OPERATING INSTRUCTIONS

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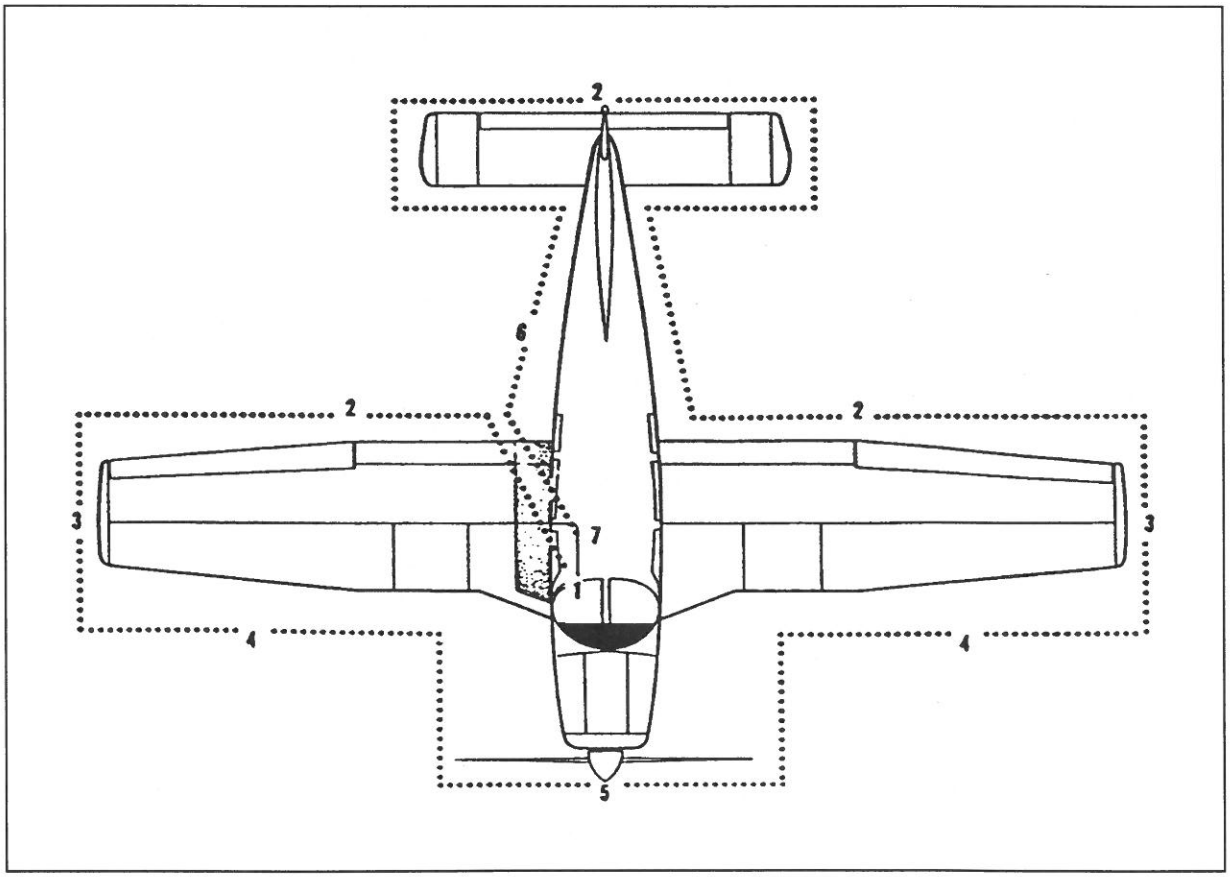
PREFLIGHT

The airplane should be given a thorough preflight and walk-around inspection. The preflight should include a check of the airplane's operational status and computation of weight and C.G. limits, takeoff distance, 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.

WALK-AROUND INSPECTION

1. In Cabin
   a. Release seat belt securing controls.
   b. Master switch ON.
   c. Check fuel quantity gauges.
   d. Master switch OFF.



2. Control Surfaces
   a. Check for external damage and operational interference of control surfaces or hinges.
   b. Insure that wings and control surfaces are free of snow, ice, or frost.

3. Wings
   a. Visually check fuel supply; secure caps.
   b. Drain fuel sumps (two on each wing for early models, one on each wing for later models).
   c. Check that fuel system vents are open.
   d. On left wing check that pitot head cover is removed and that holes in the pitot-static head are unobstructed.

4. Main Landing Gear
   a. Check main gear shock struts for proper inflation (approximately 4.50 inches showing).
   b. Check tires for cuts, wear and proper inflation.
   c. Check brake blocks and discs for wear and damage.

5. Nose Section
   a. Inspect windshield for cleanliness.
   b. Check the propeller and spinner for defects, dirt and cracks.
   c. Check for obvious fuel and oil leaks.
   d. Drain gascolator fuel sump (left side of airplane):
   e. Check oil level, 8 quarts maximum. (Insure that the dipstick is properly seated.)
   f. Check cowling and inspection covers for security.
   g. Check nose wheel tire for damage, wear, and proper inflation.
   h. Check nose gear shock strut for proper inflation (approximately 3.25 inches showing).
   i. Check for foreign matter in air inlets.

6. Fuselage
   a. Stow tow bar if used.
   b. Check baggage for proper storage and security.
   c. Close and secure the baggage compartment door.

7. Inside Airplane
   a. Upon entering the airplane, ascertain that all flight controls operate properly.
   b. Close and secure the cabin door.
   c. Check that required papers are in the airplane.
   d. Fasten seat belts and shoulder harnesses. Check function of inertia reels.

STARTING ENGINE

1. Set parking brake ON.
2. Set the carburetor heat control in the full OFF position.
3. Select the desired tank with the fuel selector valve.

STARTING ENGINE WHEN COLD

1. Open throttle approximately 1/4 inch.
2. Turn the master switch ON.
3. Turn the electric fuel pump ON.
4. Move the mixture control to FULL RICH.
5. Engage the starter by rotating the magneto switch clockwise and pressing in.
6. When the engine fires, advance the throttle to the desired setting If the engine does not fire within five to ten seconds, disengage the starter and prime with one to three strokes of the priming pump if one is installed. Repeat the starting procedure.

STARTING ENGINE WHEN HOT

1. Open the throttle approximately 1/2 inch.
2 Turn the master switch ON.
3. Turn the electric fuel pump ON.
4. Put the mixture control in full RICH.
5. Engage the starter by rotating the magneto switch clockwise and pressing in. When the engine fires, move the throttle to the desired setting.

STARTING ENGINE WHEN FLOODED

1. Open the throttle FULL.
2. Turn the master switch ON.
3. Turn the electric fuel pump OFF.
4. Put the mixture control in IDLE CUT-OFF.
5. Engage the starter by rotating the magneto switch clockwise and pressing in. When the engine fires, advance the mixture control and retard the throttle to the desired setting.

When the engine is firing evenly, advance the throttle to 800 RPM. If oil pressure is not indicated within 30 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" for the appropriate engine model.

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

STARTING ENGINE WITH EXTERNAL POWER SOURCE*

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

The procedure is as follows:

1. Turn the airplane master switch OFF.

*Optional equipment

2. 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.
3. Insert the plug of the jumper cable into the socket located on the airplane's fuselage.
4. Turn the airplane master switch ON and proceed with the normal engine starting technique.
5. After the engine has been started, turn the master switch OFF and disconnect the jumper cable plug from the airplane.
6. Turn the master switch ON and check the alternator ammeter for indication of output. DO NOT ATTEMPT FLIGHT IF THERE IS NO INDICATION OF ALTERNATOR OUTPUT.

WARM-UP

Warm-up the engine at 800 to 1200 RPM for not more than two minutes in warm weather or four minutes in cold weather. Avoid prolonged idling at low RPM as this practice may result in fouled spark plugs. If necessary to hold before takeoff, it is recommended that the engine be idled at 1200 RPM.

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

GROUND CHECK

Check the magnetos at 2000 RPM by switching from BOTH to RIGHT, then back to BOTH before switching to LEFT. The drop on either magneto should not exceed 175 RPM, and each magneto should read within 50 RPM of the other. Prolonged operation on one magneto should be avoided.

Check the vacuum gauge; the indicator should read 5" ± .1" Hg at 2000 RPM.

Check both the oil temperature and pressure. The temperature may be low for some time if the engine is being run for the first time of the day, but as long as the oil pressure is within limits, the engine is ready for takeoff.

Check the annunciator panel lights with the press-to-test button*.

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

Operation of the engine driven fuel pump should be checked while taxiing or during preflight engine runup by switching the electric fuel pump OFF and observing the fuel pressure gauge. The electric fuel pump should be ON during takeoff to prevent loss of power during takeoff should the engine driven pump fail. The engine is warm enough for takeoff when the throttle can be fully opened without the engine faltering.

*Serial nos. 7515001 and up

TAKEOFF

Just before takeoff the following items should be checked:

1. Fuel - on proper tank
2. Electric fuel pump - on
3. Engine gauges- checked
4. Flaps - set
5. Carburetor heat - off
6. Mixture - set
7. Seat backs - erect
8. Safety belts/harness - fastened
9. Trim tab - set
10. Controls - free
11. Door - latched

NOTE
Mixture full rich except a minimum amount of leaning is permitted for smooth engine operation when taking off at high elevation.

The takeoff technique is conventional. The trim tab should be set slightly aft of neutral with the exact setting determined by the loading of the airplane. Allow the airplane to accelerate to 50 to 60 miles per hour, then ease back on the wheel enough to let the airplane fly itself from the ground. 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.

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, distances can be reduced appreciably by lowering the flaps to 25° and rotating at lower airspeeds.

Short Field, Obstacle Clearance:

Lower the flaps to 25°. Apply full power before brake release. Accelerate to 66 MPH CAS and rotate, maintaining 66 MPH CAS until obstacle clearance has been attained. After the obstacle has been cleared accelerate to 87 miles per hour and then slowly retract the flaps.

Short Field, No Obstacle:

Use of partial flaps does not decrease minimum ground roll, therefore, leave the flaps up or lower the flaps to 25° as desired. Apply full power before brake release. Accelerate to 65 MPH CAS with flaps up or 52 MPH CAS with flaps at 25° and rotate. After breaking ground, accelerate to best rate of climb speed of 87 MPH CAS. Slowly retract the flaps while climbing out.

Soft Field, Obstacle Clearance:

Lower the flaps to 25°. Accelerate airplane, lift nose gear off as soon as possible, and lift off at lowest possible airspeed. Accelerate just above the ground to 66 MPH CAS to climb past obstacle clearance height. Continue climbing while accelerating to the best rate of climb speed, 87 miles per hour, and slowly retract the flaps.

Soft Field, No Obstacle:

Lower the flaps to 25°. Accelerate the airplane and lift the nose gear off as soon as possible, then lift off at the lowest possible airspeed. Accelerate just above the ground to the best rate of climb speed, 87 miles per hour. Climb out while slowly retracting the flaps.

CLIMB

The best rate of climb at gross weight will be obtained at 87 miles per hour. The best angle of climb is at 76 miles per hour. At lighter than gross weight, these speeds are somewhat reduced. For climbing en route, a speed of 100 miles per hour is recommended. This will produce better forward speed and increased visibility over the nose during the climb. Shallow turns of a few degrees will also aid forward visibility during climb out.

STALLS

Stall characteristics are conventional. Audible stall warning is provided by a horn located behind the instrument panel which sounds automatically at between 5 and 10 miles per hour above stall speed.

Stall speed at a gross weight of 2325 pounds with power off and full flaps is 58 miles per hour. With flaps up, this speed is increased.

The stall speed chart is at gross weight. Stall speeds at lower weights will be correspondingly less.

STALL SPEED TABLE

Angle of Bank	Flaps 40°	Flaps Retracted
0°	58 MPH	64.5 MPH
20°	60 MPH	67 MPH
40°	66 MPH	74 MPH
50°	72 MPH	80 MPH
60°	82 MPH	91 MPH

Power Off — Gross Weight 2325 Lbs.

CRUISING

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

The normal cruising power is 75% of the rated horsepower of the engine. True airspeeds, which may be obtained at various altitudes and power settings, can be determined from the charts in the Performance Charts Section of this manual.

Use of the mixture control in cruising flight reduces fuel consumption significantly, especially at higher altitudes, and reduces lead deposits when the alternate fuels are used.

The mixture should be leaned when 75% power or less is being used. If any doubt exists as to the amount of power being used, the mixture should be in the FULL RICH position for all operations. Always enrich the mixture before increasing power settings

To lean the mixture, pull the mixture control until the engine becomes rough, indicating that the lean mixture limit has been reached in the leaner cylinders. Then enrich the mixture by pushing the control toward the instrument panel until engine operation becomes smooth.

The continuous use of carburetor heat during cruising flight decreases engine efficiency. Unless icing conditions in the carburetor are severe, do not cruise with carburetor heat on. Apply FULL carburetor heat slowly and only for a few seconds at intervals determined by the icing conditions.

In order to keep the airplane in best lateral trim during cruise flight, the fuel should be used alternately from each tank. It is recommended that one tank be used for one hour after takeoff, the other tank be used for two hours, then return to the first tank. The second tank will contain approximately one half hour of fuel. Do not run tanks completely dry in flight.

The following is a list of some fuel management recommendations:

1. Fuel quantity should be visually checked in both tanks before entering the airplane.
2. Takeoff should be made on the fuller tank to assure best fuel flow, and this tank selected before or immediately after starting to establish an adequate fuel flow before takeoff. The tank with the higher fuel quantity should be selected for landing.
3. Fuel tank selection at low altitude is not recommended since adequate recovery time is essential in the event of an error in fuel selection.
4. The electric fuel pump should be turned on before switching tanks and left on for a short period thereafter.
5. To avoid the necessity of making a hasty selection and to assure a continuous fuel flow, the selector should be changed to another tank before the fuel is exhausted from the tank in use.
6. Operation of the engine driven pump should be checked while taxiing or during the preflight runup by switching off the electric fuel pump and observing the fuel pressure.
7. During cruise, the electric fuel pump should be in the off position so that any malfunction of the engine driven fuel pump is immediately apparent.
8. If signs of fuel starvation should occur at any time during flight, fuel exhaustion should be suspected, at which time the fuel selector should immediately be positioned to the fuller tank and the electric fuel pump switched to the on position.

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 load caused by gusts and to allow for inadvertent speed build-ups which may occur as a result of the turbulence or distractions caused by the conditions.

MANEUVERS

The airplane must be operated as a normal or utility category airplane in compliance with the operating limitations stated in the form of placards and markings, and those given in the Airplane Flight Manual. Except for training maneuvers (steep turns, chandelles, and lazy eights) which are permitted only when the airplane is loaded to the utility category, acrobatic maneuvers are prohibited.

Intentional spins are prohibited. Maneuvering at speeds in excess of 124 mph must be avoided in order to prevent overstressing the airframe.

ENGINE POWER LOSS

The most common cause of engine power loss is mismanagement of fuel. Therefore, the first step to take after engine power loss is to move the fuel selector to the tank not being used. This will often restore power even if there is no apparent reason for the engine to stop on the tank being used.

If changing to another tank does not restore power:

1. Check fuel pressure - if electric fuel pump is off, turn it ON.
2. Push mixture control to full RICH.
3. Check ignition switch. Turn to best operating magneto - LEFT, RIGHT, or BOTH.

APPROACH AND LANDING

Before landing check list:

1. Seat backs - erect
2. Safety belts/harness - fastened
3. Fuel - on proper tank
4. Electric fuel pump - on
5. Mixture - full rich
6. Flaps - set (115 MPH)*

The airplane should be trimmed to an approach speed of about 80 MPH with flaps up. The flaps can be lowered at speeds up to 115 MPH*, if desired, and the approach speed reduced 3 MPH for each additional notch of flaps. Carburetor heat should not be applied unless there is an indication of carburetor icing, since the use of carburetor heat causes a reduction of power which could be critical should a go-around be necessary. Full throttle operation with carburetor heat on is likely to cause detonation.

The amount of flap used during landings and the speed of the airplane at contact with the runway should be varied according to the landing surface, wind conditions, 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. Reduce the airspeed during flareout and contact the ground at close to stalling speed. After ground contact hold the nose wheel off as long as possible. As the airplane slows down, drop the nose and apply the brakes. There will be less chance of skidding the tires if the flaps are retracted before applying the brakes. Braking is most effective when back pressure is applied to the control wheel, putting most of the airplane 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

*125 MPH on serial nos. 7415001 through 7515449.

STOPPING ENGINE

At the pilot's discretion, the flaps should be raised and the electric fuel pump turned off. After parking, the radios should be turned off and the engine stopped by putting the mixture control in idle cut-off. The throttle should be left full aft to avoid engine vibration while stopping. The magneto and master switches should be turned off and the parking brake set.

AIRSPEED DATA

All airspeeds quoted in this manual are calibrated unless otherwise noted. Calibrated airspeed is indicated airspeed corrected for instrument and position errors. The following table gives the correlation between indicated airspeed and calibrated airspeed if zero instrument error is assumed. This calibration is valid only when flown at maximum gross weight in level flight.

AIRSPEED CORRECTION TABLE

Flaps 0°										
IAS-MPH	60	70	80	90	100	110	120	130	140	150
CAS - MPH	66	74	82	90	99	108	117	126	135	144

Flaps 40°						
IAS - MPH	60	70	80	90	100	110
CAS - MPH	65	73	81	89	98	107

MOORING

The airplane can be moved on the ground with the aid of the optional nose wheel tow bar stowed in the baggage compartment. Tie-down ropes may be attached to rings under each wing and to the tail skid. The aileron and stabilator controls should be secured by looping the seat belt through the control wheel and pulling it snug. The rudder is held in position by its connection to the nose wheel steering and normally does not have to be secured. The flaps are locked when in the full up position and should be left retracted.

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, see the Weight and Balance Section of this manual.

EMERGENCY LOCATOR TRANSMITTER*

The Emergency Locator Transmitter (ELT) when installed, is located in the aft portion of the fuselage just below the stabilator leading edge and is accessible through a plate on the right side of the fuselage. (On aircraft manufactured prior to mid-1975, this plate is retained by three steel Phillips head screws. On aircraft manufactured from mid-1975 and on, this plate is attached with three slotted-head nylon screws for ease of removal; these screws may be readily removed with a variety of common items such as a dime, a key, a knife blade, etc. If there are no tools available in an emergency the screw heads may be broken off by any means.) The ELT is an emergency locator transmitter which meets the requirements of FAR 91.52. The unit operates on a self-contained battery.

The replacement date as required by FAA regulations is marked on the transmitter label. The battery should also be replaced if the transmitter has been used in an emergency situation or if accumulated test time exceeds one hour. The unit is equipped with a portable antenna to allow the locator to be removed from the airplane in case of an emergency and used as a portable signal transmitter.

On the unit itself is a three position selector switch placarded "OFF," "ARM," "ON." The "ARM" position is provided to set the unit to the automatic position so that it will transmit only after impact and will continue to transmit until the battery is drained to depletion or until the switch is manually moved to the "OFF" position. The "ARM" position is selected when the transmitter is installed at the factory and the switch should remain in that position whenever the unit is installed in the airplane. The "ON" position is provided so the unit can be used as a portable transmitter or in the event the automatic feature was not triggered by impact or to periodically test the function of the transmitter.

Select the "OFF" position when changing the battery, when rearming the unit if it has been activated for any reason, or to discontinue transmission.

NOTE

If the switch has been placed in the "ON" position for any reason, the "OFF" position has to be selected before selecting "ARM." If "ARM" is selected directly from the "ON" position the unit will continue to transmit in the "ARM" position.

A pilot's remote switch, located on the left side panel, is provided to allow the transmitter to be controlled from inside the cabin.

1. On some models the pilot's remote switch has three positions and is placarded "ON," "AUTO/ARM," and "OFF/RESET." The switch is normally left in the "AUTO/ARM" position. To turn the transmitter off, move the switch momentarily to the "OFF/RESET" position. The aircraft master switch must be "ON" to turn the transmitter "OFF." To activate the transmitter for tests or other reasons, move the switch upward to the "ON" position and leave it in that position as long as transmission is desired.
2. On other models the pilot's remote switch has two positions and is placarded "ON/RESET" and "ARM (NORMAL POSITION)." The switch is normally left in the down or "ARM" position. To turn the transmitter off, move the switch to the "ON/RESET" position for one second then return it to the "ARM" position. To

*Optional equipment

activate the transmitter for tests or other reasons, move the switch upward to the "ON/RESET" position and leave it in that position as long as transmission is desired.

The locator should be checked during the ground check to make certain the unit has not been accidentally activated. Check by tuning a radio receiver to 121.5 MHz. If there is an oscillating sound, the locator may have been activated and should be turned off immediately Reset to the "ARM" position and check again to insure against outside interference.

NOTE

If for any reason a test transmission is necessary, the test transmission should be conducted only in the first five minutes of any hour and limited to three audio sweeps. If tests must be made at any other time, the tests should be coordinated with the nearest FAA tower or flight service station.

OPERATING TIPS

The following Operating Tips are of particular value in the operation of the airplane.

1. Learn to trim for takeoff so that only a slight back pressure on the wheel is required - to lift the airplane from the ground.
2. The best speed for takeoff is about 60 MPH under normal conditions. Trying to pull the airplane off the ground at too low an airspeed decreases the controllability of the airplane in event of engine failure.
3. Flaps may be lowered at airspeeds up to 115 MPH**. To reduce flap operating loads, it is desirable to have the airplane at a slower speed before extending the flaps.
4. Before attempting to reset any circuit breaker, allow a two to five minute cooling off period.
5. Before starting the engine, check that all radio switches, light switches and the pitot heat switch are in the off position to prevent an overloaded condition when the starter is engaged.
6. The overvoltage relay protects the electronics equipment from a momentary overvoltage condition (approximately 16.5 volts and up), or a catastrophic regulator failure. In the event of a momentary condition, the relay will open and the ammeter will indicate "0" output from the alternator. The relay may be reset by switching the ALT switch to OFF for approximately 1 second and then returning the ALT switch to ON. The ALT light on the annunciator panel* will illuminate if the alternator fails. Recycle the ALT switch and check the ALT FIELD circuit breaker. If the failure persists after this action, reduce electrical loads and land as soon as practical.
7. The vacuum gauge monitors the pressure available to assure the correct operating speed of the vacuum driven gyroscopic flight instruments. It also monitors the condition of the common air filter by measuring the flow of air through the filter.

   If the vacuum gauge does not register 5" ± .10" Hg at 2000 RPM, the following items should be checked before flight.

   a. Common air filter could be dirty or restricted.
   b. Vacuum lines could be collapsed or broken.
   c. Vacuum pump could be worn.
   d. Vacuum regulator could be improperly adjusted. The pressure, even though set correctly, can read lower under two conditions: (1) Very high altitude - above 12000 feet, (2) Low engine RPM - usually on approach or during training maneuvers. This is normal and should not be considered a malfunction.
8. The shape of the wing fuel tanks is such that in certain maneuvers the fuel may move away from the tank outlet. If the outlet is uncovered, the fuel flow will be interrupted and a temporary loss of power may result. Pilots can prevent inadvertent uncovering of the outlet by avoiding maneuvers which could result in uncovering the outlet.

   Extreme running turning takeoffs should be avoided as fuel flow interruption may occur.

   Prolonged slips or skids which result in excess of 2000 feet of altitude loss, or other radical or extreme maneuvers which could cause uncovering of the fuel outlet must be avoided as fuel flow interruption may occur when tank being used is not full.

* Serial nos. 7515001 and up
** 125 MPH on serial nos. 7415001 through 7515449