

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



ERA25FA020

WRECKAGE EXAMINATION

October 22, 2024

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A. ACCIDENT

Location: Cross City, FL
Date: October 20, 2024
Time: 1600 EDT
2000 UTC
Airplane: N510G; Lancair 360

B. WRECKAGE EXAMINATION

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C. SUMMARY

On October 20, 2024, about 1600 eastern daylight time, an experimental amateur built Lancair 360, N510G, was substantially damaged when it was involved in an accident near Cross City, FL. The commercial pilot and passenger were fatally injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 instructional flight.

D. DETAILS OF THE INVESTIGATION

1.0 Accident Site

The airplane came to rest on the airport about 4,500 ft from the runway 4 threshold, about 210 ft right of the runway 4 centerline, and in between runway 04 and taxiway B. The main wreckage was oriented on a magnetic heading of 340. The debris path was about 160 ft in length and was oriented on a magnetic heading of 048. All major components were discovered in the debris path. The initial ground impact scar was about 100 ft from the main wreckage site and green lens glass was observed in the scar. Two pieces of right wing skin including the pitot tube were

found about 15 ft from the initial impact scar along the debris path. A large crater was observed about 25 ft from the main impact scar along the debris path. The propeller was observed about 8 ft past the large crater. An impact scar which contained pieces of a wingtip was observed about 45 ft past the initial impact scar along the debris path. The main wreckage came to rest about 100 ft from the initial impact scar. The outboard section of the right wing was observed about 60 ft past the main wreckage and was the last piece of debris observed.



Photo 1: Overhead view of the accident site.



Photo 2: Overhead view of the accident site.

2.0 Airframe Examination

2.1 Fuselage

The fuselage exhibited extreme impact damage and twisting. The canopy was impact separated. The floor was partially impact separated just forward of the main wing spar and remained attached via control cables and wires. The aft fuselage was twisted right and remained attached via wires and cables.



Photo 3: View of the fuselage.

2.2 Empennage

The empennage remained attached to the fuselage, was twisted to the right, and exhibited a crack in the composite structure just forward of the horizontal stabilizer. The horizontal stabilizer and elevator were undamaged. The elevator and elevator trim tabs remained attached at all attachment points and the elevator was continuous from the control surface to the flight control stick through an impact fracture. The vertical stabilizer and rudder were undamaged. The rudder remained attached at all attachment points and was continuous from the flight control surface to the flight controls in the cockpit through a cut made by first responders to extract the pilot.



Photo 4: View of the empennage in situ at the accident site.



Photo 5: View of the empennage.



Photo 6: View of the empennage at the recovery facility.

2.3 Aircraft Wings

The right wing was impact separated from the fuselage and in multiple pieces. The outboard section of the wing containing the aileron and about 1/2 of the flap was in one piece. The wing tip was destroyed with lens glass from the right wing tip and a wing navigation light assembly were found in the initial impact scar. The lower right wing skin containing the pitot tube was found near the large impact crater. A portion of the wing spar between the fuselage spar box and outboard section of the wing spar was found in the debris path. The aileron remained attached to the wing. The aileron flight control surface was impact separated from the aileron control horn and the torque tube was impact separated. A small portion of the aileron control tube remained attached to the flight control stick in the cockpit and was impact separated at the wing root. The right flap control tube was impact separated just outside of the fuselage.



Photo 7: Outboard portion of the right wing in situ at the accident site.



Photo 8: Lens glass found in the initial ground impact scar.



Photo 9: Identifiable portions of the right wing laid out at the recovery facility.

The left wing remained attached to the fuselage at all attachment points. The left wing tip exhibited impact damage, and the left wing navigation light assembly remained attached to the wing. The left aileron and flap remained attached to the wing at all attachment points. Control continuity was confirmed from the left aileron control surface to the controls in the cockpit. Continuity of the left flap was confirmed from the flap to the flap drive motor in the fuselage. The flap motor was fully retracted which according to the schematics for the kit would be a flap "neutral" or "in trail" condition. When the flap motor was removed and the actuator bellcrank was moved by hand the left flap operated as expected and the right flap control rod moved as expected.



Photo 10: View of the left wing at the accident site.



Photo 11: View of the fully retracted flap motor at the recovery facility.

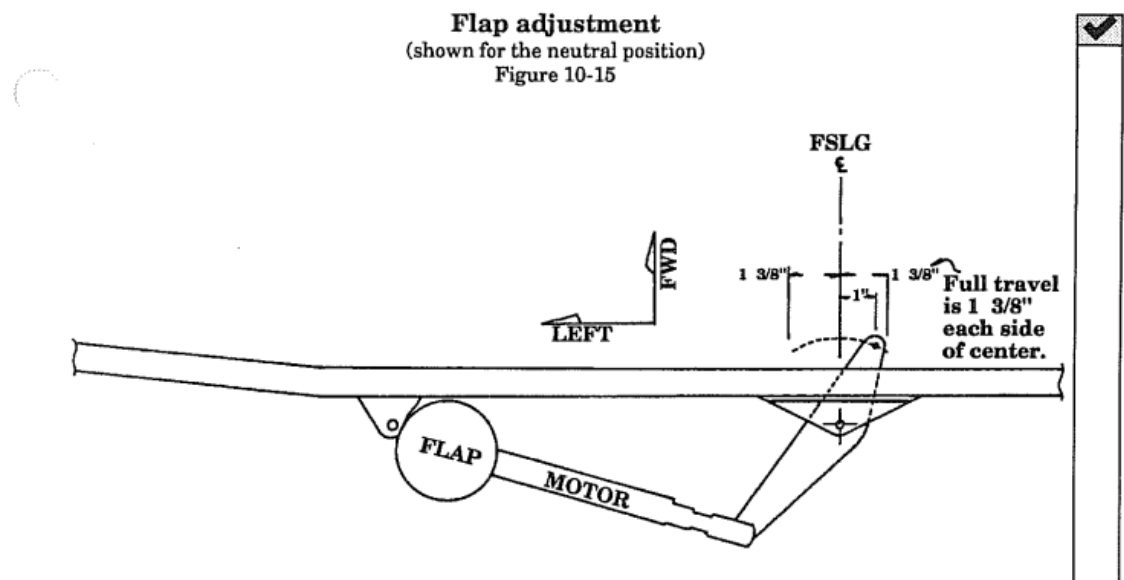


Photo 12: View of the flap motor assembly in the neutral position from the kit build manual.

2.4 Landing Gear

Both of the main landing gear and the nose landing gear were found within the main wreckage. The landing gear selector was found in the "retract" position. The landing gear dump valve was found about $\frac{3}{4}$ of the way open and exhibited impact damage.



Photo 13: View of the landing gear selector switch.



Photo 14: Landing gear dump valve.

2.5 Cockpit

The cockpit was destroyed by impact and unrecognizable. The following switches and circuit breakers were observed:

- Landing gear selector switch – Retract
- E-mag Power Left – UP
- E-mag Power Right – UP
- Mag Test – L-Mag
- AUX FUEL BOOST – ON
- L MAG – OFF
- R MAG – ON
- Primer – OFF
- SMOKE – ON
- ENGINE INSTR – UP
- AVIONICS MASTER – UP
- MASTER – UNKNOWN (IMPACT DAMAGE)
- ALTERNATOR – UP
- BOOST PUMP – UP
- PITOT HEAT – UP
- NAV LIGHT – DOWN
- STROBES – DOWN
- LANDING LIGHT – UP
- PITCH TRIM CB – IN
- NAV – 1
- AUTO PILOT – LEFT
- FUEL SHUTOFF – ABOUT 90% CLOSED



Photo 15: Switch Panel

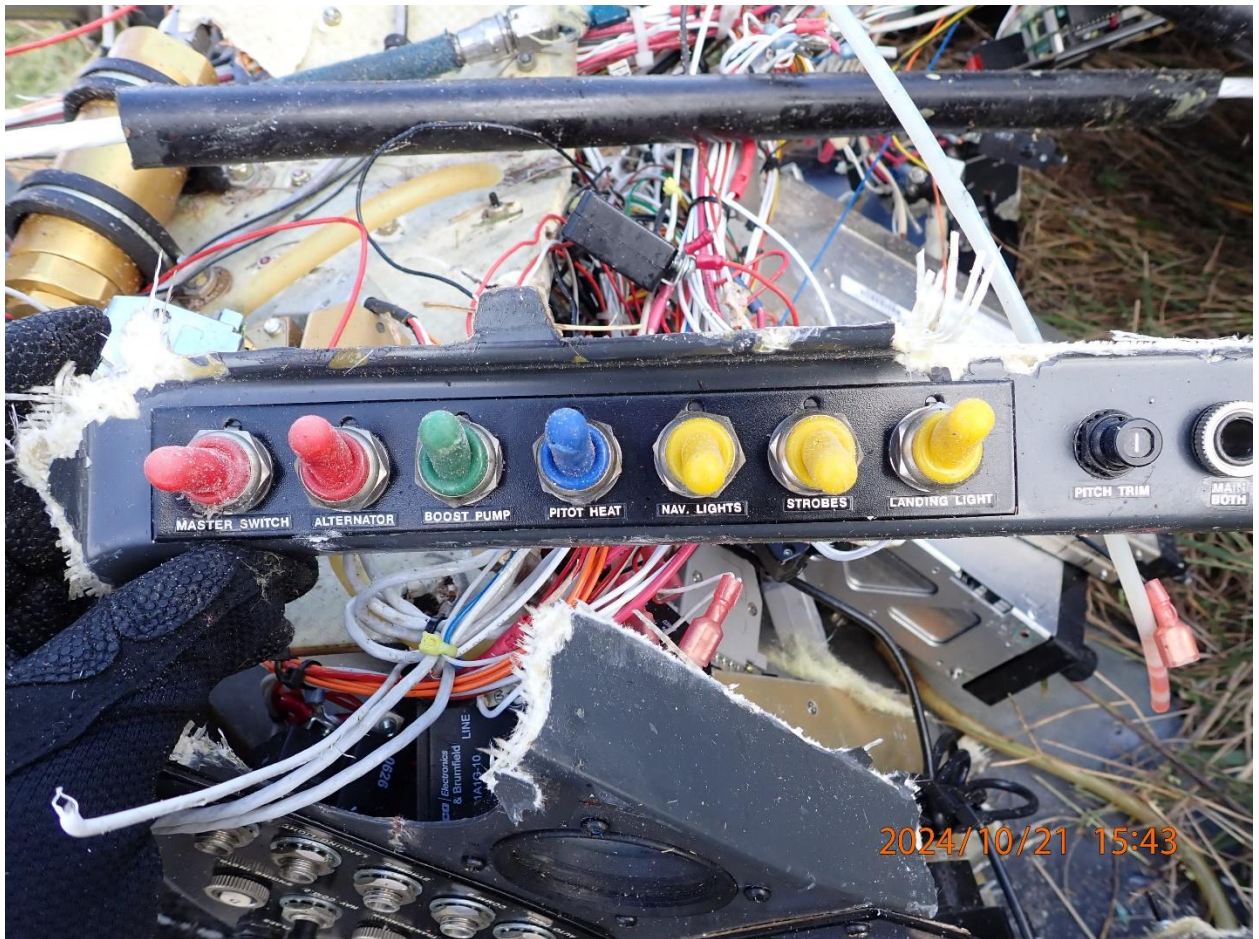


Photo 16: Switch Panel



Photo 17: Circuit breaker panel



Photo 18: Layout of recovered pieces of the instrument panel.

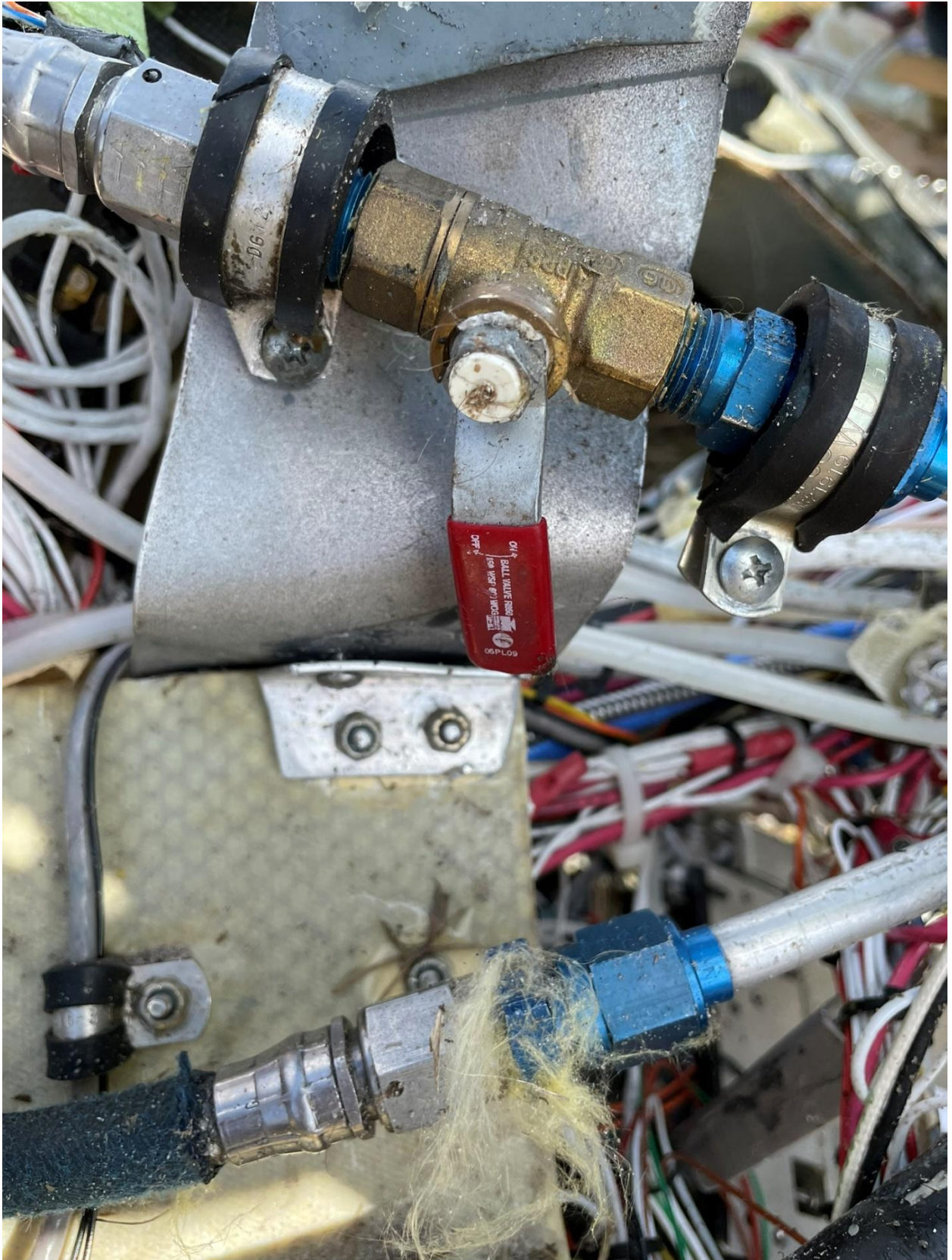


Photo 19: Fuel shutoff as found on scene.



Photo 20: View of handheld radio recovered in the debris.

2.6 Survivability

1st responders reported that both occupants were wearing 5 point harnesses.

2.7 Fuel/Fuel System

Both wing fuel tanks and the header tank were breached. The header tank was impact separated from the fuselage and the header tank fuel cap was impact separated from the tank. Both wing fuel tank caps remained attached, closed, and seated in place. Both the left and right wing fuel tank transfer pumps and inline filters contained fuel similar in color and smell to 100LL aviation fuel. Both pumps operated and pumped out fuel when power was applied. The finger screen for the header tank was impact separated from the tank but remained attached to the fuel shutoff valve. The screen was unobstructed. The fuel shut off valve was observed to be about 90% closed. An inline fuel filter from the fuel shutoff to the header tank electric boost pump was removed and contained fuel similar in color and smell to 100LL aviation fuel; the filter was unobstructed. The header tank electric boost pump was removed and contained fuel similar in color and smell to 100LL aviation fuel. The pump operated and pumped fuel when power was applied. The fuel strainer was drained and contained fuel similar in smell and color to 100LL aviation fuel.



Photo 21: Left wing fuel cap seated in place.



Photo 22: Left wing fuel tank in line filter and pump.



Photo 23: Right wing with fuel cap seated in place.



Photo 24: Right wing fuel tank pump.



Photo 25: Header tank.

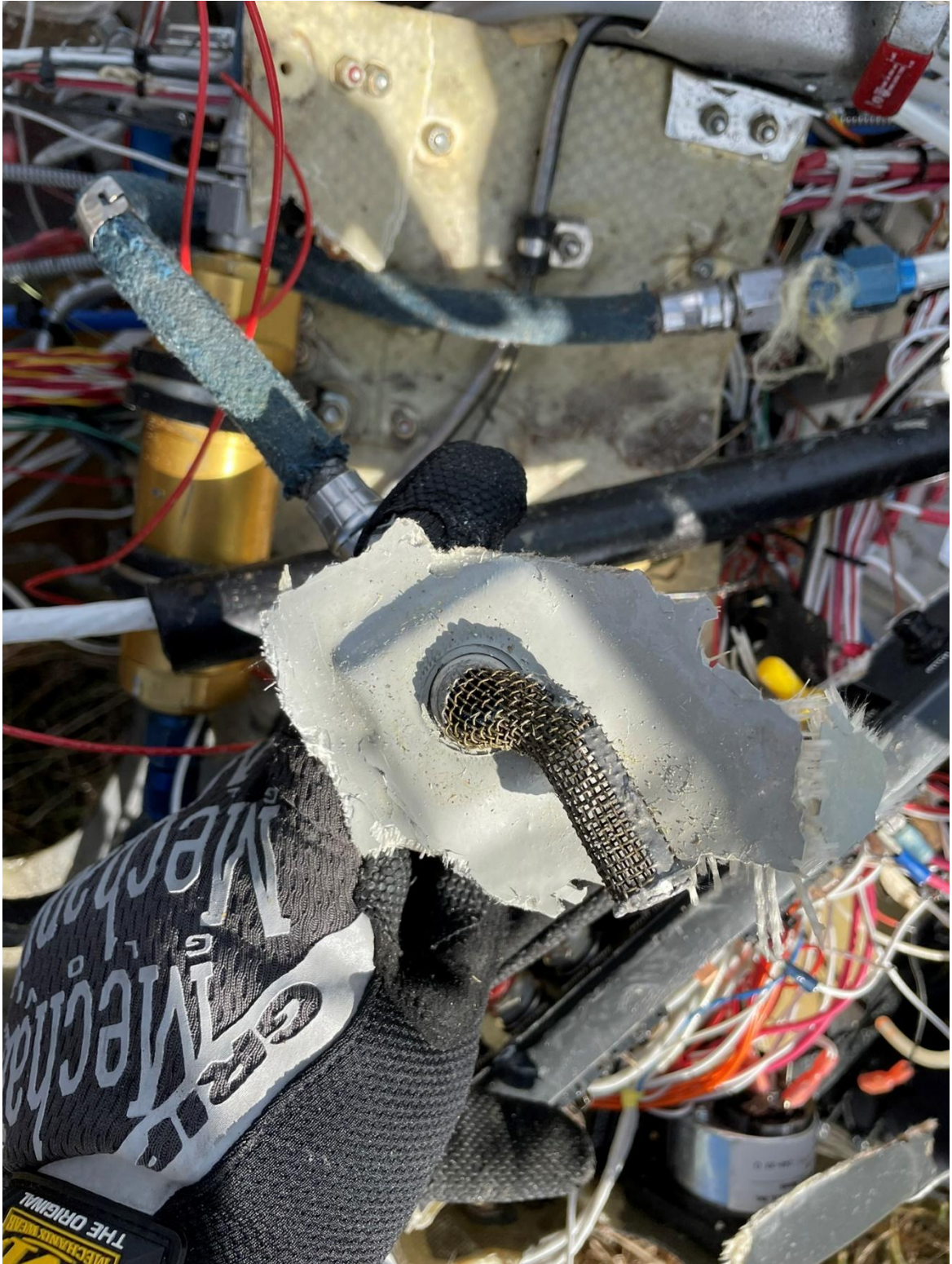


Photo 26: Header tank finger screen.



Photo 27: In line fuel filter from header tank to engine.



Photo 28: Header tank fuel pump assembly.

2.8 Other Systems

The Emergency Locator Transmitter (ELT) remained secure in its mount and connected to the antenna.

The standby battery was impact separated and found in the debris field, when measured using a multimeter it read 12.5 volts. The main battery remained installed in the aft fuselage and when measured using a multimeter it read 11.8 volts.



Photo 29: View of the impact separated standby battery.



Photo 30: View of the blue main battery installed in the airplane. (Courtesy of Lycoming)

3.0 Engine Examination

As first observed at Florida Air the engine was laying on the floor and was partially attached to the firewall and the engine mounting bracket. The engine was removed from the firewall and suspended in the air with the forks of a fork lift. The crankshaft propeller flange was sheared off from impact and remained attached to the propeller assembly. The rocker box covers were removed, the E-mags were removed, the back up alternator was removed and the engine driven fuel pump was removed. The engines crankshaft was rotated by turning the vacuum pump drive. The crankshaft rotation was stiff due to the impact damage at the flange of the crankshaft. Thumb compression and suction was observed on all four cylinders in the correct firing order, cylinder 1's valves had to be staked to observe thumb compression and suction. Normal valve action was observed on all rocker arms.



Photo 31: View of the sheared crankshaft propeller flange.



Photo 32: Impact damage at the flange of the crankshaft.

3.1 Induction and Exhaust System

The fuel servo venturi was unobstructed. The intake and exhaust pipes exhibited some impact damage and remained attached to the engine.



Photo 33: View of the unobstructed fuel servo venturi at the accident site.

3.2 Magnetos

The engine had dual E-mag electronic ignition systems installed. Timing was not checked for the ignition system, both E-mags were damaged from impact forces. With an ignition lead that appeared to be undamaged from the impact sequence and attached to a post on each E-mag that appeared undamaged from the impact sequence and a spark plug installed on the ignition lead, power was applied to the B terminal and ground to G terminal of both E-mags and the drives were rotated by hand, an electrical shock was felt by hand while rotating the drive, spark was not observed arcing from the spark plug electrode to a ground source.

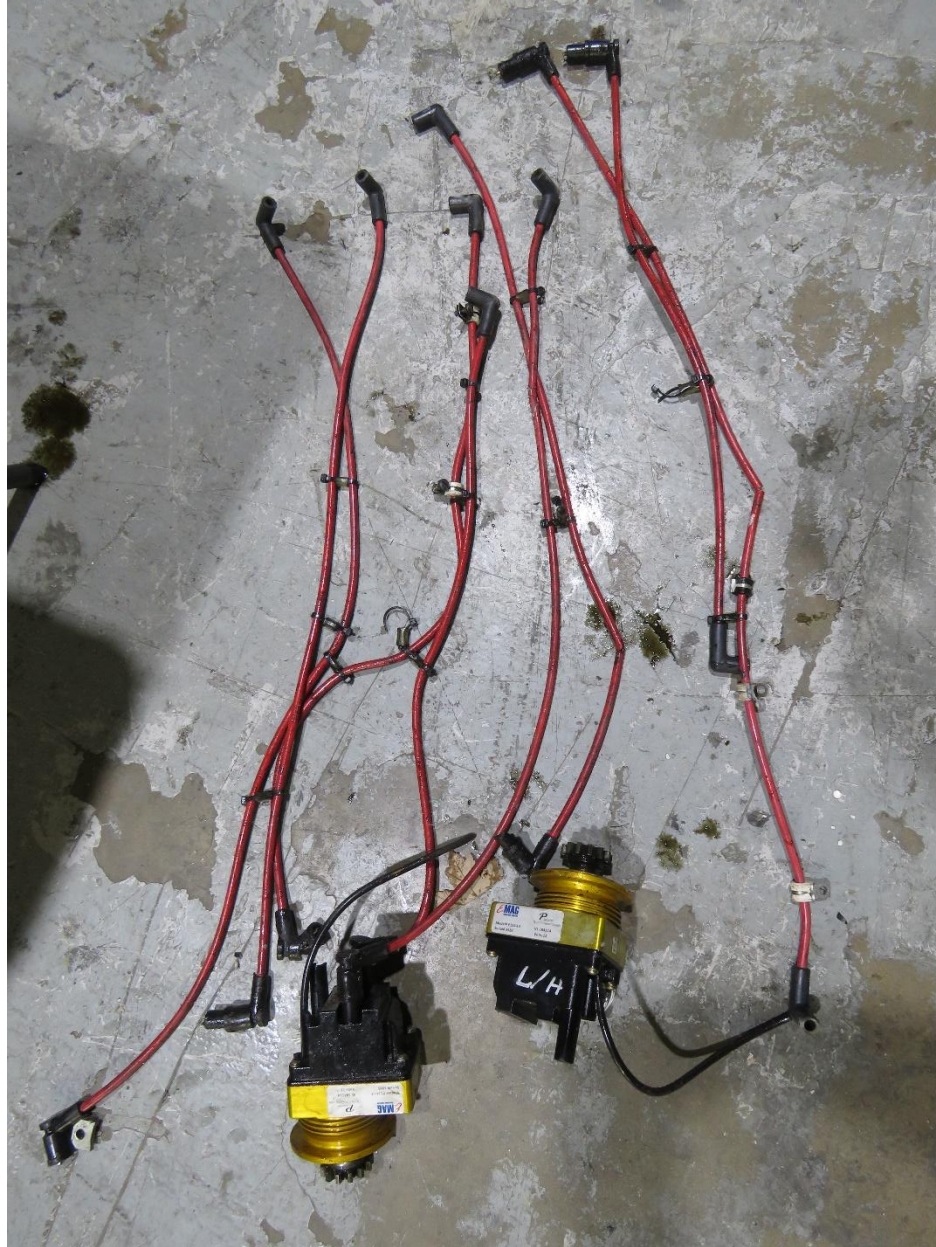


Photo 34: View of both magnetos and ignition harness.

3.3 Ignition System

Automotive style NGK spark plugs were installed in all four cylinders, the plugs in cylinders 2 and 4 were soaked in oil, the spark plugs in cylinders 1 and 3 showed normal in-service wear. The ignition harness exhibited impact damage and was unable to be tested.



Photo 35: View of spark plugs. (Photo courtesy of Lycoming)

3.4 Fuel System

The diaphragm style engine driven fuel pump remained secured to the accessory housing and was safety-wired. The engine driven pump was removed and placed in a vice. The pump produced suction at its inlet and pressure at its outlet when actuated by hand. The pump was disassembled, fuel was present in the engine driven pump, the diaphragms were pliable and undamaged, no discrepancies were observed with the engine driven fuel pump.

The fuel injection servo was impact separated from the engine at its mounting flange and the throttle and mixture controls were impact separated from the fuel servo body. The diaphragm assembly was opened and examined, the fuel and air diaphragms were pliable and undamaged, fuel was present in the servo and no contamination was observed.

The flow divider remained attached to the spine of the crankcase assembly via its attaching bracket. The flow divider was removed and disassembled, fuel was present in the flow divider and no contamination or obstructions were observed.

The fuel injection nozzles were removed from all four cylinders. All nozzles had the fuel injection nozzle insert installed. The injection nozzles from cylinders 2 and 4

had oil in the passage, the oil was removed from the Nos. 2 and 4 injection nozzles by blowing air through the nozzle.



Photo 36: View of the disassembled engine driven fuel pump. (Photo courtesy of Lycoming)

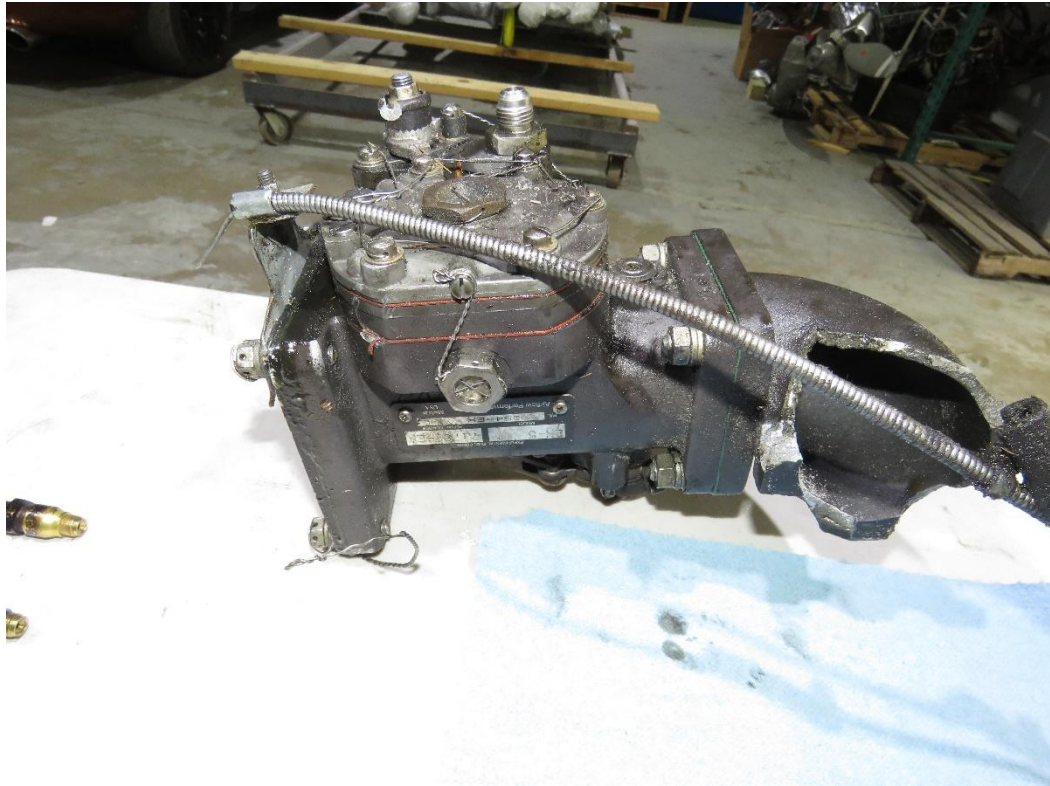


Photo 37: View of the fuel injection servo. (Photo courtesy of Lycoming)



Photo 38: View of the disassembled flow divider. (Photo courtesy of Lycoming)



Photo 39: View of the fuel injection nozzles. (Photo courtesy of Lycoming)

3.5 Lubrication System

Oil was present in the oil sump, the suction screen was removed, some carbon build-up was observed on the suction screen and a small piece of wire was attached to the suction screen. The oil filter was impact separated from the engine, was damaged, and was dated 7-13-24. Due to the damage on the oil filter, it was cut open with a reciprocating saw, no contamination was observed in the pleats of the oil filter element.

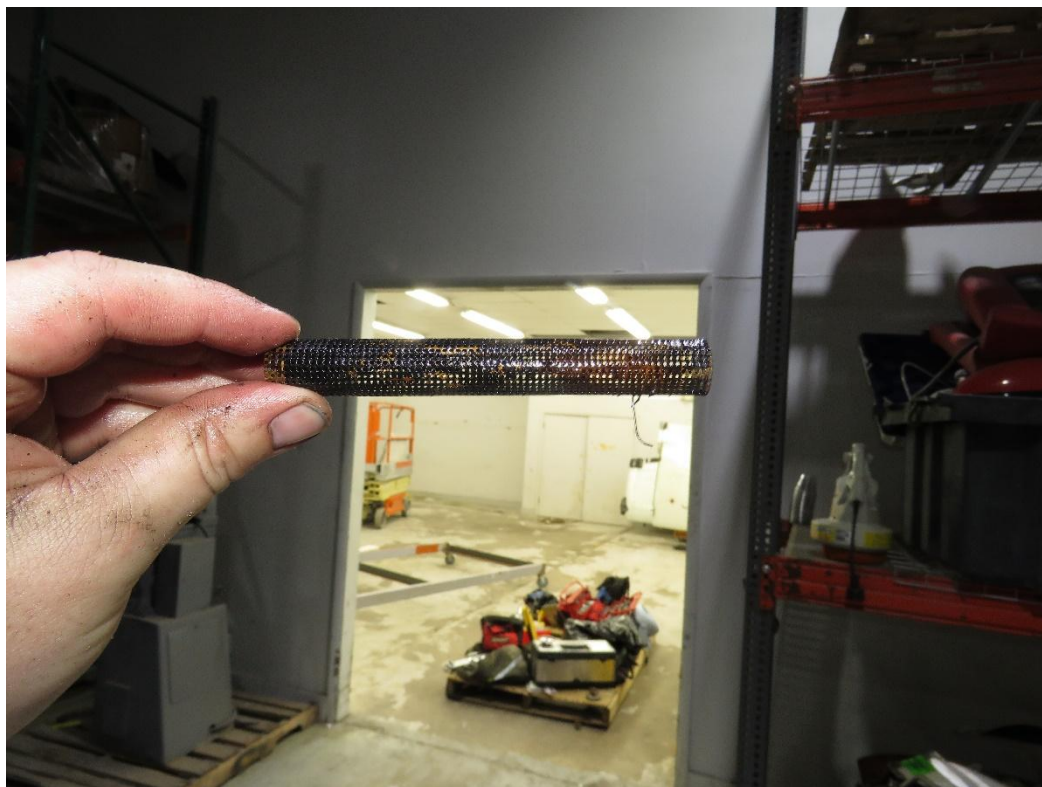


Photo 40: View of the oil suction screen. (Photo courtesy of Lycoming)



Photo 41: View of the impact separated oil filter at the accident site.

4.0 Propeller Examination

The Hartzell two-bladed metal constant speed propeller was impacted separated from the engine. It was sheared at the crankshaft flange. The propeller blades were marked A and B for narrative purposes. Blade A was bent aft about 20°, blade B appeared straight. Both blades remained secure in the propeller hub and had leading edge polishing.

The propeller governor was impact separated from the engine. The drive rotated by hand.



Photo 42: Overview of blade A.



Photo 43: View of bend in blade A.



Photo 44: Overview of blade B.



Photo 45: View of the leading edge of blade B.

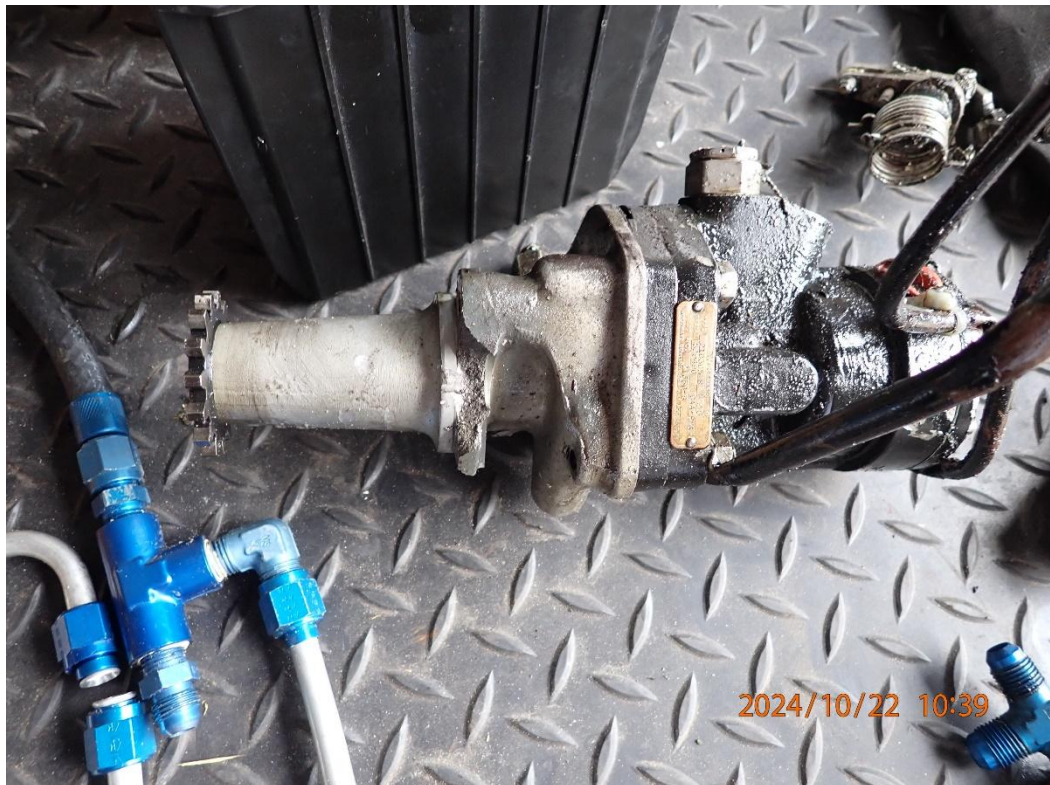


Photo 46: View of the impact separated propeller governor.

5.0 Meteorological Information

The Cross City Airport automated weather observing system was out of service at the time of the accident. A witness reported that the winds at the time were favoring runway 4 and were about 10 knots per his estimate. He referenced that the wind sock on the airfield was "full" which, per AC 150-5345-27E, would indicate at least a 15 knot wind.

Submitted by:

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