIR knob out. To raise the air temperature, pull the CABIN HT knob out approximately 1/4" to 1/2" for a small amount of cabin heat. Additional heat is available by pulling the knob out farther; maximum heat is available with the CABIN HT knob pulled out and the CABIN AIR knob pushed full in. When no heat is desired in the cabin, the CABIN HT knob is pushed full in.

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

Separate adjustable ventilators supply additional air; one near each upper corner of the windshield supplies air for the pilot and copilot, and two optional ventilators in the rear cabin ceiling supply air to the rear seat passengers.

## **SHOULDER HARNESES.**

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

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

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

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

## **INTEGRATED SEAT BELT/SHOULDER HARNESES WITH INERTIA REEL.**

Optional integrated seat belt/shoulder harnesses with inertia reels are available for the pilot and front seat passenger. The seat belt/shoulder harnesses extend from inertia reels located in the cabin ceiling to attach

points on the inboard side of the two front seats. A separate seat belt half and buckle is located on the outboard side of the seats. Inertia reels allow complete freedom of body movement. However, in the event of a sudden deceleration, they will lock up automatically to protect the occupants.

#### NOTE

The inertia reels are located for maximum shoulder harness comfort and safe retention of the seat occupants. This location requires that the shoulder harnesses cross near the top so that the right hand inertia reel serves the pilot and the left hand reel serves the front passenger. When fastening the harness, check to ensure the proper harness is being used.

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

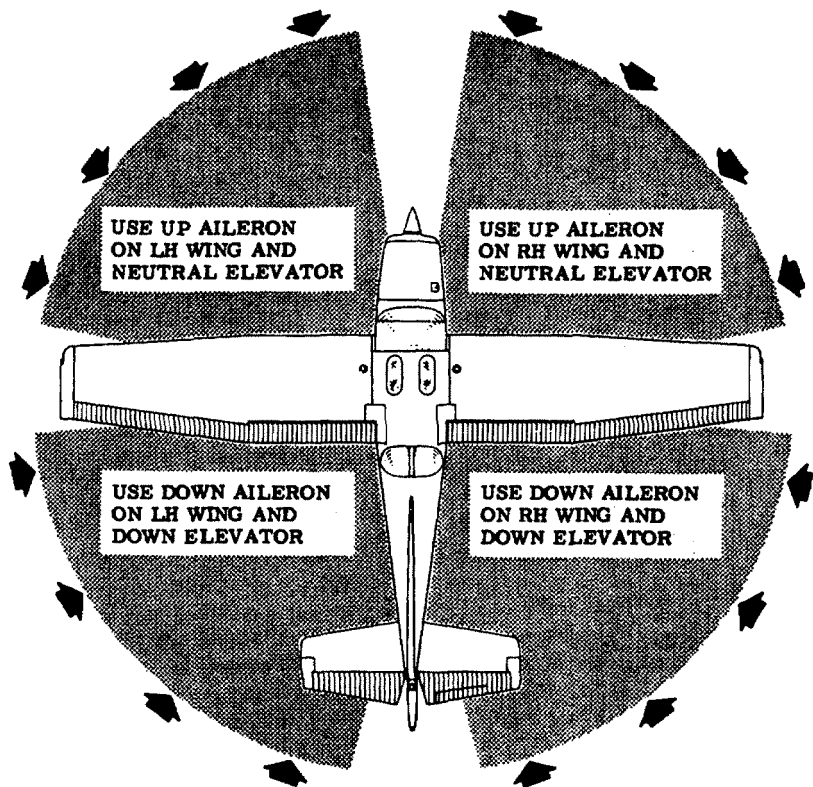
## STARTING ENGINE.

During engine starting, open the throttle approximately 1/8 inch. In warm temperatures, one or two strokes of the primer should be sufficient. In cold weather, up to six strokes of the primer may be necessary. If the engine is warm, no priming will be required. In extremely cold temperatures, it may be necessary to continue priming while cranking the engine.

Weak intermittent firing followed by puffs of black smoke from the exhaust stack indicates overpriming or flooding. Excess fuel can be cleared from the combustion chambers by the following procedure: Set the mixture control full lean and the throttle full open; then crank the engine through several revolutions with the starter. Repeat the starting procedure without any additional priming.

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. As soon as the cylinders begin to fire, open the throttle slightly to keep it running.

## TAXIING DIAGRAM



### CODE

WIND DIRECTION



### NOTE

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

Figure 2-4.

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

#### **NOTE**

Additional details for cold weather starting and operation may be found under Cold Weather Operation 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.

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

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

## **BEFORE TAKE-OFF.**

### **WARM-UP.**

If the engine accelerates smoothly, the aircraft is ready for take-off. 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 may cause fouled spark plugs.

### **MAGNETO CHECK.**

The magneto check should be made at 1700 RPM as follows. Move ignition switch first to R position and note RPM. Next move switch back to BOTH to clear the other set of plugs. Then move switch to the L position, note RPM and return the switch to the BOTH position. RPM drop

should not exceed 125 RPM on either magneto or show greater than 50 RPM differential between magnetos. If there is a doubt concerning operation of the ignition system, RPM checks at higher engine speeds will usually confirm whether a deficiency exists.

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

### **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 optional landing light (if so equipped), or by operating the wing flaps during the engine runup (1700 RPM). The ammeter will remain within a needle width of zero if the alternator and voltage regulator are operating properly.

### **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 is good cause for discontinuing the take-off. If this occurs, you are justified in making a thorough full-throttle, static runup before another take-off is attempted. The engine should run smoothly and turn approximately 2270 to 2370 RPM with carburetor heat off and mixture full rich.

#### **NOTE**

Carburetor heat should not be used during take-off unless it is absolutely necessary for obtaining smooth engine acceleration.

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

able small dents appear in the propeller blades, they should be immediately corrected as described in Section V under propeller care.

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

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

## **WING FLAP SETTINGS.**

Normal and obstacle clearance take-offs are performed with wing flaps up. The use of 10° flaps will shorten the ground run approximately 10%, but this advantage is lost in the climb to a 50-foot obstacle. Therefore, the use of 10° flaps is reserved for minimum ground runs or for take-off from soft or rough fields. If 10° of flaps are used for minimum ground runs, it is preferable to leave them extended rather than retract them in the climb to the obstacle. In this case, use an obstacle clearance speed of 65 MPH. As soon as the obstacle is cleared, the flaps may be retracted as the aircraft accelerates to the normal flaps-up climb speed of 80 to 90 MPH.

During a high altitude take-off in hot weather where climb would be marginal with 10° flaps, it is recommended that the flaps not be used for take-off. Flap settings greater than 10° are not recommended at any time for take-off.

## **PERFORMANCE CHARTS.**

Consult the Take-Off Data chart in Section VI for take-off distances 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 aircraft is accelerated to a speed slightly higher than normal, then pulled off abruptly to prevent possible settling back to the runway while drifting. When clear of the ground, make a coordinated turn into the wind to correct for drift.

## **ENROUTE CLIMB.**

### **CLIMB DATA.**

For detailed data, refer to the Maximum Rate-Of-Climb Data chart in Section VI.

### **CLIMB SPEEDS.**

Normal climbs are performed at 80 to 90 MPH with flaps up and full throttle for best engine cooling. The mixture should be full rich below 3000 feet and may be leaned above 3000 feet for smoother engine operation or to obtain maximum RPM for maximum performance climb. The maximum rate-of-climb speeds range from 91 MPH at sea level to 80 MPH at 10,000 feet. If an enroute obstruction dictates the use of a steep climb angle, climb at 75 MPH with flaps retracted.

#### **NOTE**

Steep climbs at low speeds should be of short duration to improve engine cooling.

## **CRUISE.**

Normal cruising is done at power settings up to 75% power. The engine RPM and corresponding fuel consumption for various altitudes can be determined by using your Cessna Power Computer or the Operational Data in Section VI.

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

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

## CRUISE PERFORMANCE

### SKYHAWK

	75% POWER		65% POWER		55% POWER	
ALTITUDE	TAS	MPG	TAS	MPG	TAS	MPG
Sea Level	128	15.4	121	16.8	111	17.3
4000 Feet	133	16.0	125	17.4	114	17.8
8000 Feet	138	16.6	129	17.9	117	18.3
Standard Conditions					Zero Wind	

To achieve the lean mixture fuel consumption figures shown in Section VI, the mixture should be leaned as follows:

- (1) Pull the mixture control out until engine RPM peaks and begins to fall off.
- (2) Enrichen slightly back to peak RPM.

For best fuel economy at 75% power or less, operate at the leanest mixture that results in smooth engine operation or at 50 RPM on the lean side of the peak RPM, whichever occurs first. This will result in approximately 5% greater range than shown in this manual.

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

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

In extremely heavy rain, the use of partial carburetor heat (control approximately 2/3 out), and part throttle (closed at least one inch), may

be necessary to retain adequate power. Power changes should be made cautiously followed by prompt adjustment of the mixture for smoothest operation.

## **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.

## **SPINS.**

Intentional spins are approved in this aircraft in the Utility Category only. Although this aircraft is inherently resistant to spins, the following techniques may be used to perform intentional spins for training or practice. To obtain a clean entry, decelerate the aircraft at a faster rate than is used for stalls. Then, just as the stall occurs, apply full up elevator, full rudder in the desired spin direction, and momentarily use full engine power. As the aircraft begins to spin, reduce the power to idle and maintain full pro-spin elevator and rudder deflections. The application of ailerons in the direction of the desired spin may also help obtain a clean entry.

During extended spins of two to three turns or more, the spin will tend to change into a spiral, particularly to the right. This will be accompanied by an increase in airspeed and gravity loads on the aircraft. If this occurs, recovery should be accomplished quickly by leveling the wings and recovering from the resulting dive.

To recover from an intentional or inadvertent spin, use the following procedure:

- (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 the rotation stops, neutralize the rudder, and make a smooth recovery from the resulting dive.

Intentional spins with flaps extended are prohibited.

## **LANDINGS.**

Normal landings are made power-off with any flap setting desired. Steep slips should be avoided with flap settings greater than 20° due to a slight tendency for the elevator to oscillate under certain combinations of airspeed, sideslip angle, and center of gravity loadings.

### **NOTE**

Carburetor heat should be applied prior to any significant reduction or closing of the throttle.

### **NORMAL LANDING.**

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

### **SHORT FIELD LANDING.**

For short field landings, make a power-off approach at approximately 70 MPH indicated airspeed with 40° of flaps. Touchdown should be made on the main wheels first. Immediately after touchdown, lower the nose gear to the ground and apply heavy braking as required. For maximum brake effectiveness after all three wheels are on the ground, retract the flaps, hold full nose up elevator and apply maximum possible brake pressure without sliding the tires.

### **CROSSWIND LANDING.**

When landing in a strong crosswind, use the minimum flap setting required for the field length. If flap settings greater than 20° are used in sideslips with full rudder deflection, some elevator oscillation may be felt at normal approach speeds. However, this does not affect control of the aircraft. Although the crab or combination method of drift correction

may be used, the wing-low method gives the best control. After touch-down, 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 aircraft limitations. With average pilot technique, direct crosswinds of 15 knots can be handled with safety.

## **BALKED LANDING.**

In a bailed landing (go-around) climb, reduce the wing flap setting to 20° immediately after full power is applied. If the flaps were extended to 40°, the reduction to 20° may be approximated by placing the flap switch in the UP position for two seconds and then returning the switch to neutral. If obstacles must be cleared during the go-around climb, leave the wing flaps in the 10° to 20° range and maintain a climb speed of 65 to 75 MPH until the obstacles are cleared. Above 3000 feet, lean the mixture to obtain maximum RPM. After clearing any obstacles, the flaps may be retracted as the aircraft accelerates to the normal flaps-up climb speed of 80 to 90 MPH.

## **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 pre-heater and an external power source are recommended whenever possible to obtain positive starting and to reduce wear and abuse to the engine and 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 under Ground Service Plug Receptacle for operating details.

Cold weather starting procedures are as follows:

With Preheat:

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

NOTE

Use heavy strokes of primer for best atomization of fuel. After priming, push primer all the way in and turn to locked position to avoid possibility of engine drawing fuel through the primer.

- (2) Propeller Area -- CLEAR.
- (3) Master Switch -- ON.
- (4) Mixture -- FULL RICH.
- (5) Throttle -- OPEN 1/8".
- (6) Ignition Switch -- START.
- (7) Release ignition switch to BOTH when engine starts.
- (8) Oil Pressure -- CHECK.

Without Preheat:

- (1) Prime the engine six to ten strokes while the propeller is being turned by hand with throttle closed. Leave primer charged and ready for stroke.
- (2) Propeller Area -- CLEAR.
- (3) Master Switch -- ON.
- (4) Mixture -- FULL RICH.
- (5) Ignition Switch -- START.
- (6) Pump throttle rapidly to full open twice. Return to 1/8" open position.
- (7) Release ignition switch to BOTH when engine starts.
- (8) Continue to prime engine until it is running smoothly, or alternately pump throttle rapidly over first 1/4 to total travel.
- (9) Oil Pressure -- CHECK.
- (10) Pull carburetor heat knob full on after engine has started. Leave on until engine is running smoothly.
- (11) Lock Primer.

NOTE

If the engine does not start during the first few attempts, or

if the 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.

### **IMPORTANT**

Pumping the throttle may cause raw fuel to accumulate in the intake air duct, creating a fire hazard in the event of a backfire. If this occurs, maintain a cranking action to suck flames into the engine. An outside attendant with a fire extinguisher is advised for cold starts without preheat.

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 aircraft is ready for take-off.

### **FLIGHT OPERATIONS.**

Take-off is made normally with carburetor heat off. Avoid excessive leaning in cruise.

Carburetor heat may be used to overcome any occasional engine roughness due to ice.

When operating in sub-zero temperature, avoid using partial carburetor heat. Partial heat may increase the carburetor air temperature to the 32° to 70°F range, where icing is critical under certain atmospheric conditions.

Refer to Section VII for cold weather equipment.

### **HOT WEATHER OPERATION.**

Refer to the general warm temperature starting information under Starting Engine in this section. Avoid prolonged engine operation on the ground.

## **NOISE ABATEMENT.**

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

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

- (1) Pilots operating aircraft under VFR over outdoor assemblies of persons, recreational and park areas, and other noise-sensitive areas should make every effort to fly not less than 2,000 feet above the surface, weather permitting, even though flight at a lower level may be consistent with the provisions of government regulations.
- (2) During departure from or approach to an airport, climb after take-off and descent for landing should be made so as to avoid prolonged flight at low altitude near noise-sensitive areas.

### **NOTE**

The above recommended procedures do not apply where they would conflict with Air Traffic Control clearances or instructions, or where, in the pilot's judgement, an altitude of less than 2,000 feet is necessary for him to adequately exercise his duty to see and avoid other aircraft.

# *Section III*

## **EMERGENCY PROCEDURES**

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

### **ENGINE FAILURE.**

#### **ENGINE FAILURE AFTER TAKE-OFF.**

Prompt lowering of the nose to maintain airspeed and establish a glide attitude is the first response to an engine failure after take-off. In most cases, the landing should be planned straight ahead with only small changes in direction to avoid obstructions. Altitude and airspeed are seldom sufficient to execute a 180° gliding turn necessary to return to the runway. The following procedures assume that adequate time exists to secure the fuel and ignition systems prior to touchdown.

- (1) Airspeed -- 75 MPH (flaps UP).  
70 MPH (flaps DOWN).
- (2) Mixture -- IDLE CUT-OFF.
- (3) Fuel Selector Valve -- OFF.
- (4) Ignition Switch -- OFF.
- (5) Wing Flaps -- AS REQUIRED (40° recommended).
- (6) Master Switch -- OFF.

#### **ENGINE FAILURE DURING FLIGHT.**

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

is feasible, proceed as follows:

- (1) Airspeed -- 80 MPH.
- (2) Carburetor Heat -- ON.
- (3) Fuel Selector Valve -- BOTH.
- (4) Mixture -- RICH.
- (5) Ignition Switch -- BOTH (or START if propeller is not windmilling)
- (6) Primer -- IN and LOCKED.

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

## **FORCED LANDINGS.**

### **EMERGENCY LANDING WITHOUT ENGINE POWER.**

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

- (1) Airspeed -- 75 MPH (flaps UP).  
70 MPH (flaps DOWN).
- (2) Mixture -- IDLE CUT-OFF.
- (3) Fuel Selector Valve -- OFF.
- (4) Ignition Switch -- OFF.
- (5) Wing Flaps -- AS REQUIRED (40° recommended).
- (6) Master Switch -- OFF.
- (7) Doors -- UNLATCH PRIOR TO TOUCHDOWN.
- (8) Touchdown -- SLIGHTLY TAIL LOW.
- (9) Brakes -- APPLY HEAVILY.

### **PRECAUTIONARY LANDING WITH ENGINE POWER.**

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) Drag over selected field with flaps 20° and 70 MPH airspeed, noting the preferred area for touchdown for the next landing approach. Then retract flaps upon reaching a safe altitude and airspeed.
- (2) Radio, Electrical Switches -- OFF.
- (3) Wing Flaps -- 40° (on final approach).

- (4) Airspeed -- 70 MPH.
- (5) Master Switch -- OFF.
- (6) Doors -- UNLATCH PRIOR TO TOUCHDOWN.
- (7) Touchdown -- SLIGHTLY TAIL LOW.
- (8) Ignition Switch -- OFF.
- (9) Brakes -- APPLY HEAVILY.

## **DITCHING.**

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

- (1) Plan approach into wind if winds are high and seas are heavy. With heavy swells and light wind, land parallel to swells.
- (2) Approach with flaps 40° and 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 aircraft height over a water surface.
- (5) Place folded coat or cushion in front of face at time of touchdown.
- (6) Evacuate aircraft through cabin doors. If necessary, open window to flood cabin compartment for equalizing pressure so that door can be opened.
- (7) Inflate life vests and raft (if available) after evacuation of cabin. The aircraft cannot be depended on for flotation for more than a few minutes.

## **FIRES.**

### **ENGINE FIRE DURING START ON GROUND.**

Improper starting procedures during a difficult cold weather start can cause a backfire which could ignite fuel that has accumulated in the intake duct. In this event, proceed as follows:

- (1) Continue cranking in an attempt to get a start which would suck the flames and accumulated fuel through the carburetor and into the engine.
- (2) If the start is successful, run the engine at 1700 RPM for a few

minutes before shutting it down to inspect the damage.

(3) If engine start is unsuccessful, continue cranking for two or three minutes with throttle full open while ground attendants obtain fire extinguishers.

(4) When ready to extinguish fire, discontinue cranking and turn off master switch, ignition switch, and fuel selector valve.

(5) Smother flames with fire extinguisher, seat cushion, wool blanket, or loose dirt. If practical, try to remove carburetor air filter if it is ablaze.

(6) Make a thorough inspection of fire damage, and repair or replace damaged components before conducting another flight.

## **ENGINE FIRE IN FLIGHT.**

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

(1) Mixture -- IDLE CUT-OFF.

(2) Fuel Selector Valve -- OFF.

(3) Master Switch -- OFF.

(4) Cabin Heat and Air -- OFF (except overhead vents).

(5) Airspeed -- 120 MPH. If fire is not extinguished, increase glide speed to find an airspeed which will provide an incombustible mixture.

Execute a forced landing as outlined in preceding paragraphs.

## **ELECTRICAL FIRE IN FLIGHT.**

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

(1) Master Switch -- OFF.

(2) All Radio/Electrical Switches -- OFF.

(3) Vents/Cabin Air/Heat -- CLOSED.

(4) Fire Extinguisher -- ACTIVATE (if available).

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

(5) Master Switch -- ON.

(6) Circuit Breakers -- CHECK for faulty circuit, do not reset.

(7) Radio/Electrical Switches -- ON one at a time, with delay after each until short circuit is localized.

(8) Vents/Cabin Air/Heat -- OPEN when it is ascertained that fire is completely extinguished.

## **DISORIENTATION IN CLOUDS.**

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

### **EXECUTING A 180° TURN IN CLOUDS.**

Upon entering the clouds, an immediate plan should be made to turn back as follows:

- (1) Note the time of the minute hand and observe the position of the sweep second hand on the clock.
- (2) When the sweep second hand indicates the nearest half-minute, initiate a standard rate left turn, holding the turn coordinator symbolic aircraft wing opposite the lower left index mark for 60 seconds. Then roll back to level flight by leveling the miniature aircraft.
- (3) Check accuracy of the turn by observing the compass heading which should be the reciprocal of the original heading.
- (4) If necessary, adjust heading primarily with skidding motions rather than rolling motions so that the compass will read more accurately.
- (5) Maintain altitude and airspeed by cautious application of elevator control. Avoid overcontrolling by keeping the hands off the control wheel and steering only with rudder.

### **EMERGENCY LET-DOWNS THROUGH CLOUDS.**

If possible, obtain radio clearance for an emergency descent through clouds. To guard against a spiral dive, choose an easterly or westerly heading to minimize compass card swings due to changing bank angles. In addition, keep hands off the control wheel and steer a straight course with rudder control by monitoring the turn coordinator. Occasionally check the compass heading and make minor corrections to hold an approximate course. Before descending into the clouds, set up a stabilized let-