# The primary components of the "plumbing" portion of the hydraulic system include the following:

**Reservoir:** Hydraulic fluid reservoirs are required by most aircraft systems to provide a ready source of fluid for the hydraulic pump(s) and to contain a varying volume of fluid. This variance results from differential actuator volume (dependent upon whether the actuator is extended or retracted) and for fluid thermal contraction or expansion. The reservoir size is optimized so that only the amount of fluid needed for proper function is carried. In many installations, bleed air is used to pressurize or "bootstrap" the reservoir to help prevent hydraulic pump cavitation.

**Filters:** Hydraulic fluid cleanliness is essential to proper system function. In-line filters are incorporated into the hydraulic system to remove any contaminants from the fluid.

**Shut Off Valves:** Hydraulic shut off valves are usually installed at the engine firewall. In the event of an engine fire, the shutoff valve is closed to prevent possible ignition of the hydraulic fluid.

**Control Valves:** Hydraulic motors and actuators have an associated control valve which is positioned in response to a manual or automated system selection such as moving the flap lever. The control valve responds to that selection by positioning to allow pressurized hydraulic fluid to flow into the motor or actuator in the appropriate direction.

**Pressure Relief Valve:** In some systems, especially those utilizing a fixed displacement pump, pressure relief valves are incorporated to ensure that nominal system pressure is not exceeded. If system pressure becomes too high, the relief valve opens and fluid is returned to the reservoir.

**Hydraulic Fuses:** Hydraulic fuses are in-line safety devices designed to automatically seal off a hydraulic line if pressure becomes too low.

**Accumulators:** A hydraulic accumulator is a pressure storage reservoir in which hydraulic fluid is held under pressure by an external source of energy. The external source can be a spring or a compressed gas. An accumulator enables a hydraulic system to cope with extremes of demand using a less powerful pump and to respond more quickly to a temporary demand. It also acts as a system shock absorber by smoothing out pulsations. In the event of a hydraulic pump failure, the energy stored in an accumulator can provide a limited number of brake applications after landing.