



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Western Pacific Region

DATE: July 27, 2022

AIRFRAME AND ENGINE EXAMINATION

WPR21FA258

This document contains 22 embedded photos.

ACCIDENT

Location: Missoula, Montana
Date: July 1, 2021
Aircraft: N2388L / Cessna 172
NTSB IIC: Fabian Salazar

EXAMINATION PARTICIPANTS:

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SUMMARY

A preliminary examination of the airframe and engine was conducted at the accident site in Missoula, Montana, on July 2, 2021. A follow up examination of the airframe and engine was conducted at a secure site in Belgrade, Montana, on August 17, 2021. The examination revealed no evidence of preimpact mechanical malfunction or failures with the airframe or engine that would have precluded normal operation.

DETAILS OF THE INVESTIGATION

Airframe Examination

The airplane was removed from the site by loading it onto a trailer. In the process the wreckage was sectioned by the removal of the overhead cabin roof and left wing, as a unit.

Cockpit Documentation. The cockpit was heavily damaged and most of the instruments were damaged.

Attitude indicator: Heavily damaged and unreadable

Altimeter: Instrument damaged with the face of the altimeter separated from the instrument. Dial did not show any readable slap marks.

VSI: Unreadable

DG: 050°

Turn and slip: damaged and showing a tumbled airplane in the display.

Airspeed: Heavily damaged with the needle separated from the dial. No indication of slap mark noted on the dial.

Engine tachometer and hour meter: damaged and unreadable. The hour meter was damaged and missing a digit, reading X16.7

Ignition key: broken off from the switch. The switch was in the BOTH position.

Oil Temp: full high temp, above the red line

Oil Press: 10 PSI

Master Switch: Damaged and unreadable.

Volts: Unreadable

Amps: Unreadable, but full-scale deflection high.

Exhaust Gas Temperature: needle in between the third and fourth gradient.

Fuel Pump Switch: Broken

Beacon: Broken

Landing Light: Broken:

Taxi light switch: Broken:

NAV light switch: Broken:

Strobe: Broken

Pitot Heat: Off

Avionics: Broken

Mixture: Full Rich

Throttle: Full forward

AIRFRAME EXAMINATION

The tree damage leading to the accident site was from the south at a 30° to 45° angle. The terrain slope was about 45°.

At the recovery facility, the airframe, except the fuselage, was laid out on the ground of the secured site for examination.

The cabin area was heavily damaged. There was accordion style crushing of the front cabin floor. The right-side yoke was absent with about 6 inches of the control rod extending from the instrument panel. The left-side control yoke was absent with about 12 inches extending from the instrument panel. Both control yokes may have been cut during the recovery operations.

Flight Control Continuity. Flight control continuity was established for all control surfaces, from the control surfaces to the cabin floor.

The fuselage was substantially damaged. The right side underneath the wing was cut away during the recovery. The cut away sections, along with the door were separated from the fuselage. The door exhibited crush damage and the locking handle was in the UP position.

The right side of the fuselage, aft of the right main landing gear exhibited damage with wrinkled skin and crushing from the top and bottom. A large cut was made to the right-side aft fuselage area, consistent with recovery efforts to gain access to the interior.

The right wing separated from the airplane at the root. The separated wing exhibited extensive damage at the root with aft bending from the leading edge/root area aft to the trailing edge. The leading edge of the right wing exhibited crushing and tearing, with a section near the root separated. The right aileron remained attached to the wing by at least one hinge and exhibited damage in the form of bends and dents along the top surface. The right flap separated from the wing. The right fuel cap remained secured, and the rubber seal was soft and pliable. A section of the right wing and a section of the right flap separated from the wing. The separated flap section remained attached to the wing section by one hinge.

The wing mounting hardware (bolts, nuts, etc.) remained affixed to the upper cabin roof top. Two fuel hoses protruded out from the upper cabin roof and retained the mounting hose clamps. An electrical wire protruded from the upper cabin roof and ended at two disconnected plugs. One black hose extended from the upper fuselage. The right-side wing strut remained attached to the lower fuselage and separated from the wing at the top mount.

The right main landing gear remained attached to the lower fuselage and exhibited damage to the wheel skirt, which fractured and separated from the right wheel assembly. The right wheel assembly appeared to show minor damage, with the brake assembly and brake hose attached.

The empennage remained attached to the aft fuselage area and exhibited major bending and wrinkling of the area just ahead of the horizontal stabilizers.

The right horizontal stabilizer remained attached to the empennage and exhibited damage to the leading edge throughout the span. The outer tip of the right horizontal stabilizer appeared pushed upwards by a section of a tree trunk. The right-side elevator remained attached to the horizontal stabilizer and exhibited minor damage on the top side. The right-side elevator trim tab remained attached to the elevator, exhibited minor damage on the top and appeared to be in a near-neutral setting.

The vertical stabilizer remained attached to the empennage and exhibited damage throughout the span, with wrinkled metal and some downward crushing. The dorsal was wrinkled and cracked. The rudder remained attached to the vertical stabilizer and exhibited crushing and wrinkles with bending.

The left horizontal stabilizer and left elevator separated near the root and were located near the empennage. Both exhibited upward bending about mid-span. The tip of the horizontal stabilizer was bent upwards from contact with a small tree stump.

The left-side aft fuselage exhibited heavy damage with bending and wrinkling of the airframe.

The left main landing gear remained attached to the fuselage and bent aft till almost touching the fuselage.

The left wing remained attached to the upper cabin rooftop, and exhibited aft bending about mid-span, near the wing strut. The leading edge was crushed upwards. The outboard section of the leading edge exhibited a large circumferential dent, consistent with contact with a nearby tree that exhibited an impact mark and stripped bark. Based on the impact angle of the tree to the left wing, the airplane was about 30° nose down with little bank angle. The left aileron remained attached to the wing at all hinges and exhibited damage in the form of bends wrinkling and punctures. The left flap remained attached to the fuselage and indicated down about 40°. The left fuel cap remained secured, and the rubber O-seal was soft and pliable. The wing strut remained attached at both upper and lower mounting points.

The engine cowling had separated exposing the engine. The engine was partially buried in soft terrain and had been pushed aft into the fire wall. The exhaust and intake tubes were bent aft and upwards. The muffler was completely crushed flat. The entire lower engine area was crushed upwards, and the nose gear strut was pushed aft.

The propeller separated from the engine. Both propeller blades exhibited aft bending about 90°, about mid-span with chordwise scratches present. Both propeller tips remained attached to the blades. The spinner was crushed aft. One blade exhibited twisting and had both leading-edge gouging and chordwise scars. The other blade only had chordwise scars.

The windscreens and windows were shattered and separated from the fuselage.

The front and rear seats were removed from the airplane during recovery efforts.

Seatbelt usage was confirmed by examination and review of photos.

ENGINE EXAMINATION

Engine Model number: IO-360-L2A, Serial number: L28239-51A.

The engine was examined by the manufacturer party member, at the accident site on 7/1/2021, and at the recovery site on 8/17/2021.

The engine remained partially attached to the fire wall by the mounts. The propeller and starter ring gear separated from the front of the engine.

The flow divider remained secured to the engine and the diaphragm condition was intact. No evidence of fuel was found in the flow divider. The lines to the injector nozzles were secure. The diaphragm fuel pump remained secured to the engine and exhibited no anomalies. The fuel servo separated from the engine and two of the four manifold attachment points separated from the fuel servo. The fuel servo inlet screen was pulled out and missing. The throttle end was separated from the fuel servo. The gascolator was free of debris.

The left magneto produced a spark when rotated by hand. The right magneto did not produce a spark. Further examination revealed the magneto case and the points were damaged. Both magnetos were equipped with impulse couplings that operated normally. Both magnetos had their drives secure. The left magneto exhibited no external damage.

The top and bottom spark plugs exhibited worn out to normal condition when compared to the Champion Aviation Check-A-Plug AV-27 chart. The ignition harness was not tested.

Thumb force compression was present on all cylinders. Engine drive train continuity was established. Borescope inspection of all cylinders revealed no anomalies. The oil suction screen was clean.

Both vacuum pumps were impact damaged.

PHOTO EXHIBIT



Figure 1. Right-front view showing cabin area.



Figure 2. Left wing and propeller.



Figure 3. Left and right wings.



Figure 4. Right wing

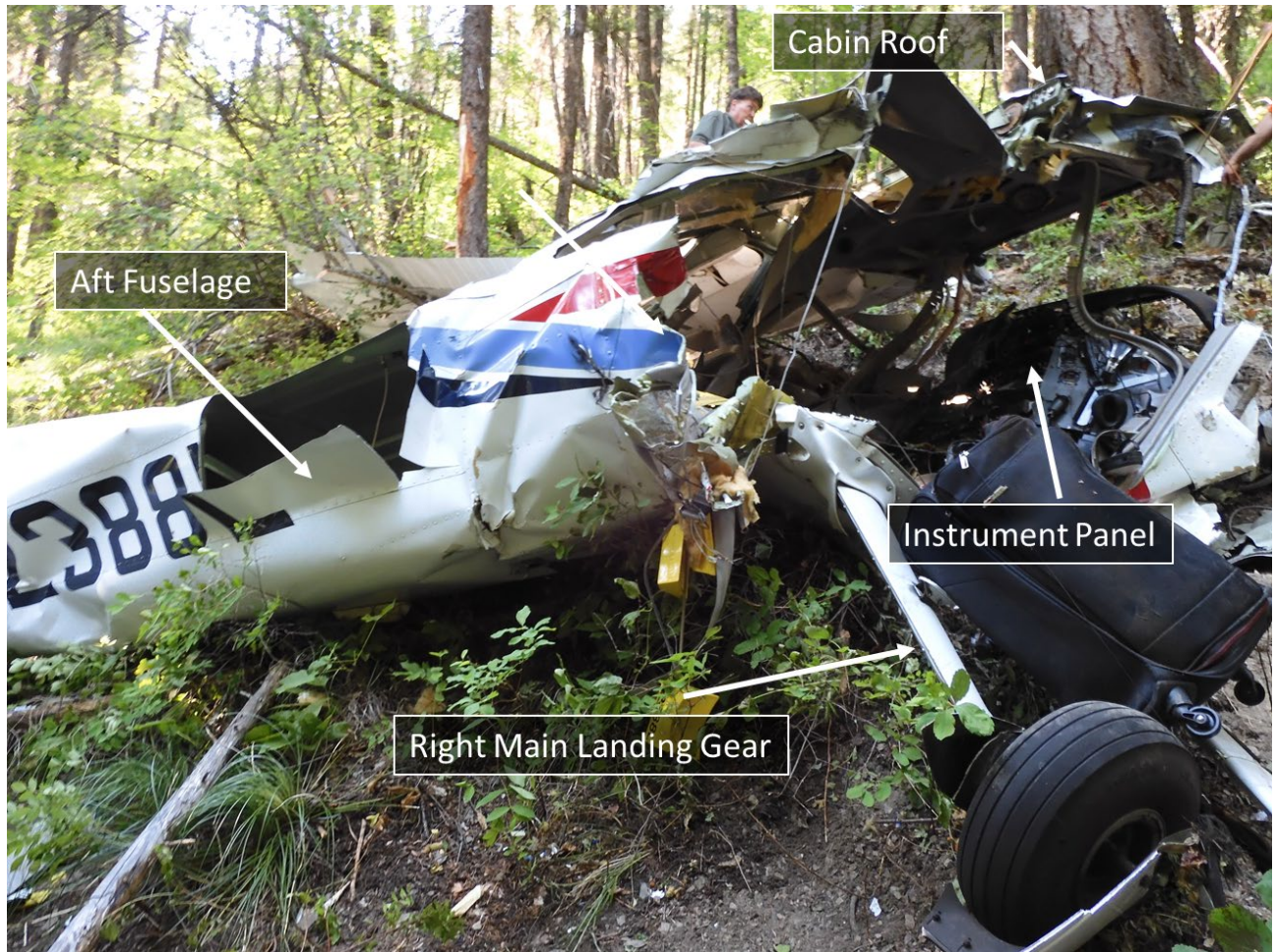


Figure 5. Right side of the fuselage.



Figure 6. Engine and cabin roof.



Figure 7. Propeller and spinner



Figure 8. Empennage.



Figure 9. Right wing at the recovery site.



Figure 10. Left wing.



Figure 11. Left wing as viewed from the wing tip.



Figure 12. Fuselage, right-side view.



Figure 13. Underside of the nose.



Figure 14. Cabin interior, right-side view.



Figure 15. Empennage.



Figure 16. Empennage, rear view.



Figure 17. Engine, rear view.



Figure 18. Engine left side.



Figure 19. Engine right side.



Figure 20. Propeller, front view.



Figure 21. Propeller, rear view.



Figure 22. Propeller spinner