

INVESTIGATION SUPPLEMENTAL MATERIAL

Investigators from the Safety Board and Textron Aviation examined the wreckage on April 26, 2022, at the facilities of Air Transport in Phoenix, Arizona.



Figure 1: Wreckage

FUEL SYSTEM

FUEL SYSTEM DESIGN

A post accident examination revealed that airplane's fuel system was modified in accordance with the supplemental type certificate (STC) SA2660SW, when the engine was converted to an IO-407-N which is fuel injected. The fuel supply was held in four bladder-type cells; the main left and right tanks, located in the inboard wing (adjacent to the fuselage), had a total capacity of 20 gallons each, equating to 17 gallons of useable fuel. The auxiliary tanks, located in the mid-wing section (outboard of the wheel-wells), were 10 gallon fuel cells in the wings and connected to each respective main. The fuel selector had a left, right, auxiliary tanks, and off position and was located to the left of the left-forward seat. The selector was equipped with a manually operated pump that was designed to provide pressure for starting and emergency operation by the pilot manipulating it in an up and down position. The selector also had a screen incorporated into the housing. Both auxiliary cells were connected to a common port in the fuel selector valve, so that both fed simultaneously when the selector valve is set to auxiliary.

Individual electric sending-units were installed in all tanks, transmitting fuel quantity information to the sole cockpit gauge. The fuel level of either cell was designed to be reflected on the fuel gauge in the cockpit by the pilot switching the auxiliary fuel gage selector switch on the left subpanel to "AUX" or "MAIN" position and the "FUEL GAUGE" switch to the desired right or left position.



Figure 2: Fuel Selector and Fuel Gauge Switches

From the fuel selector, the fuel was plumbed to the electric-driven fuel pump and then through the firewall to the engine-driven fuel pump. From the fuel pump, the fuel was routed to the servo. The fuel then continued to the manifold (mounted on top of the engine), where it was divided to each cylinder through GAMI injectors.

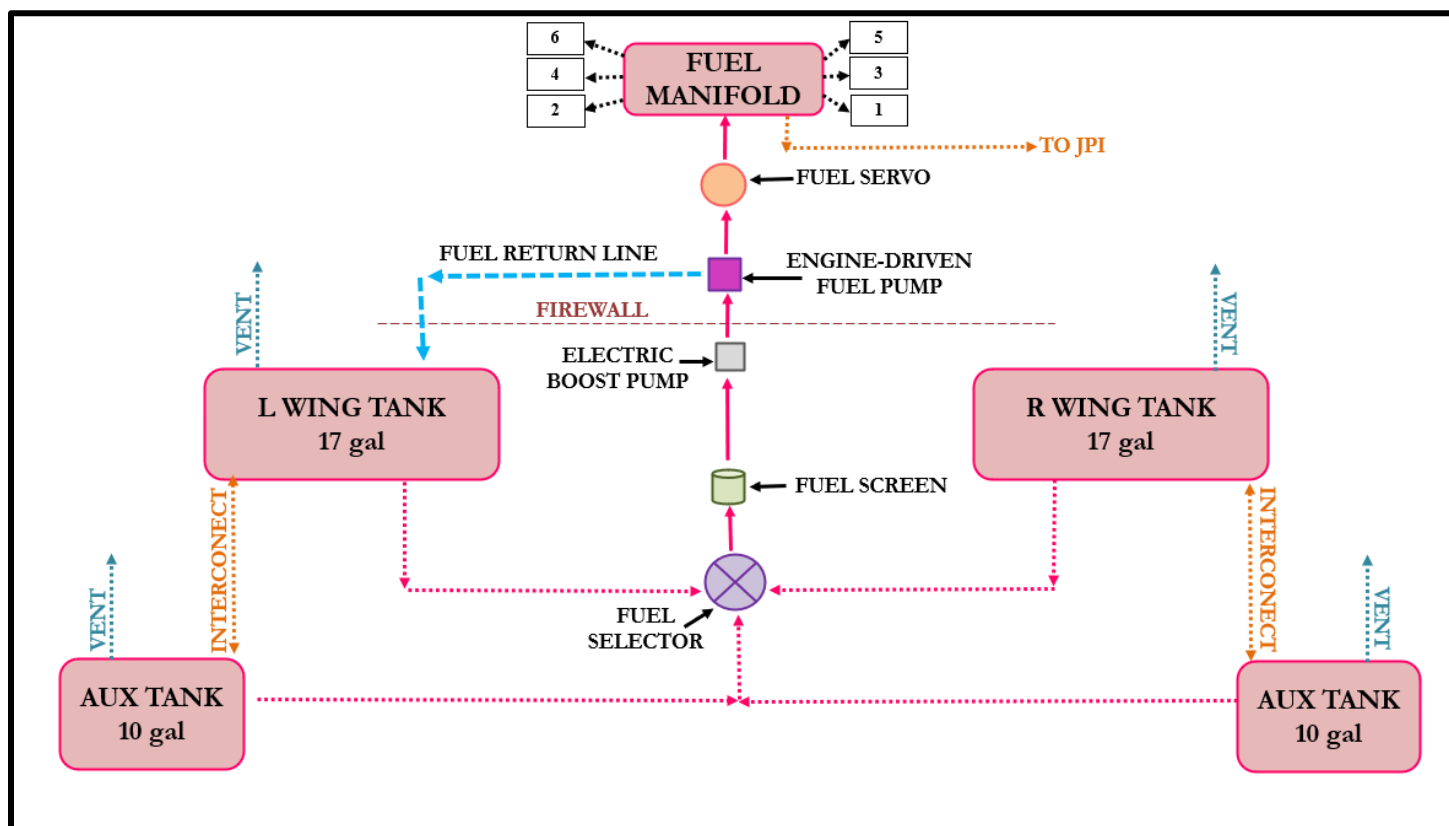


Figure 3: Fuel System Diagram

FUEL SYSTEM EXAM

Investigators established continuity in the fuel system. A water supply was plumbed to each fuel supply line at the wing roots and the line at the fuel pump was disconnect with a bucket placed under. When a position was set on the fuel selector with the electric boost pump activated, investigators observed fluid flow from the selected tank inlet through the system and exit out the bucket. The selector positions all corresponded to the desired tank(s) and the detents were felt to be strong. Disassembly revealed no anomalies. No debris was seen that was flushed from the

system. The filter was disassembled and was clean with no debris noted. The mechanical fuel pump (p/n 646212-9) was disassembled and was found intact; the carbon vanes moved freely and light scoring was observed on cavity walls. The diaphragm appeared scalloped in the body orifice area; the cover assembly likely covered those orifices and would not have resulted in that areas so this likely would have interfered. The fuel servo had both the mixture and throttle cables attached; no anomalies were found. The fuel manifold was disassembled, revealing a pliable diaphragm that was intact.

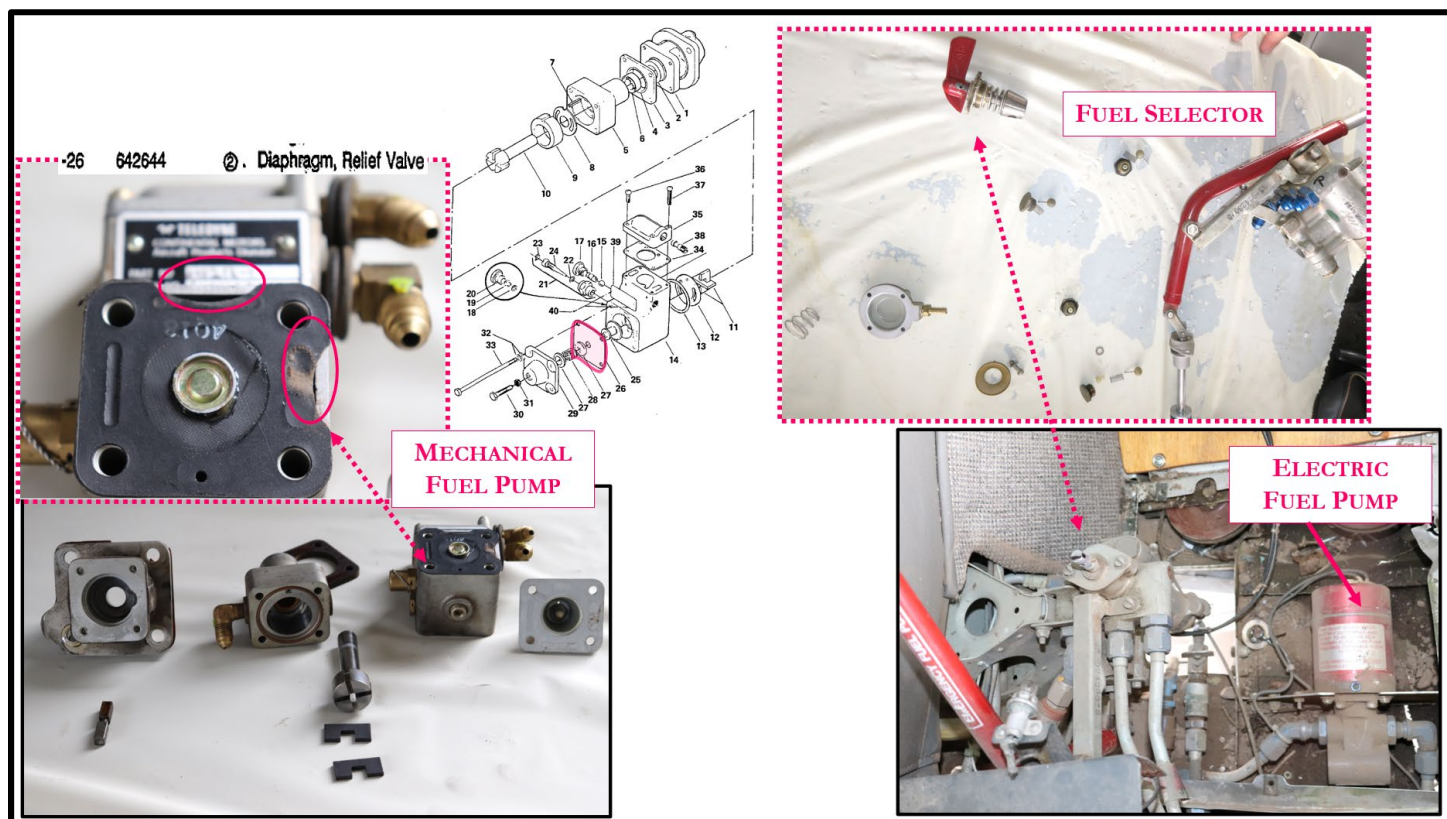


Figure 4: Fuel Pumps and Fuel Selector

The fuel caps remained secure on the tanks. The right and left main-tank fuel bladders had wrinkles in the bottom and were collapsed inward (not taut against the wing structure) consistent with the attachments not being secured. Investigators filled the left-wing bladder with water and simulated the dihedral the wing would have when installed. With the quantity sensor wired back to the fuel gauge in the cockpit, eight gallons of fuel was added to the bladder. The fuel gauge was observed to show about half-full with a measured eight gallons inside.

ENGINE EXAMINATION

The external examination of the Continental Motors IO-470-N-3E1 (s/n 96051-5-N-R) revealed no evidence of a catastrophic failure. Investigators removed all cylinders' rocker box covers and noted a light oil film on the rocker arms and valve assemblies. The upper spark plugs were removed and all were similar in appearance one another displaying a light gray coloration, consistent with normal operation; the No. 3 cylinder was slightly different with a whiter and rust color. The cylinders' combustion chambers were examined through the upper spark plug holes utilizing a lighted borescope. The combustion chambers remained mechanically undamaged and there was no evidence of foreign object ingestion. The valves and their respective seats appeared undamaged; the exhaust valves all had a red coloration. Investigators achieved manual rotation of the crankshaft by rotation of the propeller and observed spark at each lead. Thumb compression was established in all cylinders; the No. 3 cylinder initially did not have compression until the valve was staked several times. The upper rocker arm toe was not aligned with the valve end on several cylinders.