

HYDRAULIC

GENERAL

The airplane hydraulic system is comprised of a single, closed center system with two variable displacement engine driven pumps. These pumps provide hydraulic power to actuate the following systems:

- Roll Spoilers
- Landing Gear
- Speed Brakes
- Thrust Reversers
- Nosewheel Steering
- Main Wheel Brakes

The system is designed for use of MIL-PRF-87257 hydraulic fluid and synthetic rubber (Nitrile) O-Rings. Hydraulic fluid operation temperature is -40°F (-40°C) to 275°F (135°C). The ambient temperature operating range is from -65°F (-53.8°C) to 130°F (54.4°C).

Fluid on the pressure side of the system, which operates at 3000 PSI, is routed through a series of stainless steel and titanium tubing. Stainless steel tubing is used in the gear wheel wells where the tubes are exposed to the environment and in the engine pylons where the pressure tubes interface with the firewall. System return fluid is pressurized at 50 PSI and is routed through titanium, steel, and aluminum tubes. On the return side, titanium tubing is used for all 1/4 inch diameter tubes. Steel return tubes are used in the engine pylon through the firewall. All other return tubes are aluminum.

RESERVOIR

One hydraulic fluid reservoir is installed in the upper tailcone of the airplane. Maximum capacity for this reservoir is 3.0 gallons. Normal service volume is 1.5 gallons of MIL-PRF-87257 fluid. Either engine driven hydraulic pump or the electric auxiliary pump provides pressurization of the reservoir. In the event of overfill or overpressurization, fluid will be vented overboard through the reservoir relief valve. The relief valve is capable of discharging maximum inlet flow to the reservoir while maintaining the maximum allowable pressure. Manual opening of the relief valve may be accomplished by pulling the reservoir bleed valve handle located on the ground service panel in the aft right hand tailcone fairing.

Servicing of the hydraulic system can be accomplished through the ground service panel located in the right hand aft tailcone fairing. Ground service ports located in the ground service panel on the right aft fuselage, connect to the aircraft hydraulic system in the right hand pylon control manifold for the pressure connection, and on the return filter manifold for the fluid return connection. A hydraulic service unit is connected to these service ports to operate the airplane hydraulic pumps, reservoir, and return filter for ground operation of the system. The hydraulic reservoir can be serviced with the hydraulic service unit ground service connections, or through the hand pump service connection in the ground service panel.

ACTUATORS

The landing gear, spoilers and speed brakes, and thrust reversers are powered by double acting hydraulic actuators. Hydraulic power is supplied or removed from the actuators based on pilot input and limit switches. The landing gear actuators have internal mechanical locks that are engaged as the landing gear reach the fully extended position. The landing gear are mechanically locked in the up position by external locks. A hydraulic actuator/sequence valve releases these locks. The main landing gear circuit incorporates a regenerative flow path to reduce pump demand during gear extension and to improve the ability of the gear to free-fall to the down and locked position. As the main landing gear are extended, fluid from the retract side of the actuator is ported back to the extend side of the actuator through a flow regulator. The extend inlet flow is limited by a flow control. Nose landing gear retract fluid is returned to the reservoir during extension. All extend fluid is returned to the reservoir during retraction.

The speed brake actuators are equipped with an internal mechanical lock that holds the speed brake in the stowed position. Speed brakes are held in the extended position by hydraulic pressure.

The thrust reversers are mechanically locked in the stowed position. These mechanical locks are hydraulically released for deployment. Hydraulic pressure maintains the reversers in the deployed position until commanded by the flight crew to stow.

The nosewheel Power Steering unit is a hydraulically powered rack and pinion unit. During gear retraction, hydraulic pressure to the Nose Gear actuator is routed through the Power Steering unit and automatically centers the nosewheel prior to gear retraction.

PUMPS

Two variable displacement pressure compensated engine driven pumps mounted on each engine accessory drive pad provide primary fluid flow. The pumps have been sized such that either pump can handle any normally anticipated hydraulic system demand. Both pumps are located in the engine fire zones. In the event of an engine fire, a means for stopping the hydraulic fluid flow is provided by a motor driven ball valve located in the inlet line of each pump outside the fire and rotor non-containment zones.

ACCUMULATORS

Two pneumatically charged hydraulic accumulators are incorporated into the hydraulic system. One accumulator is incorporated into the main system and the other is for backup hydraulic power to the nosewheel steering system. The main system accumulator assists with the supply of short-term high flow demands and dampens pressure pulsations to the system. The nosewheel steering accumulator allows for backup hydraulic pressure to power the nosewheel steering in the event of main system pressure loss. The nosewheel steering accumulator stores sufficient charge for at least two full sweeps (center to full right or left and back) of the nose wheel.