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SINCE 1956

MODEL 310d

OWNER'S MANUAL

P199-13—RAND—200—8/76

Congratulations . . . .

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

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

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

1) FACTORY TRAINED MECHANICS to provide you with courteous expert service.
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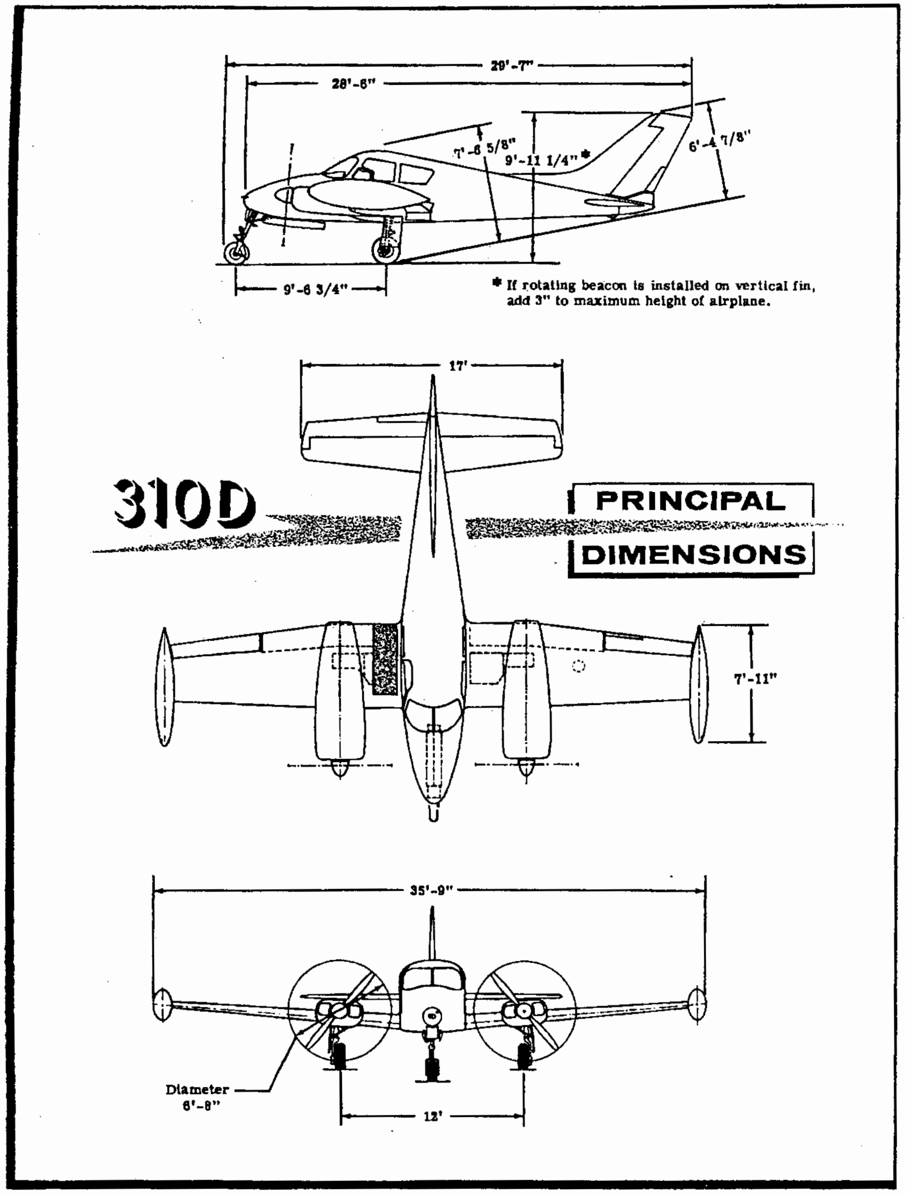

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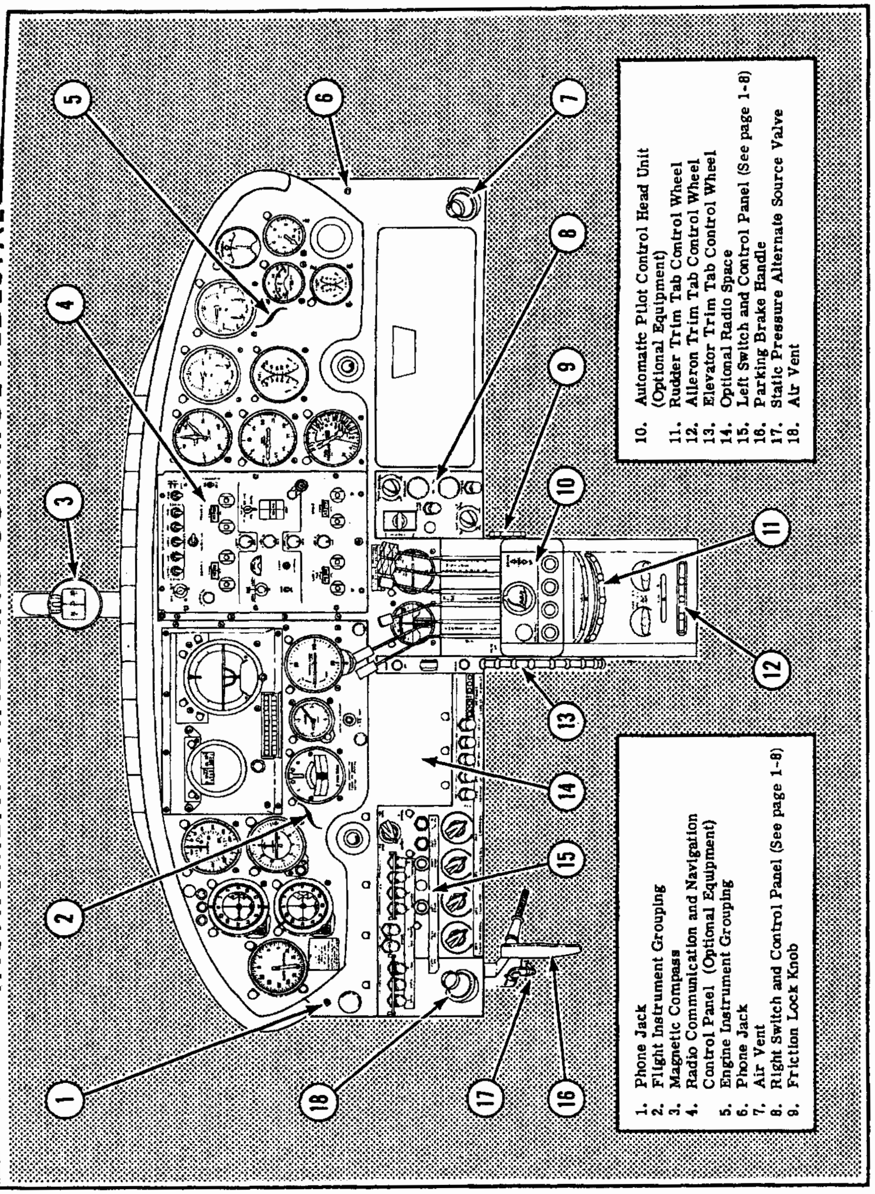


Section 1

Description

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 section describes location, operation, and function of the various items of equipment, intentionally omitting reference to some items which are obvious.

ENGINES.

Two horizontally - opposed, six-cylinder, Continental IO-470-D engines, rated at 260 horsepower at 2625 RPM, power your 310D. The engines have wet-sump oil systems, dual magnetos, continuous-flow fuel injection, and jet-augmenter exhaust systems including mufflers.

ENGINE CONTROL PEDESTAL.

The throttle, mixture levers, and propeller pitch levers are grouped on top of the engine control pedestal. They are readily accessible from either the pilot's or copilot's seats. Control lever selections are clearly marked between each group of controls. Numbered index marks are also provided between the mixture levers to facilitate mixture settings. A knurled friction knob on the right side of the pedestal can be rotated to adjust friction on the control levers to prevent creeping.

The pedestal also houses the induction air control handles and trim tab control wheels, and has provisions for mounting an automatic pilot control head.

Refer to Sections II, III, and IV for further discussion concerning the use of engine and propeller controls under normal and emergency conditions.

INDUCTION AIR CONTROL HANDLES.

The induction air control handles operate doors in the engine air intakes to select either filtered cold air or air heated by exhaust manifold heaters. Cooling and induction air flow is shown in the Air Induction System Diagram on page 1-3. If ice should form in the induction system, as evidenced by an unexplained drop in manifold pressure, pull the induction air control handle, for the engine involved, full out and lock it in position by rotating it. Do not use an intermediate position.

The alternate air (heated air) doors are spring-loaded closed and their control linkage permits engine suction to open them automatically if the air filter is blocked, regardless of the position of the induction air control handles.

IGNITION SWITCHES.

The four ignition switches control the dual magnetos on each engine. The switches may be operated individually; or by using a hinged bar mounted above them, all four may be turned off at once. For normal operation, all four switches should be ON. Individual switches should be turned off only for checking purposes. When the engines are stopped, all four switches should be OFF (down).

STARTER BUTTONS.

The starter switches are push-buttons with red, cup-shaped guards to prevent them from being pressed accidentally.

PROPELLERS.

The airplane is equipped with two all-metal, hydraulically-operated, constant-speed, full-feathering, two-bladed propellers. Propeller operation is controlled by the propeller pitch levers through a mechanical linkage to the engine-driven propeller governor on each engine.

OIL SYSTEM.

The oil capacity of each engine is twelve quarts. The last six quarts of oil are considered unusable because, in an extreme nose high climb with a low oil level, it is possible to uncover the oil pick-up line, resulting in low oil pressure. Add oil if the level is below nine quarts, and fill the sump if an extended flight is planned.

The oil quantity is easily checked by opening the left rear access door on each engine nacelle, and reading the oil level on the dipstick located just aft of the rear left cylinder of each engine. The dipstick incorporates a spring lock which prevents it from working loose in flight. The dipstick is removed by rotating it until the lock is disengaged, and pulling it out. When replacing the dipstick, make sure that the spring lock is engaged.

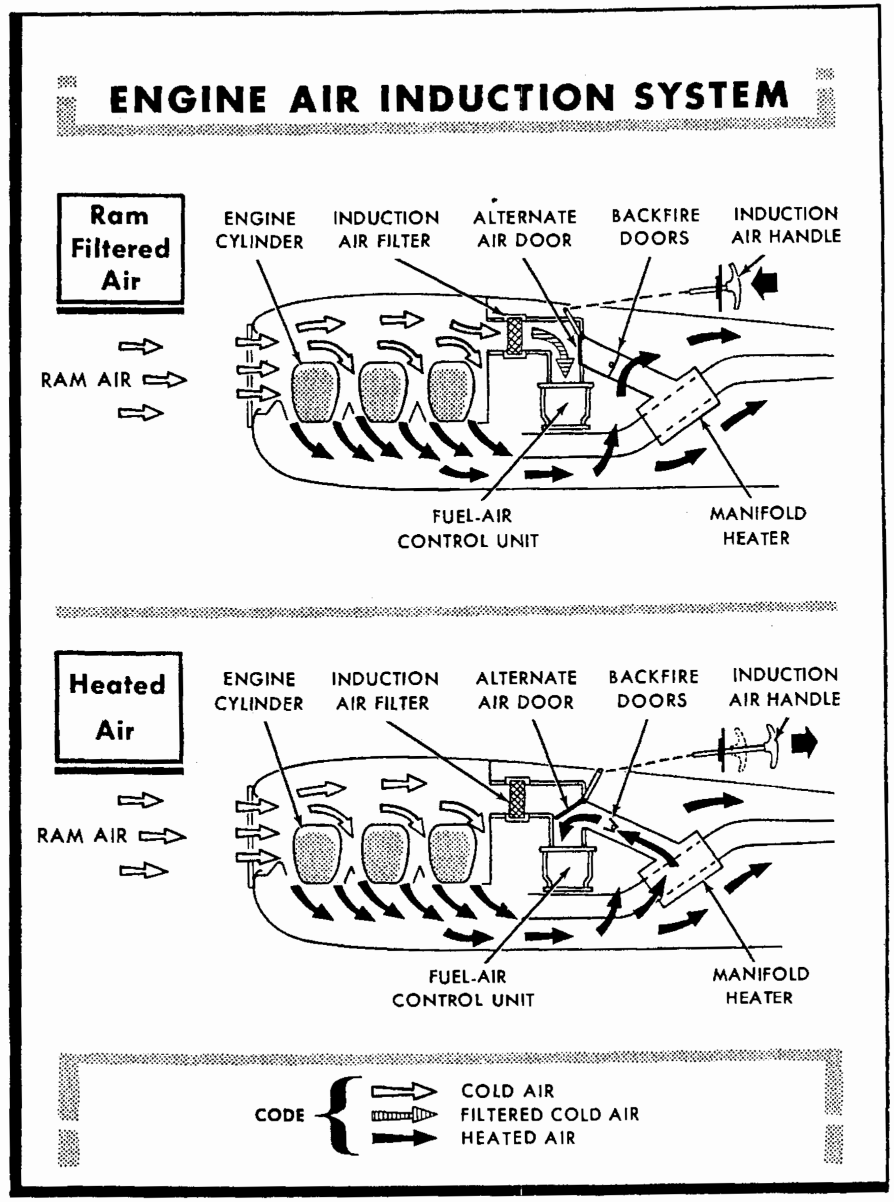
The oil filler caps are under the small access door on top of each nacelle, and can be removed by rotating them counterclockwise. In replacing the oil filler caps, see that they are on firmly and turned clockwise as far as they will go.

The oil sump drain plug is accessible through a hole in the bottom of the cowl.

The engine oil coolers are thermostatically-controlled, to maintain oil temperatures near optimum. To prevent oil congealing in the coolers when operating in low temperatures, warm oil circulates continuously through warm-up passages in their centers. For most winter weather, no special shutters or baffles are necessary with these coolers.

OIL SPECIFICATION AND GRADE.

Refer to the Servicing Diagram on pages 6-6 and 6-7 and the Service Requirements Table on the inside



back cover for the recommended oil specification, grades, and servicing intervals.

OIL SYSTEM INSTRUMENTS.

An electric oil temperature gage and a direct-reading oil pressure gage are included in the engine gage unit for each engine. A green arc on each gage dial indicates the normal operating range. Refer to Section V for instrument markings.

OIL DILUTION SYSTEM.

To prevent oil congealing when the engines are shut down in extremely low temperatures, the optional oil dilution system injects fuel into the engine oil system, reducing oil viscosity. When the engines are started and warmed up again, the fuel evaporates and the oil returns to its normal viscosity.

The oil dilution system is controlled by a single, three-position switch placarded L (left engine), OFF, and R (right engine). The switch is spring-loaded to the OFF position.

Detailed instructions for using the oil dilution system are given in Section III.

FUEL SYSTEM.

Fuel for each engine is supplied by a main tank on each wing tip and an optional auxiliary tank in the wing just outboard of each nacelle. Each engine has its own complete fuel system; the two systems are interconnected only by a crossfeed 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 if an engine-driven pump fails. The optional auxiliary tanks have no return lines or electric pumps.

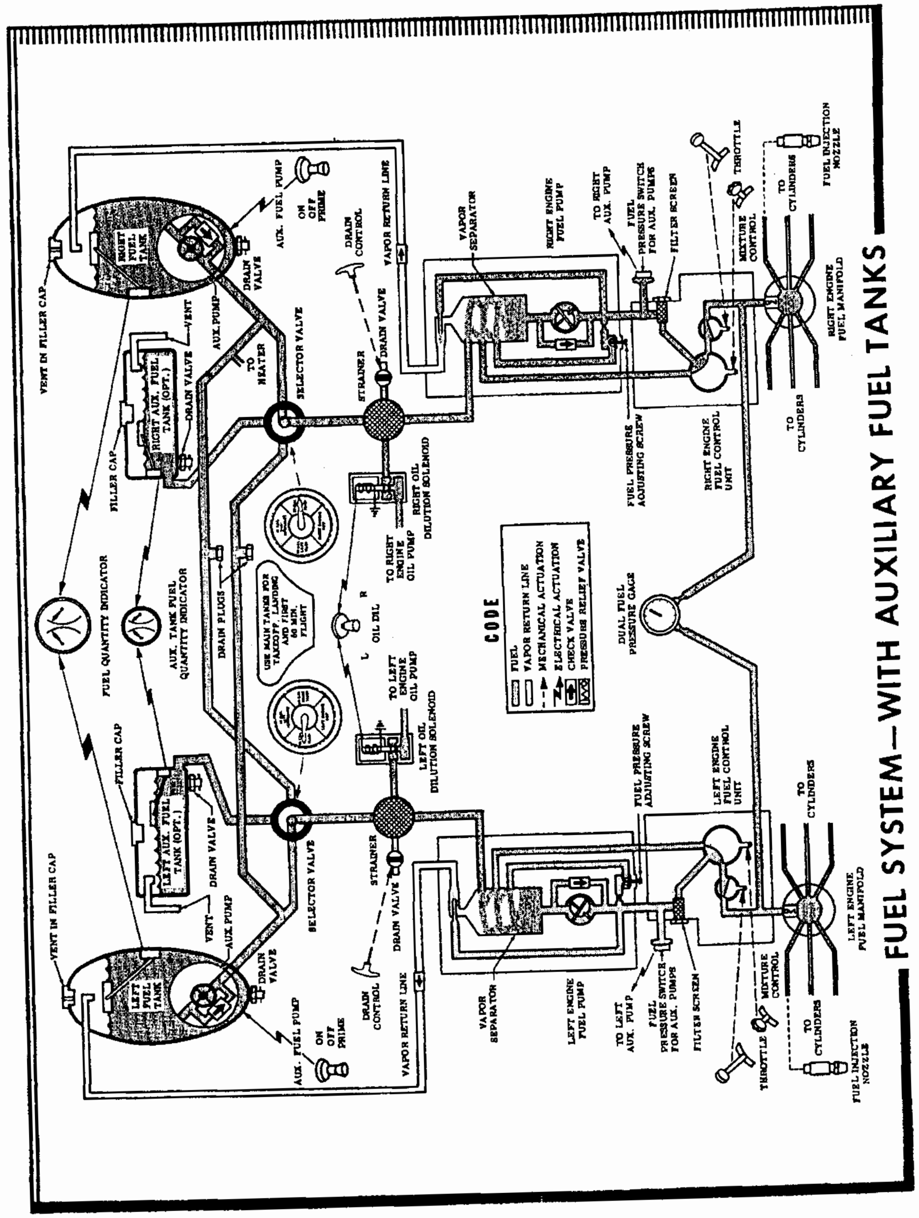
FUEL SELECTOR VALVE HANDLES.

Rotary selector valve handles on the cabin floor just back of the engine control pedestal control the fuel system. The selector valve placards for the standard fuel system 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 crossfeed position of each selector valve is the one marked for the opposite main tank. With optional auxiliary tanks, each selector has a fourth position, marked AUXILIARY which will feed its engine only from its auxiliary tank. The auxiliary tanks cannot be crossfed.

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 selector valve handles should be turned to LEFT MAIN for the left engine and RIGHT MAIN for the right engine, during take-off, landing and all normal operation.



FUEL SYSTEM—WITH AUXILIARY FUEL TANKS

AUXILIARY FUEL PUMP SWITCHES.

The auxiliary fuel pump switches are three-position switches, marked ON, OFF and PRIME. The PRIME position runs the pumps at low speed, providing approximately 5 psi pressure for priming and starting. The ON position also runs the pumps at low speed, as long as the engine-driven pumps are functioning. With the switch in the ON position, however, if an engine-driven pump fails, the auxiliary pump on that side will be switched to high speed automatically, providing sufficient fuel for all engine operations including take-off power. As a safety measure, always take-off and land with the auxiliary pump switches in the ON position.

FUEL QUANTITY INDICATORS.

Fuel quantity in each main tank is shown by a dual-reading fuel quantity indicator on the right side of the instrument panel. A second dual gage shows the fuel in each optional auxiliary tank. The indicators are electrically-operated, and with the battery switch on, indicate in gallons the amount of fuel remaining.

FUEL PRESSURE GAGE.

The fuel pressure gage is a dual instrument calibrated in pounds per square inch. The fuel pressure gage used with the Continental injection system indicates metered fuel pressure; i.e., the pressure at which fuel is delivered to the spray nozzles and fuel pressure at this point correlates directly with fuel flow. Thus, the gage is primarily a flowmeter.

The gage dial is marked with segments of arc corresponding to the proper fuel pressures for various power settings, so that it may be used to set the mixture quickly and accurately. It has cruise power settings on its low-pressure portion and take-off pressure settings for various altitudes on its high-pressure portion. The take-off markings indicate maximum-performance take-off mixtures for the altitudes shown, making it practical to lean the mixture on a high-altitude take-off.

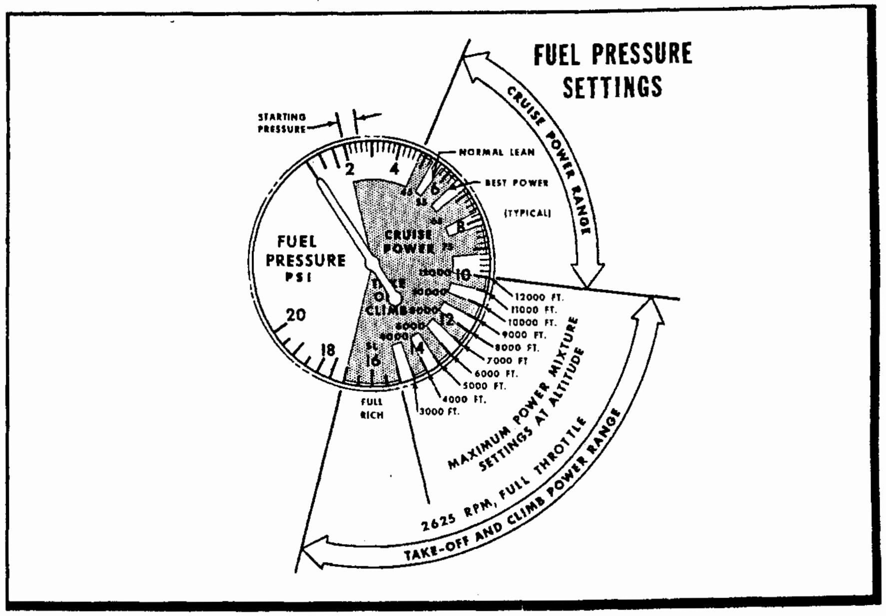
In the cruise power range, the low-pressure edge of each green segment is the normal-lean setting and the high-pressure edge is the best-power setting, for that percentage of power. In the take-off and climb range, each segment represents a maximum-power mixture for an altitude range: the low-pressure edge is the setting for the marked altitude and the high-pressure edge is the setting for a thousand feet lower. The sea-level segment represents a full-rich take-off power range.

NOTE

The fuel pressure settings on the take-off and climb power segment of the dial are for 2625 RPM and full throttle, only. Climb power settings at lower RPM should be taken from the power computer.

FUEL STRAINERS AND DRAINS.

Water and solid materials which may collect in the fuel tanks are



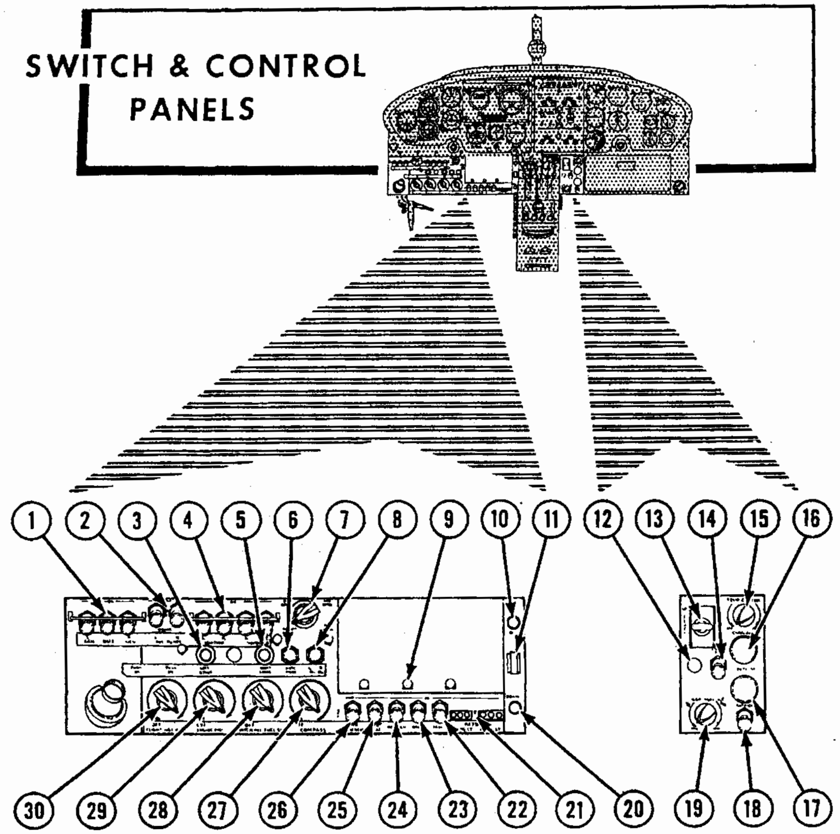
trapped by strainers and sumps in each tank and a strainer and sediment bowl in each engine nacelle.

The nacelle fuel strainers may be drained by opening each left rear nacelle door and pulling a T-handle mounted on the side of the nacelle, which operates a valve in the strainer bowl. When the handle is released, the spring-loaded valve will close.

The sump in each main fuel tank is fitted with a quick drain valve, operated with a special hollow-handled screwdriver which is kept in the map compartment. The main tank drains are accessible through small holes in the lower access plates. To drain a main sump, engage the special screwdriver with the end of the valve, press upward and rotate the screwdriver counterclockwise. Fluid in the sump will flow through the hollow handle of the screwdriver. Close the valve by rotating the screwdriver clockwise and releasing the upward pressure sharply. For draining a large quantity of fuel, the valve may be turned full counterclockwise and the pressure released; a detent at this point will hold the valve open.

The auxiliary tank drains extend through the lower wing skin and have no detents. To drain an auxiliary sump, press upward on the end of the valve, using the screwdriver. To completely drain the tank, unscrew the valve from the fitting.

Plugs for draining the fuel cross-feed lines are accessible by remov-



1. Battery and Generator Switches
2. Auxiliary Fuel Pump Switches
3. Left Starter Button
4. Ignition Switches
5. Right Starter Button
6. Automatic Pilot Power Switch (Opt. Equip.)
7. Vacuum Source Selector Valve Knob
8. Oil Dilution Switch (Opt. Equip.)
9. Post Type Light (Typical)
10. Landing Gear Up Position Light
11. Landing Gear Switch
12. Optional Switch Space
13. Wing Flaps Switch
14. Left Wing Light Switch (Opt. Equip.)
15. Cabin Air Temperature Control Knob
16. Cabin Air Knob
17. Defrost Knob
18. Propeller Anti-Ice Power Switch (Opt. Equip.)
19. Propeller Anti-Ice Rheostat (Opt. Equip.)
20. Landing Gear Down Position Light
21. Landing Lights Switches (Right Switch Opt.)
22. Taxi Light Switch (Opt. Equip.)
23. Navigation Lights Switch
24. Rotating Beacon Switch (Opt. Equip.)
25. Pitot Heat Switch
26. Cabin Heater Switch
27. Compass Light Rheostat
28. Switch Panel-Fuel Selector Light Rheostat
29. Engine Instrument Lights Rheostat
30. Flight Instrument-Radio Lights Rheostat

ing the lower right wing root fairing.

Recommended intervals for draining the sumps, strainers and fuel lines are given in the Servicing Diagram on pages 6-6 and 6-7, and in Section II.

ELECTRICAL POWER SUPPLY SYSTEM.

Electrical energy is supplied by a 28-volt, negative-ground, direct-current system, powered by a 25-ampere engine-driven generator on each engine. A 50-ampere generator system is available as optional equipment. Two 12-volt batteries, connected in series, are located in the left wing just outboard of the engine nacelle. An optional external power receptacle can be installed in the left wing under the batteries. The receptacle accepts a standard external power plug.

BATTERY AND GENERATOR SWITCHES.

A battery switch and two generator switches control the electrical power supply system. The switches may be operated individually or all three may be turned off at the same time, by using the hingedbar mounted above them.

The separate battery and generator switches provide a means of checking for a malfunctioning generator circuit, and permit such a circuit to be cut off. If a generator circuit fails or malfunctions, or when one engine is not running, the switch for that generator should be turned off. Operation should be continued on the functioning generator, using only necessary electrical equipment. If both generator 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.

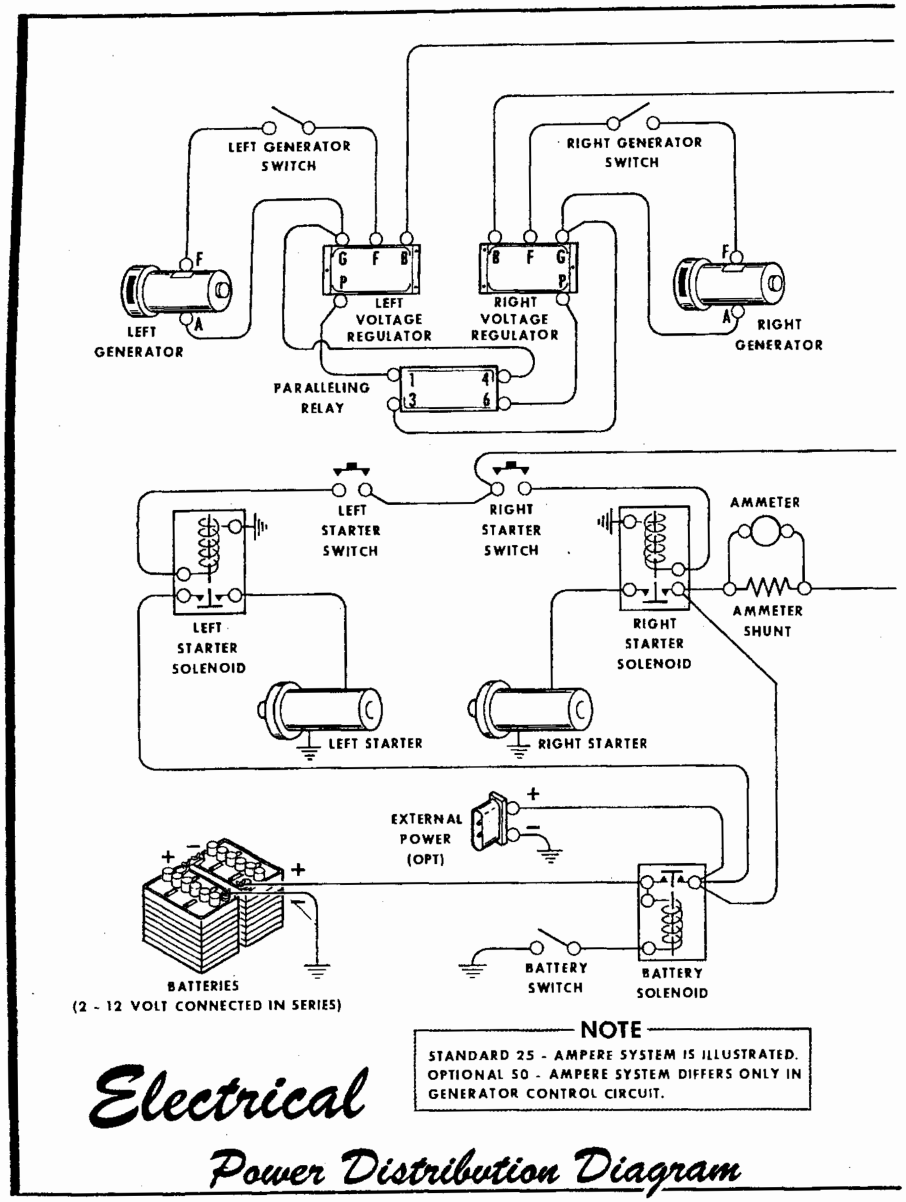
CIRCUIT BREAKERS.

All of the electrical systems in the airplane are protected by "push-to-reset" type circuit breakers located in a circuit breaker panel on the left cabin wall. The panel is covered by a metal door which is hinged along the bottom edge. If your airplane is equipped with optional 50-ampere generators, two additional circuit breakers are mounted on a small panel below and slightly forward of the main panel.

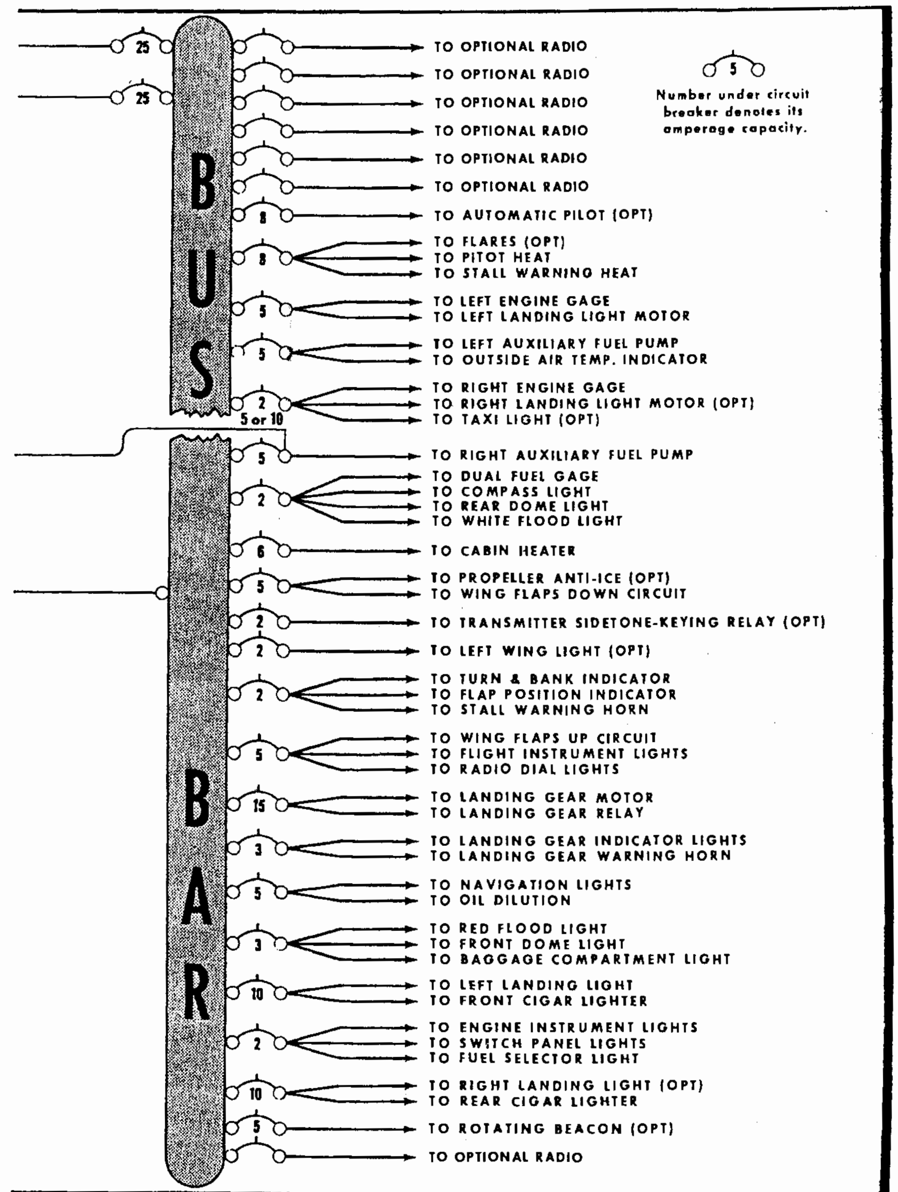
If a circuit is inoperative, wait approximately three minutes for the thermal unit to cool, then press the circuit breaker button to reset the breaker. If resetting the breaker does not restore power, the circuit should be checked for loose connections or defective components. If a circuit breaker pops out a second time, do not try to reset it again, but turn off the controlling switch for that circuit until the fault can be corrected.

FLIGHT CONTROLS.

Conventional wheel and rudder-pedal controls operate the primary flight control surfaces. Each surface has an adjustable trim tab and



Electrical
Power Distribution Diagram



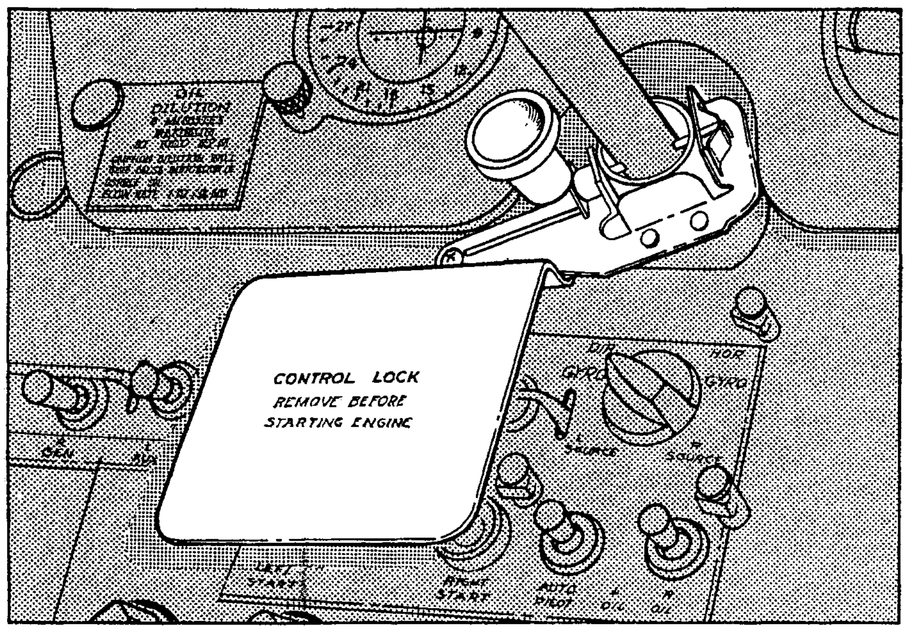
the elevator is fitted with a down-spring for improved longitudinal stability. A bungee interconnects the ailerons and rudder, for better lateral stability in certain flight maneuvers.

CONTROLS LOCK.

The controls lock, normally kept in the map compartment, should be installed on the pilot's control column whenever the airplane is parked. When the lock is installed, a large, red metal flag covers the ignition switches and starter buttons, to prevent inadvertently starting the engines with the controls locked. Install the lock as shown below.

TRIM TAB CONTROLS AND INDICATORS.

The aileron, elevator, and rudder trim tabs are operated by tab control wheels located on the engine control pedestal. A mechanical position indicator in each system shows the position of the trim tab. The aileron tab position indicator is marked ROLL, with L (roll left) and R (roll right) on their respective sides. The elevator tab position indicator is labeled NOSE DOWN, NOSE UP, and TAKE-OFF. At the take-off marking, there is a small arrow which shows the most satisfactory elevator trim for normal take-offs. The rudder tab position indicator is



labeled NOSE, with L (nose left) and R (nose right) on their respective sides.

WING FLAPS SWITCH.

The wing flaps switch controls the position of the electrically-operated wing flaps. The UP and DOWN positions of the switch are momentary hold-on positions; the switch automatically returns to the middle (OFF) position when released. The flaps can be lowered or raised to any position between 0° and 45°, and stopped at any position by allowing the flap switch to return to the OFF position. The flaps will remain in the selected position until the switch is moved to raise or lower them. At the extreme of travel, limit switches stop the flaps automatically.

Flap position is shown by an electric indicator located just above the engine control pedestal. The indicator is marked in degrees of flap deflection from full up.

Under normal conditions at 4830 pounds gross weight, the use of 45° flaps will lower the power-off stalling speed approximately 10 MPH (84 MPH to 74 MPH TIAS), to permit a slow, steep approach for short field landings over an obstacle. The flaps can be extended to 15° at any airspeed below 160 MPH, and to 45° at any speed below 140 MPH. They should never be extended above these speeds, due to structural limitations. For take-off, never use over 15° flap.

LANDING GEAR SYSTEM.

The landing gear is of the fully-retractable, tricycle type, incorporating a steerable nosewheel. The gear retraction system is operated by an electric motor which actuates a gear box mechanism and linkage. 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.

Landing gear doors fully enclose the landing gear when retracted, and are opened by mechanical linkage when the gear extends. A two-tread assist step also is mechanically connected to the landing gear linkage, and swings down out of the fuselage when the gear extends, to provide easy access to the right wing walk and cabin door.

Position lights and a warning horn provide visual and audible gear position indications to the pilot. A push-to-reset circuit breaker protects the landing gear motor circuit in the event of an overload, and a hand-crank is used to extend the landing gear if the electrical system is inoperative.

LANDING GEAR SWITCH.

The landing gear switch can be identified by its small wheel-shaped knob. The knob must be pulled out before the switch can be moved from one position to another. When released, the knob automatically locks in the slot of the selected position. The switch is marked GEAR, and the positions are labeled UP (to raise the landing gear) and DOWN to lower the landing gear). A center (OFF) position disconnects the electrical circuit. The OFF position need be used only when lowering the gear with the handcrank.

LANDING GEAR HANDCRANK.

The handcrank for manually lowering the landing gear is located just below the right edge of the pilot's seat. Normally, the crank is folded and stowed in a clip beside the seat. To use the crank, pull it out from its storage clip and unfold it until it locks in operating position. To stow the crank, push the lock release button on the crank handle, fold the handle and insert it in the storage clip. The seat must be tilted back at least one notch, to clear the crank handle.

NOTE

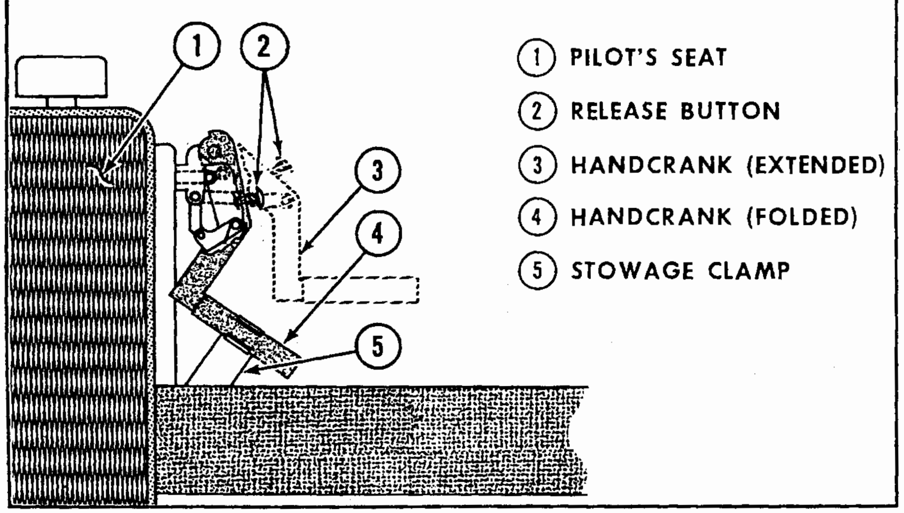
The handcrank handle must be stowed in its clip before the gear will operate electrically. When the handle is placed in operating position, it disengages the landing gear motor from the actuator gear.

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

LANDING GEAR POSITION LIGHTS.

Two landing gear position lights are mounted one above and the other below the landing gear switch. The lights are push-to-test type with dimming shutters. Clockwise rotation of the lens holder on the lights closes the shutters, permitting only a diffused ring of light to be transmitted through the lens. With the shutters in the open position (lens holder rotated counterclockwise), illumination of the light is unobstructed. The upper light is red, and is on at all times when the gear is fully retracted. The lower light is green, and illuminates only when the landing gear is fully extended and locked. The green light is connected in series with a down indicator switch on each wheel strut, and remains off until all three gears are down and locked. When neither light is on, the landing gear is in an intermediate position.

LANDING GEAR HANDCRANK



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 12 inches of manifold pressure with the gear up. 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.

STEERING SYSTEM.

The nosewheel is steerable with the rudder pedals up to 15°, either right or left of center, after which it swivels free up to a maximum deflection of 55° right or left of center. Using brakes and throttles, this deflection of 55° permits the airplane to be turned in a relatively small radius.

NOTE

Avoid locking a brake and spinning the airplane on one wheel to turn it, whenever possible. This maneuver causes tire scuffing and wear.

The steering linkage automatically disconnects from the nosewheel as the wheel is retracted, and the nosewheel is automatically straightened as it goes into the wheel well.

BRAKE SYSTEM.

The hydraulic brakes on the main wheels are operated by applying toe pressure to the pilot's or the copilot's (optional) rudder pedals. The brakes may also be set by operation of the parking brake handle. Applying foot pressure to the brake portion of the rudder pedals, as the brake handle is pulled, aids in applying the parking brakes. The parking brake mechanism has a ratchet device which holds the handle in any applied position. Turning the handle counterclockwise releases this ratchet, allowing the spring-loaded parking brake handle to retract and release the brakes.

FLIGHT INSTRUMENTS AND SYSTEMS.

PITOT-STATIC SYSTEM.

The pitot-static system provides pitot and static pressure to operate the airspeed indicator, and static pressure to operate the rate-of-climb indicator and altimeter. The system is composed of an electrically-heated pitot tube mounted on the nose of the fuselage, an external static-pressure port on each side of the fuselage aft of the baggage area, and the plumbing to connect the instruments to the sources.

NOTE

The static-pressure openings should be kept free of polish, wax, and dirt for proper instrument operation.

STATIC PRESSURE ALTERNATE SOURCE VALVE.

A static-pressure alternate-source valve is installed in the static system for use when the external static sources are malfunctioning. This valve also permits draining condensate from the static lines. The static-pressure alternate-source valve is located adjacent to the parking brake handle, and is opened by pulling the valve lever aft.

Refer to Section III, paragraph COLD WEATHER OPERATION — LET-DOWN AND LANDING for additional information concerning the static-pressure alternate-source valve operation.

PITOT HEATER SWITCH.

The pitot-heater switch controls the heating elements in both the pitot tube and stall-warning transmitter to maintain proper operation of the two systems during icing conditions. Both the pitot heater and stall-warning heater circuits are protected by a single circuit breaker.

VACUUM SYSTEM.

The directional gyro and gyro horizon are operated by engine-driven vacuum pumps. Suction gage readings may be obtained from any of four points in the vacuum system with a manually-operated "push-to turn" vacuum check selector-valve knob (page 1-8). The points of selection, as marked on the left switch and control panel, are DIR GYRO (directional gyro), HOR GYRO (gyro horizon), L SOURCE (left pump), and R SOURCE (right pump). The suction gage should indicate 4.75 to 5.25 inches of mercury when checking either vacuum-driven instrument. Both the left and right source indications should be higher than the gyro position indications.

STALL WARNING SYSTEM.

The stall-warning indicator in your airplane is an electric horn controlled by a transmitter unit in the leading edge of the left wing. This system is in operation whenever the master switch is turned on. The transmitter responds to changes in airflow over the leading edge of the wing as a stall is approached. Thus, it will warn you of an incipient stall under all conditions. In both straight-ahead and turning flight, the warning will come 5 to 10 MPH ahead of the stall.

The stall-warning transmitter unit incorporates a heater element to prevent ice from hampering its operation. The heater element is con-

trolled by the pitot-heater switch. Both the stall-warning transmitter heater element and the pitot-tube heater element are protected by the same circuit breaker. The stall warning horn is protected by a separate circuit breaker.

HEATING, VENTILATING, AND DEFROSTING SYSTEM.

A cabin heating, ventilation, and windshield defrosting system is standard equipment in your airplane. The system consists of an air inlet in the nose of the airplane, a ventilating fan, a gasoline combustion-type heater, and ten controllable ventilating and heating outlets.

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 front and rear seat occupants. The heated and ventilating air is not recirculated, but exhausts into the slipstream through a cabin air outlet.

The cabin heater depends upon the airplane fuel system for its fuel supply. Fuel pressure is supplied by a diaphragm-type 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 heater switch in the 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 turning the heater switch to the OFF position and opening the heat registers as desired.

Refer to Section III for heating system operating procedures.

CABIN HEATER SWITCH.

The cabin heater and ventilating fan are controlled by a three-position toggle switch labeled CABIN HEAT. Switch positions are HEAT, OFF, and FAN. Placing the switch in the HEAT position starts and maintains heater operation. Placing the switch in the FAN position operates the ventilating fan only.

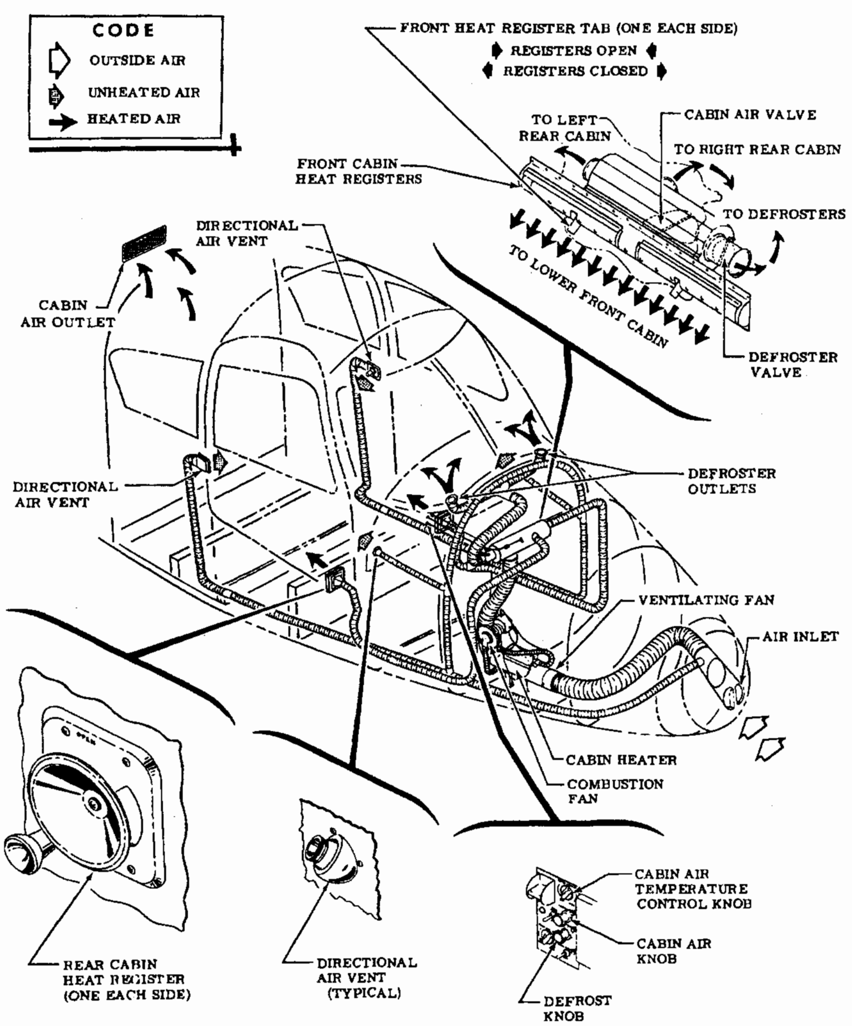
CABIN AIR TEMPERATURE CONTROL KNOB.

The cabin air temperature control knob is labeled TEMP CONTROL, OFF (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,

HEATING, VENTILATING, AND DEFROSTING SYSTEM



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 it is not adjustable in flight.

CABIN AIR KNOB.

The airflow to all cabin heat registers is controlled by operating a push-pull type knob labeled CABIN AIR. When the knob is pulled out, air flows to all heat registers in the cabin except the two defroster outlets. Airflow to the heat registers is completely shut off by pushing the knob all the way in. The knob may be set in any intermediate position to regulate the quantity of air to the cabin.

DEFROST KNOB.

Windshield defrosting and defogging is controlled by operating a push-pull type knob labeled DEFROST. When the knob is pulled out, air flows from the defroster outlets at the base of the windshield. When the knob is pushed all the way in, 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 located on the instrument panel just below the clock, and is labeled HEATER-OVERHEAT, T & B TEST. When illuminated, the light indicates that the heater overheat switch has been actuated. This condition occurs only when the temperature of the air in the heater exceeds 325°F. Once the heater overheat switch has been actuated, the heater will not operate until a landing can be made and the switch reset. The overheat switch is mounted on the aft end of the heater, in the nose of the fuselage to the right of the nosewheel well. To reset the overheat switch, press the reset button on the switch.

NOTE

The heater should be inspected thoroughly to determine the reason for the malfunction prior to resetting the overheat switch.

VENTILATING SYSTEM.

In addition to the ventilation provided by the cabin heating system, a separate ventilation system obtains ram air from the air inlet at the nose of the airplane, and ducts it to four 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 should be used.

LIGHTING EQUIPMENT.

LANDING LIGHTS.

A retractable landing light, mounted in the bottom of the left wing, is standard equipment. Provision is made for an identical light under the

FUEL SELECTOR VALVE LIGHT.

The fuel selector valve handles and the lower pedestal are illuminated by a light mounted on the forward side of the front spar. The light is controlled by the rheostat labeled SWITCH PNL — FUEL SEL.

MAGNETIC COMPASS LIGHT.

The magnetic compass, mounted on the windshield centerstrip, contains an integrally-mounted light. The light is controlled by the rheostat labeled COMPASS.

DOME LIGHTS.

Three dome lights in the cabin ceiling illuminate the entire cabin area. The front dome light is part of the overhead console panel. A second dome light is located in the middle of the cabin area. The third light serves as a dome light and baggage area light. Each dome light has a switch in its mounting.

OXYGEN SYSTEM.

The optional high-pressure, continuous-flow type oxygen system will satisfy the oxygen requirements of the pilot and four passengers for over two hours, starting with a full supply cylinder. The system has automatic regulation and needs no manual adjustment for altitude or number of outlets in use.

For greater flexibility in installing other optional equipment, two systems are available, one with the supply cylinder mounted behind the baggage compartment and the other with the cylinder mounted in the nose.

Five oxygen outlets are mounted in the overhead light console. The outlet on the extreme left, marked PILOT, contains a larger orifice which delivers approximately twice as much oxygen as the other four outlets. Although intended for the pilot's use, this orifice may be used by any person who desires more than the average amount of oxygen.

FACE MASKS.

The face masks used with this oxygen system are of the disposable, partial-rebreathing type. They can be reused many times if marked for identification by the user, or may be thrown away after each use. Normal conversation can be carried on while wearing the masks. Each face mask receives oxygen through a rubber hose into a rebreather bag. On exhalation, the first breath exhaled (rich in oxygen, because it never reaches the lungs) passes into the bag, combining with the incoming oxygen. As soon as the bag is filled, the remainder of the exhaled breath (which is low in oxygen, because it has been in the lungs) passes to the atmosphere through the upper sides of the bag. On inhalation, the user inhales the oxygen-enriched contents of the bag. When the bag is emptied, air is drawn through the upper sides of the bag to satisfy the inhalation volume of the user.

OXYGEN FLOW INDICATORS.

An oxygen flow indicator in each face mask hose provides a visual indication that oxygen is flowing to the mask; when oxygen is flowing, the red indicator flag disappears. The oxygen flow indicators operate in any position.

OXYGEN PRESSURE GAGE.

An oxygen cylinder pressure gage is centrally mounted on the aft portion of the utility shelf or on the instrument panel, depending on the cylinder location. The gage should indicate 1800 PSI when the system is fully charged. It is marked with two green arcs: 0 to 300 PSI and 1550 to 1850 PSI. The lower green arc indicates that the system is nearly exhausted and a lower altitude not requiring oxygen should be sought. The upper green arc is the fully-charged range.

OXYGEN SYSTEM SERVICING.

The oxygen cylinder is serviced through an external filler valve behind an access door in the right side of the fuselage, just above the cabin step, or on the right side of the aft nosewheel well bulkhead. The Service Requirements Table on the inside back cover lists the correct type of oxygen for refilling the cylinder.

PROPELLER ANTI-ICE SYSTEM.

The optional propeller anti-ice system will provide sufficient anti-ice fluid to the propeller blades for approximately 1/2 hour of operation under average icing conditions. The system consists of slinger rings on the propellers, to which anti-ice fluid is delivered by a motor-driven pump from a fluid reservoir in the right wing just outboard of the nacelle. The pump is controlled by a two-position switch and a rheostat, both marked PROP ANTI-ICE. The control rheostat is marked MIN (minimum flow rate) 1/2, 3/4 and MAX (maximum flow rate); it may be set in any position between these points, to provide the desired flow rate. At the pump's maximum flow, it pumps approximately one quart every four minutes to each propeller.

Propeller anti-ice operating procedures are discussed in Section III, and the fluid capacity and specification are listed in the Service Requirements Table on the inside back cover.

DE-ICE SYSTEM.

A de-icing system for the wings and horizontal stabilizer is available as optional equipment.

MISCELLANEOUS EQUIPMENT.

SEATING ARRANGEMENTS.

Four optional seating arrangements, in addition to the standard seating arrangement, are available for your airplane. The pilot's and copilot's seats are the same for all arrangements. The standard seating arrangement offers a three-passenger rear seat with a single-panel back which is adjustable to five positions. The four optional seating plans consist of the following: (1) two reclining rear seats; (2) two adjustable rear seats, identical to the pilot's and copilot's seats; (3) one adjustable rear seat on the right side and a lounge on the left side behind the pilot's seat; (4) two adjustable rear seats plus a non-adjustable seat located in the left, aft end of the cabin. Folding arm rests are standard equipment on all single seats.

The lounge, adjustable rear seats and the non-adjustable aft seat are attached to the cabin floor with "Wedjit" fasteners which permit them to be removed or installed quickly and easily. To remove a seat or lounge, twist the slotted bolt in each "Wedjit" assembly 90° and lift the seat or lounge from the floor.

To install a seat or lounge, position the attachment points above the "Wedjit" assemblies and push down until each is securely latched.

PILOT'S AND COPILOT'S SEATS.

The pilot's and copilot's seats are adjustable fore-and-aft, with three reclining positions. Handles on the lower front of each seat are provided to control adjustments. To move a seat forward or back, pull the left handle up and slide the seat to the desired position, then release the handle and slide the seat to the nearest locking position. To change the seat angle, pull up on the right handle, lean forward or back to the desired position and release the handle. The seat backs fold forward to load the rear seats.

The folding arm rests fold up beside the seat back for stowage. To stow the arm rests, lift and push out on the lower end of the arm rest vertical support rod to disengage it from the seat, fold the rod into the channel under the arm rest cushion, and push the arm rest to the stowed position. The inboard folding arm rests on the pilot's and copilot's seats and on all single rear seats will slide behind the seats in the stowed position allowing more room in the center aisle.

THREE-PASSENGER REAR SEAT.

The standard rear seat accommodates three passengers. The seat back is hinged at the bottom and may be set in any one of five positions by reaching behind the center top of the seat back, pulling on the adjustment handle, and moving the seat back to the desired position. To gain access to the baggage area from within the cabin, pull the adjustment handle forward and fold the back of the seat forward and down.

RECLINING REAR SEATS.

Two individual reclining rear seats with a removable center arm rest may be installed in your airplane. Each seat can be adjusted to suit the comfort of the occupant. To adjust the seat to a reclining position, push forward on the adjustment handle (located just above the seat cushion on the outside of each seat), lean backward to the position desired, and release the handle. To adjust the seat to an erect position, press the handle forward and lean forward while pushing back on the seat bottom. The reclining seats may be used to accommodate three passengers if both

backs are positioned at the same angle and the center arm rest is removed. To remove or install the arm rest, simply withdraw or insert it in the mounting bracket located between the seats. For additional hip room, the arm rests on each cabin will may be removed by pulling them up and out of the mounting brackets.

ADJUSTABLE REAR SEATS.

Adjustable seats identical to the pilot's and copilot's seats may be installed in the rear seat position of your airplane. Refer to the paragraph concerning the pilot's and copilot's seats for the adjustment procedure for these seats.

LOUNGE.

A lounge incorporating an adjustable back rest may be installed behind the pilot's seat. The lounge has two safety belts and two pillows, and will accommodate two passengers sitting side-by-side. The lounge will accommodate one passenger in a reclining position using a safety belt and the adjustable back rest on the aft end of the lounge. The back rest is adjustable to four positions: vertical, horizontal and two intermediate positions. To adjust the back rest, pull the handle located behind the top of the back rest, move the back rest to the desired position, and release the handle.

NOTE

If a headrest is installed on the adjustable back, it must be removed before the back can be lowered to the horizontal position.

HEADREST.

Headrests are available for use on the lounge and all seats except the three-passenger and reclining rear seats. Headrests may be installed and adjusted by inserting the two support rods into sockets in the top of the seat backs and sliding them up or down to the desired height.

WRITING DESK.

A leaf-type writing desk, made of walnut, may be installed as an optional item on the back of the pilot's or copilot's seat or the adjustable-type rear seats. To use the desk, lift the leaf and swing it to a horizontal position. When not in use, the leaf may be lifted and lowered to the stowed position, flat against the seat back.

CABIN COMPARTMENT CURTAIN.

To permit use of the dome light in the passenger area without distracting the pilot, a traverse-type curtain may be installed immediately behind the pilots' seats. A tieback strap on the left side of the cabin secures the curtain when it is not in use.

CABIN DOOR.

The large cabin door, on the right side of the airplane, has a flush-type outside door handle, a conventional inside handle, and a door stop.

The door lock, located above the outside handle, is operated with the same key used for the baggage door. It is unlocked by turning it approximately a half turn.

OUTSIDE DOOR HANDLE.

To operate the outside cabin door handle, first press the aft end of the handle and pull the handle out of its recess. Rotate the handle up and back to open the door. Once the door is opened, return the handle to its recess. Before closing the door from the outside, place the inside door handle in the CLOSE position. Close the door, extend the outside handle, and rotate it down and back about 1/4 turn to lock the door. Then return the handle to its recess.

INSIDE DOOR HANDLE.

To open the cabin door from the inside, pull the inside door handle back and down and push the door out until it engages the stop. To close the door, put the door handle in the CLOSE position, and pull the door closed with the armrest. Make sure the door is fully latched, then push the inside handle up and forward to LOCK.

NOTE

Make sure the door is locked before you take off. It is difficult to lock the door in flight.

EMERGENCY EXIT.

For emergency exit, the left rear cabin window can be jettisoned. Pull off the plastic cover over the emergency release ring under the window. Pull the ring to release the window retainers, then push the window out.

BAGGAGE AREA.

Baggage or cargo up to 200 pounds may be stowed in the space back of the rear seat. It may be loaded from the ground through the 22 x 20 inch baggage door on the right side of the fuselage near the wing trailing edge. The door has a push-button latch and a lock operated by the key used for the cabin door.

With the standard seating arrangement, the baggage floor area is approximately 1300 square inches. There is also a small utility shelf back of the baggage area for storing small articles.

In airplanes with three individual rear seats or a single seat and lounge the baggage area is reduced to approximately one half, since the third seat and a portion of the lounge occupy that space.

CARGO TIE-DOWN LUGS.

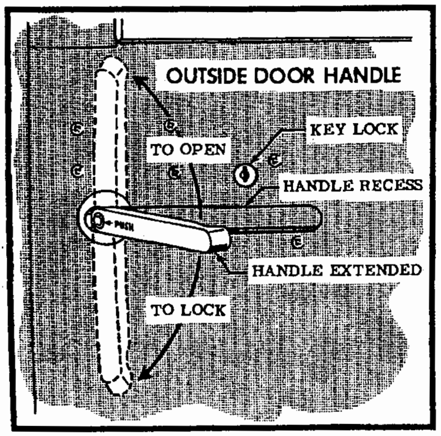
The airplane has provisions for the installation of cargo tie-down lugs. If your airplane has a standard rear seat or reclining rear seats, an optional kit is available containing eight tie-down lugs. Four of the lugs attach to the floor of the baggage area behind the rear seats. When additional cargo space is required, the rear seats may be removed, and the four remaining lugs may be installed in the area normally occupied by the rear seats. Two of the lugs attach to the fuselage rear spar, and two attach to the floor approximately 12 inches behind the front spar.

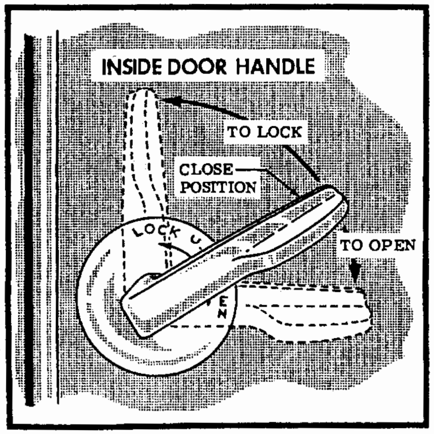
With the lounge and rear seat arrangement, the two adjustable rear seats arrangement, and the two adjustable rear seats and fixed rear seat arrangement, recessed tie-down rings are set in the floorboards and a baggage tie-down strap assembly is optional equipment. The arrangement with two adjustable rear seats uses six recessed rings and four rings are used with the lounge or third rear seat arrangement.

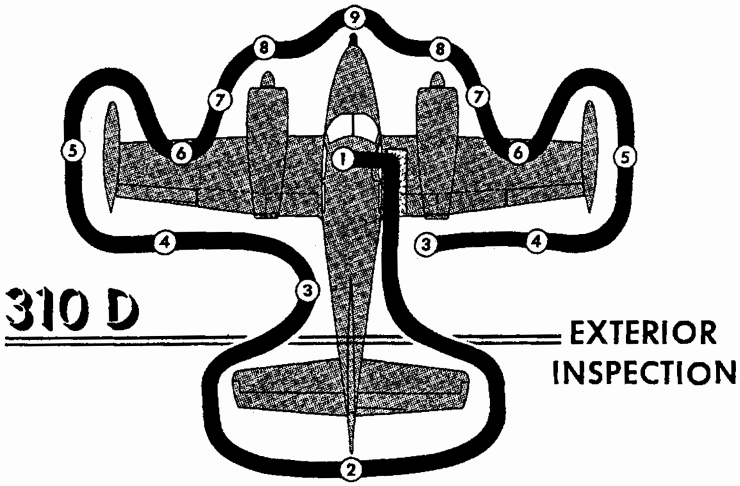
To secure baggage with the tie-down straps, place it between the rings, spread the straps over it and secure the fittings on the straps to the rings, then tighten the straps.

COAT HANGER HOOKS.

Two coat hanger hooks are positioned on the cabin ceiling over the baggage area so that clothing may be hung up full length out of the passenger area.







(1) a. Remove controls lock.
b. Momentarily turn on battery switch, and check fuel quantity gages. Check oxygen pressure.

(2) a. Remove external surface locks, if installed.
b. Check general condition of elevator, rudder and trim tab hinges, hinge bolts and actuator rod bolts.
c. Remove tie-down.

(3) a. Check static pressure source hole for obstruction.
b. Open baggage door and check that oxygen masks and hoses are available. Check cylinder shut-off valve (rear system).
c. Close baggage door and check for security.

(4) a. Check aileron and tab hinges, and hinge and actuator rod bolts.

(5) a. Check main fuel tank filler cap and fairing cover for security. On first flight of day, drain sump.

(6) a. Check auxiliary tank filler cap for security.
b. Check battery compartment cover panel for security (left side only).
c. Check anti-ice fluid supply. Check reservoir cover panel for security (right side only).
d. Check auxiliary tank vent for obstruction.
e. Check landing light for damage.
f. Remove wing tie-down.
g. On first flight of day, drain auxiliary tank sump.

(7) a. Check oil level. Minimum 9 quarts; fill to 12 quarts for extended flight.
b. Check main landing gear strut and tire inflation. Check gear door for security.
c. On first flight of the day, drain two ounces of fuel from the strainer.

(8) a. Check propeller and spinner for nicks, cracks and security.
b. Check oil filler cap for security through cooling air inlet in cowl nose cap.
c. Check cowl access doors for security.

(9) a. Check nose gear strut and tire inflation, nose gear doors for security.
b. Check oxygen cylinder shutoff valve (forward system).
c. Check pitot tube opening for obstructions.
d. Check taxi light for damage.
e. Remove tie-down.

Repeat steps "4" through "8."

Section II

Normal Procedures

AFTER FAMILIARIZING YOURSELF with the equipment of your airplane, your primary concern will be its operation. This section lists, in Pilot's Check List form, the normal procedures necessary to operate your airplane efficiently and safely.

This section is condensed to include only normal "day-to-day flying" procedures, and is one of your best sources of normal flying information. It is supplemented by Section III, which contains a narrative description of operating procedures, and Section IV, which describes emergency procedures. This subdivision of information permits quick and easy reference to any flight procedure desired.

All airspeeds mentioned in Sections II, III, and IV are indicated airspeeds (IAS) with the exception of the Stall Speed Chart on page 3-10 which is presented in true indicated airspeeds (TIAS). Corresponding true indicated airspeeds may be obtained from the airspeed correction table in Section VII.

BEFORE ENTERING THE AIRPLANE.

(1) Perform an exterior inspection, following the procedure given in the diagram on page 1-28.

BEFORE STARTING ENGINES.

(1) Adjust and lock seats in a comfortable position, and fasten safety belts.

IMPORTANT

After a seat is moved either forward or aft, it should be tested to see that the latching pins are locked securely.

(2) Lock cabin door.
(3) Check controls lock removed.

(4) Check landing gear switch — DOWN.
(5) Battery switch — ON.

NOTE

When using an external power source, do not turn on the battery until external power is disconnected, to avoid a weak battery draining off part of the current being supplied by the external source.

(6) Generator switches — ON.

NOTE

If 50-ampere generators are installed, turn on one at a time as the engines are started.

(7) Check circuit breaker panel for faulty circuits.
(8) Landing gear lights — push to test (check iris - open).
(9) Check fuel quantity indicators.
(10) Check left fuel selector valve handle — LEFT MAIN; right fuel selector valve handle — RIGHT MAIN (valves in proper detents).
(11) Adjust elevator trim tab position indicator to TAKE-OFF range.
(12) Adjust rudder trim tab position indicator to neutral position.
(13) Adjust aileron trim tab position indicator to neutral and check tab position visually.
(14) Set altimeter and clock.
(15) Turn off all radio switches.
(16) Release parking brake and test-operate brakes, noting any spongy action or excessive brake pedal travel.
(17) Check flight controls for free and correct movement.
(18) Set parking brake.
(19) For night flying, test-operate all lights except landing lights. Make sure an operating flashlight is aboard.

STARTING ENGINE (Left Engine First).

(1) Turn ignition switches ON.
(2) Open throttle approximately 1/2 inch.
(3) Set propeller pitch lever full forward for HIGH RPM.
(4) Set mixture lever full forward for FULL RICH.
(5) Clear the propeller.
(6) Turn the auxiliary fuel pump switch to PRIME position.

NOTE

Avoid leaving the auxiliary fuel pump switch in either the PRIME or ON position for more than a few seconds unless the engine is running.

(7) Press starter button when fuel pressure reaches 2 to 2.5 PSI.

NOTE

If the engines are hot, press starter button first, then turn auxiliary fuel pump switch to PRIME.

(8) Turn off auxiliary fuel pump switch when engine runs smoothly.

NOTE

During very hot weather, if there is an indication of vapor in the fuel system (fluctuating fuel pressure) with the engine running, turn the auxiliary fuel pump switch to ON until the system is purged.

(9) Check for an oil pressure indication within 30 seconds in normal weather and 60 seconds in cold weather. If no indication appears, shut off engine and investigate.
(10) Disconnect external power source, if used.

WARM-UP AND GROUND TEST (During Taxiing).

(1) Set both engines at 800 to 1000 RPM.
(2) For night flight, check landing lights.
(3) Turn on radios if required.
(4) Continue the warm-up while taxiing out to the active runway.
(5) Stop airplane at the run-up location with nosewheel straight, and set parking brake. To avoid propeller tip abrasion, do not run-up engines on loose cinders or gravel.
(6) Advance throttle to 1700 RPM with control wheel neutral or forward.
(7) Check engine instruments for operation and indication.
(8) Check generator operation by turning off each generator switch individually and noting amperage.
(9) Check magnetos (125 RPM maximum allowable drop).
(10) Check induction air heat source operation by noting RPM and manifold pressure drop.

(11) Place each propeller pitch lever in the FEATHER position until engine speed drops to 1200 RPM, then return to full forward position.

NOTE

If propeller operation has been unusually sluggish or erratic, feather propeller twice to 600 RPM in run-up, retarding throttle as necessary to avoid excessive manifold pressure at low RPM. Exercising the propeller in this manner insures optimum propeller governing in flight.

(12) Check operation of each vacuum pump and amount of suction to the gyros, with the vacuum selector test valve knob.
(13) If each engine accelerates smoothly and oil pressure remains steady at some value between 30 and 60 PSI, the engines are warm enough for take-off.

BEFORE TAKE-OFF OR DURING TAXIING.

(1) Recheck elevator trim tab position indicator for TAKE-OFF range.
(2) Recheck rudder trim tab position indicator for neutral position.
(3) Recheck aileron trim tab position indicator for neutral, and check tab visually.
(4) Turn auxiliary fuel pump switches to ON.
(5) Check induction air — COLD.
(6) Check free and correct movement of flight controls.
(7) Check that the cabin door and the pilot's window are closed and locked.
(8) Check and set flight instruments and radio as necessary.

NORMAL TAKE-OFF.

(1) Flaps 0°.
(2) Apply full throttle smoothly to avoid propeller surging.
(3) For maximum performance, set mixture for field elevation.

NOTE

Leaning during the take-off roll is normally not necessary; however, should maximum take-off or subsequent engine-out performance be desired, fuel pressure should be adjusted to match field elevation.

(4) Maintain airplane in level attitude in take-off run.

(5) Keep heels on floor to avoid dragging brakes.
(6) Apply slight back pressure to raise nosewheel as airplane reaches 82 MPH (minimum single-engine control speed).
(7) Plan to break ground at 95 MPH (minimum safe single-engine speed).
(8) Apply brakes momentarily to stop wheel rotation.
(9) Retract landing gear.
(10) Accelerate to 111 MPH (best single-engine rate-of-climb speed) and climb to a safe single-engine maneuvering altitude.
(11) Accelerate to 119 MPH (best twin-engine rate-of-climb speed).
(12) Turn auxiliary fuel pumps OFF individually, checking final fuel pressure indications.

NOTE

During very hot weather, if there is an indication of vapor in the fuel system (fluctuating fuel pressure) turn the auxiliary fuel pump ON until cruising altitude has been obtained and the system is purged.

CLIMB (Twin Engine).

(1) In normal operation, if no obstacle is ahead, climb out with flaps retracted at 130 - 140 MPH, with 24 inches of manifold pressure and 2450 RPM.
(2) Mixture should be adjusted to the high-pressure side of the cruise power fuel pressure range for economical fuel consumption in cruising climb.
(3) For maximum rate-of-climb, use full throttle and 2625 RPM at 119 MPH, decreasing climb speed to 115 MPH at 10,000 feet.
(4) The mixture should be adjusted to the low-pressure side of the take-off and climb dial range for maximum climb performance.

CRUISING.

(1) Select cruising power setting from range charts (see Section VII). Normal cruising power settings are 23 inches and 2300 RPM, and maximum cruising power settings are 24 inches and 2450 RPM.
(2) After speed is stabilized, trim airplane.
(3) Adjust mixtures to the low-pressure side of the dial range for normal operation at the desired power.
(4) Adjust friction knob to prevent engine controls from creeping.

LET-DOWN.

(1) Reduce power to obtain desired let-down rate at cruising speed.
(2) Set mixture levers full forward (FULL RICH).
(3) For steep let-downs, decrease speed to 160 MPH or less and extend flaps 15°. If necessary, for steeper let-downs, reduce speed to 140 MPH and extend landing gear.

NOTE

Avoid steep, power-off let-downs with low fuel.

BEFORE LANDING.

(1) Check the left fuel selector valve handle — LEFT MAIN and the right fuel selector valve handle — RIGHT MAIN.
(2) Check mixture levers full forward (FULL RICH).
(3) Turn on auxiliary fuel pumps.
(4) Check induction air -- COLD.
(5) Extend flaps to 15° in small increments below 160 MPH.
(6) Extend landing gear below 140 MPH.
(7) Check green landing gear position indicator light for illumination.
(8) Set propeller pitch levers for 2625 RPM (full forward) for maximum power in case of a go-around.
(9) Lower flaps to 30° — 45° below 140 MPH.
(10) Approach at approximately 95 MPH with or without power.

NORMAL LANDING.

(1) Land on main wheels first.
(2) Lower nosewheel gently to runway after speed is reduced.
(3) Avoid excessive braking unless obstacle is ahead.

GO-AROUND (Twin Engine).

(1) Apply full throttle and increase engine speed to 2625 RPM, if necessary.
(2) Reduce flap setting to 15°.
(3) Trim airplane for climb.
(4) Retract flaps as soon as all obstacles are cleared and a safe altitude and airspeed are obtained.

AFTER LANDING.

(1) Retract flaps.
(2) Park with nosewheel aligned straight ahead if possible. If gusty wind conditions prevail, caster the nosewheel to the extreme right or left position, to protect the rudder from wind damage.
(3) Turn off auxiliary fuel pumps.
(4) Stop engines by putting mixture levers in IDLE CUT-OFF.
(5) After engines stop, turn ignition switches OFF.
(6) Turn all switches OFF.
(7) Set parking brakes.
(8) Install controls lock, if required.

Notes

SECTION III

Operating Details

THIS SECTION GIVES, in narrative form, detailed information on those check list items in Section II that require further explanation.

PREFLIGHT CHECK.

The exterior inspection described in Section II 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 gear doors are often disconnected to allow more room. Therefore, it is important after such maintenance to double-check the security of these doors. If the airplane 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, de-icer boots, and radio antennae. 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 mud shield 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.

If the airplane is equipped with auxiliary fuel tanks, make sure that the filler caps are tightly sealed to prevent loss of fuel in flight. The auxiliary fuel tank vents beneath the wing should also be inspected for obstructions, especially after operation from muddy fields.

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 hoses. 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 and stall warning transmitter heating elements is determined by observing a discharge on the ammeter when the pitot heat switch is turned ON. The effectiveness of each element 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 that will be discussed in separate sections.

STARTING ENGINES.

Since the wing obscures ground crew personnel when they are draining the fuel strainers or connecting the external power source to the airplane, it becomes doubly-important to clear the airplane properly before starting. Calling out "clear" in loud tones or giving a "thumbs up" hand signal to a responsible ground crew member is best. An answering "clear" or "thumbs up" hand signal from visible ground crew personnel is the required response.

Using an external power supply for starting is recommended in cold weather, or for airplanes that are normally used extensively in instrument or night flying. With the external power source connected, it is preferable to start the airplane with the battery switch OFF. If the battery switch is ON during the engine start, weak airplane batteries will drain off part of the current supplied by the external power source, resulting in less electrical power available for the start. After the external power source is disconnected, the battery switch should be turned ON to supply power to electrical equipment.

If 50-ampere generators are installed, turn on each generator after its engine is started. If both generators are turned on at once before the engines are started, the paralleling system will reduce the output from the operating generator.

Although either one may be started first and the procedure is identical for both, the left engine is normally started first. The cable from the battery to this engine is much shorter, which permits more electrical power to be delivered to the starter. If batteries are low, the left engine should start more readily.

Unlike carburetors, which supply no fuel to the engines until an airflow has been induced by cranking, the continuous-flow fuel injection system will start spraying fuel in the intake ports as soon as the throttle and mixture controls are opened and the auxiliary pump is turned on. Thus, fuel injection engines need no primer; at the same time, if an auxiliary pump is turned on accidentally while the engine is stopped, with the throttle open and the mixture rich, solid fuel will collect in the intake manifolds, the quantity depending on 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 this fuel drains away through the manifold drains before starting the engine. To avoid flooding, be sure you are ready to crank the engine before turning on the auxiliary pump.

If the engines are hot, starting will be easier and the possibility of flooding will be reduced if the auxiliary fuel pump is left off until the starter is turning over the engine. Press the starter button, then turn on the auxiliary pump.

Engine mis-starts characterized by weak, intermittent explosions followed by puffs of black smoke from the exhaust are the result of flooding or over-priming. 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 open approximately 1/2, the mixture in idle cut-off and the auxiliary pump off. As the engine fires, move the mixture control to full rich and close the throttle to idle.

If an engine is under-primed, which may occur in cold weather with a cold engine, repeat the starting procedure with the auxiliary fuel pump switch ON until the engine fires.

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

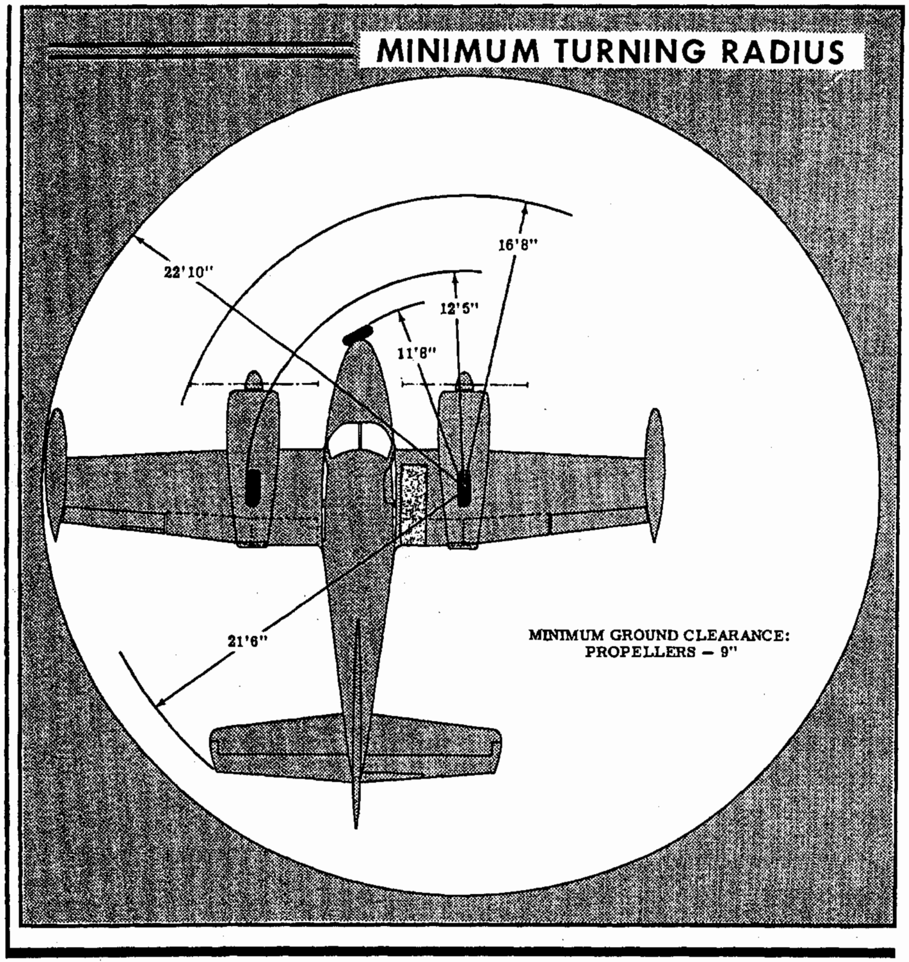
TAXIING.

A steerable nosewheel mechanism provides positive control up to 15° left or right, and free turning from 15° to 55° for sharp turns during taxiing. In addition to the nosewheel steering, which is preferred whenever practical, steering may be accomplished with the aid of the rudder, differential power, and differential braking on the main wheels. These aids are listed in the preferred order of use.

IMPORTANT

If the airplane is parked with the nosewheel castered in either direction, initial taxiing should be done with caution. To straighten the nosewheel, use full opposite rudder and differential power, instead of differential braking. After a few feet of forward travel, the nosewheel will steer normally.

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 1600 RPM while the oil is cold.

BEFORE TAKE-OFF.

Use the Pilot's Check List in the

airplane for the "before take-off" check 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 take-off should be restricted to the checks outlined in Section II.

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

If the ignition system check produces an engine speed drop in excess of 125 RPM, continue to warm up a minute or two longer, before rechecking the system. If there is doubt concerning the operation of the ignition system, checks at higher engine speed may confirm the seriousness of the deficiency. In general, a drop in excess of 125 RPM with a warm engine at 1700 RPM is not considered acceptable.

If instrument flights are contemplated, a careful check should be made of vacuum pump operation by switching the vacuum test selector valve knob to all positions. The minimum and maximum allowable suctions are 4.75 and 5.25 inches of mercury, respectively, on the instruments. (When the ARC CD-1 Course Director is installed, the suction limits at the instruments are 3.8 and 4.2 inches of mercury). The gage readings for both source positions should be higher than the gyro readings. Good generator condition is also important for instrument flight since satisfactory operation of all radio equipment and electrical instruments is essential. The generators are checked by observing the charging rate on the ammeter during an engine run-up to 1700 RPM while the generator on the opposite engine is switched off momentarily.

A simple last minute recheck of important items should include a quick glance to see that the top row of switches on the left switch panel 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.

TAKE-OFF.

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

Normal take-offs are conducted with flaps retracted to provide maximum safety in case of an engine failure after take-off. The distance required to clear a 50-foot obstacle, after an engine failure, at 95 MPH with flaps retracted is only approximately 60 percent of the distance required with flaps 15 degrees. The distance to decelerate to a stop from any given speed is also shorter, and there is less chance of tire damage with heavy braking since more weight remains on the main wheels with flaps retracted.

Full throttle operation is recommended on take-off since it is important that a speed well above minimum single-engine control speed (82 MPH) be obtained as rapidly as possible. It is desirable to accelerate the airplane to 95 MPH 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 take-off.

In order to obtain maximum engine power for take-off and climb out, adjust the mixture controls during the initial take-off roll to the low-pressure side of the dail range corresponding to the field elevation. While the performance increase obtained by leaning will be small at low altitudes, it will become greater as field elevation increases. Consequently, this technique should always be employed when operating from field elevations greater than 5000 feet above sea level. If you are familiar with typical mixture lever positions on the quadrant for best power mixture at various field elevations for your particular airplane, you may preset the mixture controls before take-off. However, these positions will vary between airplanes because of fuel metering and mixture control rigging tolerances.

After take-off it is important to maintain the minimum safe single-engine climb speed (95 MPH). As you accelerate still further to best single-engine rate-of-climb speed (111 MPH), it is good practice to climb rapidly to an altitude at which the airplane is capable of circling the field on one engine.

NOTE

For take-offs at high density altitudes, above the single-engine service ceiling, the allowance must be enough to clear obstacles in single-engine drift-down flight.

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

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 immediately after reaching 95 MPH.

The use of 15° flaps reduces the ground run and the total distance over a 50-foot obstacle by approximately 13 percent. Minimum-run and soft-field take-offs are performed with flaps 15° by lifting the nosewheel as the airspeed approaches 60 MPH, so that the airplane will leave the ground in a tail-low attitude. However, the airplane should be immediately leveled off and accelerated to 95 MPH as rapidly as possible.

Obstacle clearance take-offs from soft fields are conducted in the same manner except that a climb at 85 MPH is established after take-off. From hard-surface runways the airplane will climb at a given airspeed over an obstacle in approximately the same total distance using any lift-off speed between 65 and 85 MPH. The best technique is to lift off as the airspeed approaches 80 MPH, and then establish an 85 MPH climb. Performance data for this type of take-off is presented in Section VII.

Crosswind take-offs are performed with a minimum flap setting necessary for the runway length, to minimize the drift angle after take-off. Additional power may be carried on the upwind engine until the rudder becomes effective. The airplane is accelerated to a slightly higher than normal take-off 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 take-off with one tip tank full and the opposite tank empty creates a lateral unbalance at take-off speed. This is not recommended since gusty air or premature lift-off could create a serious control problem.

AFTER TAKE-OFF.

To set up the airplane in climb configuration, retract the landing gear, adjust power for climb, retract the flaps (if used) at a safe altitude and airspeed, 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 take-off" 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.

A cruising climb at 24 inches of manifold pressure, 2450 RPM (approximately 75% power) and 130 to 140 MPH is recommended for saving time and fuel for the overall trip. In addition, this type of climb provides better engine cooling, less engine wear, and more passenger comfort due to lower noise level. The mixture should be leaned in this type of climb to give fuel pressures on the high-pressure side of the cruising power dial range, which is approximately best-power mixture. At this setting, maximum performance for the power selected will be obtained without the high fuel consumption required for cooling at higher powers and lower climb speeds.

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 119 MPH at sea level to 114 MPH at 15,000 feet. During maximum-performance climbs the mixture should be leaned to give fuel pressures on the low-pressure side of the take-off and climb dial range to assure maximum power and adequate engine cooling.

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 106 MPH at 15,000 feet.

CRUISE.

Tabulated cruising information for normal cruising power and altitudes is presented in Section VII. These charts are based on 100 and 130 gallons of fuel for cruise, normal lean mixture, 4830 pounds gross weight, zero wind, and no fuel reserve. Allowances for warm-up, take-off 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 take-off and climb are given in the climb charts on page 7-3.

Since one of the main advantages of the airplane over ground transportation is speed, one should use the high cruising speeds obtainable. However, if a destination is slightly out of reach in one flight at normal cruising speed, it may save time and money to make the trip nonstop at some lower speed. The cruising charts show the long ranges obtainable at lower cruising speeds.

Normal cruising is done 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 310 Power Computer. A maximum cruising power of approximately 75% is allowable with 24 inches of manifold pressure and 2450 RPM.

To achieve the level flight performance shown in the cruising charts in Section VII, lean the mixtures to give fuel pressures on the low-pressure side of the cruise power dial range for the desired power. This should result in normal lean mixtures which will yield airspeeds only slightly below those available at best power mixture but with considerably lower fuel consumption and, consequently, longer range. This leaning technique offers an optimum compromise between speed and range for normal cruising flight.

Should maximum speed be desirable for short flights where range and fuel consumption are less important, the mixture should be leaned to the high-pressure side of the cruise power dial range. This will yield approximately best-power mixture with a resulting airspeed of one to two MPH greater and a fuel flow approximately two gallons per hour greater than those listed in Section VII.

If maximum range is desired, the mixture should be leaned approximately one PSI below the low-pressure edge of the dial range for the power utilized. This should result in airspeeds approximately 5 MPH lower than those listed in Section VII but with an increase of approximately 150 miles in range. At normal cruise power (below 75% power), operation

at a maximum-range mixture setting is not detrimental to engine life providing that the engines are running smoothly and the cylinder head temperatures are maintained in approximately the middle of the green arc range.

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.

Synchronize the propellers by setting one propeller at the desired engine speed, turning the friction control knob to prevent propeller pitch lever creep, and then adjusting the other propeller pitch lever until the tachometer needles are aligned one over the other. If synchronization is slightly off, as indicated by an intermittent "beat", one propeller pitch lever should be adjusted to eliminate this beat. Synchronization is simplified by limiting the adjustments to only one propeller. To avoid slack in controls, the final movement of the lever should be made in a DECREASE RPM direction.

In airplanes equipped with auxiliary fuel tanks, it is important to burn approximately one hour of fuel from the main tanks before switching to auxiliary tanks. This is necessary to provide space for approximately 7 gallons of auxiliary fuel and vapor that are returned through vapor return lines to the main tanks. If sufficient space is not available in the main tanks for this diverted fuel, the tanks may overflow through the filler cap vent hole. Since part of the fuel from the auxiliary tanks is diverted back to the main tanks instead of being consumed in the engine, these tanks will run dry sooner than may be anticipated. However, the main tank endurance will be increased by the returned fuel.

Since the auxiliary fuel tanks are designed for cruising flight, they are not equipped with pumps. Under cruising conditions, failure of an engine-driven fuel pump will not be critical because there will be ample time to switch on the main fuel tank and turn on the auxiliary fuel pump. However, operation near the ground using auxiliary fuel tanks is not recommended because of this limitation.

The fuel injection system employed on these engines is considered to be non-icing. In addition, the internal location of the induction air inlets should preclude the possibility of impact ice covering the intake air filters. Induction air heat is incorporated, however, to assure satisfactory operation in the unlikely event that unusual atmospheric conditions should cause intake system icing. The induction air handles should be left in the full cold position for all normal operations. Should intake system icing be encountered, the handles should be pulled to the full heat position.

FLIGHT CHARACTERISTICS.

The stability and control characteristics of the airplane are very satisfactory. Control forces are light and adequate control is available throughout the operating speed range. When properly trimmed, the airplane will remain in straight and level

STALL SPEED CHART

MPH - TIAS

4830 POUNDS GROSS WEIGHT

Configuration	Angle of Bank 0°	20°	40°	60°
Gear and Flaps Up	84	87	96	119
Gear Down and Flaps 15°	80	83	92	113
Gear Down and Flaps 45°	74	77	85	105

flight with little attention from the pilot.

NORMAL STALLS.

The stall characteristics of the airplane are conventional in all configurations. 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 severity as the stall is approached. The power-on stall occurs at a very steep angle either with or without flaps, and it is difficult to inadvertently stall the airplane during normal maneuvering. The stall characteristics in all configurations are characterized by a clean drop of the nose accompanied by increased buffet during the stall. The rudder should be used to prevent yaw during the approach to the stall since a rolling tendency will result if the airplane is allowed to yaw. Recovery is made very quickly with little loss of altitude if the nose is not lowered excessively and full available power is applied to both engines. Landing gear and flap position have little effect on the stall characteristics except that the stalling speed will be lowered in proportion to the degree of flap extension. Power-off stall speeds at maximum gross weight are presented as true indicated airspeeds in the stall speed chart because indicated airspeeds are inaccurate near the stall.

ACCELERATED STALLS.

Stalls in accelerated flight are preceded by stall warning horn indications, and by light aerodynamic buffet. The structural limitations of the airplane will be exceeded if accelerated stalls are performed above 163 MPH.

SPINS.

Intentional spins are not permitted in this airplane, and due to the excellent stall warning system provided, it is not probable that an inadvertent spin will be encountered. Should a spin occur, however, the following recovery procedure 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 dive with smooth steady control pressure.

FLIGHT CONTROLS.

Elevator control forces are relatively light in cruising flight at all airplane loadings. Reducing power and extending the flaps and landing gear increases the elevator control forces appreciably thereby enhancing the control feel at low airspeeds. Aileron control forces are light, and aileron control is much more effective than is at first apparent from control feel. This is more pronounced at slow speeds with full wing tip (main) tanks, where the time response to aileron deflection is increased slightly. Rudder forces are comparatively light, and only slight rudder pressure is required when rolling into and out of turns. All trim tabs are effective throughout the speed range of the airplane, the rudder and elevator trim becoming very effective at cruising airspeeds.

LEVEL FLIGHT CHARACTERISTICS UNDER VARIOUS SPEED CONDITIONS.

The airplane flight characteristics throughout the level-flight speed range are conventional in all respects. Slow flying is easily accomplished with wing flaps up or down and landing gear up or down.

MANEUVERING FLIGHT.

No acrobatic maneuvers are approved in this airplane. The airplane is, however, conventional in all respects throughout the maneuvering range encountered in normal flight.

DIVING.

Dives should be limited to the maximum diving airspeed marked on the airspeed indicator (248 MPH). Although trim changes and flight characteristics are conventional, caution should be exercised because the airplane picks up speed rapidly, and if rough air is encountered unexpectedly, it is difficult to slow the airplane down to a safe speed. Pull-outs should be very gentle to avoid excessive stresses in the airplane as well as discomfort to the passengers.

LET-DOWN.

Let-downs should be initiated as much as an hour before estimated landing time to permit a gradual rate of descent at cruising speed using enough power to keep the engines warm and the cylinders clear. Since the airplane is so aerodynamically clean it is difficult to descend rapidly without reducing power to very low settings. This results in undesirably low cylinder head temperatures, which in turn lead to spark plug fouling. The optimum engine speed in a let-down 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 for the landing. This will provide an adequate fuel flow to each engine if a full-power go-around is necessary. In airplanes equipped with auxiliary fuel tanks, the selector valves should be switched to main tanks for landing because the auxiliary tanks are not equipped with auxiliary fuel pumps.

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 light (green), is further proof that the gear is down and locked. If it is reasonably certain that the gear is down and the gear-down indicator light 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 (red) indicator light.

A simple last-minute recheck on final approach should confirm that the top row of switches on the left switch and control panel are ON, the gear-down indicator light (green) is 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.

Short-field landings on hard-surface runways are performed with 45° flaps from an 80 to 90 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 quickly lowered to the ground and heavy 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 downwind rudder. The landing is made in a 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.

AFTER LANDING.

Heavy braking in the landing roll is not recommended because skidding the main wheels is probable, with resulting loss of 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 OFF while taxiing to the hangar, except in extremely hot weather when auxiliary fuel pumps may be needed to maintain steady fuel pressures.

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 reduces 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 body. 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.

NIGHT FLYING.

Before starting the engines for a night flight, the rheostats located on the left switch and control panel and on the overhead console panel should be turned on and adjusted to provide enough illumination to check all switches, controls, etc. In addition, the dome lights may be used if desired.

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 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 optional taxi light, if installed, 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. Taxiing over loose gravel should be avoided with the landing lights extended. In the engine run-ups, special attention should be directed to generator operation by individually turning the generator switches OFF and ON and noting the response on the ammeter.

Night take-offs are conventional, although the gear retraction operation is usually delayed slightly to insure that the airplane is well clear of the runway. The landing lights, if used, should be retracted before the airspeed exceeds 160 MPH.

In cruising flight, the interior lighting intensity is usually decreased further for better outside vision.

ENGINE OPERATION IN COLD WEATHER.

STARTING.

Whenever possible, external power should be used in cold weather, due to the higher cranking power required, coupled with the decreased battery output at low temperatures.

When very cold temperatures are anticipated, oil dilution should be employed before stopping the engines, if external preheat is not available. The starting procedure is normal, although if the engines do not start immediately, it may be necessary to switch the auxiliary fuel pumps to ON for a few seconds.

The use of external preheat will considerably improve cold-weather starting and materially reduce the severity of conditions imposed on both the engines and the electrical system. Preheat also will thaw the oil trapped in the oil cooler which will probably be congealed prior to starting in very cold temperatures.

WARM-UP.

If the oil pressure gage is extremely slow in indicating pressure, it may be advisable to fill the pressure line to the gage with kerosene. No temperature indication need 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 if preheat is not used), accelerate the engines several times to higher RPM. If the engines accelerate smoothly and the oil pressure remains normal and steady, the airplane is ready for take-off.

BEFORE TAKE-OFF.

The propeller should be operated through several complete cycles to

warm the governor and propeller hub. The engines should accelerate smoothly and oil pressure should remain normal and steady.

TAKE-OFF.

Take-off procedures are normal in all respects.

CLIMB AND CRUISE.

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

LET-DOWN AND LANDING.

During let-down, watch engine temperatures closely and carry sufficient power to maintain them above operating minimums.

If erroneous instrument readings are suspected due to water or ice in the static-pressure lines, the static-pressure alternate-source valve should be opened. Since this valve vents to the relatively-low static pressure of the cabin, the airspeed indicator and 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.

If the alternate static source must be used for instrument operation, compensation should be made in indicated airspeeds and altitudes. In landing with the alternate source valve open and the pilot's storm window closed, fly at an indicated airspeed 10 MPH faster and altitude 30 feet higher than normal. During landings with the static source valve open and the pilot's storm window open make these allowances 26 MPH and 160 feet.

OIL DILUTION OPERATION.

If your airplane is equipped with an optional oil dilution system and very low temperatures are expected, dilute the oil in each engine before stopping the engines. Determine the dilution time required for the anticipated temperature from the Oil Dilution Table on page 3-16. With the engines operating at 1000 RPM, and the auxiliary fuel pumps in the ON position, hold the oil dilution switch to L (left engine) and R (right engine) for the necessary time. Fuel will flow into the oil pump of the engine receiving dilution, at the rate of 1 quart every two minutes. Diluting the oil in each engine for eight minutes (4 quarts of fuel) is considered maximum.

While diluting the engine oil, watch the oil pressure closely. A slight, gradual pressure drop is to be expected as the oil is thinned. Stop the engine, however if any sharp fluctuation in pressure is observed; it may be caused by an oil screen becoming clogged with sludge washed down by the fuel.

NOTE

When the dilution system is used

Operating Details

OIL DILUTION TABLE

	TEMPERATURE		
	0°F	-10°F	-20°F
Dilution Time	2 min.	5 min.	8 min.
Fuel Added	1 qt.	2.5 qt.	4 qt.

MAXIMUM SUMP CAPACITY —— 16 qt.
MAXIMUM FOR TAKE-OFF —— 13 qt.

for the first time each season, the oil should be changed and the oil screens cleaned to remove sludge accumulations washed down by the fuel. Use the full dilution period, drain the oil, clean the screens, refill with new oil and redilute as required for the anticipated temperature before the engine has cooled completely.

On starting and warm-up after diluting the oil, again watch the oil pressure closely for an indication of sludge blocking the oil screens. If the full dilution time was used, starting with full sumps, run the engines long enough to evaporate some of the fuel and lower the sump level to 13 quarts before take-off. Otherwise, the sumps may overflow when the airplane is nosed up for climb. To avoid progressive dilution of the oil, flights of at least an hour should be made between oil dilutions.

PITOT AND STALL WARNING HEATER OPERATION.

At least five minutes before entering a potential icing condition, turn on the pitot and stall warning heater switch, so these units will be warm enough to prevent formation of ice. Preventing ice is preferable to attempting its removal once it has formed.

PROPELLER ANTI-ICE SYSTEM OPERATION.

To operate the propeller anti-ice system, proceed as follows:

(1) Anti-ice switch — ON (up position).
(2) Anti-ice knob — MAX (turned full clockwise) for one minute to wet blades just before entering suspected icing conditions.
(3) Anti-ice knob — MIN (counterclockwise position) and note sound of ice against the fuselage.

NOTE

A slushing sound against the fuselage is desired, and fluid should be added if necessary until the slushing sound is heard. Sharp bangs indicate that the ice is solid and more fluid is required.

Under average icing conditions, the above procedure will provide approximately one-half hour of anti-icing before the fluid supply is exhausted.

HEATER OPERATION FOR HEATING AND DEFROSTING.

The heater is operated for heating and windshield defrosting in accordance with the following steps:

(1) Battery switch — ON.
(2) Cabin air knob — Full out.
(3) Defrost knob — Adjust as desired.
(4) Cabin air temperature control knob — Full clockwise to MAX.
(5) Cabin heater switch — HEAT.
(6) Heat registers — Open (as desired).

NOTE

Warm air should be felt coming out of the cabin heat registers within approximately one minute. If the heater does not start, return the heater switch to the OFF position, and check the circuit breaker labeled CABIN HEAT. Place the cabin heater switch in the HEAT position and attempt another start. If the heater still does not start, service is required and no further starting attempt should be made.

(7) Cabin air temperature control knob — Adjust as desired (after heater has been operating for one minute).
(8) To shut down the heater, place the cabin heater switch in the OFF position.

OXYGEN SYS. OPERATION.

The oxygen system operation is automatic in that no manual regulation is required to compensate for changes in altitude, or to shut off the oxygen flow when the system is not in use. To operate the system, proceed as follows:

Before Flight:
(1) Oxygen cylinder shut-off valve — Check open (valve handle rotated full counterclockwise).
(2) Oxygen pressure gage — Check for sufficient pressure for anticipated requirements of flight (see Oxygen Duration Chart, page 3-18.)

During Flight:
(1) Mask and hose — Select from plastic bag on utility shelf. If mask and hose are not connected, attach by inserting short plastic tube on mask securely into end of rubber hose.
(2) Mask — Put on.

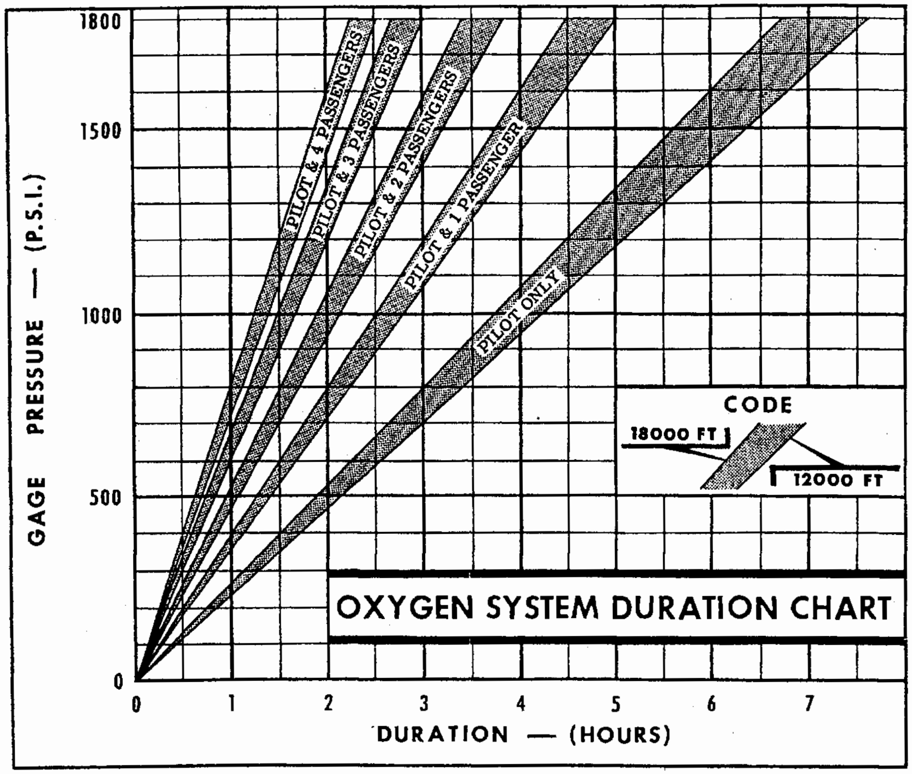
IMPORTANT

Permit no smoking when using oxygen. Oil, grease, soap and other fatty materials in contact with oxygen constitute a serious fire hazard. Be sure hands and clothing are free from oil before handling oxygen equipment.

(3) Hose coupling — Plug in overhead console.
(4) Oxygen flow indicator — Check

that red indicator disappears when hose is inserted into coupling, to insure that oxygen is flowing.

(5) Disconnect mask hoses from overhead console panel when not in use.



SECTION IV

Emergency Procedures

ENGINE FAILURE.

ENGINE FAILURE DURING TAKE-OFF BELOW 95 MPH.

(1) Cut power on operative engine and decelerate to a stop.

NOTE

The airplane can be accelerated from a standing start to 95 MPH on the ground, and then decelerated to a stop with heavy braking within 2500 feet of the starting point of the take-off run at sea level, and within 3300 feet of the starting point at 5000 feet altitude (zero wind, hard surface runway, standard conditions, full gross weight).

ENGINE FAILURE AFTER TAKE-OFF ABOVE 95 MPH WITH ROUGH TERRAIN AHEAD.

(1) Throttles — FULL FORWARD.
(2) Propeller pitch levers — FULL INCREASE RPM.
(3) Landing gear switch — UP.
(4) Determine the inoperative engine (idle engine same side as idle foot).
(5) Propeller pitch lever — FEATHER (inoperative engine).
(6) Climb out at 95 MPH.
(7) Trim tabs — Adjust for climb with airplane banked 3° — 5° toward operative engine.
(8) Accelerate to 111 MPH after obstacle is cleared.
(9) Flaps switch — UP (if extended) in small increments.
(10) Secure dead engine by turning OFF auxiliary fuel pump switch, generator switch, ignition switches, mixture lever, fuel selector valve handle.
(11) Fuel selector valve handle (operative engine) — Select tank to maintain lateral balance.

SUPPLEMENTARY INFORMATION CONCERNING ENGINE FAILURE DURING TAKE-OFF.

The most critical time for an engine to fail in a twin-engine airplane is during a two- or three-second period late in the take-off run while the airplane is accelerating to a safe engine-out climb speed. A detailed knowledge of recommended single-engine airspeeds in the table below is essential for safe operation of this airplane:

SINGLE-ENGINE AIRSPEED NOMENCLATURE	IAS—MPH
1. Minimum control speed	80
2. Minimum safe climb speed	95
3. Best angle-of-climb speed	95
4. Best rate-of-climb speed (flaps up)	111

These speeds should be memorized for instant recollection in an emergency, and it is worthwhile to review them mentally, prior to every take-off. The following paragraphs present a detailed discussion of the problems associated with engine failures during take-off.

A multi-engine airplane has an advantage over a single-engine airplane only after the engine-out minimum control speed is reached. This speed is defined as the minimum speed at which controlled flight is maintained with one engine inoperative, and full power operation on the other engine. Under these conditions, full control surface deflection of any one control is normally required to counteract extreme yawing and rolling tendencies of the airplane. This airplane has an engine-out minimum control speed of 80 MPH. Since this speed is so far below the optimum climb speed, it is not suitable for single-engine operation near the ground, especially with the landing gear and flaps extended and the inoperative propeller windmilling. A more suitable minimum safe single-engine climb speed is 95 MPH, since at this speed altitude can be maintained more easily while the landing gear is being retracted and the propeller is being feathered.

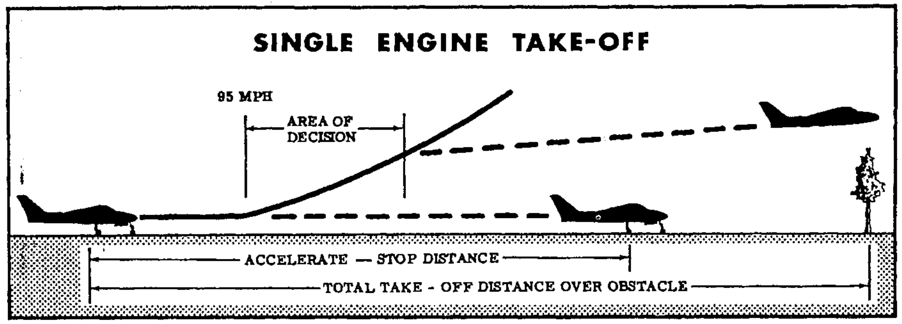
The best angle-of-climb speed for single-engine operation is defined as the speed which gives the greatest increase in altitude in a given distance. This speed becomes important when there are obstacles ahead on take-off, because once the best single-engine angle-of-climb speed is reached, altitude becomes more important than airspeed until the obstacle is cleared. The best single-engine angle-of-climb speed is approximately 98 MPH with flaps up and 91 MPH with flaps 15° for an average single-engine altitude. For convenience, a speed of 95 MPH may be used for any flap setting between 0 - 15°, since it is an average speed which also is identical to the recom-

mended minimum safe single-engine climb speed.

The best rate-of-climb speed for single-engine operation is defined as the speed that gives the greatest increase in altitude in the least time. This speed becomes important when there are no obstacles ahead on take-off, or when it is difficult to maintain or gain altitude in single-engine emergencies. The best single-engine rate-of-climb speed is 111 MPH with flaps up, and 101 MPH with flaps 15° at sea level. The flaps-up speed at 111 MPH is of primary importance, because rate-of-climb is appreciably greater with flaps up than with flaps 15°. The variation of flaps-up best rate-of-climb speed with altitude is shown in Section VII. For best climb performance, the wings should be banked 5° toward the operative engine.

Upon engine failure after reaching 95 MPH on take-off, the twin-engine pilot has a significant advantage over a single-engine pilot, for he has the choice of stopping or continuing the take-off. This would be similar to the choice facing a single-engine pilot who has suddenly lost slightly more than half of his take-off power. In this situation, the single-engine pilot would be extremely reluctant to continue the take-off if he had to climb over obstructions. However, if the failure occurred at an altitude as high or higher than surrounding obstructions, he would feel free to maneuver for a landing back at the airport.

Fortunately the Cessna 310D accelerates through this area where the airplane is "slow and low" in just a few seconds. However, to make an intelligent decision in this type of emergency, one must consider field length, obstruction height, field elevation, air temperature, headwind, and gross weight. The flight paths illustrated in the figure below indicate that the "area of decision" is bounded by: (1) the point at which 95 MPH is reached and (2) the point where obstruction altitude is reached. An engine failure in this area requires an immediate decision. Beyond this area, the airplane, within the limitations of single-engine climb performance shown in Section VII, may be maneuvered to a landing back at the airport.



At sea level, with zero wind and 4830 pounds gross weight, the distance to accelerate to 95 MPH and stop is 2390 feet, while the total unobstructed area required to take-off and climb over a 50-foot obstacle after an engine failure at 95 MPH is 2265 feet. This total distance over an obstacle can be reduced appreciably under more favorable conditions of gross weight, headwind, or obstruction height, However, it is recommended that in most cases it would be better to discontinue the take-off, since any slight mismanagement of single-engine procedure would more than offset the small distance advantage offered by continuing the take-off. The advantage of discontinuing the take-off is even more obvious at a 3000-foot field elevation where the corresponding distances are 2800 feet and 3295 feet, respectively. Still higher field elevations will cause the engine-out take-off distance to lengthen disproportionately until an altitude is reached where a successful take-off is improbable unless the airspeed and height above the runway at engine failure are great enough to allow a slight deceleration and altitude loss while the airplane is being prepared for a single-engine climb.

During single-engine take-off procedures over an obstacle, only one condition presents any considerable advantage, and this is headwind. A decrease of approximately 20% in ground distance required to clear a 50-foot obstacle can be gained for each 10 MPH of headwind. Excessive speed above best single-engine climb speed at engine failure is not nearly as advantageous as one might expect since deceleration is rapid and ground distance is used up quickly at higher speeds while the airplane is being cleaned up for climb. However, the extra speed is important for controllability.

From a study of the preceding facts, it is apparent that: (1) discontinuing a take-off upon engine failure is advisable under most circumstances: (2) altitude is more valuable to safety after take-off than is airspeed in excess of the best single-engine climb speed since excess airspeed is lost much more rapidly than is altitude; (3) climb or continued level flight at moderate altitude is improbable with the landing gear extended and the propeller windmilling; (4) in no case should the airspeed be allowed to fall below the engine-out best angle-of-climb speed, even though altitude is lost, since this speed will always provide a better chance of climb, or a smaller altitude loss, than any lesser speed. The engine-out best rate-of-climb speed will provide the best chance of climb or the least altitude loss, and is preferable unless there are obstructions which make a steep climb necessary.

Engine failure procedures should be practiced in anticipation of an emergency. This practice should be conducted at a safe altitude, with full power operation on both engines, and should be started at a safe speed of at least 110 MPH. As recovery ability is gained with practice, the starting speed may be lowered in small increments until the feel of the aircraft in emergency conditions is well known. Practice should be continued until: (1) an instinctive corrective reaction is developed, and the corrective procedure is automatic; and (2), airspeed, altitude, and heading can be maintained easily while the airplane is being prepared for a climb. In order to simulate an engine failure, set both engines at full power operation, and at a chosen speed pull the mixture control of one engine into IDLE CUT-OFF, and proceed with single-engine emergency procedures.

SINGLE-ENGINE CLIMB.

(1) Throttle — FULL FORWARD.
(2) Propeller pitch lever — FULL INCREASE RPM.
(3) Mixture lever — Adjust fuel pressure to low side of dial range.
(4) Landing gear switch — UP (if not previously retracted).
(5) Wing flaps switch — UP (in small increments, if used).
(6) Climb at 111 MPH if no obstacles are ahead.
(7) Climb at 95 MPH with obstacles ahead.

NOTE

For maximum single-engine climb, bank the airplane 5° toward the operating engine. Refer to Section VII for single-engine climb data.

ENGINE FAILURE DURING FLIGHT.

At once:

(1) Throttles — FULL FORWARD.
(2) Propeller pitch levers — FULL INCREASE RPM.
(3) Mixture levers — Adjust fuel pressure to low-pressure side of dial range.
(4) Determine inoperative engine (idle engine same side as idle foot).
(5) Trim rudder for single-engine flight.

Before securing inoperative engine:

(1) Check fuel pressure; if deficient, turn on auxiliary fuel pump.

NOTE

If fuel selector valve handle is on AUXILIARY TANK, switch to MAIN TANK.

(2) Check fuel quantity and switch to opposite tank if necessary.

(3) Check oil pressure and oil temperature indications. Shut down engine if oil pressure is low.
(4) Check ignition switches.

If proper corrective action was taken, engine will restart. If it does not, secure it as follows:

(1) Mixture lever — IDLE CUT-OFF.
(2) Propeller lever — FEATHER.
(3) Turn off auxiliary fuel pump, generator, ignition switches and fuel selector valve.
(4) To conserve battery power, turn off sufficient electrical equipment to eliminate a negative ammeter reading.
(5) Select cruise power settings on operative engine.
(6) Trim airplane 3° - 5° wing-low on the side of the operative engine.
(7) Land at the nearest suitable airport.

RESTARTING ENGINE IN FLIGHT (After Feathering).

(1) Check fuel selector valve handle on MAIN.
(2) Advance throttle until gear warning horn is silent.
(3) Advance propeller pitch lever forward of feathering detent.
(4) Set mixture lever full forward for FULL RICH.
(5) Turn ignition switches ON.
(6) Turn auxiliary fuel pump switch to PRIME position.
(7) Depress starter button when fuel pressure reaches 2 to 2.5 PSI.
(8) In cold weather, turn auxiliary fuel pump switch ON, if required.
(9) After engine starts, turn off auxiliary fuel pump.

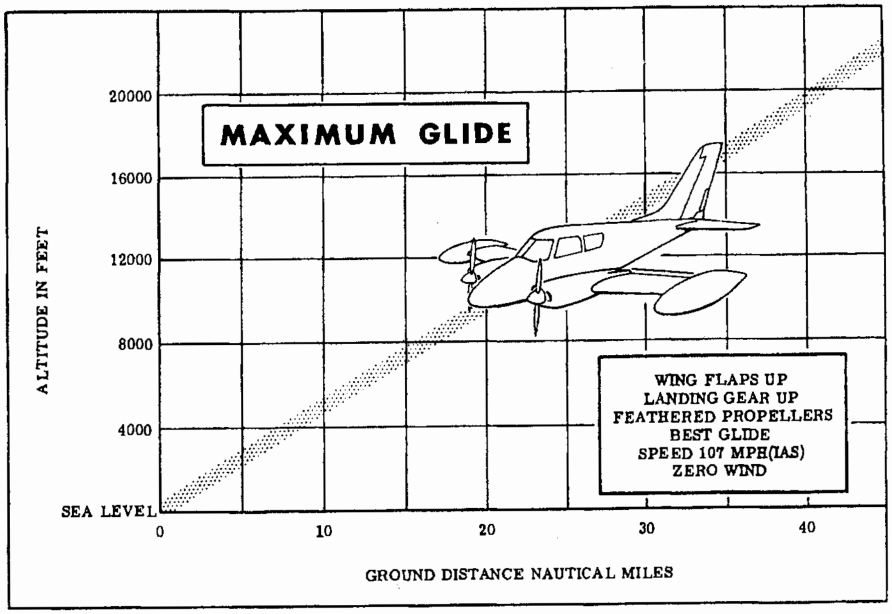
NOTE

If start is unsuccessful, turn ignition and auxiliary fuel pump switch to OFF, retard mixture lever to IDLE CUT-OFF, open throttle fully, and engage starter for several revolutions. Then repeat air start procedure.

(10) Increase power slowly until cylinder head temperature reaches 200°F.

MAXIMUM GLIDE.

In the event of failure of both engines, maximum gliding distance can be obtained by feathering both propellers, and maintaining 107 MPH with the landing gear and wing flaps up. Refer to the Maximum Glide Diagram on page 4-7 for maximum glide data.



FORCED LANDING (Precautionary Landing With Power).

(1) Drag over selected field with flaps 15° and 95 MPH airspeed, noting type of terrain and obstructions.
(2) Plan a wheels-down landing if surface is smooth and hard (pasture, frozen lake, etc).
(3) Execute a normal short-field landing, keeping nosewheel off ground until speed is decreased.
(4) If terrain is rough or soft, plan a wheels-up landing as follows:

(a) Approach with flaps down 20° at 95 MPH.
(b) Turn off all switches except ignition switches.
(c) Unlatch cabin door prior to flare-out.

IMPORTANT

Be prepared for mild tail buffet as cabin door is opened.

(d) Reduce power to a minimum during flare-out.
(e) Prior to contact, turn off ignition switches.

IMPORTANT

If flare-out is sustained with moderate power, cutting power suddenly will result in a hard landing. To avoid this, reduce power to a minimum in flare-out before turning off ignition switches.

(f) Land in a slightly tail-low attitude.
(g) Hold wheel fully back in initial slide to keep nacelles from possibly "digging in" in rough terrain.

NOTE

Airplane will slide straight ahead about 500 feet on smooth sod with very little damage.

FORCED LANDING (Complete Engine Failure).

(1) Feather propellers and rotate them to a horizontal position with starter if time permits.
(2) Mixture levers in IDLE CUT-OFF.
(3) Fuel selector valve handles - OFF.
(4) All switches OFF except battery switch.
(5) Approach at 105 MPH.
(6) If field is smooth and hard, extend landing gear within gliding distance of field.
(7) Extend flaps as necessary within gliding distance of field.

IMPORTANT

The glide path is extremely steep with flaps and gear down and propellers windmilling.

(8) Turn battery switch OFF.
(9) Make a normal landing, keeping nosewheel off ground as long as practical.
(10) If terrain is rough or soft, plan a wheels-up landing as follows:

(a) Approach at 105 MPH with gear and flaps retracted.
(b) Extend flaps to 20° within gliding distance of field.
(c) Turn battery switch OFF.
(d) Unlatch cabin door prior to flare-out.
(e) Land in a slightly tail-low attitude.
(f) Attempt to hold tail low throughout slide.

SINGLE-ENGINE LANDING.

(1) Approach at 105 MPH with excess altitude.
(2) Delay extension of landing gear until within gliding distance of field.
(3) Avoid use of flaps until landing is assured.
(4) Decrease speed below 95 MPH only if landing is a certainty.

NOTE

When speed drops below 95 MPH, the airplane is usually committed to land because an immediate climb-out is often difficult at any speed lower than the minimum safe single-engine climb speed.

(5) Land with some excess speed to allow for gusts, poor technique, etc.
(6) Maintain enough momentum to turn off the active runway without power because single-engine taxi is difficult at slow speed in certain wind conditions.

GO-AROUND (Single-Engine).

(1) If absolutely necessary and speed is above 95 MPH, apply full throttle and increase engine speed to 2625 RPM.
(2) Retract landing gear.
(3) Reduce flap setting to 15°.
(4) Climb at 111 MPH (95 MPH with obstacles directly ahead).
(5) Trim airplane for single-engine climb.
(6) Retract flaps as soon as all obstacles are cleared and a safe altitude and airspeed are obtained.

SYSTEM EMERGENCY PROCEDURES.

FUEL SYSTEM-EMERGENCY OPERATION.

In the event of an engine-driven fuel pump failure, turn the auxiliary fuel pump switch (on the inoperative side) to ON. This pump will supply sufficient fuel for take-off power; however, mixture control must be reset.

IMPORTANT

If both an engine-driven fuel pump and an auxiliary fuel pump fail, fuel may be supplied to the failing engine by feeding it from the tank with the operative auxiliary fuel pump. The engine with the operative engine-driven fuel pump should be fed from the tank containing the inoperative auxiliary fuel pump. This will permit all fuel to be used from the main tanks. However, it is impossible to use fuel from the auxiliary fuel tank on the same side as the inoperative engine-driven fuel pump.

Land as soon as practical if fuel pressure indication remains below normal.

LANDING GEAR SYSTEM-EMERGENCY OPERATION.

When the landing gear will not extend electrically, it may be extended manually in accordance with the following steps:

(1) Before proceeding manually, check landing gear circuit breakers with landing gear switch DOWN. If circuit breakers are tripped, allow 3 minutes for them to cool before resetting.
(2) If circuit breaker is not tripped, put landing gear switch in the OFF (middle) position.
(3) Pull upward on the seat right adjustment handle and tilt seat back for easier hand cranking.
(4) Remove handcrank from stowage clip.
(5) Extend handcrank until hinged link is straight by rotating crank slightly clockwise to engage extension mechanism gear teeth.
(6) Crank gear down approximately two turns past the point where the gear-down indicator light (green) comes on (approximately 60 turns of the handcrank).
(7) Check gear-down indicator light and gear warning horn with throttle retarded.
(8) Depress button on hinged crank link, and stow the handcrank in the stowage clip.
(9) Readjust seat to the upright position, if desired, for landing.

NOTE

The landing gear should never be retracted with the manual system, as undue loads will be imposed and cause excessive wear on the cranking mechanism. If the gear will not retract electrically, land and have the malfunction corrected.

FLIGHT PROCEDURE WITH OPEN CABIN DOOR.

Airflow over the curved cabin door produces negative pressure over

the door surface, resulting in an outward pull that increases with speed. Consequently, if the door should open accidentally in flight because it was not locked, it will float outward enough to disturb the airflow over the tail. This effect is shown by moderate buffeting of the tail. This buffeting attains its maximum with gear up, flaps 20°, and 80 MPH, and occasionally produces a noticeable nose-down pitch and possibly a slight roll as the door pops open. Although these motions are controllable, it is best to avoid this situation close to the ground. Therefore, it is important to make sure the door handle is in the LOCKED position before take-off.

LANDING EMERGENCIES (Except Ditching).

Landing emergencies, including landing with a flat main gear tire, flat nose gear tire, defective main gear, and defective nose gear, and the corrective action to be taken in each condition, are described in the following paragraphs. Under each condition, the landing approach is to be performed using normal throttle, mixture, and propeller pitch lever settings.

LANDING WITH FLAT MAIN GEAR TIRE.

If a blowout occurred during take-off, and the defective main gear tire is identified, proceed as follows:

(1) Landing gear switch — UP.
(2) Fuel selector valve handles — Turn to main tank on same side as defective tire. Proceed to destination, to reduce fuel load.

NOTE

Fuel should be used from this tank first to lighten the load on this wing prior to attempting a landing, if in-flight time permits. However, an adequate supply of fuel should be left in this tank so that it may be used during landing.

(3) Fuel selector valve handles — RIGHT MAIN for right engine, LEFT MAIN for left engine (prior to landing).
(4) Select a runway with a crosswind from the side opposite the defective tire if a crosswind landing is required.
(5) Landing gear switch — DOWN (below 140 MPH).
(6) Check landing gear down indicator light (green) for indication.
(7) Flaps switch — DOWN. Fully extend flaps to 45°.
(8) In approach, align airplane with edge of runway opposite the defective tire, allowing room for a mild turn in the landing roll.
(9) Land slightly wing-low on side of inflated tire and lower nosewheel

to ground immediately, for positive steering.
(10) Use full aileron in landing roll, to lighten load on defective tire.
(11) Apply brake only on the inflated tire, to minimize landing roll and maintain directional control.
(12) Stop airplane to avoid further tire and wheel damage, unless active runway must be cleared for other traffic.

LANDING WITH FLAT NOSE GEAR TIRE.

If a blowout occurred on the nose gear tire during take-off, prepare for a landing as follows:

(1) Landing gear switch — Leave DOWN.

IMPORTANT

Do not attempt to retract the landing gear if a nose gear tire blowout occurs. The nose gear tire may be distorted enough to bind the nosewheel strut within the wheel well and prevent later gear extension.

(2) Move disposable load to baggage area and passengers to available rear seat space.
(3) Flaps switch — DOWN. Extend flaps from 0° to 20° as desired.
(4) Land in a nose high attitude with or without power.
(5) Maintain back pressure on control wheel to hold nosewheel off the ground in landing roll.
(6) Use minimum braking in landing roll.
(7) Throttles — Retard in landing roll.
(8) As landing roll speed diminishes, hold control wheel fully aft until airplane is stopped.
(9) Avoid further tire damage by holding additional taxi to a minimum.

LANDING WITH DEFECTIVE MAIN GEAR.

Attempt to extend the gear manually using the procedure described in paragraph LANDING GEAR SYSTEM — EMERGENCY OPERATION. If a malfunction is then verified by observers in the control tower or another airplane, reduce the fuel load in the tank on the side of the faulty main gear as explained in paragraph LANDING WITH FLAT MAIN GEAR TIRE. When fuel load is reduced, prepare to land as follows:

(1) Fuel selector valve handles — RIGHT MAIN for right engine and LEFT MAIN for left engine.

(2) Select a wide, hard surface runway, or if necessary a wide sod runway. Select a runway with crosswind from the side opposite the defective landing gear, if a crosswind landing is necessary.
(3) Landing gear switch — DOWN.
(4) Flaps switch — DOWN. Extend flaps to 30°.
(5) In approach, align airplane with edge of runway opposite the defective landing gear, allowing room for a ground-loop in landing roll.
(6) Battery switch — OFF.
(7) Land slightly wing-low toward the operative landing gear and lower the nosewheel immediately, for positive steering.
(8) Mixture levers — IDLE CUT-OFF (both engines).
(9) Use full aileron in landing roll to lighten the load on the defective landing gear.
(10) Apply brake only on the operative landing gear to maintain directional control and minimize the landing roll.
(11) Fuel selector valve handles — OFF.
(12) Evacuate the airplane as soon as it stops.

LANDING WITH DEFECTIVE NOSE GEAR.

Attempt to extend the gear manually using the procedure described in paragraph LANDING GEAR SYSTEM - EMERGENCY OPERATION. If a malfunction is then verified by observers in the control tower or other aircraft, prepare for a wheels-down landing as follows:

(1) Move disposable load to baggage area, and passengers to available rear seat space.
(2) Select a smooth hard surface or sod runway.
(3) Landing gear switch — DOWN.
(4) Approach at 95 MPH with flaps down 20°.
(5) All switches except ignition switches — OFF.
(6) Land in a slightly tail-low attitude.
(7) Mixture levers — IDLE CUT-OFF (both engines).
(8) Ignition switches — OFF.
(9) Hold nose off throughout ground roll.
(10) Fuel selector valve handles — OFF.
(11) Evacuate the airplane as soon as it stops.

DITCHING.

(1) Plan approach into the wind if wind is high and seas are heavy. With heavy swells and light wind, land parallel to swells, being careful not to allow a wing tip to hit first.
(2) Approach with the landing gear retracted, flaps 45°, and enough

power to maintain approximately 300 ft/min. rate of descent at approximately 95 MPH at 3500 pounds, to 108 MPH at 4600 pounds gross weight.
(3) Maintain a continuous descent until touchdown to avoid flaring and touching down tail-first, pitching forward sharply, and decelerating rapidly. Strive for initial contact at fuselage area below rear cabin section (point of maximum longitudinal curvature of fuselage).

It is expected that the airplane will skip clear of the water once or twice using the optimum technique outlined above. If the final contact is made in the desired level attitude, the nose will submerge completely during two or three seconds of moderately abrupt deceleration, and then the airplane will float for a short time in a nearly level attitude. The length of floatation time will depend on the extent of damage to nose and main gear doors, tip tanks, nacelle firewalls, fuselage bottom and wings. However, it is believed that the airplane would settle rather slowly, especially with empty fuel tanks.

SECTION V

Operating Limitations

OPERATIONS AUTHORIZED.

Your airplane, with standard equipment as certificated under FAA Type Certification No. 3A10, is approved for day and night operation under VFR or IFR.

MANEUVERS—NORMAL CATEGORY.

The airplane exceeds the requirements of the Civil Air Regulations, Part 3, set forth by the United States Government for airworthiness. Spins and aerobatic maneuvers are not permitted in normal category airplanes in compliance with these regulations. In connection with the foregoing, the following gross weight and flight load factors apply:

Maximum Take-off Gross Weight	4830 lbs.
Flight Load Factor*	
Flaps Up	+3.8 -1.52
Flaps Down	+2.0

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

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

AIRSPEED LIMITATIONS (TIAS).

Maximum Structural Cruising Speed (level flight or climb)	210 MPH
Maximum Speed	
Flaps Extended 15°	160 MPH
Flaps Extended 15° - 45°	140 MPH
Maximum Speed, Gear Extended	140 MPH

Maximum Speed, Landing Light Extended . . . . 160 MPH
Maximum Speed, Pilot's Window Open . . . . 130 MPH
Maneuvering Speed* . . . . 164 MPH

*(The maximum speed at which you can use abrupt control travel or fly through extremely turbulent air without exceeding the design load factor.)

AIRSPEED INDICATOR INSTRUMENT MARKINGS.

The following table lists the certificated true indicated airspeed (TIAS) limitations for the airplane.

Never Exceed (glide or dive, smooth air) . . . . 248 MPH (red line)
Caution Range . . . . .210-248 MPH (yellow line)
Normal Operation Range . . . . 84-210 MPH (green line)
Flap Operating Range (0° -45°) . . . . 74-140 MPH (white arc)

ENGINE OPERATION LIMITATIONS.

Maximum Power and Speed . . . . .260 BHP at 2625 RPM
(for all operations)

ENGINE INSTRUMENT MARKINGS.

OIL TEMPERATURE GAGES.

Normal Operating Range . . . . .80-225° (green arc)
Maximum Temperature . . . . 225° (red line)

OIL PRESSURE GAGES.

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

FUEL PRESSURE GAGE.

Normal Operating Range . . . . 2-17 PSI (green arc)
Minimum and Maximum Pressures . . . 1.5 and 17.5 PSI (red line)

MANIFOLD PRESSURE GAGE.

Normal Operating Range . . . . .15-24 in. Hg (green arc)

CYLINDER HEAD TEMPERATURES.

Normal Operating Range . . . . 300-460°F (green arc)
Maximum Temperature . . . . 460°F (red line)

TACHOMETER.

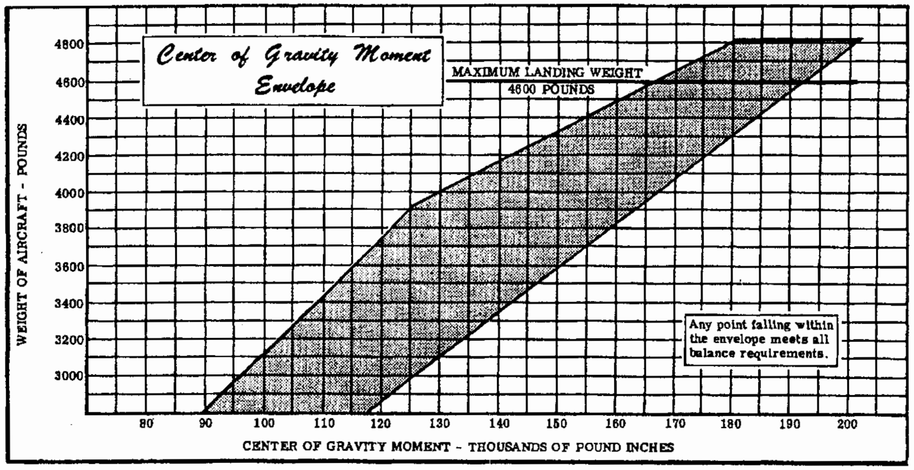
Normal Operating Range . . . . 2100-2450 RPM (green arc)
Maximum (Engine rated speed). . . . . 2625 RPM (red line)

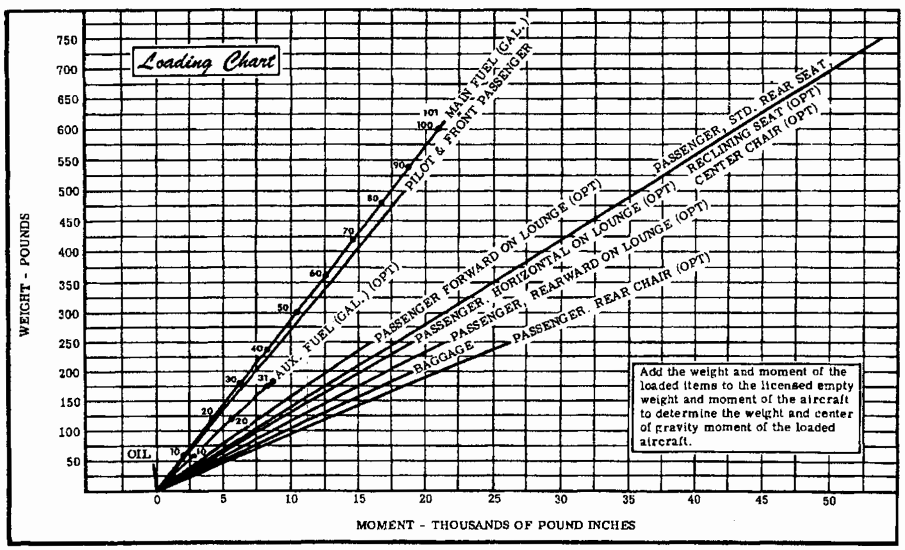
CENTER OF GRAVITY LIMITATIONS.

The center of gravity moment envelope, located at the end of this section, shows the center of gravity limitations of your airplane. A sample problem is also provided which shows one of the many possible loading arrangements. By using the sample problem as a guide, you can determine if any particular loading configuration is within the balance requirements of your airplane. If the forward and rear c. g. points, when plotted on the center of gravity moment envelope, fall within the envelope, your airplane meets all balance requirements.

WEIGHT LIMITATIONS.

The maximum takeoff gross weight for this airplane is 4830 pounds. The maximum landing gross weight is 4600 pounds. Landings may be made at weights above 4600 pounds, if the sink rate of the airplane does not exceed 540 feet per minute. The landing gear is designed at a sink rate of 540 feet/minute at 4830 pounds gross weight and at 590 feet-minute at a gross weight of 4600 pounds. These descent or sink speeds are based on a maximum limit landing load factor of 3.8.





SAMPLE PROBLEM

Example for an airplane with a licensed empty weight of 3125.0 lbs., a moment of 106.0 thousand pound-inches, 24 quarts of oil, a pilot, a front seat passenger, three rear seat passengers, 100 gallons of fuel in the main tanks, and 180 pounds of baggage.

	Weight in pounds	Moment in thousands of pound-inches (Obtained from Loading Chart)	
AIRCRAFT LICENSED EMPTY WEIGHT AND MOMENT (From weight and balance sheet)	3125.0	106.0	
OIL (24 qts. x 1.875 lb./qt.)	45.0	0.2	
PILOT AND FRONT SEAT PASSENGER	340.0	12.6	
REAR SEAT PASSENGERS (Standard rear seat)	510.0	36.2	
FUEL (MAIN TANKS) (100 gals. x 6 lb./gal.)	600.0	21.0	
BAGGAGE	180.0	17.3	
TOTAL TAKE-OFF WEIGHT	4800.00	193.3	Point I
SUBTRACT TOTAL FUEL LISTED ABOVE	600.0	21.0	
ADD MINIMUM FUEL RESERVE (21 gals.)	126.0	4.5	
TOTAL WEIGHT AND MOMENT WITH MINIMUM FUEL RESERVE	4326.0	176.8	Point II

Locate the values of Point I and Point II on the Center of Gravity Moment Envelope. Since the points fall within the envelope, the above loading meets all balance requirements.

WARNING

If either or both points do not fall within the Center of Gravity Moment Envelope, the load must be rearranged before take-off.

The above problem is an example of only one of many different loading configurations. To best utilize the available payload for each airplane, the loading chart should be consulted to determine proper load distribution.

Notes

Section VI

Care of the Airplane

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

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

GROUND HANDLING.

A tow bar is stored in the baggage area of your airplane. When the tow bar is attached to the swivel nose gear, the airplane may be steered by hand and positively controlled in all ground handling operations. Always pull or push horizontally on the tow bar when moving the airplane to keep the weight on the nosewheel for positive steering action. Do not lift on the tow bar.

MOORING YOUR AIRPLANE.

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

(1) Fasten ropes or chains of at least 700 pounds tensile strength to the wing tie-down fitting located on the underside of each wing, and secure the opposite ends to tie-down rings anchored in the ground.

(2) Caster the nosewheel to the extreme left or right position to protect the rudder from buffeting and wind damage.

(3) Secure a rope or chain to the lug located on the aft side of the nose gear strut directly behind the upper torque link attaching point. Secure the opposite end to a tie-down ring in the ground. An alternate tie-down location on the nose gear strut is around the strut just above the torque links. However, only ropes should be tied to this location and care should be exercised when securing the rope so that the adjustment of the taxi light (if installed) will not be altered.

(4) Tie a rope or chain to the tail skid, and secure the other end to a tie-down ring in the ground.

(5) Install the controls lock on the pilot's control column.

(6) Set the parking brake or use wheel chocks.

STORAGE.

The all-metal construction of your airplane makes outside storage practical. However, inside storage will increase its life just as it does for your car. Cleanliness is important under any condition.

While the airplane is stored, pull the propellers through several revolutions every few days to keep the engine bearings, cylinder walls, and other internal parts oiled. Leave the propellers turned horizontally to prevent rain water from entering the hub mechanism if the airplane is tied down outside. The fuel tanks should be kept full during storage to help prevent moisture condensation and increase fuel tank life. Also keep the tires and struts correctly inflated.

Regular use of your airplane will help keep it in good condition. An airplane left idle for any great length of time is likely to deteriorate more rapidly than if it is flown regularly, and should be carefully checked over before being put back into service after storage.

JACKING.

The airplane is equipped with four jack pads for use when it is desired to raise the entire airplane for landing gear function checks, etc. However, for minor maintenance such as tire changes, an individual wheel may be raised as follows:

(1) To raise the nosewheel, place weights (sandbags, etc.) on each side of the horizontal stabilizer by the fuselage until the tail rests securely on the tail skid. The main wheels should be chocked or the parking brakes set when raising the nosewheel in this fashion.

(2) To raise either main wheel, jacking points are provided on the aft side of each strut. Chock the opposite main wheel and the nosewheel before jacking, as a safety measure.

EXTERIOR CARE.

The painted exterior surfaces of your new Cessna have been finished with high grade synthetic materials selected for their toughness, elasticity, and excellent adhesion. With a minimum of care, they will retain their original beauty for many years.

As with any paint applied to a metal surface, the desired qualities of the paint develop slowly throughout an initial curing period which may be as long as 90 days after the finish is applied. During this curing period, precautions should be taken to avoid damaging the finish or interfering with the curing process. The finish should be cleaned only by washing with clean, cold water and mild soap, followed by a rinse with cold water and drying with cloths or a chamois. Use no polish or wax, which would exclude air from the surface. Do not rub or buff the finish and avoid flying through rain, hail or sleet. Once the finish has cured completely, it may be kept waxed with a good automotive wax. A heavier coating

of wax on the leading edges of the wings and tail and on the nose caps of the fuselage and engine nacelles will help reduce the abrasion encountered in these areas.

Spilled fluids containing dyes, such as fuel and hydraulic oil, if accidentally spilled on the painted surface should be flushed away at once to avoid a permanent stain. Battery electrolyte must be flushed off at once, and the area neutralized with alkali such as baking soda solution, followed by a thorough rinse with clear water.

WINDSHIELD AND WINDOWS.

The plastic windshield and windows should be kept clean and waxed at all times. To prevent scratches and crazing, wash them carefully with plenty of soap and water, using the palm of the hand to feel and dislodge dirt and mud. A soft cloth, chamois or sponge may be used, but only to carry water to the surface. Rinse thoroughly, then dry with a clean, moist chamois. Rubbing the surface of the plastic with a dry cloth builds up an electrostatic charge so that it attracts dust particles in the air. Wiping with a moist chamois will remove both the dust and this charge.

Remove oil and grease with a cloth moistened with kerosene. Never use gasoline, benzine, alcohol, acetone, carbon tetrachloride, fire extinguisher or anti-ice fluid, lacquer thinner or glass cleaner. These materials will soften the plastic and may cause it to craze.

After removing dirt and grease, if the surface is not seriously scratched it should be waxed with a good grade of commercial wax. The wax will fill in minor scratches and help prevent further scratching. Apply a thin, even coat of wax and bring it to a high polish by rubbing lightly with a clean, dry, soft flannel cloth. Do not use a power buffer; the heat generated by the buffing pad may soften the plastic.

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

PROPELLERS.

Preflight inspection of propeller blades for nicks, and wiping them occasionally with an oily cloth to remove grass and bug stains, coupled with periodic lubrication of the hubs, will assure long, trouble-free service. It is vital that small nicks on the propeller, particularly near the tips and on the leading edges, are dressed out as soon as possible since such nicks produce stress concentrations, and if ignored, shortly may result in cracks. Never use an alkaline cleaner on the blades; remove grease and dirt with carbon tetrachloride or Stoddard solvent.

Lubrication of the propeller hubs requires special greases specified by the manufacturer. Your Cessna Dealer has the proper lubricants. He should be consulted about lubrication, as well as other repair and maintenance work. Civil Air Regulations require that all maintenance except dressing small blade nicks, cleaning, minor spinner repairs and lubrication which does not require disassembly must be done by an FAA-authorized propeller repair station. For this work, too, your Cessna Dealer will be happy to help you.

INTERIOR CARE.

Keeping the inside of your airplane clean is no more difficult than taking care of the rugs and furniture in your home. It is a good idea to occasionally take the dust out of the upholstery with a whisk broom and a vacuum cleaner.

If spots or stains get on the upholstery they should be removed as soon as convenient, before they have a chance to soak and dry. Any good grade of commercial cleaning fluid may be used for cleaning the upholstery. Water, or cleaning materials containing water, should be avoided since the fire-retardant chemicals in the fabrics are water-soluble.

NOTE

Don't use too much fluid as the cushions are padded with foam rubber. Since some volatile solvents attack rubber, the paddings may be damaged if the material is soaked with the cleaner. Follow the manufacturer's instructions closely, and test the fluid on an obscure part of the fabric to be cleaned.

Spots or stains on Royalite trim parts and panels and leather sidewalls are easily removed using a clean cloth slightly dampened with water. A few light strokes over the area usually removes all dirt. Persistent stains may be removed using a mild soap. The soap should be removed thoroughly with a clean damp cloth and the area dried after cleaning. Never use a volatile solvent on plastic.

SERVICING.

The Servicing Diagram on pages 6-6 and 6-7 and the Service Requirements Table outline the normal servicing points, materials and procedures for your Cessna 310D. Some of the equipment shown is optional and may not be installed on your airplane. The diagram and table do not include lubrication points or intervals, but are confined to day-to-day items that you may wish to attend to yourself or find necessary to service while on a strange airport. The military specifications listed on the Service Requirements Table are not mandatory, but are intended as guides in choosing satisfactory materials. Products of most reputable manufacturers meet or exceed these specifications. Lubrication information is included in the Cessna Model 310 Service Manual. Your Cessna Dealer has the correct lubricants and the equipment and trained personnel to do this job properly.

Each item should be serviced at its prescribed interval, and at the same time, all other items requiring more frequent service should receive attention. The intervals shown should be considered maximums for average service. If your airplane is operated under abnormal conditions, check these items more frequently.

AIRPLANE FILE.

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

A. To be carried in the airplane at all times:

(1) Aircraft Airworthiness Certificate (Form ACA 1362).
(2) Aircraft Registration Certificate (Form ACA 500A).
(3) Airplane Radio Station License (if transmitter installed).
(4) Weight and Balance Report or latest copy of the Repair and Alteration Form (Form ACA 337).
(5) Airplane Equipment List.
(6) Pilot's Check List.

B. To be maintained but not necessarily carried in the airplane at all times:

(1) Airplane Log Book.
(2) Two Engine Log Books.
(3) A form containing the following information: Model, Registration Number, Factory Serial Number, Date of Manufacture, Engine Numbers, and Key Numbers (duplicate keys are available through your Cessna Dealer.

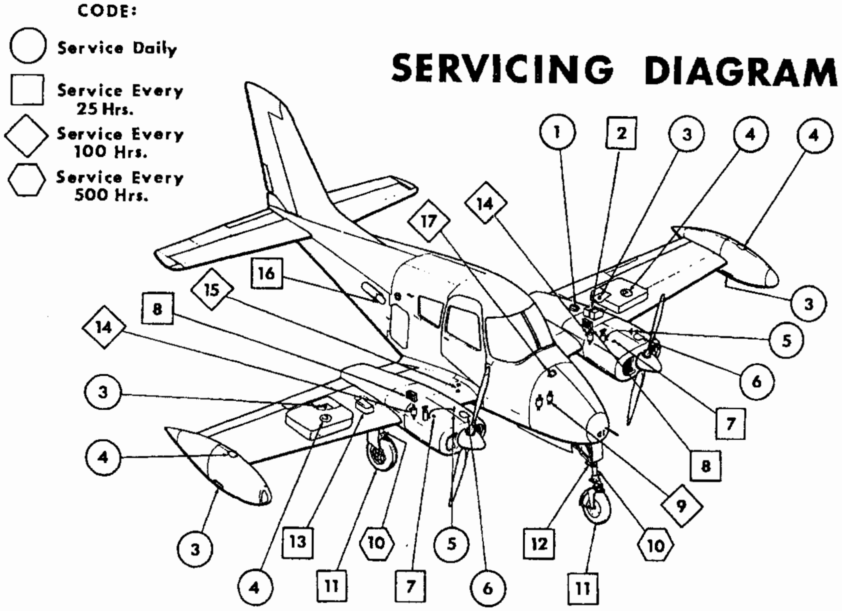
Most of the items listed are required by the United States Civil Air Regulations. Since the regulations of other nations may require other documents and data, owners of exported airplanes should check with their own aviation officials to determine their individual requirements.

INSPECTION SERVICE AND INSPECTION PERIODS.

With your airplane you will receive an Owner's Service Policy. Coupons attached to the policy entitle you to an initial inspection and the first 100-hour inspection at no charge. If you take delivery from your Dealer, he will perform the initial inspection before delivering the airplane to you. If you pick up the airplane at the factory, plan to take it to your Dealer reasonably soon after you take delivery on it. This will permit him to check it over and to make any minor adjustments that may appear necessary. Also, plan an inspection by your Dealer at 100 hours or 90 days, whichever comes first. This inspection also is performed by your Dealer for you at no charge. While these important inspections will be performed for you by any Cessna Dealer, in most cases you may prefer to have the Dealer from whom you purchase the airplane accomplish this work.

Civil Air Regulations require that all airplanes have a periodic (annual) inspection as prescribed by the administrator, and performed by a person designated by the administrator. In addition, 100-hour periodic inspections by an "appropriately-rated mechanic" are required if the airplane is flown for hire. The Cessna Aircraft Company recommends

SERVICING DIAGRAM



> **NOTE**
>
> For quick reference, specifications and quantities of fuel, oil, etc., are contained in a table on the inside back cover.

DAILY

EXTERNAL POWER RECEPTACLE (1)--Connect to 24-volt, DC, negative-ground power unit.

FUEL TANK SUMP DRAINS (3)--Drain before first flight each day, and after each refueling.

FUEL TANK FILLERS (4)--Service daily and after each flight. Keep full to retard condensation in tanks.

FUEL STRAINER DRAINS (5)--Pull handles to drain strainers of about two ounces before first flight each day and after refueling.

ENGINE OIL DIPSTICK AND FILLER CAP (6)--Check on preflight and add oil as necessary.

25 HOURS

BATTERIES (2)--Check electrolyte level every 25 hours, oftener in warm weather. Add distilled water to level of split ring. Do not overfill.

OIL SUMP DRAINS AND OIL SCREENS (7)--Change oil, remove and clean screens every 25 hours, oftener under severe operating conditions.

INDUCTION AIR FILTER (8)--Service every 25 hours, oftener under dusty conditions. Extremely dusty conditions may require daily servicing. Follow instructions stamped on filter frame.

TIRES (11)--Maintain 22 PSI pressure in nosewheel, 37 PSI pressure in main wheels. Wash off oil and grease with soap and water.

SHIMMY DAMPENER (12)--Check fluid level every 25 hours; replenish fluid as necessary.

ANTI-ICE RESERVOIR (13)--Check and refill every 25 hours. Check on preflight if icing is anticipated.

OXYGEN CYLINDER (16)--Check and refill at least every 25 hours; check against anticipated requirements on preflight. (Cylinder may be located in nose wheel well, to meet balance requirements.)

100 HOURS

BRAKE MASTER CYLINDERS (9)--Check fluid level in reservoirs, refill as needed through plugs on cylinder heads.

VACUUM PUMP OIL SEPARATOR (14)--Remove separator, flush with Stoddard solvent, dry with compressed air and reinstall.

FUEL LINE DRAIN PLUGS (15)--Drain every 100 hours, or whenever water or sediment is found in strainers. Remove right wing root fairing for access.

SUCTION RELIEF VALVE (17)--Check suction relief valve screen for dirt or obstructions if suction gage readings appear high. Remove screen and clean with compressed air or solvent and reinstall.

500 HOURS

SHOCK STRUTS (10)--Follow filling instructions on strut placard.

the 100-hour periodic inspection for your airplane. The procedure for this 100-hour inspection has been carefully worked out by the factory and is followed by the Cessna Dealer Organization. The complete familiarity of the Cessna Dealer Organization with Cessna equipment and with factory-approved procedures provides the highest type of service possible at lower cost.

Time studies of the 100-hour inspection at the factory and in the field have developed a standard flat-rate charge for this inspection at any Cessna Dealer. Points which the inspection reveals require modification or repairs will be brought to the owner's attention by the Dealer, and quotations or charges will be made accordingly. The inspection charge does not include the oil required for the oil change.

Every effort is made to attract the best mechanics in each community to Cessna service facilities. Many Dealers' mechanics have attended Cessna Aircraft Company schools and have received specialized instruction in maintenance and care of Cessna airplanes. Cessna service instruction activity in the form of service bulletins and letters is constantly being carried on so that when you have your Cessna inspected and serviced by Cessna Dealers' mechanics, the work will be complete and done in accordance with the latest approved methods.

Cessna Dealers carry a full complement of Cessna service parts and have complete repair and service facilities, including such specialized jigs and tools as may be necessary.

Your Cessna Dealer will be glad to give you current price quotations on all parts that you might need and will be glad to advise you on the practicability of parts replacement versus repairs.

DEALER FOLLOW-UP SYSTEM

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

Section VII

Operational Data

The OPERATIONAL DATA shown on the following pages are compiled from actual tests with the airplane and engines in good condition, and using average piloting technique and normal lean mixture. This data, when used in conjunction with the "Power, Fuel and Endurance Computer" furnished with your airplane will prove to be a valuable aid when planning your flights. The data will duplicate the information found on the computer; however, the information presented here in tabular form may prove more valuable for quick reference. Inasmuch as the number of variables involved precludes great accuracy, an ample fuel reserve should be provided. The charts make no allowance for wind, navigational error, pilot technique, warm-up, take-off, climb, etc. All of these factors must be considered when estimating fuel reserve.

To realize the maximum usefulness from your airplane, take advantage of the power your engines can develop. For normal cruising, choose a cruising power setting which gives you a fast cruising speed. If your destination is over 700 miles, it may pay you to fly at lower power settings, thereby increasing your range and allowing you to make the trip non-stop with ample fuel reserve. Use the range charts to solve flight planning problems of this nature.

AIRSPEED CORRECTION TABLE

Flaps 0°		Flaps 15° *		Flaps 45° **	
IAS	TIAS	IAS	TIAS	IAS	TIAS
80	85	70	79	70	76
100	103	80	87	80	83
120	122	90	94	90	90
140	142	100	103	100	100
160	160	110	112	110	110
180	180	120	121	120	120
200	200	130	131	130	131
220	220	140	140	140	141
240	239	150	150		
		160	159		

* Maximum flap speed 160 MPH   ** Maximum flap speed 140 MPH

MODEL 310D TAKE-OFF PERFORMANCE

TAKE-OFF DISTANCE WITH 15° FLAPS FROM HARD SURFACE RUNWAY

Gross Weight Pounds	IAS at Obstacle	Head Wind MPH	At Sea Level and 59°F		At 2500 Ft. and 50°F		At 5000 Ft. and 41°F		At 7500 Ft. and 32°F	
			Ground Run	Total Distance over 50 Foot Obstacle	Ground Run	Total Distance over 50 Foot Obstacle	Ground Run	Total Distance over 50 Foot Obstacle	Ground Run	Total Distance over 50 Foot Obstacle
4000	79	0 15 30	530 350 210	1060 785 545	630 425 260	1185 880 615	750 520 325	1330 995 700	905 635 410	1525 1150 820
4400	83	0 15 30	650 445 270	1210 900 630	775 535 340	1360 1020 720	925 650 420	1550 1170 835	1120 800 530	1815 1385 1000
4830	86	0 15 30	800 555 350	1395 1050 745	960 675 440	1590 1205 860	1150 825 545	1850 1410 1025	1400 1015 690	2230 1715 1265

NOTE: INCREASE DISTANCE 10% FOR EACH 25°F ABOVE STANDARD TEMPERATURE FOR PARTICULAR ALTITUDE.

MODEL 310D LANDING CHART

Gross Weight Pounds	Approach Speed At 50'-IAS	Distance Feet	Sea Level 59°F	2500' 50°F	5000' 41°F	7500' 32°F
4000	83	Ground Roll	550	585	620	660
		Total Distance Over 50' Obstacle	1530	1630	1725	1830
4300	86	Ground Roll	585	620	660	700
		Total Distance Over 50' Obstacle	1625	1730	1835	1950
4600	90	Ground Roll	620	650	700	740
		Total Distance Over 50' Obstacle	1720	1830	1950	2070

NOTE: WING FLAPS 45°. POWER OFF. HARD SURFACE RUNWAY. ZERO WIND. REDUCE LANDING DISTANCE 10% FOR EACH 6 MPH HEADWIND.

TWIN ENGINE CLIMB DATA

GROSS WEIGHT LBS.	At Sea Level and 59°F			At 5000 Ft and 41°F			At 10000 Ft and 23°F			At 15000 Ft and 5°F			At 20000 Ft and -12°F		
	Best Climb IAS mph	Rate of Climb Ft/Min	Gal. of Fuel Used	Best Climb IAS mph	Rate of Climb Ft/Min	From S.L. Fuel Used	Best Climb IAS mph	Rate of Climb Ft/Min	From S.L. Fuel Used	Best Climb IAS mph	Rate of Climb Ft/Min	From S.L. Fuel Used	Best Climb IAS mph	Rate of Climb Ft/Min	From S.L. Fuel Used
4000	113	2340	4.0	111	1875	5.7	109	1410	7.6	108	950	9.9	106	405	13.0
4400	116	2060	4.0	114	1630	5.9	112	1200	8.1	111	770	10.9	109	340	15.0
4830	119	1800	4.0	117	1405	6.2	115	1005	8.8	114	605	12.3	112	205	18.2

NOTE: FULL THROTTLE, 2625 RPM, MIXTURE AT RECOMMENDED LEANING SCHEDULE, FLAPS AND GEAR UP. FUEL USED INCLUDES WARM-UP AND TAKE-OFF ALLOWANCE.

SINGLE ENGINE CLIMB DATA

GROSS WEIGHT LBS.	At Sea Level and 59°F		At 2500 Ft and 50°F		At 5000 Ft and 41°F		At 7500 Ft and 32°F		At 10000 Ft and 23°F	
	Best Climb IAS mph	Rate of Climb Ft/Min	Best Climb IAS mph	Rate of Climb Ft/Min	Best Climb IAS mph	Rate of Climb Ft/Min	Best Climb IAS mph	Rate of Climb Ft/Min	Best Climb IAS mph	Rate of Climb Ft/Min
4000	107	675	106	545	105	420	104	290	102	160
4400	109	555	108	425	107	295	106	165	104	35
4830	111	440	110	310	109	185	108	60	107	-70

NOTE: FLAPS AND GEAR UP, INOPERATIVE PROPELLER FEATHERED, WING BANKED 5° TOWARD OPERATING ENGINE, FULL THROTTLE, 2625 RPM AND MIXTURE AT RECOMMENDED LEANING SCHEDULE. DECREASE RATE OF CLIMB 10 FT/MIN FOR EACH 10°F ABOVE STANDARD TEMPERATURE FOR PARTICULAR ALTITUDE.

CRUISE PERFORMANCE WITH NORMAL LEAN MIXTURE AT 2,500 ft

RPM	MP	%BHP	Fuel Pressure	TAS	Gal/Hr	Endurance 100 Gal	Range 100 Gal	Endurance 130 Gal	Range 130 Gal
2450	24	74	8.1	215	28.1	3.6	765	4.6	990
	23	70	7.5	208	26.3	3.8	790	4.9	1025
	22	66	7.0	203	24.9	4.0	815	5.2	1060
	21	62	6.5	197	23.3	4.3	845	5.6	1100
2300	24	68	7.2	205	25.5	3.9	800	5.1	1045
	23	64	6.7	200	24.0	4.2	835	5.4	1080
	22	60	6.3	194	22.8	4.4	855	5.7	1110
	21	57	5.9	189	21.4	4.7	885	6.1	1150
2200	23	59	6.1	193	22.3	4.5	865	5.8	1120
	22	56	5.8	188	21.2	4.7	885	6.1	1150
	21	53	5.5	183	20.1	5.0	910	6.5	1185
	20	49	5.2	177	19.0	5.2	925	6.8	1205
2100	22	52	5.4	181	19.7	5.1	920	6.6	1195
	21	49	5.1	176	18.7	5.4	940	6.9	1220
	20	45	4.8	170	17.7	5.6	955	7.3	1245
	19	42	4.6	163	16.7	6.0	980	7.8	1270
	18	39	4.3	157	15.8	6.3	990	8.2	1285
	17	36	4.1	147	14.8	6.8	995	8.8	1295

CRUISE PERFORMANCE IS BASED ON STANDARD CONDITIONS, ZERO WIND, NORMAL LEAN MIXTURE, 100 AND 130 GALLONS OF FUEL (NO RESERVE), AND 4830 POUNDS GROSS WEIGHT.

CRUISE PERFORMANCE WITH NORMAL LEAN MIXTURE AT 5,000 ft

RPM	MP	%BHP	Fuel Pressure	TAS	Gal/Hr	Endurance 100 Gal	Range 100 Gal	Endurance 130 Gal	Range 130 Gal
2450	24	77	8.5	222	29.0	3.4	765	4.5	995
	23	72	7.8	216	27.2	3.7	795	4.8	1030
	22	68	7.3	210	25.7	3.9	815	5.1	1065
	21	64	6.7	204	24.1	4.2	850	5.4	1100
2300	24	70	7.5	213	26.5	3.8	805	4.9	1045
	23	66	6.9	206	24.7	4.0	830	5.3	1085
	22	62	6.5	202	23.5	4.2	855	5.5	1115
	21	58	6.1	196	22.1	4.5	885	5.9	1150
2200	23	61	6.4	199	23.0	4.4	870	5.6	1120
	22	58	6.0	194	21.8	4.6	890	6.0	1160
	21	54	5.6	189	20.6	4.9	920	6.3	1190
	20	51	5.3	184	19.5	5.1	940	6.7	1230
2100	22	53	5.5	188	20.3	4.9	925	6.4	1200
	21	50	5.2	182	19.2	5.2	945	6.8	1235
	20	47	5.0	176	18.3	5.5	965	7.1	1250
	19	44	4.7	170	17.2	5.8	985	7.6	1285
	18	41	4.5	163	16.3	6.1	1000	8.0	1300
	17	37	4.2	155	15.3	6.5	1010	8.5	1315

CRUISE PERFORMANCE IS BASED ON STANDARD CONDITIONS, ZERO WIND, NORMAL LEAN MIXTURE, 100 AND 130 GALLONS OF FUEL (NO RESERVE), AND 4830 POUNDS GROSS WEIGHT.

CRUISE PERFORMANCE WITH NORMAL LEAN MIXTURE AT 7,500 ft

RPM	MP	%BHP	Fuel Pressure	TAS	Gal/Hr	Endurance 100 Gal	Range 100 Gal	Endurance 130 Gal	Range 130 Gal
2450	22	70	7.6	217	26.6	3.8	820	4.9	1060
	21	66	7.0	211	24.9	4.0	845	5.2	1100
	20	62	6.5	206	23.5	4.3	880	5.5	1135
	19	58	6.1	200	22.1	4.5	905	5.9	1175
2300	22	64	6.8	208	24.2	4.1	855	5.4	1120
	21	60	6.3	203	22.8	4.4	895	5.7	1160
	20	57	5.9	198	21.5	4.6	915	6.0	1190
	19	54	5.5	192	20.3	4.9	940	6.4	1225
2200	22	59	6.2	202	22.4	4.5	905	5.8	1170
	21	56	5.8	195	21.1	4.7	920	6.2	1205
	20	53	5.4	190	20.0	5.0	950	6.5	1235
	19	50	5.2	184	19.0	5.3	970	6.8	1255
2100	21	52	5.4	188	19.7	5.1	955	6.6	1240
	20	49	5.1	182	18.7	5.4	980	7.0	1270
	19	45	4.8	176	17.7	5.7	1000	7.3	1290
	18	42	4.6	170	16.8	5.9	1005	7.7	1310
	17	39	4.3	161	15.8	6.3	1015	8.2	1325
	16	36	4.1	150	14.9	6.7	1005	8.7	1305

CRUISE PERFORMANCE IS BASED ON STANDARD CONDITIONS, ZERO WIND, NORMAL LEAN MIXTURE, 100 AND 130 GALLONS OF FUEL (NO RESERVE), AND 4830 POUNDS GROSS WEIGHT.

CRUISE PERFORMANCE WITH NORMAL LEAN MIXTURE AT 10,000 ft

RPM	MP	%BHP	Fuel Pressure	TAS	Gal/Hr	Endurance 100 Gal	Range 100 Gal	Endurance 130 Gal	Range 130 Gal
2450	20	64	6.8	213	24.2	4.1	875	5.4	1145
	19	60	6.3	207	22.8	4.4	910	5.7	1180
	18	56	5.8	200	21.2	4.7	940	6.1	1225
	17	52	5.4	191	19.7	5.1	970	6.6	1260
2300	20	59	6.1	204	22.1	4.5	920	5.9	1200
	19	55	5.7	198	20.9	4.8	950	6.2	1230
	18	51	5.4	191	19.7	5.1	970	6.6	1265
	17	47	5.0	183	18.3	5.5	1005	7.1	1300
2200	20	54	5.6	197	20.6	4.8	950	6.3	1240
	19	51	5.3	190	19.5	5.1	970	6.7	1270
	18	48	5.0	184	18.4	5.4	995	7.1	1300
	17	44	4.7	176	17.3	5.8	1020	7.5	1325
2100	20	50	5.2	189	19.2	5.2	985	6.8	1280
	19	47	5.0	183	18.2	5.5	1005	7.1	1300
	18	44	4.7	176	17.2	5.8	1020	7.6	1330
	17	40	4.5	167	16.2	6.2	1030	8.0	1340
	16	37	4.2	157	15.3	6.5	1020	8.5	1330

CRUISE PERFORMANCE IS BASED ON STANDARD CONDITIONS, ZERO WIND, NORMAL LEAN MIXTURE, 100 AND 130 GALLONS OF FUEL (NO RESERVE), AND 4830 POUNDS GROSS WEIGHT.

CRUISE PERFORMANCE WITH NORMAL LEAN MIXTURE AT 15,000 ft

RPM	MP	%BHP	Fuel Pressure	TAS	Gal/Hr	Endurance 100 Gal	Range 100 Gal	Endurance 130 Gal	Range 130 Gal
2450	16	51	5.3	198	19.4	5.2	1025	6.7	1325
	15	46	4.9	188	18.0	5.5	1040	7.2	1355
	14	42	4.6	175	16.7	6.0	1050	7.8	1365
	13	37	4.2	156	15.3	6.5	1015	8.5	1325
2300	16	46	4.9	188	18.1	5.5	1040	7.2	1355
	15	42	4.6	175	16.7	6.0	1050	7.8	1365
	14	39	4.3	162	15.7	6.4	1035	8.3	1340
2200	16	43	4.7	179	17.1	5.8	1045	7.6	1360
	15	40	4.4	165	15.6	6.4	1055	8.3	1370
	14	36	4.1	145	14.8	6.8	980	8.8	1275
2100	16	40	4.4	167	16.1	6.2	1035	8.1	1350
	15	36	4.1	149	15.0	6.7	1000	8.7	1300

CRUISE PERFORMANCE IS BASED ON STANDARD CONDITIONS, ZERO WIND, NORMAL LEAN MIXTURE. 100 AND 130 GALLONS OF FUEL (NO RESERVE), AND 4830 POUNDS GROSS WEIGHT.

CRUISE PERFORMANCE WITH NORMAL LEAN MIXTURE AT 20,000 ft

RPM	MP	%BHP	Fuel Pressure	TAS	Gal/Hr	Endurance 100 Gal	Range 100 Gal	Endurance 130 Gal	Range 130 Gal
2450	13.5	42	4.7	178	17.2	5.8	1035	7.6	1345
	13	40	4.4	168	16.2	6.2	1035	8.0	1345
2300	13.5	38	4.3	155	15.6	6.4	990	8.3	1290

CRUISE PERFORMANCE IS BASED ON STANDARD CONDITIONS, ZERO WIND, NORMAL LEAN MIXTURE. 100 AND 130 GALLONS OF FUEL (NO RESERVE), AND 4830 POUNDS GROSS WEIGHT.

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WARRANTY

■ The Cessna Aircraft Company warrants each new airplane manufactured by it to be free from defects in material and workmanship under normal use and service, provided, however, that this warranty is limited to making good at The Cessna Aircraft Company's factory any part or parts thereof which shall, within ninety (90) days after delivery of such airplane to the original purchaser, be returned to Cessna with transportation charges prepaid, and which upon Cessna's examination shall disclose to its satisfaction to have been thus defective; this warranty being expressly in lieu of all other warranties expressed or implied and all other obligations or liabilities on the part of Cessna, and Cessna neither assumes nor authorizes any other person to assume for it any other liability in connection with the sale of its airplanes.

■ This warranty shall not apply to any airplane which shall have been repaired or altered outside Cessna's factory in any way so as, in Cessna's judgment, to affect the airplane's stability or reliability, or which airplane has been subject to misuse, negligence or accident.

SERVICE REQUIREMENTS

	SPECIFICATION		QUANTITY, EACH TANK U.S.	IMP.	METRIC
FUEL	Grade 100 130 Aviation Gasoline (MIL-F-5572)		*Main 51 Gal.	*Main 42.5 Gal.	*Main 193 Liters
			*Aux. 15.5 Gal.	*Aux. 12.9 Gal.	*Aux. 58.7 Liters
ENGINE OIL	Aviation Grade Straight Mineral Oil (MIL-L-6082)***		**12 Qts.	**10 Qts.	**11.4 Liters
	Above 40° F.	SAE 50 (Grade 1100)			
	Below 40° F.	SAE 30 (Grade 1065)			
ANTI-ICE FLUID	Isopropyl Alcohol Anti-Ice Fluid (MIL-F-5566)		5 Qts.	4.2 Qts.	4.7 Liters
SHIMMY DAMPENER BRAKES SHOCK STRUTS	Petroleum Base Hydraulic Fluid (Red) (MIL-H-5606)		As Required		
OXYGEN CYLINDER	Aviators Breathing Oxygen (Fed. Spec. No. BB-O-925)		As Required Max Pressure, 1800 PSIG		

*Usable fuel, each main tank: 50 U.S. Gals. (41.6 Imp. Gals., 189.3 Liters)
Usable fuel, each auxiliary tank: 15 U.S. Gals. (12.5 Imp. Gals., 56.8 Liters)
**Minimum for adequate lubrication: 6 U.S. Qts. (5 Imp. Qts., 5.7 Liters)
***Detergent oil conforming to Continental Motors Corporation Specification MHS-24 may be used. Your Cessna Dealer can supply an approved brand.