

TABLE OF CONTENTS

SECTION 7

DESCRIPTION AND OPERATION
OF THE AIRPLANE AND ITS SYSTEMS

Paragraph No.		Page No.
7.1	The Airplane.....	7-1
7.3	Airframe	7-1
7.5	Engine and Propeller.....	7-2
7.7	Induction System.....	7-3
7.9	Engine Controls.....	7-4
7.11	Landing Gear.....	7-6
7.13	Flight Controls.....	7-10
7.15	Fuel System.....	7-11
7.17	Electrical System.....	7-14
7.19	Vacuum System.....	7-17
7.21	Pitot-Static System	7-18
7.23	Instrument Panel.....	7-20
7.25	Cabin Features.....	7-23
7.27	Baggage Area	7-24
7.29	Heating, Ventilating and Defrosting System.....	7-25
7.31	Stall Warning	7-27
7.33	Finish.....	7-27
7.35	Air Conditioning	7-27
7.37	Piper External Power.....	7-29
7.39	Emergency Locator Transmitter.....	7-29

SECTION 7**DESCRIPTION AND OPERATION
OF THE AIRPLANE AND ITS SYTEMS****7.1 THE AIRPLANE**

The PA-28R-201, Arrow is a single engine, retractable landing gear, all metal airplane. It has seating for up to four occupants, a 200 pound luggage compartment, and a 200 HP engine.

7.3 AIRFRAME

With the exception of the steel engine mount, the landing gear, miscellaneous steel parts, the cowling, and the lightweight plastic extremities (tips of wings, tail fin, rudder and stabilator), the basic airframe is of aluminum alloy. Aerobatics are prohibited in this airplane since the structure is not designed for aerobatic loads.

The fuselage is a semi-monocoque structure. There is a front door on the right side. A cargo door is installed aft of the rear seat.

The wing is of a conventional design semi-tapered and employs a laminar flow NACA 652-415 airfoil section. The main spar is located at approximately 40% of the chord aft of the leading edge. The wings are attached to the fuselage by the insertion of the butt ends of the spar into a spar box carry-through, which is an integral part of the fuselage structure. The bolting of the spar ends into the spar box carry-through structure, which is located under the aft seats, provides in effect a continuous main spar. The wings are also attached fore and aft of the main spar by an auxiliary front spar and a rear spar. The rear spar, in addition to taking torque and drag loads, provides a mount for flaps and ailerons. The four-position wing flaps are mechanically controlled by a handle located between the front seats. When fully retracted, the right flap locks into place to provide a step for cabin entry. Each wing contains one fuel tank.

7.3 AIRFRAME (continued)

A vertical stabilizer, an all-movable horizontal stabilator, and a rudder make up the empennage. The stabilator incorporates an anti-servo tab which improves longitudinal stability and provides longitudinal trim. This tab moves in the same direction as the stabilator, but with increased travel.

7.5 ENGINE AND PROPELLER

The Arrow incorporates a Lycoming IO-360-C1C6 four-cylinder, direct drive, horizontally opposed fuel injected engine rated at 200 horsepower at 2700 rpm. It is furnished with a starter, 60 ampere 14-volt alternator, shielded ignition, vacuum pump drive, fuel pump, propeller governor and a dry automotive type induction air filter. The recommended overhaul period is based on Lycoming service experience. Operation beyond the recommended time is the decision of the operator. Since Lycoming from time to time revises the recommended overhaul period, the owner should check the latest Lycoming Service Instruction No. 1009 at his Piper dealer for the latest recommended overhaul period and for any additional information.

The aircraft is equipped with a constant speed, controllable pitch propeller. The propeller control is located on the power quadrant between the throttle and mixture controls. A mixture control lock is provided to prevent activation of the mixture control instead of the pitch control.

The exhaust system is a crossover type, which reduces back pressure and improves performance. It is constructed entirely of stainless steel and is equipped with dual mufflers. Cabin heat and windshield defrosting are provided by a heater shroud around the muffler.

An oil cooler is located on the forward lower right side of the firewall, with the air inlet for the cooler located on the right side of the bottom cowl. A winterization plate is provided to restrict air during winter operation. (See Winterization in Handling and Servicing.)

7.7 INDUCTION SYSTEM

The induction system incorporates a Bendix RSA-5AD1 type fuel injector. The injector is based on the principle of differential pressure, which balances air pressure against fuel pressure. The regulated fuel pressure established by the servo valve when applied across a fuel control (jetting system) makes the fuel flow proportional to airflow. Fuel pressure regulation by the servo valve causes a minimal drop in fuel pressure throughout the metering system. Metering pressure is maintained above most vapor forming conditions while fuel inlet pressure is low enough to allow use of a diaphragm pump. The servo system feature also checks vapor lock and associated starting problems.

The servo regulation meters fuel flow proportionally with airflow and maintains the mixture as manually set for all engine speeds. The fuel flow divider receives metered fuel and distributes fuel to each cylinder fuel nozzle.

The fuel flow portion of the manifold pressure/fuel flow gauge is connected to the flow divider and monitors fuel pressure. This instrument converts fuel pressure to an indication of fuel flow in gallons per hour and percentage of rated horsepower.

The alternate air source of the induction system contains a door that functions automatically or manually. If the primary source is obstructed, the door will open automatically. It may be opened manually by moving the selector on the right side of the quadrant. The primary source should always be used for takeoff.

The pilot should read and follow the procedures recommended in the Lycoming Operator's Manual for this engine, in order to obtain maximum engine efficiency and time between engine overhauls.

7.9 ENGINE CONTROLS

Engine controls consist of a throttle control, a propeller control and a mixture control lever. These controls are located on the control quadrant on the lower center of the instrument panel (Figure 7-1) where they are accessible to both the pilot and the copilot. The controls utilize teflon-lined control cables to reduce friction and binding.

The throttle lever is used to adjust the manifold pressure. It incorporates a gear up warning horn switch which is activated during the last portion of travel of the throttle lever to the low power position. If the landing gear is not locked down, the horn will sound until the gear is down and locked or until the power setting is increased. This is a safety feature to warn of an inadvertent gear up landing.

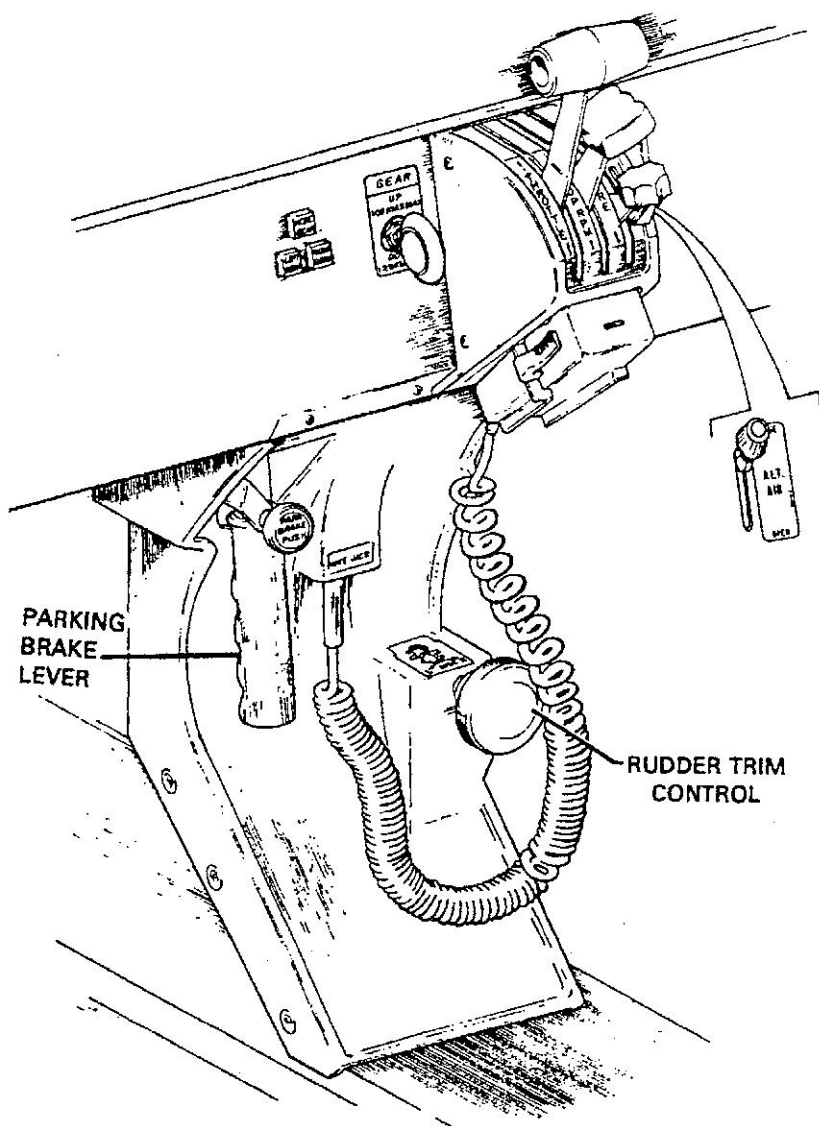
The propeller control lever is used to adjust the propeller speed from high rpm to low rpm.

The mixture control lever is used to adjust the air to fuel ratio. The engine is shut down by the placing of the mixture control lever in the full lean position. In addition, the mixture control has a lock to prevent activation of the mixture control instead of the pitch control. For information on the leaning procedure, see the Avco-Lycoming Operator's Manual.

The friction adjustment lever on the right side of the control quadrant may be adjusted to increase or decrease the friction holding the throttle, propeller, and mixture controls in a selected position.

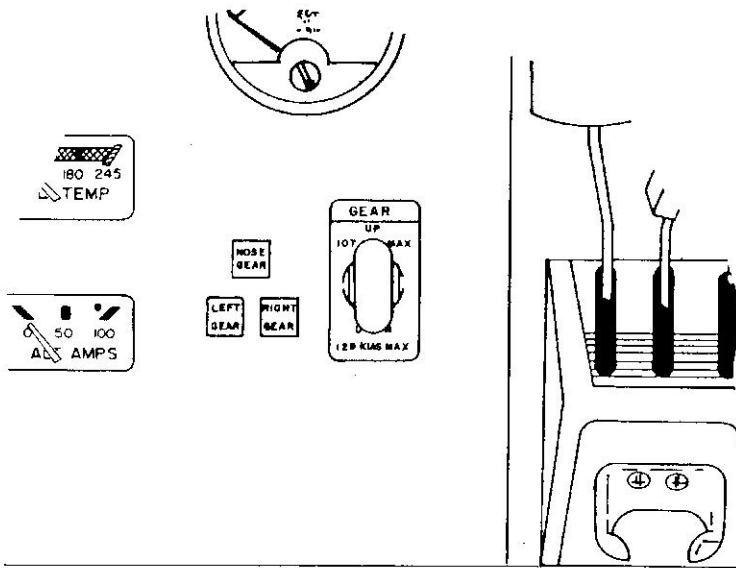
The alternate air control is located to the right of the control quadrant. When the alternate air lever is in the up, or closed, position the engine is operating on filtered air; when the lever is in the down, or open, position the engine is operating on unfiltered, heated air (refer to Figure 7-1).

7.7 ENGINE CONTROLS (continued)



CONTROL QUADRANT AND CONSOLE

Figure 7-1



LANDING GEAR SELECTOR

Figure 7-3

7.11 LANDING GEAR

The Arrow is equipped with a retractable tricycle landing gear, which is hydraulically actuated by an electrically powered reversible pump. The pump is controlled by a selector switch on the instrument panel to the left of the control quadrant (Figure 7-3). The landing gear is retracted or extended in about seven seconds.

During normal landing gear operation, the Emergency Gear Extension Lever, located between the front seats to the left of the flap handle (Figure 7-9), should be in the up position to permit proper gear retraction / operation. To perform an emergency gear extension, the emergency gear lever must be held in the down position to manually release hydraulic pressure and permit the gear to free fall. The nose gear is spring assisted.

Gear down and locked positions are indicated by three green lights located to the left of the selector. A red WARNING GEAR UNSAFE light, located at the top of the panel, illuminates while the gear is in transit, or not in the full up or locked down position. An all lights out condition indicates the gear is up. The landing gear should not be retracted above a speed of 107 KIAS and should not be extended above a speed of 129 KIAS.

7.11 LANDING GEAR (continued)

The main landing gear uses 6.00 x 6 wheels. The main gear incorporate brake drums and Cleveland single disc hydraulic brake assemblies. The nose wheel carries a 5.00 x 5 four ply tire and the main gear use 6.00 x 6 six ply tires. All three tires are tube type.

A microswitch in the throttle quadrant activates a warning horn and red WARNING GEAR UNSAFE light under the following conditions:

- a. Gear up and power reduced below approximately 14 inches of manifold pressure.
- b. Gear selector switch UP while on the ground and throttle in retarded position.
- c. Whenever the flaps are extended beyond the approach position (10°) and the landing gear are not down and locked.

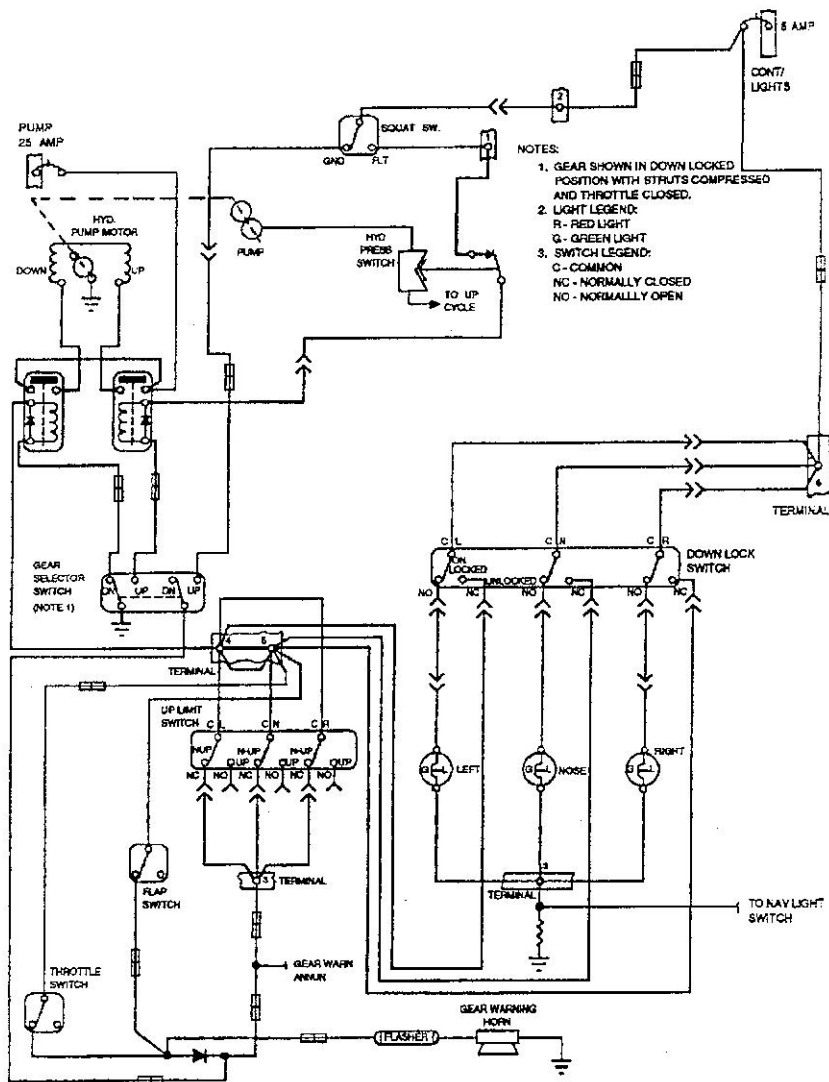
The gear warning horn emits a 90 Hertz beeping sound in contrast to the stall warning horn which emits a continuous sound.

The nose gear is steerable through a 30 degree arc each side of center through the use of the rudder pedals. As the nose wheel retracts, the steering linkage disengages to reduce rudder pedal loads in flight. The nose wheel is equipped with a hydraulic shimmy damper to reduce nose wheel shimmy. A bungee assembly is also included to reduce ground steering effort and to dampen shocks and bumps during taxiing.

The oleo struts are of the air-oil type, with normal extension being 2.75 +/- 0.25 inches for the nose gear and 2.5 +/- 0.25 inches for the main gear under normal static load (empty weight of airplane plus full fuel and oil).

The standard brake system includes toe brakes on the left and right set of rudder pedals and a hand brake located below and near the center of the instrument panel. The toe brakes and the hand brake have individual brake cylinders, but all cylinders use a common reservoir. The parking brake is incorporated in the lever brake and is operated by pulling back on the lever (Figure 7-1) and depressing the knob attached to the top of the handle. To release the parking brake, pull back on the brake lever; then allow the handle to swing forward.

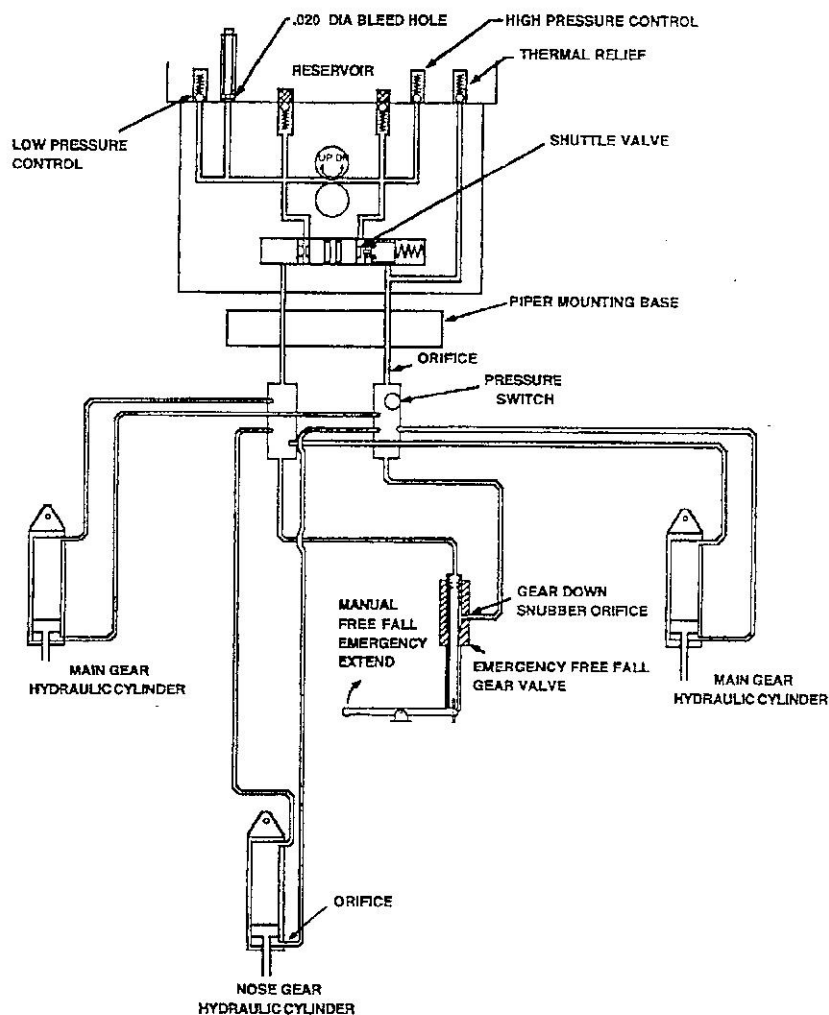
7.11 LANDING GEAR (continued)



LANDING GEAR ELECTRICAL SCHEMATIC

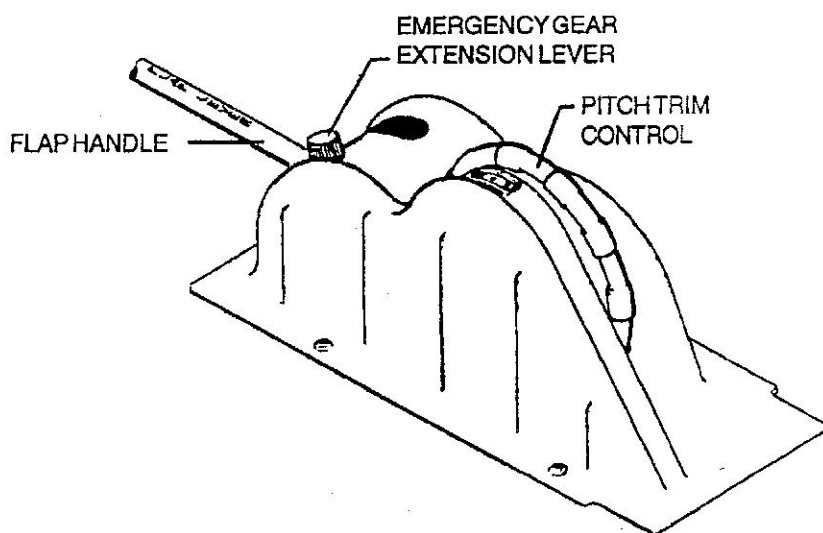
Figure 7-5

7.11 LANDING GEAR (continued)



LANDING GEAR HYDRAULIC SCHEMATIC

Figure 7-7



FLIGHT CONTROL CONSOLE

Figure 7-9

7.13 FLIGHT CONTROLS

Dual flight controls are provided as standard equipment. A cable system provides actuation of the control surfaces when the flight controls are moved in their respective directions.

The horizontal surface (stabilator) features a trim tab/servo mounted on the trailing edge. This tab serves the dual function of providing trim control and pitch control forces. The trim function is controlled by a trim control wheel located on the control console between the two front seats (Figure 7-9). Rotating the wheel forward gives nose down trim and rotation aft gives nose up trim.

The rudder is conventional in design and incorporates a rudder trim. The trim mechanism is a spring-loaded recentering device. The trim control is located on the right side of the pedestal below the throttle quadrant (Figure 7-1). Turning the trim control clockwise results in nose right trim and counterclockwise rotation results in nose left trim.

7.13 FLIGHT CONTROLS (continued)

Manually controlled flaps are provided. They are extended by a control cable and are spring-loaded to the retracted (up) position. The control is located between the two front seats on the control console (Figure 7-9). To extend the flaps pull the handle up to the desired flap setting of 10, 25, or 40 degrees. To retract, depress the button on the end of the handle and lower the control.

The airplane will experience a pitch change during flap extension or retraction. This pitch change can be corrected by either stabilator trim or increased control wheel force. When the flaps are in the retracted position the right flap, provided with a over-center lock mechanism, acts as a step.

NOTE

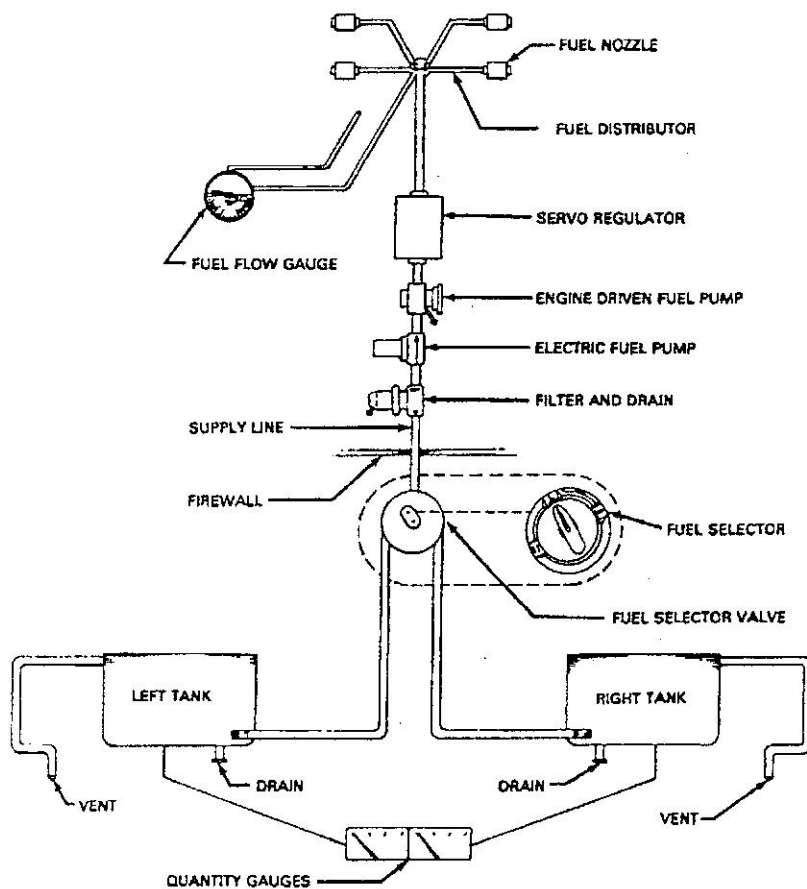
The right flap will support a load only in the fully retracted (up) position. When loading and unloading passengers make sure the flaps are in the retracted (up) position.

7.15 FUEL SYSTEM

The fuel system was designed with simplicity in mind. Fuel is contained in two 38.5 U.S. gallon tanks, one in each wing. Of the total 77 gallon capacity, only 72 gallons are usable. Each tank is equipped with a filler neck indicator tab to aid in determining fuel remaining when the tanks are not full. Usable capacity tab to the bottom of the indicator tab is 25 gallons. The minimum fuel grade is 100 octane (green) or 100LL (blue). The tanks are attached to the leading edge of the wing with screws and are an integral part of the wing structure. This allows removal for service. The tanks are vented individually by a vent tube which protrudes below the bottom of the wing at the rear inboard corner of each tank. The vents should be checked periodically to ensure they are not obstructed and will allow free passage of air.

Each fuel tank has an individual quick drain located at the bottom inboard rear corner. The fuel strainer also incorporates a quick drain, located on the left lower portion of the firewall. The quick drain protrudes thru the cowlings to allow easy draining of the fuel strainer. To avoid the accumulation of water and sediment, and to check that the tanks contain the proper grade fuel, the fuel tank sumps and strainer should be drained daily prior to first flight and after refueling.

7.15 FUEL SYSTEM (continued)



FUEL SYSTEM SCHEMATIC

Figure 7-11

7.15 FUEL SYSTEM (continued)

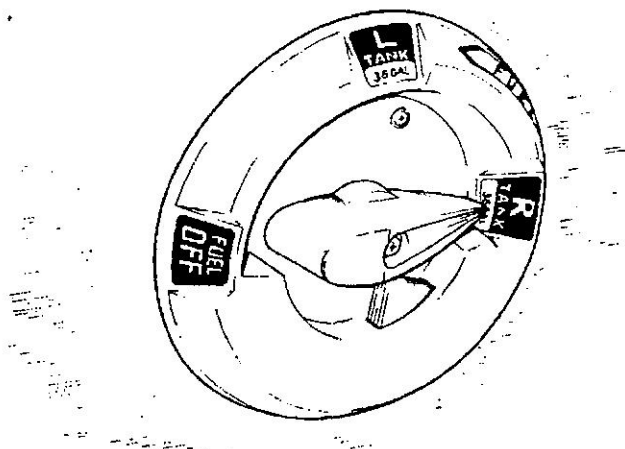
**FUEL SELECTOR**

Figure 7-13

CAUTION

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

A fuel tank selector allows the pilot to control the flow of fuel to the engine, and is located on the left side wall below the instrument panel. It has three positions: OFF, LEFT TANK and RIGHT TANK. The arrow on the handle of the selector points to the tank which is supplying fuel to the engine. The valve also incorporates a safety latch which prevents inadvertently selecting the OFF position.

Normally fuel is supplied to the engine through an engine-driven fuel pump. An electric fuel pump serves as a back-up feature. The electric fuel pump is controlled by a rocker switch on the switch panel above the engine control quadrant. The electric fuel pump should be ON when switching fuel tanks and during takeoffs and landings.

Fuel quantity and flow/pressure are indicated on gauges on the instrument panel. There is a separate fuel quantity gauge for each tank.