310 L

SECTION II
DESCRIPTION AND OPERATING DETAILS

The following paragraphs supply a general description of some systems and equipment in the airplane. This section also covers, in somewhat greater detail, some of the items in Checklist Form in Section I. Only those items of the Checklist requiring further explanation will be covered here.

EXTERIOR INSPECTION

The exterior inspection, described in Section I, is recommended for the first flight of the day. Inspection procedures for subsequent flights are normally limited to brief checks of the tail surface hinges, fuel and oil quantity, and security of fuel and oil filler caps. If the airplane has been in extended storage, has had recent major maintenance, or has been operated from marginal airports, a more extensive exterior inspection is recommended.

After major maintenance has been performed, the flight and trim tab controls should be double-checked for free and correct movement and security. The security of all inspection plates on the airplane should be checked following periodic inspections. Since radio and heater maintenance requires the mechanic to work in the nose compartment, the nose compartment access panels are opened for access to equipment. Therefore, it is important after such maintenance to double-check the security of these access panels. If the aiplane has been waxed or polished, check the external static pressure source holes for stoppage.

If the airplane has been exposed to much ground handling in a crowded hangar, it should be checked for dents and scratches on wings, tip tanks, fuselage, and tail surfaces, as well as damage to navigation and landing lights, deicer boots, and radio antenna. Outside storage for long periods may result in water and obstructions in airspeed system lines, condensation in fuel tanks, and dust and dirt on the intake air filters and engine cooling fins.

If the airplane has been operated from muddy fields or in snow and slush, check the main gear wheel wells and nosewheel for obstructions and cleanliness. Operation from a gravel or cinder field will require extra attention to propeller tips and abrasion on leading edges of the horizontal tail. Stone damage to the outer six-inches of the propeller tips can seriously reduce the fatigue life of the blades.

Airplanes that are operated from rough fields, especially at high altitudes, are subjected to abnormal landing gear abuse. Check frequently all components of the landing gear retracting mechanisms, shock struts, tires and brakes.

To prevent loss of fuel in flight, make sure main and auxiliary fuel tank filler caps are tightly sealed. The main fuel tank vents beneath the tip tanks should also be inspected for obstructions, ice or water, especially after operation in cold, wet weather.

The interior inspection will vary according to the mission and the optional equipment installed. Prior to high-altitude flights, it is important to check the condition and quantity of oxygen face masks and hose assemblies. The oxygen supply system should be functionally checked to insure that it is in working order. The oxygen pressure gage should indicate between 300 and 1800 PSI depending upon the anticipated requirements.

Satisfactory operation of the pitot tube, stall warning transmitter and main fuel tank vent heating elements is determined by observing a discharge on the voltammeter when the pitot heat switch is turned ON. The effectiveness of the pitot tube and stall warning transmitter heating elements may be verified by cautiously feeling the heat of both devices while the pitot heat switch is ON.

Flights at night and in cold weather involve a careful check of other specific areas which will be discussed later in this section.

STARTING ENGINES

The left engine is normally started first because the cable from the battery to this engine is much shorter permitting more electrical power to be delivered to the starter. If battery is low, the left engine should start more readily.

When using an external power source, it is recommended to start the airplane with the battery switch OFF.

NOTE

Release starter switch as soon as engine fires or engine will not accelerate and flooding may result.

The continuous flow fuel injection system will start spraying fuel in the engine intake ports as soon as the primer switch is actuated and the throttle and mixture controls are opened. If the auxiliary pump is turned on accidentally while the engine is stopped, with the throttle open and the mixture rich, solid fuel will collect temporarily in the cylinder intake ports, the quantity depending upon the amount of throttle opening and the length of time the pump has been operating. If this happens, it is advisable to wait a few minutes until the fuel drains away before starting the engine. To avoid flooding, begin cranking the engine prior to priming the engine.

In hot weather with a hot engine, a fluctuating fuel flow slightly lower than normal may be obtained. This is an indication of vaporized fuel and the starter should not be energized until a steady fuel flow indication is obtained.

NOTE

Caution should be exercised to prevent overpriming the engine in hot weather.

Engine mis-starts characterized by weak, intermittent explosions, followed by black puffs of smoke from the exhaust are the result of flooding or overpriming. This situation is more apt to develop in hot weather, or when the engines are hot. If it occurs, repeat the starting procedure with the throttle approximately 1/2 open, the mixture in the IDLE CUT-OFF positon and the primer switch OFF. As the engine fires, move the mixture control to FULL RICH and close the throttle to idle.

If an engine is underprimed, as may occur in cold weather with a cold engine, repeat the starting procedure while holding the primer switch on for 5 to 10 seconds until the engine fires.

If cranking longer than 30 seconds is required, allow starter-motor to cool five minutes before cranking again, since excessive heat may damage the armature windings.

TAXIING

A steerable nosewheel, interconnected with the rudder system, provides positive control up to 15° left or right, and free turning from 15° to 55° for sharp turns during taxiing. Normal steering may be aided through use of differential power and differential braking on the main wheels. These aids are listed in the preferred order of use.

At some time early in the taxi run, the brakes should be tested, and any unusual reaction, such as uneven braking, should be noted. If brake operation is not satisfactory, the airplane should be returned to the tie-down location and the malfunction corrected. The operation of the turn-and-bank indicator and directional gyro should also be checked during taxiing.

Most of the engine warm-up should be done during taxiing, with just enough power to keep the airplane moving. Engine speed should not exceed 1000 RPM while the oil is cold.

BEFORE TAKEOFF (Use The Pilot's Checklist)

Use the Pilot's Checklist in the airplane to prevent the possibility of overlooking an important check item.

Most of the warm-up will have been conducted during taxi, and additional warm-up before takeoff should be restricted to the checks outlined in Section I.

Full throttle checks on the ground are not recommended unless there is good reason to suspect that the engines are not operating properly. Do not runup the engines over loose gravel or cinders because of possible stone damage or abrasion to the propeller tips.

If the magnetos produce an engine speed drop in excess of 125 RPM, or if the drop in RPM between the left and right magneto differs by more than 50 RPM, continue warm-up a minute or two longer, before rechecking the system. If there is doubt concerning operation of the magnetos, checks at higher engine speed will usually confirm if a deficiency exists. In general, a drop in excess of 125 RPM is not considered acceptable.

If instrument flights are contemplated, a careful check should be made of the vacuum system. The minimum and maximum allowable suctions are 4.75 and 5.25 inches of mercury, respectively, on the instrument. Good alternator condition is also important for instrument flight, since satisfactory operation of all radio equipment and electrical instruments is essential. The alternators are checked during engine runup (1700 RPM) by positioning the selector switch in the L ALT and R ALT position and observing the charging rate on the ammeter.

A simple last minute recheck of important items should include a quick glance to see if all switches are ON, the mixture and propeller pitch levers are forward, all flight controls have free and correct movement, and the fuel selectors are properly positioned.

A mental review of all single engine speeds, procedures, and field length requirements should be made prior to takeoff.

TAKEOFF

Since the use of full throttle is not recommended in the static runup, closely observe full-power engine operation early in the takeoff run. Signs of rough engine operation, unequal power between engines, or sluggish engine acceleration are good cause for discontinuing the takeoff. If this occurs, you are justified in making a thorough, full throttle, static runup before another takeoff is attempted.

For maximum engine power, the mixture should be adjusted during the initial acceleration for smooth engine operation at the field elevation. The engine acceleration is increased significantly with fuel leaning above 3000 feet and this procedure always should be employed for field elevations greater than 5000 feet above sea level.

MULTI-ENGINE AIRSPEED NOMENCLATURE		MPH IAS
(1)	Multi-Engine Best Rate-of-Climb	124
(2)	Multi-Engine Best Angle-of-Climb	97
(3)	Takeoff and Climb to 50 Ft.	105
(4)	Landing Approach from 50 Ft.	105

Figure 2-1

Full throttle operation is recommended on takeoff since it is important that a speed well above minimum single-engine control speed (87 MPH) be obtained as rapidly as possible. It is desirable to accelerate the airplane to 105 MPH (recommended safe single-engine speed) while still on the ground for additional safety in case of an engine failure. This safety may have to be compromised slightly where short and rough fields prohibit such high speed before takeoff.

After takeoff it is important to maintain the recommended safe single-engine climb speed (105 MPH). As you accelerate still further to best single-engine rate-of-climb speed (120 MPH), it is good practice to climb rapidly to an altitude at which the airplane is capable of circling the field on one engine.

After obstruction height is reached, power may be reduced and climb speeds may be established as described in Section I.

On long runways, the landing gear should be retracted at the point over the runway where a wheels-down, forced landing on that runway would become impractical. However, on short runways it may be preferable to retract the landing gear after the airplane is safely airborne.

For crosswind takeoffs, additional power may be carried on the upwind engine until the rudder becomes effective. The airplane is accelerated to a slightly higher than normal takeoff speed, and then is pulled off abruptly to prevent possible settling back to the runway while drifting. When clear of the ground, a coordinated turn is made into the wind to correct for drift.

A takeoff with one tip tank full and the opposite tank empty creates a lateral unbalance at takeoff speed. This is not recommended since gusty air or premature lift-off could create a serious control problem.

Performance data for normal takeoff, accelerate stop distance and single-engine takeoff are presented in Section VI.

AFTER TAKEOFF

To set up the airplane in climb configuration, retract the landing gear, adjust power for climb, turn off the auxiliary fuel pumps and adjust the mixture for the power setting selected.

Power reduction will vary according to the requirements of the traffic pattern or surrounding terrain, gross weight, field elevation, temperature and engine condition. However, a normal "after takeoff" power setting is 24 inches of manifold pressure and 2450 RPM.

Before retracting the landing gear, apply the brakes momentarily to stop the main wheels. Centrifugal force caused by the rapidly-rotating wheels expands the diameter of the tires, and if ice or mud has accumulated in the wheel wells, the rotating wheels may rub as they enter.

CLIMB

To save time and fuel for the over-all trip, it is recommended that the normal cruising climb be conducted at 130 to 150 MPH using approximately 75% power (24 inches Hg. manifold pressure, 2450 RPM).

The mixture should be leaned in this type of climb to give the desired fuel flow in the climb dial range which is approximately best power mixture.

If it is necessary to climb rapidly to clear mountains or reach favorable winds at high altitudes, the best rate-of-climb speed should be used with maximum power. This speed varies from 124 MPH at sea level to 122 MPH at 10,000 feet. During maximum performance climbs, the mixture should be leaned to the appropriate altitude markings on the fuel flow gage. It is recommended that the auxiliary fuel pumps be on at altitudes above 12,000 feet for the duration of the climb and approximately 5 to 15 minutes after establishing cruising flight. It is also recommended that the mixture remain at the climb mixture setting for approximately 5 minutes after establishing cruising flight before leaning is initiated. These procedures will eliminate fuel vaporization problems likely to occur from rapid altitude changes.

If an obstruction ahead requires a steep climb angle, the airplane should be flown at the best angle-of-climb speed with flaps up and maximum power. This speed varies from 97 MPH at sea level to 112 MPH at 15,000 feet. Performance data for maximum climb, cruise climb and single-engine climb are presented in Section VI.

CRUISE

Tabulated cruising information is provided for normal power and altitudes in Section VI. These charts are based on 100 and 140 gallons of fuel for cruise, normal lean mixture, 5200 pounds gross weight, zero wind, and no fuel reserve. Allowances for warm-up, takeoff and climb, headwinds, variations in mixture leaning technique, and fuel reserve should be estimated; and the endurance and range shown in the charts should be modified accordingly. Fuel allowances for takeoff and climb are given in Section VI.

Normal cruising requires between 60% and 70% power. The manifold pressure and RPM settings required to obtain these powers at various altitudes and outside air temperatures can be determined with your Cessna Model 310 Power Computer. A maximum cruising power of approximately 75% (24 inches Hg. manifold pressure, 2450 RPM) may be used if desired.

Various percent powers can be obtained with a number of combinations of manifold pressures, engine speeds, altitudes, and outside air temperatures. However, at full throttle and constant engine speed, a specific power can be obtained at only one altitude for each given air temperature.

To achieve the level flight performance shown in the Cruise Performance Charts in Section VI, lean the mixtures to give the fuel flows shown. This will yield airspeeds slightly below (approximately one to two MPH) those available at best power mixture.

Should maximum speed be desirable, the mixture should be adjusted to approximately one gph higher than that indicated by the range charts or the Cessna Model 310 Power Computer. This will yield approximately best power mixture with a resulting airspeed of one to two MPH greater and a fuel flow approximately one gallon per hour greater than those listed in Section VI.

For a given throttle setting, select the lowest engine speed in the green arc range that will give smooth engine operation without evidence of laboring.

For best propeller synchronizing, the final adjustment of the propeller pitch levers should be made in a DECREASE RPM direction.

Refer to Auxiliary Fuel System paragraph in Section VII for proper fuel system management when the Auxiliary Fuel Tanks are used.

ALTERNATE INDUCTION AIR SYSTEM

The induction air system on these engines is considered to be non-icing. However, manually-operated alternate induction air is provided to assure satisfactory operation should the induction air filter become obstructed with ice. Should a decrease in manifold pressure be experienced when flying in icing conditions, the alternate air doors should be manually opened. This will provide continued satisfactory engine operation.

Since the higher intake air temperature when using alternate intake air results in a decrease in engine power, it is recommended that the alternate intake air not be utilized until indications of intake filter icing are actually observed.

Should additional power be required, the following procedure should be employed:

(1) Push propeller levers full forward for 2625 RPM. This will insure that the maximum power available is being used.
(2) Move throttles forward until maximum manifold pressure is reached.

(3) Readjust mixture control for smooth engine operation.

STALL

The stall characteristics of the airplane are conventional and aural warnings are provided by the stall warning horn between 5 and 10 MPH above the stall in all configurations. The stall is also preceded by a mild aerodynamic buffet which increases in intensity as the stall is approached. The power-on stall occurs at a very steep angle, with or without flaps, and it is difficult to inadvertantly stall the airplane during normal maneuvering.

Power-off stall speeds at maximum weight and various bank angles are presented in Section VI.

MANEUVERING FLIGHT

No aerobatic maneuvers, including spins, are approved in this airplane. The airplane is, however, conventional in all respects through the maneuvering range encountered in normal flight.

SPINS

Intentional spins are not permitted in this airplane. Should a spin occur, however, the following recovery procedures should be employed:

(1) Cut power on both engines.
(2) Apply full rudder opposing the direction of rotation.
(3) Approximately 1/2 turn after applying rudder, push control wheel forward briskly.
(4) To expedite recovery, add power to the engine toward the inside of the direction of turn.
(5) Pull out of the resulting dive with smooth, steady control pressure.

LETDOWN

Letdowns should be initiated far enough in advance of estimated landing to allow a gradual rate of descent at cruising speed. It should be at approximately 500 fpm for passenger comfort, using enough power to keep the engines warm. This will prevent undesirable low cylinder head temperatures caused by low power settings at cruise speed. The optimum engine speed in a letdown is usually the lowest one in the RPM green arc range that will allow cylinder head temperatures to remain in the recommended operating range.

BEFORE LANDING

If fuel has been consumed at uneven rates between the two main tanks because of prolonged single-engine flight, it is desirable to balance the fuel load by operating both engines from the fullest tank. However, if there is sufficient fuel in both tanks, even though they may have unequal quantities, it is important to switch the left and right selector valves to the left and right main tanks respectively, and feel for detent, for the landing. This will provide an adequate fuel flow to each engine if a full-power go-around is necessary.

Landing gear extension before landing is easily detected by a slight change in airplane trim and a slight "bump" as the gear locks down. Illumination of the gear-down indicator lights (green), is further proof that the gear is down and locked. If it is reasonably certain that the gear is down and one of the gear-down indicator lights is still not illuminated, the malfunction could be caused by a burned out light bulb. This can be checked by pushing-to-test. If the bulb is burned out, it can be replaced with the bulb from either the compass light, turn-and-bank test light, or the landing gear up (amber) indicator light.

A simple last-minute recheck on final approach should confirm that all switches are ON, the gear-down indicator lights (green) are illuminated, and the propeller pitch levers and mixture levers are full forward.

LANDING

Landings are simple and conventional in every respect. If power is used in landing approaches, it should be eased off cautiously near touchdown, because the "power-on" stall speed is considerably less than the "power-off" stall speed. An abrupt power reduction at five feet altitude could result in a hard landing if the airplane is near stall speed.

Landings on hard-surface runways are performed with 35° flaps from 105 MPH approach, using as little power as practicable. A normal flare-out is made, and power is reduced in the flare-out. The landing is made on the main wheels first, and remaining engine power is cut immediately after touchdown, The nosewheel is gently lowered to the ground and braking is applied as required. Short field landings on rough or soft runways are done in a similar manner except that the nosewheel is lowered to the runway at a lower speed to prevent excessive nose gear loads.

Crosswind landings are performed with the least effort by using the crab method. However, either the wing-low, crab or combination method may be used. Crab the airplane into the wind in a normal approach, using a minimum flap setting for the field length. Immediately before touchdown, the airplane is aligned with the flight path by applying down-wind rudder. The landing is made in nearly three-point attitude, and the nosewheel is lowered to the runway immediately after touchdown. A straight course is maintained with the steerable nosewheel and occasional braking if necessary.

Landing performance data is presented in Section VI.

AFTER LANDING

Heavy braking in the landing roll is not recommended because skidding the main wheels is probable, with resulting loss of the braking effectiveness and damage to the tires. It is best to leave the flaps fully extended throughout the landing roll to aid in decelerating the airplane. After leaving the active runway, the flaps should be retracted. Be sure the flaps switch is identified before placing it in the UP position. The auxiliary fuel pump switches normally are turned to LOW while taxiing to the hangar, except in extremely hot weather when auxiliary fuel pumps may be needed to maintain steady fuel flow.

Parking is normally accomplished with the nosewheel aligned straight ahead. This simplifies the steering during subsequent departures from the parking area. However, if gusty wind conditions prevail, the nosewheel should be castered to the extreme right or left position. This forces the rudder against the rudder stop which minimizes buffeting of the rudder in gusty wind.

With the mixture levers in IDLE CUT-OFF, the fuel flow is effectively blocked at the fuel metering unit. Thus, it is unnecessary to place the fuel selector valve handles in the OFF position if the airplane is receiving normal usage. However, if a long period of inactivity is anticipated, the fuel selector valve handles should be turned OFF to preclude any possible fuel seepage that might develop through the metering valve.

IMPORTANT

Do not leave the fuel selector handles in an intermediate position, as fuel from the main tip tanks will transfer into the auxiliary tanks if optional auxiliary fuel tanks are installed in your airplane.

NIGHT FLYING

Before starting engines for a night flight, rheostats should be turned on and adjusted to provide enough illumination to check all switches, controls, etc.

Navigation lights are then checked by observing illumination in the small peep holes in the inboard leading edges of the wing tip tanks and reflection from the pavement or ground below the tail light. The operation of the rotating beacons should be checked by observing the reflections on the ground and on the tip tanks and wings. The retractable landing lights (the right landing light is optional equipment) may be extended and checked momentarily. Returning the landing light switches to OFF, turns the lights off but leaves them extended ready for instant use.

Before taxi, the interior lighting intensity is normally decreased to the minimum at which all the controls and switches are visible. The taxi light should be turned on prior to taxiing at night. The landing lights, if used during taxiing, should be used intermittently to avoid excessive drain on the batteries. In the engine runups, special attention should be directed to alternator operation by individually turning the selector switch to L ALT and R ALT and noting response on the ammeter.

Night takeoff are conventional, although gear retraction operation is usually delayed slightly to insure the airplane is well clear of the runway.

In cruising flight, the interior lighting intensity should be decreased to the minimum which will provide adequate instrument legibility. This intensity should be readjusted periodically during flight as the degree of night vision adaptation or exterior ambient light level changes. Care should be exercised when increasing the intensity of illumination to preclude inadvertent deterioration of night vision adaptation.

COLD WEATHER OPERATION

Whenever possible, external preheat should be utilized in cold weather. The use of preheat materially reduces the severity of conditions imposed on both engines and electrical systems. It is the preferred or best method of starting engines in extremely cold weather. Preheat will thaw the oil trapped in the oil coolers and oil filters, which will probably be congealed prior to starting in very cold weather. When the oil pressure gage is extremely slow in indicating pressure, it may be advisable to fill the pressure line to the gage with kerosene or JP4.

If preheat is not available, external power should be used for starting because of the higher cranking power required and the decreased battery output at low temperatures. The starting procedure is normal, however, if the engines do not start immediately, it may be necessary to position the primer switch to LEFT or RIGHT for 5 to 10 seconds.

After a suitable warm-up period (2 to 5 minutes at 1000 RPM, if preheat is not used) accelerate the engines several times to higher RPM. The propellers should be operated through several complete cycles to warm the governors and propeller hubs. If the engines accelerate smoothly and the oil pressure remains normal and steady, the airplane is ready for takeoff.

During cruise the propellers should be exercised at half-hour intervals to flush the cold oil from the governors and propeller hubs. Electrical equipment should be managed to assure adequate alternator charging throughout the flight, since cold weather adversely affects battery capacity.

During letdown, watch engine temperature closely and carry sufficient power to maintain them above operating minimums.

The pitot, tip tank vents and stall warning heater switches should be turned ON at least 5 minutes before entering potential icing conditions (2 minutes if on the ground) so that these units will be warm enough to prevent formation of ice. Preventing ice is preferable to attempting its removal once it has formed.

Refer to Section VII for Optional Cold Weather Equipment.

FUEL SYSTEM

Fuel for each engine is supplied by a main tank (50 gallons useable) on each wing tip. Each engine has its own complete fuel system; the two systems are interconnected only by a cross-feed for emergency use. Vapor and excess fuel from the engines are returned to the main fuel tanks. Submerged electric auxiliary pumps in the main fuel tanks supply fuel for priming and starting, and for engine operation as a backup system to the engine-driven pumps. Refer to Figure 2-2 for Fuel System Schematic and Auxiliary Fuel System paragraph in Section VII for additional information.

NOTE

During very hot weather, if there is an indication of vapor in the fuel system (fluctuating fuel flow) or anytime when climbing above 12,000 feet, turn the auxiliary fuel pumps ON until cruising altitude has been obtained and the system is purged (usually 5 to 10 minutes after establishing cruising flight) It is recommended that the mixture remain at the climb mixture setting for approximately 5 minutes after establishing cruising flight before leaning is initiated.

FUEL SELECTOR VALVE HANDLES

The fuel selector valve placards are marked LEFT ENGINE OFF, LEFT MAIN and RIGHT MAIN for the left engine selector, and RIGHT ENGINE OFF, RIGHT MAIN and LEFT MAIN for the right engine selector. The cross-feed position of each selector valve is the one marked for the opposite main tank.

The fuel selector valve handles form the pointers for the selectors. The ends of the handles are arrow-shaped and point to the position on the selector placard which corresponds to the valve position.

NOTE

- The fuel selector valve handles should be turned to LEFT MAIN for the left engine and RIGHT MAIN for the right engine, during takeoff, landing, and all normal operations.

- When fuel selector valve handles are changed from one position to another, the auxiliary fuel pumps should be energized, the mixture should be in FULL RICH and the pilot should feel for the detent to insure that fuel selector valve is properly positioned.

AUXILIARY FUEL PUMP SWITCHES

The LOW position runs the pumps at low speed, providing 6 gallons per hour fuel flow for purging. The ON position also runs the pumps at low speed, as long as the engine-driven pumps are functioning. With the switch positioned to ON, however, if an engine-driven pump should fail, the auxiliary pump on that side will switch to high speed automatically, providing sufficient fuel for all engine operations including emergency takeoff. The auxiliary fuel pump will not run unless the engine oil pressure on that side is at least 20 PSI.

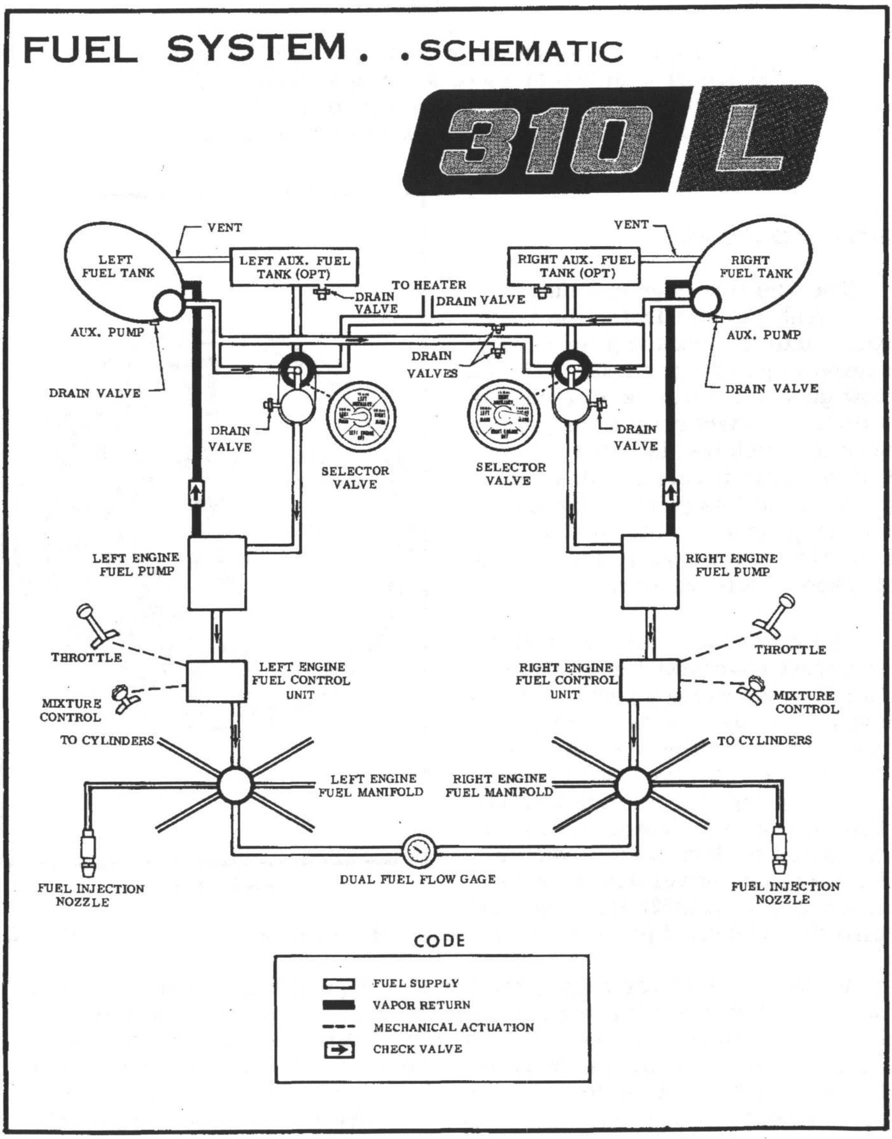

FUEL SYSTEM . .SCHEMATIC
310L
VENT
VENT
LEFT FUEL TANK
LEFT AUX. FUEL TANK (OPT)
RIGHT AUX. FUEL TANK (OPT)
RIGHT FUEL TANK
TO HEATER
DRAIN VALVE
DRAIN VALVE
AUX. PUMP
AUX. PUMP
DRAIN VALVES
DRAIN VALVE
DRAIN VALVE
DRAIN VALVE
DRAIN VALVE
SELECTOR VALVE
SELECTOR VALVE
LEFT ENGINE FUEL PUMP
RIGHT ENGINE FUEL PUMP
THROTTLE
THROTTLE
LEFT ENGINE FUEL CONTROL UNIT
RIGHT ENGINE FUEL CONTROL UNIT
MIXTURE CONTROL
MIXTURE CONTROL
TO CYLINDERS
TO CYLINDERS
LEFT ENGINE FUEL MANIFOLD
RIGHT ENGINE FUEL MANIFOLD
DUAL FUEL FLOW GAGE
FUEL INJECTION NOZZLE
FUEL INJECTION NOZZLE
CODE
FUEL SUPPLY
VAPOR RETURN
MECHANICAL ACTUATION
CHECK VALVE

Figure 2-2

NOTE

If the auxiliary fuel pump switches are positioned to ON longer than two or three seconds with the engines inoperative, on the ground, the engines and/or airplane may be damaged due to excessive fuel accumulations.

FUEL FLOW GAGE

The fuel flow gage is a dual instrument which indicates the approximate fuel consumption of each engine in gallons per hour. The fuel flow gage used with the Continental injection system senses the pressure at which fuel is delivered to the engine spray nozzles. Since fuel pressure at this point is approximately proportional to the fuel consumption of the engine, the gage is marked as a flowmeter.

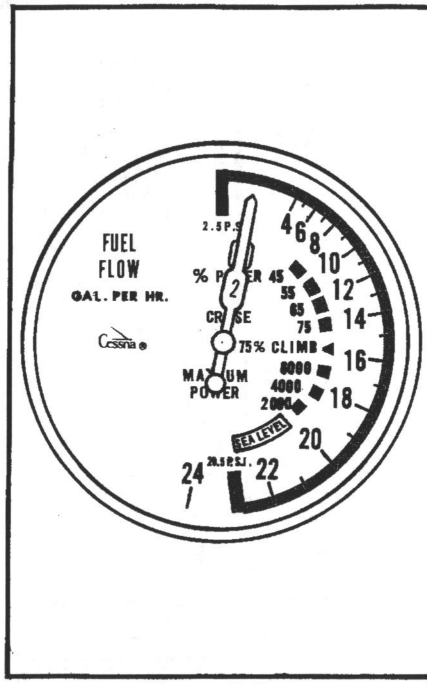


Figure 2-3.

The gage dial is marked with arc segments corresponding to proper fuel flow for various power settings and is used as a guide to quickly set the mixtures. The gage has markings for takeoff climb and cruise power settings for various altitudes. The takeoff climb markings indicate maximum performance mixtures for maximum power available for altitudes shown (2625 RPM and fuel throttle), making it practical to lean the mixtures on a high-altitude takeoff.

In the cruise power range, the low flow edge of each green segment is the normal-lean setting and the high flow edge is the best-power setting for that percentage of power. In the takeoff and climb range, each segment represents a maximum-power mixture for an altitude range; the low flow edge is the setting for the marked altitude and the high flow edge is the setting for a thousand feet lower. The sea level segment represents the range for maximum rated power at sea level.

NOTE

The fuel flow settings on the takeoff and climb power segments of the dial are for 2625 RPM and full throttle, only. Climb power settings at lower RPM should be taken from the Cessna 310 Power Computer.

FUEL STRAINER AND TANK SUMP DRAINS

Refer to Lubrication and Servicing Procedures, Section V.

ELECTRICAL SYSTEM

Electrical energy is supplied by a 28-volt, negative-ground, direct-current system, powered by a standard 50 ampere, or optional 66 ampere, engine-driven alternator on each engine. Two 12-volt batteries, connected in series, are located in the left wing just outboard of the engine nacelle. An optional external power receptacle is installed in the left wing under the batteries. The receptacle accepts a standard external power source plug. Refer to Figure 2-4 for Electrical Distribution Schematic.

BATTERY AND ALTERNATOR SWITCHES

Separate battery and alternator switches are provided as a means for checking for malfunctioning alternator circuit and permits such a circuit to be cut-off. If an alternator circuit fails or malfunctions, or when one engine is not running, the switch for that alternator should be turned off. Operation should be continued on the functioning alternator, using only necessary electrical equipment. If both alternator circuits should malfunction, equipment can be operated at short intervals and for a limited amount of time on the battery alone. In either case, a landing should be made as soon as possible to check and repair the circuits.

NOTE

When the battery switch is positioned to OFF, both alternators will be shut off, except when the alternators are energized by the emergency power switch.

AMMETER

An ammeter, located on the instrument panel, is provided to monitor

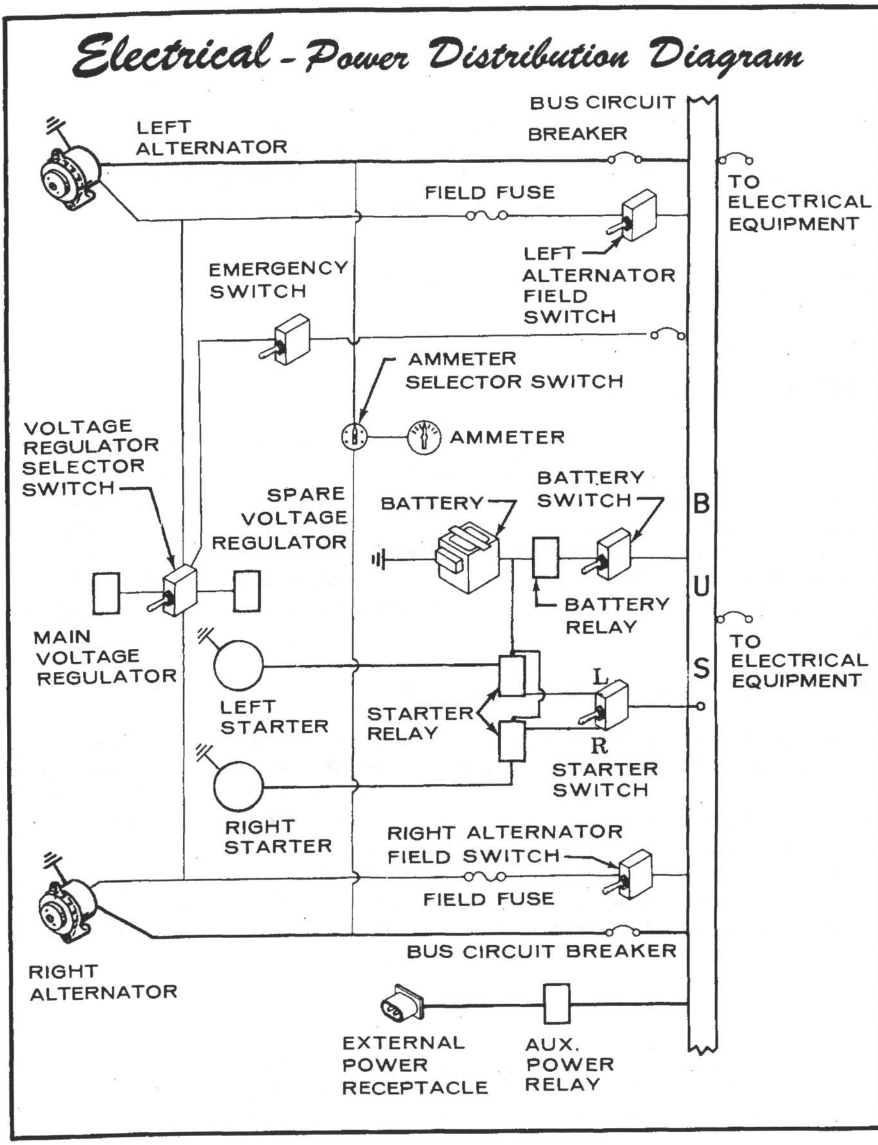

Electrical - Power Distribution Diagram
BUS CIRCUIT BREAKER
LEFT ALTERNATOR
FIELD FUSE
TO ELECTRICAL EQUIPMENT
LEFT ALTERNATOR FIELD SWITCH
EMERGENCY SWITCH
AMMETER SELECTOR SWITCH
VOLTAGE REGULATOR SELECTOR SWITCH
AMMETER
SPARE VOLTAGE REGULATOR
BATTERY
BATTERY SWITCH
B
U
S
BATTERY RELAY
MAIN VOLTAGE REGULATOR
TO ELECTRICAL EQUIPMENT
L
LEFT STARTER
STARTER RELAY
R
STARTER SWITCH
RIGHT STARTER
RIGHT ALTERNATOR FIELD SWITCH
FIELD FUSE
BUS CIRCUIT BREAKER
RIGHT ALTERNATOR
EXTERNAL POWER RECEPTACLE
AUX. POWER RELAY

Figure 2-4

alternator current output, battery charge or discharge rate. A selector switch, labeled L ALT, R ALT, and BATT is located in front of the ammeter. By positioning the switch to L ALT, R ALT, or BATT position, the respective alternator amperage can be monitored.

EMERGENCY POWER SWITCH

An emergency power switch is provided on the alternator system and is located below the circuit breaker panel. The emergency power switch supplies power to operate the alternators in case of battery failure. These alternators will not operate without some battery excitation, and placing the emergency power switch in the ON position, provides excitation from the battery even though the battery is considered to have failed.

NOTE

The battery switch must be in the OFF position before turning the emergency power switch ON.

VOLTAGE REGULATOR SWITCH

The voltage regulator switch, provided on the alternator system, is used for manually selecting the standby voltage regulator in case of main regulator failure. The switch, located on the instrument panel, has two positions; MAIN, which is the position for all normal operation; STBY, for manually selecting the standby voltage regulator, if the main voltage regulator fails.

OVERVOLTAGE RELAY

An overvoltage relay in the electrical system constantly monitors system voltage. If voltage exceeds a predetermined maximum, the relay will open and both alternators will be disabled. Positioning the regulator selector switch from MAIN to STBY will automatically reset the relay.

CIRCUIT BREAKERS

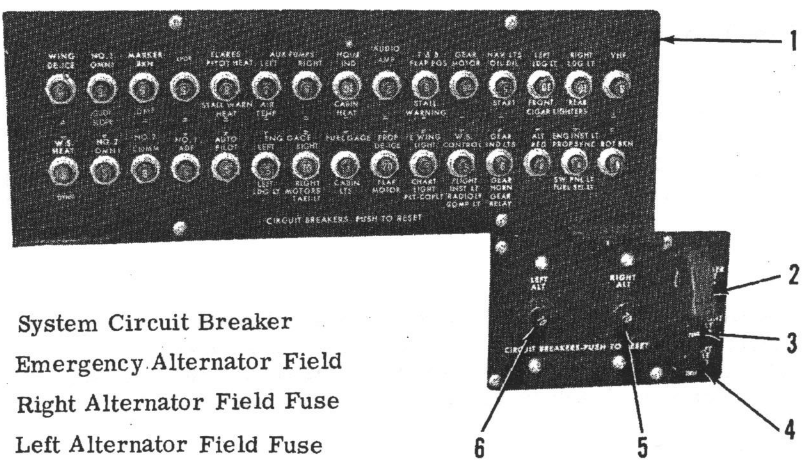
All electrical circuits in the airplane are protected by push-to-reset type circuit breakers (except the alternator field circuit which is protected by a fuse). Should an overload occur in any circuit, the resulting heat rise will cause the controlling circuit breaker to open the circuit. After allowing the circuit breaker to cool for approximately three minutes, it may be pushed (until a click is heard or felt) to re-energize the circuit. However, the circuit breaker should not be held in if it opens the circuit a second time, as this indicates a short circuit.

LANDING GEAR SYSTEM

The electrically-operated landing gear is fully-retractable and incorporates a steerable nosewheel. To help prevent accidental retraction, an automatic safety switch on the LEFT shock strut prevents retraction as long as the weight of the airplane is sufficient to compress the strut. The landing gear is operated by a switch, which is identified by a wheel-shaped knob. The switch positions are UP, OFF (center) and DOWN. To operate the gear, pull-out the switch knob and move to the desired position.

LANDING GEAR POSITION LIGHTS

Four landing gear position lights are provided, one above and three below, the landing gear switch. The upper light is amber and will illuminate at all times when the landing gear is fully retracted. The three lower lights (one for each gear) are green and will illuminate when each gear is fully extended and locked. When the gear up light and gear down lights are not illuminated, the landing gear is in an intermediate position. The lights are push-to-test type with rotatable dimming shutters.



1 System Circuit Breaker
2 Emergency Alternator Field
3 Right Alternator Field Fuse
4 Left Alternator Field Fuse
5 Right Alternator Circuit Breaker
6 Left Alternator Circuit Breaker

Figure 2-5

LANDING GEAR WARNING HORN

The landing gear warning horn is controlled by the throttles, and will sound an intermittent note if either throttle is retarded below approximately 12 inches Hg. manifold pressure with the landing gear retracted. The warning horn is also connected to the UP position of the landing gear switch and will sound if the switch is placed in the UP position while the airplane is on the ground.

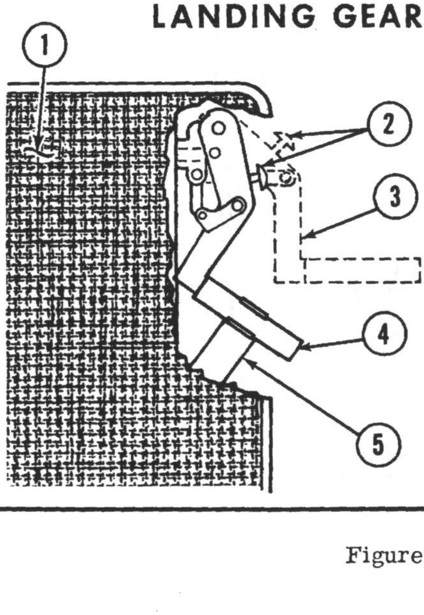
IMPORTANT

Do not pull landing gear warning circuit breaker to silence horn as this would also turn off the landing gear indicator lights.

LANDING GEAR HANDCRANK

A landing gear handcrank, Figure 2-6, for manually lowering the landing gear is located just below the right front edge of the pilot's seat. Normally, the crank is folded and stowed in a clip beside the seat. To use

LANDING GEAR HANDCRANK



1. PILOT'S SEAT
2. RELEASE BUTTON
3. HANDCRANK (EXTENED)
4. HANDCRANK (FOLDED)
5. STOWAGE CLAMP

Figure 2-6

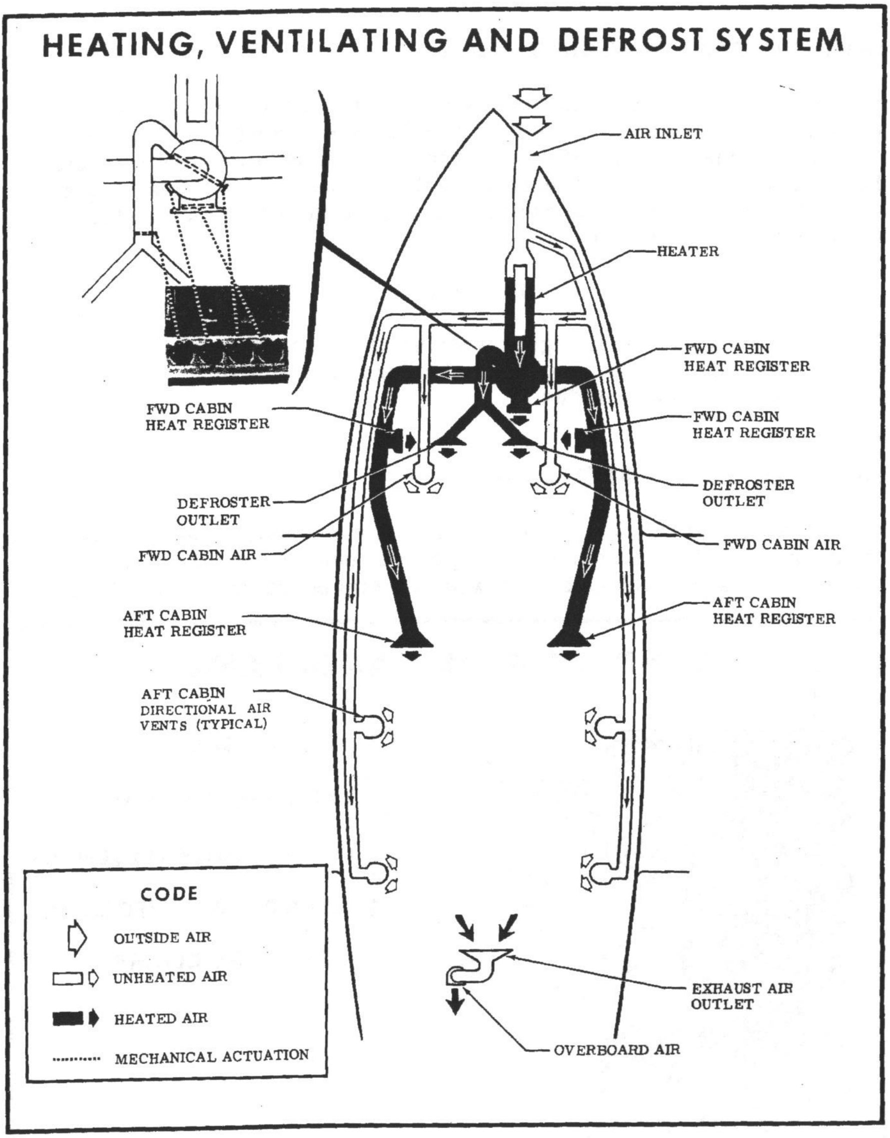

HEATING, VENTILATING AND DEFROST SYSTEM
AIR INLET
HEATER
FWD CABIN
HEAT REGISTER
FWD CABIN
HEAT REGISTER
FWD CABIN
HEAT REGISTER
DEFROSTER
OUTLET
DEFROSTER
OUTLET
FWD CABIN AIR
FWD CABIN AIR
AFT CABIN
HEAT REGISTER
AFT CABIN
HEAT REGISTER
AFT CABIN
DIRECTIONAL AIR
VENTS (TYPICAL)
CODE
OUTSIDE AIR
UNHEATED AIR
HEATED AIR
MECHANICAL ACTUATION
EXHAUST AIR
OUTLET
OVERBOARD AIR

Figure 2-7

the crank, tilt pilot's seat aft, pull crank out from its storage clip and unfold it until it locks in operating position and move the landing gear switch to the center (OFF) position, and pull out the landing gear circuit breaker. To stow the crank, push the lock release button on the crank handle, fold the handle and insert it in the storage clip.

NOTE

The handcrank handle must be stowed in its clip before the gear will operate electrically. When the handle is placed in the operating position, it disengages the landing gear motor from the actuator gear.

The procedure for manually lowering the landing gear is given in Section III.

HEATING, VENTILATING AND DEFROSTING SYSTEM

A cabin heating, ventilating and windshield defrosting system (Figure 2-7), is standard equipment in your airplane. The system consists of an air inlet on the right side of the nose, a ventilating fan, a gasoline combustion-type heater, and controllable heat outlets in the cabin. Two outlets are located at the base of the windshield for defrosting purposes, one is located on the forward cabin bulkhead and one on each side of the forward cabin. Two additional outlets are located in the aft passenger compartment on the aft face of the main spar.

HEATING AND DEFROSTING

Fresh air is picked up from the front opening in the nose of the airplane, heated by the heater, and ducted to the pilot and passenger compartments. The heated and ventilating air is not recirculated, but exhausts overboard through a passenger compartment air outlet.

The cabin heater depends upon the airplane fuel system for its fuel supply. Fuel pressure is supplied by a fuel pump mounted on the heater assembly; the main fuel system auxiliary fuel pumps need not be turned on for proper heater operation.

On the ground, the cabin heating system can be used for ventilation by placing the cabin fan switch in the CABIN FAN position. The fan provides unheated, fresh air to the cabin through the cabin heat registers. In flight, the fan becomes inoperative and the heating system can be used for ventilation by placing the cabin heat switch to the OFF position, turning the cabin air knobs to OPEN, and opening the heat registers as desired.

CABIN HEAT SWITCH

The cabin heat switch is a two-position, center-off, toggle switch. Placing the switch in the HEAT position maintains cabin heater operation. Placing the switch in the FAN position provides ventilation for the cabin while the aircraft is on the ground.

CABIN AIR TEMPERATURE CONTROL KNOB

The cabin air temperature control knob is labeled TEMP CONTROL, LOW (counterclockwise position), and MAX (clockwise position).

Heater output is controlled by adjustment of the cabin air temperature control knob. This knob adjusts a thermostat, which in turn controls heated air temperature in a duct located just aft of the heater. When the temperature of the heated air exceeds the setting of the thermostat, the thermostat automatically opens and shuts off the heater. When the heated air cools to the thermostat setting, the heater starts again. Thus, the heater continuously cycles on and off to maintain an even air temperature. The heater also will be cycled by a thermoswitch in the cabin air duct, which shuts off the heater when the duct temperature reaches approximately 220°F. When the duct temperature drops to a normal operating level, the heater will restart automatically. The action of this switch is independent of the cabin thermostat setting, and is not adjustable in flight.

FORWARD CABIN AIR KNOB

The forward cabin air knob control directs warm air to the outlet located on the forward cabin bulkhead. This direct outlet allows fast warm-up when the airplane is on the ground. Airflow through the direct outlet is completely shut off when the knob is turned to CLOSED. The knob may be set at any intermediate position to regulate the quantity of air to the pilot's compartment.

CABIN AIR KNOB

The airflow to all the heat registers in the passenger compartment is controlled by the CABIN AIR knob. When the knob is turned to OPEN, the air flows to the heat registers in the passenger compartment. Airflow to the heat registers is completely shut-off by turning the knob to CLOSED.

The knob may be set in any intermediate position to regulate the quantity of air to the cabin.

CABIN HEAT REGISTERS

Two cabin heat registers are located on the aft side of the main spar beneath the pilot's and copilot's seats and one on each side in the forward cabin. Each register is provided with a lever-operated, rotary-type valve which controls the amount of air coming from the heat registers. Each register is plainly marked for open or closed and may be placed in any intermediate position to regulate the amount of air coming from the registers.

DEFROST KNOB

Windshield defrosting and defogging is controlled by operating the knob labeled DEFROST. When the knob is turned to open, the air flows from the defroster outlets at the base of the windshield. When the knob is turned to closed, airflow to the defroster outlets is shut off. The knob may be set in any intermediate position to regulate the defroster airflow.

OVERHEAT WARNING LIGHT

An amber overheat warning light is provided and is labeled HEATER OVERHEAT, PUSH T & B TEST. When illuminated, the light indicates that the heater overheat switch has been actuated and that the temperature of the air in the heater has exceeded 325°F. Once the heater overheat switch has been actuated, the heater turns off and cannot be restarted until the overheat switch, located in the right forward nose compartment, has been reset. Prior to having the overheat switch reset, the heater should be thoroughly checked to determine the reason for the malfunction.

HEATER OPERATION FOR HEATING AND DEFROSTING

(1) Battery Switch -- ON.
(2) Cabin Air Knobs -- Open.
(3) Defrost Knob -- Adjust as desired (if defrosting is desired).
(4) Temperature Control Knob -- MAX.
(5) Cabin Heat Switch -- HEAT.
(6) Heat Registers -- As desired.

NOTE

● If warm air is not felt coming out of the registers within one minute, turn cabin heat switch OFF, check circuit breaker and try another start. If heater still does not start, no further starting attempt should be made.

● During heater operation, defrost and/or cabin air knobs must be open.

HEATER USED FOR VENTILATION

(1) Battery Switch -- ON.
(2) Cabin Air Knobs -- Open as desired.
(3) Cabin Fan Switch -- FAN.
(4) Heat Registers -- As desired.

VENTILATING SYSTEM

In addition to the ventialtion provided by the cabin heating system, a separate ventilation system obtains ram air from the air inlet just forward of the heater and ducts it to the directional vents. The ventilating system functions only in flight, since it depends entirely on ram air pressure. For ground ventilation, the ventilating fan of the heating system must be used.

STATIC- PRESSURE ALTERNATE-SOURCE VALVE

A static-pressure alternate-source valve, installed in the static system, directly below the parking brake handle, supplies an alternate static source should the external source malfunction. This valve also permits draining condensate from the static lines. When open, this valve vents to the static pressure in the cabin. Since this pressure is relatively low, the airspeed indicator and the altimeter will show slightly higher readings than normal. Therefore, the alternate static source should be used primarily as a drain valve to restore the original system. A drain valve is also located behind the map pocket on the copilot's side. If the alternate static source must be used during instrument operation, increase indicated airspeeds approximately 10 MPH and altitudes approximately 80 feet. Consult the Pilot's Checklist for accurate calibration.

PITOT HEAT SWITCH

When the pitot heat switch is placed in the ON position, the heating element in the pitot tube, stall warning transmitter and the main fuel tank vents are electrically heated to maintain proper operation of the system during icing conditions. The switch should always be in the OFF position while on the ground to prevent overheating of the heating elements.

EMERGENCY EXIT

For emergency exit, the pilot's window (left side) can be jettisoned. Pull off the plastic cover over the emergency release ring under the window and pull the ring to release the window retainers, then push the window out.

Notes ....