for the left engine, and to the right for the right engine operates the valves, allowing gasoline to flow into the oil system at an inlet in the crankcase below the fuel pump. Here, the gasoline mixes with the engine oil and is pumped to all moving parts of the engines.

FUEL SYSTEM.

Fuel is supplied to the engines from two rubberized, bladder-type fuel cells; one located in each wing-tip tank. From each tank, fuel is fed through an electric booster pump, a fuel selector valve, a fuel strainer, and through the engine driven fuel pump to the carburetor (see figure 7). The fuel cells provide a total fuel capacity of 102 gallons (51 gallons each fuel cell, of which 50 gallons are usable). The electric fuel booster pumps in the tanks provide a positive fuel flow as emergency pumps in the event of failure of the engine driven fuel pumps and provide fuel pressure for priming and starting. These booster pumps are operated by two electric switches (4 & 5, figure 5) on the switch panel located just to the left of the ignition switches, and the up position is ON. *Always take-off and land with these pumps turned ON.* Vapor return lines from the pressure carburetors return the unused fuel to the fuel cells when the engines are running. Anytime the booster pumps are turned on without the engines running, mixture controls must be in the ICO position to prevent flooding of the intake manifolds.

FUEL SPECIFICATION AND GRADE.

Aviation grade fuel should always be used except in emergency conditions. The recommended fuel is 91 octane minimum rating. Highly leaded fuels are not recommended. Filling the fuel tanks immediately after flight will reduce the air space and minimize moisture condensation in the fuel tanks.

FUEL TANK FILLER CAPS.

The wing-tip tanks are easily filled through the filler caps located on top of the tanks. Access to these filler caps is gained by unsnapping two Dzus fasteners and opening the hinged, streamlined fairing at the top of the tanks.

FUEL SELECTOR VALVES.

Two rotary-type fuel selector valve handles are located between the front seats on the cabin floor. These handles are connected mechanically to fuel selector valves located outboard of each engine nacelle. This arrangement

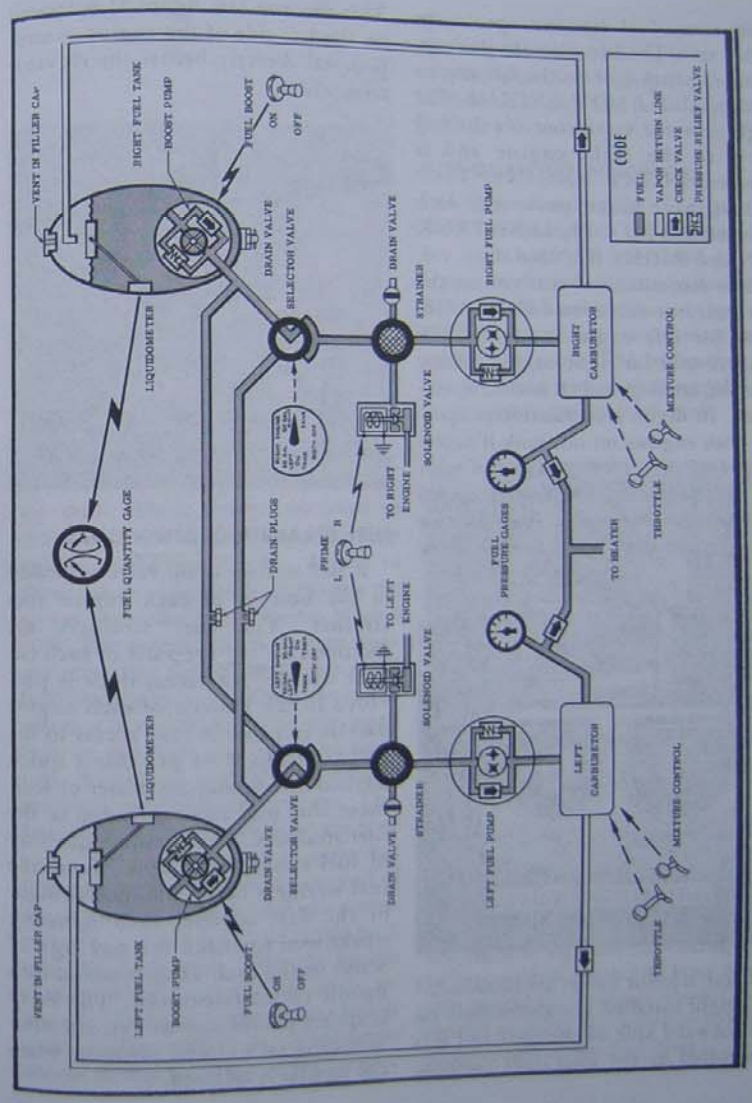


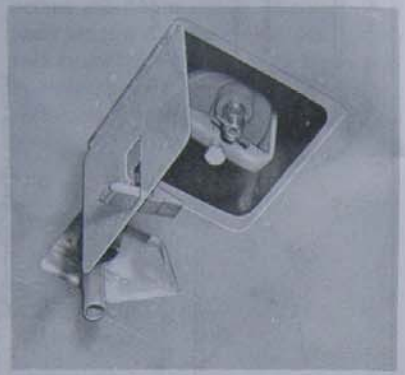
Figure 7. Fuel System Diagram

eliminates fuel line fittings in the cabin area. The left selector valve controls the fuel flow to the left engine and is labeled LEFT ENGINE. The right selector valve controls the fuel flow to the right engine and is labeled RIGHT ENGINE. These valves have three positions; each labeled BOTH OFF, LEFT TANK ON and RIGHT TANK ON.

It is recommended that you set the fuel selector valves to LEFT TANK ON for left engine and RIGHT TANK ON for right engine during take-off, landing, and all normal operations. In flight, it is possible to operate both engines on one tank if necessary. *IMPORTANT — The fuel selector valve handle is the pointer for the fuel selector valve and indicates the setting of the valve by its position above the dial.*

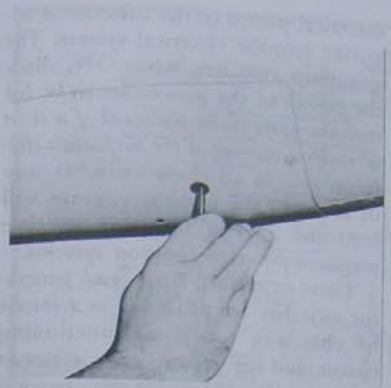
FUEL SELECTOR VALVES

These selector valves are illuminated by a light installed just above them on the forward side of the spar and it is controlled by the map light rheostat. This rheostat (19, figure 3) is located on the left side of the engine control pedestal directly below the elevator trim wheel.



FUEL STRAINER DRAIN VALVES.

A fuel strainer drain valve is located in the bottom of each engine fuel strainer. The fuel strainers are mounted on the firewalls in each engine nacelle. An access door is provided in the bottom of each engine nacelle to provide easy access to the valves. The valves provide a quick method of draining any water or sediment that may have collected in the fuel strainers. A two-ounce quantity of fuel should be drained from the fuel strainers before the initial flight of the day, or after each refueling operation, to check for any sign of water in the fuel. *To open valve,* turn handle counterclockwise. The valve is spring-loaded and will return automatically to a closed position when the handle is released.



FUEL TANK SUMP DRAIN VALVES.

A fuel tank sump drain valve is located on the underside of each wing-tip tank. These valves are used to drain any sediment or water that may collect in the fuel tanks. Access to these valves is gained by removing the access plates from the bottom of each tank. The sumps may be drained without removing these plates thru a small hole in each plate. *To drain the sumps,* insert a screwdriver thru the small hole in the plate and push the drain valve handle up until it turns itself in the slots provided and latches. This lets the fuel flow freely from the tank sump. When a sufficient quantity has been drained, push up on one end of the drain valve handle with the screwdriver to unlatch it and let it slip back into the guide slots. After the handle is back in the guide slots it can be released, and as it is spring loaded, it will automatically close. *These sumps should be drained anytime the presence of water or sediment is found while draining the fuel strainers.* It is recommended that the wing-tip tank sumps be drained at each 100 hour inspection period.

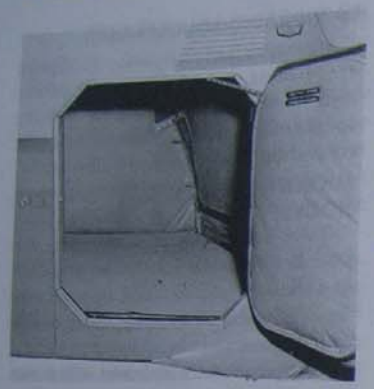
FUEL QUANTITY INDICATORS.

A fuel quantity gage (12, figure 1) with two indicators on its face (one for each tank) is provided in the upper right side of the instrument panel. Each hand indicates in gallons the amount of fuel remaining in its respective tank. The indicators are electrical and receive their signal from a measuring unit in each tank.

FUEL LINE DRAIN PLUGS

FUEL LINE DRAIN PLUGS.

Two fuel line drain plugs, one for each line, are located at the right wing root rib. To gain access to these plugs, the right wing root rib fairing must be removed. At each 100 hour inspection period, these plugs should be removed to drain any water or sediment accumulated in the fuel lines.



just aft of this push-button and is operated by the same key that operates the cabin door lock. A limit chain is used as a door stop to prevent the door from being opened back against the fuselage. The door is closed by pushing the door shut until the latch catches.

UTILITY SHELF.

A spacious utility shelf is located just above the baggage compartment. This shelf will prove very handy for storing hats, brief cases, and small articles.

BAGGAGE COMPARTMENT LIGHT.

A baggage compartment light is mounted in the baggage compartment wall just above and forward of the baggage door. This light is operated by a slide switch which is mounted just forward of it.

ASSIST STEP.

A retractable assist step provides easy access to the wing walk and requires no attention from the pilot. The step is attached to the linkage of the main landing gear and extends and retracts with this gear.

LOADING YOUR CESSNA 310.

There are several different ways to "load" your Cessna, all of which are satisfactory. However, from experience, we have found the following sequence of steps to be most satisfactory under average loading conditions as it allows the pilot to supervise the loading of the aircraft.

First, load your baggage in the baggage compartment

Second, load the rear seat

Third, load the right front seat

Finally, the pilot steps in behind the right front seat and forward thru the aisle to the left front seat

A loading schedule is provided with each airplane for your convenience in checking the airplane gross weight and center of gravity position should it become necessary. Under most normal conditions the airplane loading will be within limits and no check is needed.

SECTION II

OPERATING CHECK LIST

AFTER FAMILIARIZING YOURSELF with the equipment of your Cessna 310, your primary concern will be the operation of the airplane. This section lists in Pilot's Check List form the steps necessary to operate your Cessna efficiently and safely. It is intended to expand the normal check list in the airplane with additional information useful to the pilot.

The flight and operational characteristics of the Cessna 310 are normal in all respects. There are no "unconventional" operating characteristics that need to be mastered. All controls respond in the normal way within the entire range of operation of the airplane.

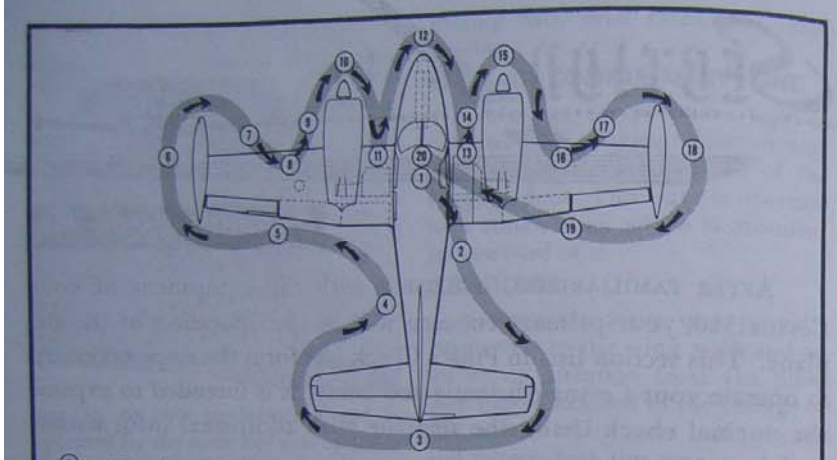
All airspeeds mentioned in sections II, III, and IV are indicated airspeeds. Corresponding true indicated airspeeds may be obtained from the airspeed correction table in section VI.

BEFORE ENTERING AIRPLANE.

(1) Perform an exterior inspection (see figure 16).

BEFORE STARTING ENGINE.

(1) Adjust seats to a comfortable position and fasten safety belts.
(2) Lock cabin door.
(3) Remove control lock if used and stow in glove compartment.
(4) Check landing gear switch "DOWN."
(5) Generator switches "ON."
(6) Battery switches "ON."
(7) Check circuit breaker panel for faulty circuits.
(8) Check fuel quantity gage.
(9) Check left engine fuel selector valve "ON LEFT TANK," and right engine fuel selector valve "ON RIGHT TANK."



(1) a. Make sure battery and ignition switches are OFF.
b. Remove control lock, if installed.

(2) a. Check to see baggage door is securely locked.
b. Check airspeed static source hole on right side of fuselage for stoppage.

(3) a. Inspect all tail surfaces for dents, cracks, etc., and de-icer boots if installed.
b. Remove rudder surface lock, if installed.
c. Check trim tabs and surface hinges for cracks and hinge bolts for security.
d. Check stinger and tail light condition.

(4) a. Check airspeed static source hole on left side of fuselage for stoppage.

(5) a. Check aileron and flap surfaces for dents, cracks, etc.
b. Check aileron trim tab and aileron and flap hinges.
c. Check condition of left wing skin.

(6) a. Check fuel quantity in tank. Make sure fuel tank filler cap is replaced tightly and that the fairing cover is secure.
b. Check navigation light condition.
c. Check condition of fuel tank exterior.

(7) a. Check condition of leading edge and de-icer boots, if installed.

(8) a. Inspect left landing light for condition and cleanliness.

(9) a. Check oil level. Do not operate with less than nine quarts. Fill to twelve quarts for extended flight.
b. Inspect cowl access doors for security.
c. On first flight of day, drain a two-ounce quantity of fuel from the strainer to check for the presence of water and sediment. If water is found to be present, the fuel tanks and fuel lines should have a sufficient quantity of fuel drained to remove any water present.

(10) a. Check propeller and spinner for nicks and security.
b. Check propeller for oil leakage.
c. In cold weather pull propeller thru two revolutions.

(11) a. Check left main landing gear doors and linkage for condition and security.
b. Check wheel well for obstructions and cleanliness.
c. Check wheel strut for proper inflation.
d. Check brake line for leaks.
e. Check tire for cuts, bruises and proper inflation.

(12) a. Remove pitot tube cover, if installed.
b. Inspect pitot tube opening for stoppage.
c. Inspect air vent opening in nose.
d. Check nose wheel doors and linkage for condition and security.
e. Check wheel well for obstructions and cleanliness.
f. Check wheel strut for proper inflation.
g. Check taxi light, if installed, for condition and cleanliness
h. Check tire for cuts, bruises and proper inflation.

(13) a. Check right main landing gear doors and linkage for condition and security.
b. Check wheel well for obstructions and cleanliness.
c. Check wheel strut for proper inflation.
d. Check brake lines for leaks.
e. Check tire for cuts, bruises and proper inflation.

(14) a. Check oil level. Do not operate with less than nine quarts. Fill to twelve quarts for extended flight.
b. On first flight of day, drain a two-ounce quantity of fuel from the fuel strainer to check for the presence of water and sediment. If water is found to be present, the fuel tanks and fuel lines should have a sufficient quantity of fuel drained to remove any water present.

(15) a. Check propeller and spinner for nicks and security.
b. Check propeller for oil leakage.
c. In cold weather pull propeller thru two revolutions.

(16) a. Inspect right landing light, if installed, for condition and cleanliness.

(17) a. Check condition of leading edge and de-icer boots, if installed.

(18) a. Check fuel quantity in tank. Make sure fuel tank filler cap is replaced tightly and that the fairing cover is secure.
b. Check navigation light condition.
c. Check condition of fuel tank exterior.

(19) a. Check aileron and flap surfaces for dents, cracks, etc.
b. Check aileron and flap hinges.
c. Check condition of right wing skin.

(20) a. Check quantity of fuel (3 gages).
b. Check windshield and cabin windows for cleanliness.

Figure 16. Exterior Inspection

(10) Adjust elevator trim tab to "TAKE-OFF" range.
(11) Adjust rudder trim tab pointer to neutral position.
(12) Adjust aileron tab to neutral and check tab position visually.
(13) Set altimeter and clock.
(14) Turn all radio switches "OFF."
(15) Release parking brake and test operate brakes, noting any "spongy" action or excessive brake pedal travel.
(16) Check flight controls for free and correct movement.
(17) Set parking brake.
(18) For night flying, test operate all exterior and interior lights and check condition of flashlight.

STARTING ENGINE. (Left engine first)

(1) Set mixture control full forward for "FULL RICH."
(2) Set propeller control full forward for "HIGH RPM."
(3) Open throttle approximately ½ inch.
(4) Turn ignition switches "ON."
(5) Clear the propeller.
(6) Depress starter button.
(7) After several engine revolutions turn fuel boost pump "ON."
(8) In cold weather engage primer switch ½ second at a time if required.

NOTE

If engine fails to start, it is probably loaded since downdraft carburetors tend to load easily. Repeat starting procedure with throttle open approximately ½, mixture control in idle cut-off, and fuel boost pump "OFF." As engine fires move mixture control to full rich and decrease throttle to idle position. Avoid leaving mixture control in full rich position with fuel boost pump turned on.

(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 — if used.

WARM-UP AND GROUND TEST. (During taxiing)

(1) Set both engines at 800 to 1,000 rpm.
(2) Turn radio "ON" if required.
(3) Continue the warm-up while taxiing out to the active runway.
(4) In extremely cold weather, use carburetor alternate air ("HEAT" position) only if necessary for smooth engine operation.

(5) Stop the airplane at the "run up" location with nose wheel straight and set parking brake. To avoid propeller tip abrasion, do not run up engine on loose cinders or gravel.
(6) Turn fuel boost pump "OFF" momentarily to check engine driven fuel pump pressure and operation.
(7) Advance throttle to 1700 rpm with control wheel neutral or forward.
(8) Check engine instruments for operation.
(9) Check generator operation.
(10) Set flight instruments (check operation of each vacuum pump thru use of vacuum source selector valve).
(11) Check magnetos (100 rpm maximum allowable drop).
(12) Check carburetor alternate air source operation by noting rpm and manifold pressure drop.
(13) Retard propeller control until engine speed drops to 1000 rpm, then advance 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.

(14) If engine accelerates smoothly and oil pressure remains steady at some value between 30 and 60 PSI, the engine is warm enough for take-off.

BEFORE TAKE-OFF OR DURING TAXIING.

(1) Recheck free and correct movement of flight controls.
(2) Recheck elevator trim tab for "TAKE-OFF" range.
(3) Recheck rudder trim tab for neutral position.
(4) Recheck aileron trim tab for neutral and check tab visually.
(5) Check carburetor alternate air source at "COLD."

CAUTION

Maximum power is reduced approximately 7% when carburetor alternate ("HEAT" position) air is applied. *Avoid intermediate positions of alternate air source control for proper engine operation.*

(6) Recheck propellers in "HIGH RPM" position (full forward).
(7) Check fuel boost pumps "ON."

TAKE-OFF.

NORMAL TAKE-OFF.

(1) Flaps 0°.
(2) Apply full throttle smoothly to avoid propeller surging.
(3) Maintain airplane in level attitude in take-off run.
(4) Keep heels on floor to avoid dragging brakes.
(5) Apply slight back pressure to raise nose wheel as airplane approaches flying speed.
(6) After take-off, level off and accelerate to 93 mph (minimum single engine control speed).
(7) Apply toe brakes momentarily to stop wheel rotation.
(8) Retract landing gear.
(9) Accelerate to 123 mph (best rate-of-climb speed).
(10) Turn fuel boost pumps "OFF" individually, checking final fuel pressure indications.

MINIMUM RUN TAKE-OFF.

(1) Extend flaps 15°.
(2) Hold brakes while applying full throttle.
(3) Release brakes and maintain a moderately tail-low attitude when take-off speed is approached.
(4) Keep heels on floor to avoid dragging brakes.
(5) Fly airplane off ground in a tail-low attitude.

OBSTACLE CLEARANCE TAKE-OFF.

(1) Extend flaps 15°.
(2) Hold brakes while applying full throttle.
(3) Release brakes and maintain a slightly tail-low attitude when take-off speed is approached.
(4) Keep heels on floor to avoid dragging brakes.
(5) Retract landing gear when airplane is airborne.
(6) Accelerate to 103 mph (best angle-of-climb speed).
(7) After obstacle is cleared, accelerate to 123 mph (best rate-of-climb speed).
(8) Retract wing flaps slowly.

CROSSWIND TAKE-OFF.

(1) Use minimum flap setting necessary for runway length.
(2) If necessary, carry additional power on the upwind engine until the rudder becomes effective.
(3) Accelerate to a slightly higher than normal take-off speed by holding nose wheel on ground; then take-off abruptly so that airplane will not settle to the runway while drifting.

(4) When clear of ground, make a coordinated turn into the wind to correct for drift.

ENGINE FAILURE DURING TAKE-OFF BELOW 93 MPH.

(1) Cut power and decelerate to a stop.

ENGINE FAILURE AFTER TAKE-OFF ABOVE 93 MPH WITH OBSTRUCTIONS AHEAD.

(1) Push engine controls full forward for maximum power.
(2) Retract landing gear.
(3) Determine inoperative engine (idle engine same side as idle foot).
(4) Feather propeller on inoperative engine.
(5) Set trim tabs for single-engine climb.
(6) Climb at 110 mph if flaps are retracted, and at 108 mph if flaps are 10°, or 103 mph if flaps are 15°.
(7) Accelerate to 121 mph and retract flaps slowly after obstacle is cleared.
(8) Secure dead engine by turning OFF boost pump, ignition switches and fuel selector valve, and putting mixture control in IDLE CUT-OFF.

CLIMB.

TWIN ENGINE.

(1) In normal operation, if no obstacle is ahead, climb out with flaps retracted at 130-140 mph, with 23 inches of manifold pressure and 2300 rpm.
(2) With obstacle ahead after take-off, climb at 103 mph (best angle-of-climb speed) with gear and flaps retracted using full throttle and 2600 rpm.
(3) For maximum rate of climb, use full throttle and 2600 rpm at 123 mph, decreasing climb speed to 119 mph at 10,000 feet.
(4) Mixture should be full rich unless engine is rough due to rich mixture.

SINGLE ENGINE.

(1) If no obstacle is ahead, climb out with gear and flaps retracted at 121 mph, with full throttle and 2600 rpm.
(2) With obstacle ahead, climb out with gear and flaps retracted at 110 mph with full throttle and 2600 rpm.
(3) For maximum single-engine climb, bank airplane 5° toward operative engine, allowing full rudder trim tab to hold airplane straight.
(4) Mixture should be full rich unless engine is rough due to rich mixture.

CRUISING.

(1) Select cruising power setting from range charts (See Section VI). 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) Lean engines individually until slight roughness or loss of power is perceptible; then enrichen mixture slightly beyond the setting required for smooth engine operation. Check cylinder head temperature for abnormal change after leaning.
(4) Adjust friction knob to prevent engine controls from creeping.

ENGINE FAILURE DURING FLIGHT.

(1) Increase power to maintain altitude and airspeed.
(2) Determine inoperative engine (idle engine same side as idle foot).
(3) Trim rudder for single engine flight.
(4) Check fuel pressure and, if deficient, turn fuel boost pump "ON."
(5) Check fuel quantity and switch to opposite tank if necessary.
(6) Check oil pressure and oil temperature indications and shut down engine if oil pressure is low.
(7) Check ignition switches.
(8) If proper corrective action was taken, engine will restart.
(9) If cause of failure was not determined, put mixture in "IDLE CUT-OFF."
(10) Feather inoperative propeller.
(11) Secure dead engine by turning boost pump, fuel selector valve, and ignition switches "OFF."
(12) Turn electrical equipment "OFF" as required to eliminate a negative reading on the ammeter, thus preventing unnecessary battery drain.
(13) Select cruise power setting on good engine.
(14) Trim airplane 3-5° wing low on the side of the operative engine.
(15) Land at the nearest suitable airport.

RESTARTING ENGINE IN FLIGHT. (After feathering)

(1) Check fuel selector valve "ON."
(2) Advance throttle forward until gear warning horn is silent.
(3) Advance propeller control forward to feathering detent.
(4) Turn ignition switches "ON."
(5) Set mixture control full forward for full rich.
(6) Depress starter button.
(7) After several engine revolutions turn fuel boost pump "ON."
(8) In cold weather engage primer switch ½ second at a time if required.
(9) After engine starts, turn fuel boost pump "OFF."

NOTE

If start is unsuccessful, turn magneto and boost pump switches

(3) Immediately before touchdown, align airplane with the flight path by applying downwind rudder.
(4) Land in a nearly level attitude.
(5) Lower nose wheel to runway immediately after touchdown.
(6) Hold straight course with steerable nose wheel and occasional braking if necessary.

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 93 mph only if landing is a certainty.

NOTE

When speed drops below 93 mph, the airplane is committed to land because a climb out at full power is impossible at any speed lower than single engine minimum control 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 93 mph, apply full throttle and increase engine speed to 2600 rpm.
(2) Retract landing gear.
(3) Reduce flap setting to 10°.
(4) Climb at 121 mph (110 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.

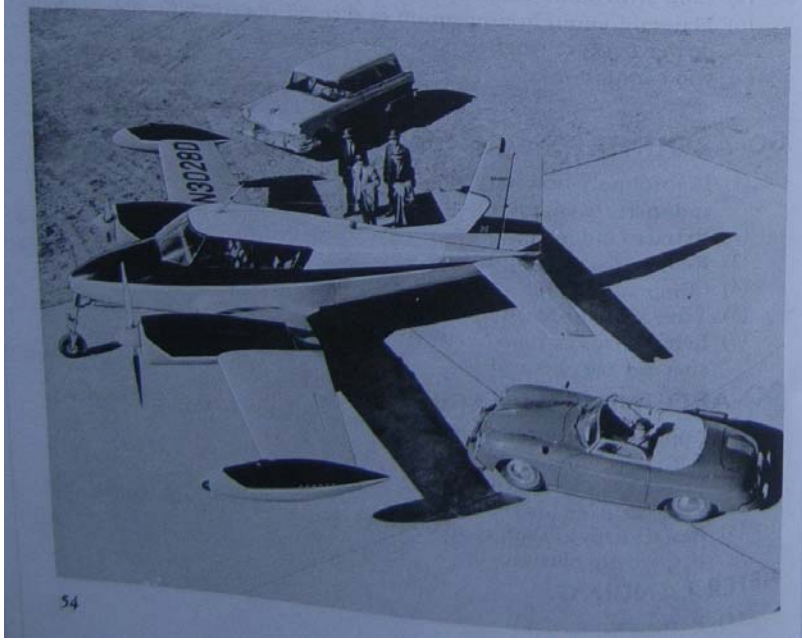
GO-AROUND. (Twin engine)

(1) Apply full throttle and increase engine speed to 2600 rpm if necessary.
(2) Retract landing gear.
(3) Reduce flap setting to 10°.
(4) Trim airplane for climb.
(5) 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 nose wheel aligned straight ahead if possible. (If gusty wind conditions prevail, caster the nose wheel to the extreme right or left position. This action will help to protect the rudder from wind damage.)
(3) Turn fuel boost pumps "OFF."
(4) Stop engine by putting mixture control in "IDLE CUT-OFF."
(5) After engine stops turn ignition switch "OFF."
(6) Turn switches "OFF."
(7) Set parking brakes.
(8) Install control lock if required.



back to the parking area. This not only permits the temperature of the various engine parts to equalize, but works oil up around the pistons and rings, thus leaving the engine in good condition for the next start.

The engine should be stopped by placing the mixture control in idle cut-off position. Do not open the throttle as the engine stops. After the engine stops turn the ignition switches "OFF."

TAXIING.

Steering is performed with the aid of nose wheel steering, rudder, differential power, and differential braking on the main wheels. These aids are listed in the preferred order of use. With practice the use of differential power becomes especially useful in steering.

If the airplane is parked with the nose wheel turned fully in either direction initial taxiing should be done with caution. To straighten the nose wheel it is recommended that full opposite rudder and differential power be applied instead of differential braking. After several feet of forward travel the nose wheel will steer normally. The nose wheel steering mechanism provides positive control up to 15° left or right and free turning from 15° to 55° for sharp turns. This allows a minimum turning radius within a few inches of the tread width of the airplane.

Taxiing over loose gravel or cinders should be done at low engine speed to avoid abrasion and stone damage to the propeller tips. Static engine run-ups over loose gravel can chew up propeller tips in a few seconds.

When parking the airplane align the nose wheel straight ahead before stopping. This simplifies the steering during subsequent departures from the parking area.

TAKE-OFF.

Before take-off from moderately short fields it is worthwhile to mentally review emergency procedures as minimum single engine control speed, single engine procedure with emphasis on inoperative engine determination, best single engine climb speeds, etc.

The use of 15° flaps reduces the ground run and the total distance over a 50 foot obstacle by approximately 13 per cent.

After take-off the toe brakes should be applied momentarily to stop wheel rotation. A rapidly rotating wheel causes the tires to "grow" due to centrifugal force. If an accumulation of mud or ice is present in the wheel well it is possible to get a rubbing action from the rotating wheel as it is retracted into the wheel well.

The best time to retract the landing gear after take-off is at that point along the runway where a wheels down forced landing on that runway would become impracticable. To minimize unnecessary strain on the landing gear retraction motor, the airplane should be climbing straight ahead during gear retraction. Turning flight imposes an additional "g" load which effectively increases the

weight of the landing gear. Under conditions of sharp turning and gusty air it is possible to overload the landing gear motor to the point of blowing a circuit breaker. This can be detected by the absence of a "gear up" RED LIGHT after a normal length of time has elapsed since starting gear retraction. To complete the retraction cycle, push the landing gear circuit breaker after allowing it to cool for several minutes.

CLIMB.

NORMAL CRUISING CLIMB.

A cruising climb at 23 inches manifold pressure, 2300 rpm and 130-140 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.

BEST RATE-OF-CLIMB.

Best rate-of-climb speed is that speed which allows the airplane to reach a given altitude in the shortest time using maximum power. This speed varies from 123 mph at sea level to 117 mph at 15,000 feet.

BEST ANGLE-OF-CLIMB.

Best angle-of-climb speed is that speed which produces the steepest flight path over an obstruction at maximum power, with gear and flaps retracted. This speed varies from 103 mph at sea level to 106 mph at 7,000 ft. These speeds are normally used only with obstructions ahead; therefore, the less effective engine cooling noticeable at these low speeds is present for only a short duration.

With gear down and flaps 15° the best angle of climb speed is approximately 79 mph below 7,000 ft.

CRUISE.

Tabulated cruising information for normal cruising power and altitudes are presented in Section No. VI. More detailed information for cruising at speeds for best range and at altitudes up to 20,000 feet are presented in the form of graphs in Section number VI also. These charts are based on 100 gallons of fuel for cruise, lean mixture, 4600 pounds gross weight, zero wind, and no fuel reserve. Allowances for warm-up, take-off, climb, headwinds, variations in mixture leaning technique, and fuel reserve should be made and are in addition to those shown in the charts.

Since the main advantage of the airplane over ground transportation is speed, one should utilize the HIGH cruising speeds obtainable. However, if a destination is slightly out of reach in one flight at normal cruising speed it would save time and money to make the trip non-stop at some lower speed. An inspection of these cruising graphs shows the long ranges obtainable at lower cruising speeds.

Normal cruising is done between 60% and 70% power. The power settings required to obtain these % powers at various altitudes and outside air temperatures are shown in Section VI. A maximum cruising power of approximately 75% is allow-