HYDRAULIC RESERVOIR REFILL LEVEL

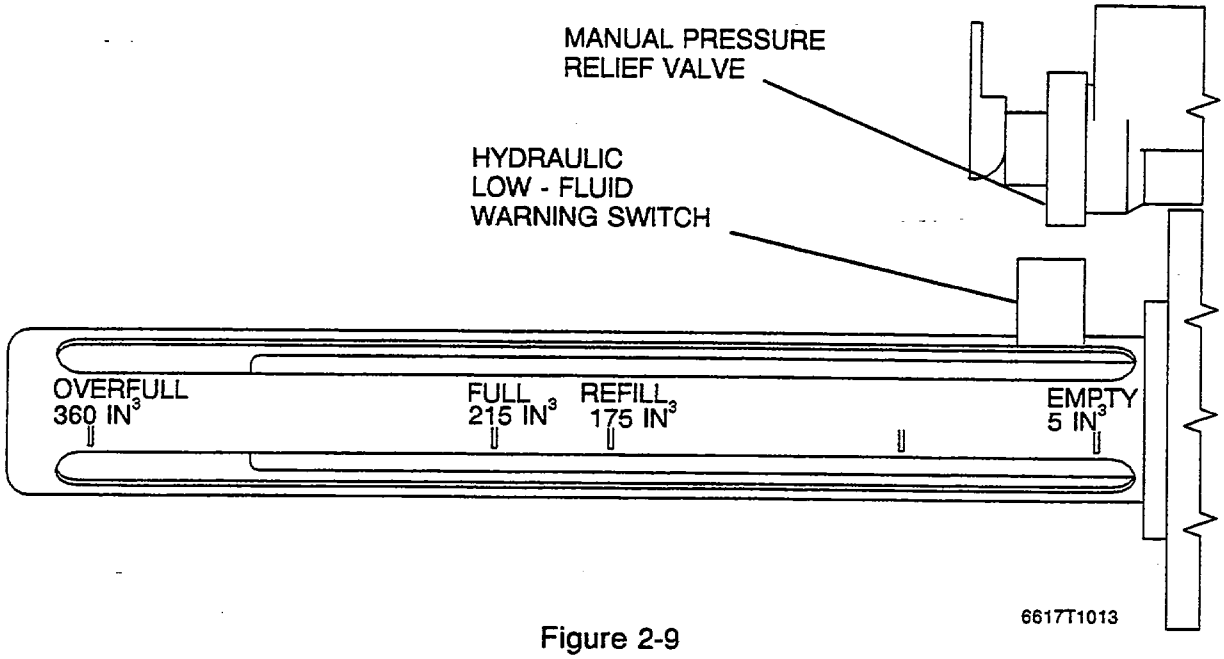

Figure 2-9

WHEEL BRAKES

The power brake and anti-skid system are designed independent of the main hydraulic system. Refer to the following topic for a complete description.

POWER BRAKE AND ANTI-SKID SYSTEM

GENERAL

The power brake and anti-skid installation is a closed center, phosphate-ester based system with its its own separate independent powerpack assembly, accumulator and reservoir. These components provide pressurized hydraulic fluid to the power brake and anti-skid servo valve, which in turn regulates a maximum of 1000 PSI, +20 or -20 PSI pressure to the brakes. This pressure is based upon pilot/co-pilot input through the brake master cylinders, and electronic inputs from the anti-skid control box.

RPM transducers at each wheel sense the beginning of a skid and transmit this information to the anti-skid control. A hand-controllable pneumatic emergency brake valve is provided in the event of a power brake failure. Pneumatic pressure is transmitted to brakes through a shuttle valve integral to each brake assembly. Additionally, a parking brake is included in the basic hydraulic brake system. Specific components are described below.

(Continued Next Page)

POWER BRAKE AND ANTI-SKID SYSTEM (continued)

POWER PACK

The powerpack is located on the left side of the nose avionics compartment. The powerpack assembly contains the pump, electric motor, filter and associated plumbing. The motor is of fixed displacement, delivering approximately 0.3 gallons per minute at 7000 RPM. The motor runs only when the gear lever in in the down position and a pressure switch mounted at the accumulator outlet is closed. The switch contacts are normally closed, and open on increasing pressure at 1500 PSI. The contacts close after pressure decreases a minimum of 300 PSI and above 1100 PSI.

If the gear is extended and pressure drops below 900 PSI, a pressure switch installed on the pump manifold will activate the LO BRK PRESS light on the annunciator. Thermal relief is provided by a manifold mounted valve at 1700 PSI.

ACCUMULATOR AND RESERVOIR

The accumulator is located on the left side of the nose avionics compartment. It is precharged to 675 PSI, with all hydraulic fluid bled out to the reservoir. The reservoir is located on the forward side of the forward pressure bulkhead, and contains sight gauges to indicate fill levels.

BRAKE MASTER CYLINDERS

The pilot and copilot brake master cylinders are plumbed in series, but a check valve from input to output allows fluid to pass above 3 PSID, sot he input signal at the control valve is the greater of either the pilot or the copilot's effort.

WHEEL BRAKES

Toe-actuated multiple disc carbon brakes are installed on the main gear wheels. Braking can be accomplished by either of two independent systems: the power brake hydraulic system or the back-up pneumatic system. Normal braking can be applied from either cockpit seat. The emergency brake control is installed under the left instrument panel only.

PARKING BRAKE VALVE

The parking brake is a part of the normal brake system and employs controllable check valves that can prevent the return of fluid after the brakes have been set. Parking brakes are set by depressing the toe brakes and pulling out the black parking brake handle located under the lower left side of the instrument panel. The parking brake should not be set if the brakes are very hot. This increases brake cool-down time due to decreased airflow, and may result in sufficient heat transfer from the brakes to cause the parking brake thermal relief valves to open or to melt the thermal relief plugs in the wheel, causing deflation of the tire.

DIGITAL ANTISKID SYSTEM

The antiskid system provides power assisted braking with skid protection. It is designed to provide maximum braking efficiency on all runway surfaces. The system consists of two wheel speed generators, power brake relay/antiskid valve, a digital control box, pressure and control switches and two indicator lights.

System operation is conventional with power braking available at all speeds while antiskid protection is available at speeds between 10 and 175 knots. The antiskid protection feature is designed to operate with maximum pilot brake applied pressure.

The wheel speed generator is bolted in the main gear axle with the drive shaft connected through a drive cap to the main wheel. As the wheel turns, the generator generates a signal for each wheel revolution that is sent to the control module as a variable frequency. The control module accepts the output of the left and right wheel speed generators independently and converts these signals to a direct current (DC) voltage directly proportional to wheel speed. Any significant variation between either wheel speed voltage produces an error signal that activates the power brake and antiskid valve which controls the amount of braking being applied against each wheel. At touchdown, the generator voltage reaches maximum as soon as the wheel spins up. As long as no skid occurs, the generator voltage follows wheel speed and the reference voltage follows the voltage of the generator. When excessive deceleration of a wheel occurs, generator voltage suddenly drops. An error signal is generated which energizes the servo valve segment of the power brake and antiskid valve. The servo valve controls the movement of spools within the main body of the power brake and antiskid valve which modulate the braking effort being applied by the pilot as required to maintain generator voltage and reference voltage within the skid limits, preventing the skid condition. When the airplane speed drops below approximately 10 knots, the antiskid function disengages.

To ensure proper braking on water, snow and ice-covered, hard-surface runways and all unimproved surfaces, it is necessary for the pilot to apply maximum effort to the brake pedals throughout the braking run. When the system anticipates a skid and releases the applied brake pressure, any attempt by the pilot to modulate braking can result in an interruption of the applied brake signal and may increase stopping distance significantly.

A switch on the instrument panel allows the pilot to select antiskid ON or OFF. When the switch is in the ON position, the antiskid function is operational. With the control switch in the OFF position, the ANTISKID INOP light on the annunciator panel will illuminate and the pilot will have power braking available without the antiskid function. If the power system should fail, braking will only be available through the back-up pneumatic system. The antiskid control module incorporates test circuitry which continually monitors the antiskid system. If a fault is detected, the ANTISKID INOP light will illuminate on the annunciator panel. Certain faults in the system are displayed on a "BITE" indicator (fault display unit), which is located under the removable panel at the aft of the left nose compartment.

EMERGENCY BRAKING

In the event of normal hydraulic braking system failure, a pneumatic system is available. The pneumatic pressure required is contained in the emergency air bottle and is controlled by a lever with red knob located to the left of the AUX GEAR CONTROL T-handle. Pulling the lever aft will apply equal pressure to both main landing gear brake assemblies. Releasing the back pressure on the lever and allowing it to move forward will relieve the pressure. The air pressure to the brakes may be modulated to provide any braking rate desired, but differential braking and antiskid will not be available. The emergency air bottle, when fully charged, contains sufficient pressure for ten or more full brake applications. For the most efficient use of the system, apply sufficient air pressure to the brakes to obtain the desired deceleration rate. Maintain that pressure until airplane is stopped. When the handle is released, residual air pressure from the brakes is exhausted overboard. Normal braking should not be applied while using the pneumatic brakes. Depressing the pedals will reposition the shuttle valves in the brake lines to open, allowing high pressure air from the brake housing to enter the brake hydraulic reservoir, which might possibly rupture it. Adequate emergency braking for most conditions will be available from a properly serviced air bottle, even if the landing gear have been extended pneumatically. After stopping and clearing the runway, it is probably best to shut down the engines and have the airplane towed to the ramp, as there is no warning in the cockpit when the air bottle is depleted.

BRAKE SYSTEM ELECTRICAL POWER

The brake system receives electrical power through two 20-ampere circuit breakers on the left circuit breaker panel. The SKID CONTROL circuit breaker provides power to the brake antiskid system and the PWR BRKS circuit breaker provides power to the power brake motor/pump.

CAUTION

DO NOT PULL THE PWR BRKS CIRCUIT BREAKER TO PREVENT THE POWER BRAKE PUMP FROM CYCLING. WITH THE CIRCUIT BREAKER DISENGAGED, THE POWER BRAKE SYSTEM IS INOPERATIVE AND THE RUDDER PEDAL TOE BRAKES ARE DISABLED. BRAKING IS THEN AVAILABLE ONLY BY USE OF THE PNEUMATIC BRAKE SYSTEM.

LANDING GEAR

GENERAL

The landing gear is electrically controlled and hydraulically actuated. Each landing gear assembly uses a single wheel assembly and an oil over air strut. The nose gear has a chined tire for water and slush deflection. The main landing gear doors are mechanically connected to the main gear struts and extend and retract with the individual gear assemblies. The nose gear utilizes three doors. The rear door is mechanically connected to the nose gear strut and extends aft, or retracts forward with the nose gear assembly. The two forward double-action doors are mechanically linked to the nose gear. These doors remain open with the nose gear fully extended.

The gear actuators incorporate an internal lock to hold the gear in the extended position. They are held retracted by mechanical uplocks that are normally released hydraulically. The landing gear completes a retraction or extension cycle in less than 6 seconds. The gear can be extended at airspeeds up to 250 KIAS (VLO extend). It can be retracted at speeds up to 200 KIAS (VLO retract). With the landing gear extended, the maximum speed is 250 KIAS (VLE).

CONTROL

The landing gear control panel contains the landing gear handle, an audible warning system, three gear safe indicators and a red gear unlocked indicator. The landing gear handle has two positions: full down and full up. The gear handle must be pulled out to clear a detent before it can be repositioned. Operation of the gear and doors will not begin until the handle has been positioned in one of the two detents. A gear handle locking solenoid activated by the left main gear squat switch, physically prevents inadvertent movement of the gear handle while on the ground.

EXTENSION AND RETRACTION

In a landing gear retraction cycle, the following takes place:

1. With weight off the left landing gear squat switch, power is applied to the solenoid lock, allowing the landing gear handle to be placed in the UP position.
2. Actuation of the gear handle to the UP position:
   a. Lights the GEAR UNLOCK warning light when a gear unlocks.
   b. Closes the bypass valve in the hydraulic return line, pressurizing the system as required.
   c. Positions the landing gear control valve to route hydraulic fluid to the retract side of the hydraulic cylinders.
3. The landing gear are mechanically snatched and held in place by the uplatches.
4. Actuation of the three gear up microswitches:
   a. Opens the bypass valve in the hydraulic system returning it to open center operation and low pressure.
   b. Removes power from the landing gear control valve.
   c. Extinguishes GEAR UNLOCKED indicator light.

The sequence during a gear extension is identical with the following exceptions:

1. Solenoid lock on landing gear handle is not in use.
2. Gear handle to the DOWN position causes fluid to be routed by the control valve through the uplocks to release them, and then to the extend side of the actuating cylinders. The green LH, RH and NOSE gear indicating lights illuminate as each gear locks down. After all gear are down-and-locked, the gear down microswitches return the hydraulic system to open center operation.

POSITION AND WARNING SYSTEM

The landing gear position and warning system provides visual and audible indication of landing gear position. Three green safe lights and a red GEAR UNLOCK light are located in a group adjacent to the gear control handle. Each green light corresponds to one gear, NOSE, LH or RH and indicates that it is in the down and locked position. The red light indicates an unsafe gear position (in transit or not locked). The landing gear warning system sounds an audible warning when one of the following three conditions exist:

1.) Gear not down and locked, both throttles retarded below approximately 70 percent N_2, and flaps greater than 15 degrees.

2.) Gear not down and locked, both throttles retarded below approximately 70 percent N_2, and valid radio altimeter signal indicates less than 500 feet AGL.

3.) Gear not down and locked, both throttles retarded below approximately 70 percent N_2, and, a non-valid radio altimeter signal and airspeed below 150 KIAS.

The audible warning system cannot be silenced until the conditions which initiated warning system activation are corrected.

LANDING GEAR POSITION WARNING

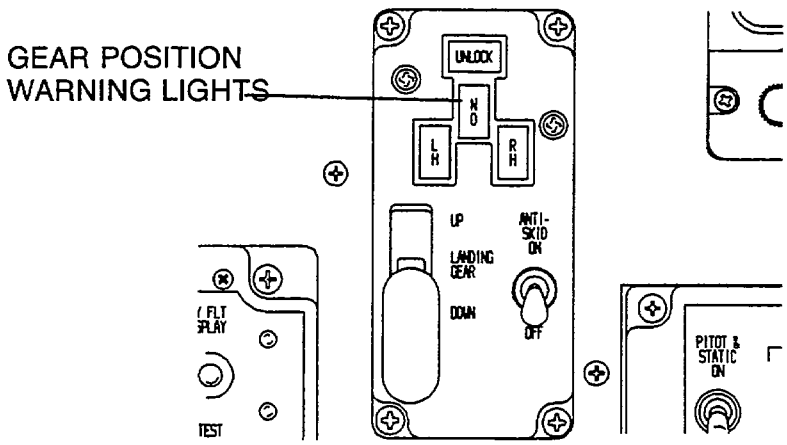

Figure 2-10

EMERGENCY EXTENSION

In the event of normal system malfunction, a manually operated system is provided to release the landing gear for free-fall extension.

The manual system is actuated by the red AUX GEAR CONTROL T-handle located under the pilot's instrument panel. The handle is pulled and rotated clockwise to lock. This action mechanically disengages the landing gear uplocks, allowing the landing gear to free-fall to the down and locked position and also unlocks the red, collar-type, blow down knob. Lowering the landing gear by the free fall method is not advisable at speeds above 200 KIAS, as the gear may not fully extend above that speed. Approximately 150 KIAS with flaps up is the optimum speed/configuration for free fall extension. Yawing the airplane may be required to achieve green light indications and the pneumatic system should always be used to assure positive locking of all three gear actuators. If the landing gear down and locked lights are not illuminated, verify that the gear is out of the up and locked position before utilizing the blow-down system.

Pulling the red, collar-type knob on the T-handle shaft mechanically ports the emergency air bottle into the extend side of all three landing gear actuators. The gear is driven to the down and locked position and normal indications will appear in the cockpit providing the gear handle is down. After actuation of the pneumatic system, the knob and T-handle should be reset. After each use, the system must be reserviced.

PNEUMATIC

GENERAL

An air bottle which provides for emergency extension of the landing gear and/or emergency braking is located on the left side of the forward pressure bulkhead. The bottle is properly serviced at 1500-2000 PSI and can be checked on preflight by a gauge visible in the left side of the nose avionics compartment. A relief valve on the bottle will rupture at 4000 PSI if the bottle becomes overpressurized.

The bottle has outlets to the vent line, the gear auxiliary extension line, and the brake air pressure line. In normal system configuration the landing gear auxiliary extension line is connected to the vent line through the position of the control valve.

EMERGENCY GEAR EXTENSION

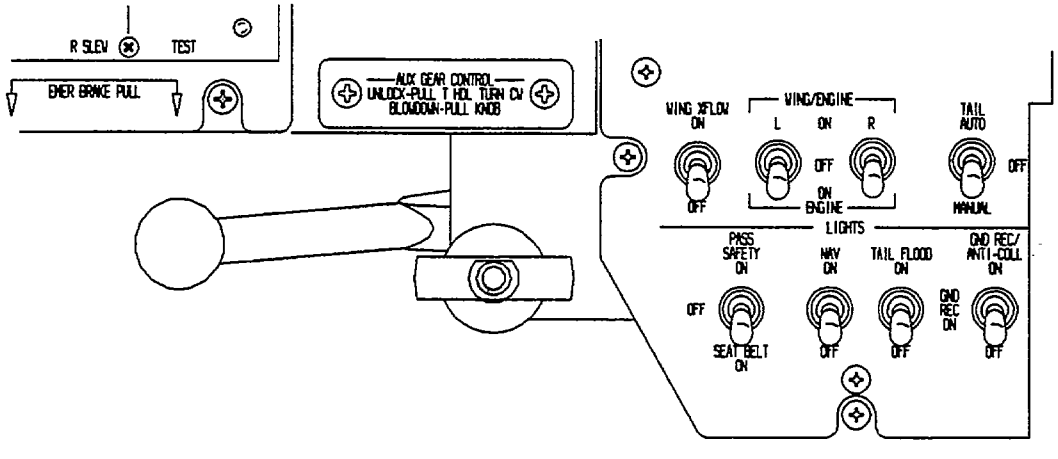

Figure 2-11