

National Transportation Safety Board

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AIRFRAME AND ENGINE EXAMINATION REPORT

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The airplane was located in the pilot/owner's hangar. When first observed, the airplane wings were removed and stored in a cradle adjacent to the fuselage. The main gear had been removed, and the fuselage was supported on a box.

The airplane was lifted, and the damaged landing gear was reinstalled to facilitate the examination. The upper and lower engine cowlings were removed to access the engine compartment. The fuel lines were examined and appeared to be continuous and secure from the fuel gascolator mounted on the engine firewall to the lower fuel manifold below the dual fuel pump system located on the left (looking forward) side of the firewall.

The dual fuel pump system consisted of two micro-fuel filters mounted below two electric fuel pumps. Fuel ran in parallel between the lower fuel manifold through each of the micro-filters to the fuel pumps and then conjoining through a banjo-fitting at the top of the fuel pumps. The remainder of the fuel line between the banjo fitting and the engine were secure.

Dust gathered on the engine firewall showed signs of collecting on a wet surface below the dual fuel pump system.

The fuel line between the gascolator and the dual fuel pump manifold was damaged/compressed due to buckling of the engine firewall. That portion of fuel line was removed, and a fuel line was attached to the fuel manifold to feed from a fuel can, to facilitate feeding the fuel pumps for a test of the system. A small amount of liquid consistent with fuel dripped from the fuel line when it was removed. The fuel return line was interrupted as it exited the engine, and a fuel line was added to allow fuel to return to an external fuel receptacle.

A fuel source was connected to the aircraft utilizing the same fuel that was recovered from the airplane at the time of the accident. According to the pilot, the fuel consisted of a mixture of 100LL and 93 Octane automotive gasoline. The fuel source was contained in a fuel jug and the fuel line that was connected to the fuel manifold below the two fuel pumps was placed into the jug. The fuel return was also fed into the fuel

jug. Electrical power was then turned on, and the left outboard (No. 1) fuel pump was turned on. The pump could be heard running, but it did not initially pick up fuel. The right or inboard (No. 2) fuel pump was turned on, and fuel began through the return line back to the fuel jug almost immediately. The No. 2 pump was turned off, and the No. 1 pump was turned back on. Fuel then began to flow through the No. 1 fuel pump. A sound similar to cavitation could be heard with the No. 1 fuel pump running, but fuel continued to flow at a steady rate. Power was switched to the No. 2 fuel pump. It initially did not have cavitation like sounds, but the sounds could be heard after the pump ran for 10-15 seconds. A light film of fuel was observed on the top of both fuel pumps, but a source of the fuel could not be seen.

The inboard spark plugs were then removed from each of the four cylinders. Each spark plug appeared to have normal burn signatures. The spark plugs had recently been replaced and appeared in like new condition. The spark plugs were re-installed to facilitate an engine run.

The airplane was moved out of the hangar, and an engine run was conducted. The first attempted start occurred with the No. 1 fuel pump selected. The engine started immediately and ran at idle with no issues noted. The engine was shut down, and no leaks were observed in the area of the fuel pumps. The engine was restarted and ran on the No. 2 fuel pump. The airplane started and ran without any issues noted. The engine was run to 2700 RPM. Again, no fuel leak was noted in the fuel pump area. The fuel pump was switched to the outboard or No. 1 fuel pump while the engine was running and the engine was run to 2700 RPM. No fuel was noted leaking on top of the fuel pumps following the engine run.

The airplane was moved back into the hangar and both fuel pumps were cycled again to allow fuel to run through both pumps. A film of fuel was observed developing on the top of the no.2 fuel pump. Fuel could be seen seeping from between the copper washer between the check valve and the banjo-fitting above the no. 2 fuel pump.

Torque was verified on the top nuts attaching the fuel lines to the banjo fitting above each of the fuel pumps at the manufacturer specified 13.2 foot pounds. The torque wrench broke over as soon as torque was applied to the nuts. Both were turned approximately 1/16 of a turn past the specified torque to apply additional torque to the nuts. Both fuel pumps were then cycled on and off, and no additional fuel leakage was observed.

An additional download of the Dynon data was conducted following the engine runs.

FUEL VENT SYSTEM

Positive air pressure was applied to the right-wing tank fuel connector and air was felt flowing through the vent tube located on the wing. Positive air pressure was supplied

to the left-wing fuel tank connector, and no airflow was felt through the vent tube on the wing. A small piece of wire was inserted approximately 3 inches into the vent tube and removed. Positive air pressure was reapplied, and some airflow was then felt flowing through the vent tube. Debris was NOT noted exiting the vent tube as the air was applied.

A borescope was used to examine the inside of the left-wing fuel tank. The vent and the fuel pickup points were observed, and both were free of obstructions. The inside of the tank appeared clean, and no debris was observed.

The AHARS panel located on the lower left wing was removed to access the fuel vent line connections and the fuel vent line was disconnected at the fuel tank. Positive air pressure was applied from the tank side of the vent fuel line and air flowed freely to the vent tube on the wing. Air also flowed freely from the tank to the break in the vent line at the fuel tank.

1.5 gallons of fuel was added to the header tank at the left-wing fuel line separation where the left wing was removed. The fuel then flowed freely to header tank and from the header tank to the gascolator when the fuel shut off valve was opened. NOTE: the drain plug on the bottom of the gascolator was impact damaged, so fuel drained from bottom of the gascolator and the output fuel port where the fuel line to the fuel pump manifold had been removed.

Fuel was again added to the header tank, and all fuel lines and vent lines were plugged. An attempt was made to allow fuel to flow through the fuel gascolator. Fuel flowed from the gascolator drain plug at a very slow/minimal rate. The cap blocking the left-wing fuel vent line to the header tank was unblocked and fuel was observed flowing at a steady rate from both the fuel gascolator drain plug and the output fuel port on the gascolator. The left-wing vent line was plugged again and the right-wing vent line plug was removed and again fuel flow from the gas collator drain and output fuel port at what appeared to be a steady rate. No additional anomalies were noted with the fuel vent system.

Submitted by:

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