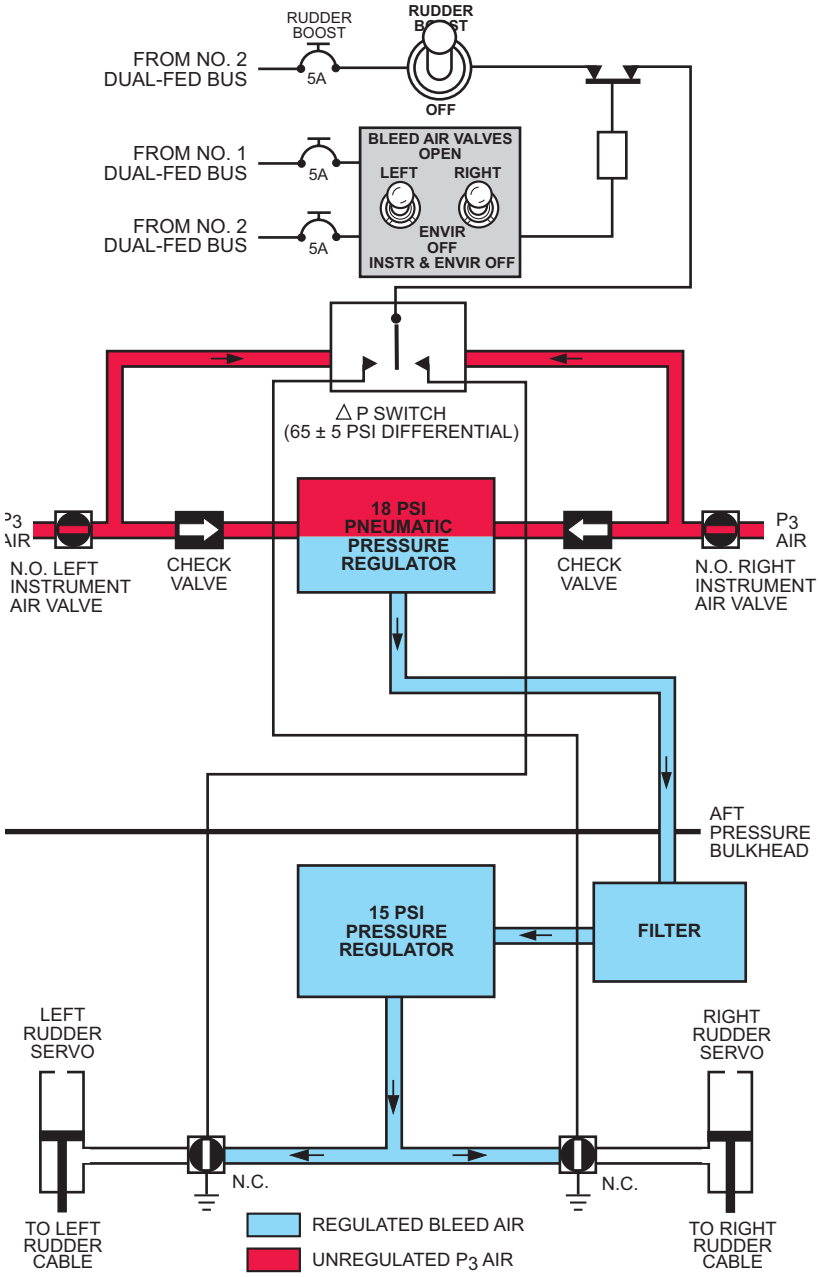
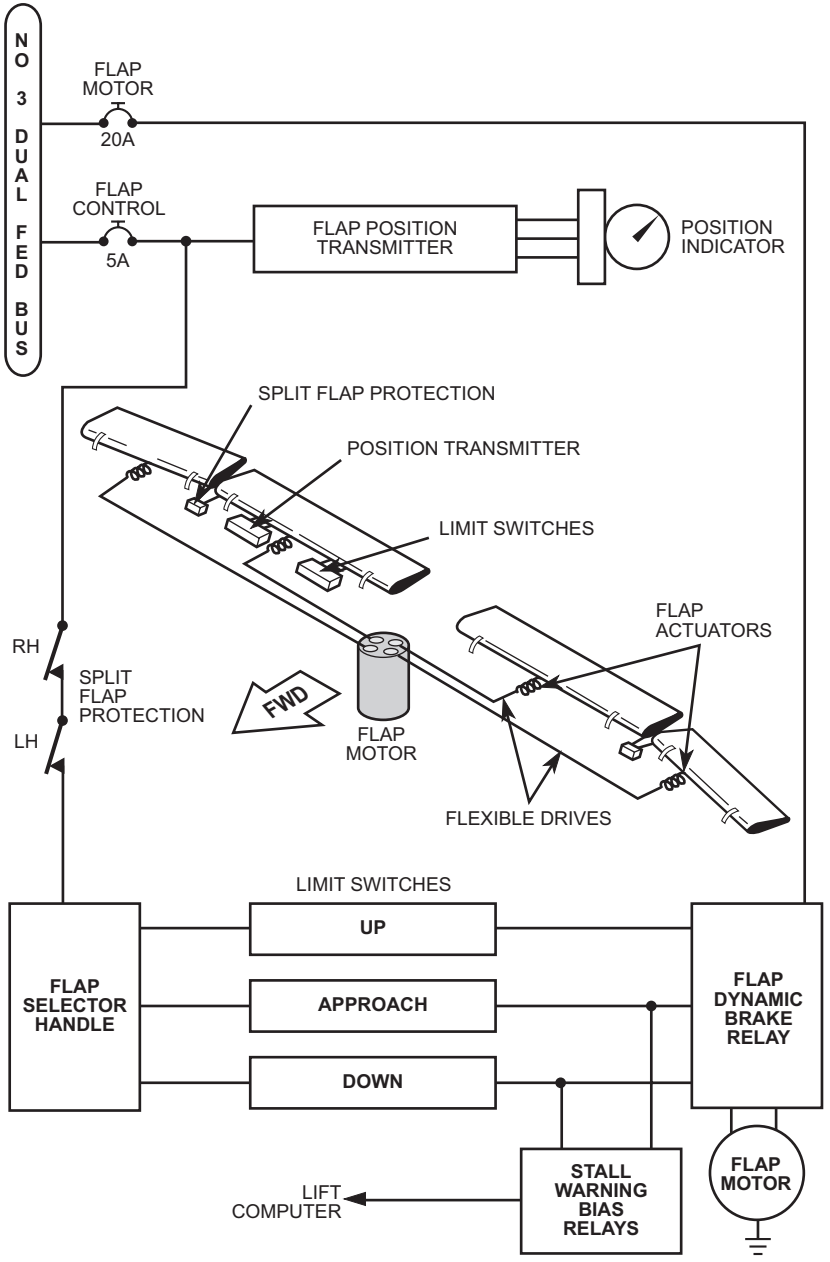
Rudder Boost System



Flap System


NO 3 DUAL FED BUS
FLAP MOTOR
20A
FLAP CONTROL
5A
FLAP POSITION TRANSMITTER
POSITION INDICATOR
SPLIT FLAP PROTECTION
POSITION TRANSMITTER
LIMIT SWITCHES
FLAP ACTUATORS
RH
SPLIT FLAP PROTECTION
LH
FWD
FLAP MOTOR
FLEXIBLE DRIVES
LIMIT SWITCHES
UP
APPROACH
DOWN
FLAP SELECTOR HANDLE
FLAP DYNAMIC BRAKE RELAY
FLAP MOTOR
STALL WARNING BIAS RELAYS
LIFT COMPUTER

Flight Controls

Primary flight controls include the ailerons, elevators, and rudder. These control the aircraft through the pitch, roll, and yaw axes. Each of the primary flight controls has a mechanically operated trim system; the elevator trim system also has an electrically operated trim system. The flap system is the only secondary flight control system.

Related flight systems include the stall warning, rudder boost, and yaw damper systems.

Primary Flight Controls

Ailerons on the outboard trailing edge of each wing provide roll control mechanically through the control wheel or electrically through the autopilot servo. Rotating the control wheel left or right from neutral mechanically actuates the ailerons through a system of cables and bellcranks. Mechanical stops on the ailerons limit total movement to approximately 25° up and 15° down from neutral. The autopilot also actuates the ailerons through a servo connected to the aileron control circuit's cables.

A trim tab on the left aileron provides lateral trim capability. Rotating the AILERON TAB knob left or right from the neutral or "0" position mechanically drives the trim tab up or down respectively. Toward RIGHT drives the tab up for a left wing up movement; movement toward LEFT produces the opposite effect.

The elevators on the trailing edge of the T-tail horizontal stabilizer provide pitch control. Pushing the control column fore and aft from neutral mechanically deflects the elevators down and up through cables and bellcranks. Stops limit total elevator movement to approximately 20° up and 14° down from neutral. An autopilot servo connected to the control cables also operates the elevators.

A mechanically or electrically operated pitch trim system drives the elevator trim tabs to reduce elevator control forces and trim the aircraft in the longitudinal axis. Rotating the ELEVATOR TAB wheel forward or aft from neutral mechanically drives the trim tab actuators. The jack-screw type actuators then extend or retract to move the elevator trim tabs in the necessary direction to pitch the nose up or down. With the ELEV TRIM switch in the ON position, the electric pitch trim system is activate. Actuating a set of TRIM switches toward the NOSE UP or NOSE DN position drives powers the electric trim tab actuator. The actuator's clutch then engages to connect the motor to the cable drum. The motor then operates the trim tab actuators through cables.

A bi-level, pushbutton, momentary-on trim disconnect switch is inboard of the dual-element thumb switch on the outboard grip of each control wheel. If an autopilot is installed, pressing the switch to the first level disconnects the autopilot and yaw damper system. Pressing the switch to the second level additionally disconnects the electric elevator-trim system. If no autopilot is installed, pressing the switch to the first level has no effect. The second level disconnects the elevator-trim system.

The rudder provides directional control of the aircraft about the vertical axis. A direct connect cable system from both sets of rudder pedals to the tail section drives the rudder. Deflecting a set of rudder pedals from neutral mechanically deflects the rudder to produce a yaw movement. Total rudder movement is approximately 25° left or right from neutral.

Rotating the RUDDER TAB wheel left or right from neutral mechanically moves the rudder trim tab to reduce rudder pedal control forces. Total tab deflection is approximately 15° left or right from neutral.

Rudder Boost and Yaw Damper

A rudder boost system pneumatically positions the rudder to compensate for asymmetric engine power differences. With the RUDDER BOOST switch in ON, the BLEED AIR VALVES switches in OPEN or ENVIR OFF, and engine bleed air available, the rudder boost system is active.

If engine power difference increases (i.e., failed engine), a differential pressure switch (DP) moves toward the low pressure side. Once pressure differential reaches approximately 60 ±4 PSI, the switch opens the opposite side's shutoff valve. The shutoff valve then supplies bleed air to the rudder servo to drive the rudder toward the engine producing more power.

With the BLEED AIR VALVE switch(es) in INST & ENVIR OFF the rudder boost relay interrupts pressure differential switch power supply to disengage the rudder boost system.

On aircraft without an autopilot, the rudder boost system also provides a yaw damping function. Bleed air passes through a 10 PSI pressure regulator before reaching a solenoid control valve and yaw control valve. With the YAW DAMP switch in ON and weight-off-wheels, the system's yaw sensor, amplifier, and control valve generate rudder inputs with the rudder boost servos to counteract aircraft yaw.

On aircraft with an autopilot, the yaw damping function is part of the autopilot. The yaw sensor, amplifier, control valve and related equipment are not present.

Flaps

Each wing contains two flaps on the trailing edge inboard of the ailerons. With flaps extended, stall speed decreases.

Selection of a flap position on the FLAP handle controls travel of the flaps by powering flap motor through limit switches and the flap motor relay. The flap motor drives a gearbox connected to four flexible driveshafts that, in turn, connect to jackscrew actuators at each flaps. To prevent overtravel, the flap motor has a dynamic braking system of two sets of motor windings.

Limit switches interrupt power to the flap motor when the desired position is reached. On **aircraft BB-2 to 187**, roller type microswitches limit flap travel. On **aircraft BB-188 and subsequent; aircraft with SI-1121-II**, open-cam type microswitches provide greater reliability in limiting flap travel.

A safety mechanism interrupts power if a split flap situation occurs. On **aircraft BB-2 to 424** this system cuts power by pulling one of the flap motor fuses. On **aircraft BB-425 and subsequent; BL-1 and subsequent**, flap asymmetry operates a flap safety switch.

The landing gear warning system provides an aural and visual warning of improper flight configurations. With the FLAP handle in UP, APPROACH, or DOWN, retarding the power levers below about 79% N_1 RPM setting with the landing gear retracted sounds the gear warning horn and flashes the landing gear lever light. With the FLAP handle in UP or APPROACH, pressing the horn silence button stops the horn. Advancing the power levers or extending the landing gear cancels the warning completely. With flaps down, the horn cannot be silenced by advancing the power levers or by pressing the horn silence button.

Stall Warning System

The stall warning system provides an audible warning to notify the crew of an impending stall.

With weight-off-wheels, an electrically heated lift transducer measures the aircraft's angle-of-attack (AOA). The system's lift computer then processes the transducer's inputs and modifies it based on flap setting. The lift computer adjusts the stall warning limits to the following:

- 5 to 13 kts above stall with flaps retracted (UP)
- 5 to 12 kts above stall with APPROACH flaps
- 8 to 14 kts above stall with flaps extended fully (DOWN).

If a stall is imminent, the lift transducer triggers the warning horn sounds.

With weight-on-wheels, placing the STALL WARN TEST switch in the test position magnetically deflects the lift transducer to the pre-stall position. If the system is working normally, the stall warning horn sounds.

NOTE: Stall Warning system may be unreliable during operations in icing conditions with accumulation of ice on airframe surfaces.

Flight Controls

Flap System

Power Source	No. 3 Dual-Fed bus – electric motor/control
Control	FLAP handle
Monitor	FLAP indicator
Protection	Circuit breakers FLAP CONTROL (5A) FLAP MOTOR (20A) Split flap protection Limit switches