

TESTS AND RESEARCH

A National Transportation Safety Board investigator and Federal Aviation Administration investigators examined the airplane at both the accident site and that the facilities of Air Transport in Phoenix, Arizona October 20 and 21, 2017.

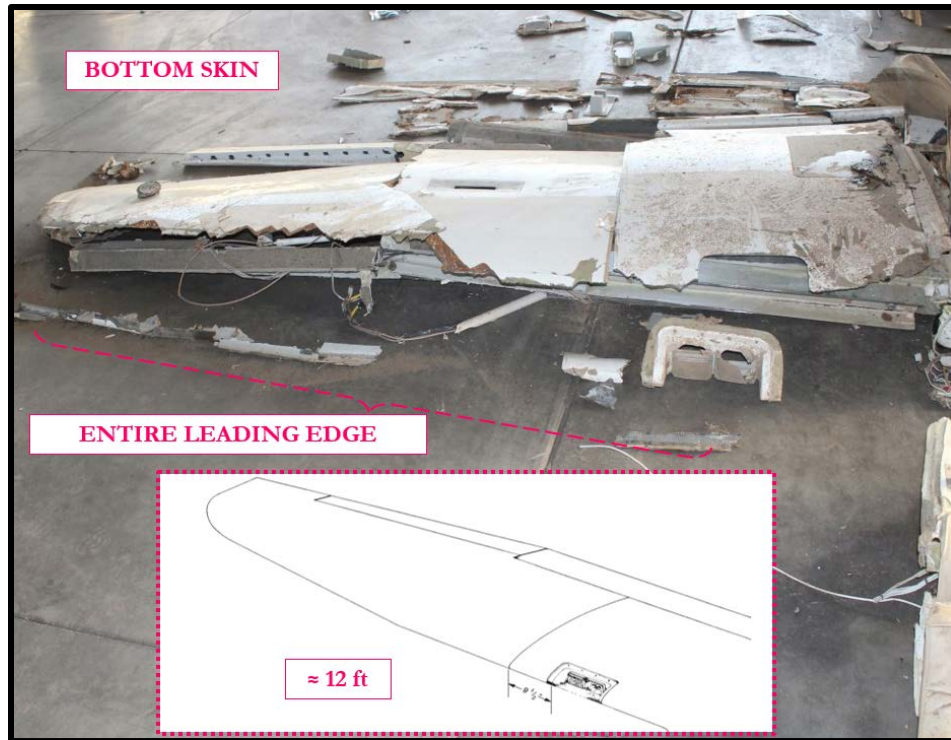
AIRFRAME



Picture 01: Airplane's Data Plate

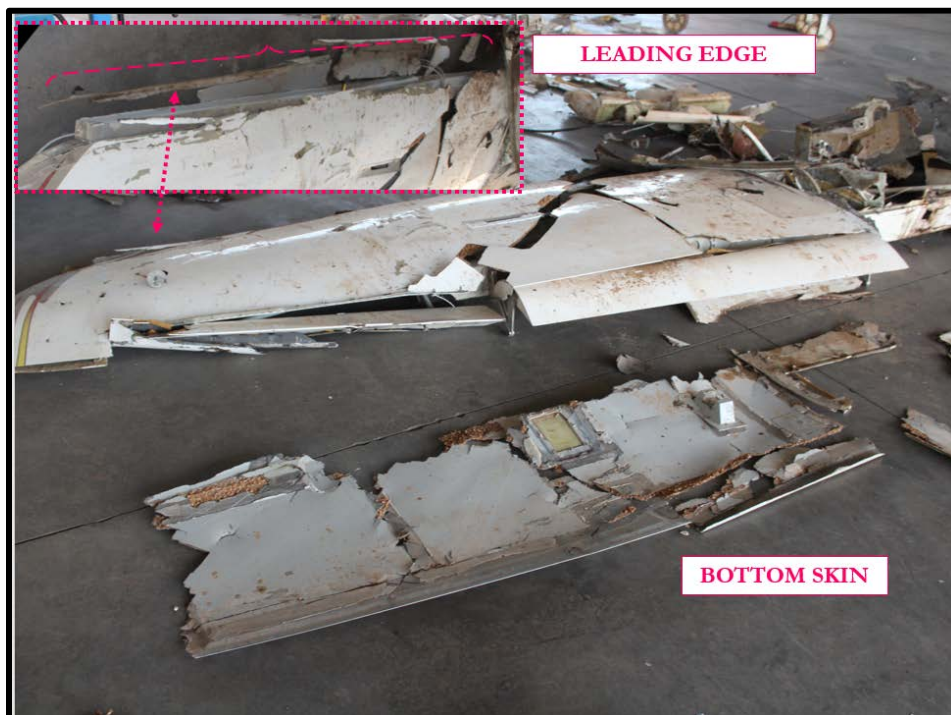
The left and right wing pieces were all accounted for at the accident site. The wings both sustained crush deformation, with the leading edge skin not attached to the main wing section and found forward in the debris field. The fuel caps and their respective flanges were both found forward of the respective wing consistent with fuel inside the wing forcing the cap outward during impact. Control surface continuity could not be established due to the severe fragmentation, but there was no evidence of a mechanical malfunction or anomaly.

The right wing, found separated from fuselage skin but adjacent to the wreckage in an upright position, had separated into numerous pieces. The main spar remained intact and the top wing skin was separated into three major pieces. The majority of the bottom wing skin pieces were severely fragmented and located under the wing partially buried in the dirt. The leading edge was separated into numerous pieces and located in the area near the outboard section; the landing light was several feet forward of the wreckage. The aileron was located next to the outboard section and had come detached at its respective hinges. Fragments of blue/green lens was found adjacent to the wingtip. The landing gear remained inside the wheel well and portions of the landing gear door were found in the wreckage, consistent with the landing gear being in the retracted position at the time of impact. The flap was separated into two major pieces and located adjacent to the wing and the wreckage. The inboard hinge of the right flap remained attached to both the spar and control surface; the outboard hinge remained attached to the flap section but had come separated from the spar.



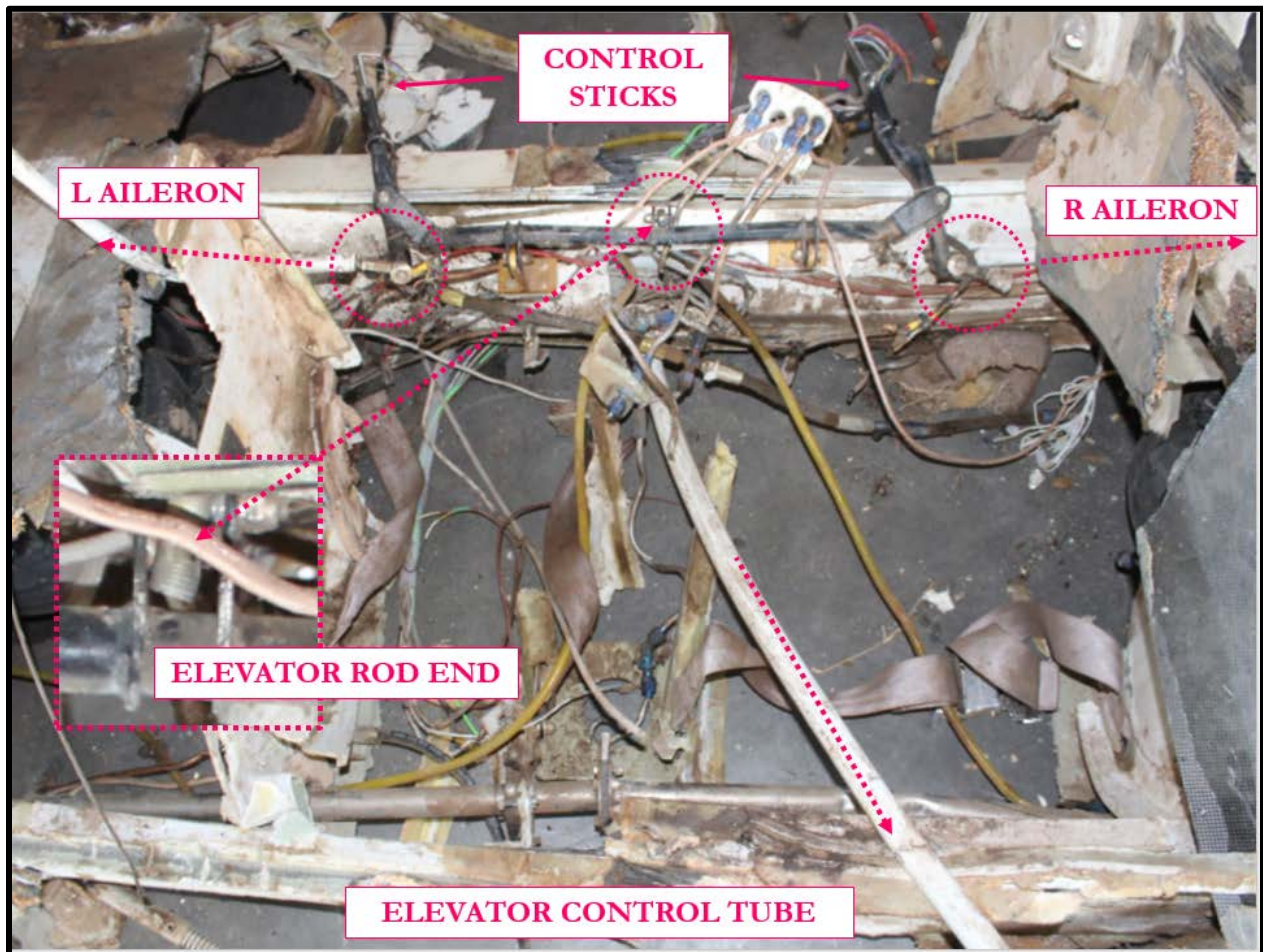
Picture 02: Right Wing (upper surface)

The left wing, found separated from fuselage skin but adjacent to the wreckage in an upright position, had separated into numerous pieces and had not sustained as much crush damage as the right wing. The main spar remained intact and the top wing skin was separated into three major pieces. The majority of the bottom wing skin pieces were severely fragmented and located under the wing partially buried in the dirt. The leading edge was separated into several pieces and located in the area forward of the main wreckage. The aileron and flap control surfaces remained attached at their respective hinges. Fragments of red lens was found forward of the wingtip. The landing gear remained inside the wheel well and portions of the landing gear door were found in the wreckage, consistent with the landing gear being in the retracted position at the time of impact.



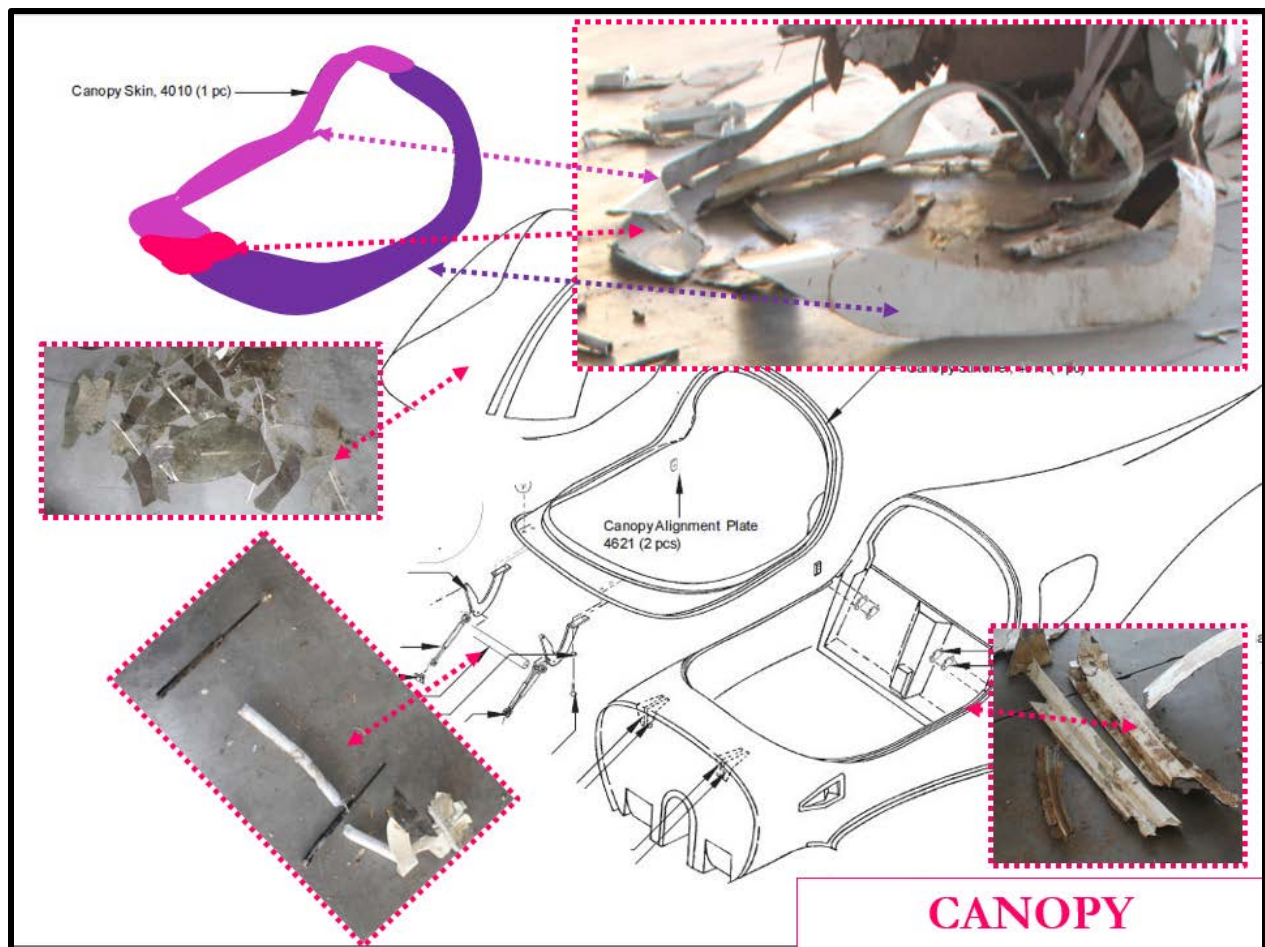
Picture 03: Left Wing (upper surface)

The left aileron control tube remained affixed to the mixer bar in the cockpit; the right aileron control tube had separated at the rod end, with the rivets sheared where the tubing connects. The mixer bar remained attached to the spar and manipulation of the control sticks resulted in output forces to the aileron control rods. The control sticks had exposed wires at the top and the portion covering the sticks was never located. The elevator control tube, found forward of the wreckage near the tree, contains several bends and was disconnected at the mixer bar; the rod end remained attached to the bar and had separated about halfway down the length of the threads consistent with it being attached at the time of impact. The aft elevator attachment bellcrank remain attached to the aft bulkhead. A portion of the control rod was attached continued until it was bent upward into the area with the tail had flipped on the backbone of the tail section.

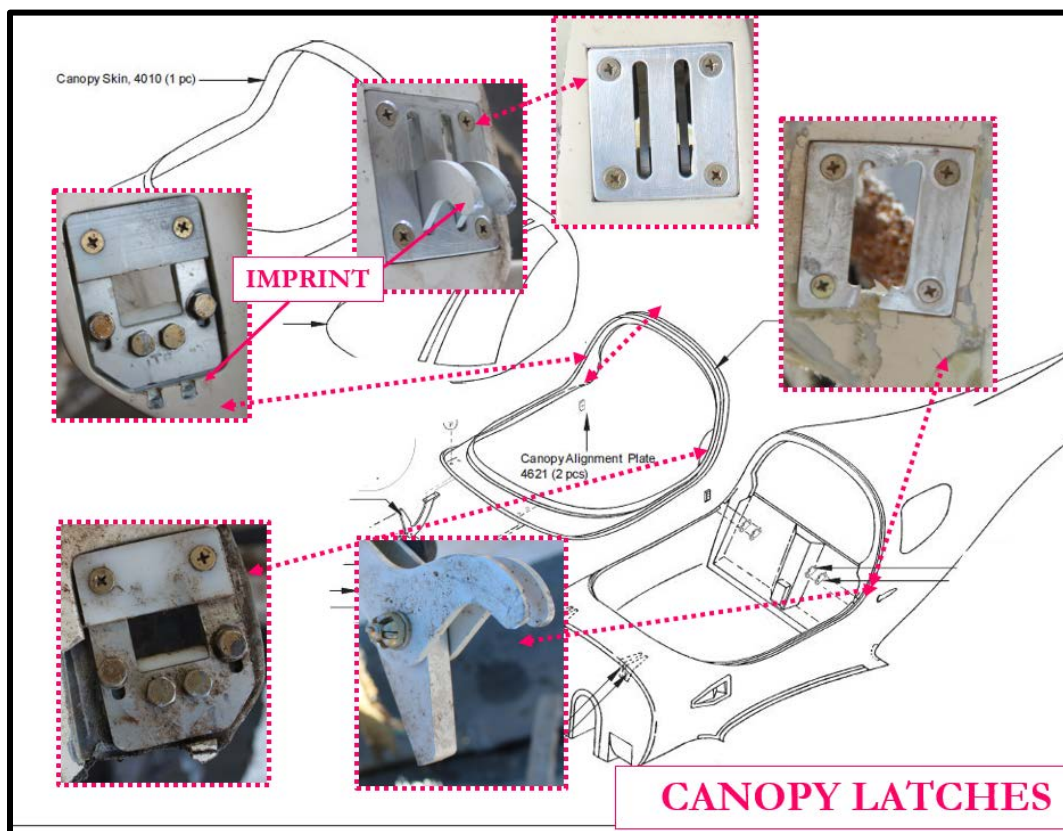


Picture 04: Aileron and Elevator Controls from Fuselage

The canopy was fragmented into multiple sections and found within the debris field. The right upper canopy frame had two groups under the hinge receptacle which were consistent in size and shape with that of the latching. The left hinge receptacle was fragmented in the frame. Both signatures were indicative of the canopy being latched at the time of impact. The seatbelts were found unlatched with no evidence of deformation.



Picture 05: Canopy Pieces



Picture 06: Canopy Latches

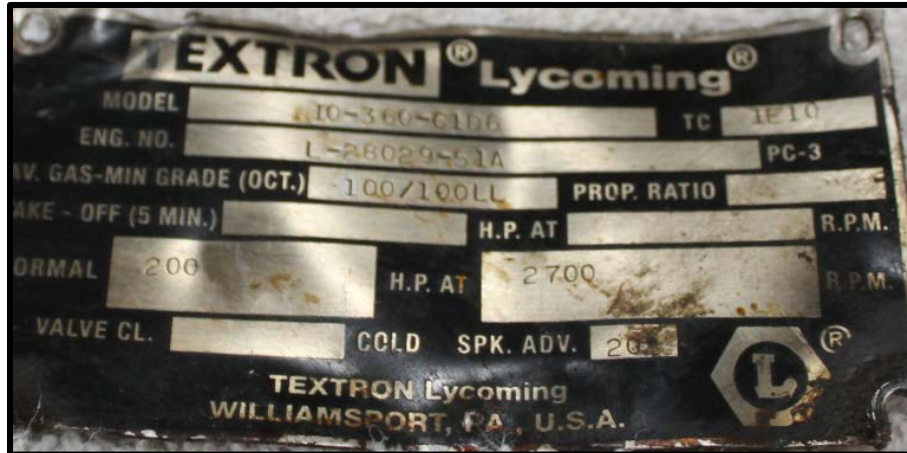
The empennage had separated aft of the aft bulkhead. The vertical stabilizer had come to rest inside the tail cone section splitting down the backbone. The right horizontal stabilizer and elevator remained attached and contact. The left horizontal stabilizer fragmented in the outboard area and the piece of leading edge was found immediately under the wreckage. The elevator had separated at its balance weight which was located on the left side of the wreckage near the wing. The rudder remained attached, with the exception of the upper portion and balance weight which had separated and was located near the left wing.

The rudder pedals were located in the cockpit area and had broken free from the airframe with the exception of a portion of the pilot upper left pedal. The pedals suffered crush deformation and revenge. The control cables were found attached to the pedals and traced through the fuselage skin to the bell crank arms. The platform where the rudder bell crank was located had come free from the empennage skin and was loosely laying in the tail cone section at impact. The control rod was attached to the bell crank and had separated in the area where the tail had separated from the fuselage. The stops were intact and there was no evidence of deformation.



Picture 07: Empennage

The Lycoming IO-360-C1D6, serial number L-88029-51A, sustained impact damage. Despite several attempts, investigators could not rotate the crankshaft. The top spark plugs were removed revealing a light grey coloration consistent with normal operation. The cylinders were examined through the spark plug holes revealing that the combustion chambers were mechanically undamaged, and there was no evidence of foreign object ingestion or detonation. The valves were intact and undamaged. There was no evidence of valve to piston face contact observed. The gas path and combustion signatures observed at the spark plugs, combustion chambers and exhaust system components displayed coloration that were consistent with normal operation.



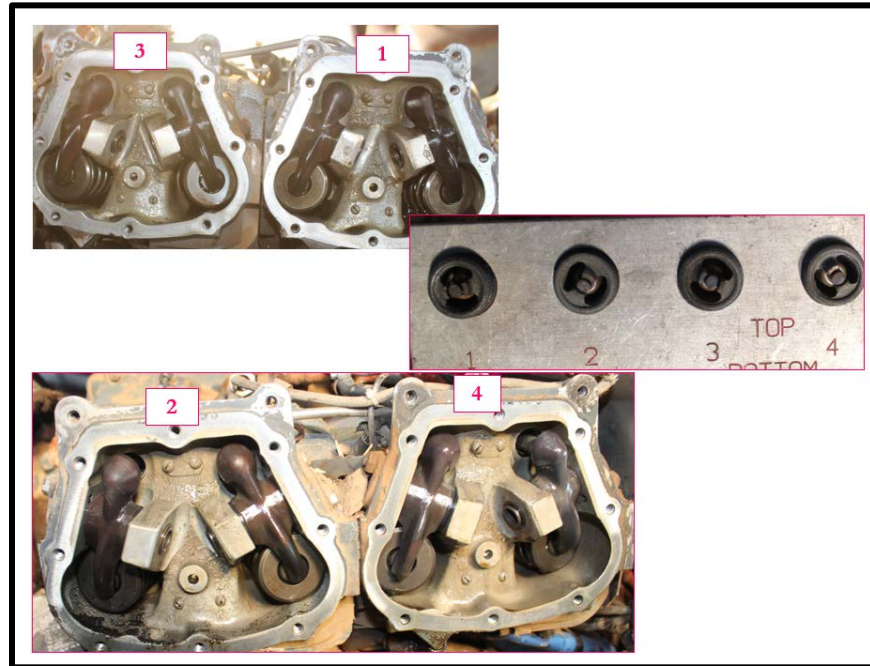
Picture 09: Engine Data Plate



Picture 10: Engine

There was no oil residue observed in the exhaust system gas path. Ductile bending and crushing of the exhaust system components was observed consistent with impact. The right and left magnetos were broken from their

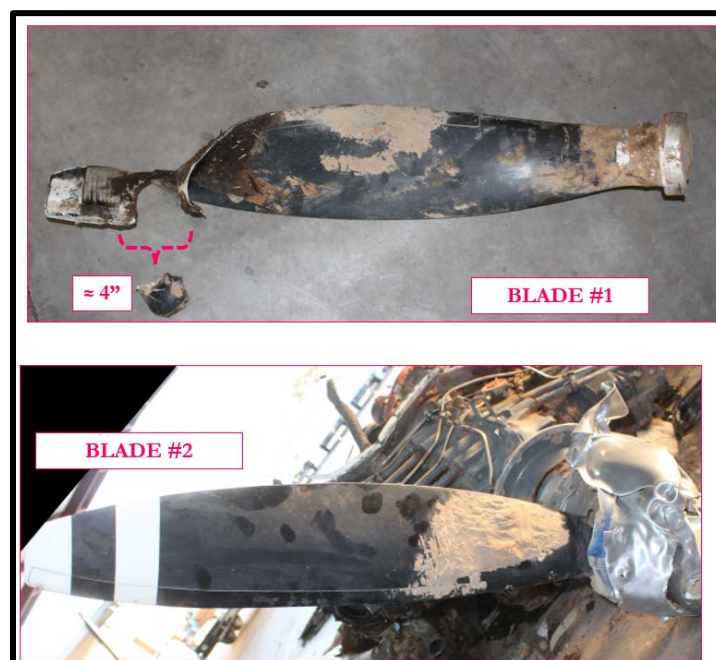
flanges and upon removal, were rotated by hand. Spark was obtained at each post during rotation. The Rayco turbo charger was disassembled. Light scoring was observed on the turbine side.



Picture 11: Cylinders (external) and Spark Plugs

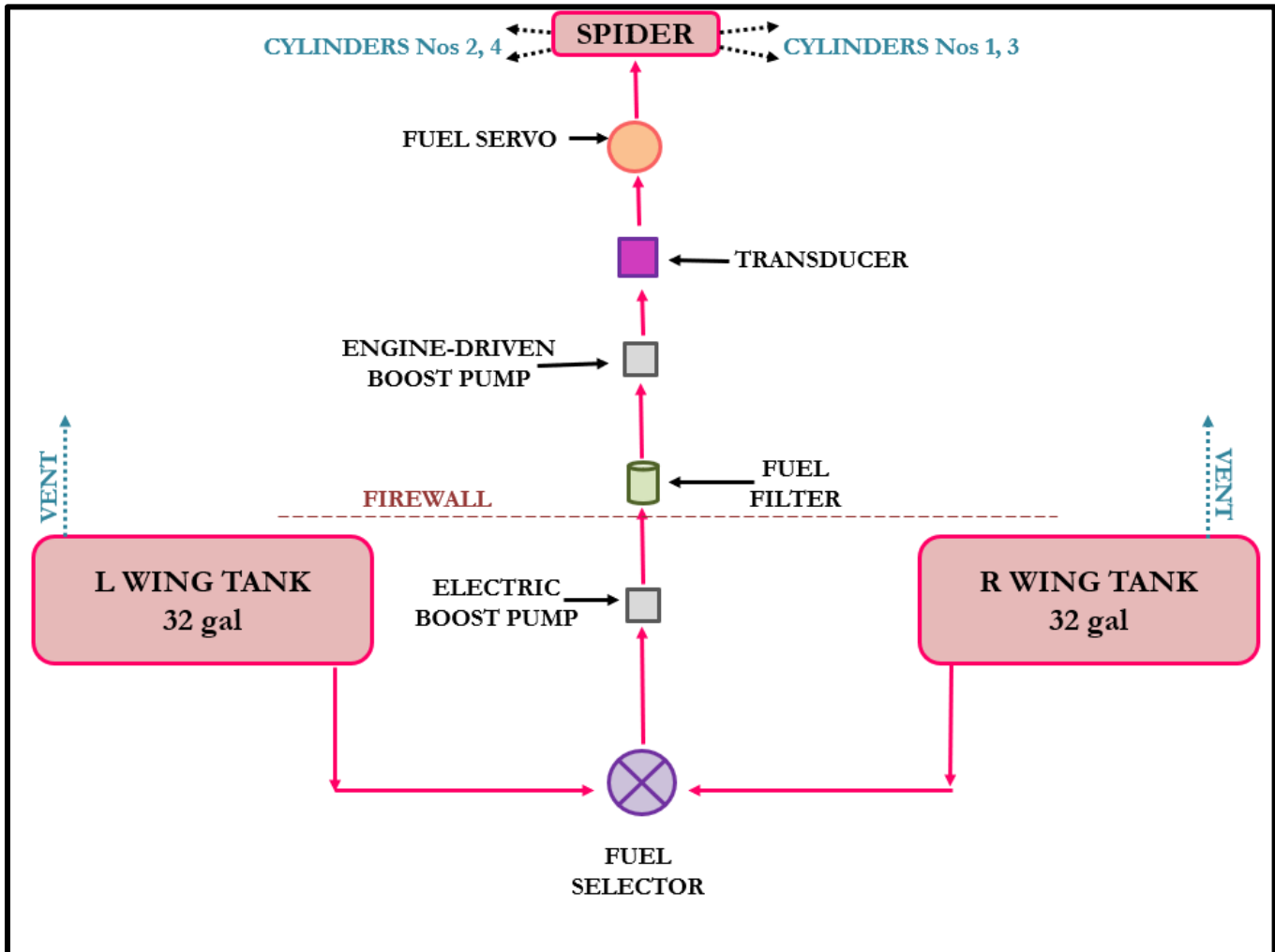
PROPELLER

One propeller blade (labeled as number 2) was visible at the accident site. The other blade (labeled as number 1) was buried under the engine and had separated with the tip oriented toward the firewall and the hub near the propeller spinner. Blade number 2 was found relatively straight with no evidence of twisting. Blade number 1 was twisted at the tip and contained a 4 inch gouge where a portion of the outboard leading edge piece had become separated and was found buried near the remainder of the blade. One side of the blade was polished silver and contained numerous chordwise scratches.



Picture 12: Propeller Blades

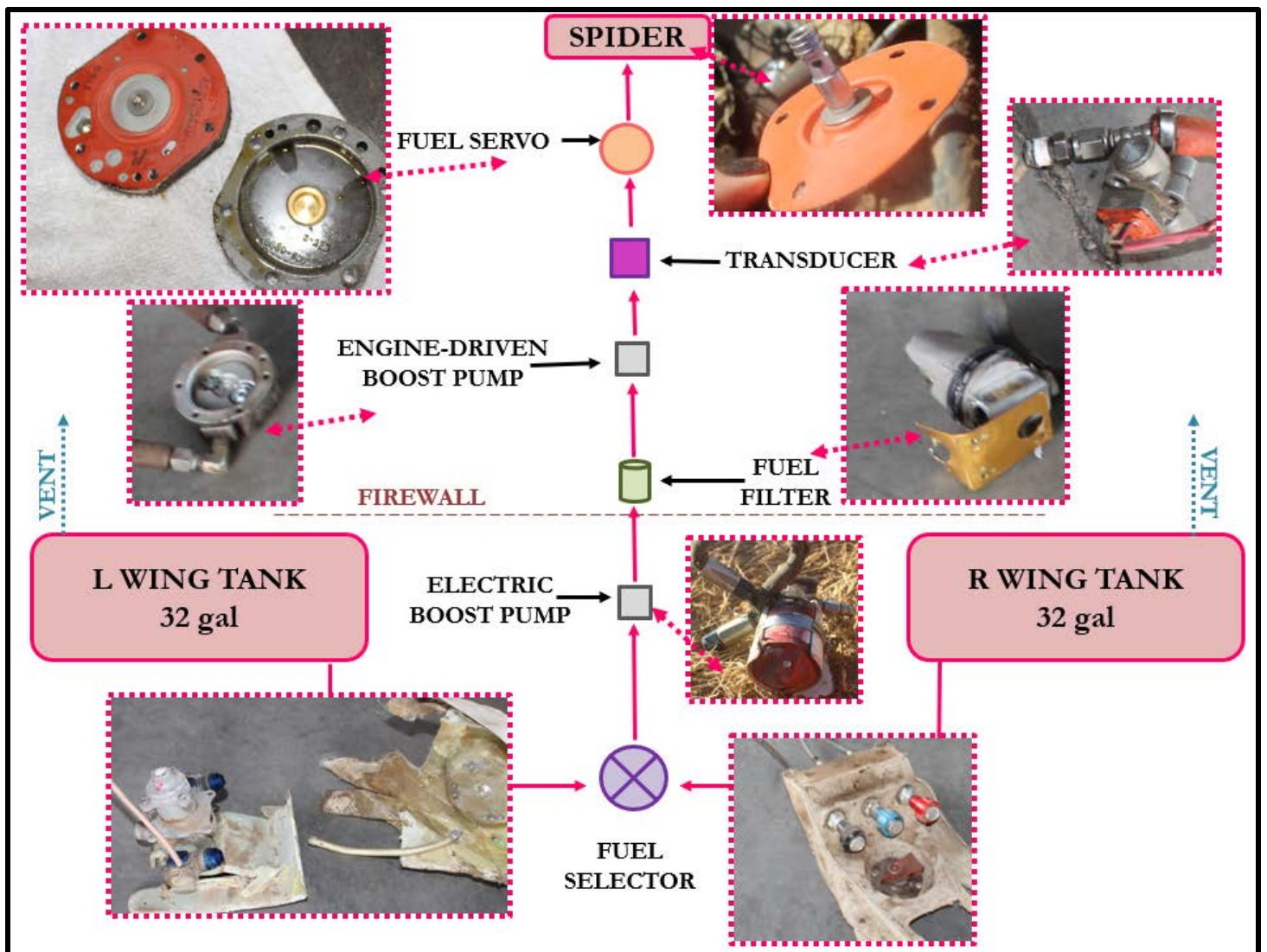
The airplane's fuel system was a gravity-fed design where fuel flowed from the internal wing tanks located in the outboard section of each wing, through a selector valve, and continued to the electric boost pump. From the pump, the fuel was routed to a filter and then to the engine-driven fuel pump. Thereafter, the fuel continued to a transducer which was mounted on the fuel servo which metered the fuel delivered to the fuel distributor (spider).



Picture 13: Fuel System Design

The fuel selector was found with the handle pointing to the “LEFT” tank position. The position of the fuel selector valve, manufactured by Andair, LTD, was in the left position. The selector was found in several pieces: the handle (which was still attached to the airframe), the extender (which was located loosely in the wreckage adjacent to the pilot seat), the valve (which was attached to the spar). The fuel filter was partially disassembled and the screen was found to be clean. The fuel servo was disassembled and found to contain liquid that had a smell akin to AVGAS; the diaphragms were pliable and the valve was intact. The transducer was disassembled and when air was forced through the inlet, the internal wheel could be heard rotating.

Removal of the fuel manifold (spider) revealed no evidence of liquid; the diaphragm was pliable and the spring was intact.



Picture 14: Fuel System