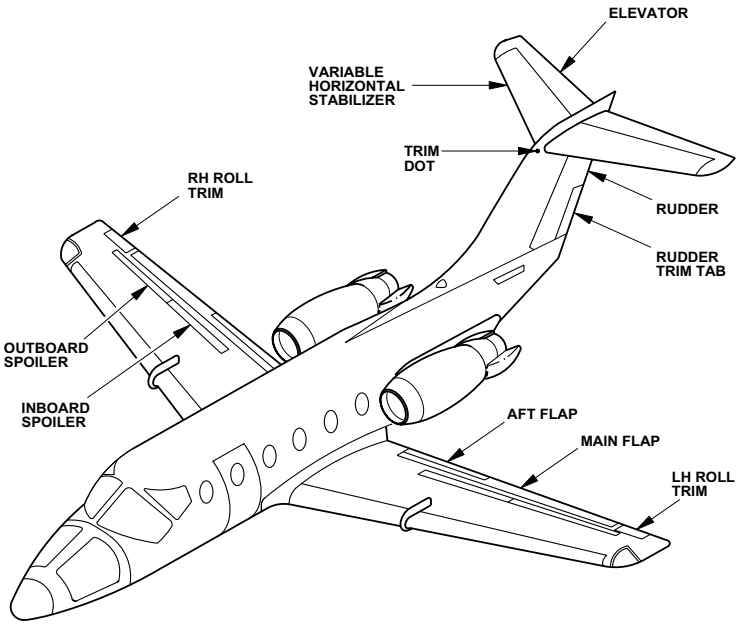
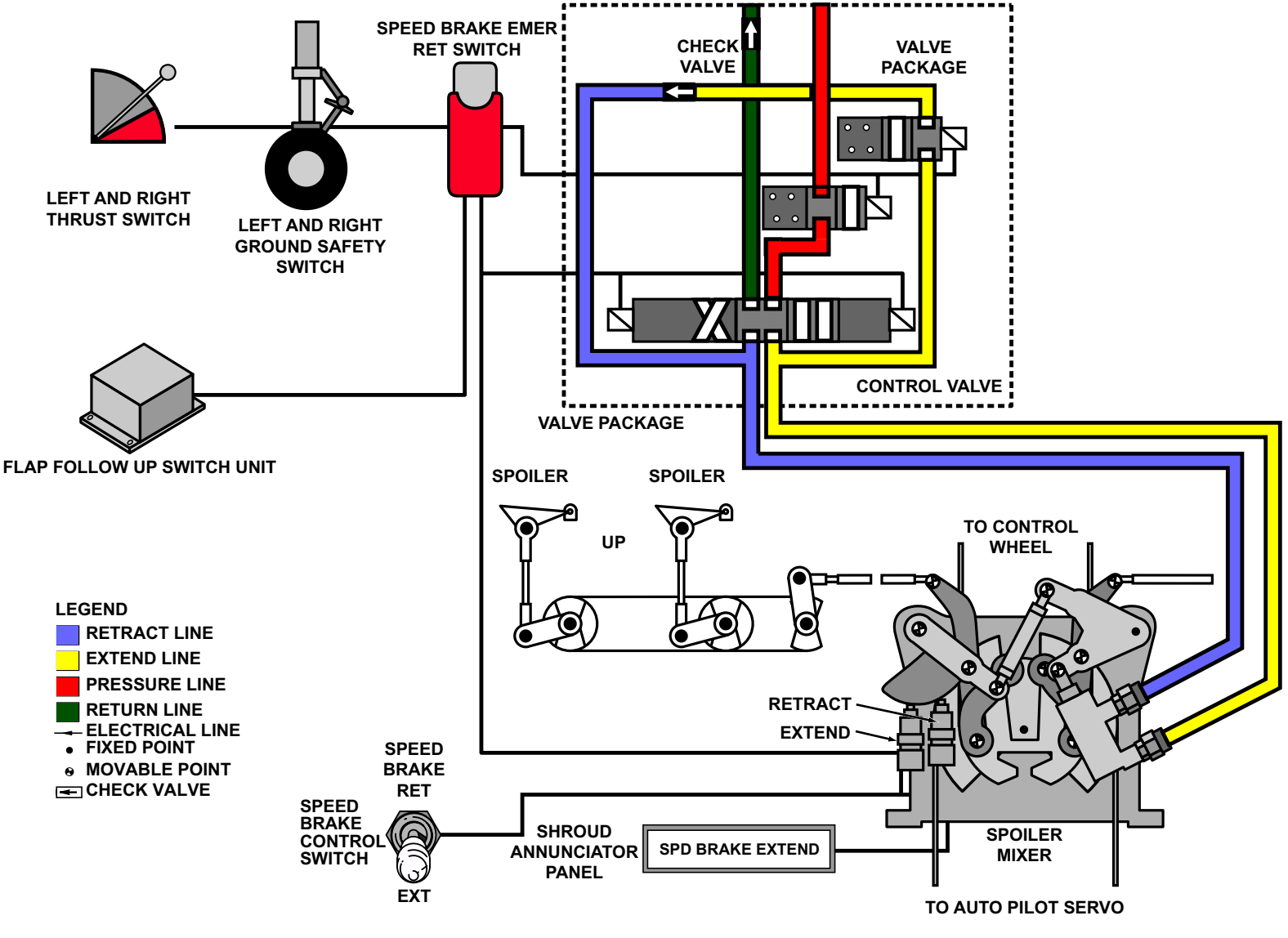
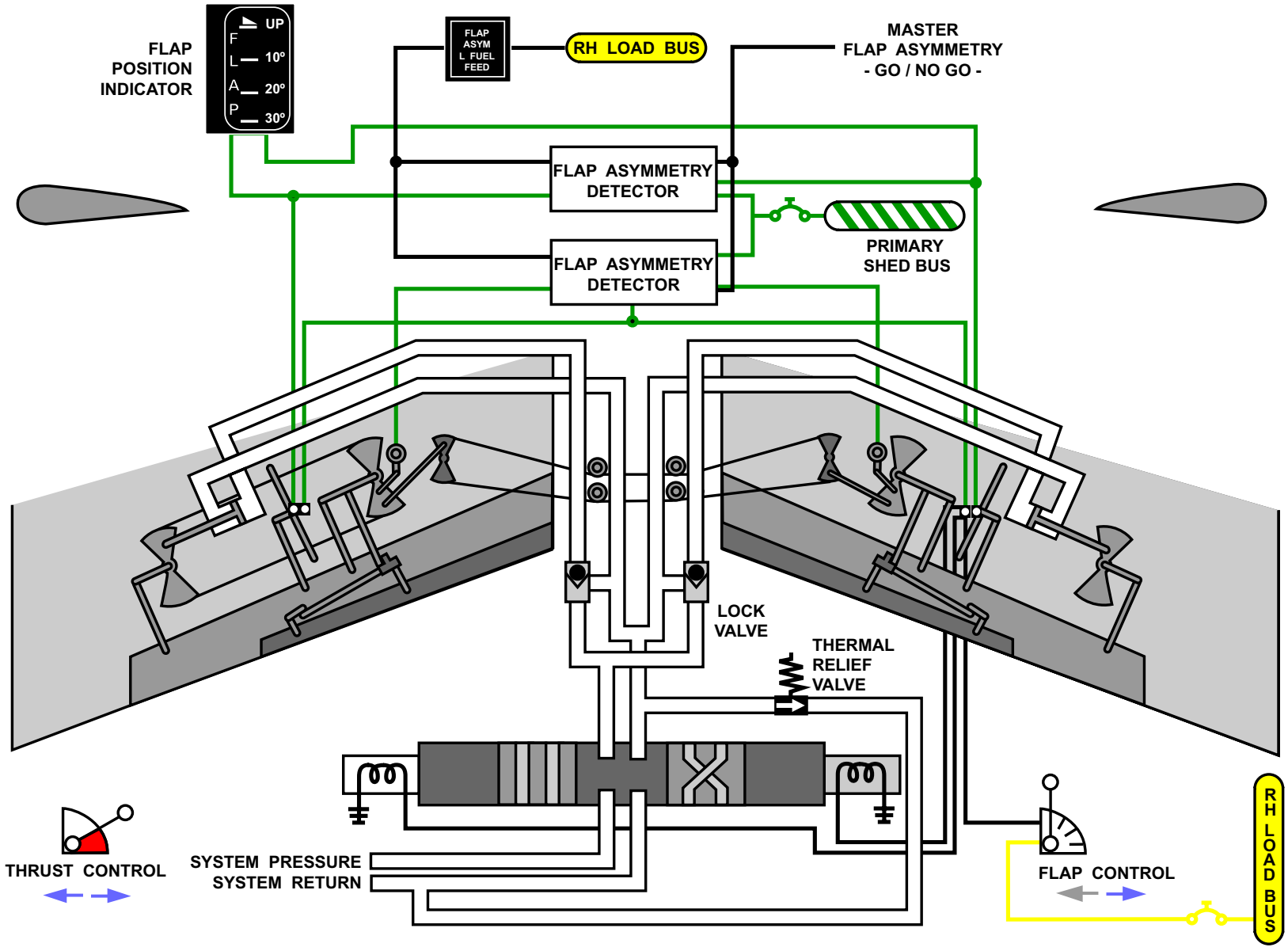
Flight Control Surfaces



Speedbrake System



Flap System


FLAP POSITION INDICATOR
UP
F
L
A
P
10°
20°
30°
FLAP ASYM L FUEL FEED
RH LOAD BUS
MASTER FLAP ASYMMETRY - GO / NO GO -
FLAP ASYMMETRY DETECTOR
FLAP ASYMMETRY DETECTOR
PRIMARY SHED BUS
LOCK VALVE
THERMAL RELIEF VALVE
THRUST CONTROL
SYSTEM PRESSURE
SYSTEM RETURN
FLAP CONTROL
RH LOAD BUS
B4CRH-FC003I

Flight Control System

The primary flight controls include the rudder, elevators and spoilers, all manually actuated. Electrically operated trim is provided in all three axes. The secondary flight controls consist of the pitch trim system, the roll trim system, the yaw trim system, flaps and speedbrakes. After touchdown, speedbrake surfaces, deflected in unison, provide lift dump for increased braking capabilities.

The primary control systems are manually operated through control cables, push-pull rods, and mechanical linkages. The pitch trim system, roll trim system, and yaw trim system are electrically operated. The speedbrake and flaps are controlled electrically and operated hydraulically and mechanically.

Primary Flight Controls

The elevators control pitch attitude. The elevator control system is operated manually by moving the control columns. Elevator control surfaces are fully mass balanced to ensure freedom from flutter. Full travel range of the elevator is 25 degrees up and 12 degrees down.

There are no ailerons on the airplane, so spoilers control roll attitude. Movement of the pilot's or copilot's control wheels operates the spoiler control system manually.

The rudder controls yaw attitude. The rudder control system is operated manually by moving the pilot's or copilot's rudder pedals. The rudder surface is fully mass balanced to ensure freedom from flutter. Full travel range of the rudder is 30° left and right from the neutral position.

Secondary Flight Controls

Pitch Trim System

Changing incidence of the horizontal stabilizer controls pitch trim. The horizontal stabilizer actuator is electrically operated. Normal operating time from stop to stop is 22.0 seconds +8.0 or -3.5 seconds. Incidence angle is -10.7 degrees nose up and -1.5 degrees nose down.

Normal trim control is accomplished by using the spring-loaded TRIM switches on each control wheel. If a malfunction develops during operation, the entire normal trim system can be electrically rendered inoperative. An emergency control system is provided for pitch trim.

The normal trim and emergency trim systems are isolated electrically. Using the PITCH TRIM switch installed on the center pedestal activates emergency trim. Set the PITCH TRIM select switch to EMER. To trim the airplane nose down or nose up, depress the spring-loaded PITCH TRIM switch to N. DN or N. UP position. The emergency trim operates at half the normal speed. To interrupt the normal pitch trim system, push the TRIM INT & A/P DISENG switch on the control wheel. Turn the PITCH TRIM select switch on the center pedestal to the DISC position to disengage both the normal and emergency trim systems.

When the trim arm or activation circuit is energized for more than five seconds, the pitch trim aural warning sounds. This warning is also activated when the normal trim system or emergency trim system is operated continuously for more than five seconds. The pitch trim aural warning also sounds if the thrust levers are advanced past approximately 80% N_1; the airplane is on the ground; and the pitch trim is not set in the takeoff trim zone.

The pitch trim position indicator is located on the pedestal. The range of the indicator is -1.3 degrees to -11 degrees nose up. The pointer of the indicator moves off scale DN when the AC power is cut off.

Roll Trim System

Roll trim is controlled by electrically activated roll trim surfaces. Operating time from stop to stop is 25 ±6 seconds. The deflection angle of the tab control surface is 25 degrees up and 25 degrees down.

The same trim switch used for pitch trim is used for roll trim. When the ROLL TRIM SELECT switch on the center pedestal is set to BOTH and the TRIM switch is depressed and held to LWD (left wing down) or RWD (right wing down), the trim actuators move the roll trim surfaces.

If either roll trim surface fails to move, turn the ROLL TRIM SEL switch to the operating side. This disconnects the left and right roll trim surfaces from one another and allows only the selected side to move. To interrupt the normal roll trim, push the TRIM INT & A/P DISENG switch on the control wheel. Turn the ROLL & RUD TRIM switch on the pedestal to the DISC position to disengage both the normal and emergency trim systems.

Two rotating pointers indicate position of the roll trim surfaces in degrees. A trim position transmitter on the trim actuator electrically positions the indicator.

Yaw Trim System

Yaw trim is controlled by an electrically actuated rudder trim surface. The electrical rudder trim surface actuator is installed in the vertical stabilizer. The operating time from neutral to full deflection is 48 ±16 seconds. The full deflection angle of the rudder trim control is 24 degrees left and 24 degrees right.

The RUD TRIM switch is located on the pedestal. Like the roll and pitch trim, the RUD TRIM switch requires two separate actions. The switch must be pushed in and turned to operate the trim. If trim runaway should occur, it can be stopped by pushing and holding the TRIM INT & A/P DISENG switch, turning the ROLL & RUD TRIM interrupt switch to DISC position, and then releasing the TRIM INT & A/P DISENG switch. The rudder position indicator on the center pedestal shows rudder trim position.

Speedbrake

The spoilers are used as a speedbrake, as well as for roll control. The SPEED BRAKE switch on the center pedestal electrically controls the speedbrake. The speedbrake is hydraulically operated. See Tables 4-1 through 4-3 for the Speed Brake Deflection Charts.

When the SPEED BRAKE switch is positioned to EXT, electrical power is applied to the extend solenoid of the speedbrake control valve. This valve supplies hydraulic pressure to the speedbrake actuator which deploys the spoilers up to a maximum of 36 degrees on both wings. This creates drag and reduces lift. The speedbrake actuator uses the same mechanical linkage as the spoiler system to deploy the speedbrakes; therefore, the pilot can still move the spoiler, using the control wheel to maintain lateral control. By setting the SPEED BRAKE switch to the RET position, electrical power is applied to the retract solenoid of the speedbrake control valve, hydraulic pressure is supplied to the speedbrake actuator retract port, and the spoiler surfaces are retracted.

When the SPEED BRAKE switch is set to the EXT position, advancing either thrust lever to the T.O. position or setting flaps beyond 10 degrees de-energizes the SPEED BRAKE control switch holding coil. The switch springs to the retract position and the spoilers retract automatically.

If the spoilers will not retract normally, emergency retraction can be accomplished by placing the pedestal mounted and guarded SPEED BRAKE EMER RET switch to the EMER RET position. This deactivates the solenoids and dumps hydraulic pressure. The speedbrakes are blown down by aerodynamic force.

The SPD BRAKE EXT annunciator, located on the shroud indicator panel, illuminates when the SPEED BRAKE switch is positioned to EXT and the speedbrake retract limit switch, installed in the spoiler mixer box, is de-energized.

Refer to Tables 4D-A thru 4D-C for speedbrake deflections.

Spoiler Surface		Full Left	Full Right
LH	Inboard	68º	-14º
	Outboard	72º	-14º
RH	Inboard	-14º	68º
	Outboard	-14º	72º

Table 4E-A; Speedbrake Retracted and Control Wheel Fully Rotated

Spoiler Surface		Full Left	Full Right
LH	Inboard	36º	36º
	Outboard	36º	36º
RH	Inboard	36º	36º
	Outboard	36º	36º

Table 4E-B; Speedbrake Extended

Spoiler Surface		Full Left	Full Right
LH	Inboard	73º	14º
	Outboard	76º	14º
RH	Inboard	14º	73º
	Outboard	14º	76º

Table 4E-C; Speedbrake Extended and Control Wheel Fully Rotated

Flaps

The fowler-type flaps run approximately the full wingspan. The flaps on each wing consist of a main flap and an aft flap. The main flap moves along tracks, actuated by push-pull rods in the drive mechanism on the wing rear spar. The main flap mechanically extends the aft flap as it extends. The wing flaps are hydraulically actuated with one actuator per side and are interconnected by a cable system to ensure symmetrical operation. The flap system is controlled by a flap control lever located on the center pedestal to the right of the thrust levers. The flap control lever has four positions: 0°, 10°, 20° and 30°.

Flap position transmitters, located on the flap operating mechanism, send a signal to the AC-powered flap-position indicator. The transmitters also send signals to the flap asymmetry detector unit that, in turn, will stop flap operation if a 5 -7 degree discrepancy occurs between the two outboard sections or the two inboard sections. When this occurs, the FLAP ASYM annunciator will illuminate and the flap asymmetry detector will operate the asymmetry cutout relay. A selector valve in the flap valve module is de-energized to shut off system pressure to the flap actuators and flap movement will stop. The flaps cannot be moved from the position where the asymmetry occurred.