

be turned off whenever fuel flow will remain steady with it off, and the mixture must be readjusted accordingly. The auxiliary fuel pump should be turned off and the mixture reset prior to descent.

HIGH ALTITUDE ENGINE ACCELERATION

The engine will accelerate normally from idle to full throttle with full rich mixture at any altitude below 20,000 feet. At higher altitudes, it is usually necessary to lean the mixture to get smooth engine acceleration from idle to maximum power.

PROPELLER

The airplane has an all-metal, three-bladed, constant-speed, governor-regulated propeller. A setting introduced into the governor with the propeller control establishes the propeller speed, and thus the engine speed to be maintained. The governor then controls flow of engine oil, boosted to high pressure by the governing pump, to or from a piston in the propeller hub. Oil pressure acting on the piston twists the blades toward high pitch (low RPM). When oil pressure to the piston in the propeller hub is relieved, centrifugal force, assisted by an internal spring, twists the blades toward low pitch (high RPM).

A control knob on the lower center portion of the instrument panel is used to set the propeller and control engine RPM as desired for various flight conditions. The knob is labeled PROP PITCH PUSH INCR RPM. When the control knob is pushed in, blade pitch will decrease, giving a higher RPM. When the control knob is pulled out, the blade pitch increases, thereby decreasing RPM. The propeller control knob is equipped with a vernier feature which allows slow or fine RPM adjustments by rotating the knob clockwise to increase RPM, and counterclockwise to decrease it. To make rapid or large adjustments, depress the button on the end of the control knob and reposition the control as desired.

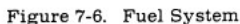
FUEL SYSTEM

The fuel system (see figure 7-6) consists of two vented integral fuel tanks (one in each wing), two fuel reservoir tanks, a fuel selector valve, auxiliary fuel pump, fuel strainer, engine-driven fuel pump, fuel/air control unit, fuel manifold, and fuel injection nozzles.

NOTE

Unusable fuel is at a minimum due to the design of the fuel system. However, when the fuel tanks are 1/4 full or less, prolonged uncoordinated flight such as slips or skids can uncover the fuel tank outlets, causing fuel starvation and

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MODEL P210N



engine stoppage. Therefore, with low fuel reserves, do not allow the airplane to remain in uncoordinated flight for periods in excess of one minute.

Fuel flows by gravity from the two integral tanks to two reservoir tanks, and from the reservoir tanks to a three-position selector valve labeled LEFT ON, RIGHT ON, and OFF. With the selector valve in the LEFT ON or RIGHT ON position, fuel from either the left or right tank flows through a bypass in the auxiliary fuel pump (when it is not in operation), and through a strainer to an engine-driven fuel pump. The engine-driven fuel pump delivers the fuel to the fuel/air control unit where it is metered and directed to a manifold which distributes it to each cylinder.

NOTE

Fuel cannot be used from both fuel tanks simultaneously.

Vapor and excess fuel from the engine-driven fuel pump and fuel/air control unit are returned by way of the selector valve to the reservoir tank and wing fuel tank system being used.

The airplane may be serviced to a reduced capacity to permit heavier cabin loadings. This is accomplished by filling each tank to the bottom edge of the fuel filler neck, thus giving a reduced fuel load of 201 pounds in each tank (198 pounds usable in all flight conditions).

Fuel system venting is essential to system operation. Complete blockage of the venting system will result in decreasing fuel flow and eventual engine stoppage. Venting is accomplished by vent lines, one from each fuel tank, which are equipped with check valves. The fuel filler caps are equipped with vacuum operated vents which open, allowing air into the tanks, should the fuel tank vent lines become blocked.

Fuel quantity is measured by two float-type fuel quantity transmitters (one in each tank) and indicated by two electrically-operated fuel quantity indicators on the lower portion of the pedestal adjacent to the fuel selector valve handle. The indicators are marked in pounds (top scale) and gallons (bottom scale) with a red line indicating an empty tank. When an indicator shows an empty tank, approximately 0.5 gallon remains in the tank as unusable fuel. The indicators cannot be relied upon for accurate readings during skids, slips, or unusual attitudes. Maximum indicator travel is reached with 41 to 42 gallons in the tank. Therefore, indications at the right end of the scale (40 gallons to F) should be verified by visual inspection of the tanks if a short field takeoff or a long range flight is planned. If both indicator pointers should rapidly move to a zero reading, check the cylinder head temperature and oil temperature gages for operation. If these gages are not indicating, an electrical malfunction has occurred.

UNUSABLE FUEL

Unusable fuel is the quantity of fuel that cannot safely be used in flight. The amount of unusable fuel varies with airplane and fuel system design, and the maximum amount is determined in accordance with Civil or Federal Aviation Regulations (CARs or FARs). Unusable fuel is always included in the airplane's licensed or basic empty weight for weight and balance purposes. Unusable fuel should never be included when computing the endurance of any airplane.

FUEL PLANNING WITH MINIMUM RESERVES

Airplane accidents involving engine power loss continue to reflect fuel starvation as the primary cause or a contributing factor. Some of these accidents were caused by departing with insufficient fuel onboard to complete the intended flight. Fuel exhaustion in flight can mean only one thing - a forced landing with the possibility of serious damage, injury, or death.

A pilot should not begin a flight without determining the fuel required and verifying its presence onboard. To be specific, during VFR conditions, do not take off unless there is enough fuel to fly to the planned destination (considering wind and forecast weather conditions), assuming the airplane's normal cruising airspeed, fly after that for at least 30 minutes during the day, or at least 45 minutes at night.

Departure fuel requirements are a little different when operating under IFR conditions. Do not depart an airport on an IFR trip unless the airplane has enough fuel to complete the flight to the first airport of intended landing (considering weather reports and forecasts) and fly from that airport to the planned alternate airport, and afterwards still fly at least 45 minutes at normal cruising speed.

FLIGHT COORDINATION VS. FUEL FLOW

The shape of most airplane wing fuel tanks is such that, in certain flight maneuvers, the fuel may move away from the fuel tank supply outlet. If the outlet is uncovered, fuel flow to the engine may be interrupted and a temporary loss of power might result. Pilots can prevent inadvertent uncovering of the tank outlet by having adequate fuel in the tank selected and avoiding maneuvers such as prolonged uncoordinated flight or sideslips which move fuel away from the feed lines.

It is important to observe the uncoordinated flight or sideslip limitations listed in the respective operating handbook. As a general rule, limit uncoordinated flight or sideslip to 30 seconds in duration when the fuel level in the selected fuel tank is 1/4 full or less. Airplanes are usually considered in a sideslip anytime the turn and bank "ball" is more than one quarter ball out of the center (coordinated flight) position. The amount of usable fuel decreases with the severity of the sideslip in all cases.

FUEL SELECTION FOR APPROACH/LANDING

On some single-engine airplanes, the fuel selector valve handle is normally positioned to the BOTH position to allow symmetric fuel feed from each wing fuel tank. However, if the airplane is not kept in coordinated flight, unequal fuel flow may occur. The resulting wing heaviness may be corrected during flight by turning the fuel selector valve handle to the tank in the "heavy" wing. On other single-engine airplanes, the fuel selector has LEFT ON or RIGHT ON positions, and takeoffs and landings are to be accomplished using fuel from the fuller tank.

Most multi-engine airplanes have fuel tanks in each wing or in wing tip tanks, and it is advisable to feed the engines symmetrically during cruise so that approximately the same amount of fuel will be left in each side for descent, approach, and landing. If fuel has been consumed at uneven rates between the two wing tanks because of prolonged single-engine flight, fuel leak or siphon, or improper fuel servicing, it is desirable to balance the fuel load by operating both engines from the fuller tank. However, as long as there is sufficient fuel in both wing tanks, even though they may have unequal quantities, it is important to switch the left and right fuel selectors to the left and right wing tanks, respectively, feeling for the detent, prior to the approach. This will ensure that adequate fuel flow will be available to each operating engine if a go-around is necessary. In the case of single-engine operation, operate from the fuller tank, attempting to have a little more fuel in the wing on the side with the operating engine prior to descent.

On all multi-engine airplanes equipped with wing tip fuel tanks, the tip tanks are the main fuel tanks on the tank selector valve controls. Refer to Supplement 12 of this Pilot Safety and Warning Supplements Manual and the applicable airplane operating handbook.

3. Standby Generator Switch (if installed) -- ON.
4. Nonessential Electrical Equipment -- OFF.
5. Flight -- TERMINATE as soon as practical.

LOW-VOLTAGE LIGHT ILLUMINATES DURING FLIGHT (Ammeter Indicates Discharge)

NOTE

Illumination of the low-voltage light may occur during low RPM conditions with an electrical load on the system such as during a low RPM taxi. Under these conditions, the light will go out at higher RPM. The master switch need not be recycled since an over-voltage condition has not occurred to de-activate the alternator system. Momentary illumination and/or ammeter needle deflection may also occur during startup of the landing gear system hydraulic pump motor.

1. Avionics Power Switch -- OFF.
2. Alternator Circuit Breaker -- CHECK IN.
3. Master Switch -- OFF (both sides).

NOTE

If operating in unpressurized flight, the dump valve control handle should be pulled to the dump position prior to shutting off all electrical power, to avoid the possibility of sudden pressurization of the cabin.

4. Master Switch -- ON.
5. Low-Voltage Light -- CHECK OFF.
6. Avionics Power Switch -- ON.

If low-voltage light illuminates again:

7. Alternator -- OFF.
8. Standby Generator Switch (if installed) -- ON.
9. Nonessential Radio and Electrical Equipment -- OFF.
10. Flight -- TERMINATE as soon as practical.

PRESSURIZATION SYSTEM EMERGENCIES

PRESSURIZED AIR CONTAMINATION - CABIN HEAT ON

1. Cabin Heat Control -- PUSH OFF.

PRESSURIZED AIR CONTAMINATION - CABIN HEAT OFF

Use the following procedure only in the event that pressurized air

EXCESSIVE RATE OF CHARGE

After engine starting and heavy electrical usage at low engine speeds (such as extended taxiing) the battery condition will be low enough to accept above normal charging during the initial part of a flight. However, after thirty minutes of cruising flight, the ammeter should be indicating less than two needle widths of charging current. If the charging rate were to remain above this value on a long flight, the battery would overheat and evaporate the electrolyte at an excessive rate.

Electronic components in the electrical system could be adversely affected by higher than normal voltage. The alternator control unit includes an over-voltage sensor which normally will automatically shut down the alternator if the charge voltage reaches approximately 31.5 volts. If the over-voltage sensor malfunctions, as evidenced by an excessive rate of charge shown on the ammeter, the alternator should be turned off, the alternator circuit breaker pulled, nonessential electrical equipment turned off and the flight terminated as soon as practical. If the standby generator is installed, it should be turned on for the remainder of the flight.

INSUFFICIENT RATE OF CHARGE

NOTE

Illumination of the low-voltage light and ammeter discharge indications may occur during low RPM conditions with an electrical load on the system, such as during a low RPM taxi. Under these conditions, the light will go out at higher RPM. The master switch need not be recycled since an over-voltage condition has not occurred to de-activate the alternator system. Momentary illumination and/or ammeter needle deflection may also occur during startup of the landing gear system hydraulic pump motor.

If the over-voltage sensor should shut down the alternator, or if the alternator output is low, a discharge rate will be shown on the ammeter followed by illumination of the low-voltage warning light. Since this may be a "nuisance" trip-out, an attempt should be made to reactivate the alternator system.

NOTE

If operating in unpressurized flight, the dump valve control handle should be pulled to the dump position prior to shutting off all electrical power, to avoid the possibility of sudden pressurization of the cabin.

To do this, turn the avionics power switch off, check that the alternator

additional information.

Total Capacity: 90 gallons.

Total Capacity Each Tank: 45 gallons.

Total Usable: 89 gallons.

OIL

Oil Grade (Specification):

MIL-L-6082 Aviation Grade Straight Mineral Oil: Use to replenish supply during first 25 hours and at the first 25-hour oil change. Continue to use until a total of 50 hours has accumulated or oil consumption has stabilized.

NOTE

The airplane was delivered from the factory with a corrosion preventive aircraft engine oil. This oil should be drained after the first 25 hours of operation.

Continental Motors Specification MHS-24 (and all revisions thereto), Ashless Dispersant Oil: This oil **must be used** after first 50 hours or oil consumption has stabilized.

Recommended Viscosity for Temperature Range:

All temperatures, use SAE 20W-50 or

Above 4°C (40°F), use SAE 50

Below 4°C (40°F), use SAE 30

NOTE

Multi-viscosity oil with a range of SAE 20W-50 is recommended for improved starting and turbocharger controller operation in cold weather.

Oil Capacity:

Sump: 10 Quarts.

Total: 11 Quarts.

MAXIMUM CERTIFICATED WEIGHTS

Ramp: 4016 lbs.

Takeoff: 4000 lbs.

Landing: 3800 lbs.

Weight in Baggage Compartment:

Baggage Area "A" - Station 124 to 152: 200 lbs.

Baggage Area "B" - Station 152 to 166: 80 lbs.

NOTE

The maximum allowable combined weight capacity for baggage areas A and B is 200 pounds.