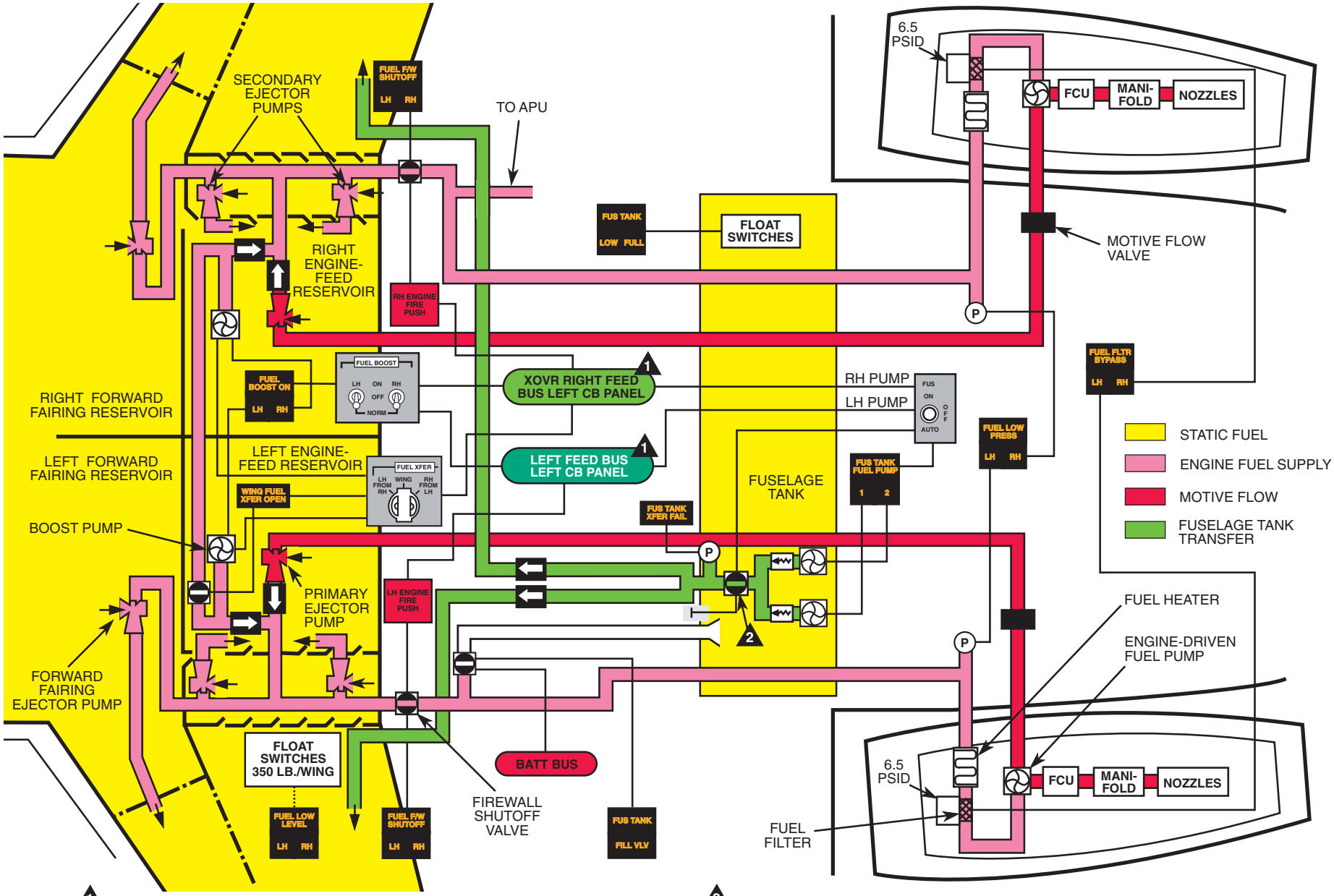
Fuel System



1 UNITS 0152 AND SUBSEQUENT, BOTH FIRE DETECT SYSTEMS AND FIREWALL SHUTOFF VALVES RECEIVE 28V DC FROM THE EMERGENCY BUS.

2 UNITS 0092 AND SUBSEQUENT

Fuel Storage

Each integral fuel tank consists of an outer wing, center wing (engine-feed reservoir), and forward fairing reservoir and holds 3,242 lbs of fuel. A fuselage tank behind the aft pressure bulkhead holds an additional 900 lbs. Two electric boost pumps in the bottom of the tank transfer fuel to the wing tanks. Total aircraft fuel capacity is approximately 7,384 lbs.

Flapper valves in the wing ribs open to allow fuel flow toward the center wing reservoir; they close to prevent outward flow during maneuvering. A wing reservoir venting system consisting of lines and float valves positively pressurizes the wing reservoir. It also allows fuel vapor and/or expanding fuel to escape overboard. Positive and negative pressure relief valves open to prevent tank overpressurization and vent the tank to atmosphere if the venting system clogs and a vacuum exists.

Air scoops on the wing forward fairing direct air past the fairing reservoirs to prevent vapor accumulation. The air exhausts through four vent tubes. Fuel dripping from a vent tube denotes a fairing reservoir leak that must be corrected.

The fuselage tank has an independent vent system consisting of a vent line, siphon breaker line, and cavity vent system. A drain mast on the fuselage bottom shrouds the vent line.

A filler cap on each outboard wing allows gravity fueling of the integral fuel tanks. Fuel flows inboard through the wing reservoir flapper valves to the fairing and center wing reservoirs. Normally, the fuselage tank cannot be gravity fueled; fuel must be transferred with a boost pump from the wing reservoir to the fuselage tank through a transfer valve. All fuel tanks can be fueled simultaneously through the single point refueling adapter.

Drain valves at the tank low points allow fuel sampling and removal of accumulated water and contaminants.

Fuel Indicating

Capacitance-type fuel probes in the wing reservoirs and fuselage tank drive the vertical tape FUEL QTY indicator. The indicator marked in pounds of fuel (LBS) shows left, fuselage, and right fuel tank quantity. The left wing and fuselage tank indicating system operates on 28V DC from the Crossover Right Feed bus. The right fuel tank indicating system operates on 28V DC from the Left Feed bus.

An optional fuel totalizer beneath the FUEL QTY indicator normally shows total fuel quantity. It can also show individual fuel tank quantity and aircraft gross weight.

Each center wing reservoir has a low level float switch. When a reservoir reaches empty, the float switch closes to illuminate the associated FUEL LOW LEVEL LH/RH annunciator. The fuselage tank has a high and low float switch. When the tank is full, the high level float switch illuminates the FUS TANK FULL annunciator. When the tank is nearly empty, the low level float switch illuminates the FUS TANK LOW annunciator.

A temperature sensor in the left and right center wing reservoir drives the digital dual-reading FUEL TEMP indicator. The indicator shows fuel temperature from -60°C to +70°C.

A fuel transmitter downstream of each engine's fuel control unit drives the vertical tape FUEL FLOW indicator. The indicator, marked in pounds-per-hour (PPH) individually shows left and right engine fuel flow up to 2,400 PPH.

Fuel Distribution

During engine start with a FUEL BOOST switch in NORM, movement of the throttle lever from cutoff energizes the boost pump relay. The electric boost pump operates and supplies fuel to the engine through the firewall shutoff valve. After the engine is running, its fuel pump develops sufficient pressure to supply the engine and the primary ejector pump.

High pressure fuel bypassed from the engine-driven fuel pump flows toward the primary ejector pump through the motive flow valve at 300 PSI. As fuel flows through the ejector pump, it creates a venturi effect that draws fuel from the engine-feed reservoir and provides it at a high volume and low pressure to the engine. When fuel pressure in the supply line exceeds 7.5 PSI, the pressure switch opens to de-energize the boost pump relay and stop electric boost pump operation.

Motive flow fuel from the primary ejector pump also supplies the two secondary ejector pumps in the center wing reservoir and one secondary ejector pump in the forward fairing reservoirs. These ejector pumps move fuel from the outboard wing to the fuel-feed reservoir and from the forward fairing reservoir to the outboard wing reservoir.

If an engine fire occurs, pressing the illuminated ENG FIRE switchlight closes the fuel and hydraulic firewall shutoff valve to stop fuel flow to the engine. When the shutoff valve close, the associated FUEL F/W SHUTOFF LH/RH and HYD F/W SHUTOFF LH/RH annunciators illuminate. Pressing the switchlight a second time opens the firewall shutoff valves.

If an engine-driven pump fails with the FUEL BOOST switch in NORM and pressure in the fuel supply line drops to approximately 5 PSI, the pressure switch closes and energizes the boost pump relay. The electric boost pump operates and provides fuel to the engine and the primary ejector pump. During low fuel pressure conditions, the pressure switch also illuminates the FUEL LOW PRESS annunciator after an eight second delay.

With the throttle lever in the cutoff position during engine shutdown, the pressure switch is out of the circuit to prevent electric boost pump operation as fuel pressure drops below 5.3 PSI.

Fuel Transfer

Two separate fuel transfer systems move fuel from one engine-feed reservoir to the other and from the fuselage tank to the wing reservoirs.

Rotating the FUEL XFR WING knob from OFF to LH FROM RH or RH FROM LH opens the fuel transfer valve and energizes the electric boost pump on the FROM side. The pump operates and moves fuel from its engine-feed reservoir through the open fuel transfer valve and non-operating boost pump into the opposite fuel-feed reservoir. During fuel transfer, the WING FUEL XFER OPEN annunciator and the associated FUEL BOOST ON annunciator illuminate.

Placing the FUEL XFR FUS switch ON opens the fuselage tank transfer valve and energizes the two electric transfer pumps in the fuselage tank. Fuel flows under pressure through two check valves and lines into the left and right outer wing reservoirs. When the FUS TANK LOW annunciator illuminates, the switch should be moved to OFF to prevent transfer pump damage caused by cavitation.

If the transfer pumps fail to develop sufficient pressure with the FUEL XFR FUS switch in ON after 50 seconds, a pressure switch in the transfer lines illuminates the FUS TANK XFER annunciator. On **unit 0092 and subsequent and earlier aircraft with SB650-28-22**, if the fuselage tank transfer valve fails to open electrically, it can be opened manually with FUS TANK XFER handle underneath the aft vanity. When fuel transfer is complete, turn the FUEL XFR FUS switch to OFF and close the transfer valve.

Fueling and Defueling

During overwing fueling, fuel flows through the filler cap into the outboard wing reservoir. From the outboard wing reservoir gravity carries the fuel through the flapper valves into the center wing reservoir and forward fairing reservoir. When there is at least 175 gallons in the left wing tanks, the fuselage tank can be filled with the WING-TO-FUSELAGE transfer switch behind an access door in the bottom of the left wing tip. Turning the transfer switch to ON opens a transfer valve, illuminates the FUS TANK FILL VLV annunciator, and activates the left fuel-feed reservoir boost pump. Fuel flows from the fuel-feed reservoir to the fuselage tank. When the fuselage tank fills, its high level float switch closes to deactivate the boost pump and close the transfer valve.

Before beginning normal pressure fueling, precheck valves for the wing and fuselage fuel tanks should be checked. The FUSE TANK FILL knob must be pulled out to fill the fuselage tank.

After lifting each of the three precheck toggles next to the fueling adapter, fuel flows from the fueling adapter through the precheck manual shutoff valves to each tank's pilot valve float chamber. Fuel also flows from the fueling adapter through each tank's spring-loaded closed refueling shutoff valve. As the fuel level in the float chambers rise, the pilot valves close and pressure builds in the pilot lines. Differential pressure then overcomes the pressure holding the refuel shutoff valve open and refueling stops. After checking the precheck valves, close them before starting normal pressure fueling.

Fuel flows from the fueling adapter through lines to the wing and fuselage tank refueling shutoff valves and forces them open. As the tanks reach full, the pilot valve closes and pressure builds in the pilot lines. When pilot line pressure exceeds the pressure forcing the refueling shutoff valve open, the shutoff valve closes and fueling stops.

Fuel System

Power Source	Pressure L/R engine-driven pumps L/R motive flow L/R wing tank boost pumps Fuselage tank boost pumps (2)
Distribution	Fuselage tank to wing tanks Engine-feed tanks to engines Wing tank to opposite (transfer only) Right wing to APU Left wing to fuselage (ground only)
Control	Throttles ENG FIRE PUSH lights (fuel firewall shutoff valve) Switches FUEL BOOST PUMP FUEL COMP L/R FUEL XFER
Monitors	Annunciators FUEL BOOST ON FUEL LOW PRESS FUEL LOW LEVEL FUEL FILTER BYPASS WING FUEL XFER OPEN FUS TANK LOW/FULL FUEL TANK FUEL PUMP FUS TANK XFER FAIL FUS TANK FILL VALVE FUEL F/W SHUTOFF FUEL COMP MANUAL