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(o) Miscellaneous
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
361	Headrests (2) Center, Piper Dwg. 79337-18	_____	2.0	132.1	264
363	Headrests (2) Rear, Piper Dwg. 79337-18	<u> X </u>	2.0	171.5	343
365	Oversize Headrests - Front (2), Piper Dwg. 79764-2	_____	3.2	99.5	318
367	Oversize Headrests - Center (2), (Fwd. Facing Seats Only) Piper Dwg. 79764-2	_____	3.2	132.1	423
369	Oversize Headrests - Aft (2), Piper Dwg. 79764-2	_____	3.2	171.5	549
371	Inertia Safety Belts (Center) (2) Piper PS50039-4-15 (Pacific Scientific P/N 1107319-03 Black) or (Americam Safety Equipt. Co. P/N 500853-403)	_____	1.5	133.9	201
373	Inertia Safety Belts (Rear) (2) Piper PS50039-4-14 (Pacific Scientific P/N 1107319-01 Black) or (American Safety Equipt. Co., P/N 500853-401)	_____	1.6	181.5	290
375	Assist Straps Piper Dwg. 79455-0	_____	0.3	120.0	36
377	Curtain and Rod Installation Piper Dwg. 67955-3	<u> X </u>	5.2	143.6	747

SECTION 6
WEIGHT AND BALANCE

PIPER AIRCRAFT CORPORATION
PA-32RT-300, LANCE II

(o) Miscellaneous
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
379	Refreshment Console Piper Dwg. 37825-5	<u>X</u>	7.0	118.5	830
380	Executive Writing Table Piper Dwg. 36800-2	<u>X</u>	3.9	185.6	724
381	Luxurious Interior Piper Dwg. 67953-3	<u> </u>	*25.0	113.9	2848
383	Fire Extinguisher Installation				
	a. Piper Dwg. 35680-14 (Graviner P/N HA1014-01)	<u> </u>	5.6	62.8	352
	b. Piper Dwg. 76167-2 (W. Kiddie P/N 2¾DCK-6)	<u> </u>	4.6	71.0	327
385	Clip Installation - Map Piper Dwg. 37907-2	<u>X</u>	0.1	75.0	8

TOTAL OPTIONAL EQUIPMENT

207.3

113.3

23477

EXTERIOR FINISH

Base Color Juneau White

Registration No. Color Black

Trim Color Matador Red

Type Finish Lacquer

Indian Silver

Dakota Black

*Weight and moment difference between standard and optional equipment.

SECTION 7
DESCRIPTION AND OPERATION
OF THE AIRPLANE AND ITS SYSTEMS

7.1 THE AIRPLANE

The Lance II is a single engine, low wing retractable landing gear, all metal airplane featuring the tail surfaces in a "T" configuration. It has seating for up to seven occupants and two separate one hundred pound luggage compartments.

7.3 AIRFRAME

With the exception of the steel engine mount, the landing gear, miscellaneous steel parts, the cowlings, and the lightweight plastic extremities (tips of wings, tail fin 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 and a rear door on the left. A cargo door is installed aft of the rear passenger door. When both rear doors are open, large pieces of cargo can be loaded through the extra-wide opening. A door on the right side of the nose section gives access to the nose baggage compartment.

The wing is of a conventional design 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 center 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 two interconnected fuel tanks. Both tanks on one side are filled through a single filler neck located in the outboard tank.

A vertical stabilizer, an all-movable horizontal stabilator, and a rudder make up the empennage. The stabilator, which is mounted on top of the fin, 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 Lycoming IO-540-K1G5D engine installed in the PA-32RT-300 is rated at 300 horsepower at 2700 rpm. This engine has a compression ratio of 8.7 to 1 and requires 100/130 minimum octane fuel. The engine is equipped with a geared starter, a 60 ampere alternator, dual magnetos, vacuum pump drive, a diaphragm-type fuel pump, and fuel injection.

The exhaust system consists of individual exhaust pipes routed in pairs to three heavy gauge stainless steel mufflers. Exhaust gases are directed overboard at the underside of the engine cowl. The mufflers are surrounded by a shroud which provides heat for the cabin and for windshield defrosting.

The cowling is designed to cool the engine in all normal flight conditions, including protracted climb, without the use of cowl flaps or cooling flanges.

The constant speed propeller is a Hartzell HC-C2YK-1()F/F8475D-4 with a diameter of 80 inches. The propeller is controlled by a governor mounted at the left forward side of the crankcase. The governor is operated by a cable from the power control quadrant.

7.7 INDUCTION SYSTEM

An induction scoop is located on the left side of the lower cowl. An intake air box is attached to the inside of the cowl adjacent to the air filter box. The air filter box is located at the aft end of the induction scoop. Access to the filter is gained through a detachable plate located on the outside of the lower cowl.

The intake air box incorporates a manually operated two-way valve designed to allow induction air either to pass through the filter or to bypass the filter and supply heated air directly to the engine. Alternate air selection insures induction air flow should the filter become blocked. Since the air is heated, the alternate air system offers protection against induction system blockage caused by snow or freezing rain, or by the freezing of moisture accumulated in the induction air filter. Alternate air is unfiltered; therefore, it should not be used during ground operation when dust or other contaminants might enter the system. The primary (through the filter) induction source should always be used for takeoffs.

The Bendix RSA-10ED1 type fuel injection system consists of a servo regulator which meters fuel flow in proportion to airflow to the engine, giving the proper fuel-air mixture at all engine speeds, and a fuel flow divider which receives the metered fuel and accurately divides the fuel flow among the individual cylinder fuel nozzles.

A combination fuel flow indicator and manifold pressure gauge is installed in the left side of the instrument panel. The fuel flow indicator is connected to the fuel flow divider and monitors fuel pressure. The instrument converts fuel pressure to an indication of fuel flow in gallons per hour and percentage of cruise power.

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.

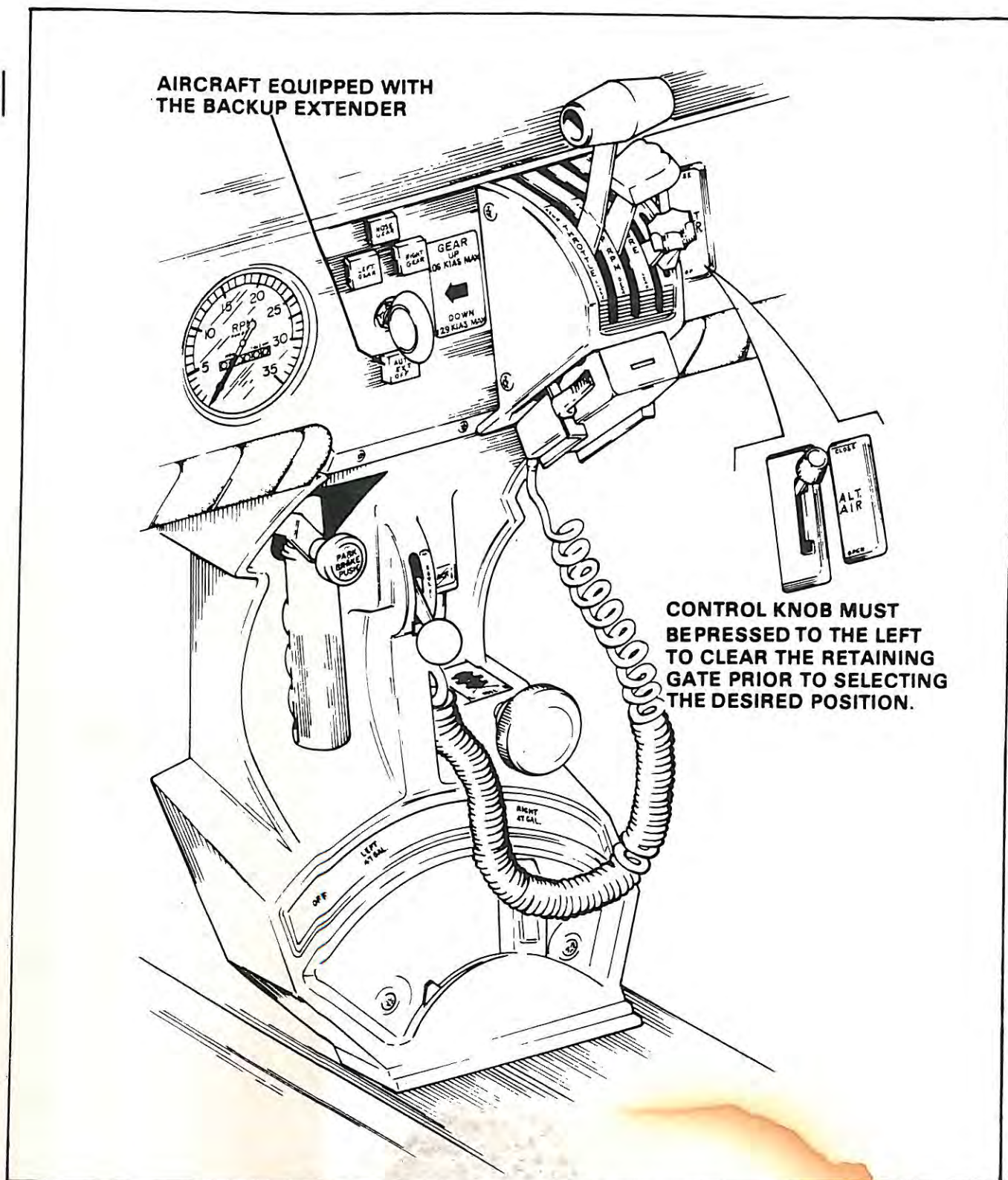
The throttle lever is used to adjust the manifold pressure. It incorporates a gear up warning horn switch which is activated during the last portion of travel of the throttle lever to the low power position. If the landing gear is not locked down, the horn will sound until the gear is down and locked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

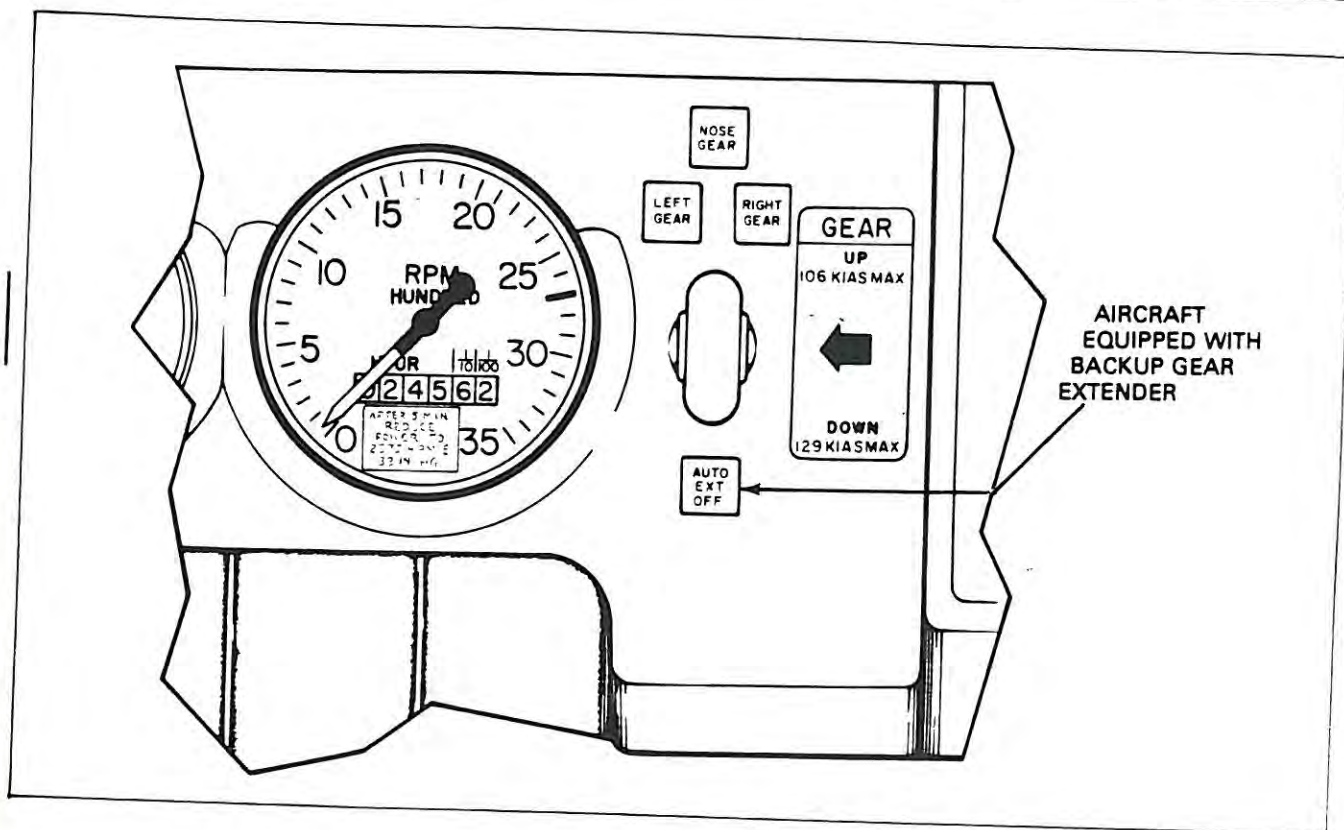
The friction adjustment lever on the right side of the control quadrant may be adjusted to increase or decrease the friction holding the throttle, propeller, and mixture controls or to lock the controls in a selected position.

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. The control is operated by pressing the knob to the left to clear the retaining gate and then moved in the desired direction (refer to Figure 7-1).



CONTROL QUADRANT AND CONSOLE

Figure 7-1



LANDING GEAR SELECTOR

Figure 7-3

7.9 LANDING GEAR

The Turbo Lance II 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.

Some aircraft also incorporate a pressure sensing device in the system which lowers the gear regardless of gear selector position, depending upon airspeed and engine power (propeller slipstream). The gear is designed to extend at airspeeds below approximately 103 KIAS with power off even if the selector is in the up position. The extension speeds will vary from approximately 81 KTS to approximately 103 KIAS depending on power settings and altitude. The device also prevents the gear from retracting at airspeeds below approximately 81 KTS with full power, though the selector switch may be in the up position. This speed increases with reduced power and/or increased altitude. Manual override of the device is provided by an emergency gear lever located between the front seats to the right of the flap handle (refer to Figure 7-9). The sensing device operation is controlled by differential air pressure across a flexible diaphragm which is mechanically linked to a hydraulic valve and an electrical switch which actuates the pump motor. A high pressure and static air source for actuating the diaphragm is provided in a mast mounted on the left side of the fuselage above the wing. Any obstruction of the holes in this mast will cause the gear to extend. An optional heated mast is available to alleviate obstruction in icing conditions. The optional heated mast is turned on whenever the PITOT HEAT is turned on.

WARNING

Avoid ejecting objects out of the pilot storm window which could possible enter or obstruct the holes in the mast.

The emergency gear lever, when placed in the raised position, can be used to override the system, and gear position is then controlled by the selector switch regardless of airspeed/power combinations. The emergency gear lever is provided with a latching device which may be used to lock the override lever in the up position. The latch is located on the right side panel of the console below the level of the manual override lever. To lock the override lever in the up position, raise the override lever to the full up position and push the latch down. A yellow warning light located below the gear selector switch (Figure 7-3) flashes to warn the pilot that the automatic gear lowering system is disabled. The latch is spring-loaded to the off position to aid disengagement. To disengage the latch raise the override lever and release. The lever will return to its normal position and the yellow flashing light will extinguish. The lever must also be latched in the raised (up) position when gear-up stalls are practiced.

The emergency gear lever, when used for emergency extension of the gear, manually releases hydraulic pressure to permit the gear to free-fall with spring assistance on the nose gear. The lever must be held in the downward position for emergency extension.

Gear down and locked positions are indicated by three green lights located above the selector, and a red Warning Gear Unsafe light is located at the top of the panel. An all lights out condition indicates the gear is up. The landing gear should not be retracted above a speed of 106 KIAS and should not be extended above a speed of 129 KIAS.

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

Two micro-switches in the throttle quadrant activate a warning horn and red Warning Gear Unsafe light under the following conditions:

1. Gear up and power reduced below approximately 14 inches of manifold pressure.
2. On aircraft equipped with the backup gear extender, if the system has extended the landing gear and the gear selector is UP, except at full throttle.
3. Gear selector switch UP while on the ground.

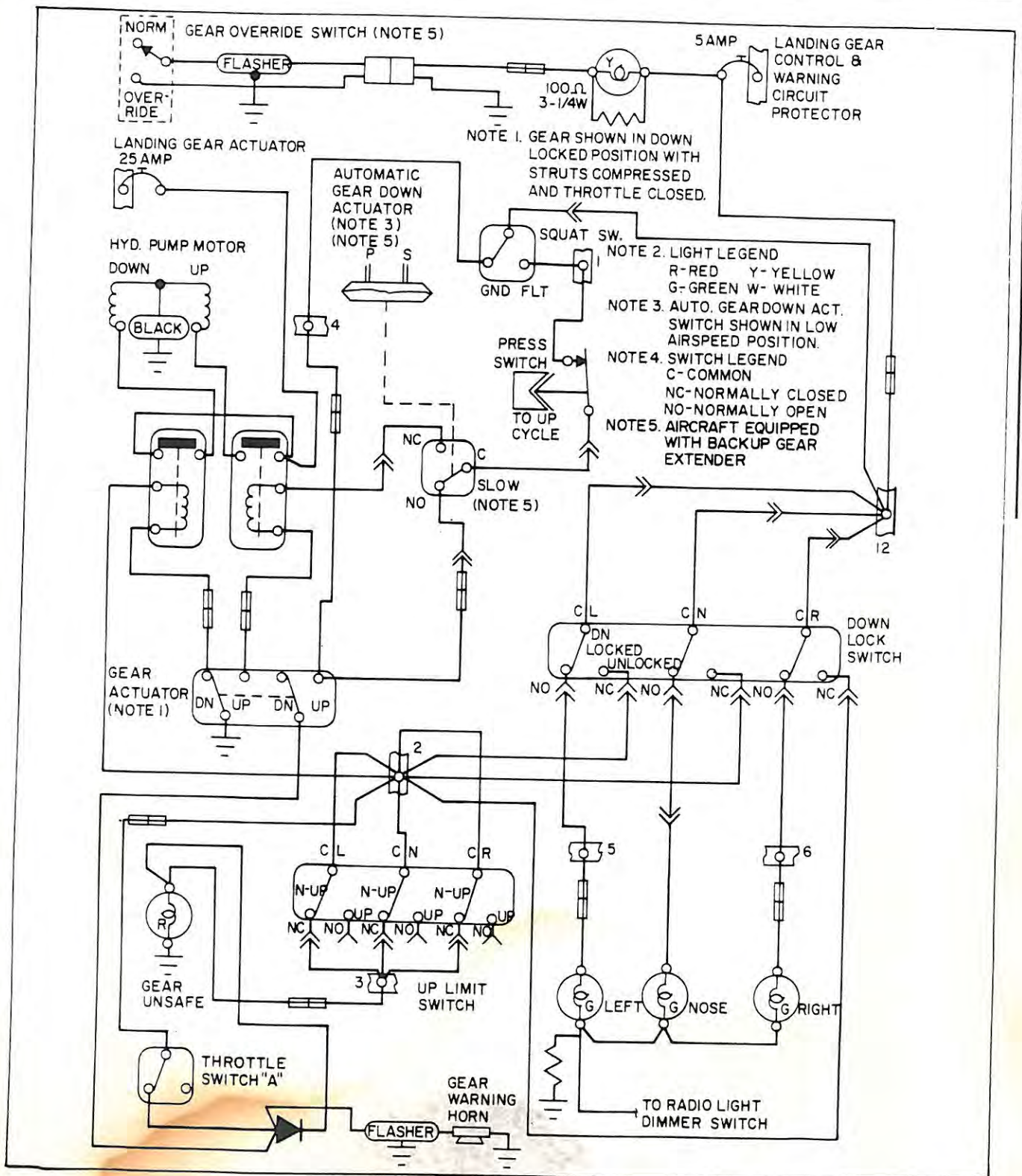
On aircraft which are NOT equipped with the backup gear extender, an additional switch is installed which activates the warning horn and light whenever the flaps are extended beyond the approach position (10°) and the landing gear are not down and locked.

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

The nose gear is steerable through a 22.5 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 dampener to reduce nose wheel shimmy.

The oleo struts are of the air-oil type, with normal extension being 2.60 inches for the nose gear and 4.0 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 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.



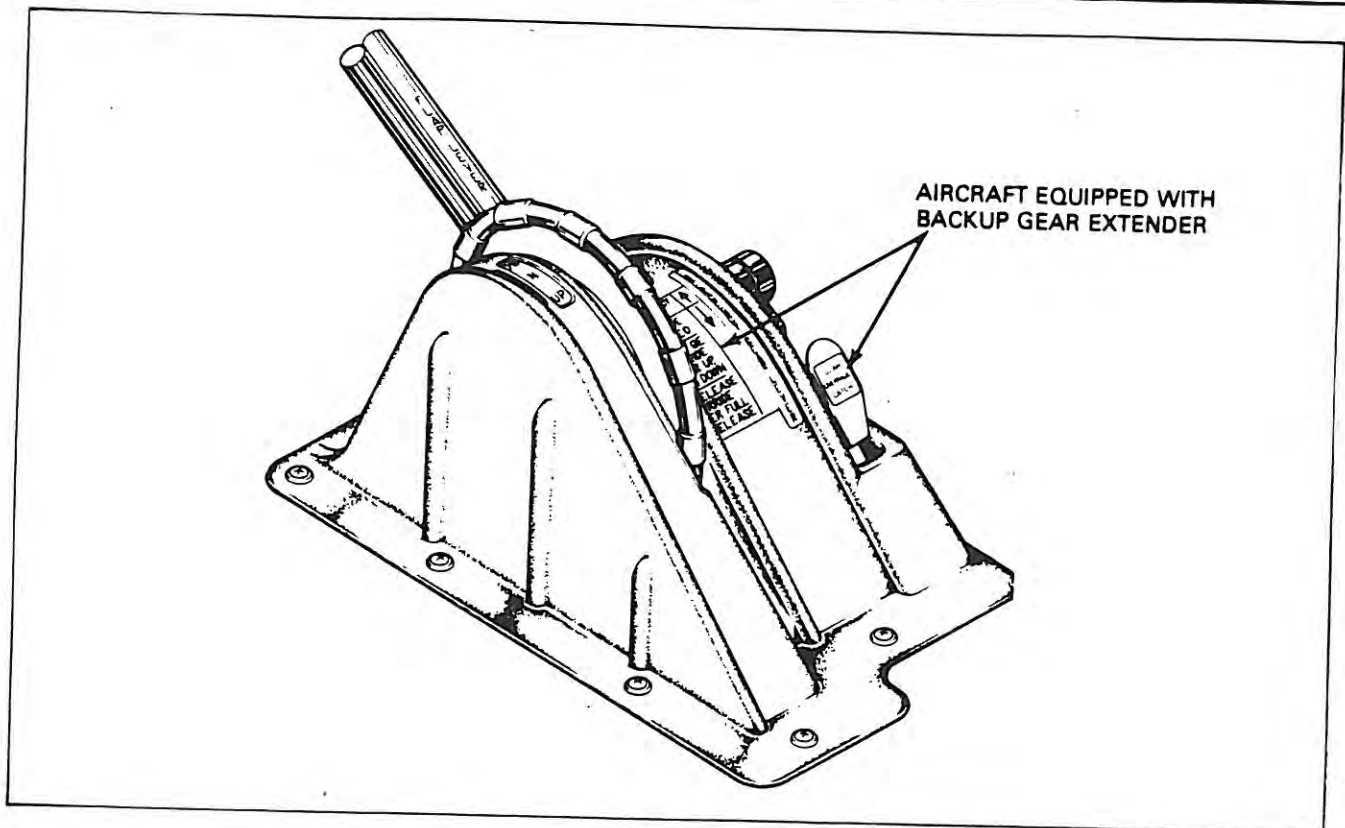
LANDING GEAR ELECTRICAL SCHEMATIC

Figure 7-5

PIPER AIRCRAFT CORPORATION
PA-32RT-300, LANCE II



ISSUED: JANUARY 18, 1978
REVISED: JANUARY 31, 1987



FLIGHT CONTROL CONSOLE
Figure 7-9

7.11 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) is mounted atop the fin in a T configuration and 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. Turning the trim control clockwise gives nose right trim and counterclockwise rotation gives nose left trim.

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. 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.

When extending or retracting flaps, there is a pitch change in the aircraft. This pitch change can be corrected either by 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 standard fuel capacity of the Lance II is 98 gallons, of which 94 gallons are usable. The tanks are attached to the wing structure with screws and nut plates and can be removed for service or inspection.

When using less than the standard 98 gallon capacity of the tanks, fuel should be distributed equally between each side.

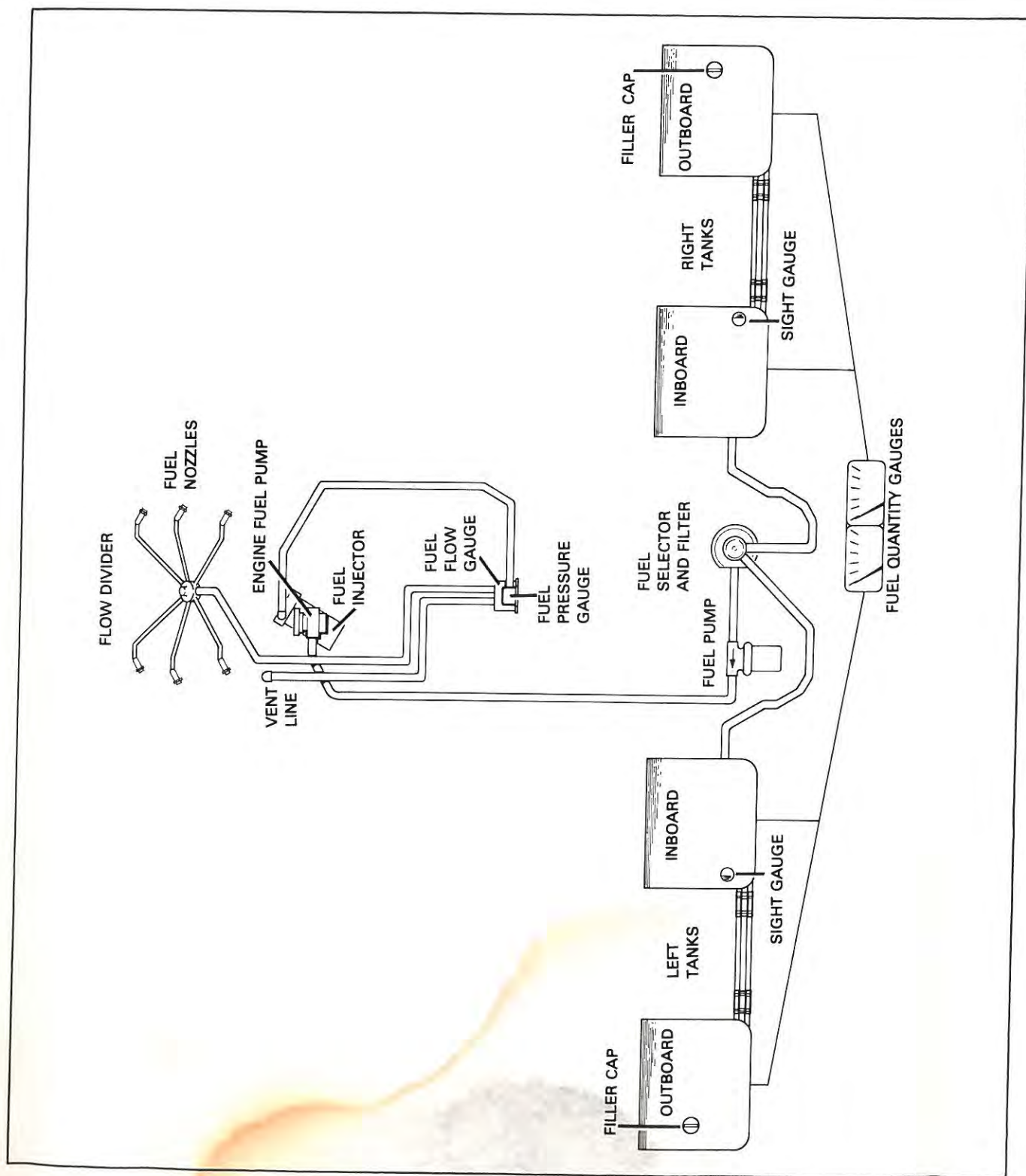
The fuel selector control is located below the center of the instrument panel on the sloping face of the control tunnel (refer to Figure 7-1). It has three positions, one position corresponding to each wing tank plus an OFF position.

To avoid the accumulation of water and sediment, the fuel tank sumps and strainer should be drained daily prior to first flight and after refueling. Each tank is equipped with an individual quick drain located at the lower inboard rear corner of the tank. The fuel strainer and a system quick drain valve are located in the fuselage at the lowest point of the fuel system. It is important that the fuel system be drained in the following manner:

1. Drain each tank sump through its individual quick drain located at the lower inboard rear corner of the tank, making sure that enough fuel has flowed to ensure the removal of all water and sediment.
2. Place a container beneath the fuel strainer sump drain outlet located under the fuselage.
3. Drain the fuel strainer sump by pressing down on the lever located on the right side of the cabin on the forward edge of the wing spar housing (Figure 7-13). Move the selector through the following sequence: OFF position, left, right, while draining the strainer sump. Make sure that enough fuel has flowed to drain the fuel line between each tank outlet and the fuel strainer, as well as the strainer itself. With full fuel tanks, it will take approximately 6 seconds to drain all of the fuel from the line from either tank to the fuel strainer. When the tanks are less than full, it will take a few seconds longer.
4. Examine the contents of the container placed under the fuel sump drain outlet. When the fuel flow is free of water and sediment, close the drain and dispose of the contents of the bottle.

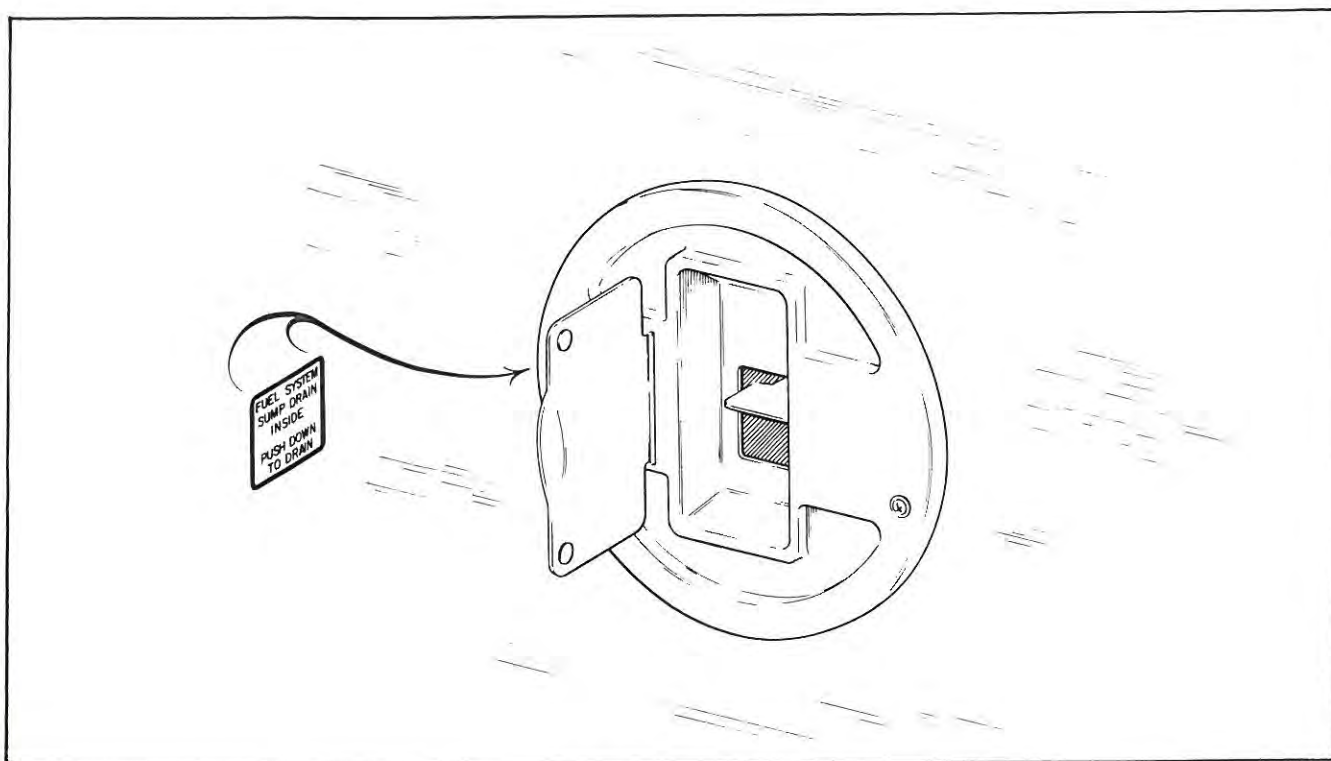
CAUTION

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



FUEL SYSTEM SCHEMATIC

Figure 7-11



FUEL DRAIN LEVER

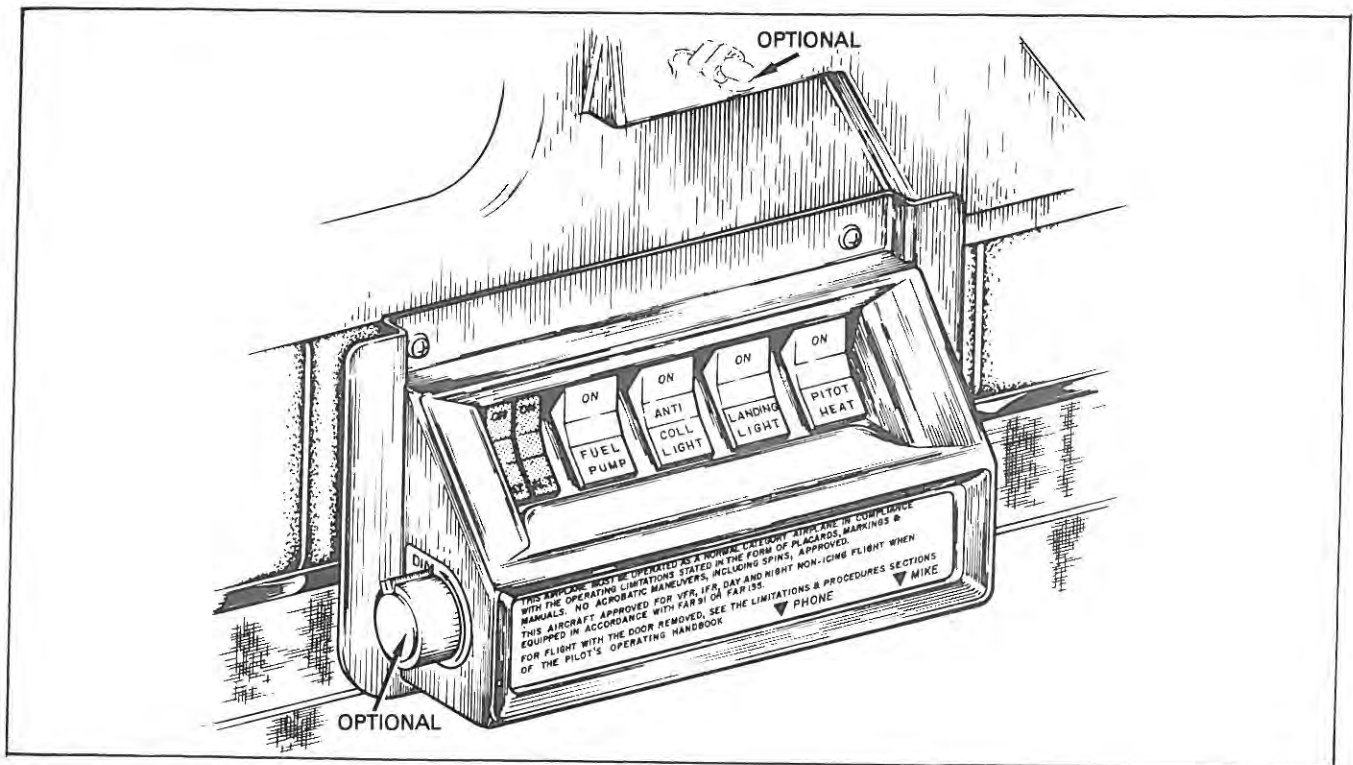
Figure 7-13

After using the underseat quick drain, check from the outside to make sure that it has closed completely and is not leaking.

Fuel quantity gauges for each of the tanks are located in the engine gauge cluster on the left side of the instrument panel. A fuel pressure indicator is also incorporated in the engine gauge cluster.

A fuel quantity indicator to measure the fuel not visible through the filler neck in each wing is installed in the inboard fuel tank. This gauge indicates usable fuel quantities from 5 gallons to 25 gallons in the ground attitude. The sole purpose of this gauge is to assist the pilot in determining fuel quantities of less than 25 gallons during the preflight inspection.

An electric fuel pump is provided for use in case of failure of the engine driven pump. The electric pump operates from a single switch and independent circuit protector. It should be ON for all takeoffs and landings.



SWITCH PANEL

Figure 7-15

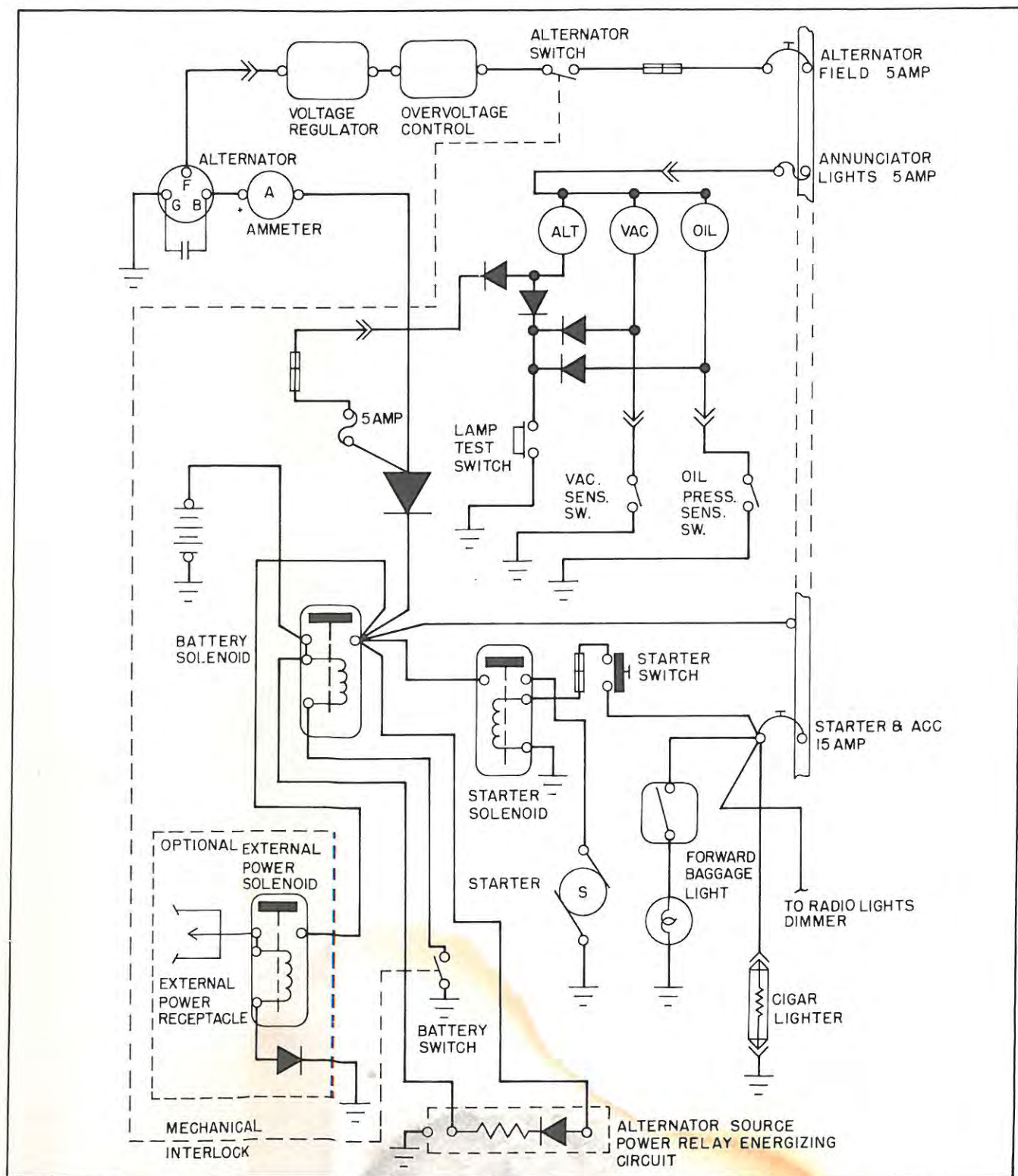
7.17 ELECTRICAL SYSTEM

The 14-volt electrical system includes a 12-volt battery for starting and to back up alternator output. Electrical power is supplied by a 60 ampere alternator. The battery, a master switch relay, a voltage regulator and an overvoltage relay are located beneath the floor of the forward baggage compartment. Access to these electrical components is gained by removing the compartment floor and the access panel located on the left side of the forward fuselage.

Electrical switches are located on a panel to the pilot's left (Figure 7-15) and all circuit breakers are on the lower right instrument panel (refer to Figure 7-19). A switch panel light is available as optional equipment. The light is installed above the switch panel and is controlled by a rheostat switch mounted on the left side of the panel. Two thumb-wheel rheostat switches to the left of the circuit breakers control the navigation lights and the intensity of the instrument panel lights.

Standard electrical accessories include the starter, the electric fuel pump, the stall warning indicator, the ammeter, and the annunciator panel.

The annunciator panel includes alternator and low oil pressure indicator lights. When the optional gyro system is installed, the annunciator panel also includes a low vacuum indicator light. The annunciator panel lights are provided only as a warning to the pilot that a system may not be operating properly, and that the applicable system gauge should be checked and monitored to determine when or if any corrective action is required.



ALTERNATOR AND STARTER SCHEMATIC

Figure 7-17

Optional electrical accessories include the navigation lights, anti-collision strobe lights, instrument panel lighting and cabin courtesy lights. The cabin courtesy light installation consists of two light/switch panels, one mounted above each cabin entrance. Make sure the lights are off when leaving the aircraft. Leaving the lights on for an extended period of time could cause depletion of the battery.

Circuit provisions are made to handle the addition of communications and navigational equipment.

The ammeter in the alternator system displays in amperes the load placed on the alternator. It does not indicate battery discharge. With all electrical equipment off (except the master switch) the ammeter will be indicating the amount of charging current demanded by the battery. As each item of electrical equipment is turned on, the current will increase to a total appearing on the ammeter. This total includes the battery. The average continuous load for night flight, with radios on, is about 30 amperes. This 30 ampere value, plus approximately 2 amperes for a fully charged battery, will appear continuously under these flight conditions.

The master switch is a split switch with the left half operating the master relay and the right half energizing the alternator. This switch is interlocked so that the alternator cannot be operated without the battery. For normal operation, be sure that both halves are turned on.

WARNING

When optional panel lights are installed, radio dimming switch must be off to obtain gear lights full intensity during daytime flying. When aircraft is operated at night and panel light radio dimming switch is turned on, gear lights will automatically dim.

NOTE

Anti-collision lights should not be operating when flying through overcast and clouds since reflected light can produce spacial disorientation. Do not operate strobe lights while taxiing in the vicinity of other aircraft.

PIPER AIRCRAFT CORPORATION
PA-32RT-300, LANCE II



Figure 7-19

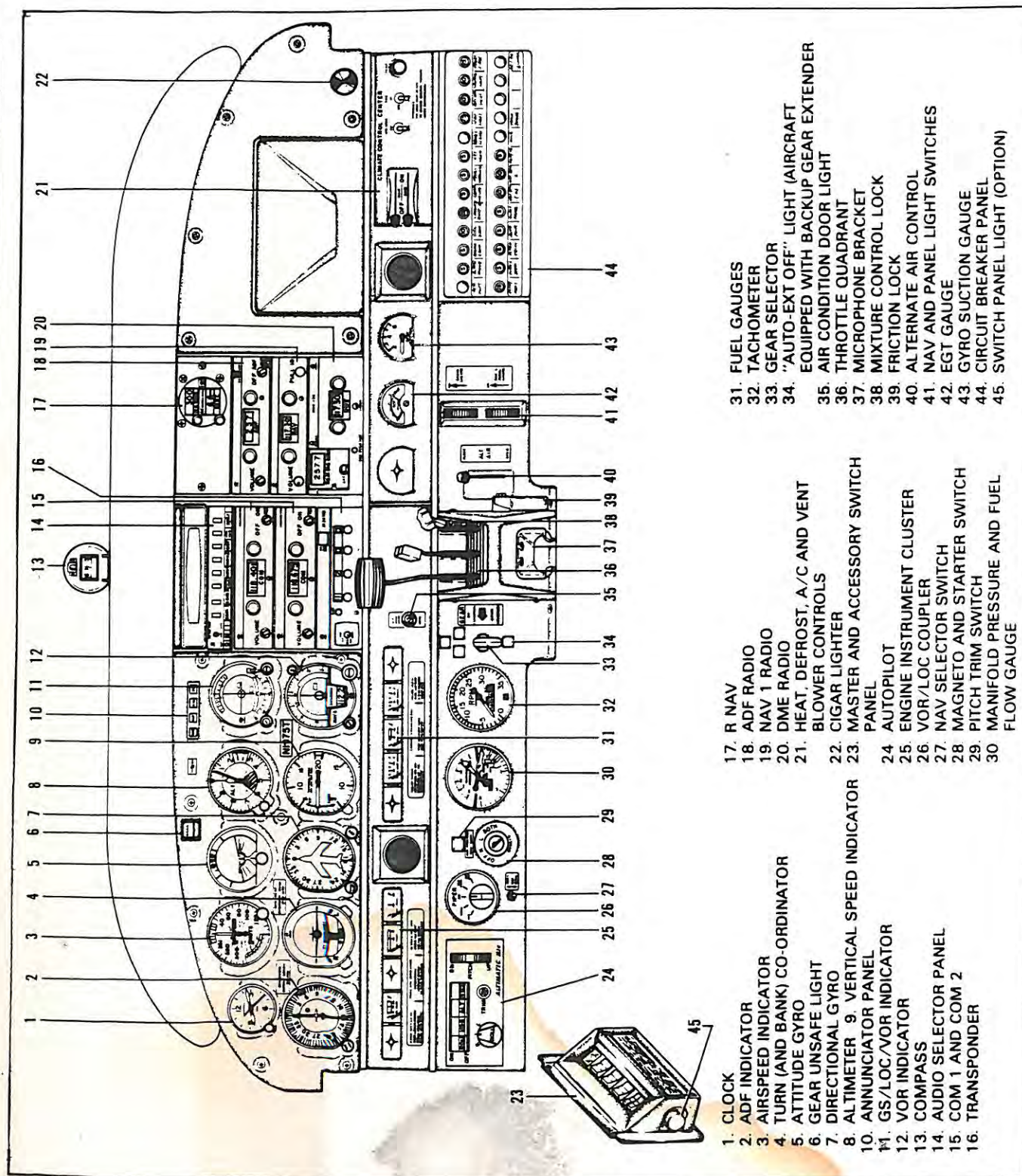
7.19 VACUUM SYSTEM

The vacuum system is designed to operate the air driven gyro instruments. This includes the directional and attitude gyros when installed. The system consists of an engine driven vacuum pump, a vacuum regulator, a filter and the necessary plumbing.

The vacuum pump is a dry type pump which eliminates the need for an air/oil separator and its plumbing. A shear drive protects the pump from damage. If the drive shears the gyros will become inoperative.

The vacuum gauge, mounted on the right instrument panel to the right of the radios, (refer to Figure 7-21) provides valuable information to the pilot about the operation of the vacuum system. A decrease in pressure in a system that has remained constant over an extended period, may indicate a dirty filter, dirty screens, possibly a sticking vacuum regulator or leak in system (a low vacuum indicator light is provided in the annunciator panel). Zero pressure would indicate a sheared pump drive, defective pump, possibly a defective gauge or collapsed line. In the event of any gauge variation from the norm, the pilot should have a mechanic check the system to prevent possible damage to the system components or eventual failure of the system.

A vacuum regulator is provided in the system to protect the gyros. The valve is set so the normal vacuum reads $5.0 \pm .1$ inches of mercury, a setting which provides sufficient vacuum to operate all the gyros at their rated RPM. Higher settings will damage the gyros and with a low setting the gyros will be unreliable. The regulator is located behind the instrument panel.



INSTRUMENT PANEL

Figure 7-21

7.21 INSTRUMENT PANEL

The instrument panel is designed to accommodate the customary advanced flight instruments and the normally required power plant instruments. The artificial horizon and directional gyro are vacuum operated and are located in the center of the left hand instrument panel. The vacuum gauge is located on the right hand instrument panel. The turn indicator, on the left side, is electrically operated.

The radios are located in the center section of the panel, and the circuit breakers are in the lower right corner of the panel.

An annunciator panel is mounted in the upper instrument panel to warn the pilot of a possible malfunction in the alternator, oil pressure, or vacuum systems.

7.23 PITOT-STATIC SYSTEM

The system supplies both pitot and static pressure for the airspeed indicator, altimeter and vertical speed indicator (when installed).

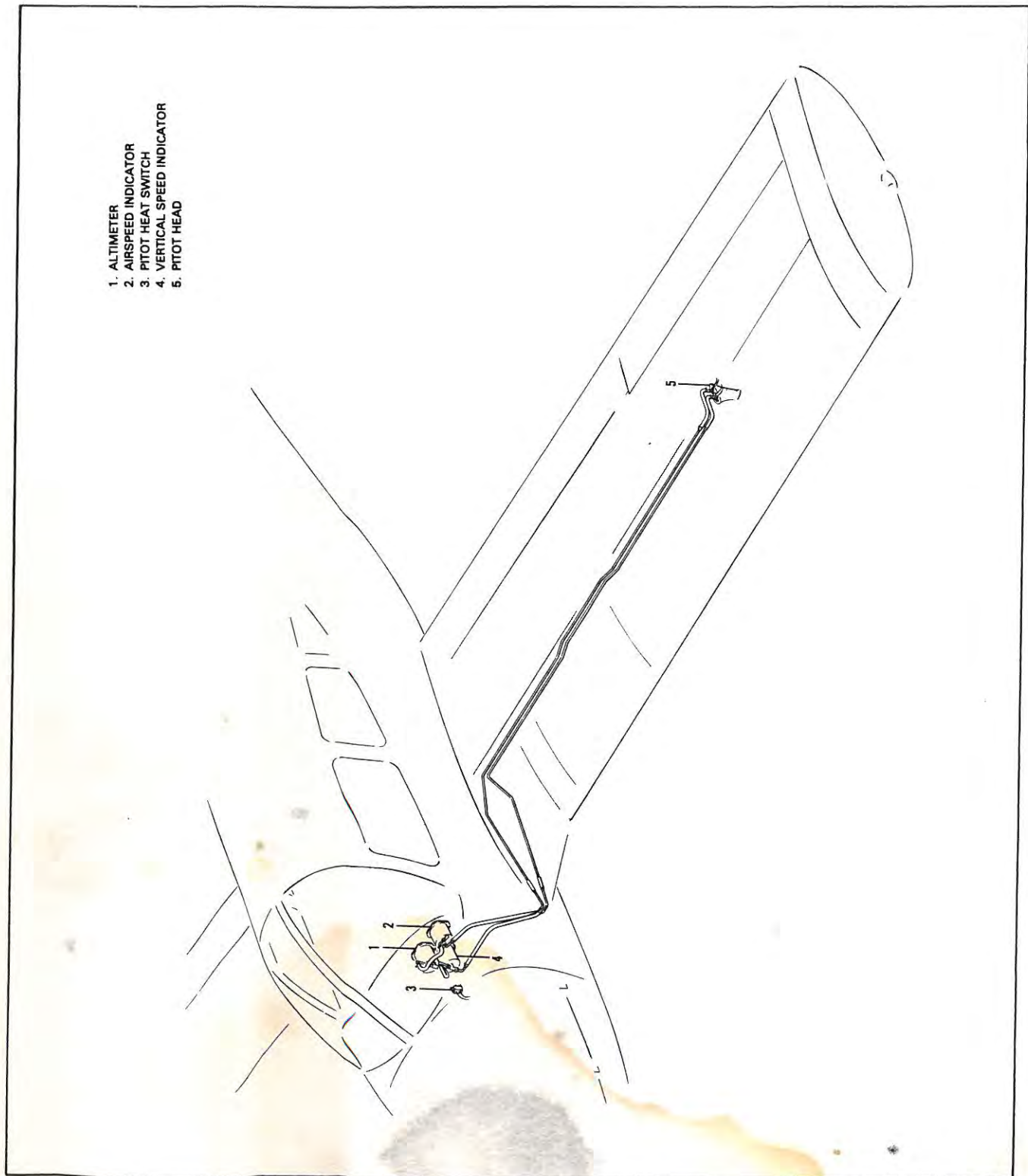
Pitot and static pressure are picked up by the pitot head on the bottom of the left wing. An optional heated pitot head, which alleviates problems with icing or heavy rain, is available. The switch for pitot heat is located on the switch panel to the pilot's left.

An alternate static source is available as optional equipment. The control valve is located below the left side of the instrument panel. When the valve is set in the alternate position, the altimeter, vertical speed indicator and airspeed indicator will be using cabin air for static pressure. The storm window and cabin vents must be closed and the cabin heater and defroster must be on during alternate static source operation. The altimeter error is less than 50 feet unless otherwise placarded.

To prevent bugs and water from entering the pitot and static pressure holes when the airplane is parked, a cover should be placed over the pitot head. A partially or completely blocked pitot head will give erratic or zero readings on the instruments.

NOTE

During preflight, check to make sure the pitot cover is removed.



PITOT-STATIC SYSTEM

Figure 7-23

7.25 CABIN FEATURES

For ease of entry and exit and for pilot and passenger comfort, the front seats are adjustable fore and aft. All seats recline and have armrests and are available with optional headrests. The front seats can be equipped with optional vertical adjustment. The center and rear seats may be removed for additional cargo space.

NOTE

To remove the center seats, retainers securing the back legs of the seats must be unlocked. This is accomplished by depressing the plunger behind each rear leg. Any time the seats are installed in the airplane, the retainers should be in the locked position. To remove the rear seats, depress the plunger behind each front leg and slide seat to rear.

An optional jump seat can be installed between the two middle seats to give the airplane a seven-place capacity.

Single strap shoulder harnesses controlled by inertia reels are standard equipment for the front seats and are offered as optional equipment for the third, fourth, fifth and sixth seats, but not for the seventh seat. The shoulder strap is routed over the shoulder adjacent to the windows and attached to the lap belt in the general area of the person's inboard hip.

The inertia reel should be checked by tugging sharply on the strap. The reel will lock in place under this test and prevent the strap from extending. Under normal movement, the strap will extend and retract as required.

An optional club seating interior is also available. In the club seating interior the center seats face aft. These seats are equipped with lap belts only. Removal of the seats is accomplished by removing the two bolts holding the aft attach points and sliding the seat aft.

An optional refreshment console is located between the center seats. It is removed in an identical manner to the center seats.

An optional cabin work table, serving the two seats on the right side of the passenger cabin, is offered to the club seating arrangement. The table must be stowed during takeoff and landing. If the table is to be used, it should be set up after a level cruise is established.

To remove the cabin work table from the aft baggage compartment, unlock the stud located on the bottom of the close-out bulkhead. Loosen the white tie-down strap and remove the table from the mounting brackets by lifting the table two inches straight up until it clears the mounting brackets. Do not twist the table while it is in the brackets.

To install the cabin work table during flight, hold the table in place and tilt the free end of the table upward 30° until the lobed upper knobs on the table supports align with the top holes of the escutcheons located below the right cabin window trim. Hold the upper lobes in place and lower the free end of the table to the level work position. The retaining springs will click when secure.

To stow the cabin work table, remove the table by lifting the free end of the table upward to disengage the bottom lobes of the table supports. Lift until the top support lobes disengage at approximately 30° of tilt and remove the table. Position the table in the stowage area and, with the table

work surface facing forward, place the slots in the table support into the receptacle clips mounted on the hat shelf. Make sure the white tie-down strap is not behind the table. With the table fully placed in the clips, bring the white tie-down strap across the face of the table and lock over the stud located on the bottom of the close-out bulkhead.

7.27 BAGGAGE AREA

The airplane has two separate baggage areas, each with a 100 pound capacity. A 7 cubic foot forward luggage compartment, located just aft of the fire wall, is accessible through a 16 x 22 inch door on the right side of the fuselage. A 17.3 cubic foot aft compartment is located behind the fifth and sixth seats and is accessible through the cargo door on the aft side of the fuselage and during flight from inside the cabin.

An automatic forward baggage light feature is available which utilizes a magnetic reed switch and a magnet for activation. The switch and magnet are mounted just above the hinge line of the forward baggage door.

Opening the baggage door fully causes activation of the switch which illuminates the baggage light. The baggage light is independent of the aircraft master switch; therefore, the light will illuminate regardless of the position of the master switch. The baggage door should not be left open for extended time periods, as battery depletion could result.

NOTE

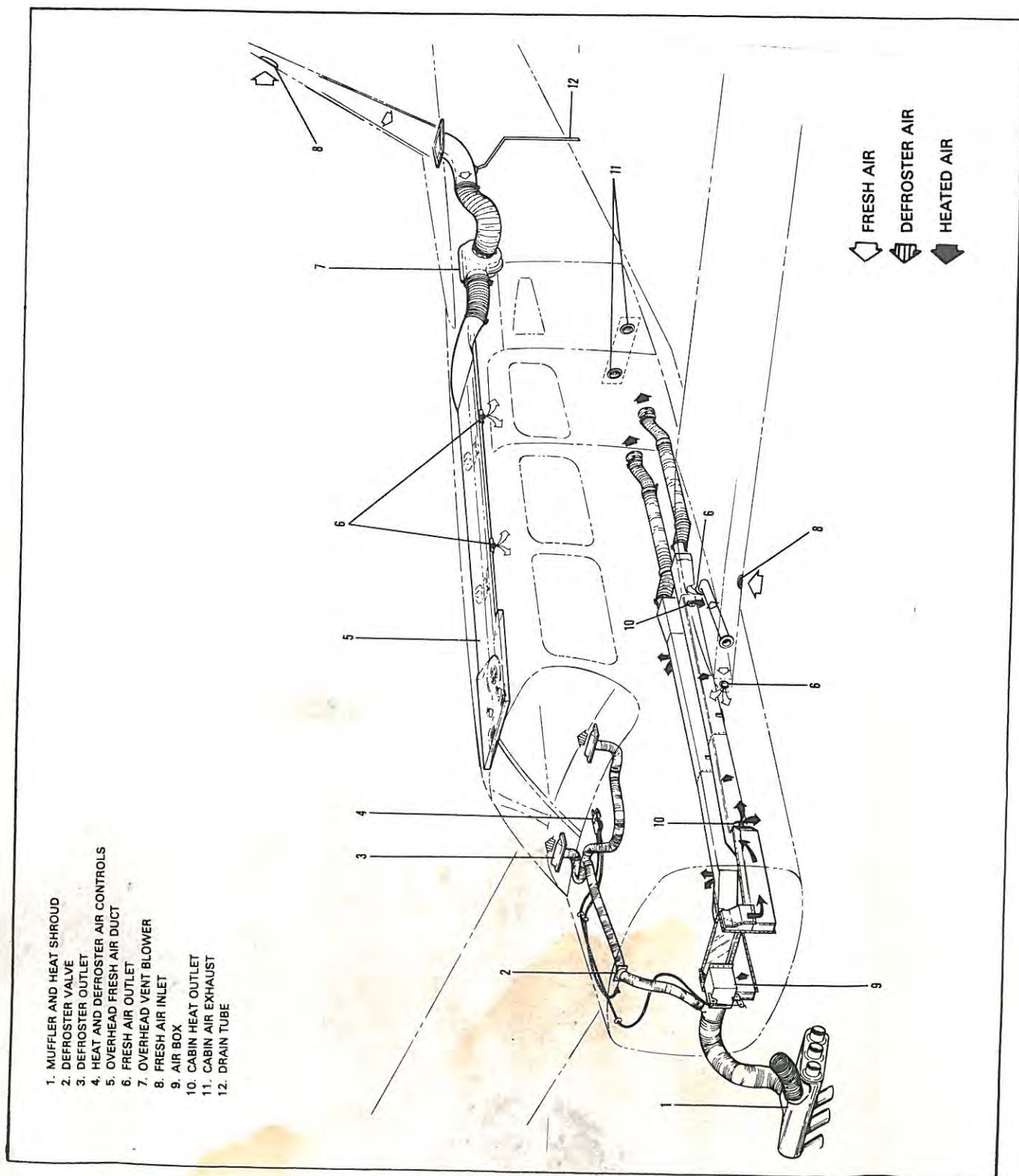
It is the pilot's responsibility to be sure when the baggage is loaded that the airplane's C.G. falls within the allowable C.G. range. (Refer to Weight and Balance Section.)

7.29 HEATING AND VENTILATING SYSTEM

Fresh air is ducted from the front left engine baffle to the heater muff by a flexible hose. Hot air from the heater muff is routed through a flexible hose on the right side of the engine compartment, to the valve box mounted on the fire wall just above the tunnel cut out. It is then ducted down each side of the tunnel below the baggage floor to the cabin ducting and outlets (Figure 7-25).

Defrost heat is bled off from the main flow at the valve box and routed through flexible hose to a shut-off valve located to the right of center at the top of the fire wall. From this point, it is ducted to the defroster outlets.

Fresh air inlets are located in the leading edge of each wing at the intersection of the tapered and straight sections, and in the leading edge of the fin. Two adjustable outlets are located on each side of the cabin, one forward and one aft of the front seat near the floor. There are also adjustable outlets above each seat. In airplanes without air conditioning, an optional blower may be added to the overhead vent system to aid in the circulation of cabin air.



HEATING AND VENTILATING SYSTEM

Figure 7-25

7.31 STALL WARNING

An approaching stall is indicated by a stall warning horn which is activated between five and ten knots above stall speed. Mild to moderate airframe buffeting may also precede the stall. Stall speeds are shown on graphs in the Performance Section. The stall warning horn emits a continuous sound. The landing gear warning horn is different in that it emits a 90 cycle per minute beeping sound. The stall warning horn is activated by a lift detector installed on the leading edge of the left wing. 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.

7.33 FINISH

All exterior surfaces are primed with etching primer and finished with acrylic lacquer. An optional polyurethane enamel finish is available.

7.35 AIR CONDITIONING*

The air conditioning system is a recirculating air system. The major components include an evaporator, a condenser, a compressor, a blower, switches and temperature control.

The evaporator is located behind the rear baggage compartment. This cools the air used for the air conditioning system.

The condenser is mounted on a retractable scoop located on the bottom of the fuselage and to the rear of the baggage compartment area. The scoop extends when the air conditioner is ON and retracts to a flush position when the system is OFF.

The compressor is mounted on the forward right underside of the engine. It has an electric clutch which automatically engages or disengages the compressor to the belt drive system of the compressor.

Air from the baggage area is drawn through the evaporator by the blower and distributed through an overhead duct to individual outlets located adjacent to each occupant.

The switches and temperature control are located on the lower right side of the instrument panel in the climate control center panel. The temperature control regulates the temperature of the cabin. Turning the control clockwise increases cooling; counterclockwise decreases cooling.

The fan speed switch and the air conditioning ON-OFF switch are inboard of the temperature control. The fan can be operated independently of the air conditioning; however, the fan must be on for air conditioner operation. Turning either switch off will disengage the compressor clutch and retract the condenser door. Cooling air should be felt within one minute after the air conditioner is turned on.

NOTE

If the system is not operating in 5 minutes, turn the system OFF until the fault is corrected.

*Optional equipment

The fan switch allows operation of the fan with the air conditioner turned OFF to aid in cabin air circulation. "LOW" or "HIGH" can be selected to direct a flow of air through the air conditioner outlets in the overhead duct. These outlets can be adjusted or turned off individually.

The condenser door light is located to the right of the engine instrument cluster in front of the pilot. The door light illuminates when the door is open and is off when the door is closed.

A circuit breaker on the circuit breaker panel protects the air conditioning electrical system.

Whenever the throttle is in the full forward position, it actuates a micro switch which disengages the compressor and retracts the scoop. This allows maximum power and maximum rate of climb. The fan continues to operate and the air will remain cool for about one minute. When the throttle is retarded approximately 1/4 inch, the clutch will engage, the scoop will extend, and the system will again supply cool, dry air.

7.37 PIPER EXTERNAL POWER*

An optional starting installation known as Piper External Power (PEP) is accessible through a receptacle located on the left side of the nose section aft of the cowlings. An external battery can be connected to the socket, thus allowing the operator to crank the engine without having to gain access to the airplane's battery.

7.39 EMERGENCY LOCATOR TRANSMITTER*

The Emergency Locator Transmitter (ELT) when installed, is located in the aft portion of the fuselage and is accessible through a plate on the right side of the fuselage. 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.

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 also be replaced if the transmitter has been used in an emergency situation or if the accumulated test time exceeds one hour, or if the unit has been inadvertently activated for an undetermined time period.

On the unit itself is 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 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.

*Optional equipment

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. The pilot's remote switch 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 actuate 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.

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.

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.

7.41 RADAR*

A weather radar system can be installed in this airplane. The basic components of this installation are an R-T/Antenna and a cockpit indicator. The function of the weather radar system is to detect weather conditions along the flight path and to visually display a continuous weather outline on the cockpit indicator. Through interpretation of the advance warning given on the display, the pilot can make an early decision on the most desirable weather avoidance course.

NOTE

When operating weather avoidance radar systems inside of moderate to heavy precipitation, it is advisable to set the range scale of the radar to its lowest scale.

For detailed information on the weather radar system and for procedures to follow in operating and adjusting the system to its optimum efficiency, refer to the appropriate operating and service manuals provided by the radar system manufacturer.

WARNING

Heating and radiation effects of radar can cause serious damage to the eyes and tender organs of the body. Personnel should not be allowed within fifteen feet of the area being scanned by the antenna while the system is transmitting. Do not operate the radar during refueling or in the vicinity of trucks or containers accommodating explosives or flammables. Flashbulbs can be exploded by radar energy. Before operating the radar, direct the nose of the airplane so that the forward 120 degree sector is free of any metal objects such as other aircraft or hangars for a distance of at least 100 yards, and tilt the antenna upward 15 degrees. Do not operate the radar while the airplane is in a hangar or other enclosure.

*Optional equipment

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7-27

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SECTION 8

AIRPLANE HANDLING, SERVICING AND MAINTENANCE

8.1 GENERAL

This section provides guidelines relating to the handling, servicing and maintenance of the Lance II.

Every owner should stay in close contact with his Piper dealer or distributor and Authorized Piper Service Center to obtain the latest information pertaining to his aircraft and to avail himself of the Piper Aircraft Service Back-up.

Piper Aircraft Corporation takes a continuing interest in having the owner get the most efficient use from his aircraft and keeping it in the best mechanical condition. Consequently, Piper Aircraft from time to time issues Service Bulletins, Service Letters and Service Spares Letters relating to the aircraft.

Service Bulletins are of special importance and should be complied with promptly. These are sent to the latest registered owners, distributors and dealers. Depending on the nature of the bulletin, material and labor allowances may apply, and will be addressed in the body of the Bulletin.

Service Letters deal with product improvements and service hints pertaining to the aircraft. They are sent to dealers, distributors and occasionally (at the factory's discretion) to latest registered owners, so they can properly service the aircraft and keep it up to date with the latest changes. Owners should give careful attention to the Service Letter information.

Service Spares Letters offer improved parts, kits and optional equipment which were not available originally and which may be of interest to the owner.

If an owner is not having his aircraft serviced by an Authorized Piper Service Center, he should periodically check with a Piper dealer or distributor to find out the latest information to keep his aircraft up to date.

Piper Aircraft Corporation has a Subscription Service for the Service Bulletins, Service Letters and Service Spares Letters. This service is offered to interested persons such as owners, pilots and mechanics at a nominal fee, and may be obtained through Piper dealers and distributors.

A service manual, parts catalog, and revisions to both, are available from your Piper dealer or distributor. Any correspondence regarding the airplane should include the airplane model and serial number to insure proper response.

8.3 AIRPLANE INSPECTION PERIODS

The Federal Aviation Administration (FAA) occasionally publishes Airworthiness Directives (ADs) that apply to specific groups of aircraft. They are mandatory changes and are to be complied with within a time limit set by the FAA. When an AD is issued, it is sent by the FAA to the latest registered owner of the affected aircraft and also to subscribers of their service. The owner should periodically check with his Piper dealer or A & P mechanic to see whether he has the latest issued AD against his aircraft.

The Owner Service Agreement which the owner receives upon delivery of the aircraft should be kept in the aircraft at all times. This identifies him to authorized Piper Dealers and entitles the owner to receive service in accordance with the regular service agreement terms. This agreement also entitles the transient owner full warranty by any Piper dealer in the world.

One hundred hour inspections are required by law if the aircraft is used commercially. Otherwise this inspection is left to the discretion of the owner. This inspection is a complete check of the aircraft and its systems, and should be accomplished by a Piper Authorized Service Center or by a qualified aircraft and power plant mechanic who owns or works for a reputable repair shop. The inspection is listed, in detail, in the inspection report of the appropriate Service Manual.

An annual inspection is required once a year to keep the Airworthiness Certificate in effect. It is the same as a 100-hour inspection except that it must be signed by an Inspection Authorized (IA) mechanic or a General Aviation District Office (GADO) representative. This inspection is required whether the aircraft is operated commercially or for pleasure.

A Progressive Maintenance program is approved by the FAA and is available to the owner. It involves routine and detailed inspections at 50-hour intervals. The purpose of the program is to allow maximum utilization of the aircraft, to reduce maintenance inspection cost and to maintain a maximum standard of continuous airworthiness. Complete details are available from Piper dealers.

A spectographic analysis of the oil is available from several sources. This system, if used intelligently, provides a good check of the internal condition of the engine. For this system to be accurate, oil samples must be sent in at regular intervals, and induction air filters must be cleaned or changed regularly.

8.5 PREVENTATIVE MAINTENANCE

The holder of a Pilot Certificate issued under FAR Part 61 may perform certain preventive maintenance described in FAR Part 43. This maintenance may be performed only on an aircraft which the pilot owns or operates and which is not used to carry persons or property for hire, except as provided in applicable FAR's. Although such maintenance is allowed by law, each individual should make a self-analysis as to whether he has the ability to perform the work.

All other maintenance required on the airplane should be accomplished by appropriately licensed personnel.

If maintenance is accomplished, an entry must be made in the appropriate logbook. The entry should contain:

- (a) The date the work was accomplished.
- (b) Description of the work.
- (c) Number of hours on the aircraft.
- (d) The certificate number of Pilot performing the work.
- (e) Signature of the individual doing the work.

8.7 AIRPLANE ALTERATIONS

If the owner desires to have his aircraft modified, he must obtain FAA approval for the alteration. Major alterations accomplished in accordance with Advisory Circular 43.13-2, when performed by an A & P mechanic, may be approved by the local FAA office. Major alterations to the basic airframe or systems not covered by AC 43.13-2 require a Supplemental Type Certificate.

The owner or pilot is required to ascertain that the following Aircraft Papers are in order and in the aircraft.

- (a) To be displayed in the aircraft at all times:
 - (1) Aircraft Airworthiness Certificate Form FAA-8100-2.
 - (2) Aircraft Registration Certificate Form FAA-8050-3.
 - (3) Aircraft Radio Station License if transmitters are installed.
- (b) To be carried in the aircraft at all times:
 - (1) Pilot's Operating Handbook.
 - (2) Weight and Balance data plus a copy of the latest Repair and Alteration Form FAA-337, if applicable.
 - (3) Aircraft equipment list.

Although the aircraft and engine logbooks are not required to be in the aircraft, they should be made available upon request. Logbooks should be complete and up to date. Good records will reduce maintenance cost by giving the mechanic information about what has or has not been accomplished.

8.9 GROUND HANDLING

(a) Towing

The airplane may be moved on the ground by the use of the nose wheel steering bar that is stowed in the rear baggage compartment or by power equipment that will not damage or excessively strain the nose gear steering assembly. Towing lugs are incorporated as part of the nose gear fork.

CAUTION

When towing with power equipment, do not turn the nose gear beyond its steering radius in either direction, as this will result in damage to the nose gear and steering mechanism.

CAUTION

Do not tow the airplane when the controls are secured.

In the event towing lines are necessary, ropes should be attached to both main gear struts as high up on the tubes as possible. Lines should be long enough to clear the nose and/or tail by not less than fifteen feet, and a qualified person should ride in the pilot's seat to maintain control by use of the brakes.

(b) Taxiing

Before attempting to taxi the airplane, ground personnel should be instructed and approved by a qualified person authorized by the owner. Engine starting and shut-down procedures as well as taxi techniques should be covered. When it is ascertained that the propeller back blast and taxi areas are clear, power should be applied to start the taxi roll, and the following checks should be performed:

- (1) Taxi a few feet forward and apply the brakes to determine their effectiveness.
- (2) Taxi with the propeller set in low pitch, high RPM setting.
- (3) While taxiing, make slight turns to ascertain the effectiveness of the steering.
- (4) Observe wing clearance when taxiing near buildings or other stationary objects. If possible, station an observer outside the airplane.
- (5) When taxiing over uneven ground, avoid holes and ruts.
- (6) 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.

(c) Parking

When parking the airplane, be sure that it is sufficiently protected from adverse weather conditions and that it presents no danger to other aircraft. When parking the airplane for any length of time or overnight, it is suggested that it be moored securely.

- (1) To park the airplane, head it into the wind if possible.
- (2) Set the parking brake by pulling back on the brake lever and depressing the knob on the handle. To release the parking brake, pull back on the handle until the catch disengages; then allow the handle to swing forward.

CAUTION

Care should be taken when setting brakes that are overheated or during cold weather when accumulated moisture may freeze a brake.

- (3) Aileron and stabilator controls should be secured with the front seat belt and chocks used to properly block the wheels.

(d) Mooring

The airplane should be moored for immovability, security and protection. The following procedures should be used for the proper mooring of the airplane:

- (1) Head the airplane into the wind if possible.
- (2) Retract the flaps.
- (3) Immobilize the ailerons and stabilator by looping the seat belt through the control wheel and pulling it snug.
- (4) Block the wheels.
- (5) Secure tie-down ropes to the wing tie-down rings and to the tail ring at approximately 45 degree angles to the ground. When using rope of non-synthetic material, leave sufficient slack to avoid damage to the airplane should the ropes contract.

CAUTION

Use bowline knots, square knots or locked slip knots. Do not use plain slip knots.

NOTE

Additional preparations for high winds include using tie-down ropes from the landing gear forks and securing the rudder.

- (6) Install a pitot head cover if available. Be sure to remove the pitot head cover before flight.
- (7) Cabin and baggage doors should be locked when the airplane is unattended.

8.11 ENGINE AIR FILTER

(a) Removing Engine Air Filter

- (1) Remove the access door on left side of lower cowl.
- (2) Remove the wing nuts securing the filter. Remove the filter.

(b) Cleaning Engine Air Filter

The injector air filter must be cleaned at least once every 50 hours, and more often, even daily, when operating in dusty conditions. Extra filters are inexpensive, and a spare should be kept on hand for use as a rapid replacement.

To clean the filter:

- (1) Tap the filter gently to remove dirt particles, being careful not to damage the filter. DO NOT wash the filter in any liquid. DO NOT attempt to blow out dirt with compressed air.
- (2) If the filter is excessively dirty or shows any damage, replace it immediately.
- (3) Wipe the filter housing with a clean cloth soaked in unleaded gasoline. When the housing is clean and dry, install the filter.

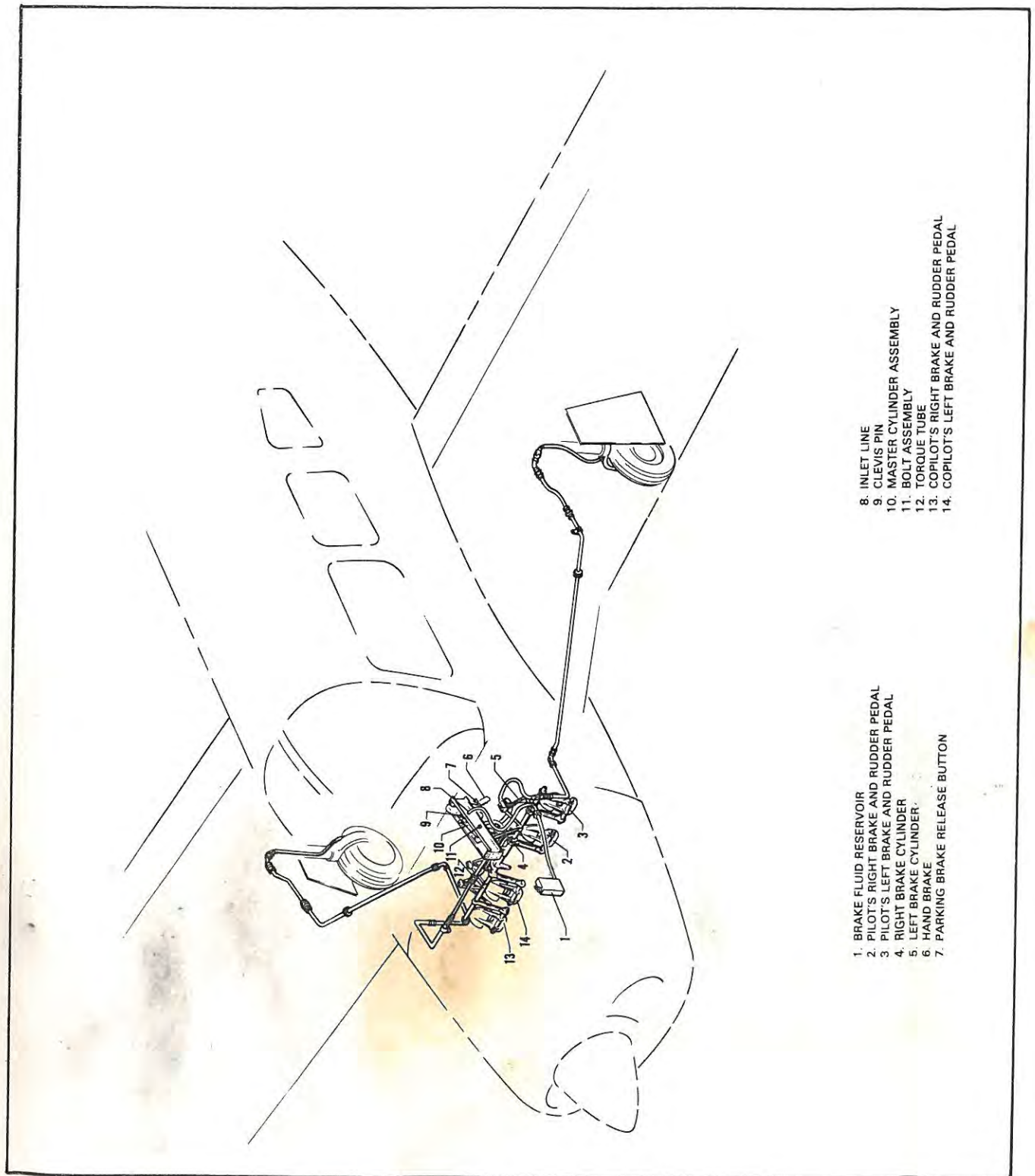
(c) Installation of Engine Air Filter

After cleaning or when replacing the filter, install the filter in the reverse order of removal.

8.13 BRAKE SERVICE

The brake system is filled with MIL-H-5606 (petroleum base) hydraulic brake fluid. The fluid level should be checked periodically or at every 100 hour inspection and replenished when necessary. The brake reservoir is located on the left side of the fire wall in the engine compartment. If the entire system must be refilled, fill with fluid under pressure from the brake end of the system. This will eliminate air from the system.

No adjustment of the brake clearances is necessary. If after extended service brake blocks become excessively worn, they should be replaced with new segments.



BRAKE SYSTEM

Figure 8-1

8.15 LANDING GEAR SERVICE

The main landing gear uses Cleveland Aircraft Products 6.00 x 6 wheels with 6.00 x 6, eight-ply rating tires and tubes. The nose wheel uses a Cleveland Aircraft Products 5.00 x 5 wheel with a 5.00 x 5 six-ply rating, type III tire and tube. (Refer to paragraph 8.23.)

Wheels are removed by taking off the hub cap, cotter pin, axle nut, and the two bolts holding the brake segment in place. Mark tire and wheel for reinstallation; then dismount by deflating the tire, removing the three through-bolts from the wheel and separating the wheel halves.

Landing gear oleos should be serviced according to the instructions on the units. The main oleos should be extended under normal static load until $4.0 \pm .25$ inches of oleo piston tube is exposed, and the nose gear should show $2.60 \pm .25$ inches. To add air to the oleo struts, attach a strut pump to the valve assembly near the top of the oleo strut housing and pump the oleo to the desired position. To add oil, jack the aircraft, release the air pressure in the strut, remove the valve core and add oil through this opening with the strut extended. After the strut is full, compress it slowly and fully to allow excess air and oil to escape. With the strut still compressed reinsert the valve core and pump up the strut as above.

In jacking the aircraft for landing gear or other service, two hydraulic jacks and a tail stand should be used. At least 250 pounds of ballast should be placed on the base of the tail stand before the airplane is jacked up. The hydraulic jacks should be placed under the jack points on the bottom of the wing and the airplane jacked up until the tail skid is at the right height to attach the tail stand. After the tail stand is attached and the ballast added, jacking may be continued until the airplane is at the height desired.

The steering arms from the rudder pedals to the nose wheel are adjusted at the rudder pedals or at the nose wheel by turning the threaded rod end bearings in or out. Adjustment is normally accomplished at the forward end of the rods and should be done in such a way that the nose wheel is in line with the fore and aft axis of the plane when the rudder pedals and rudder are centered. Alignment of the nose wheel can be checked by pushing the airplane back and forth with the rudder centered to determine that the plane follows a perfectly straight line. The turning arc of the nose wheel is $22.5^\circ \pm 2^\circ$ in either direction and is limited by stops at the rudder pedals.

8.17 PROPELLER SERVICE

The spinner and backing plate should be cleaned and inspected for cracks frequently. Before each flight the propeller should be inspected for nicks, scratches, and corrosion. If found, they should be repaired as soon as possible by a rated mechanic, since a nick or scratch causes an area of increased stress which can lead to serious cracks or the loss of a propeller tip. The back face of the blades should be painted when necessary with flat black paint to retard glare. To prevent corrosion, the surface should be cleaned and waxed periodically.

8.19 OIL REQUIREMENTS

The oil capacity of the Lycoming IO-540 series engine is 12 quarts, and the minimum safe quantity is 2-3/4 quarts. It is recommended that the oil be changed every 50 hours and sooner under unfavorable operating conditions. The following grades are recommended for the specified temperatures:

Average Ambient Air Temperature For Starting	Single Viscosity Grade	Multi-Viscosity Grades
Above 60°F	SAE 50	SAE 40 or SAE 50
30° to 90°F	SAE 40	SAE 40
0° to 70°F	SAE 30	SAE 40 or 20W-30
Below 10°F	SAE 20	SAE 20W-30

8.21 FUEL SYSTEM

(a) Servicing Fuel System

At every 50 hour inspection, the fuel screens in the strainer and in the injector must be cleaned. The screen in the injector is located in the housing where the fuel line connects to the injector. The fuel strainer is located under the floor panel and is accessible for cleaning through an access plate on the underside of the fuselage. After cleaning, a small amount of grease applied to the gasket will facilitate reassembly.

(b) Fuel Requirements (AVGAS ONLY)

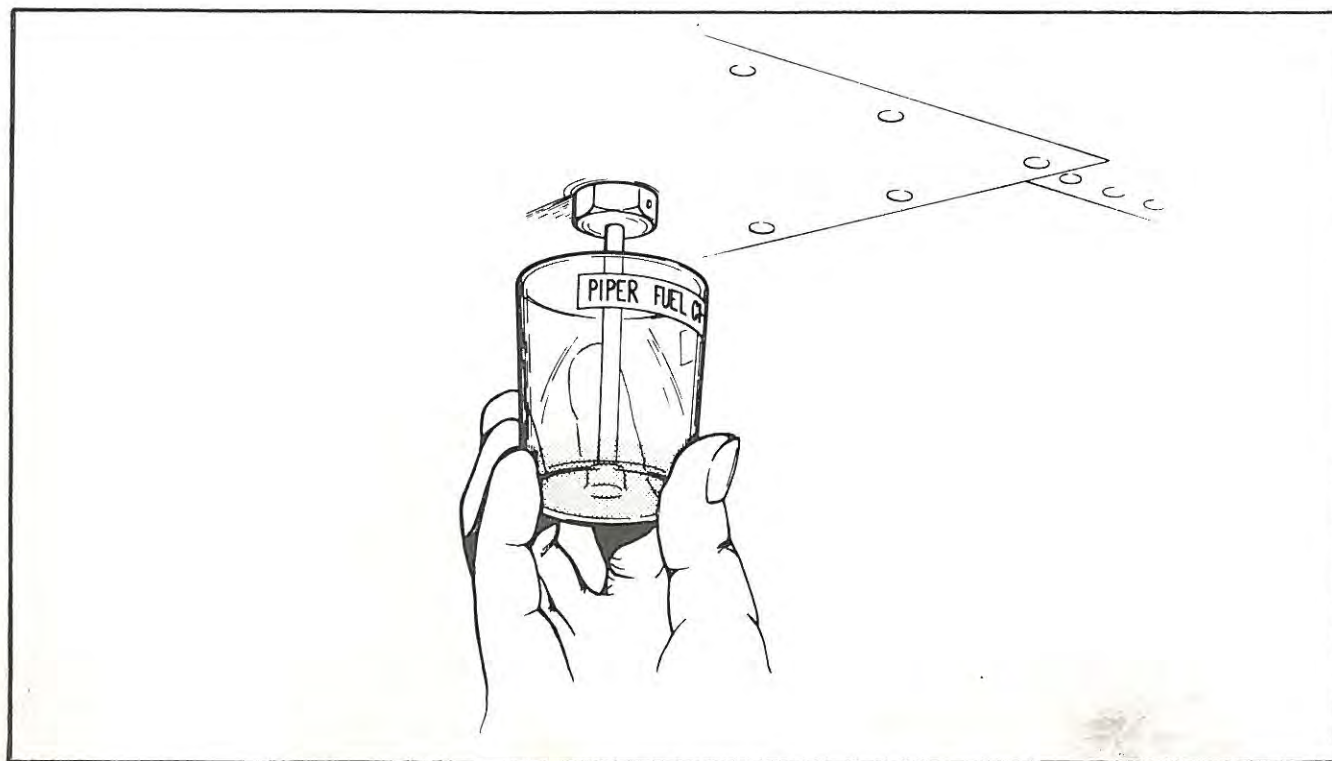
Aviation grade fuel with a minimum octane of 100/130 is specified for this airplane. Since the use of lower grades can cause serious engine damage in a short period of time, the engine warranty is invalidated by the use of unapproved fuels. Refer to the latest issue of Lycoming Service Instruction 1070 for approved alternate grade fuels.

(c) Filling Fuel Tanks

Observe all safety precautions required when handling gasoline. Fill the fuel tanks through the filler located on the forward slope of the wing. Each wing holds a maximum of 49 U.S. gallons. When using less than the standard 98 gallon capacity, fuel should be distributed equally between each side.

(d) Draining Fuel Strainer, Sumps and Lines

The fuel tank sumps and strainer should be drained before the first flight of the day and after refueling to avoid the accumulation of water and sediment. Each fuel tank has an individual quick drain at the lower inboard corner. A fuel strainer with a fuel system quick drain is located at the lowest point in the system. Each tank sump should be drained through its individual quick drain until sufficient fuel has flowed to ensure the removal of any contaminants. The fuel strainer sump quick drain, operated by a lever inside the cabin on the right forward edge of the wing spar housing, should be opened while the fuel selector valve is moved through the two tank positions. Enough fuel should flow at each position to allow the fuel lines and the strainer to ensure removal of contaminants. A container is provided for the checking of fuel clarity. (See Description - Airplane and Systems Section for more detailed instructions.)



FUEL TANK DRAIN

Figure 8-3

CAUTION

When draining fuel, be sure that no fire hazard exists before starting the engine.

After using the fuel system quick drain, check from outside the airplane to be sure that it has closed completely and is not leaking.

(e) Draining Fuel System

The bulk of the fuel may be drained by opening the individual drain on each tank. The remaining fuel may be drained through the fuel strainer.

8.23 TIRE INFLATION

For maximum service from the tires, keep them inflated to the proper pressures - 35 psi for the nose gear and 38 psi for the main gear. All wheels and tires are balanced before original installation, and the relationship of tire, tube, and wheel should be maintained upon reinstallation. Unbalanced wheels can cause extreme vibration in the landing gear; therefore, in the installation of new components, it may be necessary to rebalance the wheels with the tires mounted. When checking tire pressure, examine the tires for wear, cuts, bruises, and slippage.

8.25 BATTERY SERVICE

Access to the 12-volt battery is through an access panel in the left side of the fuselage and by removing the floor of the forward baggage compartment. The battery box has a plastic tube which is normally closed off with a cap and which should be opened occasionally to drain off any accumulation of liquid. The battery should be checked for proper fluid level. DO NOT fill the battery above the baffle plates. DO NOT fill the battery with acid - use water only. A hydrometer check will determine the percent of charge in the battery.

If the battery is not up to charge, recharge starting at a 4 amp rate and finishing with a 2 amp rate. Quick charges are not recommended.

8.27 CLEANING

(a) Cleaning Engine Compartment

Before cleaning the engine compartment, place a strip of tape on the magneto vents to prevent any solvent from entering these units.

- (1) Place a large pan under the engine to catch waste.
- (2) With the engine cowling removed, spray or brush the engine with solvent or a mixture of solvent and degreaser. In order to remove especially heavy dirt and grease deposits, it may be necessary to brush areas that were sprayed.

CAUTION

Do not spray solvent into the alternator, vacuum pump, starter, or air intakes.

- (3) Allow the solvent to remain on the engine from five to ten minutes. Then rinse the engine clean with additional solvent and allow it to dry.

CAUTION

Do not operate the engine until excess solvent has evaporated or otherwise been removed.

- (4) Remove the protective tape from the magnetos.
- (5) Lubricate the controls, bearing surfaces, etc., in accordance with the Lubrication Chart in the applicable Service Manual.

(b) Cleaning Landing Gear

Before cleaning the landing gear, place a plastic cover or similar material over the wheel and brake assembly.

- (1) Place a pan under the gear to catch waste.
- (2) Spray or brush the gear area with solvent or a mixture of solvent and degreaser, as desired. Where heavy grease and dirt deposits have collected, it may be necessary to brush areas that were sprayed, in order to clean them.
- (3) Allow the solvent to remain on the gear from five to ten minutes. Then rinse the gear with additional solvent and allow to dry.
- (4) Remove the cover from the wheel and remove the catch pan.
- (5) Lubricate the gear in accordance with the Lubrication Chart.
- (6) Caution: Do not brush the micro switches.

(c) Cleaning Exterior Surfaces

The airplane should be washed with a mild soap and water. Harsh abrasives or alkaline soaps or detergents could make scratches on painted or plastic surfaces or could cause corrosion of metal. Cover areas where cleaning solution could cause damage. To wash the airplane, use the following procedure:

- (1) Flush away loose dirt with water.
- (2) Apply cleaning solution with a soft cloth, a sponge or a soft bristle brush.
- (3) To remove exhaust stains, allow the solution to remain on the surface longer.
- (4) To remove stubborn oil and grease, use a cloth dampened with naphtha.
- (5) Rinse all surfaces thoroughly.
- (6) Any good automotive wax may be used to preserve painted surfaces. Soft cleaning cloths or a chamois should be used to prevent scratches when cleaning or polishing. A heavier coating of wax on the leading surfaces will reduce the abrasion problems in these areas.

(d) Cleaning Windshield and Windows

- (1) Remove dirt, mud and other loose particles from exterior surfaces with clean water.
- (2) Wash with mild soap and warm water or with aircraft plastic cleaner. Use a soft cloth or sponge in a straight back and forth motion. Do not rub harshly.
- (3) Remove oil and grease with a cloth moistened with kerosene.

CAUTION

Do not use gasoline, alcohol, benzene, carbon tetrachloride, thinner, acetone, or window cleaning sprays.

- (4) After cleaning plastic surfaces, apply a thin coat of hard polishing wax. Rub lightly with a soft cloth. Do not use a circular motion.
- (5) A severe scratch or mar in plastic can be removed by rubbing out the scratch with jeweler's rouge. Smooth both sides and apply wax.

(e) Cleaning Headliner, Side Panels and Seats

- (1) Clean headliner, side panels, and seats with a stiff bristle brush, and vacuum where necessary.
- (2) Soiled upholstery, except leather, may be cleaned with a good upholstery cleaner suitable for the material. Carefully follow the manufacturer's instructions. Avoid soaking or harsh rubbing.

CAUTION

Solvent cleaners require adequate ventilation.

- (3) Leather should be cleaned with saddle soap or a mild hand soap and water.

(f) Cleaning Carpets

To clean carpets, first remove loose dirt with a whisk broom or vacuum. For soiled spots and stubborn stains use a nonflammable dry cleaning fluid. Floor carpets may be cleaned like any household carpet.

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SECTION 9
SUPPLEMENTS

9.1 GENERAL

This section provides information in the form of Supplements which are necessary for efficient operation of the airplane when equipped with one or more of the various optional systems and equipment not provided with the standard airplane.

All of the Supplements provided by this section are "FAA Approved" and consecutively numbered as a permanent part of this Handbook. The information contained in each Supplement applies only when the related equipment is installed in the airplane.

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SUPPLEMENT 1

AIR CONDITIONING INSTALLATION

SECTION 1 - GENERAL

This supplement supplies information necessary for the efficient operation of the airplane when the optional air conditioning system is installed. The information contained within this supplement is to be used "as described" in conjunction with the complete handbook.

This supplement has been "FAA Approved" as a permanent part of this handbook and must remain in this handbook at all times when the optional air conditioning system is installed.

SECTION 2 - LIMITATIONS

- (a) To insure maximum climb performance the air conditioner must be turned "OFF" manually prior to takeoff to disengage the compressor and retract the condenser door. Also the air conditioner must be turned "OFF" manually before the landing approach in preparation for a possible go-around.
- (b) Placards
In full view of the pilot, in the area of the air conditioner controls when the air conditioner is installed:

"WARNING - AIR CONDITIONER MUST BE OFF TO INSURE
NORMAL TAKEOFF CLIMB PERFORMANCE."

In full view of the pilot, to the right of the engine gauges (condenser door light):

"AIR COND DOOR
OPEN"

SECTION 3 - EMERGENCY PROCEDURES

No changes to the basic Emergency Procedures provided by Section 3 of this Pilot's Operating Handbook are necessary for this supplement.

SECTION 4 - NORMAL PROCEDURES

Prior to takeoff, the air conditioner should be checked for proper operation as follows:

- (a) Check aircraft master switch "ON."
- (b) Turn the air conditioner control switch to "ON" and the fan switch to one of the operating positions - the "AIR COND DOOR OPEN" warning light will turn on, thereby indicating proper air conditioner condenser door actuation.
- (c) Turn the air conditioner control switch to "OFF" - the "AIR COND DOOR OPEN" warning light will go out, thereby indicating the air conditioner condenser door is in the up position.
- (d) If the "AIR COND DOOR OPEN" light does not respond as specified above, an air conditioner system or indicator bulb malfunction is indicated and further investigation should be conducted prior to flight.

The above operational check may be performed during flight if an in flight failure is suspected.

The condenser door light is located to the right of the engine instrument cluster in front of the pilot. The door light illuminates when the door is open and is off when the door is closed.

SECTION 5 - PERFORMANCE

Operation of the air conditioner will cause slight decreases in cruise speed and range. Power from the engine is required to run the compressor, and the condenser door, when extended, causes a slight increase in drag. When the air conditioner is turned off there is normally no measurable difference in climb, cruise or range performance of the airplane.

NOTE

To insure maximum climb performance the air conditioner must be turned off manually before takeoff to disengage the compressor and retract the condenser door. Also the air conditioner must be turned off manually before the landing approach in preparation for a possible go-around.

Although the cruise speed and range are only slightly affected by the air conditioner operation, these changes should be considered in preflight planning. To be conservative, the following figures assume that the compressor is operating continuously while the airplane is airborne. This will be the case only in extremely hot weather.

- (a) The decrease in true airspeed is approximately 6 KTS at all power settings.
- (b) The decrease in range may be as much as 45 nautical miles for the 94 gallon capacity.

The climb performance is not compromised measurably with the air conditioner operating since the compressor is declutched and the condenser door is retracted, both automatically, when a full throttle position is selected. When the full throttle position is not used or in the event of a malfunction which would cause the compressor to operate and the condenser door to be extended, a decrease in rate of climb of as much as 100 fpm can be expected. Should a malfunction occur which prevents condenser door retraction when the compressor is turned off, a decrease in rate of climb of as much as 50 fpm can be expected.

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SUPPLEMENT 2

AUTOFLITE II AUTOPILOT INSTALLATION

SECTION 1 - GENERAL

This supplement supplies information necessary for the operation of the airplane when the optional AutoFlite II Autopilot is installed in accordance with STC SA-3054 SW-D. The information contained within this supplement is to be used "as described" in conjunction with the complete handbook.

This supplement has been "FAA Approved" as a permanent part of this handbook and must remain in this handbook at all times when the optional AutoFlite II Autopilot is installed.

SECTION 2 - LIMITATIONS

- (a) Autopilot operation prohibited above 174 KIAS. (Autopilot Vmo)
- (b) Autopilot must be "OFF" for takeoff and landing.

SECTION 3 - EMERGENCY PROCEDURES

- (a) In case of malfunction, PRESS disconnect switch on pilot's control wheel.
- (b) In case of malfunction, overpower autopilot at either control wheel.
- (c) AutoFlite II master switch - OFF.
- (d) In climb, cruise or descent configuration a malfunction with a 3 second delay in recovery initiation may result in 55° bank and a 220' altitude loss.
- (e) In approach configuration, coupled or uncoupled, a malfunction with a 1 second delay in recovery initiation may result in a 20° bank and a 20' altitude loss.

SECTION 4 - NORMAL PROCEDURES

AUTOFLITE II PREFLIGHT INSPECTION

- (a) AutoFlite master switch - ON.
- (b) Rotate Turn Command Knob to left and right. Aircraft control wheels should rotate in corresponding directions.
- (c) With AutoFlite II on, rotate aircraft control wheel to left and right. Only light forces should be required to override roll servo clutch.
- (d) AutoFlite II master switch - OFF - rotate control wheel left and right to assure disengagement.

AUTOFLITE II IN-FLIGHT PROCEDURE

- (a) Engagement
 - (1) Check Turn Command Knob in center detent position.
 - (2) AutoFlite II master switch - ON.
- (b) Disengagement
 - (1) AutoFlite II master switch - OFF.
- (c) Heading Changes
 - (1) Move Trim Knob on instrument for Drift Correction from a Constant Heading.
 - (2) Move Turn Command Knob for left or right banked turns. Rotation of knob to stop will yield an appropriate bank angle to obtain an appropriate standard rate turn. Intermediate settings may be used for lesser turn rates.
- (d) OMNI Tracker
 - (1) Turn Command Knob - move to center detent position and push IN to engage tracker. Aircraft will track desired radial established on NAV 1 (or as selected, if equipped with a NAV Selector Switch).

NOTE

Tracker must be engaged within 10° of being "on course" i.e. VOR course needle centered and aircraft heading within a 10° of VOR course.

- (2) Trim Knob - push IN for high sensitivity. Use high sensitivity position for Localizer tracking and as desired for OMNI tracking.
- (e) Maintain directional trim during all autopilot operations.

SECTION 5 - PERFORMANCE

No changes to the basic performance provided by Section 5 of this Pilot's Operating Handbook are necessary for this supplement.

SUPPLEMENT 3

AUTOCONTROL IIIB AUTOPILOT INSTALLATION

SECTION 1 - GENERAL

This supplement supplies information necessary for the operation of the airplane when the optional Piper AutoControl IIIB is installed in accordance with STC SA-3053 SE-D. The information contained within this supplement is to be used "as described" in conjunction with the complete handbook.

This supplement has been "FAA Approved" as a permanent part of this handbook and must remain in this handbook at all times when the optional Piper AutoControl IIIB Autopilot is installed.

SECTION 2 - LIMITATIONS

- (a) Autopilot operation prohibited above 174 KIAS. (Autopilot Vmo)
- (b) Autopilot must be "OFF" for takeoff and landing.

SECTION 3 - EMERGENCY PROCEDURES

- (a) In an emergency the AutoControl IIIB can be disconnected by:
 - (1) Pushing the roll ON-OFF Rocker Switch "OFF."
- (b) The autopilot can be overpowered at either control wheel.
- (c) An autopilot runaway, with a 3 second delay in the initiation of recovery while operating in climb, cruise or descending flight, could result in a 55° bank and 220' altitude loss.
- (d) An autopilot runaway, with a 1 second delay in the initiation of recovery, during an approach operation, coupled or uncoupled, could result in a 20° bank and 20' altitude loss.
- (e) Emergency Operation with Optional NSD 360A (HSI) Slaved and/or Non-Slaved:

NSD 360A

- (1) Appearance of HDG Flag:
 - a. Check air supply (vac. or pressure) for adequate air supply (4.2 IN-HG min.).
 - b. Check compass circuit breaker.
 - c. Observe display for proper operation.
- (2) To disable heading card-pull circuit breaker and use magnetic compass for directional data.

NOTE

If heading card is not operational, autopilot should not be used.

- (3) With card disabled VOR/LOC and Glide Slope displays are still functional, use card set to rotate card to aircraft heading for correct picture.

SECTION 4 - NORMAL PROCEDURES

PREFLIGHT INSPECTION

(a) AUTOPILOT

- (1) Place Radio Coupler in "HDG" Mode (if installed) and place the AP "ON-OFF" switch to the "ON" position to engage roll section. Rotate roll command knob left and right and observe that control wheel describes a corresponding left and right turn, then center knob.
- (2) Set proper D.G. heading on D.G. and turn HDG bug to aircraft heading. Engage "HDG" mode rocker switch and rotate HDG bug right and left. Aircraft control wheel should turn same direction as bug. Grasp control wheel and manually override servo, both directions.

(b) RADIO COUPLER (OPTIONAL)

- (1) Tune and identify VOR or VOT station. Position Radio Coupler to OMNI Mode. Engage Autopilot "ON" and HDG switches. Set HDG bug to aircraft heading and rotate O.B.S. to cause OMNI indicator needle to swing left and right slowly. Observe that control wheel rotates in direction of needle movement.
- (2) Disengage AP "ON-OFF" switch. Reset Radio Coupler control to HDG.

IN-FLIGHT

(a) Trim airplane (ball centered).

(b) Check air pressure vacuum to ascertain that the directional gyro and attitude gyro are receiving sufficient air.

(c) Roll Section:

- (1) To engage, center Roll knob, push AP "ON-OFF" switch to "ON" position. To turn, rotate console ROLL knob in desired direction. (Maximum angle of bank should not exceed 30°.)
- (2) For heading mode, set directional gyro with magnetic compass. Push directional gyro HDG knob in, rotate bug to aircraft heading. Push console heading rocker (HDG) switch to "ON" position. To select a new aircraft heading, push D.G. heading knob "IN" and rotate, in desired direction of turn, to the desired heading.

(d) Radio Coupling VOR-ILS with H.S.I. Type Instrument Display. (Optional)

(1) VOR Navigation

- a. Tune and identify VOR Station. Select desired course by rotating CRS knob of H.S.I.
- b. Select OMNI mode on Radio Coupler.
- c. Select HDG mode on autopilot console to engage coupler. Aircraft will turn to a 45° intercept angle to intercept the selected VOR course. Intercept angle magnitude depends on radio needle off course magnitude, 100% needle deflection will result in 45° intercept with the intercept angle diminishing as the needle off set diminishes.
- d. NAV mode - NAV mode provides reduced VOR sensitivity for tracking weak, or noisy VOR signals. NAV mode should be selected after the aircraft is established on course.

- (2) ILS-LOC Front Course
 - a. Set inbound, front, localizer course on H.S.I.
 - b. Select LOC-Normal on Radio Coupler to intercept and track inbound on the localizer. Select LOC-REV to intercept and track outbound to the procedure turn area.
 - c. Select HDG Mode on autopilot console to engage coupler.
- (3) ILS - Back Course
 - a. Set inbound, front localizer course on H.S.I.
 - b. Select LOC-REV on radio coupler to intercept and track inbound on the back localizer course. Select LOC-NORM to intercept and track outbound on the back course to the procedure turn area.
 - c. Select HDG mode on autopilot console to engage coupler.
- (e) Radio Coupling - VOR/ILS with Standard directional gyro. (Optional)

Radio Coupler operation in conjunction with a standard directional gyro and VOR/LOC display differs from operation with an integrated display (H.S.I.) only in one respect. The HDG bug is used as the radio course datum and therefore must be set to match the desired VOR course as selected on the O.B.S.

 - (1) For VOR Intercepts and Tracking:

Select the desired VOR course and set the HDG bug to the same heading. Select OMNI mode on the coupler and HDG Mode on the autopilot console.
 - (2) For ILS Front Course Intercepts and Tracking:

Tune the localizer frequency and place the HDG bug on the inbound, front course heading. Select LOC-NORM mode on the coupler and HDG mode on the autopilot console.
 - (3) For LOC Back Course Intercepts and Tracking:

Tune the localizer frequency and place the HDG bug on the inbound course heading to the airport. Select LOC-REV mode with coupler and HDG mode on the autopilot console.

SECTION 5 - PERFORMANCE

No changes to the basic performance provided by Section 5 of the Pilot's Operating Handbook are necessary for this supplement.

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SUPPLEMENT 4

ALTIMATIC IIIC AUTOPILOT INSTALLATION

SECTION 1 - GENERAL

This supplement supplies information necessary for the operation of the airplane when the optional AltiMatic IIIC Autopilot is installed in accordance with STC SA-3253 SW-D. The information contained within this supplement is to be used "as described" in conjunction with the complete handbook.

This supplement has been "FAA Approved" as a permanent part of this handbook and must remain in this handbook at all times when the optional AltiMatic IIIC Autopilot is installed.

SECTION 2 - LIMITATIONS

- (a) Autopilot operation prohibited above 174 KIAS. (Autopilot Vmo)
- (b) Autopilot operation prohibited with more than 2 notches of flap extension.
- (c) Autopilot must be "OFF" during takeoff and landing.
- (d) A placard stating "Conduct Trim Check prior to flight (see POH)" to be installed in clear view of pilot.

SECTION 3 - EMERGENCY PROCEDURES

This aircraft is equipped with a Master Disconnect/Interrupt Switch on the pilot's control wheel. When the switch button is depressed it will disconnect the autopilot. When depressed and held it will interrupt all Electric Elevator Trim Operations. Trim operations will be restored when the switch is released. If an autopilot or trim emergency is encountered, do not attempt to determine which system is at fault. Immediately depress and hold the Master Disconnect/Interrupt button. Turn off autopilot and trim master switch and retrim aircraft, then release the interrupt switch.

NOTE

During examination of this supplement, the pilot is advised to locate and identify the autopilot controls, the trim master switch and circuit breakers for both systems.

- (a) In the event of an autopilot malfunction the autopilot can be:
 - (1) Overpowered at either control wheel.

CAUTION

Do not overpower autopilot pitch axis for periods longer than 3 seconds because the autotrim system will operate in a direction to oppose the pilot and will, thereby, cause an increase in the pitch overpower forces.

- (2) Disconnected by depressing the Master Disconnect/Interrupt Switch.
 - (3) Disconnected by depressing the Trim Switch "AP OFF" bar.
 - (4) Disconnected by pushing the roll rocker switch "OFF."
- (b) In the event of a trim malfunction:
- (1) Depress and hold the Master Trim Interrupt Switch.
 - (2) Trim Master Switch - "OFF." Retrim aircraft as necessary using manual trim system.
 - (3) Release Master Interrupt Switch - be alert for possible trim action.
 - (4) Trim Circuit Breaker - Pull. Do not operate trim until problem is corrected.
 - (5) If the trim system operates only in one direction, pull the trim circuit breaker and do not operate the trim system until corrective action is taken. Monitor autopilot operation closely when operating without trim follow-up.
- (c) If a trim runaway occurs with the autopilot operating, the above procedure will disconnect the autopilot which will immediately result in higher control wheel forces. Be prepared to manually retrim, as necessary to eliminate undesirable forces.
- (d) Altitude Loss During Malfunction:
- (1) An autopilot malfunction during climb, cruise or descent with a 3 second delay in recovery initiation could result in as much as 55° of bank and 350 feet of altitude loss.
 - (2) An autopilot malfunction during an approach with a 1 second delay in recovery initiation could result in as much as 22° of bank and 80 feet altitude loss. Maximum altitude loss measured in approach configuration and operating either coupled or uncoupled.

EMERGENCY OPERATION WITH OPTIONAL HSI
(Slaved and/or Non-Slaved)

- (a) Appearance of HDG Flag:
- (1) Check air supply gauge (vac or pressure) for adequate air supply (4 in. Hg min.).
 - (2) Check NSD 360 circuit breaker.
 - (3) Observe display for proper operation.

Note: If heading card is not operational, autopilot should not be used.

- (b) To disable heading card - pull circuit breaker and use magnetic compass for directional data.
- (c) With card disabled - VOR and Glide Slope displays are still functional; use card set to rotate card to aircraft heading for correct picture.
- (d) Slaving Failure - (i.e. failure to self correct for gyro drift):
- (1) Check gyro slaving switch is set to No. 1 position (if equipped with Slave No. 1 - No. 2 switch) or "Slaved" position when equipped with Slaved and Free Gyro Mode Switches.
 - (2) Check for HDG Flag.
 - (3) Check compass circuit breaker.
 - (4) Reset heading card while observing slaving meter.

NOTE

Dead slaving meter needle or a needle displaced fully one direction indicates a slaving system failure.

- (5) Select slaving amplifier No. 2, if equipped. If not equipped, proceed to step 7.
- (6) Reset heading card while checking slaving meter. If proper slaving indication is not obtained.
- (7) Switch to free gyro mode and periodically set card as on unslaved gyro.

NOTE

In the localizer mode, the "TO-FROM" arrows may remain out of view, depending upon the design of the NAV converter and in the installation.

SECTION 4 - NORMAL PROCEDURES

PREFLIGHT INSPECTION - AUTOPILOT

(a) Roll Section

- (1) Place Radio Coupler in "Heading" mode and place roll rocker switch "ON" to engage roll section. Rotate roll command knob left and right and observe that control wheel describes a corresponding left and right turn, then center knob.
- (2) Set proper D.G. Heading on D.G. and turn Heading Bug to aircraft heading. Engage "Heading" mode rocker switch and rotate heading bug right and left. Aircraft control wheel should turn same direction as bug. Grasp control wheel and manually override servo, both directions.
- (3) Disengage autopilot by depressing trim switch. Check aileron operation is free and autopilot is disconnected from controls.

(b) Pitch Section

- (1) Engage "Roll" rocker switch.
- (2) Center pitch command disc and engage "Pitch" rocker switch.
- (3) Rotate pitch command disc up and then down and check control yoke moves same direction. Check to see that servo can be overridden by hand at control wheel.

NOTE

Autopilot might not be able to raise elevators, on ground, without assistance from pilot.

- (4) Hold control yoke and disengage autopilot by pressing Master Autopilot Disconnect/Trim Interrupt Switch button. Check Roll and Pitch controls to assure autopilot has disconnected.

General

This aircraft is equipped with a Command Trim System designed to withstand any type of single malfunction, either mechanical or electrical, without uncontrolled operation resulting. The preflight check procedure is designed to uncover hidden failures that might otherwise go undetected. Proper operation of the electric elevator trim system is predicated on conducting the following preflight check before each flight. If the trim system fails any portion of the procedure, pull the trim circuit breaker out until trim system is repaired. Substitution of any trim system component for another model is not authorized. For emergency interrupt information, refer to Emergency Procedures Section of this Supplement.

Command Electric Trim Switch

The Command Electric Trim Switch on the left hand portion of the pilot's control wheel has two functions:

- (1) When the top bar (AP OFF) is pressed, it disconnects the Autopilot.
- (2) When the top bar is pressed AND the rocker is moved forward, nose down trim will occur, when moved aft, nose up trim will occur.

- (c) Pre-Flight: Command Trim - Before Each Flight
 - (1) Check trim circuit breaker - IN.
 - (2) Trim Master Switch - ON.
 - (3) AP OFF - Check normal trim operation - UP. Grasp trim control and check override capability. Check nose down operation. Recheck override.
 - (4) Activate center bar only - Push rocker fore and aft - only. Trim should not operate with either separate action.
- (d) Autotrim - Before Each Flight
 - (1) AP ON - (Roll and Pitch Sections) Check automatic operation by activating autopilot pitch command UP then DN. Observe trim operation follows pitch command direction.

NOTE

In autopilot mode, there will be approximately a 3 second delay between operation of pitch command and operation of trim.

- (2) Press center bar (AP OFF) - release - check autopilot disengagement.
- (3) Rotate trim control to check manual trim operation. Reset to takeoff position prior to takeoff.

AUTOPILOT IN-FLIGHT PROCEDURE

- (a) Trim airplane (Ball Centered).
- (b) Check air pressure or vacuum to ascertain that the directional gyro and attitude gyro are receiving sufficient air.
- (c) Roll Section
 - (1) To engage. Center ROLL knob, push ROLL rocker to "ON" position. To turn, rotate console ROLL knob in desired direction.
 - (2) For heading mode, set directional gyro with magnetic compass. Push directional gyro HDG knob in, rotate to select desired heading. Push console heading rocker (HDG) to "ON" position. (Maximum angle to bank will be 20° with heading lock engaged.)
- (d) Pitch Section (Roll section must be engaged prior to pitch section engagement).
 - (1) Center pitch trim indicator with the pitch command disc.
 - (2) Engage pitch rocker switch. To change attitude, rotate pitch command disc in the desired direction.
- (e) Altitude Hold

Upon reaching desired or cruising altitude, engage altitude hold mode rocker switch. As long as Altitude Hold mode rocker is engaged, aircraft will maintain selected altitude. For maximum passenger comfort, rate of climb or descent should be reduced to approximately 500 FPM prior to altitude hold engagement. For accurate Altitude Holding below 90 KIAS lower flaps one or two notches.

NOTE

Prior to disengaging Altitude Hold mode, rotate Pitch Command to center.

- (f) Radio Coupling VOR-ILS with H.S.I. type instrument display. (Optional)
- (1) VOR Navigation
 - a. Tune and identify VOR Station. Select desired course by rotating CRS knob of H.S.I.
 - b. Select OMNI mode on Radio Coupler.
 - c. Select HDG mode on autopilot console to engage coupler. Aircraft will turn to a 45° intercept angle to intercept the selected VOR course. Intercept angle magnitude depends on radio needle off - course magnitude, 100% needle deflection will result in 45° intercept angle, diminishing as the needle off-set diminishes.
 - d. NAV mode - NAV mode provides reduced VOR sensitivity for tracking weak, or noisy, VOR signals. NAV mode should be selected after the aircraft is established on course.
 - (2) ILS-LOC Front Course
 - a. Set inbound, front, localizer course on H.S.I.
 - b. Select LOC-Normal on Radio Coupler to intercept and track inbound on the localizer. Select LOC-REV to intercept and track the localizer course outbound to procedure turn area.
 - c. Engage HDG mode on autopilot console to engage coupler.
 - (3) ILS - Back Course
 - a. Set inbound, front, localizer course on H.S.I.
 - b. Select LOC-REV, on radio coupler to intercept and track inbound on the back localizer course. Select LOC-NORM to intercept and track outbound on the back course to the procedure turn area.
 - c. Engage HDG mode on autopilot console to engage coupler.
- (g) Radio Coupling - VOR/ILS with standard directional gyro. (Optional)
- Radio Coupler operation in conjunction with a standard directional gyro and VOR/LOC display differs from operation with an integrated display (H.S.I.) only in one respect. The HDG bug is used as the radio course datum and therefore must be set to match the desired VOR/ILS course as selected on the O.B.S.
- (1) For VOR Intercepts and Tracking:

Select the desired VOR Course and set the HDG bug to the same heading. Select OMNI mode on the coupler and engage HDG mode on the autopilot console.
 - (2) For ILS Front Course Intercepts and Tracking:

Tune the localizer frequency and place the HDG bug on the inbound, front course heading. Select LOC-NORM mode on the coupler and engage HDG mode on the autopilot console.
 - (3) For LOC Back Course Intercepts and Tracking:

Tune the localizer frequency and place the HDG bug on the inbound course heading to the airport. Select LOC-REV mode on the coupler and engage HDG mode on the autopilot console.

(h) Coupled Approach Operations

(1) VOR or LOC

- a. After arrival at the VOR Station, track outbound to the procedure turn area as described in Section 4 (f) or (g) above as appropriate. Slow to 90-95 KIAS, while inbound to F.A.F. and lower one or two notches of flaps.
- b. Use HDG mode and Pitch or Altitude Hold modes as appropriate during procedure turn.
- c. At the F.A.F. inbound, return to pitch mode for control of descent and lower landing gear.
- d. At the M.D.A. Select Altitude Hold mode and add power for level flight. Monitor altimeter to assure accurate altitude control is being provided by the autopilot.
- e. Go Around. For missed approach select desired pitch attitude with pitch command disc and disengage altitude hold mode. This will initiate the pitch up attitude change. Immediately add takeoff power and monitor Altimeter and rate of climb for positive climb indication. After climb is established, retract flaps and gear. Adjust attitude as necessary for desired airspeed and select HDG mode for turn from the VOR final approach course.

(2) ILS - Front Course Approach With Glide Slope Capture. (Optional)

- a. Track inbound to L.O.M. as described in Section 4 (f) or (g) above and in Altitude Hold mode.
- b. Inbound to L.O.M. slow to 90-100 KIAS and lower flaps one or two notches.
- c. Automatic Glide Slope capture will occur at Glide Slope intercept if the following conditions are met:
 1. Coupler in LOC-Normal mode.
 2. Altitude Hold mode engaged (Altitude Rocker on Console).
 3. Under Glide Slope for more than 20 seconds.
 4. Localizer radio frequency selected on NAV Receiver.
- d. At Glide Slope Intercept immediately lower landing gear and reduce power to maintain approximately 90-95 KIAS on final approach. Glide Slope capture is indicated by lighting of the green Glide Slope engage Annunciator Lamp and by a slight pitch down of the aircraft.
- e. Monitor localizer and Glide Slope raw data throughout approach. Adjust power as necessary to maintain correct final approach airspeed. All power changes should be of small magnitude and smoothly applied for best tracking performance. Do not change aircraft configuration during approach while autopilot is engaged.
- f. Conduct missed approach maneuver as described in (h) (1) e. above.

NOTE

Glide Slope Coupler will not automatically decouple from Glide Slope. Decoupling may be accomplished by any of the following means:

1. Disengage Altitude Mode.
2. Switch Radio Coupler to HDG Mode.
3. Disengage Autopilot.

SECTION 5 - PERFORMANCE

No changes to the basic performance provided by Section 5 of the Pilot's Operating Handbook are necessary for this supplement.

SUPPLEMENT 5

PIPER ELECTRIC PITCH TRIM

SECTION 1 - GENERAL

This supplement supplies information necessary for the operation of the airplane when the optional Piper Electric Pitch Trim is installed. The information contained within this supplement is to be used "as described" in conjunction with the complete handbook.

This supplement has been "FAA Approved" as a permanent part of this handbook and must remain in this handbook at all times when the optional Piper Electric Pitch Trim is installed.

SECTION 2 - LIMITATIONS

No changes of the basic limitations provided by Section 2 of this Pilot's Operating Handbook are necessary for this supplement.

SECTION 3 - EMERGENCY PROCEDURES

- (a) In case of malfunction, PRESS disconnect switch located above the ignition switch.
- (b) In case of malfunction, overpower the electric trim at either control wheel.
- (c) Maximum altitude change with a 4 second delay in recovery initiation is 800 feet and occurs in the descent configuration. Maximum altitude change in the approach configuration with a 4 second recovery delay is 100 feet.

SECTION 4 - NORMAL PROCEDURES

The electric trim system may be turned ON or OFF by a switch located above the ignition switch. The pitch trim may be changed when the electric trim system is turned on either by moving the manual pitch trim control wheel or by operating the trim control switch on the pilot's control yoke. To prevent excessive speed increase in the event of an electric trim run-away malfunction, the system incorporates an automatic disconnect feature which renders the system inoperative above approximately 169 KIAS. The disconnected condition does not affect the manual trim system.

SECTION 5 - PERFORMANCE

No changes to the basic performance provided by Section 5 of this Pilot's Operating Handbook are necessary for this supplement.

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SUPPLEMENT 6

KFC 200 AUTOMATIC FLIGHT CONTROL SYSTEM (WITH FLIGHT DIRECTOR INSTALLATION)

SECTION 1 - GENERAL

This manual is to acquaint the pilot with the operation of the KFC 200 Automatic Flight Control System with optional Flight Director as installed in the PA-32RT-300, Lance II. The aircraft must be operated within the limitations herein specified.

This supplement has been "FAA Approved" as a permanent part of this handbook based on King STC SA1430CE, and must remain in this handbook at all times when the optional King KFC 200 Automatic Flight Control System is installed.

The KFC 200 is certified in this airplane with two-axis control, pitch and roll. The system may be operated as a flight director alone with the pilot steering the airplane to the flight director command presentation or the autopilot can be engaged to steer the airplane to the flight director command presentation.

The airplane is equipped with an electric pitch trim system which is also used to accomplish automatic trimming to unload the autopilot elevator servo so that autopilot disengagement does not result in transient airplane motion. An autotrim/electric pitch trim monitor is provided in the autopilot. Autotrim and/or electric pitch trim faults are visually annunciated on the Mode Annunciator and accompanied by an audible warning.

ABBREVIATIONS

ALT	Altitude or Altitude Hold
AP or A/P	Autopilot
APPR	Approach
ARM	System Arm for Capture
BC	Back Course
CDI	Course Deviation Indicator or Control
CPLD	Coupled
CWS	Control Wheel Steering
DISC	Disconnect
FCS	Flight Control System
FD	Flight Director System
FDI	Flight Director Indicator
GA	Go Around
GS	Glideslope
HDG	Heading Select
NAV	Navigation
PAH	Pitch Attitude Hold
PNI	Pictorial Navigation Indicator

SECTION 2 - LIMITATIONS

- (a) During autopilot operation, pilot must be seated at the controls with seat belt fastened. Operation is restricted to left side pilot position.
- (b) Maximum speed for autopilot operation is 181 kts indicated airspeed (KIAS). Minimum speed for autopilot operation is 85 kts indicated airspeed (KIAS).
- (c) During autopilot operation, the wing flaps must not be extended beyond 25° (2 notches).
- (d) The autopilot must be disengaged during takeoff and landing.
- (e) System approved for Category I operation only (APPR selected).
- (f) Autopilot attitude command limits:
 - Pitch $\pm 15^\circ$
 - Roll $\pm 25^\circ$
 - Yaw NA
- (g) The maximum fuel imbalance must not exceed 12 gallons (approximately one half hour flight time) during autopilot operation. If the autopilot is disengaged with a large fuel imbalance, a roll transient control force will occur.
- (h) Placards:
 - Location - Pilot's control wheel, left horn:

AP TRIM
DISC INTERRUPT

- Pilot's control wheel, left horn:

CWS

- Pilot's control wheel, left horn:

TRIM DN/UP

- Throttle lever:

GA

SECTION 3 - EMERGENCY PROCEDURES

(a) AUTOPILOT DISENGAGEMENT

Disengage AP and/or prevent engagement by:

- (1) Pilot's A/P DISC switch.
- (2) AP engage lever on Mode Controller.
- (3) Pulling the AUTOPILOT circuit breaker.
- (4) Turning BAT-MASTER switch OFF.
- (5) Turning FCS MASTER switch OFF.
- (6) Depressing GA switch on engine throttle.

(b) AUTOMATIC AUTOPILOT DISENGAGEMENT

Any of the following conditions will cause AP to automatically disengage:

- (1) External power failure.
- (2) Actuating manual electric pitch trim.
- (3) Internal Flight Control System failure.
- (4) With KCS 55A system a loss of compass valid (displaying HDG flag) disengages the AP and FD when a mode using Heading information is engaged. With compass flag present only FD and vertical modes can be selected.

(c) MANUAL ELECTRIC PITCH TRIM DISENGAGEMENT

Manual electric pitch trim can be disengaged by pressing AP DISC/TRIM INTERRUPT switch and holding it down until recovery can be made, then turn off FCS MASTER switch and manually retrim the airplane using the manual trim control wheel. After the airplane is trimmed out, pull the (PITCH TRIM) breaker and turn the FCS MASTER switch back on.

NOTE

IF (PITCH TRIM) CIRCUIT BREAKER IS PULLED, AP CAN BE ENGAGED/RE-ENGAGED BUT AIRPLANE ELECTRIC TRIM SYSTEM WILL BE DISABLED (TRIM LIGHT ANNUNCIATOR FLASHES) AND AIRPLANE MUST BE TRIMMED MANUALLY TO MAINTAIN PITCH CONTROL AUTHORITY.

(d) MAXIMUM ALTITUDE LOSSES DUE TO AUTOPILOT MALFUNCTIONS

Configuration

- (1) Cruise, Climb, Descent
- (2) Maneuvering
- (3) APPR

Altitude Loss

300 feet
100 feet
100 feet

CAUTION

OVERPOWERING THE AUTOPILOT IN THE PITCH AXIS FOR PERIODS OF 3 SECONDS OR MORE WILL RESULT IN THE AUTOTRIM SYSTEM OPERATING IN THE DIRECTION TO OPPOSE THE PILOT AND WILL, THEREFORE, CAUSE AN INCREASE IN THE PITCH OVERPOWER FORCES AND IF AUTOPILOT DISENGAGES WOULD RESULT IN A PITCH TRANSIENT CONTROL FORCE.

SECTION 4 - NORMAL PROCEDURES

- (a) The BAT MASTER switch function is unchanged and can be used in an emergency to shut off all electrical power while the problem is isolated.
- (b) The FCS MASTER switch supplies power to the AUTOPILOT and PITCH TRIM system.
- (c) The KFC 200 is controlled by the following circuit breakers:

AUTOPILOT - This supplies power to the FCS KC 295 Computer, KC 290 Mode Controller, KA 285 Annunciator panel, AP Pitch and Roll servos and KI 256.

COMPASS SYSTEM - This supplies power to the KCS 55A Compass System.

PITCH TRIM - This supplies power to the FCS autotrim and manual electric pitch trim systems.

(d) PILOT'S CONTROL WHEEL SWITCH FUNCTIONS

AP DISC/TRIM INTERRUPT - This emergency disconnect switch will disengage the AP, interrupt the power to the electric trim system and disconnect all FD Modes. To resume AP control, a FD Mode and the AP lever on the Mode Controller must be re-engaged. In the event of electric trim or autotrim failure, the switch can be held depressed, which removes all power from the trim system to allow the pilot time to turn off the FCS MASTER switch and pull the (PITCH TRIM) circuit breaker.

CWS - This switch when depressed and held will allow the pilot to manually fly the airplane without disengaging the AP. When the switch is released, the AP will resume control (within the pitch and roll attitude limits). The CWS switch will resync the FD in PAH, or ALT hold mode and will transfer the GA mode to PAH. When the CWS is held depressed Manual Electric Trim may be operated without disengaging the AP.

TRIM UP/DN - Manual Electric pitch trim is activated by a dual action type switch that requires both halves be moved simultaneously for actuating up or down trim commands. Operation of the manual electric pitch trim switch will disengage the AP lever switch on the Mode Controller (except when CWS switch is held depressed as previously noted).

GA - The GA switch is located on the throttle and the operation of the switch will indicate a fixed angle of climb of 6° on the FDI. Selection of the GA Mode when in the APPR or NAV CPLD Mode will disengage the mode and revert to the FD Mode (wings level) for lateral steering. The AP, if engaged, will disengage. However, the AP may be engaged/re-engaged with the GA Mode selected and will follow the FDI pitch command to climb at the fixed angle.

(e) FCS WARNING FLAGS AND ANNUNCIATORS DESIGNATION AND OPERATION

FD - The KI 256 Flight Director Indicator command bars will be biased out of view whenever the system is invalid or a FD mode is not engaged.

HDG - This warning flag mounted in the Pictorial Navigation Indicator will be in view whenever the Directional Gyro information is invalid. If a HDG invalid occurs with either NAV, APPR or HDG modes selected the AP and/or FD is disengaged. Basic FD mode may then be re-engaged along with any vertical mode and the AP re-engaged.

TRIM - The TRIM warning light, located in the lower right corner of the annunciator panel, will flash and be accompanied by an audible warning whenever autotrim and/or manual electric pitch trim failures occur. The trim servo motor running without a command is monitored on autotrim and manual trim. The trim servo motor not running when commanded to run and the trim servo motor running in the wrong direction are monitored on Autotrim only. The TRIM warning light flashes four times and the audible warning sounds when the test switch on the Mode Controller is depressed.

GS - The Glideslope valid (GS pointer being in view on PNI) has to be present before GS may couple. If, after GS CPLD, the valid is lost, the system will flash the GS Annunciator and transfer from GS CPLD to PAH with the FDI pitch steering bar providing pitch attitude steering information. If the GS valid returns the system will revert back to GS CPLD.

NAV - The NAV or APPR Modes (ARM or CPLD) may be selected and will function with or without a NAV warning flag present. The FDI bank steering will continue to provide steering information with or without a valid NAV signal.

(f) BEFORE ENGAGING FLIGHT CONTROL SYSTEM

- (1) Check that all circuit breakers for the system are in.
- (2) Allow sufficient time for gyros to come up to speed and system warm-up. (3-4 minutes)

- (g) PREFLIGHT CHECK (Perform prior to each flight)
- (1) With no modes engaged and power applied to all systems, depress the Test Button on the Mode Controller. All annunciators will be illuminated on the annunciator panel, including the three marker lights, if the airplane uses the KA 285 as a remote marker annunciator. Also, the red TRIM failure light will flash. At least four or more flashes must be observed to indicate proper operation of the autotrim/manual electric pitch trim feature and audible warning should sound.
 - (2) With the AP disengaged, run the following manual electric pitch trim checks.
 - a. Verify that the PITCH TRIM circuit breaker is in.
 - b. Actuate the left-side switch to the fore and aft positions. The trim solenoid should engage, but the trim should not run. Actuate the right-side switch to the fore and aft positions. The trim solenoid should not engage and the trim should not run.
 - c. Grasping the manual trim wheel, run the trim both up and down and check the overpower capability. (Check that the trim indicator moves with the wheel.)
 - d. Press the AP DISC/TRIM INTERRUPT switch down and hold. The manual electric pitch trim will not operate either up or down.
 - (3) Engage the FD. Then engage the AP, depress the CWS switch, center the flight controls and then release the CWS switch. Apply force to the controls to determine if the AP can be overpowered.
 - (4) Check the operation of the pilot's control wheel switch functions.
 - (5) Engage the FD and AP and put in a pitch (UP) command using the vertical trim switch on the Mode Controller. Hold the control column to keep it from moving and observe the autotrim run in the nose-up direction after approximately three seconds delay. Use the vertical trim switch and put in a pitch (DN) command. Hold the control column and observe that the autotrim runs in the nose-down direction after approximately three seconds.
 - (6) Engage the HDG mode and the AP. Set the HDG bug to command a right turn. The control wheel will rotate clockwise. Set the HDG bug to command a left turn. The control wheel will rotate counterclockwise.

CAUTION

DISENGAGE THE AP AND CHECK THAT THE AIRPLANE MANUAL PITCH TRIM IS IN THE TAKEOFF POSITION PRIOR TO TAKEOFF.

NOTE

IF THE AUTOPILOT CIRCUIT BREAKER IS TRIPPED, THE RED "TRIM" FAILURE LIGHT ON THE ANNUNCIATOR PANEL WILL BE DISABLED AND THE AUDIBLE WARNING WILL CONTINUOUSLY SOUND INDICATING THAT THE FAILURE LIGHT IS DISABLED. IN THIS EVENT THE "PITCH TRIM" CIRCUIT BREAKER SHOULD BE PULLED AND INFLIGHT TRIM ACCOMPLISHED BY USING THE MANUAL PITCH TRIM WHEEL.

(h) IN-FLIGHT OPERATION

(1) Engage Procedure:

After takeoff, clean up airplane and establish climb. Engage the FD mode first, monitor flight controls and engage AP. The pitch attitude will lock on any attitude up to 15° pitch attitude.

Engaging and holding the CWS switch allows the pilot to momentarily revert to manual control while retaining his previous modes, except GA, and conveniently resuming that profile at his discretion.

(2) Disengage Procedure:

Check the airplane trim by monitoring the command bars before disengaging the AP. While monitoring the flight controls, disengage the system by one of the following methods: depressing the pilot's AP DISC; by operation of the manual electric pitch trim switch; or by the operation of the engage lever on the Mode Controller. The AP light on the annunciator panel will flash at least four times and remain off to indicate that the AP is disengaged. To deactivate the flight director system, depress the FD switch on the Mode Controller or press the AP DISC/TRIM INTERRUPT switch on the pilot's control wheel.

(3) Flight Director Mode (FD):

The FD mode must be engaged before the AP can be engaged. The FD alone indicates PAH and wings level. The pilot may choose to fly the FDI commands manually, without the AP engaged, by depressing the FD mode switch on the Mode Controller and selecting any of the other modes he wishes to follow. When the AP is engaged, the airplane will automatically follow the FDI commands. The FD may be disengaged by depressing the FD mode switch on the Mode Controller at any time the AP is not engaged or by pressing the AP DISC/TRIM INTERRUPT switch on the pilot's control wheel with or without the AP engaged. FD mode engagement is displayed on the annunciator.

NOTE

THE "VERTICAL TRIM" SWITCH, LOCATED ON THE MODE CONTROLLER, MAY BE USED TO TRIM THE COMMAND PITCH ATTITUDE AT A RATE OF ONE DEGREE PER SECOND (THE PITCH ATTITUDE DEGREES LEGEND ON THE AIRPLANE ATTITUDE INDICATOR WILL NOT SERVE TO INDICATE ACCURATE FDI PITCH STEERING BAR PITCH ATTITUDES IN DEGREES).

(4) Altitude Hold Mode (ALT):

When the ALT switch on the Mode Controller is pressed, the FDI will provide commands for maintaining the pressure altitude existing at the time the switch is depressed. For smooth operation, engage the ALT at no greater than 500 feet per minute climb or descent. The ALT will automatically disengage when glideslope couples or the GA switch is depressed. ALT hold may be turned off at any time by depressing the ALT switch. ALT engagement is displayed on the annunciator panel.

NOTE

THE "VERTICAL TRIM" SWITCH, LOCATED ON THE MODE CONTROLLER, MAY BE USED TO CHANGE OR TRIM THE COMMAND ALTITUDE UP OR DOWN AT 500 TO 700 FPM WITHOUT DISENGAGING THE MODE. THE NEW PRESSURE ALTITUDE THAT EXISTS WHEN THE SWITCH IS RELEASED WILL THEN BE HELD.

(5) Heading Mode (HDG):

Set the heading bug to the desired heading on the PNI, depress the HDG switch on the Mode Controller and HDG will be displayed on the annunciator panel. The airplane FDI and/or AP will command a turn to the heading selected and hold. The pilot may then choose any new heading by merely setting the bug on a new heading. The airplane FDI and/or AP will automatically command a turn in the direction of the new setting. To disengage the HDG Mode, depress the HDG switch on the Mode Controller and observe the HDG light go out on the annunciator. The HDG mode will automatically disengage when APPR or NAV CPLD is achieved.

(6) Navigation Mode (NAV):

The Navigation mode may be selected by tuning the NAV receiver to the desired frequency, setting the CDI to the desired radial and depressing the NAV switch on the Mode Controller. The annunciator will indicate NAV ARM until intercepting the selected course, unless the NAV switch is engaged with wings level and a centered needle on the CDI. Then the mode will go directly to NAV CPLD as displayed on the annunciator panel. The system can intercept at any angle up to 90° and will always turn toward the course pointer. If a condition requiring a capture exists at mode engagement, the pilot is required to set up an intercept angle using either HDG or FD mode. NAV may be disengaged by depressing the NAV switch or by engaging HDG when in NAV CPLD or by engaging APPR when in NAV CPLD/ARM.

CAUTION

THE "NAV" MODE OF OPERATION WILL CONTINUE TO PROVIDE AIRPLANE COMMAND AND/OR CONTROL WITHOUT A VALID VOR/LOC SIGNAL (NAV FLAG IN VIEW).

(7) Approach Mode (APPR):

The Approach mode may be selected by tuning the NAV receiver to the desired VOR or LOC frequency, setting the CDI to the desired radial or inbound course and depressing the APPR switch on the Mode Controller. The annunciator will indicate APPR ARM until the course is intercepted unless the APPR switch is engaged with the wings level and there is a centered needle on the CDI. In that situation, the mode will go directly to APPR CPLD as displayed on the annunciator panel.

The system can intercept at any angle up to 90° and will always turn toward the course pointer. See approach procedure for more detail. APPR mode can be disengaged by depressing the APPR switch on the Mode Controller, by depressing the GA switch on the engine throttle control, or by engaging HDG or NAV when in APPR CPLD. The annunciator panel indicates the status of the approach mode.

CAUTION

THE "APPR" MODE OF OPERATION WILL CONTINUE TO PROVIDE AIRPLANE COMMAND AND/OR CONTROL WITHOUT A VALID VOR/LOC SIGNAL (NAV FLAG IN VIEW).

(8) Back Course Mode (BC):

For BC operation, proceed as for normal approach mode, but engage BC after selecting APPR. The BC switch reverses the signals in the computer and cannot be engaged without a LOC frequency selected. BC status is indicated on the annunciator panel. BC mode can be disengaged by depressing either the BC, APPR or GA switches, or by selecting other than a LOC frequency on the NAV receiver.

(9) Vertical Mode Switch (TRIM DN/UP):

Operation of the vertical trim switch on the Mode Controller provides a convenient means of adjusting the Alt hold or PAH angle function without disengaging the mode.

(10) Go Around Mode (GA):

The GA mode may be engaged at any time by depressing the GA switch on the engine throttle. GA will illuminate on the annunciator panel indicating mode status. The GA mode provides a fixed pitch up angle indication on the FDI that will command the best rate of climbout. The AP, if engaged, will disengage. GA will cancel all other vertical modes as well as APPR or NAV CPLD.

(i) VOR PROCEDURES

- (1) Tune NAV receiver to appropriate frequency.
- (2) Set a desired heading with the HDG bug to intercept the radial and engage HDG and AP (maximum recommended intercept angle - 90°).
- (3) Select the desired radial and engage NAV. The FCS will remain on HDG as indicated on the annunciator panel and in ARM on the NAV mode. When the airplane intercepts the beam, the system will automatically couple and track in NAV mode and indicate CPLD on the annunciator panel.
- (4) A new course may be selected over the VOR station when operating in the NAV mode, by selecting a new radial when the To-From indication changes.
- (5) For VOR approach, see approach procedure.

(j) APPROACH PROCEDURES

- (1) Tune ILS or VOR.
- (2) Set CDI to front course.
- (3) Set Heading Bug and engage HDG to intercept selected CDI course at any angle (maximum recommended intercept angle - 90°).
- (4) Engage APPR and note APPR ARM on the annunciator panel.
- (5) When airplane approaches the selected CDI course, APPR will couple, HDG will decouple, the FDI and/or AP will give commands to track LOC or VOR, and CPLD will illuminate on the annunciator panel.
- (6) When the glideslope beam is intercepted, the glideslope will couple automatically and indicate GS on the annunciator panel. If ALT was engaged prior to intercepting the glideslope, it will automatically disengage when GS couples. FDI and/or AP will now provide commands to track LOC and GS. Adjust throttle to control speed on descent. Set HDG bug for missed approach but do not engage HDG.

- (7) When middle marker signal is received, system will automatically switch to a more stable track mode.
- (8) Landing or missed approach.
 - a. Disengage AP and land.
 - b. Go Around by depressing GA switch on engine throttle. The AP if engaged, will disengage. The FDI will indicate a climb. Manually fly the airplane and retrim as required to establish the GA attitude on the FDI. The AP may then be re-engaged. APPR may be engaged for a straight away missed approach or HDG may be engaged to turn to the missed approach heading.
- (k) BACK COURSE PROCEDURE

Same as front course except that BC is engaged after APPR is engaged and the airplane must be set for descent manually by holding the vertical trim switch DN on the Mode Controller or by establishing the desired PAH using the CWS interrupt switch.

SECTION 5 - PERFORMANCE

Installation of the King KFC 200 Flight Control System does not affect the basic performance information presented by Section 5 of this handbook.

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SUPPLEMENT 7

KFC 200 AUTOMATIC FLIGHT CONTROL SYSTEM
(WITHOUT FLIGHT DIRECTOR INSTALLATION)

SECTION 1 - GENERAL

This manual is to acquaint the pilot with the operation of the KFC 200 Automatic Flight Control System as installed in the PA-32RT-300, Lance II. The aircraft must be operated within the limitations herein specified.

This supplement has been "FAA Approved" as a permanent part of this handbook based on King STC SA1430CE, and must remain in this handbook at all times when the optional King KFC 200 Automatic Flight Control System is installed.

The KFC 200 Autopilot is certified in this airplane with two-axis control, pitch and roll.

The airplane is equipped with an electric pitch trim system which is also used to accomplish automatic trimming to unload the autopilot elevator servo so that autopilot disengagement does not result in transient airplane motion. An autotrim/electric pitch trim monitor is provided in the autopilot. Autotrim and/or electric pitch trim faults are visually annunciated on the Mode Annunciator and accompanied by an audible warning.

ABBREVIATIONS

ALT	Altitude or Altitude Hold
AP or A/P	Autopilot
APPR	Approach
ARM	System Arm for Capture
BC	Back Course
CDI	Course Deviation Indicator or Control
CPLD	Coupled
CWS	Control Wheel Steering
DISC	Disconnect
FCS	Flight Control System
FD	Flight Director System
GS	Glideslope
HDG	Heading Select
NAV	Navigation
PAH	Pitch Attitude Hold
PNI	Pictorial Navigation Indicator

SECTION 2 - LIMITATIONS

- (a) During autopilot operation, pilot must be seated at the controls with seat belt fastened. Operation is restricted to left side pilot position.
- (b) Maximum speed for autopilot operation is 181 kts indicated airspeed (KIAS). Minimum speed for autopilot operation is 85 kts indicated airspeed (KIAS).
- (c) During autopilot operation, the wing flaps must not be extended beyond 25° (2 notches).
- (d) The autopilot must be disengaged during takeoff and landing.
- (e) System approved for Category I operation only (APPR selected).
- (f) Autopilot attitude command limits:
 - Pitch $\pm 15^\circ$
 - Roll $\pm 25^\circ$
 - Yaw NA
- (g) The maximum fuel imbalance must not exceed 12 gallons (approximately one half hour flight time) during autopilot operation. If the autopilot is disengaged with a large fuel imbalance, a roll transient control force will occur.
- (h) Placards:
 - Location - Pilot's control wheel, left horn:

AP TRIM
DISC INTERRUPT

- Pilot's control wheel, left horn:

CWS

- Pilot's control wheel, left horn:

TRIM UP/DN

SECTION 3 - EMERGENCY PROCEDURES

- (a) AUTOPILOT DISENGAGEMENT
 - Disengage AP and/or prevent engagement by:
 - (1) Pilot's A/P DISC switch.
 - (2) AP engage lever on Mode Controller.
 - (3) Pulling the AUTOPILOT circuit breaker.
 - (4) Turning BAT MASTER switch OFF.
 - (5) Turning FCS MASTER switch OFF.
- (b) AUTOMATIC AUTOPILOT DISENGAGEMENT
 - Any of the following conditions will cause AP to automatically disengage:
 - (1) External power failure.
 - (2) Actuating manual electric pitch trim.
 - (3) Internal Flight Control System failure.
 - (4) With KCS 55A system a loss of compass valid (displaying HDG flag) disengages the AP and FD when a mode using heading information is engaged. With compass flag present only FD and vertical modes can be selected.

(c) MANUAL ELECTRIC PITCH TRIM DISENGAGEMENT

Manual electric pitch trim can be disengaged by pressing AP DISC/TRIM INTERRUPT switch and holding it down until recovery can be made, then turn off FCS MASTER switch and manually retrim the airplane using the manual trim control wheel. After the airplane is trimmed out, pull the (PITCH TRIM) breaker and turn the FCS MASTER switch back on.

NOTE

IF (PITCH TRIM) CIRCUIT BREAKER IS PULLED, AP CAN BE ENGAGED/RE-ENGAGED BUT AIRPLANE ELECTRIC TRIM SYSTEM WILL BE DISABLED (TRIM LIGHT ANNUNCIATOR FLASHES) AND AIRPLANE MUST BE TRIMMED MANUALLY TO MAINTAIN PITCH CONTROL AUTHORITY.

(d) MAXIMUM ALTITUDE LOSSES DUE TO AUTOPILOT MALFUNCTIONS

Configuration

- (1) Cruise, Climb, Descent
- (2) Maneuvering
- (3) APPR

Altitude Loss
300 feet
100 feet
100 feet

CAUTION

OVERPOWERING THE AUTOPILOT IN THE PITCH AXIS FOR PERIODS OF 3 SECONDS OR MORE WILL RESULT IN THE AUTOTRIM SYSTEM OPERATING IN THE DIRECTION TO OPPOSE THE PILOT AND WILL, THEREFORE, CAUSE AN INCREASE IN THE PITCH OVERPOWER FORCES AND IF AUTOPILOT DISENGAGES WOULD RESULT IN A PITCH TRANSIENT CONTROL FORCE.

SECTION 4 - NORMAL PROCEDURES

- (a) The BAT MASTER switch function is unchanged and can be used in an emergency to shut off all electrical power while the problem is isolated.
- (b) The FCS MASTER switch supplies power to the AUTOPILOT and PITCH TRIM system.
- (c) The KFC 200 is controlled by the following circuit breakers:

AUTOPILOT - This supplies power to the FCS KC 295 Computer, KC 292 Mode Controller, KA 285 Annunciator panel and AP Pitch and Roll Servos.

COMPASS SYSTEM - This supplies power to the KCS 55A Compass System.

PITCH TRIM - This supplies power to the FCS autotrim and manual electric pitch trim systems.

(d) PILOT'S CONTROL WHEEL SWITCH FUNCTIONS

AP DISC/TRIM INTERRUPT - This emergency disconnect switch will disengage the AP and interrupt the power to the electric trim system. To resume AP control, the AP lever on the Mode Controller must be re-engaged. In the event of electric trim or autotrim failure the switch can be held depressed, which removes all power from the trim system to allow the pilot time to turn off the FCS MASTER switch and pull the (PITCH TRIM) circuit breaker.

CWS - This switch when depressed and held will allow the pilot to manually fly the airplane without disengaging the AP. When the switch is released the AP will resume control (within the pitch and roll attitude limits). The CWS switch will resync PAH, or ALT hold mode. When the CWS is held depressed Manual Electric Trim may be operated without disengaging the AP.

TRIM UP/DN - Manual electric pitch trim is activated by a dual action type switch that requires both halves be moved simultaneously for actuating up or down commands. Operation of the manual electric pitch trim switch will disengage the AP lever switch on the Mode Controller (except when CWS switch is held depressed as previously noted).

(e) FCS WARNING FLAGS AND ANNUNCIATORS DESIGNATION AND OPERATION

HDG - This warning flag mounted in the Pictorial Navigation Indicator will be in view whenever the Directional Gyro information is invalid. If a HDG invalid occurs with either NAV, APPR, or HDG modes selected the AP is disengaged. Basic AP mode may then be re-engaged along with any vertical mode.

TRIM - The trim warning light, located in the lower right corner of the annunciator panel, will flash and be accompanied by an audible warning whenever autotrim and/or manual electric pitch trim failures occur. The trim servo motor running without a command is monitored on autotrim and manual trim. The trim servo motor not running when commanded to run and the trim servo motor running in the wrong direction are monitored on Autotrim only. The TRIM warning light flashes four times and the audible warning sounds when the test switch on the Mode Controller is depressed.

GS - The Glideslope valid (GS pointer being in view on PNI) has to be present before GS may couple. If, after GS CPLD, the valid is lost, the system will flash the GS Annunciator and transfer from GS CPLD to PAH. If the GS valid returns, the system will revert back to GS CPLD.

NAV - The NAV or APPR Modes (ARM or CPLD) may be selected and will function with or without a NAV warning flag present. The AP will continue to provide steering with or without a valid NAV signal.

(f) BEFORE ENGAGING FLIGHT CONTROL SYSTEM

- (1) Check that all circuit breakers for the system are in.
- (2) Allow sufficient time for gyros to come up to speed and system warm-up (3-4 minutes).

- (g) PREFLIGHT CHECK (PREFORM PRIOR TO EACH FLIGHT)
- (1) With no modes engaged and power applied to all systems, depress the Test Button on the Mode Controller. All annunciators will be illuminated on the annunciator panel except FD and GA. The three marker lights will also illuminate if the airplane uses the KA 285 as a remote marker indicator. Also, the red TRIM failure light will flash. At least four or more flashes must be observed to indicate proper operation of the autotrim/manual electric pitch trim feature and the audible warning should sound.
 - (2) With the AP disengaged, run the following manual electric pitch trim checks.
 - a. Verify that the PITCH TRIM circuit breaker is in.
 - b. Actuate the left-side switch to the fore and aft positions. The trim solenoid should engage, but the trim should not run.
Actuate the right-side switch to the fore and aft positions. The trim solenoid should not engage and the trim should not run.
 - c. Grasping the manual trim wheel, run the trim both up and down and check the overpower capability. (Check that the trim indicator moves with the wheel.)
 - d. Press the AP DISC/TRIM INTERRUPT switch down and hold. The manual electric pitch trim will not operate either up or down.
 - (3) Engage the AP, depress the CWS switch, center the flight controls and then release the CWS switch. Apply force to the controls to determine if the AP can be overpowered.
 - (4) Check the operation of the pilot's control wheel switch functions.
 - (5) Engage the AP and put in a pitch (UP) command using the vertical trim switch on the Mode Controller. Hold the control column to keep it from moving and observe the autotrim run in the nose-up direction after approximately three seconds delay. Use the vertical trim switch and put in a pitch (DN) command. Hold the control column and observe that the autotrim runs in the nose-down direction after approximately three seconds.
 - (6) Engage the AP and HDG. Set the HDG bug to command a right turn. The control wheel will rotate clockwise. Set the HDG bug to command a left turn. The control wheel will rotate clockwise.

CAUTION

DISENGAGE THE AP AND CHECK THAT THE AIRPLANE MANUAL PITCH TRIM IS IN THE TAKEOFF POSITION PRIOR TO TAKEOFF.

NOTE

IF THE AUTOPILOT CIRCUIT BREAKER IS TRIPPED, THE RED "TRIM" FAILURE LIGHT ON THE ANNUNCIATOR PANEL WILL BE DISABLED AND THE AUDIBLE WARNING WILL CONTINUOUSLY SOUND INDICATING THAT THE FAILURE LIGHT IS DISABLED. IN THIS EVENT THE "PITCH TRIM" CIRCUIT BREAKER SHOULD BE PULLED AND INFLIGHT TRIM ACCOMPLISHED BY USING THE MANUAL PITCH TRIM WHEEL.

(h) IN-FLIGHT OPERATION

(1) Engage Procedure:

After takeoff, clean up airplane and establish climb. Engage the AP. The pitch attitude will lock on any attitude up to 15 °.

Engaging and holding the CWS switch allows the pilot to momentarily revert to manual control while retaining his previous modes and to conveniently resume that profile at his discretion.

(2) Disengage Procedure:

While monitoring the flight controls, disengage the system by one of the following methods: depressing the pilot's A/P DISC/TRIM INTERRUPT switch; by operation of the manual electric pitch trim switch; or by the operation of the engage lever on the Mode Controller. The AP light on the annunciator panel will flash at least four times and remain off to indicate that the AP is disengaged.

(3) AP Mode

The AP must be engaged before any other mode can be engaged. The AP alone indicates PAH and wings level. The AP will automatically follow any other modes engaged. Disengaging the AP disengages all other modes.

NOTE

THE "VERTICAL TRIM" SWITCH, LOCATED ON THE MODE CONTROLLER, MAY BE USED TO TRIM THE COMMAND PITCH ATTITUDE AT A RATE OF ONE DEGREE PER SECOND.

(4) Altitude Hold Mode (ALT):

When the ALT switch on the Mode Controller is pressed, the airplane will maintain the pressure altitude existing at the time the switch is depressed. For smooth operation, engage ALT at no greater than 500 feet per minute climb or descent. The ALT will automatically disengage when glideslope couples. ALT hold may be turned off at any time by depressing the ALT switch. ALT engagement is displayed on the annunciator panel.

NOTE

THE "VERTICAL TRIM" SWITCH, LOCATED ON THE MODE CONTROLLER, MAY BE USED TO CHANGE OR TRIM THE COMMAND ALTITUDE UP OR DOWN AT 500 TO 700 FPM WITHOUT DISENGAGING THE MODE. THE NEW PRESSURE ALTITUDE THAT EXISTS WHEN THE SWITCH IS RELEASED WILL THEN BE HELD.

(5) Heading Mode (HDG):

Set the heading bug to the desired heading on the PNI, engage the AP, depress the HDG switch on the Mode Controller and HDG will be displayed on the annunciator panel. The AP will command a turn to the heading selected and hold. The pilot may then choose any new heading by merely setting the bug on a new heading. The AP will automatically command a turn in the direction of the new setting. To disengage the HDG Mode, depress the HDG switch on the Mode Controller and observe the HDG light go out on the annunciator. The HDG mode will automatically disengage when APPR or NAV CPLD is achieved.

(6) Navigation Mode (NAV)

The Navigation mode may be selected by tuning the NAV receiver to the desired frequency, setting the CDI to the desired radial and, with the AP engaged, depressing the NAV switch on the Mode Controller. The annunciator will indicate NAV ARM until intercepting the selected course, unless the NAV switch is engaged with wings level and a centered needle on the CDI. Then the mode will go directly to NAV CPLD as displayed on the annunciator panel. The system can intercept at any angle up to 90° and will always turn toward the course pointer. If a condition requiring a capture exists at mode engagement, the pilot is required to set up an intercept angle using either HDG or AP mode. NAV may be disengaged by depressing the NAV switch or by engaging HDG when in NAV CPLD or by engaging APPR when in NAV CPLD/ARM.

CAUTION

THE "NAV" MODE OF OPERATION WILL CONTINUE TO PROVIDE AIRPLANE CONTROL WITHOUT A VALID VOR/LOC SIGNAL (NAV FLAG IN VIEW).

(7) Approach Mode (APPR)

The Approach mode may be selected by tuning the NAV receiver to the desired VOR or LOC frequency, setting the CDI to the desired radial or inbound course and depressing the APPR switch on the Mode Controller. The annunciator will indicate APPR ARM until the course is intercepted unless the APPR switch is engaged with the wings level and there is a centered needle on the CDI. In that situation, the mode will go directly to APPR CPLD as displayed on the annunciator panel.

The system can intercept at any angle up to 90° and will always turn toward the course pointer. See approach procedure for more detail. APPR mode can be disengaged by depressing the APPR switch on the Mode Controller, or by engaging HDG or NAV when in APPR CPLD. The annunciator panel indicates the status of the approach mode.

CAUTION

THE "APPR" MODE OF OPERATION WILL CONTINUE TO PROVIDE AIRPLANE CONTROL WITHOUT A VALID VOR/LOC SIGNAL (NAV FLAG IN VIEW).

- (8) Back Course Mode (BC):
For BC operation, proceed as for normal approach mode, but engage BC after selecting APPR. The BC switch reverses the signals in the computer and cannot be engaged without a LOC frequency selected. BC status is indicated on the annunciator panel. BC mode can be disengaged by depressing either the BC or APPR switches, or by selecting other than a LOC frequency on the NAV receiver.
- (9) Vertical Mode Switch (TRIM DN/UP):
Operation of the vertical trim switch on the Mode Controller provides a convenient means of adjusting the ALT Hold or PAH angle function without disengaging the mode.
- (i) VOR PROCEDURES
 - (1) Tune NAV receiver to appropriate frequency.
 - (2) Set a desired heading with the HDG bug to intercept the radial and engage AP and HDG (maximum recommended intercept angle 90°).
 - (3) Select the desired radial and engage NAV. The FCS will remain on HDG as indicated on the annunciator panel and in ARM on the NAV mode. When the airplane intercepts the beam, the system will automatically couple and track in NAV mode and indicate CPLD on the annunciator panel.
 - (4) A new course may be selected over the VOR station when operating in the NAV mode, by selecting a new radial when the To-From indication changes.
 - (5) For VOR approach, see approach procedure.
- (j) APPROACH PROCEDURES
 - (1) Tune ILS or VOR.
 - (2) Set CDI to front course.
 - (3) Set Heading Bug and engage HDG to intercept selected CDI course at any angle (maximum recommended intercept angle 90°).
 - (4) Engage APPR and note APPR ARM on the annunciator panel.
 - (5) When airplane approaches the selected CDI course, APPR will couple, HDG will decouple, the AP will give commands to track LOC or VOR, and CPLD will illuminate on the annunciator panel.
 - (6) When glideslope beam is intercepted, the glideslope will couple automatically and indicate GS on the annunciator panel. If ALT was engaged prior to intercepting the glideslope, it will automatically disengage when GS couples. The AP will now provide commands to track LOC and GS. Adjust throttle to control speed on descent. Set HDG bug for missed approach but do not engage HDG.
 - (7) When middle marker signal is received, system will automatically switch to a more stable track mode.
 - (8) For landing or missed approach, disengage AP.
- (k) BACK COURSE PROCEDURE
Same as front course except that BC is engaged after APPR is engaged and the airplane must be set for descent manually by holding the vertical trim switch DN on the Mode Controller or by establishing the desired PAH using the CWS interrupt switch.

SECTION 5 - PERFORMANCE

Installation of the King KFC 200 Flight Control System does not affect the basic performance information presented by Section 5 of this handbook.

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HARTZELL PROPELLER INC.

SERVICE CENTER

One Propeller Place
Piqua, Ohio 45356-2634 U.S.A.

HARTZELL

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

TO PIPER PA32()()-300 AIRPLANE MANUAL

PA32RT-300

Serial No: 32R-7885090

Registration No: N30927

This supplement must be attached to the FAA Approved Airplane Flight Manual when the airplane is modified by the installation of a Hartzell HC-C3YR-1()F/F7663R propeller in accordance with STC #: SA1791GL.

The information contained herein supplements or supersedes the basic manual only in those areas listed herein. For limitations, procedures, and performance information not contained in this supplement, consult the Airplane Manual.

FAA Approved

Date

AUG 29 1992

Donald P. Michal, Manager

Chicago Aircraft

Certification Office

FAA Central Region

HARTZELL PROPELLER INC.

SERVICE CENTER

One Propeller Place
Piqua, Ohio 45356-2634 U.S.A.

HARTZELL

AFM SUPPLEMENT

PIPER PA32()()-300

STC #: SA1791GL

Limitations Section

Propeller

Hartzell HC-C3YR-1()F/F7663R

Pitch: High 32 ± 1 , Low $12.4 \pm .2$
at 30 inch station

Maximum diameter: 78 inches

Minimum diameter: 76 inches

Spinner

Hartzell 835-47()

Power Instruments

No change

Placards

No change

Procedures Section

No change

Performance Section

No change

FAA Approved



Date

AUG 29 1992

MANUAL
VALVE

Standby Vacuum System
AFM SUPPLEMENT

MANUAL
VALVE

Standby Vacuum System
AFM SUPPLEMENT

FAA APPROVED AIRPLANE FLIGHT MANUAL
SUPPLEMENT

OR

SUPPLEMENTAL FLIGHT MANUAL
FOR

AIRCRAFT MODEL: PA-32RT-300
SERIAL NUMBER: 32R-7885090
REGISTRATION NUMBER: N30927

This supplement must be attached to the FAA approved Airplane Flight Manual, when the Precise Flight Standby Vacuum has been installed in accordance with STC(s).

SA2160NM, SA2161NM, SA2162NM, SA2164NM, SA2167NM,
SA2168NM, SA2683NM - Aircraft

&

SE1779NM - Lycoming Engine

or

SE1780NM - Continental Engine

The information contained in this document supplements or supersedes the basic manual only in those areas listed. For Limitations, Procedures, and Performance information not contained in this supplement, consult the basic Airplane Flight Manual.

FAA APPROVED:


Manager,

Special Certification Branch
Seattle Aircraft Certification Office

DATE OF APPROVAL: Feb 4, 2000

SYSTEM DESCRIPTION

A Precise Flight Standby Vacuum System may be installed to provide a temporary vacuum system in the event of a primary vacuum failure. The Standby Vacuum System operates on the differential between the intake manifold and ambient air pressure and is directed through a shuttle valve system to drive your flight instruments.

CAUTION: The use of the Standby Vacuum System requires a degree of Pilot skill and proficiency that is best maintained through practice. It is recommended, upon recurrent IFR training, in VFR conditions, in the presence of a CFI, that the aircraft be flown at the RPM and or Manifold Pressure settings found on the required placard and entered in this AFMS. This procedure will familiarize the pilot with limitations of using engine manifold vacuum for instrument power and maintaining level flight.

ISSUED: February 4, 2000

1 of 8

2 of 8

ISSUED: February 4, 2000

I. OPERATING LIMITATIONS

A. INSTRUCTIONS

1. The Standby Vacuum System is for emergency or standby use only and not for dispatch purposes.
2. Vacuum powered and/or Vacuum gyro directed autopilot operation may be unreliable when the Standby Vacuum System is the sole source of vacuum. Vacuum powered or vacuum gyro directed autopilot should be OFF when operating with a failed primary vacuum system.
3. The Supplemental Vacuum System is not designed to operate pneumatic de-ice systems. DO NOT operate a pneumatic de-ice system when operating with a failed primary vacuum system.
4. Above 10,000 ft. pressure altitude, engine power settings may have to be significantly reduced to provide adequate vacuum power for proper gyro instrument operation.
5. The following placards are required to be in full view of pilot:

B. PLACARDS

Placard to be located on the push/pull control cable

Placard to be located around the LED for the pump inop warning light.

Placard to be placed in front and in full view of the pilot.

STANDBY VACUUM SYSTEM EQUIPPED; FOR
OPERATING INSTRUCTIONS AND LIMITATIONS SEE
SUPPLEMENT IN OWNERS MANUAL OR PILOTS
OPERATING HANDBOOK

I. OPERATING PROCEDURES

A. NORMAL PROCEDURES

1. GROUND CHECK

- Cycle the Aux. Vac. System Valve - ON - , and return the Aux. Vac. System Valve - OFF - position.

2. BEFORE TAKEOFF

- Idle Engine at low speed, momentarily rotate the Aux. Vac. System Valve - ON - and check vacuum gauge. Normally, the vacuum reading will be slightly higher. After checking system rotate the Aux. Vac. System Valve - OFF - . Check that vacuum gauge has returned to the previous reading.

3. ENROUTE

- Regularly check vacuum gauge and monitor warning light for proper vacuum system operation.

B. PLACARDS

One of the following placards must be placed in full view of the pilot near the instrument vacuum indicator after appropriate entries have been made.

Approximate Standby Vacuum Available - Altitude - Power Chart for aircraft with Constant Speed Propeller - Maximum Continuous RPM.

PRESS ALT. (FT.)	RPM	MAN. PRESSURE	SVS VACUUM IN. HG MIN.
2000	Max. Cont.		
4000	Max. Cont.		
6000	Max. Cont.		
8000	Max. Cont.		
10,000	Max. Cont.		

Approximate Standby Vacuum Available - Altitude - Power Chart for aircraft with a Fixed Pitch Propeller

PRESS ALT. (FT.)	RPM	SVS VACUUM IN. HG MIN.
2000		
4000		
6000		
8000		
10,000		

B. EMERGENCY PROCEDURES (CONT.)

1. PRIMARY VACUUM FAILURE WARNING LIGHT ILLUMINATES

- Rotate the Aux. Vac. System Valve -ON- and adjust throttle setting as required to maintain adequate vacuum for the primary instruments - Suction Gauge Reading in the Green Arc - If necessary descend to a lower altitude to obtain a larger differential between manifold and ambient pressure. Vacuum power must be closely monitored by checking the vacuum gauge frequently.
- The SVS is not designed for continued IFR flight. Immediate steps should be taken to return to VFR conditions or to land. If this is not possible, IFR flight should be continued only as long as necessary to return to VFR conditions or land the airplane.

WARNING: FAILURE OF THE VACUUM SYSTEM STILL CONSTITUTES AN EMERGENCY SITUATION OF THE SVS. IT REGARDLESS OF THE INSTALLATION OF THE SVS. IT MAY NOT BE POSSIBLE TO MAINTAIN A SAFE ALTITUDE AND MAKE USE OF THE SVS. IN SUCH A SITUATION THE AIRPLANE MUST BE FLOWN USING NON-VACUUM POWERED INSTRUMENTS.

B. EMERGENCY PROCEDURES (CONT.)

- If descent is impractical:
 - Periodically and temporarily reduce power as required to provide adequate vacuum to the aircraft primary instruments.
 - Reapply power as required, while comparing vacuum driven gyros against the Turn and Bank Indicator, Turn Coordinator, VSI and/or other flight instruments.
 - When an obvious discrepancy is noted between the vacuum driven instruments and other flight instrumentation. Periodically and temporarily reduce power as required to provide adequate vacuum to the aircraft primary instruments.

III. PERFORMANCE

NO CHANGE

-- END --

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FAA APPROVED

AIRPLANE FLIGHT MANUAL SUPPLEMENT
or
SUPPLEMENTAL AIRPLANE FLIGHT MANUAL
for
GARMIN 400W SERIES GPS-WAAS NAVIGATION SYSTEM
as installed in

PIPER LANCE PA-32RT-300
Make and Model Airplane

Reg. No. N30927 S/N 32R-7885090

This document serves as an Airplane Flight Manual Supplement or as a Supplemental Airplane Flight Manual when the aircraft is equipped with the Garmin 400W Series unit. This document must be carried in the airplane at all times when the Garmin 400W Series unit is installed in accordance with STC SA01933LA.

The information contained herein supplements or supersedes the information made available to the operator by the manufacturer in the form of clearly stated placards, markings, or manuals or in the form of an FAA approved Airplane Flight Manual, only in those areas listed herein. For limitations, procedures and performance information not contained in this document, consult the basic placards, markings, or manuals or the basic FAA approved Airplane Flight Manual.

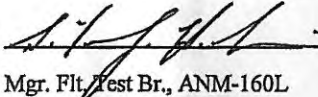
FAA APPROVED


Manager, Flight Test Branch, ANM-160L
Federal Aviation Administration
Los Angeles Aircraft Certification Office
Transport Airplane Directorate

DATE: November 20, 2007

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AIRPLANE FLIGHT MANUAL SUPPLEMENT
or SUPPLEMENTAL AIRPLANE FLIGHT MANUAL
for a Garmin 400W Series Navigation System

LOG OF REVISIONS				
Rev. No.	No.	Page Date	Description	FAA Approved
A Original	All		Complete Supplement	 Mgr. Flt. Test Br., ANM-160L FAA, Los Angeles ACO Transport Airplane Directorate Date <u>Nov 20, 2007</u>

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for a Garmin 400W Series Navigation System**

Section 1. GENERAL

1.1 Garmin 400W Series GPS/WAAS Nav Com

The Garmin 400W Series GPS/WAAS Navigator is a panel-mounted product that contains a GPS/WAAS receiver for GPS approved primary navigation, under TSO C146a (plus optional VHF Com and VHF Nav radios) in an integrated unit with a moving map and color display. The 400W Series unit features a graphical display which may also be used to depict traffic, weather, or terrain data.

The navigation functions are operated by dedicated keys and graphical menus which are controlled by the buttons and the dual concentric rotary knob along the bottom and right side of the display.

Optional VHF Com and VHF Nav radio functions are controlled via dedicated buttons and knobs on the left side of the display and adjacent to frequencies they are controlling.

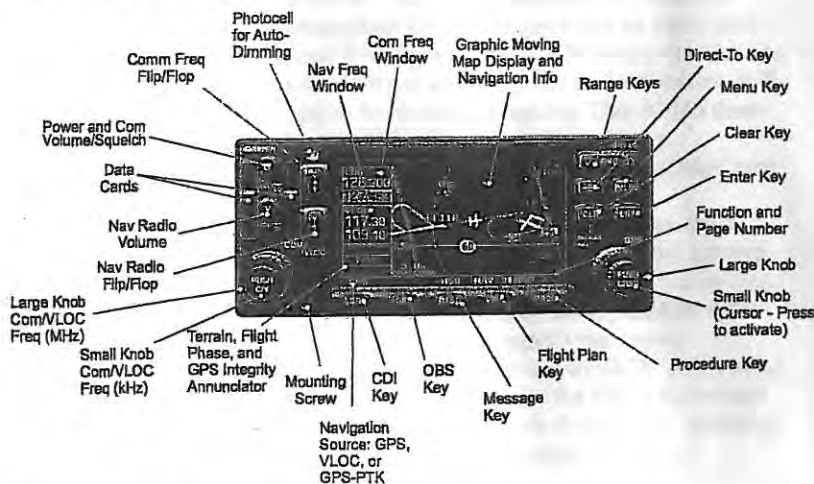


Figure 1 - 400W Series Control and Display Layout

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1.2 Operation

GPS/WAAS TSO-C146a Class 3 Operation: The Garmin 400W Series unit, when installed in accordance with STC SA01933LA, uses GPS and WAAS (within the coverage of a Space-Based Augmentation System complying with ICAO Annex 10) for enroute, terminal area, non-precision approach operations (including "GPS", "or GPS", and "RNAV" approaches), and approach procedures with vertical guidance (including "LNAV/VNAV" and "LPV").

Navigation is accomplished using the WGS-84 (NAD-83) coordinate reference datum. GPS navigation data is based upon use of only the Global Positioning System (GPS) operated by the United States of America.

1.3 Class II Oceanic, Remote, and other Operations:

The Garmin 400W Series, as installed, has been found to comply with the requirements for GPS primary means of Class II navigation in oceanic and remote airspace, when used in conjunction with WAAS Garmin Prediction Program part number 006-A0154-03. Oceanic operations are supported when the 400W Series unit annunciates OCN. This provides an alarm limit of four NMI and a mask angle of five degrees. The 400W series unit also has the ability to predict RAIM availability at any waypoint in the database or if WAAS corrections are expected to be absent or disabled. This AFMS does not constitute an operational approval for Oceanic or Remote area operations. Additional equipment installations or operational approvals may be required.

- a) Oceanic navigation requires an additional approved long range oceanic and/or remote area navigation system with independent display, sensors, antenna, and power source. (It may be a second 400W/500W Series unit.)
- b) Redundant VHF Com and VHF Nav systems may be required for other than U.S. 14 CFR Part 91 operations. Check foreign regulation requirements as applicable. (It may be a second 400W/500W Series unit.)
- c) Operations approval may be granted for the use of the 400W Series unit RAIM prediction function in lieu of the Prediction Program for operators requiring this capability. Refer to your appropriate civil aviation authorities for these authorizations.

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Section 2. LIMITATIONS

2.1 Pilot's Guide

The GARMIN 400W Series Pilot's Guide, part number and revision listed below (or later revisions), must be immediately available for the flight crew whenever navigation is predicated on the use of the 400W Series unit.

400W Series Pilot's Guide & Reference P/N 190-00356-00 Rev B
400W/500W Series Optional Displays P/N 190-00356-30 Rev B
400W/500W Series Display Interfaces P/N 190-00356-31 Rev B

This AFM supplement does not grant approval for IFR operations to aircraft limited to VFR operations. Additional aircraft systems may be required for IFR operational approval. Systems limited to VFR shall be placarded in close proximity to the 400W Series unit
"GPS LIMITED TO VFR USE ONLY".

2.2 System Software:

The system must utilize the Main and GPS software versions listed below (or later FAA approved versions). The software versions are displayed on the self-test page immediately after turn-on for approximately 5 seconds or they can be accessed in the AUX pages.

Subsequent software versions may support different functions. Check the 400W Series Pilot's Guide for further information.

Table 1 - Approved Software Versions

Software Item	Approved Software Version (or later FAA approved versions)	
	SW version	As displayed on unit
Main SW Version	3.00	3.00
GPS SW Version	3.0	3.0

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for a Garmin 400W Series Navigation System**

2.3 Navigation Database

The 400W Series unit database cards listed in the following table must be installed. (IAW the TSO deviations granted to Garmin for the 400W unit, navigation database cards may not be marked with the part number. The software automatically precludes invalid databases for use by the 400W)

- a) IFR enroute and terminal navigation is prohibited unless the pilot verifies the currency of the database or verifies each selected waypoint for accuracy by reference to current approved data.
- b) GPS instrument approaches using the 400W Series units are prohibited, unless the 400W Series unit's approach data is verified by the pilot or crew to be current. Instrument approaches must be accomplished in accordance with an approved instrument approach procedure that is loaded from the 400W Series unit database.
- c) Installations with dual 400W/500W Series units will only crossfill between units when they contain the same database cycle. Updating of each database must be accomplished on the ground prior to flight.

Table 2 – Approved Navigation Database Cards

Part Number	Description
010-10546-00	Data Card, IFRW, World Wide
010-10546-01	Data Card, IFRW, Americas
010-10546-02	Data Card, IFRW, International

2.4 Terrain Database

The 400W Series unit supports Terrain and requires a Terrain database card to be installed in order for the feature to operate. The table below lists compatible database cards for the 400W series. Each of the data base cards contains the following data:

- a) The Terrain Database has an area of coverage from North 75° Latitude to South 60° Latitude in all longitudes.
- b) The Airport Terrain Database has an area of coverage that includes the United States, Canada, Mexico, Latin America, and South America.
- c) The Obstacle Database has an area of coverage that includes the United States, and is updated as frequently as every 56 days.

NOTE: The area of coverage may be modified as additional terrain data sources become available.

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Table 3 – Approved Terrain Database Cards

Part Number	Description
010-10201-20	Data Card, TAWS / Terrain, 128MB
010-10201-21	Data Card, TAWS / Terrain, 256MB

2.5 Navigation

No navigation is authorized north of 89° (degrees) north latitude or south of 89° (degrees) south latitude.

2.6 Approaches

- a) During GPS approaches, the pilot must verify the 400W Series unit is operating in the approach mode. (LNAV, LNAV+V, L/VNAV, or LPV)
- b) When conducting approaches referenced to true North, the heading selection on the AUX pages must be adjusted to TRUE.
- c) Accomplishment of an ILS, LOC, LOC-BC, LDA, SDF, MLS, VOR approach, or any other type of approach not approved for GPS overlay, is not authorized with GPS navigation guidance.
- d) Use of the GNS 430W VOR/LOC/GS receiver to fly approaches not approved for GPS requires VOR/LOC/GS navigation data to be present on the external indicator (i.e. proper CDI source selection).
- e) For aircraft with remote source selection annunciation or remote GPS navigation annunciations installed, conducting IFR approaches is prohibited if the remote annunciation is found to be inoperative during pre-flight. (This limitation does not prohibit the conduct of an IFR approach if the required remote annunciation fails during flight. The indications provided on the 400W Series unit display may be used as a backup).
- f) Except in emergency conditions, IFR approaches are prohibited whenever any physical or visual obstruction (such as a throw-over yoke) restricts pilot view or access to the 400W Series unit or the affected CDI.

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2.7 Autopilot Coupling

IFR installations of a Garmin 400W Series unit allow the operator to fly all phases of flight based on the navigation information presented to the pilot; however, not all modes may be coupled to the autopilot. All autopilots may be coupled in Oceanic (OCN), Enroute (ENR), and Terminal (TERM) modes; however, the FAA requires that vertical coupling of an autopilot for approaches be demonstrated to meet their intended function and provide safe and proper operation to published minimums. This installation is limited to:

☐ No limitations for autopilot coupling.

☒ Lateral GPS coupling (LNAV only). For 430W units: The GS of an ILS (VLOC) may be coupled to the autopilot without any limitations.

This limitation may be removed after an FAA Flight Test demonstration. Contact Garmin International, Tech Support for additional information.

2.8 Terrain Display

Terrain refers to the display of terrain information. Pilots are NOT authorized to deviate from their current ATC clearance to comply with terrain/obstacle alerts. Terrain unit alerts are advisory only and are not equivalent to warnings provided by TAWS. Navigation must not be predicated upon the use of the terrain display.

The terrain display is intended to serve as a situational awareness tool only. By itself, it may not provide either the accuracy or the fidelity on which to base decisions and plan maneuvers to avoid terrain or obstacles.

2.9 VNAV

VNAV information may be utilized for advisory information only. Use of VNAV information for Instrument Approach Procedures does not guarantee Step-Down Fix altitude protection, or arrival at approach minimums in a normal position to land.

2.10 Weather Display

If an optional weather receiver is interfaced to the 400W Series unit, the weather information displayed is limited to supplemental use only and may not be used in lieu of an official weather data source.

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for a Garmin 400W Series Navigation System

2.11 Traffic Display

Traffic may be displayed on the 400W Series unit when connected to an approved optional TCAS, TAS, or TIS traffic device. These systems are capable of providing traffic monitoring and alerting to the pilot. Traffic shown on the display may or may not have traffic alerting available. The display of traffic is an aid to visual acquisition and may not be utilized for aircraft maneuvering. Display of this traffic data and related operations are described in the 400W Series unit Pilot's Guide.

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Section 3. EMERGENCY PROCEDURES

3.1 Emergency Procedures

No change.

3.2 Abnormal Procedures

- a) If the Garmin 400W Series unit GPS navigation information is not available, or is invalid, utilize other remaining operational navigation equipment installed in the airplane as appropriate. If the 400W Series unit loses GPS position and reverts to Dead Reckoning mode (indicated by the annunciation of "DR" in the lower left of the display), the moving map will continue to be displayed. Aircraft position will be based upon the last valid GPS position and estimated by Dead Reckoning methods. Changes in airspeed or winds aloft can affect the estimated position substantially. Dead Reckoning is only available in Enroute mode; Terminal and Approach modes do not support DR.
- b) If a "Loss of Integrity" (INTEG) message is displayed during:
Enroute/Terminal: continue to navigate using GPS equipment and periodically cross-check the GPS guidance to other approved means of navigation.
GPS Approach: GPS approaches are not authorized under INTEG - Execute missed approach or revert to alternate navigation.
- c) During a GPS LPV precision approach or GPS LNAV/VNAV approach, the 400W Series unit will downgrade the approach if the Vertical alarm limits are exceeded. This will cause the vertical guidance to flag as unavailable. The procedure may be continued using the LNAV only minimums.
- d) During any GPS approach in which precision and non-precision alarm limits are exceeded, the 400W Series unit will flag the lateral guidance and generate a system message "ABORT APPROACH loss of navigation". Immediately upon viewing the message the unit will revert to Terminal alarm limits. If the position integrity is within these limits lateral guidance will be restored and the GPS may be used to execute the missed approach, otherwise alternate means of navigation should be utilized.

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Section 4. NORMAL PROCEDURES

Refer to the 400W Series unit Pilot's Guide defined in paragraph 2.1 on page 6 of this document for normal operating procedures. This includes all GPS operations, VHF COM and NAV, and Multi-Function Display information. For information on TIS traffic, or data linked weather see the Pilot's Guide addendum for optional displays. For information on active traffic sensor or Stormscope operation and displays see the Pilot's Guide addendum for display interfaces.

Although intuitive and user friendly the 400W Series unit requires a reasonable degree of familiarity to prevent operations without becoming too engrossed at the expense of basic instrument flying in IMC and basic see-and-avoid in VMC. Pilot workload will be higher for pilots with limited familiarity in using the unit in an IFR environment, particularly without the autopilot engaged. Garmin provides excellent training tools with the Pilot's Guide and PC based simulator. Pilots should take full advantage of these training tools to enhance system familiarization. Use of an autopilot is strongly encouraged when using the 400W Series unit in IMC conditions

4.1 Approaches with Vertical Guidance

The 400W Series unit supports three types of GPS approaches with vertical guidance: LPV approaches, LNAV/VNAV (annunciated as L/VNAV) approaches, and LNAV approaches with advisory vertical guidance (annunciated as LNAV+V). For LNAV approaches with advisory vertical guidance, the 400W Series will annunciate LNAV+V indicating vertical guidance is available. LNAV minimums will be controlling in this case.

NOTE:

If flying an LPV or LNAV/VNAV approach, be prepared to fly the LNAV only approach prior to reaching the final approach fix (FAF). If the GPS integrity is not within vertical approach limits, the system will flag the vertical guidance. This may be annunciated by a downgrade to LNAV message.

For additional information on approaches with vertical guidance refer to the 400W Series unit Pilot's Guide.

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4.2 Autopilot Operation

The Garmin 400W Series may be coupled to an optional autopilot if installed in the aircraft when operating as prescribed in the LIMITATIONS section of this manual. For lateral guidance, some installations may utilize GPSS or GPS Roll Steering in lieu of the analog deviation information. If an HSI is used with GPSS engaged, the pilot should rotate the course pointer as prompted on the 400W Series unit to prevent loss of situational awareness and to prevent the aircraft from turning inappropriately if the autopilot is switched from digital (GPSS) to analog mode. For autopilot operational instructions, refer to the FAA approved Flight Manual or Flight Manual Supplement for the autopilot.

4.3 Coupling the Autopilot during approaches

The Garmin 400W Series supports analog and digital (GPSS) control interfaces to an optionally installed autopilot. Some autopilots revert to ROLL mode (wings level) and/or flag a NAV failure if the digital data becomes unavailable or is inhibited. The CDI selection of VLOC should inhibit the digital control interface. When switching between GPS and VLOC the pilot should be aware that the autopilot may need to be re-engaged into APR or NAV mode after changing the CDI source.

Autopilot coupling to GPS vertical guidance requires that the autopilot be engaged in an analog APR mode identical to coupling to an ILS. Some autopilots may revert to ROLL mode when the navigation outputs of the 400W Series unit sequence to the final approach fix. In these installations the unit will be configured to PROMPT the pilot to "Enable the autopilot approach outputs" in order to prevent the autopilot from entering ROLL mode without the pilot being aware of the transition.

- ☐ This installation prompts the pilot and requires the pilot to enable the A/P outputs just prior to engaging the autopilot in APR mode.
- ☐ This installation supports a seamless transition from digital (GPSS) to analog guidance for the autopilot. To capture the vertical guidance, the pilot may engage the autopilot in APR mode at any time when the GPS Glide Slope (VDI) becomes valid (displayed without a FLAG).
- ☐ This installation interfaces to the autopilot in analog mode only. To capture the vertical guidance, the pilot may engage the autopilot in APR mode at any time when the GPS Glide Slope (VDI) becomes valid.
- ☒ The autopilot does not support any vertical capture or tracking in this installation.

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Analog only autopilots should use APR mode for coupling to LNAV approaches. Autopilots which support digital roll steering commands (GPSS) may utilize NAV mode and take advantage of the digital tracking during LNAV only approaches.

4.4 WFDE Prediction Program

The Garmin WAAS Fault Detection and Exclusion (WFDE) Prediction Program is required for Remote/Oceanic operations.

The Prediction Program should be used in conjunction with the Garmin 400W/500W Simulator. After entering the intended route of flight in the Simulator flight plan the pilot selects the FDE Prediction Program under the Options menu of the Simulator program.

For detailed information refer to the WFDE prediction program instructions (190-00643-01). The availability of FDE is only required for Oceanic or Remote operations.

Section 5. PERFORMANCE

No change.

Section 6. WEIGHT AND BALANCE

See current weight and balance data.

Section 7. SYSTEM DESCRIPTIONS

See Garmin 400W Series unit Pilot's Guide for a complete description of the 400W Series unit.

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TABLE OF CONTENTS

SECTION 10

OPERATING TIPS

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SECTION 10
OPERATING TIPS

10.1 GENERAL

This section provides operating tips of particular value in the operation of the Lance II.

10.3 OPERATING TIPS

- (a) Learn to trim for takeoff so that only a very light back pressure on the control wheel is required to lift the airplane off the ground.
- (b) The best speed for takeoff is 75 to 85 KIAS under normal conditions. Trying to pull the airplane off the ground at too low an airspeed decreases the controllability of the airplane in the event of engine failure.
- (c) Flaps may be lowered at airspeeds up to 109 KIAS. To reduce flap operating loads, it is desirable to have the airplane at a slower speed before extending the flaps. The flap step will not support weight if the flaps are in any extended position. The flaps must be placed in the "UP" position before they will lock and support weight on the step.
- (d) Before attempting to reset any circuit breaker, allow a two to five minute cooling off period.
- (e) Before starting the engine, check that all radio switches, light switches and the pitot heat switch are in the off position so as not to create an overloaded condition when the starter is engaged.
- (f) Strobe lights should not be operating when flying through overcast and clouds, since reflected light can produce spacial disorientation. Do not operate strobe lights when taxiing in the vicinity of other aircraft.
- (g) The rudder pedals are suspended from a torque tube which extends across the fuselage. The pilot should become familiar with the proper positioning of his feet on the rudder pedals so as to avoid interference with the torque tube when moving the rudder pedals or operating the toe brakes.
- (h) In an effort to avoid accidents, pilots should obtain and study the safety related information made available in FAA publications such as regulations, advisory circulars, Aviation News, AIM and safety aids.

- (i) 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 ft. 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.



THIS COPY OF SERVICE BULLETIN
ATTACHED TO FLIGHT
MANUAL AS COMPLIANCE
WITH PART II OF BULLETIN.

SERVICE BULLETIN

No. 866A

Piper Aircraft Corporation
Vero Beach, Florida, U.S.A.

* PIPER CONSIDERS *
* COMPLIANCE MANDATORY *

Date March 4, 1988

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(Service Bulletin No. 866A supersedes and voids Service Bulletin No. 866 dated June 19, 1987).

This Service Bulletin is divided into Two (2) PARTS. Refer to each PART for specific means of compliance and Compliance Time.

REASON FOR REVISION:

To revise Purpose, add PART II,
and revise Summary.

SUBJECT:

Back Up Landing Gear Extender
Removal

MODELS AFFECTED:

PA-28R-180 Arrow (*)
PA-28R-200 Arrow/Arrow II (*)
PA-28R-201 Arrow III
PA-28R-201T Turbo Arrow III
PA-28RT-201 Arrow IV
PA-28RT-201T Turbo Arrow IV

PA-32R-300 Lance
PA-32RT-300 Lance II
PA-32RT-300T Turbo Lance II
PA-32R-301 Saratoga S.F.

PA-32R-301T Turbo Saratoga S.P.

SERIAL NUMBERS AFFECTED:

28R-30004 through 28R-7130013
28R-35001 through 28R-7635545
28R-7737001 through 28R-7837317
28R-7703001 through 28R-7803373
28R-7918001 through 28R-8218026
28R-7931001 through 28R-8631005,
2831001 and 2831002
32R-7680001 through 32R-7880068
32R-7885001 through 32R-7985105
32R-7887001 through 32R-7987126
32R-8013001 through 32R-8613005,
3213001 and 3213002
32R-8029001 through 32R-8029110,
32R-8029121 through 32R-8629006,
and 3229001 through 3229003

(*) NOTE: Some PA-28R-180/200 Arrow/Arrow II aircraft are affected by Piper Service Bulletin No. 769: "Landing Gear Back-Up Actuator Override Mechanism" Installation. Compliance with Service Bulletin No. 769 is required prior to or concurrent with compliance with this Service Bulletin.

APPROVAL:

The technical contents of this Service Bulletin
have been approved by the F.A.A.

(Over)
ATA: 3236

PURPOSE:

The Piper Back Up Gear Extender System (the 'System'), originally installed in the above listed aircraft, is designed as a safety device to help prevent both inadvertent landing with the gear retracted and premature retraction of the gear during take off. When properly operated and maintained, the System automatically extends the landing gear when airspeed falls below a certain value and prevents the landing gear from retracting before a certain airspeed is attained. The airspeed values vary according to the aircraft model. The System can be deactivated ("overridden") by the pilot. (See Note * on page 1)

It has been alleged that properly functioning Systems were contributory factors in aircraft accidents, propagated by other emergencies. In view of controversies concerning the benefits versus potential hazards of the System's operation, Piper issued Service Bulletin No. 866, dated June 19, 1987, requiring removal of the System from all affected aircraft.

Piper's primary concern is that pilots, not familiar with all aspects of the System's operation, might inadvertently encounter situations that would adversely affect safe flight. However, Piper also recognizes the owner/operator of an aircraft bears the ULTIMATE responsibility for assuring continued airworthiness and safe operation of his or her aircraft at ALL TIMES, (Refer to FAA FAR's 91.3 and 91.163).

Therefore, after thoroughly reviewing the facts to date, including significant customer comments, Service Bulletin No. 866A is being issued. It reiterates the System removal requirements of Service Bulletin No. 866, and provides an alternative means of compliance for affected owner/operators who choose to continue operation of their aircraft with the Back Up Gear Extender installed and functioning.

Piper considers compliance with EITHER PART I or PART II of this Service Bulletin to be MANDATORY and further recommends that the System, if presently installed, be "locked out" until PART I or PART II of this Service Bulletin has been complied with.

Failure to comply with this Service Bulletin could result in an inability to attain/maintain safe airspeeds including, but not limited to:

Reduced rate of climb due to delayed gear retraction; reduced glide ratio due to premature Gear Extension; and failure of the Backup Gear Extender due to impact icing on the air pressure mast.

PART I

SUBJECT:Back Up Landing Gear Extender
Removal.COMPLIANCE TIME:Within the next one hundred (100)
hours of operation or at the next scheduled maintenance event, whichever occurs
first.INSTRUCTIONS:All instructions necessary to accomplish this
modification are contained in the Back Up Landing Gear Extender Removal Kits,
Piper Part Number 765-303 for the PA-28R/28RT Series and Piper Part Number
765-199 for the PA-32R/32RT Series.MATERIAL REQUIRED:One (1) each Back Up Landing Gear Extender Removal
Kit, Piper Part Number 765-303 for PA-28R/28RT or 765-199 for PA-32R/32RT
Series, per aircraft.NOTE:Special list pricing will be extended for a period of 180 days from
the date of this Service Bulletin. The Back Up Landing Gear Extender
Removal Kits will again be offered at a special list price of \$132.00
each for Piper Part Number 765-303 and \$127.00 each for Piper Part
Number 765-199.-----
PART IISUBJECT:

Alternate Means of Compliance.

COMPLIANCE TIME:Prior to further flight if the Back
Up Landing Gear Extender system is installed and operational.INSTRUCTIONS:Compliance with all instructions below is required of ALL persons acting
as Pilot in Command of the affected aircraft.

1. Review and understand all information contained in the applicable Airplane
Flight Manual/Pilot's Operating Handbook, Operations, Limitations and
Systems sections, pertaining to the normal and emergency operation of the
Back Up Landing Gear Extension System for the affected aircraft model.
2. Review and understand all information contained in the Pilot's Operating
Handbook pertaining to the normal and emergency operation of the affected
aircraft model with the landing gear extended; with particular emphasis on
stall speeds; take off, climb, glide and slow flight performance; and Back
Up Landing Gear Extension System operating airspeeds.
3. Attach a copy of this Service Bulletin to the Airplane Flight Manual or
Pilot's Operating Handbook.

(Over)