

National Transportation Safety Board

Office of Aviation Safety

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AIRFRAME AND ENGINE EXAMINATION REPORT

January 22, 2025

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A. ACCIDENT

Location: Durkee, Oregon
Date: November 7, 2024
Time: 0837 Pacific standard time
Helicopter: Robinson R-44 II / N4361R

B. AIRFRAME AND ENGINE EXAMINATION REPORT

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C. SUMMARY

On November 7, 2024, about 0837 Pacific standard time, a Robinson Helicopter Company R-44 II, N4361R, was substantially damaged when it was involved in an accident near Durkee, Oregon. The pilot was not injured. The helicopter was operated as a Title 14 *Code of Federal Regulations* Part 133 external load flight.

On January 22, 2025, the IIC and party members from Robinson Helicopters and Lycoming Engines traveled to Baker City Municipal Airport (BKE), Baker, Oregon, to conduct a follow up examination of the accident helicopter. After examination of the airframe and engine, it was concluded that there were no mechanical malfunctions or failures that would have precluded normal operations.

D. DETAILS OF THE EXAMINATION

1.0 Accident Site

The IIC did not travel to the accident site. The accident site was located on a ridgeline at an elevation of about 5,300 ft mean sea level (msl). The helicopter was recovered by the operator and transported to a company hangar located at BKE. The maintenance personnel removed components for the main rotor hub to facilitate turning the blades downward. Maintenance also removed the tail rotor assembly to

facilitate the work done to the main rotor system. The tail rotor assembly was loosely reinstalled for the examination.

2.0 Airframe Examination

2.1 Fuselage

The fuselage was substantially damaged and exhibited a fractured windscreen, damage to the left side, left door, and large dents and tears to the sheet metal underneath the left-side rear door, and bent framework. The tail cone exhibited large dents to the sheet metal and bent structural metal under the skin, along with bending of the tail cone.



Figure 1. N4361R at the recovery facility.

2.2 Empennage

The empennage exhibited substantial damage to the lower vertical, and horizontal stabilizers. The tail rotor blades remained wholly attached to the hub. One blade exhibited dents to the leading edge. The other blade exhibited only minor damage.

The tail rotor gearbox remained attached to the end of the tail cone and contained oil.



Figure 2. Empennage.



Figure 3. Tail rotor assembly, and Main rotor blade B.

2.3 Main Rotor Assembly

The main rotor assembly remained attached to the mast. The blades, arbitrarily identified as A and B, exhibited large upward bending along with chordwise creases along the span, consistent with excessive upward coning.

Blade A remained wholly intact with no obvious impact marks along the leading edge. The pitch change link from the pitch horn of blade A to the rotating swashplate was removed during recovery. The bushings for the teetering hinge were removed during recovery. The pitch horn remained attached to the blade grip.



Figure 4. Top view of Blade A (over the cockpit) and the root end of Blade B.

Blade B remained mostly intact, except for a 2 ft section of the outboard blade that was fracture separated from the rest of the blade. The main section of the blade remained attached to the blade grip. The pitch change link from the pitch horn to the rotating swashplate, and the bushings for the teetering bearings were removed for recovery.



Figure 5. Top view of blade B and bottom view of blade A.



Figure 6. Top view of Blade B tip.



Figure 7. View of main rotor hub assembly and swashplate assembly.

The swashplate assembly remained secured to the top of the mast and functioned normally. The control rods from the rotating swashplate to the pitch horns exhibited minor damage. The control rods from the hydraulic servos to the non-rotating swashplate exhibited bending but remained intact.

The hydraulic servos remained attached to the control rods and moved throughout their maximum travel.

The control tubes from the hydraulic servos to the cyclic control and collective control remained attached and moved with moderate force. Flight control continuity was confirmed from the cyclic and collective to the non-rotating swashplate, and from the anti-torque pedals to the tail rotor pitch links.

2.4 Landing Gear

The right-side landing gear skid and right-side aft strut fractured and separated from the fuselage. The left-side skid remained attached to the fuselage at the left-side forward strut. The left-side rear strut fractured and separated from the skid but remained attached to the fuselage.

2.5 Cockpit

The cockpit exhibited minor damage, except for the right-side windscreen which was fractured. With approval from the IIC, the helicopter's radios were removed and not available for examination. The flight and engine instruments remained secured in the instrument panel. The dual tachometer was inoperative. The low rotor horn was tested and functioned normally.



Figure 8. Instrument panel with power applied.

2.6 Fuel/Fuel System

The main and auxiliary fuel tanks remained secured in the fuselage but contained no fuel. The vent line between the two tanks separated and was likely the location for fuel to escape. Both fuel tanks remained secured to the top of the fuselage and the fuel caps remained secured to their ports. The gascolator contained minimum fuel. The gascolator screen was clear and free of debris. The fuel servo venturi contained a large amount of engine oil, likely due to the storage attitude of the fuselage.

2.7 Engine Examination

The engine was examined by the party member from Lycoming Engines. Highlights of the examination are detailed below:

- The engine remained attached to the engine mounts
- One exhaust tube (right side merge before muffler) was partially dented
- Control linkage remained secure and exhibited minimal damage
- Plugs appeared normal compared to the Champion Check-A-Plug chart
- Left side sparkplugs coated in oil. Plugs were cleaned and reused
- Engine oil found in fuel servo Venturi.
- Filter assembly for intake remained secured and exhibited minimal damage
- Visual inspection prior to running showed no signs of damage precluding a test run
- Cleaned oil from cylinders 2,4 and 6
- Tactile thumb compression confirmed at all cylinders.
- Rotated engine and no anomalies noted.
- A total of four gallons of 100 low lead fuel added.
- Test ran engine, idled high, but ran with no anomalies.
- Engine ran at a high RPM due to structural damage interfering with throttle linkage.

3.0 Test Run

The helicopter remained suspended from a metal A-frame and the left skid for stability. The battery had been charged overnight. About 2 gallons of 100 low lead aviation fuel was placed in the main fuel tank. The party member from Robinson Helicopters conducted the test run.

Test run number one. The engine started almost immediately. The engine ran smoothly at a high RPM for about two minutes. Normal oil pressure was indicated from the oil pressure gauge. The party member then shut the engine down. The source of the high RPM was determined to be caused by structural damage

interfering with the throttle linkage. But it was determined that the high RPM was not above normal limits of the engine. It was agreed that the party member would restart the engine, run it for about 5 minutes, conduct a check of the magnetos, then shut down the engine.

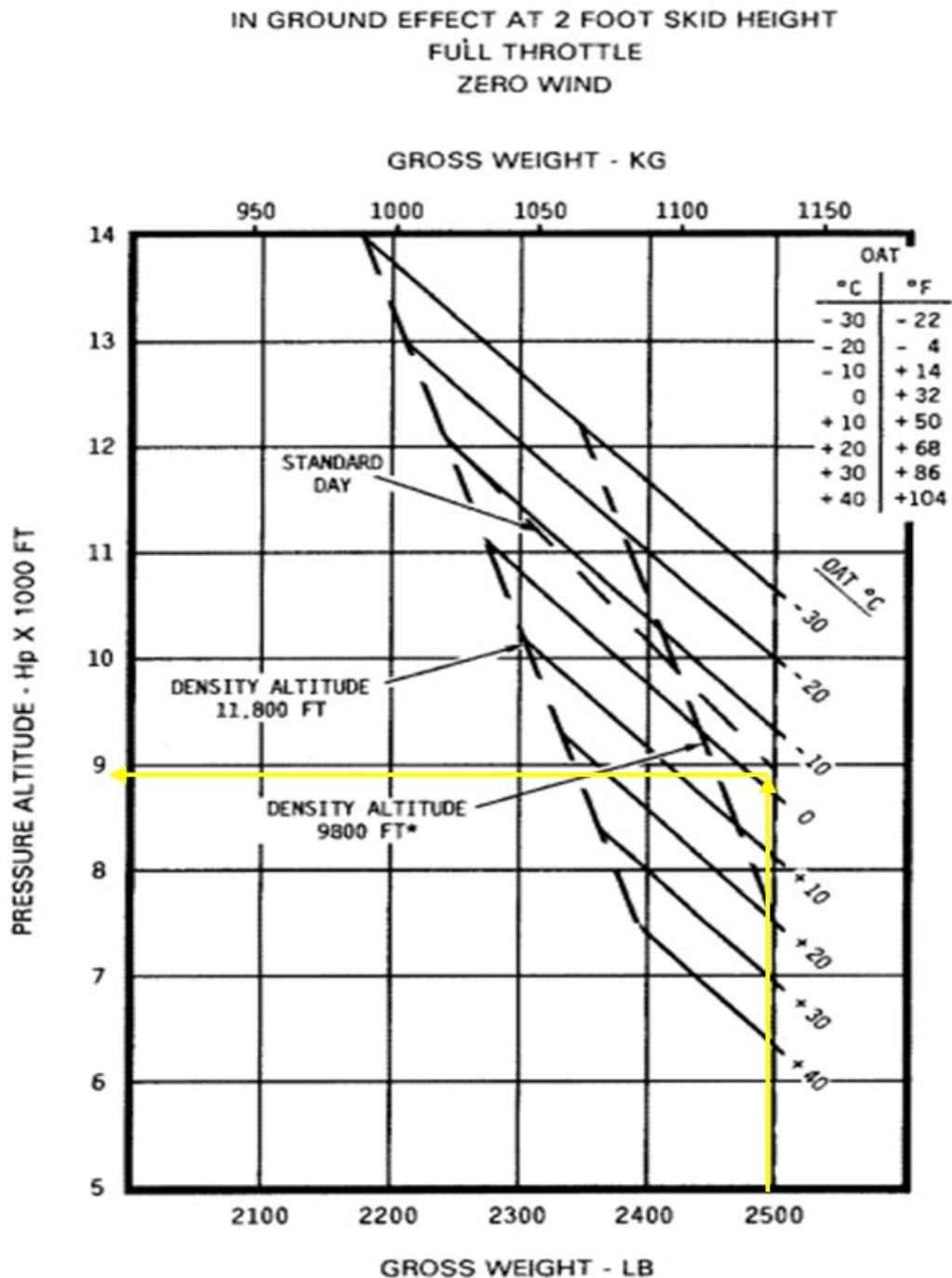
Test run two. The engine started almost immediately but still ran at a high RPM. About two minutes into the test run the engine increased its RPM slightly and then began to reduce its RPM, consistent with exhausting the fuel supply. The party member shut the engine down. Two additional gallons of 100 low lead aviation fuel were added to the main fuel tank.

Test run three. The engine started almost immediately and ran at a high RPM. After about 1 minute, the party member conducted a magneto check. Engine RPMs could be heard reducing slightly and increasing as the party member switched the magnetos off and on as per the magneto check procedures. The engine tachometer did not provide useful data to quantify the engine speed changes.

4.0 Performance

4.1 Hover in ground effect (IGE)

The pilot estimated the altitude of the drop off site to be about 5,300 ft mean sea level (msl) and the temperature to be about -1°C. A review of the performance charts for the accident helicopter revealed that at the estimated environmental conditions, the helicopter was capable of hovering in ground effect at 2,500 pounds, up to 8,900 ft msl.



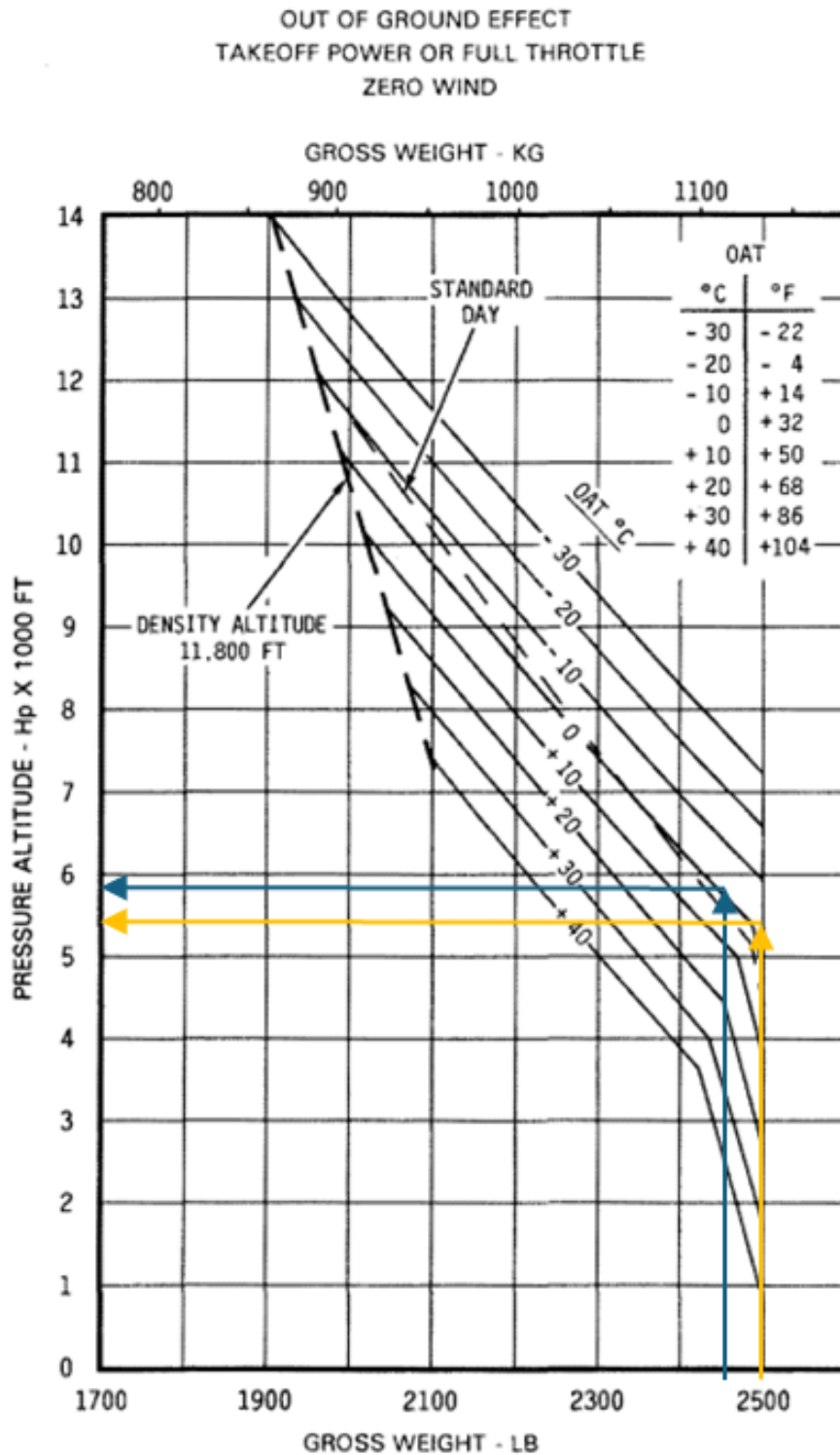
IGE HOVER CEILING VS. GROSS WEIGHT

*Hover controllability with 17 knot wind substantiated up to 9800 feet density altitude.

Figure 9. Hover in ground effect chart. Courtesy of Robinson Helicopters.

4.2 Hover out of ground effect (OGE)

At the estimated environmental conditions of the accident site, the helicopter was capable of an out of an OGE hover, at the maximum gross weight, up to 5,300 ft msl. At the estimated gross weight of 2,450 pounds, the helicopter was capable of an OGE hover, up to 5,800 ft msl (figure 10).



OGE HOVER CEILING VS. GROSS WEIGHT

Figure 10. Hover out of ground effect chart. Courtesy of Robinson Helicopters. Blue arrows show performance at 2,450 pounds. The yellow arrows show performance at 2,500 pounds.

Submitted by:

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IIC