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NORMAL PROCEDURES

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SECTION 4

NORMAL PROCEDURES

4.1 GENERAL

This section describes the recommended procedures for the conduct of normal operations for PA-31-350 Chieftain airplane. All of the required (FAA regulations) procedures and those necessary for the operation of the airplane as determined by the operating and design features of the airplane are presented.

Normal procedures associated with those optional systems and equipment which require handbook supplements are presented in Section 9 (Supplements).

These procedures are provided as a source of reference and review and to supply information on procedures which are not the same for all aircraft. Pilots should familiarize themselves with the procedures given in this section in order to become proficient in the normal operations of the airplane.

The first portion of this section is a short form check list which supplies an action sequence for normal procedures with little emphasis on the operation of the systems.

The remainder of the section is devoted to amplified normal procedures which provide detailed information and explanations of the procedures and how to perform them. This portion of the section is not intended for use as an in-flight reference due to the lengthy explanations. The short form check list should be used in flight.

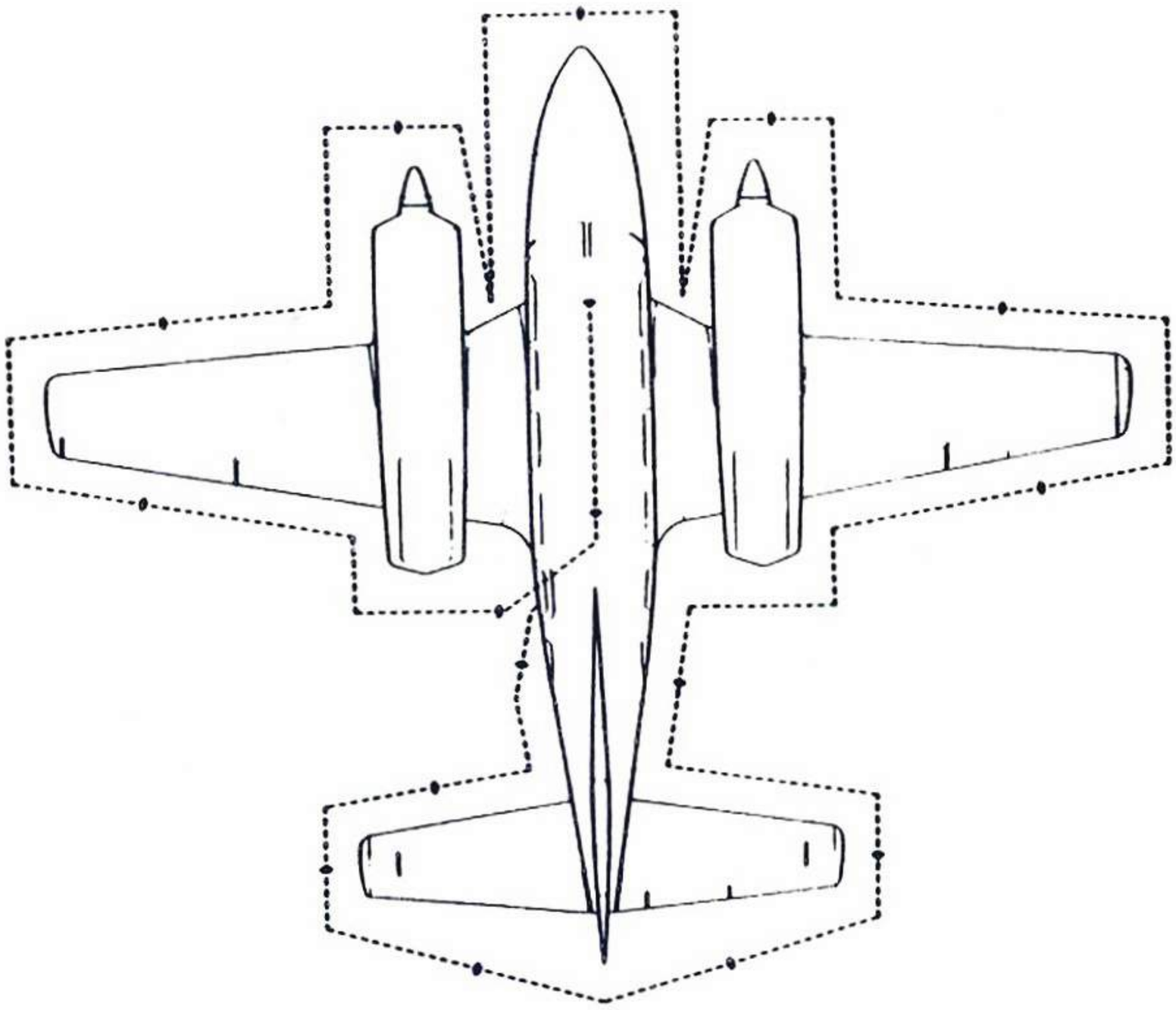
The pilot should use the full Maximum Continuous Power rating of the engine when safety considerations so dictate.

4.3 AIRSPEEDS FOR SAFE OPERATION

The following airspeeds are those which are significant to the operation of the airplane. These figures are for standard airplanes flown at gross weight under normal conditions at sea level. For additional airspeed information see Section 2.

Performance for a specific airplane may vary from published figures depending upon the equipment installed, the condition of the engines, airplane, and equipment, atmospheric conditions and piloting technique.

(a)	Never Exceed Speed	236 KIAS
(b)	Maximum Structural Cruising Speed	185 KIAS
(c)	Design Maneuvering Speed	160 KIAS
(d)	Maximum Flaps Extended Speed	
	25° Flaps	162 KIAS
	Full Flaps (40°)	132 KIAS
(e)	Maximum Gear Extended Speed	153 KIAS
(f)	Maximum Gear Operating Speed	
	Extend	153 KIAS
	Retract	128 KIAS
(g)	Best Rate of Climb Speed	
	0° Flaps	101 KIAS
(h)	Best Angle of Climb Speed	
	0° Flaps	84 KIAS
(i)	Final Approach Speed	95 KIAS
(j)	Intentional One Engine Inoperative Speed	92 KIAS
(k)	Maximum Demonstrated Crosswind	20 KTS



WALK -AROUND
Figure 4-1

4.5 NORMAL PROCEDURES CHECK LIST

PREFLIGHT CHECK

COCKPIT

Controls ..... release
Magneto switches ..... OFF
Electrical switches ..... OFF
Flap switch ..... OFF
Mixtures ..... IDLE CUT-OFF
Master switch ..... ON
Gear lights ..... 3 green
Fuel quantity ..... sufficient
Trim ..... neutral
Cowl flaps ..... OPEN
Master switch ..... OFF
Airplane papers ..... checked
Emergency window ..... secure

Oxygen pressure ..... sufficient
Oxygen masks ..... in place

LEFT WING

Surface condition ..... checked
Nacelle locker door ..... locked
Flap and flap tracks ..... checked
Aileron ..... checked
Fuel tanks and filler caps ..... checked
Fuel tank vents ..... clear
Tie down ..... removed
Fuel drains (4) ..... drain and check for water, sediment and proper fuel
Landing gear ..... checked
Chock ..... removed
Nacelle ..... checked
Oil ..... checked
Cowl flap area ..... checked
Propeller ..... checked
Accessory section (engine) ..... checked
Gear mirror ..... checked

NOSE SECTION

General condition ..... checked
Baggage ..... secure
Baggage door ..... locked
Battery vents ..... clear
Nose gear ..... checked
Chock ..... removed
Pitot tubes ..... clear
Landing lights ..... checked

RIGHT WING

Check as for left wing (3 fuel drains).

FUSELAGE (RIGHT SIDE)

General condition ..... checked
Static openings ..... clear
Antennas ..... checked

EMPENNAGE

Surface condition ..... checked
Tie down ..... removed
Trim tabs ..... neutral and checked for play
Hinges and push rods ..... checked

FUSELAGE (LEFT SIDE)

General condition ..... checked
Static openings ..... clear
Doors ..... checked

BEFORE STARTING ENGINES

Preflight inspection ..... completed
Cabin doors ..... secure
Passenger briefing ..... completed
Seats ..... adjusted
Belts and harness ..... secure
Parking brake ..... set

WARNING

Braking may not occur if parking brake handle is pulled and held prior to brake pedal application.

Controls ..... checked
Fuel selectors ..... INBOARD
Crossfeed ..... OFF
Fuel fire wall shutoffs ..... ON
Alternate air ..... OFF (in)
Circuit breakers ..... checked
Electrical switches ..... OFF
Alternator CB switches ..... ON
Avionics switches ..... OFF
Alternate static source ..... OFF
Mixtures ..... IDLE CUT-OFF

Master switch ..... ON
Cowl flaps ..... OPEN
Gear lights ..... 3 green
Annunciator panel ..... press-to-test
Alternator inop. lights ..... ON
Pneumatic source malf. lights ..... ON
Door ajar lights ..... OUT
Boost pump and fuel flow lights ..... checked
Emergency fuel pumps ..... OFF
Prop sync ..... OFF
AP/FD switch ..... OFF
Seat belts and no smoking sign ..... ON

ENGINE START

NORMAL START

(Master switch off when using APU.)
Throttle ..... open 1/2 inch
Prop control ..... forward
Mag switches ..... ON
Mixture ..... RICH (6 sec) then IDLE CUT-OFF
Prop ..... clear
Starter ..... engaged
Mixture (when eng. starts) ..... advance
Oil and fuel pressure ..... checked
Alternator inop. light ..... OUT
Pneumatic malf. light ..... OUT
Gear handle (hydraulic check) ..... DOWN then returns to neutral
Second engine ..... repeat first 10 steps thru "pneumatic malf. light - OUT"

HOT START

Throttle ..... open 1/2 inch
Prop control ..... forward
Mag switches ..... ON

Prop ..... clear
Starter ..... engaged
Mixture (when eng. starts) ..... advance
Normal start procedure ..... complete

FLOODED START

Mixture ..... IDLE CUT-OFF
Mag switches ..... ON
Throttle ..... full OPEN
Prop ..... clear
Starter ..... engaged
When engine starts:
Mixture ..... advance
Throttle ..... 1000 RPM

BEFORE TAXIING

APU ..... removed
Master switch ..... ON
Lights ..... as required
Heater/Air cond. ..... as required
Avionics switches ..... ON
Gyros ..... set
Altimeter and clock ..... set
Electric trim ..... ON and checked
Autopilot ..... checked and OFF
Fuel valves (all positions) ..... checked
Radios ..... checked
Parking brake ..... release

TAXIING

Brakes ..... checked
Flight instruments ..... checked

ENGINE RUN-UP

Parking brake ..... set
Mixtures ..... RICH
Prop controls ..... forward
Cowl flaps ..... OPEN
Engine instruments ..... checked
Throttles ..... 1500 RPM
Prop controls (max. drop 500 RPM) ..... feather checked
Gyro pressure (4-6 in. Hg.) ..... checked
Alternator output ..... checked
Alternator inop. lights ..... OUT
Annunciator panel lights ..... OUT
Throttles ..... 2300 RPM
Mags (max. drop 175 RPM;
max. diff. 50 RPM) ..... checked
Prop controls (max. drop 300 RPM) ..... exercised
Throttles (600-650 RPM) ..... idle checked
Throttles ..... 1000 RPM
Friction lock ..... set

BEFORE TAKEOFF

Seat belts and no smoking sign ..... ON
Fuel selectors ..... INBOARD
Fuel quantity ..... sufficient
Mixtures and props ..... forward
Flaps ..... checked and set 0° for normal takeoff
checked and set 15° for short field takeoff
Autopilot ..... OFF
Trim ..... set
Surface deice ..... OFF
Pitot and prop heat ..... as required
Windshield heat ..... as required
Avionics ..... as required
Direction indicator ..... set
Radar ..... as desired
Transponder ..... as required

Controls ..... checked
Emergency fuel pumps ..... ON
Air conditioner ..... OFF
Prop sync ..... OFF
Parking brake ..... release

NORMAL TAKEOFF

Brakes ..... apply and hold
Mixtures ..... full forward
Propellers ..... full forward
Throttles ..... full forward
Manifold pressure (43" normal-static
sea level, std. temp.) ..... checked
Prop speed ..... 2575 RPM
Brakes ..... release
Rotate ..... 85 KIAS min.
Gear ..... UP
Accelerate to ..... barrier speed (95 KIAS)

SHORT FIELD TAKEOFF

Brakes ..... apply and hold
Mixtures ..... full forward
Propellers ..... full forward
Throttles ..... full forward
Manifold pressure (43" normal-static
sea level, std. temp.) ..... checked
Prop speed ..... 2575 RPM
Brakes ..... release
Rotate ..... 76 KIAS
Accelerate to ..... barrier speed (92 KIAS)

After the barrier has been cleared:

Gear ..... retract
Flaps ..... retract
Accelerate to ..... Best Single Engine
Angle of Climb Speed
(104 KIAS)

CLIMB

Maximum Normal Operating Power (when safely clear of obstacles or terrain) ..... 40" MP/2400 RPM
Mixture (30 GPH min, 475° CHT max, 1500° EGT max) ..... LEAN
Cowl flaps ..... as required
Emergency fuel pumps ..... OFF
Air conditioner ..... as desired
Seat belts and no smoking sign ..... ON
Oxygen ..... as required

CRUISE

Fuel selectors ..... OUTBOARD OR INBOARD
Power ..... set
Cowl flaps ..... as required
Mixture ..... leaned

DESCENT

Mixtures ..... min. 1350° EGT
Fuel selectors ..... INBOARD
Power ..... as required
Oxygen (below 10,000 ft.) ..... OFF
Pitot and windshield heat ..... as required

BEFORE LANDING

Seat belts and no smoking sign ..... ON
Emergency fuel pumps ..... ON
Air conditioner ..... OFF
Mixtures ..... RICH
Prop sync ..... OFF
Prop controls ..... 2400 RPM
Gear (below 153 KIAS) ..... DOWN
Gear lights ..... 3 green

Gear mirror ..... checked
Brake pressure ..... checked
Autopilot ..... OFF
Wing flaps ..... as required
(162 KIAS max. to 25°)
(132 KIAS max. to 40°)

Landing lights ..... as required
Radar ..... OFF

BALKED LANDING

Props ..... full forward
Power ..... as required
Wing flaps ..... 15°
Gear ..... UP
Wing flaps ..... UP
Airspeed ..... 98 KIAS min.

AFTER LANDING (CLEAR OF RUNWAY)

Cowl flaps ..... OPEN
Wing flaps ..... UP
Emerg. fuel pumps ..... OFF
Heater switch (if used) ..... FAN
Prop controls ..... forward
Strobes ..... OFF

SHUTDOWN

Parking brake ..... set
Avionics ..... OFF
AP/FD ..... OFF
Throttles ..... IDLE
Mag grounding ..... checked

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4.7 AMPLIFIED NORMAL PROCEDURES (GENERAL)

The following paragraphs are provided to supply detailed information and explanations of the normal procedures necessary for operation of the airplane.

4.9 PREFLIGHT CHECK

The airplane should be given a thorough preflight and walk-around check. The preflight should include a determination of the airplane's operational status, a check that necessary papers are onboard and in order, and a computation of weight and C.G. limits, takeoff distance, and in-flight performance. Baggage should be weighed, stowed, and tied down. A weather briefing for the intended flight path should be obtained, and other factors relating to a safe flight should be checked before takeoff.

COCKPIT

Upon entering the cockpit, release the controls if they have been secured. After insuring that magneto switches, electrical switches and flap switch are OFF and that mixture levers are in IDLE CUT-OFF, turn the master switch ON. Check that the fuel quantity gauges are operating and that there is sufficient fuel for the flight. Fuel quantity gauges indicate the amount of fuel in the tanks selected on the fuel selector valves. Check that the three green gear position lights illuminate. Set all trim controls to neutral and fully open the cowl flaps. Turn OFF the master switch.

While still inside the airplane, check that the emergency window is secure and that an oxygen mask is present and operational and properly stowed if installed. Check the oxygen pressure gauge on the lower right instrument panel to ascertain that the oxygen supply is sufficient. Check that the oxygen control knob is pushed into the OFF position.

A complete walk-around check should be routinely performed during each preflight. A set pattern should be established, starting at the cabin door and proceeding forward, completely around the airplane, and terminating upon return to the cabin door.

LEFT WING

Proceed first along the trailing edge of the left wing, checking the wings, control surfaces, and hinges for damage and operational interference. The wings and control surfaces should be free of ice, snow, frost, or other extraneous substances. Static wicks should be in place and in good condition. Nacelle baggage doors should be closed and locked. The fuel supply should be checked visually, and fuel caps securely in place. Fuel vents should be clear of obstructions. If surface deicing is installed, the boots should be free from defects and flat against the wing surface. If tie-downs and chocks have been employed, they should be removed before flight. The wing tip and lights should show no signs of damage.

On the underside of the left wing are four fuel drains which should be briefly drained and checked for any possible accumulation of moisture or sediment in the fuel system, and to verify fuel octane by checking the color. Opening each fuel drain valve for a few seconds should allow sufficient fuel flow to allow the removal of contaminants. Collecting drained fuel in a clear container and examining it visually is recommended.

The landing gear should be examined. The strut should be inflated to expose about 3.25 inches of piston tube when supporting an empty airplane with full fuel tanks and full oil and operating fluids. The condition of components of the strut, the gear doors, the brakes, the gear micro switch, etc., should appear sound, and fittings, attachments, screws, hinges, etc., should be secure. The tire should be inflated to 66 psi, and should be examined for breaks, cuts, bruises, cracks, and excessive wear.

At the engine nacelle, access panels should be secure. The engine cowl flap area, wheel wells, and nacelle intakes should be clear of debris, bird nests, etc. Oil quantity can be checked through the access door on the top of the nacelle. The oil filler must be replaced securely.

The propeller blades and spinner should be checked for nicks, cracks, dents, or other defects. There should be no indication of leakage of oil, fuel, or other fluids in the area of the wing or on or about the nacelle and landing gear. Inboard of the nacelle, the gear mirror should be clean and intact, and the wing root fillet should show no signs of stress.

NOSE SECTION

Continue from the left wing forward around the nose section of the airplane. All access plates should be secure, and the general condition of the nose section should appear sound. Baggage should be securely stowed and the baggage compartment door completely closed and locked. Battery vents and heater inlets and outlets should be open and clear. The nose gear should be checked in the same manner as the main gear, with a proper strut piston tube exposure of about 3.25 inches, and a proper tire inflation of 42 psi. No leakage of hydraulic or brake fluid should be present. If a chock has been employed, it should be removed. Landing and taxi lights should be clean and intact.

If pitot tube covers have been installed, they must be removed, and the pitot head opening checked and ensured clear of insects, dirt, or other obstructions. When pitot heat operation is to be checked, the master switch and pitot heat switch must be turned on, and the pitot head found hot to touch. Be careful, as the pitot tube gets extremely hot.

The windshield and pilot and copilot side windows should be clean and the windshield wipers in good condition.

RIGHT WING

Continuing aft and around the right wing, the same checks and procedures as performed on the left wing should be completed in reverse order. There are three fuel valves which must be drained and checked for any possible accumulation of moisture or sediment in the fuel system, and to verify octane by checking the color. The right aileron includes a trim tab which must be checked.

FUSELAGE (RIGHT SIDE)

Check the general condition of the right side of the fuselage. The emergency exit window should be secure and flush with the fuselage skin, and all side windows should be clean and without defects. Antennas and cables should be in place and securely attached. The openings in the static pads should be clean and unobstructed.

EMPENNAGE

All surfaces of the empennage should be examined for damage and operational interference. Fairings and access covers should be attached and in good condition. Deicer boots should be in good condition and flat against the surface. The elevator and rudder should be free and in good condition. With the trim controls set neutral, all trim tabs should be neutral. Check the condition of the tabs, and ensure that all hinges and push rods are secure and in good condition. If the tail has been tied down, remove the tie-down rope.

FUSELAGE (LEFT SIDE)

On the left side of the fuselage, the static openings should be clear, side windows clean and sound, and cabin door attachments and hinges operational. If night flight is anticipated, before completing the walk-around ensure that all exterior lights are operational; the master switch must be ON for this check.

When all occupants are boarded, the pilot should check that all cabin doors are properly closed and latched. The door support cables should be held in position, if necessary, so that they will not interfere with the closing of the door.

4.11 BEFORE STARTING ENGINES

After preflight interior and exterior checks have been completed and the airplane has been determined ready for flight, the cabin door should be secured, and all occupants seated. Check that the aft baggage compartment and the cabin cargo area if it is loaded are secure and that tie-downs are used where necessary. Passengers should be briefed on the use of seat belts and shoulder harnesses, the emergency exit, supplementary oxygen, ventilation controls, seat adjustment, comfort facilities, etc. The pilot should advise the passengers when smoking is prohibited and caution them against handling controls, equipment, door handles, and the emergency exit. It may be advisable to inform passengers of sounds or sensations which may not be familiar to them, but which are associated with normal flight. All seats should be adjusted and secured in position and seat belts and shoulder harnesses properly fastened.

To set the parking brake, first depress and hold the toe brake pedals and then pull out the parking brake handle.

WARNING

Braking may not occur if parking brake handle is pulled and held prior to brake pedal application.

Check that control levers move smoothly, and adjust the friction control as desired. Fuel selectors should be set on the inboard tank position, the crossfeed turned OFF, and the fuel fire wall shutoffs checked open.

Check that the manual alternate air controls on the lower instrument panel are pushed in and OFF. All circuit breakers should be IN and alternator circuit breaker switches ON. All other electrical switches and all avionics switches should be OFF. Check that all radio switches, light switches, and the pitot heat switch are OFF to avoid an electrical overload when the starter is engaged. The alternate static source control under the left side of the instrument panel should be OFF, and the mixture controls should be in the IDLE CUT-OFF position.

Turn ON the master switch. Three green gear lights should illuminate. The alternator inoperative lights and pneumatic source malfunction lights should come on and remain on until the engines are started. The door ajar lights on the overhead panel should both be out. Check that both cowl flaps are open. Check the function of the boost pump and fuel flow warning lights by using the press-to-test feature. Check the annunciator panel by using the press-to-test switch. Before starting the engines, turn ON the seat belt and no smoking signs, and check that passengers comply.

4.13 ENGINE START

NORMAL START

If an external auxiliary power unit (APU) is used for starting; the master switch and all avionics switches should be OFF until both engines are running and the power unit is removed. When an APU is used, it is recommended that the right engine be started first. Open the throttle of the first engine to be started about 1/2 inch, advance the propeller control forward, and turn the magneto switches ON. Advance the mixture control to RICH for about six seconds to prime the engine, then pull the mixture control aft to IDLE CUT-OFF. Visually confirm that the propeller area is clear, and engage the starter. When the engine starts, advance the mixture

control slowly toward the RICH position. Adjust the throttle as necessary to maintain a speed below 1000 RPM. Check the oil pressure gauge for an indication. Normally there should be an indication of oil pressure within 30 seconds. In cold weather it may take a few seconds longer. If after allowing sufficient time there is no oil pressure, shut down the engine until the cause is determined and remedied. Check the fuel pressure gauge.

Check to see that the alternator inoperative light and the pneumatic malfunction light for the running engine are extinguished. To check the function of the hydraulic pump of the first engine started, place the gear selector lever in the DOWN position. If the pump is functioning properly, the gear lever will automatically return to neutral.

Start the second engine following the same procedure. The hydraulic pump check should be eliminated from the starting procedures for the second engine. When both engines are running, all warning lights should be extinguished.

HOT START

If the engines are still warm from previous operation, the mixture control should remain in IDLE CUT-OFF and the priming steps eliminated. Open the throttle 1/2 inch, and advance the propeller control. Turn ON the magneto switches and engage the starter. When the engine starts, advance the mixture control, and proceed as in a Normal Start (see above).

FLOOD START

If an engine is flooded (by overpriming, for example), the mixture should be pulled to IDLE CUT-OFF. After turning ON the magneto switches, advance the throttle to the fully OPEN position and engage the starter. Advance the mixture control only after the engine has started, and retard the throttle lever to 1000 RPM.

4.15 BEFORE TAXIING

If an APU has been used for start, it should be disconnected and the master switch turned ON.

Lights and heater or air conditioner may be turned on as desired. Set gyros and clocks as required. Set the altimeter to field elevation. Turn ON and check electric trim. Turn ON the avionics master switch. Check the autopilot (see Section 9), then turn it OFF. Check the fuel selectors in all positions, at the same time observing that fuel warning lights should not illuminate. Check the radios, and set them as desired.

Release the parking brake by first depressing and holding the toe brake pedals and then pushing in on the parking brake handle.

4.17 TAXIING

While taxiing, apply the brakes to determine their effectiveness. Check the flight instruments to see that they are functioning.

4.19 ENGINE RUN-UP

Set the parking brake. Advance mixture and propeller controls, and open the cowl flaps. Check engine instrument to see that they are functional and that readings are within limitations. (See Section 2.)

The engines are equipped with a dynamic counterweight system and must be operated accordingly. Use smooth steady movements of the throttle controls, and avoid rapid opening and closing. Set the throttles to an engine speed of 1500 RPM. Retard the propeller controls aft to check feathering; however, do not allow a drop of more than 500 RPM. Check that the gyro pressure gauge is reading within the green arc.

Check alternator output by pressing first one and then the other momentary push button located on either side of the ammeter. Alternator output readings should be approximately equal.

Advance the throttles until engine speed reaches 2300 RPM. Check the magnetos on each engine by turning OFF, then ON, each of the four magneto switches in turn. The normal drop when a magneto is turned off is about 90 RPM. The maximum allowable drop is 175 RPM. The maximum differential between the magnetos on one engine is 50 RPM. After checking one magneto, do not check the next until the engine speed returns to 2300 RPM. Operation of an engine on one magneto should be kept to a minimum.

Exercise the propeller levers through their range to check their operation. Response should be normal. Do not allow speed to drop more than 300 RPM.

Retard the throttles to 600-650 RPM to check idling. Set the throttles at 1000 RPM; recheck the flight instruments, and reset them if necessary. Set the desired amount of friction on the engine control levers.

4.21 BEFORE TAKEOFF

Seat belts and no smoking signs should be ON for takeoff. Inboard fuel tanks must be used for takeoff; therefore ensure that both fuel selectors are on the inboard tank positions and that the fuel quantity is sufficient. Check crossfeed is in OFF position.

Check that the mixture and propeller controls are full forward. Check the wing flaps for proper operation. Extend wing flaps 15°. Visually confirm that right and left wing flaps are equally extended. Retract the flaps. After the flaps begin to move, press and hold the flap test switch. The flaps should stop and the FLAP annunciator should illuminate. Release the flap test switch; the annunciator should extinguish and the flaps retract to 0°. Confirm flaps are at 0° for normal takeoff or actuate to 15° for a short field takeoff. Check to be sure that the propeller synchrophaser, autopilot, air conditioner, and surface deicers are OFF if installed. Set trim for takeoff.

Recheck alternator output. Turn pitot, propeller, and windshield heat on if necessary. Set avionics as required. Set the direction indicator if necessary and set the transponder as required. Make certain that controls are free and that all engine instruments are reading within limits. Turn emergency fuel pumps ON for takeoff. Check that no warning lights are illuminated. Do not take off if a fuel flow warning light is illuminated. Release the parking brake.

4.23 TAKEOFF

NORMAL

While holding the brakes with the mixture and propeller levers full forward, advance the throttles slowly to a manifold pressure of 30 inches of mercury; then continue to advance the throttles at a normal rate and release brakes, but do not allow manifold pressure to exceed 49 inches. Use smooth, steady throttle movements, and avoid rapid opening and closing. Propeller speed for takeoff should be 2575 RPM.

The engines are adjusted to provide 43 inches Hg. manifold pressure at full throttle in standard temperature at sea level. Depending upon an altitude and temperature it is possible to reach higher (up to 49 inches) or lower manifold pressures.

Each engine density controller is set to produce rated takeoff power for the engine. The takeoff power manifold pressure for each engine will not necessarily be the same. However, if the spread in manifold pressure exceeds three inches during a full throttle climb, the density controller settings should be checked and serviced.

At 85 KIAS, rotate to a 10° pitch attitude and allow the aircraft to fly off. Maintain a pitch attitude which will result in acceleration of the aircraft to 95 KIAS at 50 feet. Before airspeed reaches 128 KIAS, retract the landing gear. Continue acceleration to the desired climb airspeed.

SHORT FIELD

The initial segment of the short field takeoff procedure is identical to the normal procedure except that the brakes shall be held until it has been determined that each engine is operating normally at maximum continuous power. After it has been determined that each engine is operating normally at maximum continuous power, release the brakes, neutralize the elevator control and initiate the takeoff roll. Maintain directional control with the nose wheel steering system only. Avoid making steering inputs with the brakes as this may result in increasing the takeoff ground roll distance.

At 76 KIAS, rotate the aircraft to achieve an attitude that will result in an initial climb airspeed of 92 KIAS. Maintain 92 KIAS until the barrier has been cleared. After the barrier has been cleared, retract the landing gear, the flaps and accelerate to 104 KIAS (best single engine angle of climb).

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4.24 CLIMB

When clearance above obstacles and terrain permits, reduce to Maximum Normal Operating Power by setting the throttles to 40 inches Hg. manifold pressure and the propellers to 2400 RPM. Turn air conditioner on as desired. Lean the mixture to a minimum fuel flow of 30 gallons per hour at a maximum exhaust gas temperature of 1500° F and maximum cylinder head temperature of 475° F. Adjust cowl flaps and mixture as necessary to maintain engine temperatures within limits.

Turn the emergency fuel pumps OFF one at a time, and check fuel gauges and warning lights. At power settings above 75%, maintain the mixture controls in the full RICH position except with Maximum Normal Operating Power setting when the mixture may be leaned as stated in the preceding paragraph.

Although the maximum approved operating altitude for this airplane is 24,000 feet, under standard atmospheric conditions and at maximum gross weight the multi-engine service ceiling and absolute ceiling are 27,200 feet and 28,300 feet, respectively.

4.25 CRUISE

During cruise, fuel selectors may be on either inboard or outboard tanks. When the airplane is loaded with a rearward C.G., it is recommended that outboard tanks be used first. This will tend to move the C.G. forward with fuel burn-off. Outboard tanks should be used during coordinated level flight only. If outboard tanks are used during climbs, descents or prolonged uncoordinated level flight, power loss may result even if there is appreciable fuel remaining.

Throttle levers should be set as required. During power changes, move the throttles slowly to the desired setting, wait a few seconds for the system to stabilize, and then make adjustments, if necessary, after leaning the engines. Always return the mixtures to full rich before increasing power. To increase power, always increase propeller RPM prior to manifold pressure. To decrease power, always decrease manifold pressure prior to propeller RPM.

For "best power" during cruise, lean to 125° F rich of peak EGT. For best economy, lean to peak EGT. Never exceed 1650° F EGT. Refer to Paragraph 4.37 for Leaning Procedures.

Adjust cowl flaps as necessary to maintain engine temperatures within limits. The maximum continuous cylinder head temperature is 475° F during normal operation. At high altitudes, cylinder head temperatures can be maintained within limits through careful leaning and proper use of cowl flaps. When cruise conditions permit, it is desirable to maintain cylinder head temperatures below 435° F to provide maximum engine life.

Fuel flow warning lights indicate an impending fuel flow interruption which could result in power loss. Use of the emergency fuel pumps will not normally be required for climbs or cruise at any altitude; however, high power climbs to high altitude under conditions of elevated ambient temperature, high climb rate, and extremely volatile fuel may cause a fuel boost pressure warning light to illuminate and/or the engine fuel pressure gauge to indicate fluctuation of 2-5 psi. The emergency fuel pump should be turned ON to provide stable engine operation during such high power operations, but should be turned OFF after leveling off if reduction to cruise power extinguishes the boost pump warning light and if engine fuel pressure remains steady with the emergency fuel pump off. Any time fuel pressure falls below 34 psi the emergency fuel pump should be turned ON.

NOTE

Heater operation will cause the right fuel pressure gauge to fluctuate during heater cycling.

Since inboard tanks must be used for landing, be sure to retain sufficient fuel in the inboard tanks for normal descent and landing in addition to reserve fuel for a possible go-around.

NOTE

Fuel remaining in the tanks when the fuel gauge indicates zero fuel cannot be used safely in flight.

During cruise, propellers should be synchronized as close as possible. The control levers can be secured in their settings by use of the friction knob on the right side of the control pedestal. During flight, monitor fuel gauges and engine gauges.

4.27 DESCENT

During power reduction for descent, be sure EGT is maintained at minimum of 1350° F. Throttling back at high altitudes (above 15,000 feet) without first checking that the mixture has been so leaned could result in engine power loss.

Set fuel selectors on INBOARD tanks and set power as required for descent. Adjust cowl flaps as necessary to maintain engine temperatures within limits.

At altitudes below 10,000 feet, turn OFF the oxygen system. The pitot heat and windshield heat may be used as required.

4.29 BEFORE LANDING

When preparing for landing, turn ON seat belt and no smoking signs and ensure that all occupants comply. Turn ON emergency fuel pumps, turn OFF air conditioner and set mixture controls to full RICH. If a propeller synchrophaser system is installed, turn it OFF.

Set the propeller controls to 2400 RPM. Landing gear may be lowered at airspeeds below 153 KIAS. Determine landing gear extension by checking the gear position lights. Secondary indications of gear extension are the return of the selector lever to a neutral position and the appearance of the nose gear in the gear mirror on the inboard side of the left nacelle.

Operate the toe brakes to determine if there is sufficient pressure for normal braking and make sure that the parking brake is not set. Should brake freeze-up (caused by icing of the brake assembly during flight) be suspected, it is recommended that maximum brake pressure be applied several times to "break-up" possible ice accumulation. The autopilot and propeller synchrophaser should be OFF for landing.

Extend the wing flaps as required. The maximum speed for up to 25° of flap extension is 162 KIAS; the maximum speed for 40° flap extension is 132 KIAS.

Landing lights should be turned on as required. Radar should be OFF for landing.

4.31 BALKED LANDING

In a balked landing situation, set props full forward and apply power as required, set the flaps to 15° and retract the landing gear. Flaps should be set at 15° until obstacles are cleared. A minimum airspeed of 98 KIAS should be attained.

The Before Landing checklist should be completed before all landings; landing after go-arounds or balked landings are no exception.

4.33 AFTER LANDING (CLEAR OF RUNWAY)

When the airplane is taxied clear of the active runway, cowl flaps should be fully opened, wing flaps should be fully retracted, and trim set to neutral. The emergency fuel pumps and strobe lights should be turned OFF.

If the heater is in use, place the heater switch in the FAN position for a few minutes to allow the heater to cool down before turning it off. This cooling down period is only necessary during ground operation, not when the heater is turned off in flight.

Taxi with the propeller controls full forward. Unnecessary radio and electrical equipment may be shut down.

4.35 SHUTDOWN

After the airplane is taxied to a stop, set the parking brake. If the temperature is below freezing and the brakes are wet, they should not be set if there is a possibility of the brakes being frozen. Turn OFF avionics and the autopilot AP/FD master switch. The heater switch may be turned OFF after it has cooled down. Turn OFF all other electrical equipment.

Retard the throttle levers to idle power before checking magneto grounding. Turn both magnetos on one engine OFF, then immediately back ON. An engine will stop briefly if magnetos are grounded. During this check, do not allow engines to come to a complete stop.

Advance the throttles to 1000 RPM to check the battery. With both engines turning 1000 RPM and all electrical equipment off, if the ammeter shows a battery charge rate in excess of 25 amps, the battery has a low charge. In this case, do not stop engines until current drops below 25 amps or there may not be sufficient battery current for starting.

Leave throttles at 1000 RPM. Since one engine's hydraulic pump was tested at start, the other should be tested at shutdown. Place the mixture control of the first engine started in IDLE CUT-OFF. When the engine has stopped, place the gear selector handle DOWN. If the hydraulic pump on the running engine is functioning, the selector will return to neutral. After this check, place the mixture control of the second engine in IDLE CUT-OFF. Switch magnetos OFF, and, lastly, turn the airplane master switch OFF.

For mooring instructions refer to Paragraph 8.9.

4.37 LEANING PROCEDURES

When leaning below best power is permitted (refer to Maximum Manifold Pressure Vs. Altitude graph in Section 5 - Performance), the engines may be operated at peak EGT or on the lean side of peak EGT as long as stable engine operation results without exceeding any engine limitations during steady state or transient conditions.

BEST POWER

To lean the mixture to best power, proceed as follows:

(a) Lean the mixture slowly until EGT has stabilized at peak.

NOTE

Do not exceed 1650° F EGT.

(b) Enrich the mixture 125° F.
(c) At high power setting if 1650° F is reached before peak EGT, refer to Lycoming Operator's Manual for correct procedure.

BEST ECONOMY

To lean the mixture to best economy, proceed as follows:
(a) Lean the mixture slowly until EGT has stabilized at peak.

NOTE

Do not exceed 1650° F EGT.

LEAN SIDE OF PEAK

To lean the mixture on the lean side of peak, proceed as follows:
(a) At the desired power setting, lean the mixture slowly until EGT has stabilized at peak.

NOTE

Do not exceed 1650° F EGT.

(b) If peak EGT is 1650° F or less, continue to lean until a maximum of 50° reduction in EGT is obtained. Readjust manifold pressure as necessary to maintain the desired power setting.

(c) If 1650° F EGT is reached before peak EGT is obtained, lean according to the following procedure:
    (1) With the mixture leaned to 1650° F, reduce manifold pressure until EGT is reduced approximately 75°.
    (2) Lean the mixture slowly until peak EGT is obtained.
    (3) Lean the mixture additionally until 50°-100° on the lean side of peak is obtained. Do not lean into engine roughness.
    (4) Slowly increase manifold pressure to the desired power setting without permitting EGT to exceed 1650° F.
    (5) Carefully adjust the mixture until EGT is 1625° to 1650° F.

NOTE

Enriching the mixture will increase the EGT when operating on the lean side of peak EGT.

(6) Before enriching the mixture, reduce the manifold pressure as in step (1) to prevent exceeding 1650° F EGT.

4.39 V_{SSE} - INTENTIONAL ONE ENGINE INOPERATIVE SPEED

V_{SSE} is a speed selected by the aircraft manufacturer as a training aid for pilots in the handling of multi-engine aircraft. It is the minimum speed for intentionally rendering one engine inoperative in flight. This minimum speed provides the margin the manufacturer recommends for use when intentionally performing engine inoperative maneuvers during training in the particular airplane.

The intentional one engine inoperative speed, V_{SSE}, for the PA-31-350 is 92 KIAS.

4.41 V_{MCA} - AIR MINIMUM CONTROL SPEED

V_{MCA} is the minimum flight speed at which a twin-engine airplane is directionally controllable as determined in accordance with Federal Aviation Regulations. Airplane certification conditions include one engine becoming inoperative and windmilling; not more than a 5° bank toward the operative engine; landing gear up; flaps UP and most rearward center of gravity.

V_{MCA} for the PA-31-350 has been determined to be 76 KIAS.

The V_{MCA} demonstration, which may be required for the FAA flight test for the multi-engine rating, approaches an uncontrolled flight condition with power reduced on one engine. The demonstration and all intentional one engine operations should not be performed at an altitude of less than 5000 feet above the ground. The recommended procedure for V_{MCA} demonstration is to reduce the power to idle on the simulated inoperative engine at or above the intentional one engine inoperative speed, V_{SSE}, and slow down at approximately one knot per second until the FAA Required Demonstration Speed, V_{MCA}, or stall warning is obtained.

V_{SSE} is a minimum speed selected by the manufacturer for intentionally rendering one engine inoperative in flight for pilot training.

V_{SSE} for the PA-31-350 is 92 KIAS.

V_{MCA} DEMONSTRATION

(a)	Landing Gear	UP
(b)	Flaps	UP
(c)	Airspeed	at or above 92 KIAS (V_{SSE})
(d)	Propeller Controls	HIGH RPM
(e)	Throttle (Simulated Inoperative Engine)	IDLE
(f)	Throttle (Other Engine)	MAX ALLOWABLE
(g)	Airspeed	reduce approximately 1 knot per second until either V_{MCA} or STALL WARNING is obtained

CAUTIONS

Use rudder to maintain directional control (heading) and ailerons to maintain 5° bank towards the operative engine (lateral attitude). At the first sign of either V_{MCA} or stall warning (which may be evidenced by: Inability to maintain heading or lateral attitude, aerodynamic stall buffet, or stall warning horn) immediately initiate recovery; reduce power to idle on the operative engine, and immediately lower the nose to regain V_{SSE}.

One engine inoperative stalls are not recommended.

Under no circumstances should an attempt be made to fly at a speed below V_{MCA} with only one engine operating.

4.43 SIMULATED SINGLE ENGINE ZERO THRUST

To approximate single engine flight conditions without intentionally rendering an engine inoperative, use the following power settings to simulate zero thrust (feathered) conditions.

Mixture control (inop. engine) ..... full rich
Propeller control (inop. engine) ..... high RPM
Throttle (inop. engine) ..... ajdust to achieve RPM listed below

ZERO THRUST

KTAS	RPM
80	1600
90	1800
100	2000
110	2200
120	2400
125	2500

Straight line variation between points.