properly serviced at 1800-2050 PSI and can be checked on preflight by a gage visible in the right forward baggage compartment. A relief valve on the bottle will open 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.

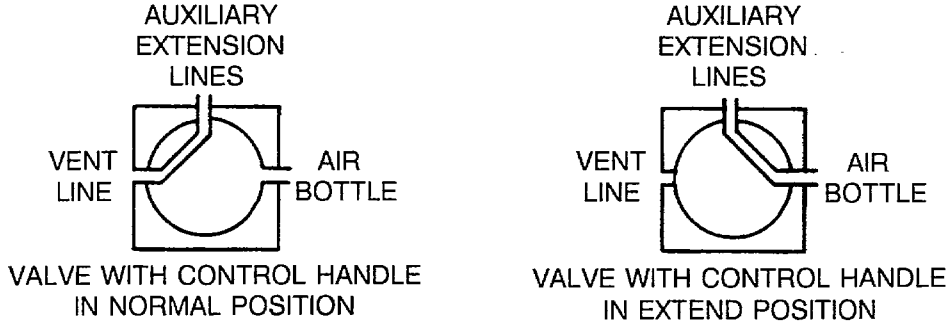

Figure 2-13. Emergency Air Bottle Control Valve

When the collar-type knob on the AUX GEAR CONTROL T-handle shaft is pulled, a valve is repositioned to direct air from the bottle through the auxiliary extension lines to the landing gear uplocks and the extend side of the landing gear actuators.

Emergency braking is controlled through a manually operated three-way pressure regulating valve. Air from the bottle is connected directly to the inlet port of the valve by the brake air pressure line. The outlet port is connected to the brakes and, when the emergency brake handle is in NORMAL position, is vented to an exhaust line. When the emergency brakes are applied, the vent is closed, the inlet port opens and high pressure air is applied to the brakes. Releasing the emergency brake handle opens the vent, relieving pressure. This allows modulation of the system to obtain the desired braking force. Each time the handle is cycled some air pressure is vented overboard, reducing the emergency bottle supply.

FLIGHT CONTROLS

GENERAL

All aerodynamic controls, with the exception of the flaps and speed brakes, are mechanically actuated by cables. The ailerons, elevator and rudder have manually trimmed control surfaces and cockpit trim position indicators. The elevator also trims electrically.

Flaps are hydraulically powered and can be operated to 15 degrees at 200 KIAS or below, to 35 degrees at 161 KIAS or below, and to 60 degrees (ground flaps) on the ground. Spoiler-type speedbrakes are hydraulically actuated and electrically controlled and can be extended throughout the flight envelope.

AILERONS

The ailerons provide excellent lateral control throughout the entire operating envelope. Full range of travel is 23.5 degrees, +1 or -1 degree up and 20.5 degrees, +1 or -1 degree down. One trim tab, located on the left aileron, is mechanically controlled by a knob on the

center pedestal. An indicator on the pedestal shows the amount of trim selected in relation to a neutral position. Full travel of the tab is 20 degrees, +1 or -1 degree up and 12° +1 or -1 down.

ELEVATOR

Elevator control is mechanical through a cable system made up of four cable assemblies. Full elevator travel is through a range of 20 degrees, +0 or -1 degree up, to 15 degrees, +1 or -1 degree down. Elevator trim tabs installed on each elevator can be positioned electrically or mechanically through cockpit trim tab actuators easily accessible to both pilots. Full travel of the tabs is 12 degrees, +1 or -1 degree up and 20 degrees, +1 or -1 degree down. An elevator trim wheel on the pedestal provides manual trim control. A trim switch, located on the left side of the pilot's control wheel and on the right side of the copilot's control wheel, controls an electric trim motor which in turn positions the elevator tabs. The pilot's trim switch has priority and will interrupt and override the copilot's control. If the electric trim malfunctions, it can be overridden by the manual trim system, or momentarily disabled by pressing the AP/TRIM DISC switch on the pilot's or copilot's yoke. Pulling the PITCH TRIM circuit breaker on the left circuit breaker panel will remove power from the electric trim motor.

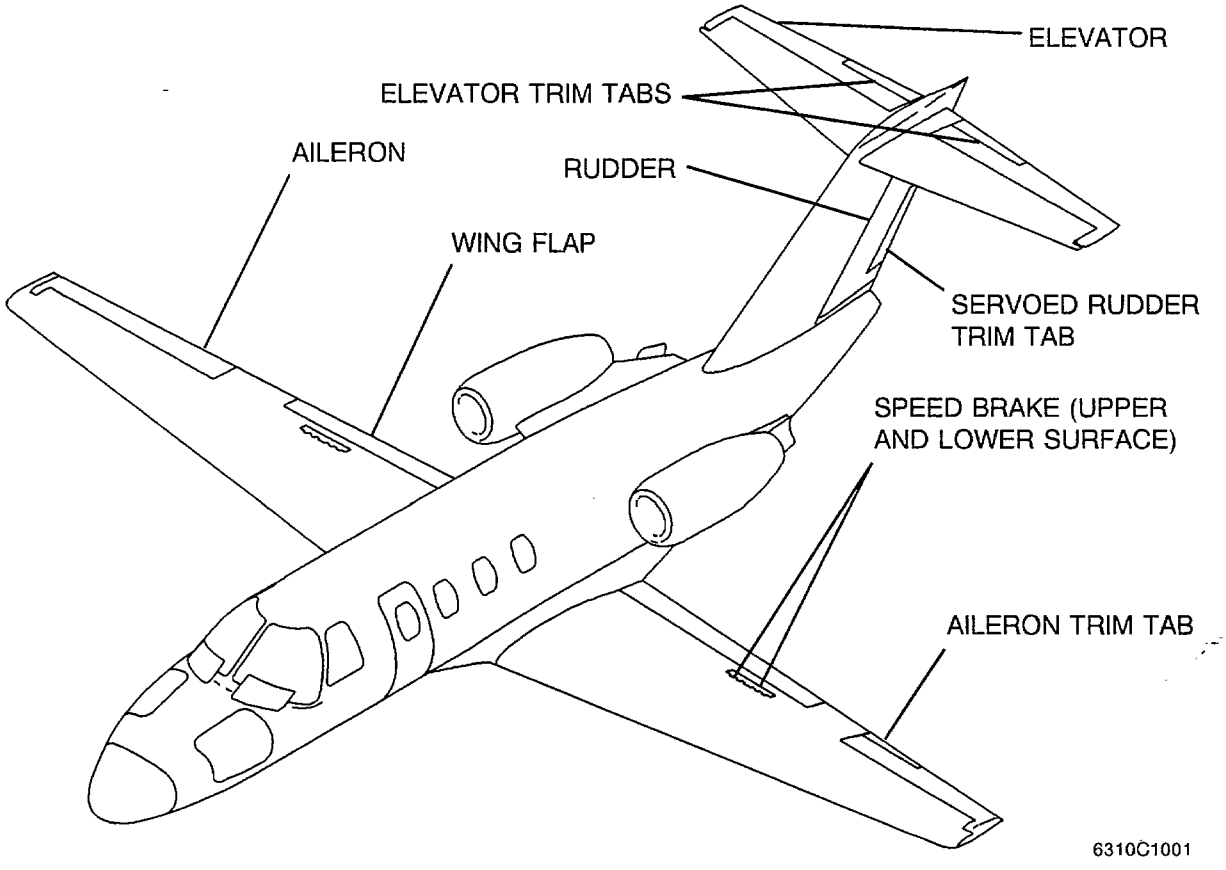

Figure 2-14. Flight Controls

RUDDER

Rudder control is very effective at all flight speeds. Full rudder deflection is 30 degrees, +1 or -1 degree either side of center. The rudder trim tab is a servo type which reduces pedal pressures and provides adjustable trim. For each degree of angular displacement of the rudder, the trim tab will move approximately one-third degree in the opposite direction. The rudder trim is mechanically operated by the rudder trim wheel on the center pedestal.

With the rudder in the trail position, the trim tab will deflect 20 degrees, +1 or -1 degree left and right. An indicator on the pedestal shows trim tab position relative to neutral.

NOSE GEAR STEERING

The nose gear is mechanically steered by the rudder pedals to 20 degrees either side of center. Steering is accomplished through mechanical linkage with a bungee that allows the nose gear to center before entering the wheel well on retraction. Additional castering of approximately 64 degrees of the nose wheel can be achieved against the bungee by application of differential power and braking. For ground handling and towing, maximum deflection of the nose wheel is 95 degrees either side of center.

SPEED BRAKES

The speed brakes are installed on the upper and lower surfaces of each wing to permit rapid rates of descent, rapid deceleration, and to spoil lift during landing roll. The speed brakes are electrically controlled and hydraulically actuated by a switch located on the throttle quadrant and may be selected to the fully extended or fully retracted positions. When the speed brakes are fully extended a white SPD BRK EXTEND annunciator will illuminate to remind the pilot of the deployed status of the speed brakes. The angular travel for the upper speed brake panels is 49 degrees, +2 or -2 degrees and the lower panels travel 68 degrees, +2 or -2 degrees. The lower speed brake panels close with the upper panel. The speed brakes will also automatically deploy when GROUND FLAPS position is selected on the flap handle.

When the speed brake switch is positioned to EXTEND, electrical power is applied to close the loading valve in the hydraulic system return line and open the speed brake control valve. This allows hydraulic fluid up to 1500 PSI to flow to the extend side of the speed brake actuators. Once the speed brakes are extended, the speed brake control valve closes to create a hydraulic lock and hold the speed brakes open. The loading valve opens and the hydraulic system returns to an open center condition. Moving the speed brake switch to RETRACT again pressurizes the system, and the speed brake control valve allows fluid to go to the retract side of the speed brake actuator. The speed brakes also extend upon landing when the main gear squat switch closes and the GROUND FLAPS position is selected

When the speed brakes are fully retracted, the control valve closes, the hydraulic system loading valve opens and open center operation resumes.

Throttle quadrant switches prevent speed brake extension at engine power settings above approximately 85 percent N_2. If the speed brakes are extended at lower power settings and the throttles are subsequently advanced above 85 percent, the speed brakes will retract.

During prolonged speed brake application, particularly at high speeds, air loads on the speed brakes will force some fluid past the closed control valve allowing the speed brakes to partially retract. The SPD BRK EXTEND annunciator will extinguish and the HYD PRESS ON annunciator will illuminate until the speed brakes are again fully deployed.

In the event of an electrical failure while the speed brakes are extended, the control valve will fail to the open position and the speed brakes will trail. If a dual hydraulic pump failure or fluid loss should occur with the speed brakes extended, moving the switch to RETRACT will deenergize the speed brake control valve and the speed brakes will trail.

FLAPS

The trailing edge flaps are electrically controlled and hydraulically actuated by the main hydraulic system. Normal flap travel is from 0 to 35 degrees and any intermediate position can be selected. A mechanical detent is installed at the takeoff and approach (15°) position of the flap lever. The full flap position (35°) is reached by pushing down on the flap lever when passing through the takeoff and approach detent.

The gear warning tone or the "LANDING GEAR" aural warning, if the aural system is installed, will sound any time the flaps are selected past the T.O. & APPR. position with the gear not down and locked. The warning cannot be silenced with the "Horn Silence" button when the airplane is in this configuration.

The flaps have an additional position called GROUND FLAPS (60°) which provides additional drag during the landing roll. Selection of the GROUND FLAPS (60°) position in flight is prohibited. If the flap handle is placed in the GROUND FLAPS position in flight the FLAPS >35° annunciator and MASTER CAUTION will illuminate after an eight-second delay. Even though the GROUND FLAPS position is prohibited from use in flight, it has been demonstrated that the airplane can be safely flown if that position should inadvertently be selected. If the GROUND FLAPS position is inadvertently selected during landing aproach a high sink rate may be expected. In such a case, engine thrust should be increased and the flaps raised to a normal landing setting. On the ground selecting GROUND FLAPS also extends the speed brakes. If GROUND FLAPS deploy in flight, the speed brakes will deploy if the throttles are below 85% N_2 RPM and retract with the throttles above 85% N_2. Avoid cycling the throttles above and below 85% N_2, as the speed brakes will cycle.

CONTROL LOCK

The control lock is mechanically operated and, when engaged, locks the ailerons, elevators and rudder in the neutral position and the throttles in the OFF position. The control lock handle, located below the instrument panel on the left side, controls the system. When the handle is pulled straight aft to the detent, the flight controls and throttles are locked. To release the control lock system, rotate the T-handle 45 degrees clockwise and push it in. With the control lock engaged, the maximum deflection of the nosewheel is restricted to 60 degrees either side of center. Exceeding this amount of turn will cause excessive force to be placed on the control lock mechanism and rudder control cables. Towing the airplane with the control lock engaged should be avoided. The controls should be neutralized before engaging the lock.

ELECTRICAL

GENERAL

Electrical power is normally supplied by two 29-volt direct current (DC), 300-ampere, engine-driven starter/generators. A 24-volt, 42-ampere hour (44 ampere-hour optional) battery is located in the tailcone compartment to supply power for starting and emergency requirements. A receptacle below the left engine pylon is provided for connection of an external power unit.

DIRECT CURRENT (DC) POWER

The direct current (DC) power distribution system consists of the starter/generators, battery, indicators, switches and bus network. The DC buses supply power for all DC functions except engine starting. Normally, the left generator powers the left main DC bus and the right generator the right main DC bus. Both operate in parallel, but in the event either generator is off the line, the crossfeed bus acts as a cross tie so that the remaining generator will power both main DC buses. The crossfeed bus is protected at each end, where it connects to the left and right busses, by a 225 ampere fuse.

DC power to the avionics equipment is controlled by the AVIONIC POWER ON/OFF switch, which serves as an avionics master switch.