

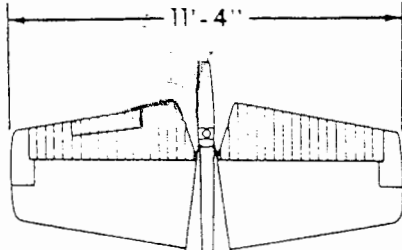
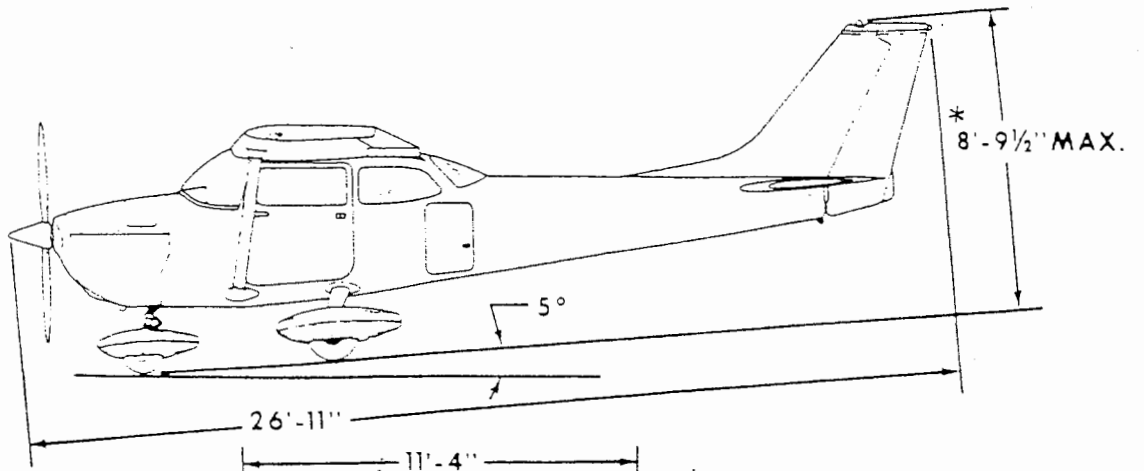
# Cessna 172

# Skyhawk

# N7770G



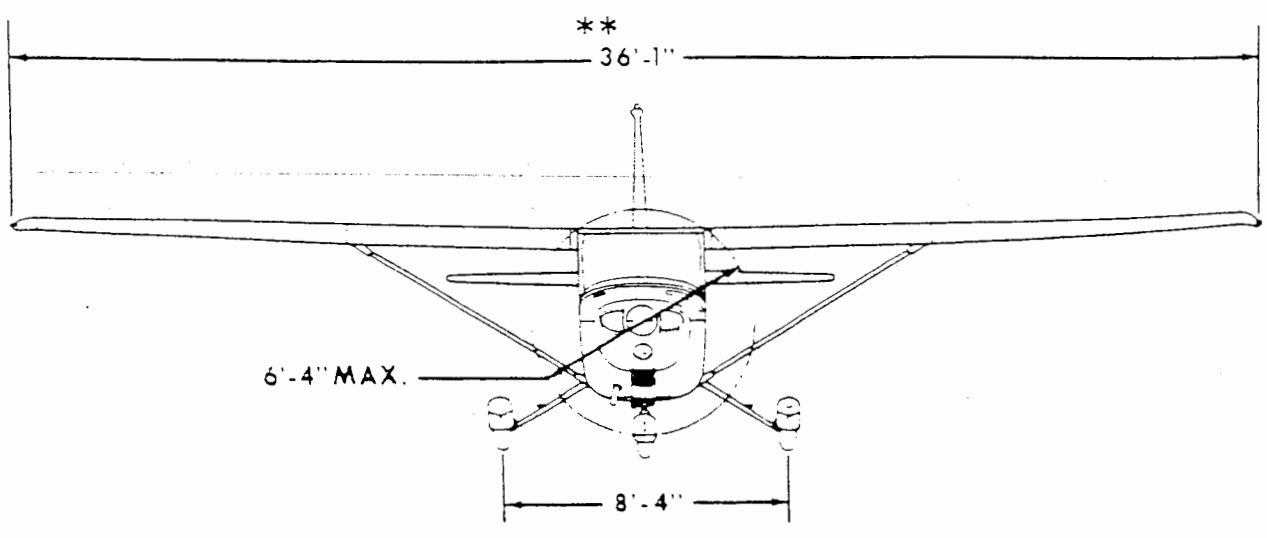
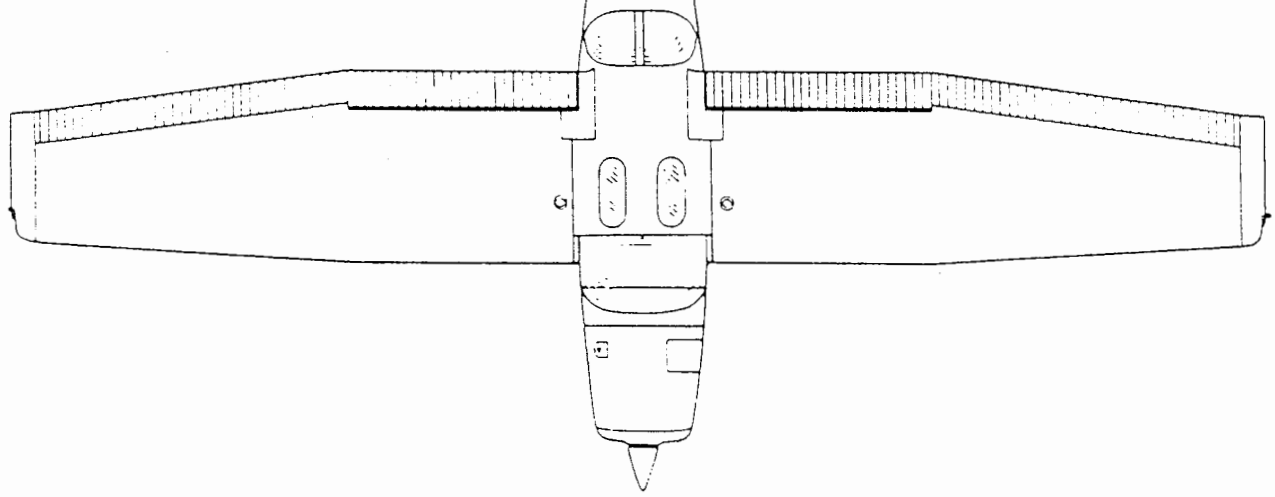
Owner's Manual  
1971 C-172



\* Maximum height of airplane with nose gear depressed and optional flashing beacon installed.

\*\* Wing span of airplane with optional strobe lights installed.

# PRINCIPAL DIMENSIONS



# PERFORMANCE - SPECIFICATIONS

	Model 172*	Skyhawk*
GROSS WEIGHT . . . . .	2300 lbs	2300 lbs
SPEED:		
Top Speed at Sea Level . . . . .	139 mph	140 mph
Cruise, 75% Power at 9000 ft . . . . .	131 mph	132 mph
RANGE:		
Cruise, 75% Power at 9000 ft . . . . .	615 mi	620 mi
38 Gal., No Reserve	4.7 hrs	4.7 hrs
	131 mph	132 mph
Cruise, 75% Power at 9000 ft . . . . .	775 mi	780 mi
48 Gal., No Reserve	5.9 hrs	5.9 hrs
	131 mph	132 mph
Optimum Range at 10,000 ft . . . . .	640 mi	655 mi
38 Gal., No Reserve	5.5 hrs	5.5 hrs
	117 mph	118 mph
Optimum Range at 10,000 ft . . . . .	820 mi	830 mi
48 Gal., No Reserve	7.0 hrs	7.0 hrs
	117 mph	118 mph
RATE OF CLIMB AT SEA LEVEL . . . . .	645 fpm	645 fpm
SERVICE CEILING . . . . .	13,100 ft	13,100 ft
TAKE-OFF:		
Ground Run . . . . .	865 ft	865 ft
Total Distance Over 50-Foot Obstacle. . .	1525 ft	1525 ft
LANDING:		
Ground Roll . . . . .	520 ft	520 ft
Total Distance Over 50-Foot Obstacle. . .	1250 ft	1250 ft
STALL SPEED:		
Flaps Up, Power Off . . . . .	57 mph	57 mph
Flaps Down, Power Off . . . . .	49 mph	49 mph
EMPTY WEIGHT (Approximate) . . . . .	1250 lbs	1300 lbs
USEFUL LOAD . . . . .	1050 lbs	1000 lbs
BAGGAGE . . . . .	120 lbs	120 lbs
WING LOADING: Pounds/Sq Foot . . . . .	13.2	13.2
POWER LOADING: Pounds/HP . . . . .	15.3	15.3
FUEL CAPACITY: Total		
Standard Tanks . . . . .	42 gal.	42 gal.
Optional Long Range Tanks . . . . .	52 gal.	52 gal.
OIL CAPACITY: Total . . . . .	8 qts	8 qts
PROPELLER: Fixed Pitch (Diameter) . . . . .	76 inches	76 inches
ENGINE:		
Lycoming Engine . . . . .	O-320-E2D	O-320-E2D
150 rated HP at 2700 RPM		

\* This manual covers operation of the Model 172/Skyhawk which is certificated as Model 172L under FAA Type Certificate No. 3A12.

$V_x = 70 \text{ mph}$   
 $V_y = 80 \text{ mph}$   
 $V_a = 122 \text{ mph}$

# SERVICING REQUIREMENTS

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## FUEL:

AVIATION GRADE -- 80/87 MINIMUM GRADE  
CAPACITY EACH STANDARD TANK -- 21 GALLONS  
CAPACITY EACH LONG RANGE TANK -- 26 GALLONS  
(TO ENSURE MAXIMUM FUEL CAPACITY WHEN RE-FUELING, PLACE THE FUEL SELECTOR VALVE IN EITHER "LEFT" OR "RIGHT" POSITION TO PREVENT CROSS-FEEDING).

## 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 A RANGE OF SAE 10W30 IS RECOMMENDED FOR IMPROVED STARTING AND LUBRICATION DURING WARM-UP IN COLD WEATHER. DETERGENT OR DISPERSANT OIL, CONFORMING TO LYCOMING SPECIFICATION NO. 301E, 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 OPTIONAL OIL FILTER IS INSTALLED, ONE ADDITIONAL QUART IS REQUIRED WHEN THE FILTER ELEMENT IS CHANGED.)

## HYDRAULIC FLUID:

MIL-H-5606 HYDRAULIC FLUID

## TIRE PRESSURES:

NOSE WHEEL ----- 31 PSI ON 5.00 X 5, 4 PLY TIRE  
26 PSI ON 6.00 X 6, 4 PLY TIRE  
MAIN WHEELS ----- 29 PSI ON 6.00 X 6, 4 PLY TIRES

## NOSE GEAR SHOCK STRUT:

**KEEP FILLED WITH HYDRAULIC FLUID AND INFLATED WITH AIR TO 45 PSI.**



- 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. 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 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, there is a possibility that the fuel tank sumps contain water. Thus, the fuel tank sump drain plugs and fuel selector valve drain plug should be removed to check for the presence of water.
  - c. Check propeller and spinner for nicks and security.
  - d. Check landing light 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. 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.
- ⑦
  - a. Check aileron for freedom of movement and security.
- ⑧
  - a. Disconnect wing tie-down.
  - b. Check main wheel tire for proper inflation.
  - c. Visually check fuel quantity, then check fuel filler cap secure.

# *Section I*

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## 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.

### **BEFORE STARTING THE ENGINE.**

- (1) Seats, Seat Belts and Shoulder Harnesses -- Adjust and lock.
- (2) Fuel Selector Valve -- "BOTH."
- (3) Brakes -- Test and set.
- (4) Radios and Electrical Equipment -- "OFF."

## STARTING THE ENGINE.

- (1) Mixture -- Rich.
- (2) Carburetor Heat -- Cold.
- (3) Primer -- 2 - 6 strokes as required (none if engine is warm).  
Close and lock primer.
- (4) Throttle -- Open 1/8".
- (5) Master Switch -- "ON."
- (6) Propeller Area -- Clear.
- (7) Ignition Switch -- "START" (release when engine starts).
- (8) Oil Pressure -- Check.

## BEFORE TAKE-OFF.

- (1) Parking Brake -- Set.
- (2) Flight Controls -- Check for free and correct movement.
- (3) Fuel Selector Valve -- "BOTH."
- (4) Elevator Trim -- "TAKE-OFF" setting.
- (5) Throttle Setting -- 1700 RPM.
- (6) Engine Instruments and Ammeter -- Check.
- (7) Suction Gage -- Check (4.6 to 5.4 inches of mercury).
- (8) Magnetos -- Check (RPM drop should not exceed 125 RPM on either magneto or 50 RPM differential between magnetos).
- (9) Carburetor Heat -- Check operation.
- (10) Flight Instruments and Radios -- Set.
- (11) Optional Autopilot or Wing Leveler -- Off.
- (12) Cabin Doors and Window -- Closed and locked.

## TAKE-OFF.

### NORMAL TAKE-OFF.

- (1) Wing Flaps -- 0°.
- (2) Carburetor Heat -- Cold.
- (3) Power -- Full throttle.
- (4) Elevator Control -- Lift nose wheel at 60 MPH.
- (5) Climb Speed -- 75 to 85 MPH.

### MAXIMUM PERFORMANCE TAKE-OFF.

- (1) Wing Flaps -- 0°.



- (2) Carburetor Heat -- Cold.
- (3) Brakes -- Apply.
- (4) Power -- Full throttle.
- (5) Brakes -- Release.
- (6) Airplane Attitude -- Slightly tail low.
- (7) Climb Speed -- 68 MPH until all obstacles are cleared.

## 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) Power -- Full throttle.
- (3) Mixture -- Full rich (mixture may be leaned above 3000 feet).

## CRUISING.

- (1) Power -- 2200 to 2700 RPM.

### NOTE

Maximum cruise RPM varies with altitude. For details, refer to Section IV.

- (2) Trim Tab -- Adjust.
- (3) Mixture -- Lean for maximum RPM.

## 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 -- Apply full heat before closing throttle.
- (4) Wing Flaps -- As desired.
- (5) Airspeed -- 70 to 80 MPH (flaps up), 65 to 75 MPH (flaps down).

## **BALKED LANDING (GO-AROUND).**

- (1) Power -- Full throttle.
- (2) Carburetor Heat -- Cold.
- (3) Wing Flaps -- Retract to 20°.
- (4) Upon reaching an airspeed of approximately 65 MPH, retract flaps slowly.

## **NORMAL LANDING.**

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

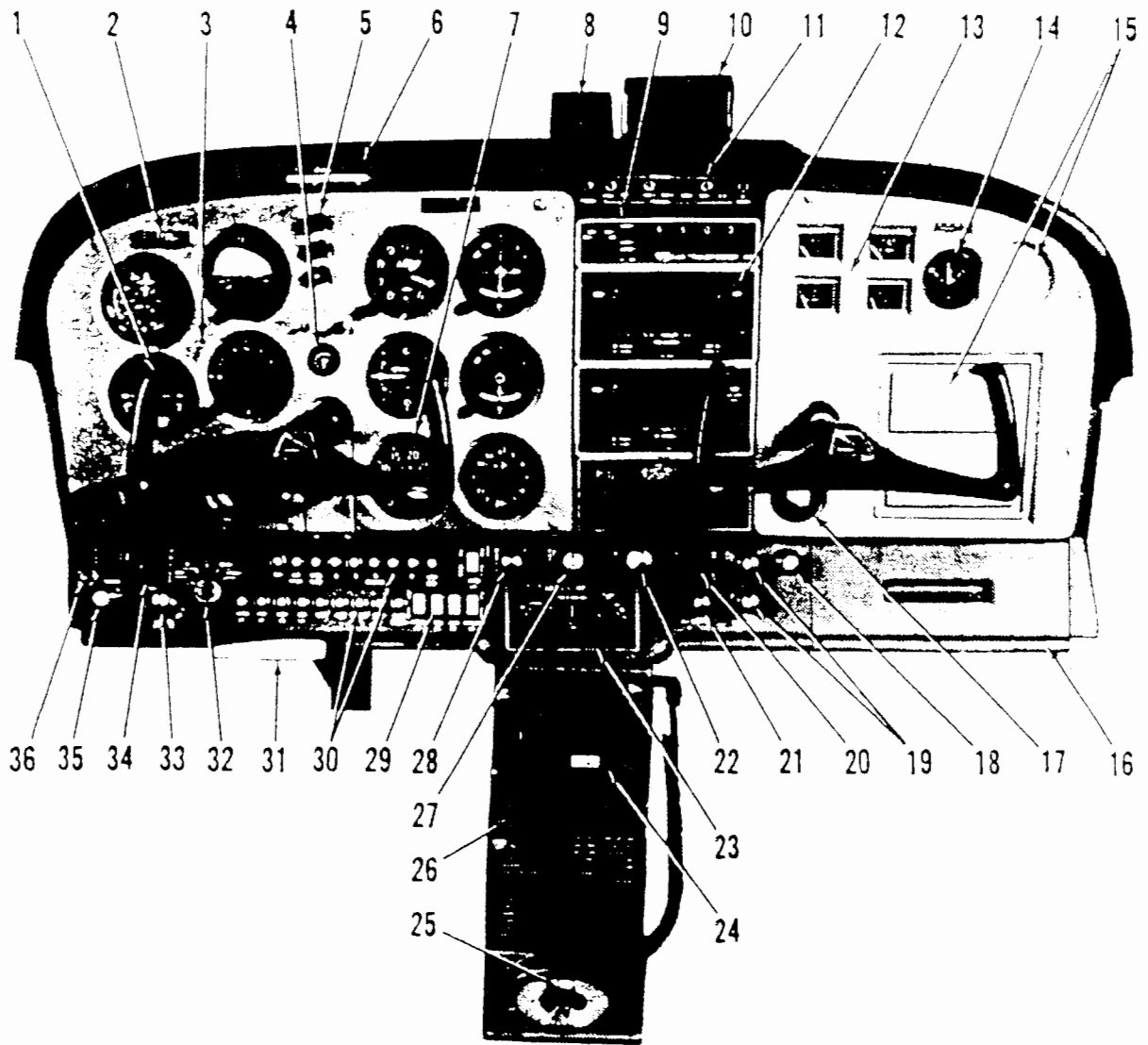
## **AFTER LANDING.**

- (1) Wing Flaps -- Up.
- (2) Carburetor Heat -- Cold.

## **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.

# INSTRUMENT PANEL



- |   |   |   |
|---|---|---|
| 1. Boom Microphone Keying Switch (Opt.)               | 12. Radios (Opt.)                                 | 24. Microphone (Opt.)                         |
| 2. Aircraft Registration Number                       | 13. Fuel and Oil Gages                            | 25. Fuel Selector Valve Handle                |
| 3. Flight Instrument Group                            | 14. Ammeter                                       | 26. Elevator Trim Control Wheel               |
| 4. Suction Gage (Opt.)                                | 15. Optional Instrument and Radio Space           | 27. Throttle                                  |
| 5. Marker Beacon Indicator Lights and Switches (Opt.) | 16. Map Compartment                               | 28. Carburetor Heat Control                   |
| 6. Compass Correction Card                            | 17. Wing Flap Position Indicator                  | 29. Electrical Switches                       |
| 7. Tachometer   | 18. Cigar Lighter                                 | 30. Circuit Breakers                          |
| 8. Magnetic Compass                                   | 19. Cabin Air and Heat Controls                   | 31. Parking Brake Handle                      |
| 9. Transponder (Opt.)                                 | 20. Wing Flap Switch                              | 32. Ignition/Starter Switch                   |
| 10. Rear View Mirror (Opt.)                           | 21. Static Pressure Alternate Source Valve (Opt.) | 33. Instrument and Radio Dial Light Rheostats |
| 11. Radio Selector Switches (Opt.)                    | 22. Mixture Control Knob                          | 34. Master Switch                             |
|   | 23. Autopilot Control Unit (Opt.)                 | 35. Primer                                    |
|   |   | 36. Phone Jack                                |

Figure 2-1.

## DESCRIPTION AND OPERATING DETAILS

The following paragraphs describe the systems and equipment whose function and operation is not obvious when sitting in the 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 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 and 48 gallons for the optional long range 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

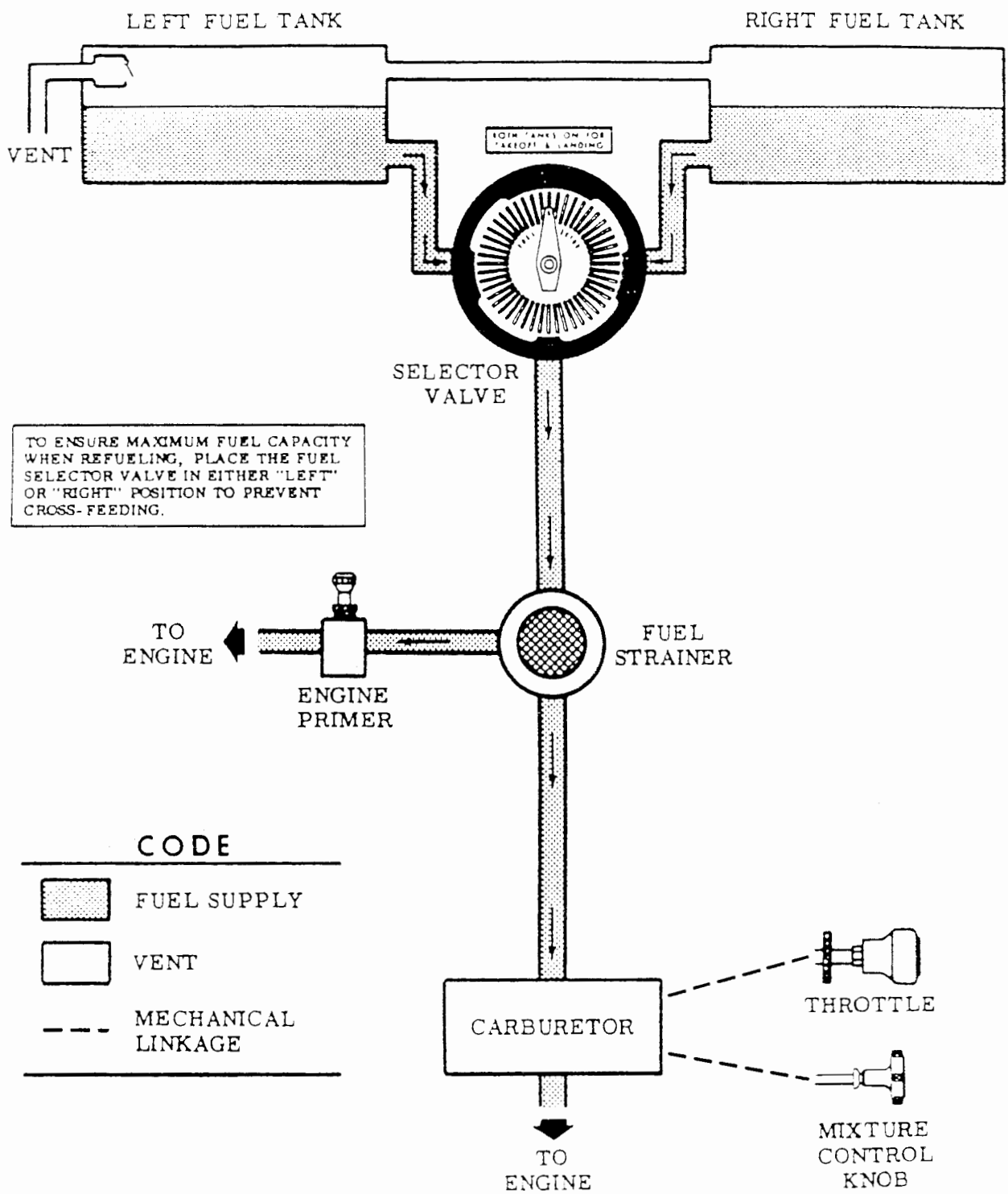


Figure 2-2.

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.

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). 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 containing 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 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,"

# ELECTRICAL SYSTEM SCHEMATIC

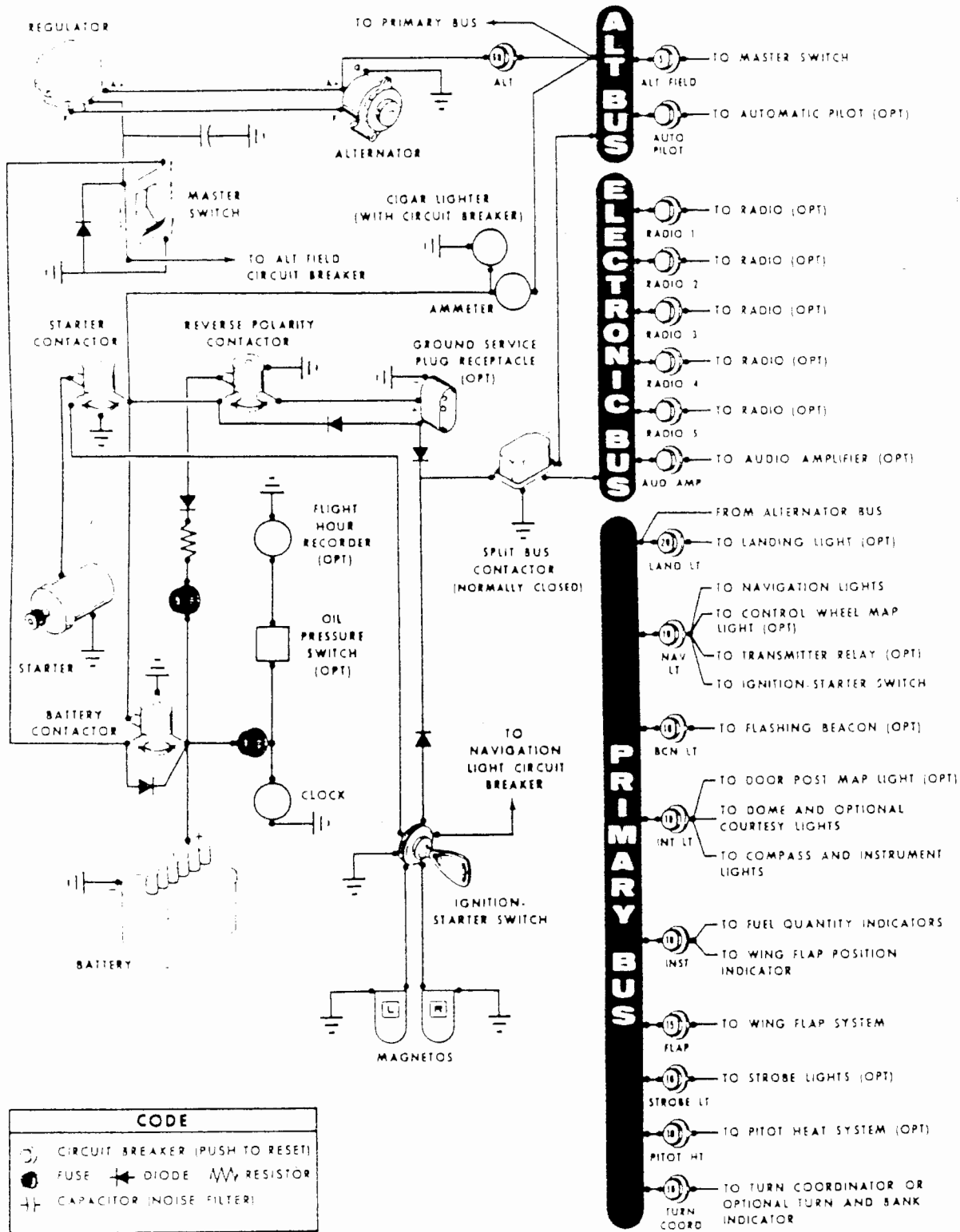


Figure 2-3.

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.

## **CIRCUIT BREAKERS AND FUSES.**

The majority of electrical circuits in the airplane are protected by "push-to-reset" circuit breakers mounted on the instrument panel. Exceptions to this are the optional clock, flight hour recorder, and battery contactor closing (external power) circuits 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. The alternator field and wiring is protected by an automatically resetting circuit breaker.

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 LTS." 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. Optional lighting includes a single landing light 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 knurled disk type rheostat control located at the bottom of the control wheel.

A door post map light is also offered as optional equipment, and is located at the top of the left forward door post. 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 door post 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".

## 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 full 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.

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.

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 on the front of the forward door post. When stowing the harness, place it behind both retaining clips and secure the loose end behind the retaining clip above the door. The optional rear seat shoulder harnesses are attached just below 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. Place the metal stud at the end of the harness in the retaining slot on the seat belt buckle. Tighten the harness by pulling down on the adjustment strap. Leave just enough slack to allow all controls to be reached.

Releasing and removing the shoulder harness is accomplished by

pulling upward on the narrow release strap, then 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, then pulling the harness over the head by pulling up on the release strap.

## 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.

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.

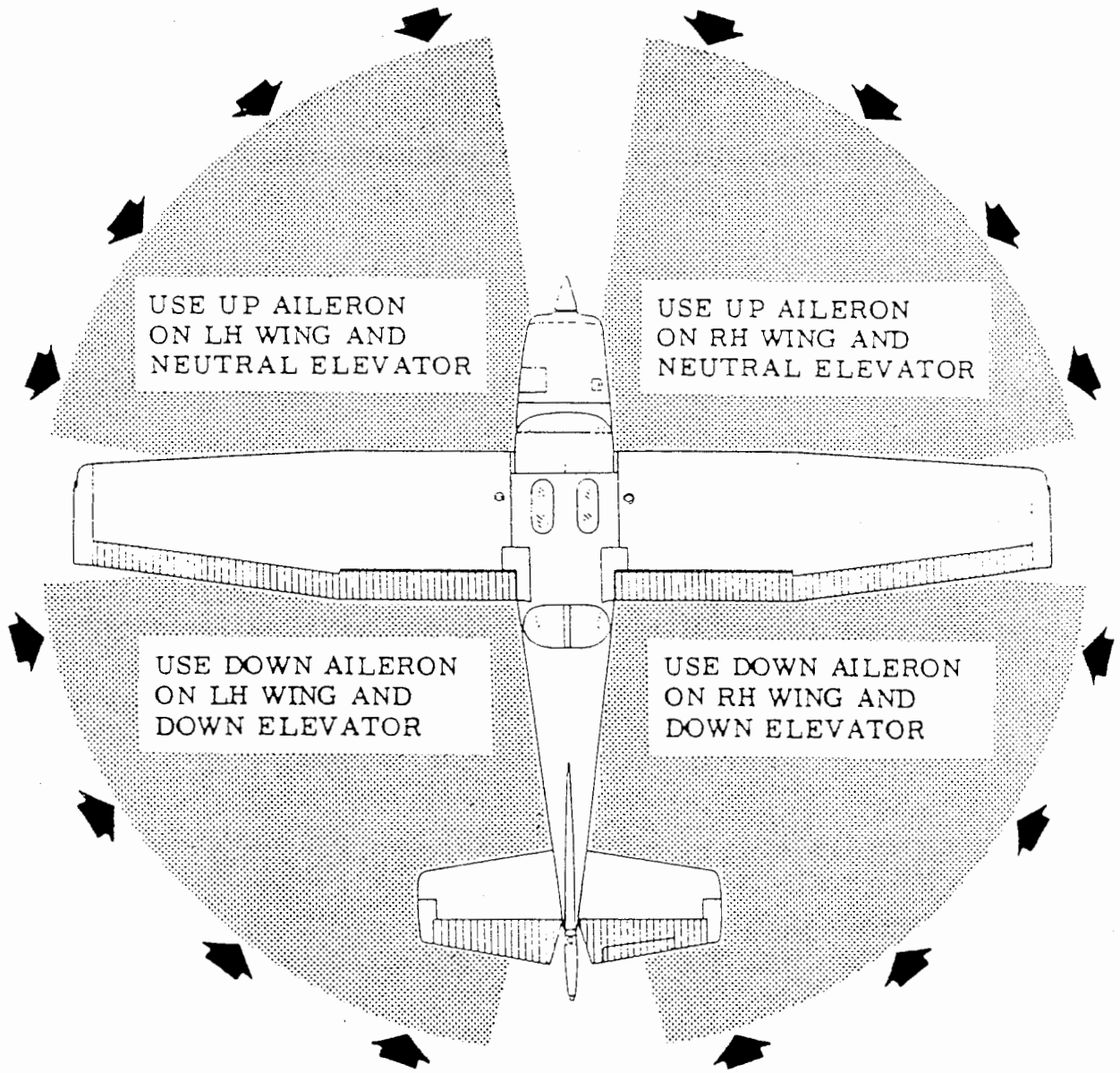
### NOTE

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

# 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.

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 airplane 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 2260 to 2360 RPM with carburetor heat off.

### 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 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.

### 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 airplane 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 of 30° to 40° 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 airplane is accelerated to a speed slightly higher than normal, then pulled off abruptly to prevent possible settling back to the runway while drifting. When clear of the ground, make a coordinated turn into the wind to correct for drift.

## 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. The maximum rate-of-climb speeds range from 82 MPH at sea level to 79 MPH at 10,000 feet. If an obstruction dictates the use of a steep climb angle, climb at 68 MPH with flaps retracted.

## NOTE

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

## 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 can be determined by using your Cessna Power Computer or the OPERATIONAL DATA, Section VI.

Cruising can be done more efficiently at high altitudes because of lower air density and therefore higher true airspeeds for the same power. This is illustrated in the table below, which shows performance at 75% power at various altitudes. All figures are based on lean mixture, 38 gallons of fuel (no reserve), zero wind, standard atmospheric conditions, and 2300 pounds gross weight.

To achieve the lean mixture fuel consumption figures shown in Section VI, the mixture should be leaned as follows: pull mixture control out until engine RPM peaks and begins to fall off, then enrichen slightly back to peak RPM.

Carburetor ice, as evidenced by an unexplained drop in RPM, can be removed by application of full carburetor heat. Upon regaining the origi-

MAXIMUM CRUISE SPEED PERFORMANCE			
75% POWER			
ALTITUDE	RPM	TRUE AIRSPEED	RANGE
SEA LEVEL	2490	123	575
5000 ft.	2600	128	600
9000 ft.	FULL THROTTLE	132	620



nal 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 prohibited in this airplane, except in the Utility Category. To recover from a spin, use the following technique.

- (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.

## LANDINGS.

Normal landings are made power-off with any flap setting desired. Slips should be avoided with flap settings greater than 30° due to a downward pitch encountered under certain combinations of airspeed, side slip 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 69 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. 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 MPH can be handled with safety.

### BALKED LANDING (GO-AROUND).

In a balked landing (go-around) climb, reduce the wing flap setting

to 20° immediately after full power is applied. If obstacles must be cleared during the go-around climb, leave the wing flaps in the 10° to 20° range until the obstacles are cleared. After clearing any obstacles the flaps may be retracted as the airplane 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 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 airplane 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.

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## 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; 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. All electrical 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 periods of 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 remains above this value on a long flight, it is possible that the battery will overheat and evaporate the electrolyte at an excessive rate. In addition, electronic components in the electrical system could be adversely affected by the higher than normal voltage if a faulty voltage regulator setting is causing the overcharging.

To preclude these possibilities, the alternator side of the split master switch should be turned "OFF." The flight should be terminated and/or the current drain on the battery minimized as soon as practical because the battery can supply the electrical system for only a limited period of time. If it becomes apparent that the battery voltage is getting too low to operate the electrical system, the alternator switch can be turned back on for several minutes at a time until the battery is partially recharged. If the emergency occurs at night, the alternator switch should be returned to the "ON" position just before landing light and flaps will be required for 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.**

An 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 a total loss of oil pressure is accompanied by a 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.

## **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) 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 after well clear of all obstacles.
- (2) On downwind leg, turn off all switches except the ignition and master switches.
- (3) Approach with flaps 40° at 70 MPH.
- (4) Unlatch cabin doors prior to final approach.
- (5) Before touchdown, turn ignition and master switches "OFF."
- (6) Land in a slightly tail-low attitude.

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

If an engine stoppage occurs, establish a flaps up glide at 80 MPH. If time permits, attempt to restart the engine by checking for fuel quantity, proper fuel selector valve position, and mixture control setting. Also check that engine primer is full in and locked and ignition switch is properly positioned.



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) Pull mixture control to idle cut-off position.
- (2) Turn fuel selector valve handle to "OFF."
- (3) Turn all switches "OFF" except master switch.
- (4) Airspeed -- 70 to 80 MPH (flaps up).
- (5) Extend wing flaps as necessary within gliding distance of field.
- (6) Airspeed -- 65 to 75 MPH (flaps down).
- (7) Turn master switch "OFF."
- (8) Unlatch cabin doors prior to final approach.
- (9) Land in a slightly tail-low attitude.
- (10) Apply heavy braking while holding full up elevator.

## 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 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 window 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 floatation for more than a few minutes.

## DISORIENTATION IN CLOUDS.

When flying in marginal weather, the pilot should make sure that the

Wing Leveler control knob (if installed) 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 elevator control. Avoid overcontrolling by keeping the hands off the control wheel and steering only with rudder.

### EMERGENCY LET-DOWNS THROUGH CLOUDS.

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

- (1) Apply full rich mixture.
- (2) Use full carburetor heat.
- (3) Reduce power to set up a 500 to 800 ft./min. rate of descent.
- (4) Adjust the elevator trim tab 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) Check trend of compass card movement and make cautious corrections with rudder to stop the turn.
- (8) Upon breaking out of clouds resume normal cruising flight.

## RECOVERY FROM A SPIRAL DIVE.

If a spiral is encountered, proceed as follows:

- (1) Close the throttle.
- (2) Stop the turn by using coordinated aileron and rudder control to align the symbolic airplane in the turn coordinator with the horizon reference line.
- (3) Cautiously apply elevator back pressure to slowly reduce the indicated airspeed to 90 MPH.
- (4) Adjust the elevator trim control to maintain a 90 MPH glide.
- (5) Keep hands off the control wheel, using rudder control to hold a straight heading.
- (6) Apply carburetor heat.
- (7) Clear engine occasionally, but avoid using enough power to disturb the trimmed glide.
- (8) Upon breaking out of clouds, apply normal cruising power and resume flight.

## FIRES.

### ENGINE FIRE DURING START ON GROUND.

Improper starting procedures such as pumping the throttle 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, release the starter switch and turn off master switch, ignition switch, and fuel selector valve handle.

- (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) Pull mixture control to idle cut-off.
- (2) Turn fuel selector valve handle "OFF."
- (3) Turn master switch "OFF."
- (4) Establish a 120 MPH glide.
- (5) Close cabin heat control.
- (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 cabin heat control full out to obtain windshield defroster airflow. Adjust cabin air control to get maximum defroster heat and airflow.
- (4) Open the throttle to increase engine speed and minimize ice build up on propeller blades.
- (5) Watch for signs of carburetor air filter ice and apply carburetor heat as required. An unexplained loss in engine speed could be caused by carburetor ice or air intake filter ice.
- (6) Plan a landing at the nearest airport. With an extremely rapid ice build-up, select a suitable "off airport" landing site.
- (7) With an ice accumulation of one quarter inch or more on the wing leading edges, be prepared for significantly higher stall speed.
- (8) Leave wing flaps retracted. With a severe ice build-up on the horizontal tail, the change in wing wake airflow direction caused by wing flap extension could result in a loss of elevator effectiveness.
- (9) Open left window and scrape ice from a portion of the windshield for visibility in the landing approach. The metal control lock shield may be used as a scraper.
- (10) Perform a landing approach using a forward slip, if necessary, for improved visibility.
- (11) Approach at 75 to 85 MPH, depending upon the amount of ice accumulation.
- (12) Avoid steep turns during the landing approach.
- (13) Perform a landing in level attitude.

## OPERATING LIMITATIONS

### OPERATIONS AUTHORIZED.

Your Cessna exceeds the requirements of airworthiness as set forth by the United States Government, and is certificated under FAA Type Certificate No. 3A12 as Cessna Model No. 172L.

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 both the normal and utility 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 . . . . .	2300 lbs
Flight Load Factor	
*Flaps Up . . . . .	+3.8            -1.52
*Flaps Down . . . . .	+3.5

\*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.

## MANEUVERS - UTILITY CATEGORY.

This airplane is not designed for purely aerobatic flight. However, in the acquisition of various certificates such as commercial pilot, instrument pilot and flight instructor, certain maneuvers are required by the FAA. All of these maneuvers are permitted in this airplane when operated in the utility category. In connection with the utility category, the following gross weight and flight load factors apply, with maximum entry speeds for maneuvers as shown:

Gross Weight . . . . .	2000 lbs
Flight Load Factor	
Flaps Up . . . . .	+4.4            -1.76
Flaps Down . . . . .	+3.5

In the utility category, the baggage compartment and rear seat must not be occupied. No aerobatic maneuvers are approved except those listed below:

<u>MANEUVER</u>	<u>MAXIMUM ENTRY SPEED*</u>
Chandelles . . . . .	122 mph (106 knots)
Lazy Eights . . . . .	122 mph (106 knots)
Steep Turns . . . . .	122 mph (106 knots)
Spins . . . . .	Slow Deceleration
Stalls (Except Whip Stalls). . . . .	Slow Deceleration

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

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

## 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) . . . . .	174 MPH
Maximum Structural Cruising Speed . . . . .	140 MPH
Maximum Speed, Flaps Extended . . . . .	100 MPH
*Maneuvering Speed . . . . .	122 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) . . . . .	174 MPH (red line)
Caution Range . . . . .	140-174 MPH (yellow arc)
Normal Operating Range. . . . .	59-140 MPH (green arc)
Flap Operating Range . . . . .	52-100 MPH (white arc)

## ENGINE OPERATION LIMITATIONS.

Power and Speed . . . . .	150 BHP at 2700 RPM
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## ENGINE INSTRUMENT MARKINGS.

### OIL TEMPERATURE GAGE.

Normal Operating Range . . . . .	Green Arc
Maximum Allowable . . . . .	245°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 QUANTITY INDICATORS.**

Empty (2.0 gallons unusable each tank) . . . . . E (red line)

**TACHOMETER.**

Normal Operating Range:

At sea level . . . . . 2200-2500 (inner green arc)

At 5000 feet . . . . . 2200-2600 (middle green arc)

At 10,000 feet . . . . . 2200-2700 (outer green arc)

Maximum Allowable. . . . . 2700 (red line)

**CARBURETOR AIR TEMPERATURE GAGE (OPT).**

Icing Range . . . . . -15° to 5°C (yellow 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 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**

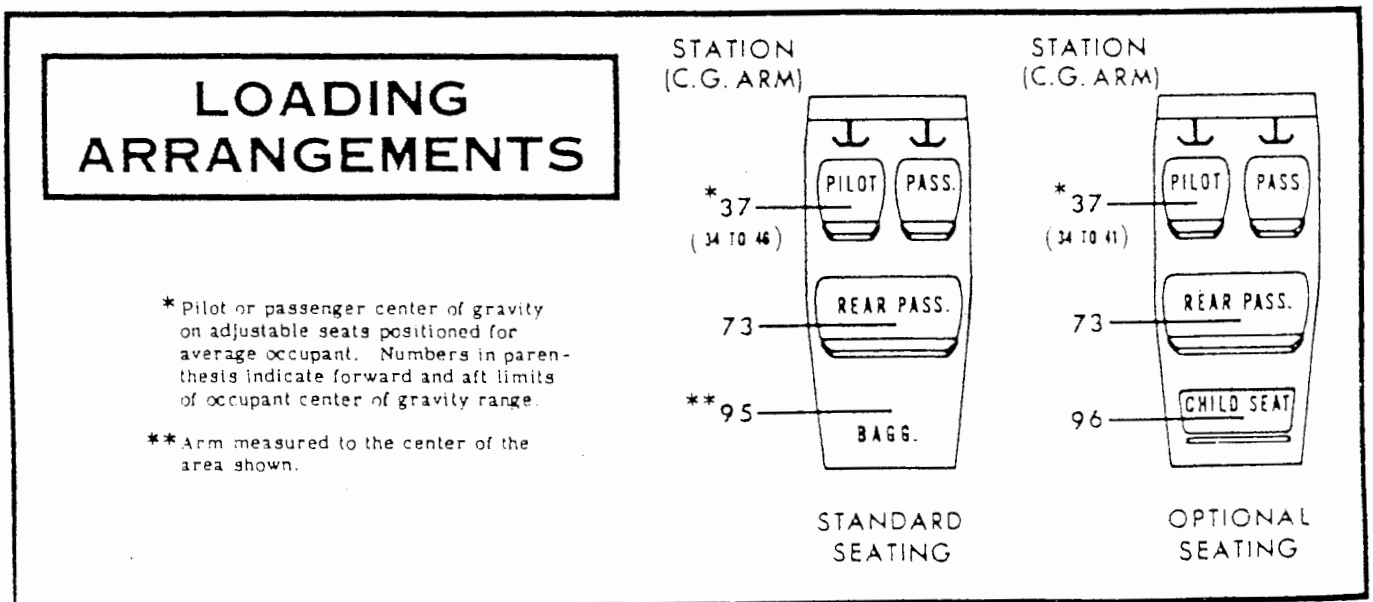
The Weight and Balance Data sheet is included in the aircraft file. In addition to the licensed empty weight and moment noted on this sheet, the c.g. arm (fuselage station) is shown. The c.g. arm figure need not be used on the Sample Loading Problem. The moment shown on the sheet must be divided by 1000 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.

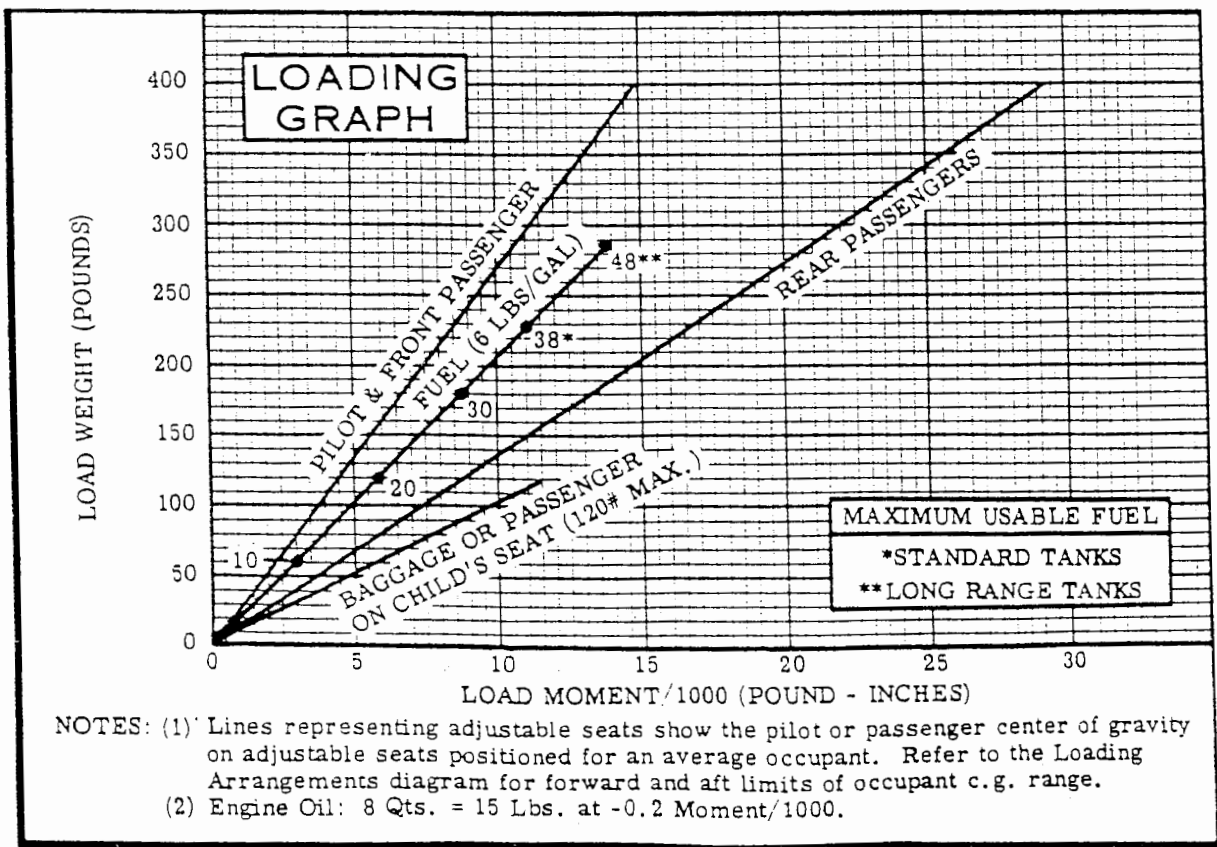
Total the weights and moments/1000 and plot these values on the Center of Gravity Moment Envelope to determine whether the point falls within the envelope, and if the loading is acceptable.

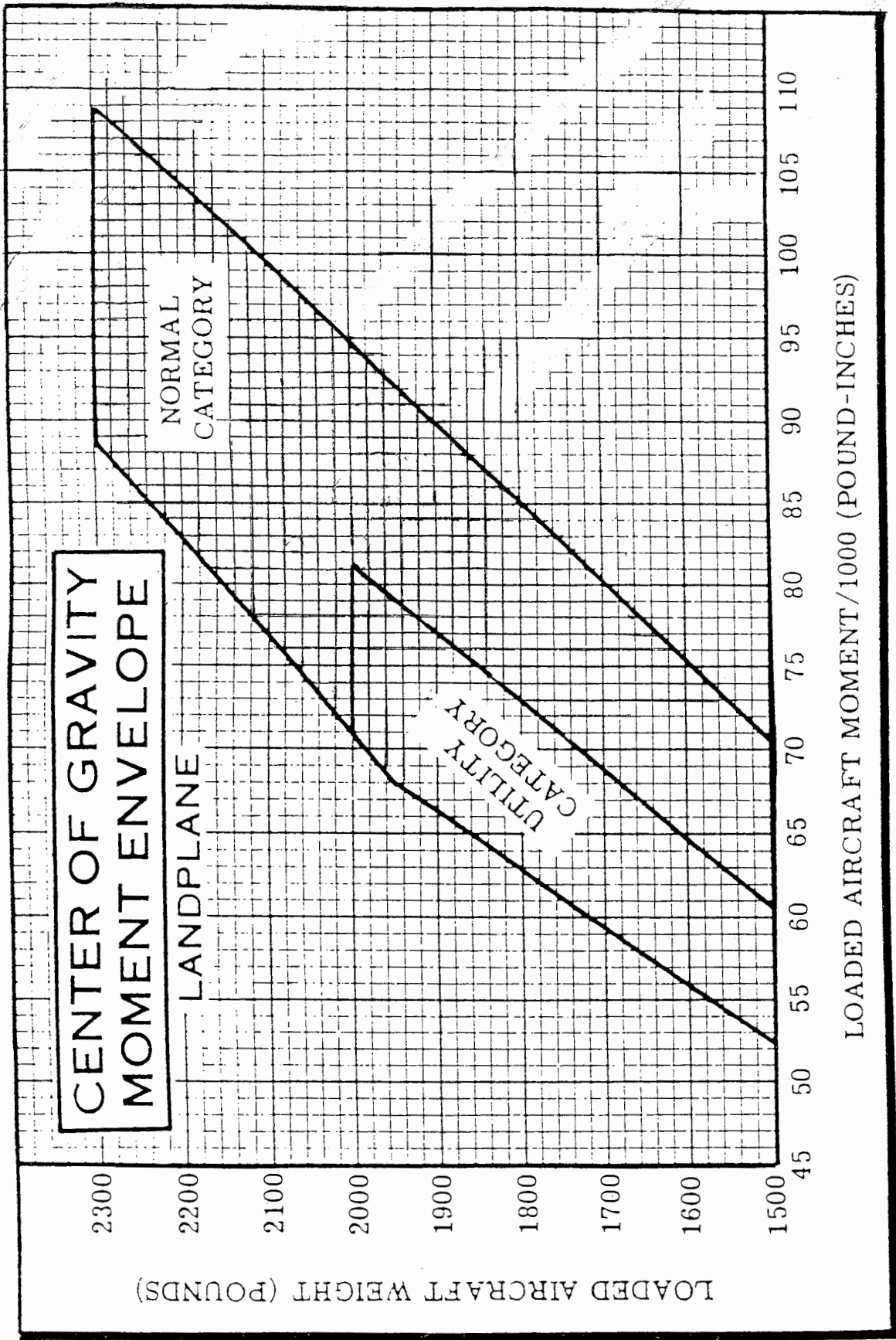


SAMPLE LOADING PROBLEM	SAMPLE AIRPLANE		YOUR AIRPLANE	
	Weight (lbs.)	Moment (lb. -ins. /1000)	Weight (lbs.)	Moment (lb. -ins. /1000)
1. Licensed Empty Weight (Sample Airplane) . . . . .	1364	51.7	<b>1414</b>	<b>54.5</b>
2. Oil (8 qts. - Full oil may be assumed for all flights) . . . . .	15	-0.2	15	-0.2
3. Fuel (Standard - 38 Gal at 6#/Gal) . . . . .	228	10.9		
Fuel (Long Range - 48 Gal at 6#/Gal) . . . . .				
4. Pilot and Front Passenger (Station 34 to 46) . . . . .	340	12.6		
5. Rear Passengers . . . . .	340	24.8		
6. Baggage (or Passenger on Child's Seat) (Station 82 to 108) . . . . .	13	1.2		
7. TOTAL WEIGHT AND MOMENT	2300	101.0		

8. Locate this point (2300 at 101.0) on the center of gravity moment envelope, and since this point falls within the envelope, the loading is acceptable.

Verified March, 2004





# LANDING DATA

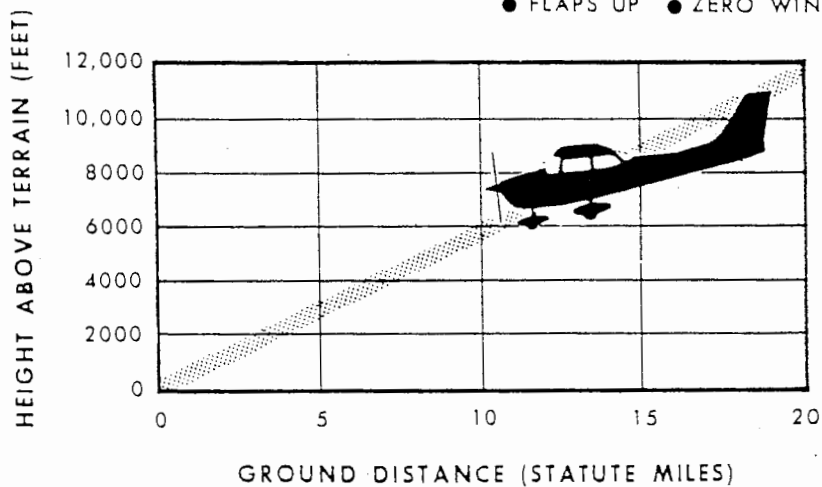
LANDING DISTANCE ON HARD SURFACE RUNWAY  
NO WIND - 40° FLAPS - POWER OFF

GROSS WEIGHT LBS.	APPROACH IAS MPH	@ S.L. & 59° F		@ 2500 ft. & 50° F		@ 5000 ft. & 41° F		@ 7500 ft. & 32° F	
		GROUND ROLL	TOTAL TO CLEAR 50' OBS.	GROUND ROLL	TOTAL TO CLEAR 50' OBS.	GROUND ROLL	TOTAL TO CLEAR 50' OBS.	GROUND ROLL	TOTAL TO CLEAR 50' OBS.
2300	69	520	1250	560	1310	605	1385	650	1455

- NOTES: 1. Reduce landing distance 10% for each 5 knot 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.

## MAXIMUM GLIDE

- SPEED 80 MPH (IAS)
- PROPELLER WINDMILLING
- FLAPS UP ● ZERO WIND



# CRUISE & RANGE PERFORMANCE

SKYHAWK

Gross Weight- 2300 Lbs.  
Standard Conditions  
Zero Wind Lean Mixture

NOTE: Maximum cruise is normally limited to 75% power. Cruise speed for the standard Model 172 is approximately one MPH less than shown below for the Skyhawk configuration.

ALT.	RPM	% BHP	TAS MPH	GAL / HOUR	38 GAL (NO RESERVE)		48 GAL (NO RESERVE)	
					ENDR. HOURS	RANGE MILES	ENDR. HOURS	RANGE MILES
2500	2700	86	134	9.7	3.9	525	4.9	660
	2600	79	129	8.6	4.4	570	5.6	720
	2500	72	123	7.8	4.9	600	6.2	760
	2400	65	117	7.2	5.3	620	6.7	780
	2300	58	111	6.7	5.7	630	7.2	795
	2200	52	103	6.3	6.1	625	7.7	790
5000	2700	82	134	9.0	4.2	565	5.3	710
	2600	75	128	8.1	4.7	600	5.9	760
	2500	68	122	7.4	5.1	625	6.4	790
	2400	61	116	6.9	5.5	635	6.9	805
	2300	55	108	6.5	5.9	635	7.4	805
	2200	49	100	6.0	6.3	630	7.9	795
7500	2700	78	133	8.4	4.5	600	5.7	755
	2600	71	127	7.7	4.9	625	6.2	790
	2500	64	121	7.1	5.3	645	6.7	810
	2400	58	113	6.7	5.7	645	7.2	820
	2300	52	105	6.2	6.1	640	7.7	810
	10,000	2650	70	129	7.6	5.0	640	6.3
2600		67	125	7.3	5.2	650	6.5	820
2500		61	118	6.9	5.5	655	7.0	830
2400		55	110	6.4	5.9	650	7.5	825
2300		49	100	6.0	6.3	635	8.0	800
12,500		2600	63	123	7.0	5.4	665	6.8
	2500	57	115	6.6	5.8	665	7.3	835
	2400	51	105	6.2	6.1	645	7.8	815

Figure 6-4.

## TAKE-OFF DATA

TAKE-OFF DISTANCE FROM HARD SURFACE RUNWAY WITH FLAPS UP

GROSS WEIGHT (POUNDS)	IAS AT 10' MPH	HEAD WIND KNOTS	AT SEA LEVEL & 59°F		AT 2500 FT. & 59°F		AT 5000 FT. & 41°F		AT 7500 FT. & 23°F	
			GROUND RUN	TOTAL TO CLEAR 50 FT. OBS.	GROUND RUN	TOTAL TO CLEAR 50 FT. OBS.	GROUND RUN	TOTAL TO CLEAR 50 FT. OBS.	GROUND RUN	TOTAL TO CLEAR 50 FT. OBS.
2000	58	0	465	1325	1040	1210	1255	2460	1355	2855
		10	415	1170	750	1165	320	1355	1150	3110
		20	405	110	305	1120	430	1480	310	2425
2000	50	0	500	1995	755	1325	905	1925	1120	2155
		10	425	320	530	1005	445	1250	319	1585
		20	275	530	340	720	425	710	595	1255
1700	58	0	435	730	520	320	425	1295	755	1370
		10	290	370	355	380	430	520	535	1040
		20	175	185	215	170	270	515	345	745

- NOTES: 1. Increase distance 10% for each 15°F above standard temperature for particular altitude.  
 2. For operation in a dry grass runway, increase distances both "ground run" and "total to clear 50 ft. obstacle" by 75% of the "total to clear 50 ft. obstacle" figure.

## MAXIMUM RATE-OF-CLIMB DATA

GROSS WEIGHT POUNDS	IAS MPH	RATE OF CLIMB FT. MIN.	GAL. OF FUEL USED	AT 5000 FT. & 41°F			AT 10,000 FT. & 23°F			AT 15,000 FT. & 5°F		
				IAS MPH	RATE OF CLIMB FT. MIN.	FROM S.L. FUEL USED	IAS MPH	RATE OF CLIMB FT. MIN.	FROM S.L. FUEL USED	IAS MPH	RATE OF CLIMB FT. MIN.	FROM S.L. FUEL USED
2000	42	445	1.0	31	425	2.4	79	330	4.3	73	22	11.5
2000	79	340	1.0	79	510	2.2	76	380	1.4	75	155	5.3
1700	77	1085	1.0	76	425	1.3	73	370	2.3	72	315	4.4

- NOTES: 1. Flaps up, full throttle, mixture leaned for smooth operation above 3000 ft.  
 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.

## STALL SPEEDS, POWER OFF

CONDITION	ANGLE OF BANK				
	0°	20°	40°	60°	
2300 LBS. GROSS WEIGHT	FLAPS UP	57	59	65	81
	FLAPS 10°	52	54	59	74
	FLAPS 40°	49	51	56	69

SPEEDS ARE MPH, CAS

## AIRSPEED CORRECTION TABLE

	IAS	40	50	60	70	80	90	100	110	120	130	140
FLAPS UP	CAS	55	58	65	72	82	91	101	110	120	129	139
FLAPS DOWN	CAS	48	54	63	72	82	93	105	•	•	•	•

## How to use the GPS In Cessna 7770G

Turn the unit on by pushing the **Red** button. Wait 3 to 5 minutes.  
When the unit is showing directional information you are ready to use it.  
To fly somewhere, push the **GOTO** button once.  
Type in the identifier of the airport you want to go to. Use a "K" if the identifier is 3 letters (KOSH) or not if there is a number in the identifier (W78).  
When you have the identifier typed in push the **ENTER** key.  
The screen will show the course and distance and the time to that waypoint.  
To see it in the map version, press the **QUIT** key.  
Fly so as to keep the line on the map straight up and down.  
If the screen flashes a MESSAGE, push the **PAGE** button to read it.  
Push **PAGE** again to return to the map.  
If nothing seems to work, turn the unit off by pressing the **Red** button until the screen counts down to off.  
Start over.

## How to use the Loran-C In Cessna 7770G

Turn it on and wait (3 to 5 Minutes)  
Press **ENT** then the **NAV** Keys.  
Turn the selector knob one click to the right  
The screen will tell you what waypoint (3-Letter Ident.) it is set to fly to.  
If that is where you want to go to, press NAV.  
If not, press and hold the **ENT** key for a moment until the identifier flashes.  
Turn the selector knob to identify a different waypoint.  
Press **ENT** and it will stop flashing.  
Press **NAV** to fly to it.  
Rotate the selector knob for more data about your trip to this waypoint.

