OPERATING INSTRUCTIONS

THIS SECTION IS DESIGNED:

1. To help you operate your Aztec "E" with safety and confidence.
2. To more fully acquaint you with the basic performance and handling characteristics of the airplane.
3. To more fully explain your Aztec "E's" operation than is permissible to set forth in the Airplane Flight Manual.

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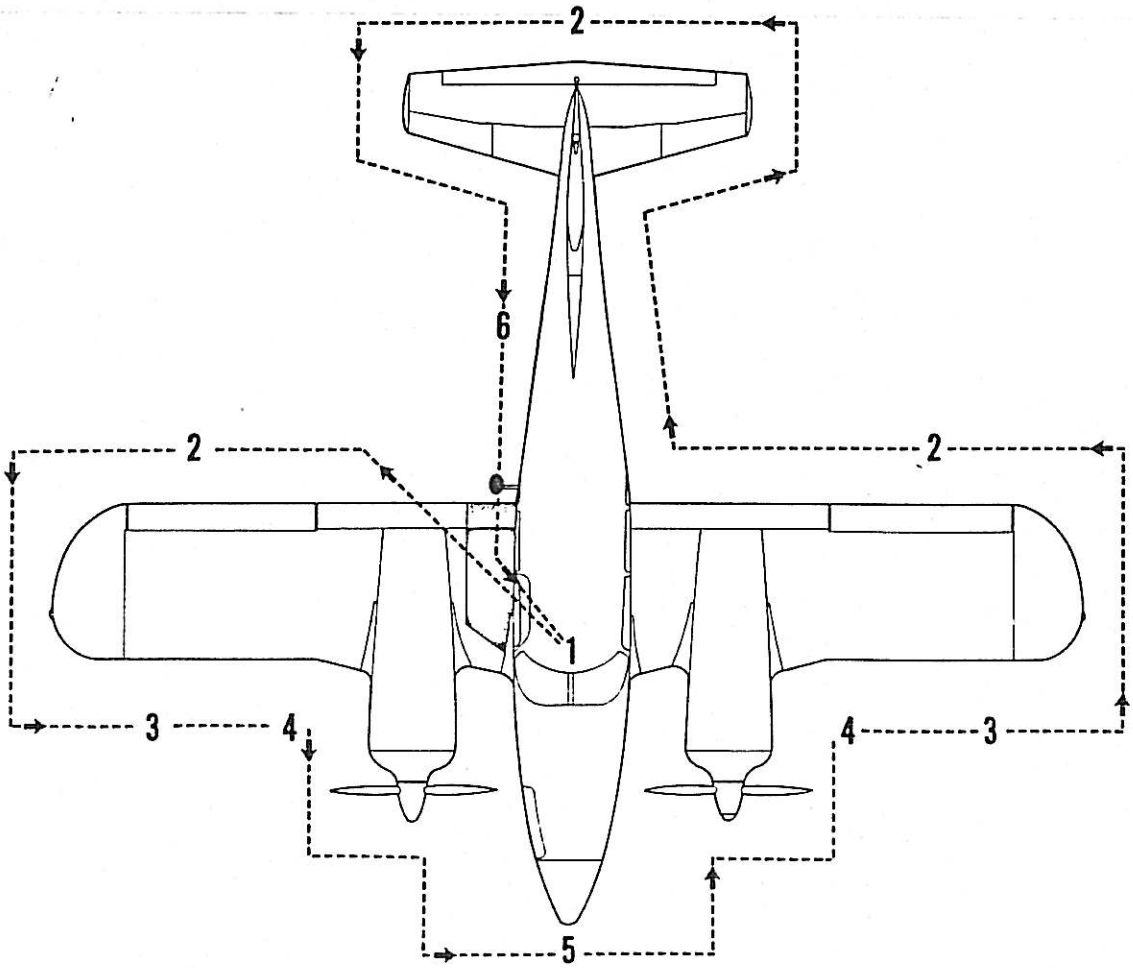
OPERATING INSTRUCTIONS

PREFLIGHT

The following safety procedure instructions must become an integral part of the pilot's operational routine and preflight inspection.

Begin the preflight inspection in the cockpit. Check that the landing gear selector is in the neutral position. Turn master switch on and check that the green landing gear indicator lights are on. If the green lights are not on, make sure that the instrument panel light switch is turned to the OFF position. The landing gear indicator lights are automatically dimmed and difficult to see in the daytime if the instrument lights are on.

During the external preflight check see that the baggage doors are properly secured. Prior to flight, passengers should be briefed about seat belts, the use of oxygen when applicable, how to evacuate the airplane, and advised not to smoke during take-off or landing. They should be cautioned against handling or interfering with essential equipment and flight controls, fuel valves, switches, circuit breakers, trim knob or cranks, door handle, radios, etc.



1. a. Ignition and master switches "OFF".
   b. Check that the landing gear selector and the other controls are in their proper position.
2. a. Check for external damage or operational interference to the control surfaces, wings or fuselage.
   b. Check for snow, ice or frost on the wings or control surfaces.
3. a. Visually check fuel supply.
   b. Check fuel cell caps and covers for security (adjust caps to maintain tight seal).
   c. Fuel system vents open.
4. a. Landing gear shock struts properly inflated (approximately 3" piston exposed).
   b. Tires satisfactorily inflated and not excessively worn.
   c. Drain fuel strainers and lines.
   d. Cowling, landing gear doors and inspection covers properly attached and secured.
   e. Propellers free of detrimental nicks.
   f. No obvious fuel or oil leaks.
   g. Engine oil at the proper level.
5. a. Windshield clean and free of defects.
   b. Tow-bar and control locks detached and properly stowed. Check that baggage doors are secured.
6. a. Upon entering the airplane check that all controls operate normally.
   b. Check that the landing gear selector and the other controls are in their proper position.
   c. Check that required papers are in order and in the airplane.

BEFORE STARTING ENGINES

1. Baggage - secure.
2. Weight and C.G. - compute.
3. Performance - compute.
4. Aircraft papers - in order.
5. Maps and charts - check.
6. Cabin door - locked.
7. Seat belts - secure.
8. Crew seats - adjusted.
9. Parking brake - set.
10. Altimeter - set.
11. Controls - response.
12. Oxygen press - check for adequate supply.
13. Fuel valves - on.
14. Circuit breakers - check.
15. Switches (Radio, etc.) - off.
    Except: Main voltage regulator - on.
    Alternators - on.

STARTING ENGINES

Be sure that all radio switches, light switches and pitot heat switch are in the off position before starting engines.

1. Master switch - on.
2. Cowl flaps - open to proper position.

3. Throttle controls - open 1/2 inch.
4. Propeller controls - forward.
5. Electric fuel pumps - on.
6. Mixture controls - rich until indication on fuel flow gauge, then idle cut-off.
7. Magneto switches - on.
8. Propellers - clear.
9. Starters - engage.
10. Mixtures - advance.
11. Oil pressure - check.

If engine does not fire within 5-10 seconds, disengage starter and reprime.

Starting Engine When Hot:

1. Master switch - "ON".
2. Magneto switches - "ON".
3. Electric fuel pump - "OFF".
4. Open throttle 1/2 inch.
5. Mixture in idle cut-off.
6. Engage starter.
7. Mixture full rich when engine fires.
8. Check oil pressure.

Starting Engine When Flooded:

1. Master switch - "ON".
2. Magneto switches - "ON".
3. Electric fuel pump - "OFF".
4. Throttle full open.
5. Mixture in idle cut-off.
6. Engage starter.
7. Retard throttle and advance mixture when engine fires.
8. Check oil pressure.

Cranking periods should be limited to 30 seconds with a two minute interval between. Longer cranking periods shorten the life of the starter.

PRE TAXI AND TAXI

1. Radio - as required.
2. Parking brake - off.
3. Brake operation - check.
4. Lights - as required.
5. Flight instruments - operating.
6. Emergency locator - check.

WARM-UP AND GROUND CHECK

Check the oil pressure as soon as the engines start. If no pressure is indicated within thirty seconds stop the engine and determine the trouble. If cold temperatures exist (10° F or below), a longer period of time will be necessary before an indication is received.

Warm-up the engines at 1000 to 1400 RPM for not more than two minutes in warm weather and four minutes in cold. The engines are warm enough for take-off when no faltering occurs with the throttle opened. Avoid prolonged idling at low RPM to prevent fouled spark plugs. Check the magnetos with the propeller in low pitch (max. RPM) and the engine running at 2200 RPM. The maximum drop on each magneto should not exceed 175 RPM and the differential drop between magnetos should not exceed 50 RPM. Operation on one magneto should not exceed 10 seconds. The engines are warm enough for takeoff when the throttle can be opened without engine faltering.

NOTE

On turbocharged airplanes, engine oil temperature gauge reading must be above 60° before full power is applied.

Move the propeller controls through their complete range to check feathering action, then leave them in the full forward low pitch position. Feathering action can be checked by running the engine between 2000 and 2200 RPM and pulling the prop control rapidly in and out of feathered position to prevent a drop of more than 500 RPM. Excessive manifold pressure will occur if the RPM falls below 1000 during this check. Propellers should be cycled three times in cold weather.

Cowl flaps permit cooling of the engines by manual control during ground operations or special conditions of flight. It is recommended that cylinder head temperature not exceed 435° F and the oil temperature should not exceed 245° F.

The electric fuel pumps should be turned off after starting or during warm-up to make sure that the engine driven pumps are operating. Prior to take-off the electric pumps should be turned on again to prevent loss of power during take-off should an engine driven pump fail.

To check that the engine-driven hydraulic pump is functioning, place the landing gear selector in the "DOWN" position with the gear down and the left engine running. The gear selector will automatically return to the neutral position if the hydraulic pump is producing pressure.

PRE TAKE-OFF

The autopilot should be off before take-off.

On a cold day, test defroster and cabin heater before take-off. Do not fly in cold weather when the heater is inoperative, as the windshield may become frosted.

Check list:

1. Parking brake - on.
2. Engine run-up.
   - (a) Mixture controls - forward.
   - (b) Propeller controls - forward.
   - (c) Throttle controls - forward (2200 RPM)
   - (d) Magnetos - check.
     Maximum drop - 175 RPM
     Maximum differential drop left to right - 50 RPM.
   - (e) Throttle controls - forward (2200 RPM).
   - (f) Propeller controls - exercise.
     (Check feather, 500 RPM maximum decrease.)
3. Engine gauges - check green.
4. Lights - as required.
5. Pitot heat - as required.
6. Transponder - stand-by.

7. Trim tabs - set.
8. Gyro pressure - 4.8 to 5.1 in. Hg.
9. Directional Gyro - set.
10. Turn and Bank - operating.
11. Altimeter - set.
12. Clock - wind and set.
13. Alternator output - check.
14. Electric fuel pumps - on.
15. Door - locked.

The normally recommended setting for sea level take-off is full throttle at 2575 RPM. The slightly rich mixture for this setting aids in cooling the engine.

TAKE-OFF AND CLIMB

CAUTION

Do not take-off with ice or frost on the wings, as ice or frost will radically change the flight characteristics of the airplane.

1. Parking brake - off.
2. Mixture controls - forward.
3. Propeller controls - forward.
4. Throttle controls - forward.
5. Accelerate to - 80 MPH (69 knots)
   (Prior to climb)
6. Landing gear - retract.
7. Accelerate to - best R/C speed.
8. Climb power - set.
   (At approx. 400 AGL)
9. Electric fuel pump - off one at a time.
10. Cowl flaps - set.
    (Maintain cylinder head temperature at or below maximum.)
11. Oxygen - on.
    (Above 10,000' or lower, as required.)

Trim for take-off so that a light back pressure on the control wheel allows the airplane to lift from the runway.

On take-off the aircraft should be kept either on, or near the runway, until reaching Vmc. After Vmc has been reached the aircraft should be accelerated as rapidly as possible to the best rate of climb speed if there are no obstacles ahead. If there are obstacles ahead maintain the best angle of climb speed. The applicable speed should be maintained until all obstacles are cleared and the airplane gains sufficient altitude.

During normal conditions, retraction of the landing gear should occur when a gear down landing is no longer possible on the runway. Attain the best rate of climb speed and at least 400 feet above ground level before reducing power.

The best rate of climb is obtained initially at 120 MPH (104 knots) on normally aspirated airplanes and 115 MPH on turbocharged airplane, but to give a high forward speed as well as a good rate of climb, a cruising climb speed of 135 MPH (117 knots) is recommended. Turn the electric fuel pump off after climb out.

On airplanes equipped with 24 volt 70 amp alternators, the cowl flaps must be full open during climbs above 18,000 ft with an alternator load of 60 amps or more.

SPINS

All spins are prohibited, however in the event an unintentional spin is encountered recovery can be accomplished by immediately using the following procedures:

a. Retard both throttles to the idle position.
b. Apply full rudder in the opposite direction to the spin.
c. Push control wheel full forward. While it is not necessary for recovery, the use of ailerons against the turn (i.e. right aileron if spin is to the left) will expedite recovery.
d. Maintain controls in these positions until the spin stops. Then neutralize rudder and ailerons.
e. Recover from dive with smooth back pressure on the control wheel. No abrupt control movement should be used during recovery from the dive, as the maneuvering speed and positive limit maneuvering load factor may be exceeded.

CRUISING

1. Electric fuel pumps - off.
2. Power - set.
3. Mixture - lean in accordance with instructions below.
4. Cowl flaps - set.
   (Position to maintain allowable cylinder head and oil temperatures.)
5. Fuel valves - on.
6. Trim - set.
7. Engine gauges - check and monitor.

The cruise power concept now possible with Lycoming engines permits more efficient use of the available horsepower. Simplified power management allows a more constant manifold pressure and eliminates continual reference to power charts.

Refer to Power and Performance charts for power settings.

To INCREASE power, first increase RPM; then increase manifold pressure.

To DECREASE power, first decrease manifold pressure; then decrease RPM.

To obtain the desired cruise, set the manifold pressure and RPM according to the power setting table.

During climbing operation the servo regulator will sense the change in altitude and will automatically lean the mixture. For better economy, manual leaning with the mixture control can be accomplished. For information on leaning procedure see Avco-Lycoming approved Leaning Procedures for Aztec "E" engines.

Since a fuel injected engine such as is used on the Aztec takes an appreciable length of time to start a fuel starvation, it is recommended that you avoid emptying a fuel cell to depletion. If it is necessary to use all the fuel in a fuel cell, carefully monitor the fuel flow meter and change the fuel selector valve position at the first indication of a decrease in fuel flow. This will enable you to keep the engine operating while using all of the fuel in the fuel cell.

LYCOMING APPROVED LEANING PROCEDURES FOR AZTEC "E" ENGINES

BASIC LEANING INFORMATION.

A. At 75% power or less the engine may be leaned anywhere as desired and at any altitude as long as the engine operates smoothly, and the temperatures and pressures are within prescribed limits.
B. Use of more than 75% power with improper leaning can result in engine damage. When in doubt use full rich mixture above 75% power, otherwise carefully follow these steps for correct cruise leaning:
   1. Establish 75% cruise power and lean to peak EGT without exceeding 1650° F on EGT.
   2. Reduce temperature 125° F below peak EGT by enriching at 75% power and mark this position on the EGT gauge.
   3. Return the mixture control to the rich position and increase RPM and MP to desired higher power.

4. Lean out mixture until EGT is at value established in step 2 above. Monitor cylinder head temperature. Cross check fuel flow. Do not lean to peak EGT above 75% power.

C. Take-off and climb below 5,000 feet, use full rich mixture through 5,000 feet with an unturbocharged engine; for continued climb lean mixture for smooth engine operation only, not for economy.

Normally Aspirated Fuel Injected Power Plants:

Observe fuel flow gauge as a general reference for leaning, use the exhaust gas temperature gauge for specific leaning reference, cross check cylinder head temperature gauge. If these instruments are not available, limit power for cruise to 75% and lean until engine roughens or loses power, then enrich for smooth operation.

BASIC LEANING INFORMATION. (Turbocharged Power Plant)

For turbo cruise, intermediate, economy and long range cruise (best economy) select desired RPM and MP then adjust the mixture to obtain and operate at peak EGT.

For best power - carefully follow steps listed below:

1. Select desired RPM and MP.
2. Adjust the fuel mixture to obtain peak EGT.
3. Increase fuel mixture and lower EGT value 125°F from established peak value.

CAUTION

Never exceed 1650°F EGT whenever determining peak.

4. If reaching 1650°F before obtaining peak EGT, it will be necessary to reduce MP to a lower cruise power setting before again attempting to determine peak EGT.
5. When peak EGT has been established at the reduced power setting, return mixture control to full rich before adjusting throttle to increase MP to turbo-cruise conditions.
6. Adjust and lean mixture to EGT value of 125°F from the peak value obtained in step 4.

NOTES

1. Always return mixture to full rich before changing power settings.
2. Never permit exhaust gas temperature to exceed 1650°F.
3. For maximum service life, maintain cylinder head temperature below 435°F during high performance cruise operation and below 400°F for economy cruise powers.

RELATED GENERAL INFORMATION

A. If cylinder head temperatures are higher than recommended during flight, reduce them to within recommended operating range by enriching the mixture, or by adjusting cowl flaps, or by reducing power, or by the use of any combination of these methods.

B. In general the left and right engine cylinder head temperatures should be essentially the same with equal leaning at equal powers.

C. Definitions:
   1. Best power mixture - the leanest mixture strength which produces the highest indicated airspeed for any given engine speed and manifold pressure.
   2. Best economy range mixture - leaned to peak EGT or approximately 10°F to the lean side of peak. On those engines without an EGT, it is the leanest mixture position without roughness and with a slight loss in cruise airspeed.

During flight, keep account of time and fuel used in connection with power settings to determine how the fuel flow and fuel quantity gauging systems are operating. If the fuel flow indication is considerably higher than the fuel actually being consumed or an asymmetric flow gauge indication is observed, you may have a clogged fuel nozzle which should be cleaned.

PROPELLER SYNCHRONIZER OPERATING PROCEDURES (With Manual Phase Control)

The propeller synchronizer is a electro-mechanical servo mechanism that will maintain the speed of the "slaved" propeller coincident with the speed of the "master" propeller. The left engine is set up as the "master" and the right engine as the "slave". The control is a concentric control with the outer knob as mode selector and the inner knob for phase control.

For Taxiing:

Set the synchronizer switch to "MAN".

For Take-off:

After advancing throttles and tightening the control pedestal friction knob, set the synchronizer switch to "AUTO".

For Cruise:

Set the synchronizer switch to "MAN". Establish the desired power setting; manually synchronizing the props to within 5 R.P.M. Tighten friction knob and set synchronizer switch to "AUTO".

Phase Control:

The center knob of the concentric control is for phase control. It will vary the relative blade positions of the two propellers, up to 180°, to reduce the acoustic input to the fuselage.

Select the position of the phase control for best pilot and/or passenger comfort. Make change in small increments and allow 20 seconds at each setting for the propellers to stabilize.

PROPELLER SYNCHROPHASER OPERATING PROCEDURE

The propeller synchrophaser automatically maintains both propellers at the same RPM and at a selected phase angle. This eliminates the propeller "Beat" effect and minimizes vibration.

The left engine is established as the master engine. The right engine is equipped with a slave governor which automatically maintains its engine RPM with the left engine RPM.

The propeller synchrophaser switch is located on the lower left side of the instrument panel. It has two positions, "MAN." for manual or stand by and "Prop Sync." for propeller synchrophaser.

For Taxiing:

Set the synchrophaser switch to "MAN."

For Take-off and Landing:

Set the synchrophaser switch to "MAN."

For Cruise:

Synchronize the propellers as close as possible manually within approximately 10 RPM, then set the synchrophaser switch in the "Prop Sync." position.

NOTE

Normally, propeller synchrophasing is achieved in a few seconds but occasionally it may take a full minute to achieve full propeller synchrophasing.

If a change in power setting is desired, set the synchrophaser switch to "MAN." position, wait 30 seconds. Adjust the power setting, then set the synchrophaser switch in the "Prop Sync." position.

Propeller "Phase" is preset at the factory. For further information on Phase control and the Propeller Synchrophasing System, consult your aircraft service manual.

NOTE

Should it be necessary to completely deactivate the Prop Sync. system the circuit breaker must be pulled.

NOTE

Each time a propeller RPM differential greater than 50 RPM occurs, it will be necessary to recycle the system to "MAN." for 30 to 40 seconds. Manually re-synchronize propellers, then turn switch to "Prop Sync." position.

NOTE

Should there be an electrical system failure or the master switch is turned off, the slave engine will return to the controlled selected RPM + approximately 25 RPM regardless of the position of the synchrophaser switch (out of synchronization).

APPROACH AND LANDING

Prior to extending the landing gear for landing, retard both throttle controls to check that the landing gear warning horn is operating. Flying the airplane with the horn inoperative is not permitted. It can lead to a gear up landing as it is easy to forget the landing gear when approaching for a single engine landing when other equipment is inoperative or when attention is drawn to events outside of the cockpit. Therefore it is especially important to check that the landing gear is down when there is any distraction in the landing situation.

Lower the gear at speeds below 150 miles per hour and the flaps at speeds listed on the landing check list. The flaps extend in approximately 8 to 10 seconds and retract in approximately two seconds. Maintain sufficient speed during turns in the traffic pattern. Set the propeller at a high cruising RPM of at least 2400 RPM for ample power if a go-around is necessary. Mixture control should be in the full rich position unless density altitude or conditions of high temperature and humidity dictate otherwise.

Ascertain the landing gear is down and locked on base leg or final approach by checking the green indicator lights on the instrument panel and the external mirror to make sure the nose landing gear is extended.

NOTE

When the instrument lights are on, the gear position lights are dimmed for night flight.

The degree of wing flap extension and touch down speed vary with conditions, but under normal conditions full wing flap (50 degrees) should be used during the final approach and landing to reduce stall speed and to permit contact with the runway at a slower speed.

Contact the ground at the minimum speed consistent with landing conditions.

For short, slow landings under normal conditions use full wing flaps, partial power, and hold the nose up as long as possible before and after contacting the ground with the main wheels.

In high winds and crosswinds, it is desirable to approach a landing at higher than normal speeds with half or no wing flaps. If a go-around is necessary apply full throttle, retract the landing gear, and slowly retract the wing flaps.

During a crosswind approach hold a crabbed angle into the wind until ready to flare out for the landing. Then lower the wing that is into the wind, reduce crabbed angle, and keep the wheels aligned to the runway using rudder.

Avoid prolonged side slip with a fuel selector set to a fuel cell with low fuel indication.

Prior to landing and early in the roll out, the brakes should be checked for operation. After landing maximum braking is achieved by retracting wing flaps and pulling back on the control wheel as wheel brakes are applied.

CAUTION

It is possible for a pilot to inadvertently reach for the landing gear selector switch instead of the wing flap switch while there is still enough lift on the wings to keep full weight of the airplane off the wheels and thus prevent the actuation of the landing gear safety mechanism, causing retraction during the landing roll. If additional braking is not needed, the wing flaps should be retracted after the airplane has been maneuvered to a stop off the runway. If a landing must be made without wheel brakes the airplane should be flown to contact the ground at a slower speed and landed short on the longest available runway.

The procedure for manually lowering the landing gear should be memorized and understood completely so that it can be accomplished quickly in an emergency situation, such as a single engine landing. (See Emergency Procedures.)

Landing check list:

1. Oxygen (below 10,000 ft) - off.
2. Seat belts - fastened.
3. Electric fuel pumps - on.
4. Mixture controls - forward.
5. Fuel valves - on, fullest cells.
6. Landing gear (under 150 MPH) (130 knots) - extend, check green.
7. Propellers - set.
8. Cowl flaps - as required.
9. Flaps - set.

Full Flap 125 MPH (104 knots) (max.)
1/2 Flap 140 MPH (122 knots) (max.)
1/4 Flap 160 MPH (139 knots) (max.)

10. Heater (if used) - fan on.

POST LANDING

Check List:

1. Wing flaps - retract.
2. Cowl flaps - open.
3. Electric fuel pump - off.
4. Prop controls - forward.

When completely stopped in a parking spot, check the following items for shut down:

1. Radio and elec. equip. - off.
2. Heater (if used) fan - off.
3. Mixture controls - idle cut-off.
4. Magneto switches - off.
5. Master switch - off.
6. Parking brake - on.
7. Main volt reg. - on.
8. Alternators - on.

If control locks are not available and the airplane is to be left for more than a few minutes, secure the control wheel with the safety belt strap. Chock the wheels and secure tie downs at appropriate places.

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 Airplane Flight Manual and Weight and Balance form supplied with each airplane.

In anticipation of gust load conditions when operating near zero fuel gross weight, carry fuel in the outboard tanks and distribute cargo in accordance with the Flight Manual and Weight and Balance form. Regarding increased payloads, cargo weight is not approved in excess of passenger and seat weight displaced.

ALTERNATE INDUCTION AIR

When flying in wet, heavy snow or other conditions where the induction air filters may become clogged, monitor the manifold pressure gauge. A decrease in manifold pressure may indicate a clogged filter. If the decrease is followed by a slight increase in manifold pressure, this will then indicate that the automatic alternate induction air system is in operation, and the manifold pressure may then be brought back to the desired level with the throttle control.

A continued drop in manifold pressure would indicate that the automatic induction air system was not working. In this case, actuate the manual alternate air control, which serves as a backup for the automatic system. A partial regain of manifold pressure will indicate that the manual alternate air induction system is operating. Throttle controls may be advanced to gain additional manifold pressure.

The manual alternate air control should not be actuated on the ground with the engines operating, because the engines would then be supplied with unfiltered air. These manual controls should be placed in the FULL "ON" position prior to entering known or expected icing conditions.

ROUGH AIR FLIGHT

In conditions of extreme turbulence, reduce power to slow the airplane below the design maneuvering speed of 149 miles per hour.

A further reduction of power will ease the stress to which the airplane is subjected by virtue of turbulence. When flying in extreme turbulence or strong vertical currents, using the autopilot, the altitude-hold mode should not be used.

RADIO OPERATION

Communication and navigational equipment controls are located in the center of the instrument panel. Associated switches are located in a junction box above the radio stack. Circuit breakers for the radios are located on the lower right sub-panel. All sets are turned on by the switch in the control head of each unit. After power is supplied, either one of the transmitters may be operated by moving the selector switch to the desired position. Refer to individual radio operating manuals for detailed instructions.

PIPER AUTOMATIC LOCATOR

The Piper Automatic Locator, when installed is located under the removable dorsal fin and is provided as an emergency locator signal transmitter which meets the requirements of FAR 91.52. The unit operates on a self-contained battery.

A battery replacement date is marked on the transmitter label. To comply with FAA regulations, the battery must be replaced on or before this date. The battery must be replaced if the transmitter has been used in an emergency situation or if accumulated test time exceeds one hour or if the unit has been inadvertently activated for an undetermined time period.

The unit has a three position selector switch placarded "OFF," "ARM" and "ON." The "ARM" position is provided to set the unit to the automatic position so that it will transmit only after impact and continue to transmit until the battery power is drained to depletion or the switch is manually moved to the "OFF" position. The "ARM" position is selected when the locator is installed at the factory and should remain in that position whenever the unit is installed in the aircraft. 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 check the function of the transmitter periodically.

The "OFF" position is provided for the purpose of changing the battery or to prolong the service life of the battery if used as a portable transmitter or rearming the unit if it should be activated for any reason.

Attached to the unit is a portable antenna, provided so that the locator may be removed from the aircraft, in case of an emergency, and used as a portable signal transmitter.

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