

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



WPR24FA200

AIRFRAME & ENGINE EXAMINATION REPORT

May 6, 2024

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A. ACCIDENT

Location: Bluestem, Washington
Date: June 19, 2024
Time: 1620 Pacific daylight time
Helicopter: Robinson R-44 II Raven / N323TT

B. AIRFRAME & ENGINE EXAMINATION REPORT

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C. SUMMARY

On June 19, 2024, about 1620 Pacific daylight time, a Robinson Helicopters R-44 II, N323TT, was destroyed when it was involved in an accident near Bluestem, Washington. The pilot and pilot-rated-passenger were fatally injured. The helicopter was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

D. DETAILS OF THE EXAMINATION

1.0 Accident Site.

The helicopter (figure 1) came to rest upright on a heading of 086° magnetic, at an elevation of 2,182 ft mean sea level (msl). The terrain was in an unpopulated, open area west of the Bluestem Creek. The terrain consisted of rolling hills with small rocks and loose soil, covered with small vegetation. No trees or other significant obstacles existed near the accident site. The empennage and both main rotor pitch horns were scattered in a debris field around the helicopter. The location of the site was N47° 32' 48.2" W118° 09' 19.4" (figure 1). The location of the tail rotor assembly and the end of

the tailcone was: N47° 32' 45.7" W118° 09' 22.7" at an elevation of 2,294 ft msl. Both main rotor pitch horns and small fragments of door acrylic were found between the main wreckage and the separated end of the tailcone.



Figure 1. N323TT front view.

2.0 Airframe Examination

2.1 Fuselage.

A fire thermally damaged the fuselage and reduced most of the fuselage to melted and disfigured metal and ash. Most components were unrecognizable. A section of the tailcone and the entire tail rotor assembly and tail rotor gear box separated from the tailcone as a unit and came to rest about 415 ft west of the wreckage.

2.2 Tailcone.

The tailcone remained attached to the aft fuselage (figures 2 and 3) and exhibited thermal damage at the fuselage end and a fracture separation at the gearbox end. The entirety of this section of tailcone exhibited a flattened profile. This section of tailcone also exhibited a uniform upward "scorpion" bend. The tail rotor drive shaft extended out from the tail rotor end and exhibited bends and a fracture separation from the gear box end.



Figure 2. Tailcone. Fuselage end on the left, bear box end on the right.



Figure 3. Tailcone rear view.

2.3 Empennage

The empennage separated from the tailcone as a unit (figures 4 and 5) and consisted of the end of the tailcone, tail rotor gearbox, tail rotor assembly and the horizontal and vertical stabilizers. The lower section of the vertical stabilizer and the outboard end of the horizontal stabilizer both exhibited ground impact damage. The tail rotor gearbox remained secured to the end of the tailcone and exhibited minimal damage, contained oil, and rotated freely.



Figure 4. Empennage.

Both tail rotor blades exhibited damage at the tips to about three inches inboard of the tips. There were no indications of damage to the leading edges. The tailcone exhibited an inward dent and striations consistent with tail rotor blade tip contact. No evidence of smoke or soot was observed on the empennage or tail rotor assembly.

The tail rotor drive shaft remained attached to the clutch shaft yoke flex plate. There was a break in the drive shaft near the fractured end of the tailcone. The tail rotor control tube also remained attached at the forward bellcrank assembly and

exhibited a break near the fractured end of the tailcone. The tail rotor gear box remained attached to the aft end of the tailcone and rotated freely.



Figure 5. Empennage and tail rotor assembly, left-side view.

2.4 Main Rotor, Swash Plate, and Transmission.

The main rotor assembly remained attached to the mast. One blade, identified as blade A (figure 6), remained whole and exhibited a uniform downward bend. The blade was thermally damaged. As mentioned earlier, the pitch horn and the rod end bearing of the pitch control rod fractured and separated from the blade grip and was found in the debris field.

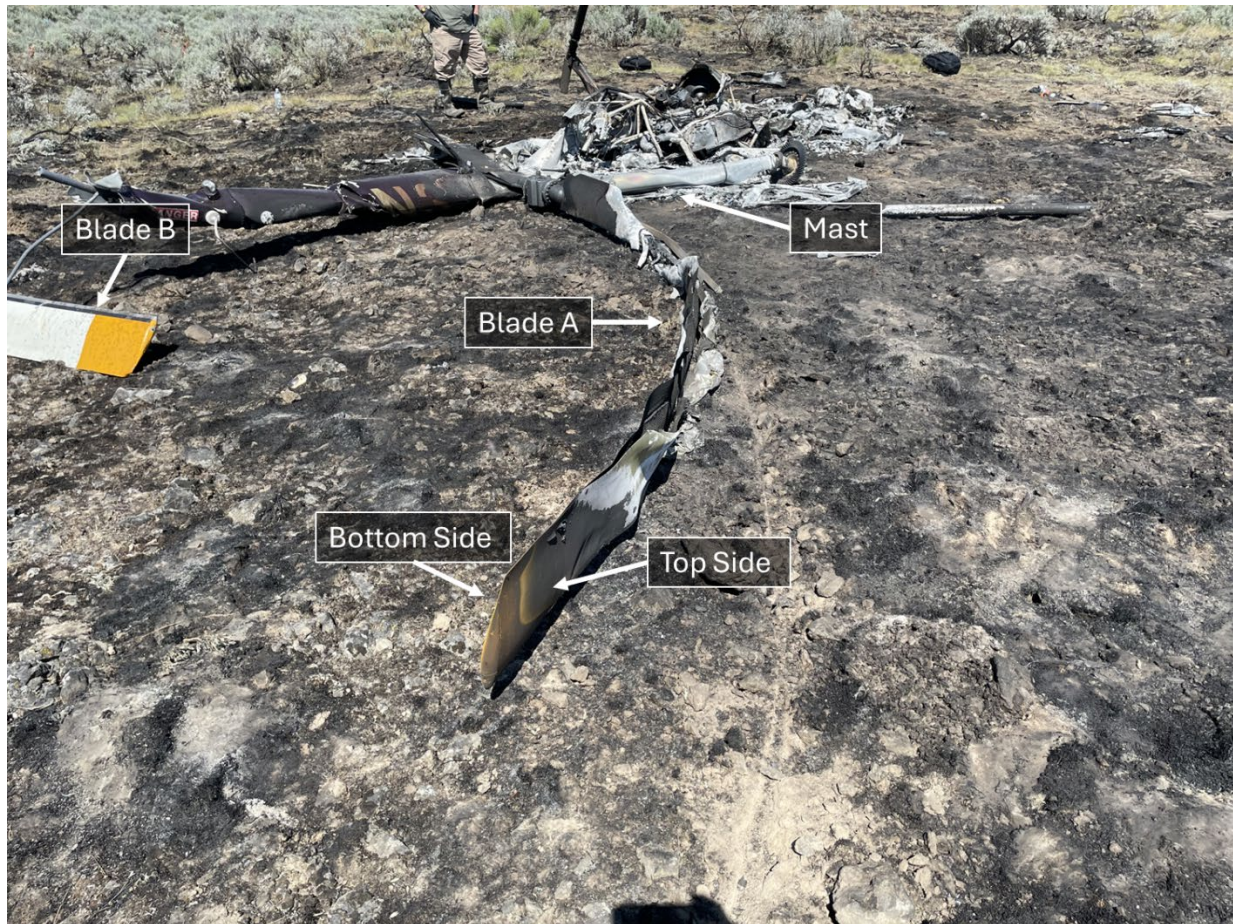


Figure 6. Main rotor, blade A. Blade B tip in view.

The other blade, identified as blade B (figure 7), fractured into three major sections, and a section of the blade, about 5 ft inboard of the tip, separated from the blade and came to rest several feet from the main wreckage. A section of this blade, about 24 inches inboard of the tip exhibited purple color transfer, consistent with the color of the fuselage and tailcone (figure 8). The pitch horn and the rod end bearing of the pitch control rod, fractured and separated from the blade grip and was found in the debris field (figure 9). The blade sections exhibited a downward bend across the entire blade.



Figure 7. Blade B Tip



Figure 8. A section of Blade B showing color transfer like the color of the fuselage and tailcone paint.



Figure 9. Blade A and blade B pitch horns, control rod ends and hardware.

The main rotor hub remained secured to the mast. Both blade grips remained secured to the hub. Both droop stop tusks exhibited no damage. Both elastomeric teeter stops were crushed. The mast exhibited a large bend near the base.

The swashplate remained secured. Both pitch control rods remained secured at the rotating swashplate. The non-rotating swashplate exhibited a separation of two control rods. One lug contained a fractured mounting nut along with a section of the mounting bolt. The other lug was free of the mounting hardware. The control tubes separated along with the hydraulic servos. There was no evidence of contact between the separated control rods and the rotating swashplate.

The transmission base remained attached to the transmission mounts. The transmission top fractured and the mast was found near the transmission. The mast retained the large gear attached to the base (figures 10 and 11).



Figure 10. Transmission base.



Figure 11. Main rotor mast.

2.5 Landing Gear

The skid landing gear exhibited impact damage that spread the landing gear outward and forward to the point that allowed the belly of the helicopter to contact the ground. The landing gear components were fractured into multiple sections and thermally damaged. The landing gear was equipped with non-OEM steps. The steps fractured and separated from the struts/skids. The aft end of the left skid exhibited an upward bend of about 45° (figure 12).



Figure 12. Left skid, aft end.

2.6 Cockpit

The cockpit was thermally damaged to the point of being unrecognizable and most components were reduced to ash. The airspeed indicator was readable, and the indicator pointed to zero. Fight controls were located in both right and left seats.

2.7 Fuel/Fuel System

The entire fuel delivery system was thermally damaged and mostly reduced to ash. The fuel servo was thermally damaged and separated from the engine. Both fuel caps were located and the thermally damaged fuel tank components were identified but too thermally damaged to assess their preaccident condition. See figures 13 and 14.



Figure 13. Right fuel tank components.



Figure 14. Left fuel tank components.

2.8 Other Systems

The helicopter was equipped with a video camera system and an engine monitoring unit; however, both systems were thermally damaged.

2.9 Drive

The upper and lower sheaves had impact dents across several grooves. The V-belts were consumed by fire. The overrunning (Sprag) bearing operated properly. There was little to no evidence of drive system rotation at impact.

3.0 Engine Examination

The engine was examined by the party member for the manufacturer. The engine was a Lycoming IO-540 series 6-cylinder. The engine was thermally damaged. The engine cases were fractured into multiple sections, exposing the internal components of the engine. The cooling fan was crushed upward at the six o'clock position. The top spark plugs were removed. Some were impact damaged. The number two spark plug exhibited a white powdery residue on the electrode and insulator and some corrosion. Some sparkplugs exhibited normal coloration when compared with a Champion Check-A-Plug chart.

- The engine left magneto was an electronic type. It was thermally damaged and would not rotate. The spark plug leads were thermally damaged.
- The right magneto was a conventional mechanical magneto. It was thermally damaged and would not rotate. The spark plug leads were thermally damaged.
- The fuel injectors were removed. The engine left injectors were difficult to remove. The engine left injector ports exhibited a machined appearance at the top of the injector ports.
- The cylinders were examined using a borescope. The number 1,3 and 5 cylinders exhibited minor damage. The number 2 cylinder exhibited a molten pool of metal at the lower section of the cylinder. The number 4 and number 6 cylinder exhibited heat damage with discoloration.
- Fuel Servo was thermally damaged.
- Drive train continuity was established; however, the drive train would not move.
- The number 2 piston appeared heat damaged with a jagged edge on the lower 6 O'clock section. The cylinder could not be removed despite a vigorous attempt.

4.0 Follow Up Examination of the fuel servo

Examination of maintenance records provided by Helicopters Northwest, revealed the helicopter had recently been equipped with a JP Instruments fuel flow transducer. On May 6, 2025, the IIC and the party member from Lycoming Engines travelled to the secured facility and recovered the fuel servo, engine driven fuel pump (mechanical fuel pump), and four fuel lines associated with the fuel delivery system.

4.1 Fuel Servo

The fuel servo was thermally damaged. All lines normally connect to the fuel servo were separated, except for the fuel flow transducer to flow divider line, which remained attached to the fuel servo but was fractured about two inches from the attachment point.

4.2 Line A. Fuel Servo Out to Fuel Flow Transducer In Line.

The fuel servo to fuel flow transducer line was identified as line A (figures 15 and 16). Line A was originally found laying on the fuel servo and was thermally damaged. Most of the outer fabric webbing remained loosely around the line. Molten metal that hardened on the fuel servo created a cradle that the line rested in. The fuel transducer in port fractured and remained secured to one end of line A. The other end had separated from the fuel servo along with the fuel servo attachment point. This end had fractured and separated from the fuel line and was held in place by the webbing fabric. The B-nut at the fuel servo out was loose.

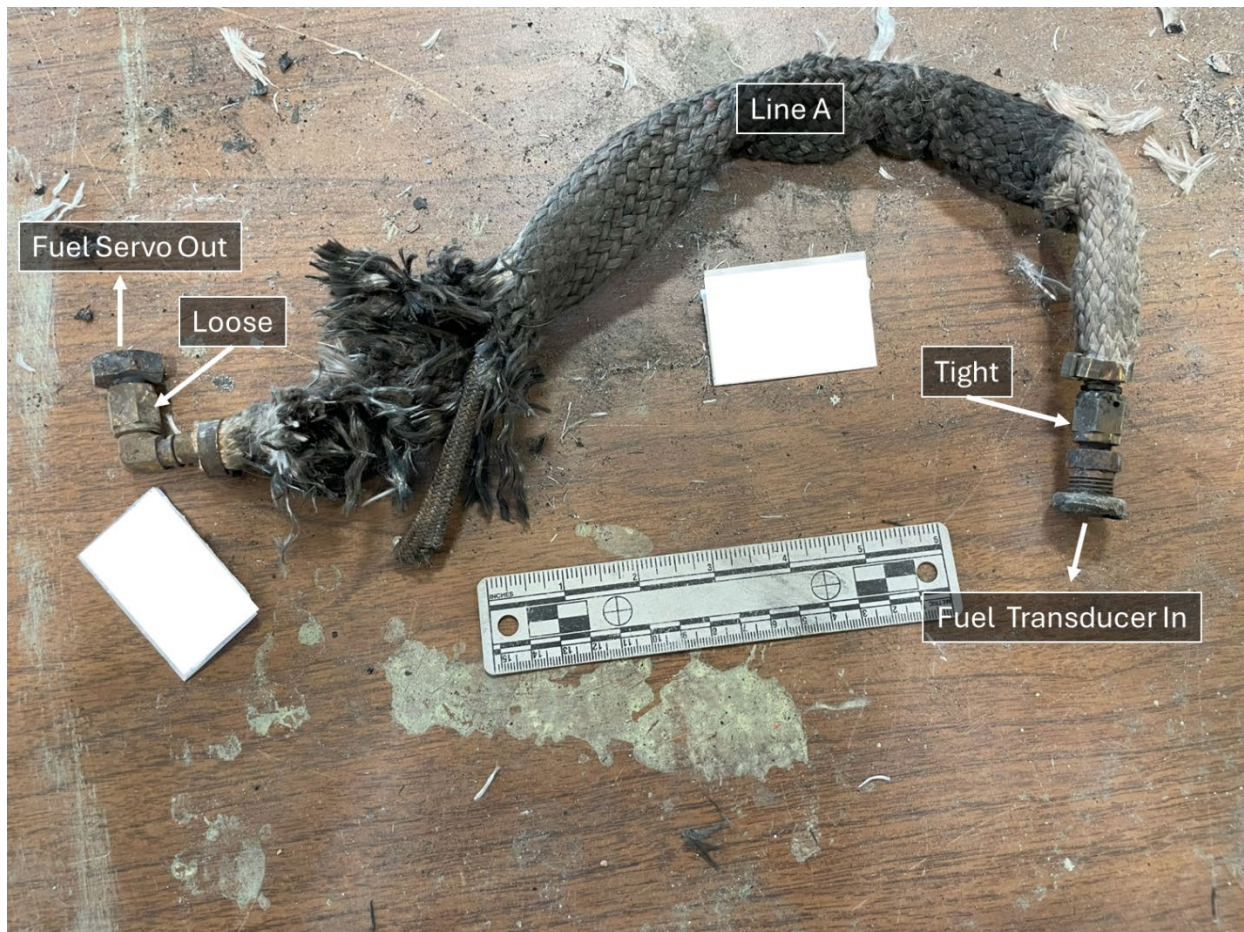


Figure 15. Fuel line A.

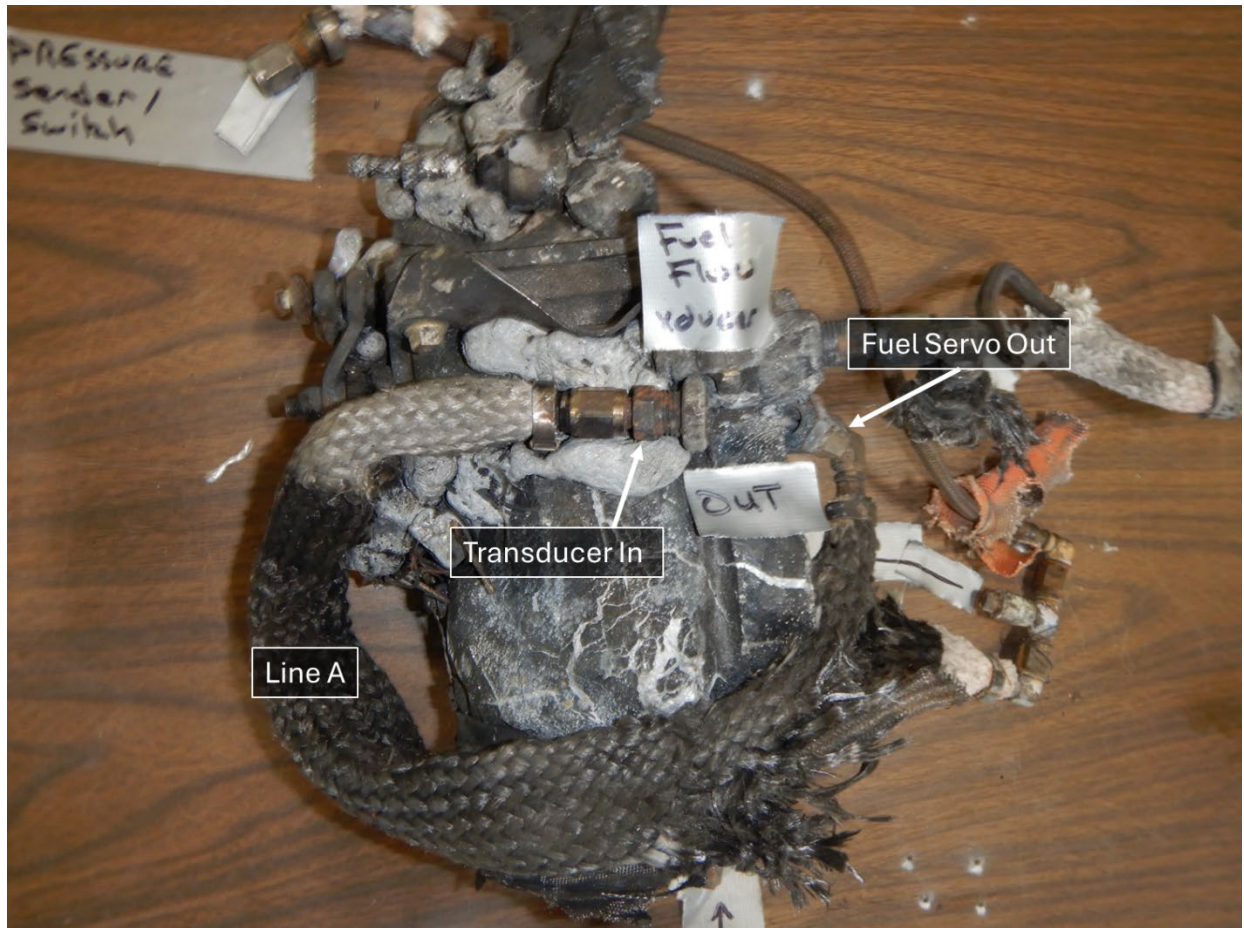


Figure 16. Fuel line A, as found on the fuel servo.

4.3 Line B, Pressure Relief Valve Out to Tank In Line.

The pressure relief valve to the tank line was identified as Line B (figure 17). The B-nut on one end, the end that attached to a T-fitting, was found loose. The other end had separated along with material from the attachment point.



Figure 17. Fuel line B, Pressure relief valve assembly.

4.4 Line C. Electric Fuel Pump Out to Engine Driven Fuel Pump (EDFP) In line

The electric fuel pump to the EDFP was identified as line C (figure 18). Line C remained attached to the EDFP and was thermally damaged with the webbing burned away. The B-nut on this end was loose. Some of the webbing was cut away to facilitate examination of the line. The EDFP separated from the engine and was thermally damaged. The electrical fuel pump out end of the line remained tightly attached to a 90° fitting.

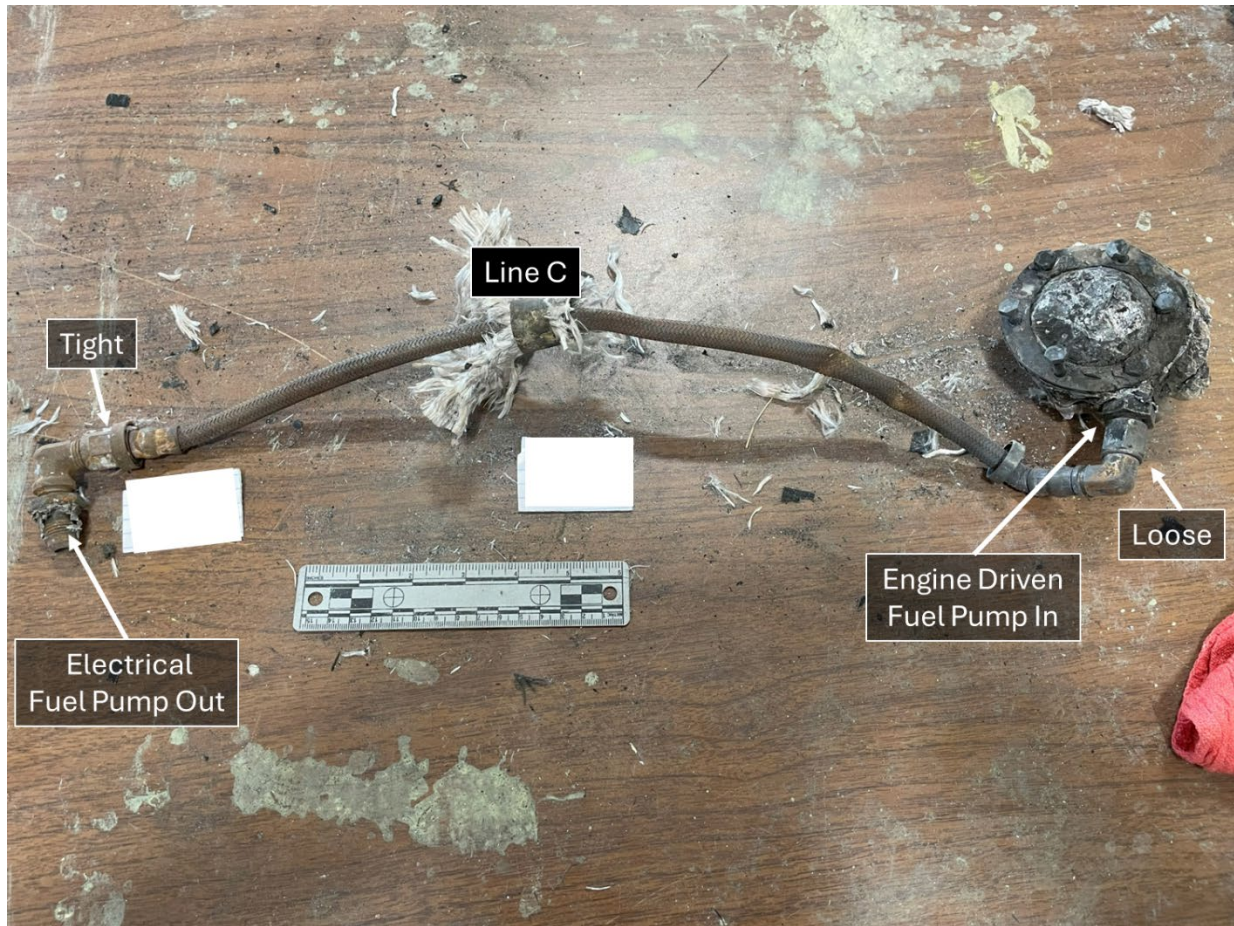


Figure 18. Fuel line C.

4.5 Line D. Fuel Flow Transducer Out to Fuel Flow Divider

The fuel flow transducer to fuel divider line was identified as line D (figure 19 and 20). Line D remained attached to the airframe and was thermally damaged, with most of the fabric webbing remaining around the line. The line was found separated from the thermally damaged flow divider. The line had fractured and separated from the fuel servo end. The remaining section of line E remained tightly attached to the fuel servo.

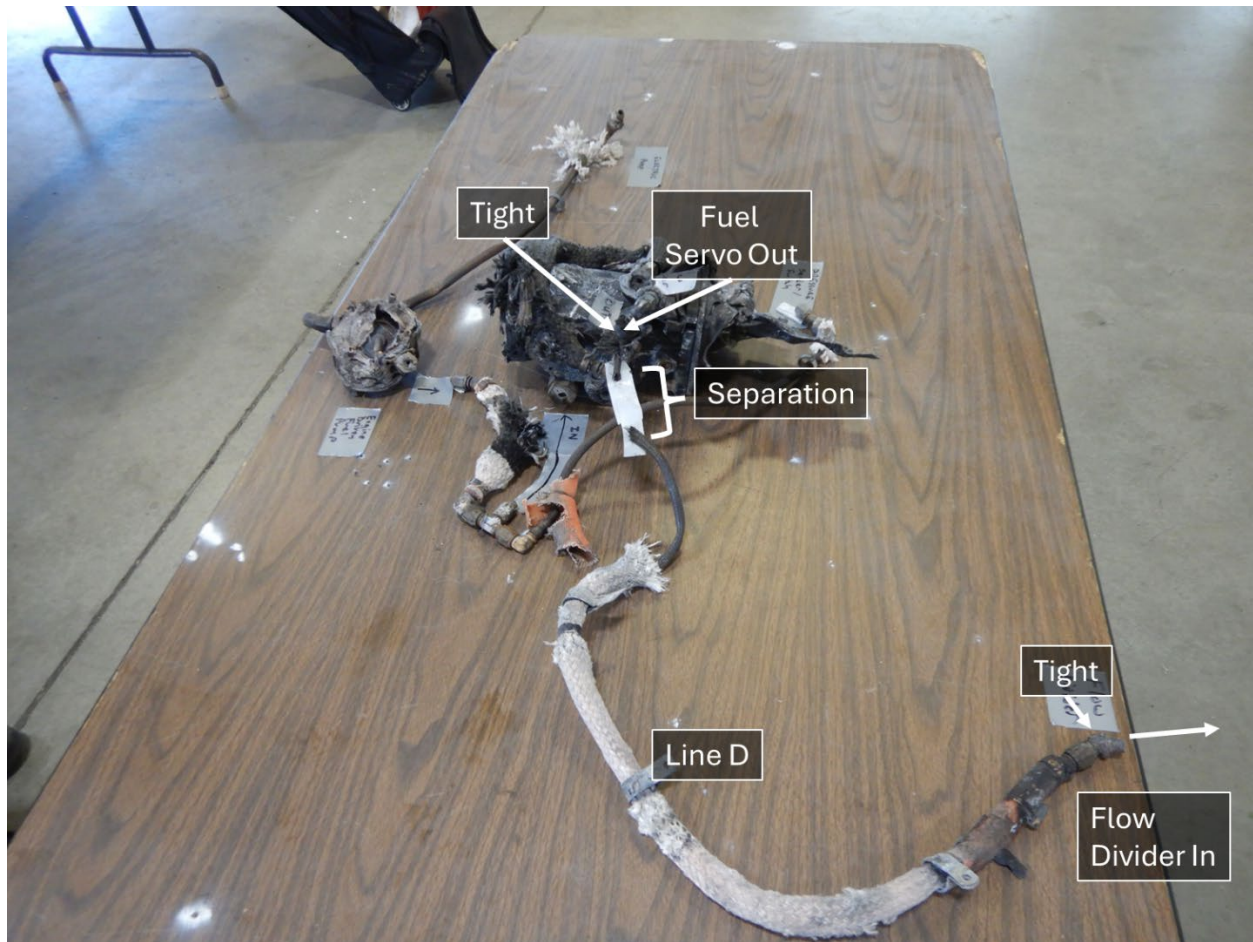


Figure 19. Fuel line D.



Figure 20. Line D, fractured end.

4.6 Line E. EDFP to T-Fitting

The line from the EDFP to a T-fitting was identified as Line E (figure 21). Line E separated from the thermally damaged EDFP at the B-nut. The other end remained tightly secured to one end of a T-fitting. The middle outlet of the T-fitting was missing the line but connected to the fuel manifold input. The second outlet of the T-fitting was connected to the fuel return line.

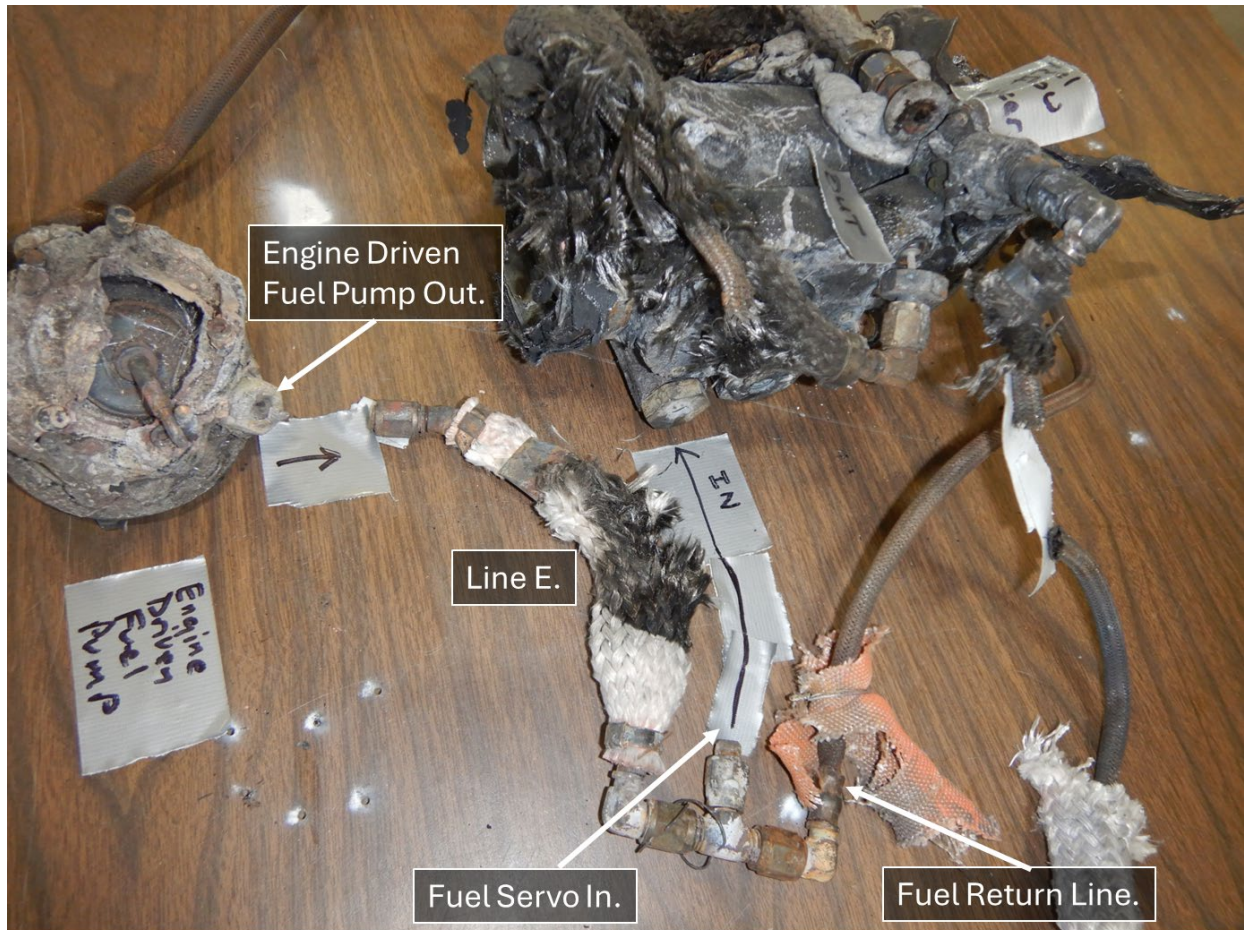


Figure 21. Fuel line E.

5.0 Aircraft Information

The helicopter was manufactured in 2023. Additional Information According to the Director of Maintenance for Helicopters Northwest, the maintenance records were inside the helicopter (figure 21).



Figure 21. Possible maintenance documents.

According to the Sheriff deputy, who arrived at the accident site shortly after the accident, the weather at the time of the accident was clear with few clouds and light winds.

Submitted by:

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IIC