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**SECTION 4  
NORMAL PROCEDURES**

**4.1 GENERAL**

This section provides the normal operating procedures for the PA-28-161, Cadet airplane. All of the normal operating procedures required by the FAA, as well as those procedures which have been determined as necessary for the operation of the airplane, as determined by the operating and designed features of the airplane, are presented.

Normal operating procedures associated with optional systems and equipment which require handbook supplements are presented in Section 9, Supplements.

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

This section is divided into two parts. The first part is a short form checklist supplying an action - reaction sequence for normal procedures with little emphasis on the operation of the systems. Numbers in parentheses after each checklist section indicate the paragraph where the corresponding amplified procedure can be found.

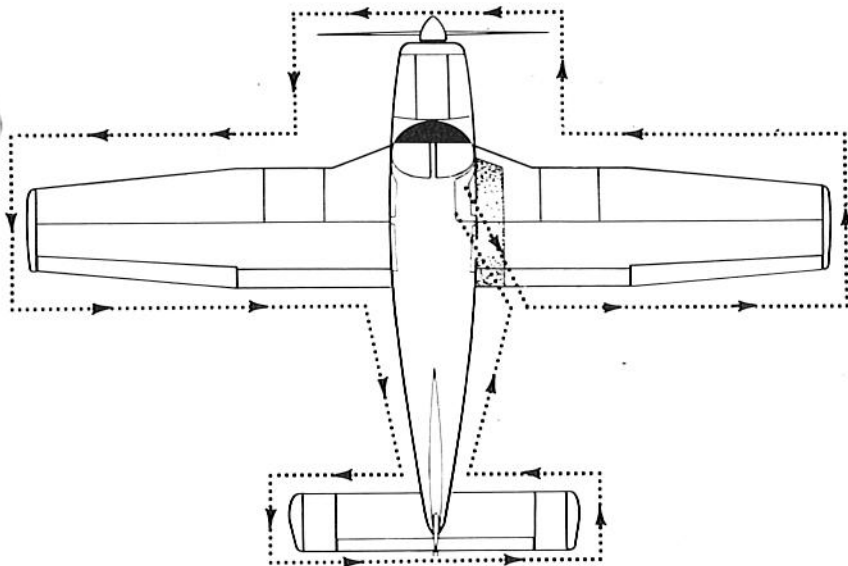
The second part of this section contains the amplified normal procedures which provide detailed information and explanations of the procedures and how to perform them. This portion of the section is not intended for use as an inflight reference due to the lengthy explanations. The short form checklists should be used on the ground and in flight. Numbers in parentheses after each paragraph title indicate where the corresponding checklist can be found.

### **4.3 AIRSPEEDS FOR SAFE OPERATIONS**

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 standard conditions at sea level.

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

- |  |          |
|--|----------|
| (a) Best Rate of Climb Speed                           | 79 KIAS  |
| (b) Best Angle of Climb Speed                          | 63 KIAS  |
| (c) Turbulent Air Operating Speed (See Subsection 2.3) | 111 KIAS |
| (d) Maximum Flap Speed                                 | 103 KIAS |
| (e) Landing Final Approach Speed (Flaps 40°)           | 63 KIAS  |
| (f) Maximum Demonstrated Crosswind Velocity            | 17 KTS   |



**WALK-AROUND**

Figure 4-1

#### 4.5 NORMAL PROCEDURES CHECKLIST

##### 4.5a Preparation (4.9)

Airplane Status .....	AIRWORTHY, PAPERS ON BOARD
Weather .....	SUITABLE
Baggage .....	WEIGHED, STOWED, TIED
Weight and C.G. ....	WITHIN LIMITS
Navigation .....	PLANNED
Charts and Navigation Equipment.....	ON BOARD
Performance and Range.....	COMPUTED AND SAFE

#### CAUTION

The flap position should be noted before boarding the airplane. The flaps must be placed in the UP position before they will lock and support weight on the step.

**4.5b Preflight Checklists (4.11)**

**COCKPIT (4.11a)**

Control Wheel ..... RELEASE BELTS  
Circuit Breakers ..... IN  
Avionics ..... OFF  
Parking Brake ..... SET  
Electric Switches ..... OFF  
Magneto Switch ..... OFF  
Mixture ..... IDLE CUT-OFF  
BATT MASTR Switch ..... ON  
Fuel Quantity Gauges ..... CHECK  
Annunciator Panel ..... CHECK  
BATT MASTR Switch ..... OFF  
Flight Controls ..... CHECK  
Flaps ..... CHECK  
Trim ..... CHECK, SET NEUTRAL  
Pitot Drain ..... DRAIN, CLOSE  
Static Drain ..... DRAIN, CLOSE  
Windows ..... CHECK, CLEAN  
Tow Bar ..... STOW  
Baggage ..... SECURE

**RIGHT WING (4.11b)**

Wing ..... FREE of ICE, SNOW, FROST  
Control Surfaces ..... CHECK for interference -  
CLEAR of ICE, SNOW, FROST  
Hinges ..... CHECK for interference  
Static Wicks ..... CHECK  
Wing Tip and Lights ..... CHECK  
Fuel Tank ..... CHECK supply  
visually - SECURE CAPS

**CAUTION**

When draining any amount of fuel, care should be taken to ensure that no fire hazard exists before starting engine.

Fuel Tank Sump ..... DRAIN, CHECK for water,  
sediment and proper fuel  
Fuel Vent ..... CLEAR  
Tie Down and Chock ..... REMOVE



**4.5b Preflight Checklists (4.11) (Continued)**

**RIGHT WING (4.11b) (Continued)**

Main Gear Strut ..... PROPER  
INFLATION (4.50 in.)  
Tire ..... CHECK  
Brake Block and Disc ..... CHECK  
Fresh Air Inlet ..... CLEAR

**NOSE SECTION (4.11c)**

Fuel and Oil ..... CHECK FOR LEAKS  
Cowling ..... SECURE  
Windshield ..... CLEAN  
Propeller and Spinner ..... CHECK  
Air Inlets ..... CLEAR  
Alternator Belt ..... CHECK TENSION  
Landing Light ..... CHECK  
Nose Chock ..... REMOVE  
Nose Gear Strut ..... PROPER  
INFLATION (3.25 in.)  
Nose Wheel Tire ..... CHECK  
Oil ..... CHECK LEVEL  
Dipstick ..... PROPERLY SEATED  
Fuel Strainer ..... DRAIN, CHECK for water,  
sediment and proper fuel

**LEFT WING (4.11d)**

Wing ..... FREE of ICE, SNOW, FROST  
Fresh Air Inlet ..... CLEAR  
Main Gear Strut ..... PROPER  
INFLATION (4.50 in.)  
Tire ..... CHECK  
Brake Block and Disc ..... CHECK  
Fuel Tank Sumps ..... DRAIN, CHECK for water,  
sediment and proper fuel  
Fuel Vent ..... CLEAR  
Tie Down and Chock ..... REMOVE  
Fuel Tanks ..... CHECK supply  
visually - SECURE CAPS  
Pitot/Static Head ..... REMOVE COVER -  
HOLES CLEAR  
Wing Tip and Lights ..... CHECK  
Control Surfaces ..... CHECK for interference -  
FREE of ICE, SNOW, FROST

4.5b Preflight Checklists (4.11) (Continued)

LEFT WING (4.11d) (Continued)

Hinges . . . . . CHECK for interference  
Static Wicks . . . . . CHECK

FUSELAGE (4.11e)

Antennas . . . . . CHECK  
Empennage . . . . . FREE of ICE, SNOW, FROST  
Fresh Air Inlet . . . . . CLEAR  
Stabilator and Trim Tab . . . . . CHECK for interference  
Tie Down . . . . . REMOVE  
BATT MASTR Switch . . . . . ON  
Cockpit Lighting . . . . . CHECK  
Nav and Strobe Lights . . . . . CHECK  
Stall Warning . . . . . CHECK  
Pitot Heat . . . . . CHECK  
All Switches . . . . . OFF  
Passengers . . . . . BOARD  
Cabin Door . . . . . CLOSE and SECURE  
Seat Belts and Harnesses . . . . . FASTEN - CHECK  
interia reel

4.5c Before Starting Engine Checklist (4.13)

BEFORE STARTING ENGINE (4.13)

Brakes . . . . . SET  
Carburetor Heat . . . . . FULL OFF  
Fuel Selector . . . . . DESIRED TANK  
Avionics . . . . . OFF  
ALTR Switch . . . . . ON

4.5d Engine Start Checklist (4.15)

NORMAL START - COLD ENGINE (4.15a)

Throttle . . . . . ¼ INCH OPEN  
BATT MASTR Switch . . . . . ON  
Electric Fuel Pump . . . . . ON  
Mixture . . . . . FULL RICH  
Starter . . . . . ENGAGE  
Throttle . . . . . ADJUST  
Oil Pressure . . . . . CHECK

If engine does not start within 10 sec., prime and repeat starting procedure.

4.5d Engine Start Checklist (4.15) (Continued)

**NORMAL START - HOT ENGINE (4.15b)**

Throttle ..... ½ INCH OPEN  
BATT MASTR Switch ..... ON  
Electric Fuel Pump ..... ON  
Mixture ..... FULL RICH  
Starter ..... ENGAGE  
Throttle ..... ADJUST  
Oil Pressure ..... CHECK

**ENGINE START WHEN FLOODED (4.15c)**

Throttle ..... OPEN FULL  
BATT MASTR Switch ..... ON  
Electric Fuel Pump ..... OFF  
Mixture ..... IDLE CUT-OFF  
Starter ..... ENGAGE  
Mixture ..... ADVANCE  
Throttle ..... RETARD  
Oil Pressure ..... CHECK

**ENGINE START WITH EXTERNAL POWER SOURCE (4.15d)**

BATT MASTR Switch ..... OFF  
All Electrical Equipment ..... OFF  
Terminals ..... CONNECT  
External Power Plug ..... INSERT in  
receptacle

**NOTE**

For all normal operations using the PEP jumper cables, the battery master switch should be OFF. However, it is possible to use the ship's battery in parallel by turning the battery master switch ON. This will give longer cranking capabilities, but will not increase the amperage.

**CAUTION**

Care should be exercised, because, if the ship's battery has been depleted, the external power supply can be reduced to the level of the ship's battery. This can be tested by turning the battery master switch ON momentarily while the starter is engaged. If cranking speed increases, the ship's battery is at a higher level than the external power supply.

**4.5d Engine Start Checklist (4.15) (Continued)**

**ENGINE START WITH EXTERNAL POWER SOURCE (4.15d)  
(Continued)**

Proceed with normal start

Throttle..... LOWEST POSSIBLE  
RPM  
External Power Plug ..... DISCONNECT from  
receptacle  
BATT MASTR Switch ..... ON - CHECK AMMETER  
Oil Pressure ..... CHECK

**4.5e Engine Warm-Up Checklist (4.17)**

**ENGINE WARM-UP (4.17)**

Throttle..... 800 to 1200 RPM

**4.5f Taxiing Checklist (4.19)**

**TAXIING (4.19)**

Parking Brake ..... RELEASE  
Taxi Area ..... CLEAR  
Throttle..... APPLY SLOWLY  
Brakes ..... CHECK  
Steering..... CHECK

**4.5g Ground Check Checklist (4.21)**

**GROUND CHECK (4.21)**

Parking Brake ..... SET  
Throttle..... 2000 RPM  
Magnetos ..... max. drop 175 RPM  
-max. diff. 50 RPM  
Vacuum..... 4.8 to 5.1 in. Hg  
Oil Temperature ..... CHECK  
Oil Pressure ..... CHECK  
Air Conditioner..... CHECK  
Annunciator Panel ..... PRESS-TO-TEST  
Carburetor Heat ..... CHECK

Engine is warm for takeoff when throttle can be opened without engine faltering.

4.5g Ground Check Checklist (4.21) (Continued)

**GROUND CHECK (4.21) (Continued)**

Electric Fuel Pump ..... OFF  
Fuel Pressure ..... CHECK  
Throttle ..... RETARD

4.5h Before Takeoff Checklist (4.23)

**BEFORE TAKEOFF (4.23)**

Battery Master Switch ..... ON  
Alternator Switch ..... ON  
Flight Instruments ..... CHECK  
Fuel Selector ..... PROPER TANK  
Electric Fuel Pump ..... ON  
Engine Gauges ..... CHECK  
Carburetor Heat ..... OFF  
Seat Backs ..... ERECT

NOTE

The mixture should be set FULL RICH, but a minimum amount of leaning is permitted for smooth engine operation when taking off at high elevation.

Mixture ..... SET  
Primer ..... LOCK

NOTE

The inertia reel type shoulder harness should be given a pull test to check its locking restraint feature.

NOTE

If the fixed shoulder harness (non-inertial reel type) are installed for the aft seat occupants they should be adjusted to provide adequate restraint.



**4.5i Takeoff Checklist (4.25) (Continued)**

**SOFT FIELD, OBSTACLE CLEARANCE (4.25d)**

Flaps ..... 25° (second notch)

Accelerate and lift off nose gear as soon as possible. Lift off at lowest possible airspeed. Accelerate just above ground to 52 KIAS to climb past obstacle height. Continue climbing while accelerating to best rate of climb speed, 79 KIAS.

Flaps ..... RETRACT SLOWLY

**SOFT FIELD, NO OBSTACLE (4.25e)**

Flaps ..... 25° (second notch)

Accelerate and lift off nose gear as soon as possible. Lift off at lowest possible airspeed. Accelerate just above ground to best rate of climb speed, 79 KIAS.

Flaps ..... RETRACT SLOWLY

**4.5j Climb Checklist (4.27)**

**CLIMB (4.27)**

Best Rate Climb Speed (Flaps Up) ..... 79 KIAS  
Best Angle Climb Speed (Flaps Up) ..... 63 KIAS  
En Route ..... 87 KIAS  
Electric Fuel Pump ..... OFF at  
desired altitude

**4.5k Cruise Checklist (4.29)**

**CRUISE**

Reference performance charts and Avco-Lycoming Operators Manual.  
Normal Maximum Power ..... 75%  
Power ..... SET per power table  
Mixture ..... ADJUST

**4.5m Descent Checklist (4.31)**

**NORMAL DESCENT (4.31a)**

Throttle ..... 2500 rpm  
Airspeed ..... 126 KIAS  
Mixture ..... RICH  
Carburetor Heat ..... ON if required

**POWER OFF DESCENT (4.31b)**

Carburetor Heat ..... ON if required  
Throttle ..... CLOSE  
Airspeed ..... AS REQUIRED  
Mixture ..... AS REQUIRED  
Power ..... VERIFY with throttle  
EVERY 30 SECONDS

**4.5n Approach And Landing Checklist (4.33)**

**APPROACH AND LANDING (See charts in Section 5) (4.33)**

Fuel Selector ..... PROPER TANK  
Seat Backs ..... ERECT  
Belts/ Harness ..... FASTEN/CHECK

**NOTE**

If the fixed shoulder harness (non-inertia reel type) is installed, it must be connected to the seat belt and adjusted to allow proper accessibility to all controls including fuel selector, flaps, trim, etc, while maintaining adequate restraint for the occupant.

**NOTE**

If the inertia reel type shoulder harness is installed, a pull test of its locking restraint feature should be performed.

Electric Fuel Pump ..... ON  
Mixture ..... SET



**4.5n Approach And Landing Checklist (4.33) (Continued)**

**APPROACH AND LANDING (See charts in Section 5) (4.33)  
(Continued)**

Flaps ..... SET - 103 KIAS  
MAXIMUM  
Air Conditioner ..... OFF  
Trim to 70 KIAS  
Final Approach Speed (Flaps 40°) ..... 63 KIAS

**4.5o Stopping Engine Checklist (4.35)**

**STOPPING ENGINE (4.35)**

Flaps ..... RETRACT  
Electric Fuel Pump ..... OFF  
Electrical Switches ..... OFF  
Air Conditioner ..... OFF  
Radios ..... OFF  
Throttle ..... FULL AFT  
Mixture ..... IDLE CUT-OFF  
Magnetos ..... OFF  
ALTR Switch ..... OFF  
BATT MASTR Switch ..... OFF  
Trim ..... SET

**NOTE**

When alternate fuels are used, the engine should be run up to 1200 rpm for one minute prior to shutdown to clean out any unburned fuel.

**NOTE**

The flaps must be placed in the UP position for the flap step to support weight. Passengers should be cautioned accordingly.

**4.5p Mooring Checklist (4.37)**

**MOORING (4.37)**

Parking Brake ..... SET  
Control Wheel ..... SECURE with belts  
Flaps ..... FULL UP  
Wheel Chocks ..... IN PLACE  
Tie Downs ..... SECURE

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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 the safe operation of the airplane.

#### **4.9 PREPARATION (4.5a)**

The airplane should be given a thorough preflight and walk-around check. The preflight should include a check of the airplane's required papers, operational status, computation of weight and C.G. limits, takeoff and landing distances, and in-flight performance. A weather briefing should be obtained for the intended flight path, and any other factors relating to a safe flight should be checked before takeoff.

#### *CAUTION*

The flap position should be noted before boarding the airplane. The flaps must be placed in the UP position before they will lock and support weight on the step.

#### **4.11 PREFLIGHT CHECK (4.5b)**

##### **4.11a Cockpit (4.5b)**

Upon entering the cockpit, release the seat belts securing the control wheel, check that all circuit breakers are in, turn OFF all avionics equipment, and set the parking brake. Ensure that all electrical switches and the magneto switch are OFF and that the mixture is in idle cut-off. Turn ON the battery master (BATT MASTR) switch, check the fuel quantity gauges for adequate supply and check that the annunciator panel illuminates. Turn OFF the battery master (BATT MASTR) switch. Check the primary flight controls and flaps for proper operation and set the trim to neutral. Open the pitot and static drains to remove any moisture that has accumulated in the lines. Check the windows for cleanliness. Properly stow the tow bar and baggage and secure.

#### **4.11b Right Wing (4.5b)**

Begin the walk-around at the trailing edge of the right wing by checking that the wing surface and control surfaces are clear of ice, frost, snow or other extraneous substances. Check the flap, aileron and hinges for damage and operational interference. Static wicks should be firmly attached and in good condition. Check the wing tip and lights for damage.

Open the fuel cap and visually check the fuel color and the quantity should match the indication that was on the fuel quantity gauge, replace cap securely. The fuel tank vent should be clear of obstructions.

Drain the fuel tank through the quick drain located at the lower inboard rear corner of the tank, making sure that enough fuel has been drained to ensure that all water and sediment is removed. The fuel system should be drained daily prior to the first flight and after each refueling and checked for proper fuel.

#### *CAUTION*

When draining any amount of fuel, care should be taken to insure that no fire hazard exists before starting engine.

Remove the tie down and chock.

Next, check the landing gear. Check the gear strut for proper inflation; there should be 4.50 +/- 0.25 inches of strut exposure under a normal static load. Check the tire for cuts, wear, and proper inflation. Make a visual check of the brake block and disc.

Check that the fresh air inlet is clear of foreign matter.

#### **4.11c Nose Section (4.5b)**

Check the general condition of the nose section, look for oil or fluid leakage and that the cowling is secure. Check the windshield and clean if necessary. The propeller and spinner should be checked for detrimental nicks, cracks, or other defects. The air inlets should be clear of obstructions and check the alternator belt for proper tension. The landing light should be clean and intact.

**4.11c Nose Section (4.5b) (Continued)**

Remove the chock and check the nose gear strut for proper inflation, there should be 3.25 +/- 0.25 inches of strut exposure under a normal static load. Check the tire for cuts, wear, and proper inflation. Check the engine baffle seals. Check the oil level, make sure that the dipstick has been properly seated.

Open the fuel strainer located on the left side of the firewall long enough to remove any accumulation of water and sediment and check for proper fuel.

**4.11d Left Wing (4.5b)**

The wing surface should be clear of ice, frost, snow, or other extraneous substances. Check that the fresh air inlet is clear of foreign matter and remove the chock. Check the main gear strut for proper inflation, there should be 4.50 +/- 0.25 inches of strut exposure under a normal static load. Check the tire and the brake block and disc.

Open the fuel cap and visually check the fuel color. The quantity should match the indication on the fuel quantity gauge. Replace cap securely. The fuel tank vent should be clear of obstructions. Drain enough fuel to ensure that all water and sediment has been removed and check for proper fuel.

Remove tie down and chock. Remove the cover from the pitot/static head on the underside of the wing. Make sure the holes are open and clear of obstructions. Check the wing tip and lights for damage. Check the aileron, flap, and hinges for damage and operational interference and that the static wicks are firmly attached and in good condition.

**4.11e Fuselage (4.5b)**

Check the condition and security of the antennas. The empennage should be clear of ice, frost, snow, or other extraneous substances, and the fresh air inlet on the side of fuselage should be clear of foreign matter. Check the stabilator and trim tab for damage and operational interference. The trim tab should move in the same direction as the stabilator. Remove the tie down.

**4.11e Fuselage (4.5b) (Continued)**

Upon returning to the cockpit, an operational check of the interior lights, exterior lights, stall warning system, and pitot heat should now be made. Turn the battery master switch and other appropriate switches ON. Check the panel lighting and the overhead flood light. Visually confirm that exterior lights are operational. Lift the stall detector on the leading edge of the left wing and determine that the warning horn is activated. With the pitot heat switch ON, the pitot head will be hot to the touch. After these checks are complete, the master switch and all electrical switches should be turned OFF.

Board the passengers and close and secure the cabin door. Fasten the seat belts and shoulder harnesses. Pull test the locking restraint feature of the shoulder harness inertia reel. Fasten seat belts on empty seats.

**4.13 BEFORE STARTING ENGINE (4.5c)**

Before starting the engine the brakes should be set ON and the carburetor heat lever moved to the full OFF position. The fuel selector should then be moved to the desired tank. Check to make sure that all the avionics are OFF. Place the alternator switch in the ON position.

**4.15 ENGINE START (4.5d)**

**4.15a Normal Start - Cold Engine (4.5d)**

Open the throttle lever approximately  $\frac{1}{4}$  inch. Turn ON the battery master switch and the electric fuel pump.

Move the mixture control to full RICH and engage the starter by rotating the magneto switch clockwise. When the engine fires, release the magneto switch, and move the throttle to the desired setting.

If the engine does not fire within five to ten seconds, disengage the starter, prime the engine and repeat the starting procedure.

**4.15b Normal Start - Hot Engine (4.5d)**

Open the throttle approximately  $\frac{1}{2}$  inch. Turn ON the battery master switch and the electric fuel pump. Move the mixture control lever to full RICH and engage the starter by rotating the magneto switch clockwise. When the engine fires, release the magneto switch and move the throttle to the desired setting.

**4.15c Engine Start When Flooded (4.5d)**

The throttle lever should be full OPEN. Turn ON the battery master switch and turn OFF the electric fuel pump. Move the mixture control lever to idle cut-off and engage the starter by rotating the magneto switch clockwise. When the engine fires, release the magneto switch, advance the mixture and retard the throttle.

**4.15d Engine Start With External Power Source (4.5d)**

An optional feature called the Piper External Power (PEP) allows the operator to use an external battery to crank the engine without having to gain access to the airplane's battery.

Turn the battery master (BATT MASTR) switch OFF and turn all electrical equipment OFF. Connect the RED lead of the PEP kit jumper cable to the POSITIVE (+) terminal of an external 12-volt battery and the BLACK lead to the NEGATIVE (-) terminal. Insert the plug of the jumper cable into the socket located on the fuselage. Note that when the plug is inserted, the electrical system is ON. Proceed with the normal starting technique.

After the engine has started reduce power to the lowest possible rpm and disconnect the jumper cable from the aircraft. Turn the battery master (BATT MASTR) switch ON and check the alternator ammeter for an indication of output. DO NOT ATTEMPT FLIGHT IF THERE IS NO INDICATION OF ALTERNATOR OUTPUT.

**NOTE**

For all normal operations using the PEP jumper cables, the battery master switch should be OFF. However, it is possible to use the ship's battery in parallel by turning the battery master switch ON. This will give longer cranking capabilities, but will not increase the amperage.

**4.15d Engine Start With External Power Source (4.5d) (Continued)**

*CAUTION*

Care should be exercised, because, if the ship's battery has been depleted, the external power supply can be reduced to the level of the ship's battery. This can be tested by turning the battery master switch ON momentarily while the starter is engaged. If cranking speed increases, the ship's battery is at a higher level than the external power supply.

When the engine is firing evenly, advance the throttle to 800 rpm. If oil pressure is not indicated within thirty seconds, stop the engine and determine the trouble. In cold weather it will take a few seconds longer to get an oil pressure indication. If the engine has failed to start, refer to the Lycoming Operating Handbook, Engine Troubles and Their Remedies.

Starter manufacturers recommend that cranking periods be limited to thirty seconds with a two minute rest between cranking periods. Longer cranking periods will shorten the life of the starter.

**4.17 WARM-UP (4.5e)**

Warm-up the engine at 800 to 1200 rpm for not more than two minutes in warm weather and four minutes in cold. Avoid prolonged idling at low rpm, as this practice may result in fouled spark plugs.

Takeoff may be made as soon as the ground check is completed, provided that the throttle may be opened fully without backfiring or skipping, and without a reduction in engine oil pressure.

Do not operate the engine at high rpm when running up or taxiing over ground containing loose stones, gravel or any loose material that may cause damage to the propeller blades.

**4.19 TAXIING (4.5f)**

Before ground personnel attempt to taxi the airplane, they should be instructed and approved by a qualified person authorized by the owner. Ascertain that the propeller back blast and taxi areas are clear.



#### **4.19 TAXIING (4.5f) (Continued)**

Power should be applied slowly to start the taxi roll. Taxi a few feet forward and apply the brakes to determine their effectiveness. While taxiing, make slight turns to ascertain the effectiveness of the steering.

Observe wing clearances when taxiing near buildings or other stationary objects. If possible, station an observer outside the airplane.

Avoid holes and ruts when taxiing over uneven ground.

Do not operate the engine at high rpm when running up or taxiing over ground containing loose stones, gravel or any loose material that may cause damage to the propeller blades.

#### **4.21 GROUND CHECK (4.5g)**

Set the parking brake and advance the throttle to 2000 rpm for checking the magnetos. Drop off on either magneto should not exceed 175 rpm and the difference between the magnetos should not exceed 50 rpm. Operation on one magneto should not exceed 10 seconds.

Check the vacuum gauge; the indicator should read 4.8 to 5.1 in. Hg at 2000 rpm.

Check the annunciator panel lights with the press-to-test button. Also check the air conditioner.

Carburetor heat should also be checked prior to takeoff to be sure the control is operating properly and to purge any ice which may have formed during taxiing. Avoid prolonged ground operation with carburetor heat ON as the air is unfiltered.

The electric fuel pump should be turned OFF after starting or during warm-up to make sure that the engine driven pump is operating. Check both oil temperature and oil pressure. The temperature may be low for some time if the engine is being run for the first time of the day. The engine is warm enough for takeoff when the throttle can be opened without the engine faltering.

**4.23 BEFORE TAKEOFF (4.5h)**

All aspects of each particular takeoff should be considered prior to executing the takeoff procedure.

Ensure that the battery master and alternator switches are ON. Check and set all of the flight instruments as required. Check the fuel selector to make sure it is on the proper tank (fullest). Turn ON the electric fuel pump to prevent loss of power should the engine driven pump fail during takeoff, and check the engine gauges. The carburetor heat should be in the OFF position. Check that all seat backs are erect.

**NOTE**

The mixture should be set FULL RICH, but a minimum amount of leaning is permitted for smooth engine operation when taking off at high elevation.

The mixture should be set, and the primer should be checked to ensure that it is locked.

**NOTE**

The inertia reel type shoulder harness should be given a pull test to check its locking restraint feature.

**NOTE**

If the fixed shoulder harness (non-inertial reel type) are installed for the aft seat occupants they should be adjusted to provide adequate restraint.

Pull test the locking restraint feature of the shoulder harness inertial reel. Fasten seat belts snugly around empty seats.

Exercise and set the flaps and trim. Ensure proper flight control movement and response. The door should be properly secured and latched. On air conditioned models, the air conditioner must be OFF to ensure normal takeoff performance.

#### **4.25 TAKEOFF (See charts in Section 5) (4.5i)**

Takeoffs are normally made with flaps up; however, for short field takeoffs and for takeoffs under difficult conditions, such as deep grass or a soft surface, total distances can be reduced appreciably by lowering the flaps to 25°.

##### **4.25a Normal (4.5i)**

The normal takeoff technique is conventional. The trim should be set slightly aft of neutral, with the exact setting determined by the loading of the airplane. Allow the airplane to accelerate to 45 to 55 KIAS, then ease back on the control wheel to rotate to climb attitude. Premature raising of the nose or raising it to an excessive angle will result in a delayed takeoff. After takeoff, let the airplane accelerate to the desired climb speed by lowering the nose slightly.

##### **4.25b 0° Flaps Takeoff Performance (4.5i)**

A short field takeoff is accomplished without flaps by applying full power before brake release; lift off at 40-50 KIAS (depending on weight) and accelerate to and maintain 44-55 KIAS (depending on weight) past obstacle and climb out at 79 KIAS.

##### **4.25c 25° Flaps Takeoff Performance (4.5i)**

A short field takeoff with an obstacle clearance is accomplished by first lowering the flaps to 25°. Apply full power before brake release and accelerate to 40-50 KIAS (depending on weight) and rotate. Accelerate to and maintain 44-55 KIAS (depending on weight) until obstacle clearance is attained. After the obstacle has been cleared, accelerate to 79 KIAS and then slowly retract the flaps.

##### **4.25d Soft Field, Obstacle Clearance (4.5i)**

Takeoff from a soft field with an obstacle clearance requires the use of 25° flaps. Accelerate the airplane and lift the nose gear off as soon as possible and lift off at the lowest possible airspeed. Accelerate just above the ground to 52 KIAS to climb past obstacle clearance height. Continue climbing while accelerating to the best rate of climb speed, 79 KIAS and slowly retract the flaps.

**4.25e Soft Field, No Obstacle (4.5i)**

For a soft field takeoff without an obstacle to clear, extend the flaps 25°, accelerate the airplane and lift the nose gear off as soon as possible. Lift off at the lowest possible airspeed. Accelerate just above the ground to the best rate of climb speed, 79 KIAS, and retract the flaps while climbing out.

**4.27 CLIMB (4.5j)**

The best rate of climb at gross weight will be obtained at 79 KIAS. The best angle of climb may be obtained at 63 KIAS. At lighter than gross weight these speeds are reduced somewhat. For climbing en route, a speed of 87 KIAS is recommended. This will produce better forward speed and increased visibility over the nose during the climb.

When reaching the desired altitude, the electric fuel pump may be turned off.

**4.29 CRUISE (4.5k)**

The cruising efficiency and speed is determined by many factors, including power setting, altitude, temperature, loading and equipment installed in the airplane.

The normal cruising power is 55% to 75% of the rated horsepower of the engine. Airspeeds which may be obtained at various altitudes and power settings can be determined from the performance graphs provided by Section 5.

Use of the mixture control in cruising flight significantly reduces fuel consumption while reducing lead deposits when alternate fuels are used. The mixture should be full rich when operating above 75% power, and leaned during cruising operation when 75% power or less is being used.

To lean the mixture for best power cruise performance place the mixture control full forward and set the throttle approximately 35 rpm below the desired cruise power setting and lean the mixture to peak rpm. Adjust the throttle, if necessary, for final rpm setting.

#### **4.29 CRUISE (4.5k) (Continued)**

##### *CAUTION*

Prolonged operation with a lean mixture, at more than 75% engine power, can result in engine damage. When leaning to establish best economy cruise mixture below 6,000 feet, care must be taken not to remain in the power range above 75% more than 15 seconds. Above 6,000 feet, the engine is incapable of producing more than 75% power.

A simplified leaning procedure has been developed to obtain the best engine efficiency, while providing the best fuel economy and maximum miles per gallon, for a given power setting. Taking care not to exceed engine speed limitations, set the throttle and mixture controls full forward. Now, begin to lean the mixture. At first the rpm will increase slightly but, as leaning is continued, the rpm will decrease. Continue leaning until the desired cruise engine rpm is established.

Always turn the electric fuel pump ON before switching tanks, and leave it ON for a short period thereafter. To keep the airplane in best lateral trim during cruising flight, use fuel alternately from each tank. It is recommended that one tank be used for one hour after takeoff, then the other tank be used for two hours; then return to the first tank, which will have approximately one and one half hours of fuel remaining if the tanks were full at takeoff. The second tank will contain approximately one half hour of fuel. Do not run tanks completely dry in flight. The electric fuel pump should normally be OFF, so that any malfunction of the engine driven fuel pump is immediately apparent. If signs of fuel starvation should occur at any time during flight, suspect fuel exhaustion. Immediately position the fuel selector to the other tank, and switch the electric fuel pump ON.

#### **4.31 DESCENT (4.5m)**

##### **4.31a Normal Descent (4.5m)**

To achieve the performance on Figure 5-31, a power on descent must be used. The throttle should be set for 2500 rpm, mixture full rich and maintain an airspeed of 126 KIAS. If carburetor ice is encountered apply full carburetor heat.

**4.31b Power Off Descent (4.5m)**

If a prolonged power off descent is to be made, and icing conditions are suspected, apply full carburetor heat prior to power reduction. Throttle should be retarded and mixture control leaned as required. Power response should be verified approximately every 30 seconds by partially opening and then closing the throttle (clearing the engine). When leveling off, enrich mixture, set power as required and select carburetor heat off unless carburetor icing conditions are suspected.

**4.33 APPROACH AND LANDING (See charts in Section 5) (4.5n)**

Check to ensure the fuel selector is on the proper (fullest) tank and that the seat backs are erect. The seat belts and shoulder harnesses should be fastened and the inertia reel checked.

**NOTE**

If the fixed shoulder harness (non-inertia reel type) is installed, it must be connected to the seat belt and adjusted to allow proper accessibility to all controls including fuel selector, flaps, trim, etc, while maintaining adequate restraint for the occupant.

**NOTE**

If the inertia reel type shoulder harness is installed, a pull test of its locking restraint feature should be performed.

Turn the electric fuel pump ON and turn the air conditioner OFF. The mixture should be set in the full RICH position.

The airplane should be trimmed to an initial approach speed of 70 KIAS, and a final approach speed of 63 KIAS with flaps extended to 40°. If desired, the flaps can be lowered at speeds up to 103 KIAS.

The mixture control should be kept in full RICH position to ensure maximum acceleration if it should be necessary to open the throttle again. Carburetor heat should not be applied unless there is an indication of carburetor icing, since the use of carburetor heat causes a reduction in power which may be critical in case of a go-around. Full throttle operation with carburetor heat on can cause detonation.

**4.33 APPROACH AND LANDING (See charts in Section 5) (4.5n) (Continued)**

The amount of flap used during landings and the speed of the aircraft at contact with the runway should be varied according to the landing surface and conditions of wind and airplane loading. It is generally good practice to contact the ground at the minimum possible safe speed consistent with existing conditions.

Normally, the best technique for short and slow landings is to use full flap and enough power to maintain the desired airspeed and approach flight path. Mixture should be full RICH, fuel on the fullest tank, and electric fuel pump ON. Reduce the speed during the flareout and contact the ground close to the stalling speed. After ground contact hold the nose wheel off as long as possible. As the airplane slows down, gently lower the nose and apply the brakes. Braking is most effective when flaps are raised and back pressure is applied to the control wheel, putting most of the aircraft weight on the main wheels. In high wind conditions, particularly in strong crosswinds, it may be desirable to approach the ground at higher than normal speeds with partial or no flaps.

**4.35 STOPPING ENGINE (4.5o)**

The flaps should be raised at the pilot's discretion. Turn OFF the electric fuel pump and all electrical switches. The air conditioner and radios should be turned OFF. Stop the engine by pulling the mixture control back to idle cut-off. The throttle should be left full aft to avoid engine vibration while stopping. After the engine stops, turn the magneto, battery master, and alternator switches OFF, and reset the trim.

**NOTE**

When alternate fuels are used, the engine should be run up to 1200 rpm for one minute prior to shutdown to clean out any unburned fuel.

**NOTE**

The flaps must be placed in the UP position for the flap step to support weight. Passengers should be cautioned accordingly.

#### **4.37 MOORING (4.5p)**

If necessary to move the airplane on the ground, use a nose wheel tow bar. The aileron and stabilator controls should be secured by looping the safety belt through the control wheel and pulling it snug. The flaps are locked when in the UP position and should be left retracted.

Tie downs can be secured to rings provided under each wing and to the tail skid. The rudder is held in position by its connections to the nose wheel steering and normally does not have to be secured.

#### **4.39 STALLS**

The stall characteristics are conventional. An approaching stall is indicated by a stall warning horn which is activated between five and ten KTS above stall speed. Mild airframe buffeting and gentle pitching may also precede the stall.

The gross weight stalling speed with power off and full flaps is 44 KIAS. With the flaps up this speed is increased. Loss of altitude during stalls varies from 100 to 275 feet, depending on configuration and power.

#### **NOTE**

The stall warning system is inoperative with the master switch OFF.

During preflight, the stall warning system should be checked by turning the master switch ON, lifting the detector and checking to determine if the horn is actuated. The master switch should be returned to the OFF position after the check is complete.

#### **4.41 TURBULENT AIR OPERATION**

In keeping with good operating practice used in all aircraft, it is recommended that when turbulent air is encountered or expected, the airspeed be reduced to maneuvering speed to reduce the structural loads caused by gusts and to allow for inadvertent speed build-ups which may occur as a result of the turbulence or of distractions caused by the conditions. (See Subsection 2.3.)



#### **4.43 WEIGHT AND BALANCE**

It is the responsibility of the owner and pilot to determine that the airplane remains within the allowable weight vs. center of gravity envelope while in flight.

For weight and balance data, refer to Section 6 (Weight and Balance).

#### **4.45 NOISE LEVEL**

The noise level of this aircraft is 72.0 dB(A).

No determination has been made by the Federal Aviation Administration that the noise levels of this airplane are or should be acceptable or unacceptable for operation at, into, or out of, any airport.

The above statement notwithstanding, the noise level stated above has been verified by and approved by the Federal Aviation Administration in noise level test flights conducted in accordance with FAR 36, Noise Standards - Aircraft Type and Airworthiness Certification. This aircraft model is in compliance with all FAR 36 noise standards applicable to this type.

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