National Transportation Safety Board
Office of Aviation Safety
Washington, DC 20594

CEN23FA125

N949SH – AIRFRAME AND ENGINE EXAMINATION REPORT

March 9, 2023

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A. ACCIDENT

Location: Port O'Connor, Texas
Date: March 6, 2023
Time: 2157 Central Time
Helicopter: N494SH, Robinson R-44II

B. N949SH – AIRFRAME AND ENGINE EXAMINATION REPORT

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Party Coordinator	Thom Webster, senior air safety investigator Robinson Helicopter Company Torrance, California
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C. DETAILS OF THE EXAMINATION

1.0 Accident Site

The helicopter came to rest in an open, flat field in Port O'Connor, Texas. The field is private property and in a residential area. There was no evidence of the helicopter impacting any obstacles (such as trees, towers, wires, or buildings). The accident site elevation was about 20 feet above mean sea level.

There were no ground injuries.

There was a postimpact fire that consumed most of the wreckage.

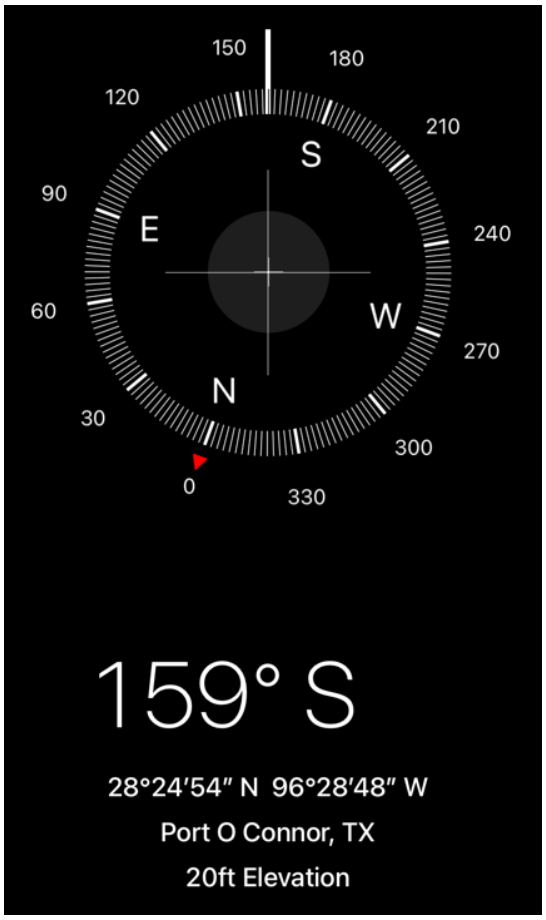
The helicopter impacted the initial impact point on a 138° heading. The initial impact point (a dirt crater) was about 10 ft long (north to south) by about 6 ft wide (east to west), and about 9 inches at its deepest point. There were two small divots, on each side, at the beginning of the crater. A small arc shaped divot was located

approximately 15 ft west of the grater and an 18 ft long divot was located approximately 10 ft south of the two small divots next to the large crater.

From the initial impact point to the final impact point, it was about 28 feet on a 145° heading.

For the final impact point, the helicopter came to rest on a 159° heading. The final impact point, an area of burned grass and dirt was about 10 ft long (north to south) by about 12 ft wide (east to west), with no visible depth like the initial impact point.

The debris field covered 200 ft north/south and 225 ft east/west.



Except for about an 8 ft section of the red blade spar, all the major structural components were located at the accident site.

The wreckage was recovered by Lone Star Retrieval on March 9, 2023, and it was transported to Air Salvage of Dallas in Lancaster, Texas.

2.0 Airframe Examination (Robinson Helicopter Company, R-44II, serial number 10878)

All fracture surfaces with the airframe observed were consistent with overstress signatures.

There were no preimpact mechanical malfunctions or failures noted with the airframe.

Cabin

The cabin structure and components were mostly consumed by fire. The instrument console, individual instruments, one seat cushion along with some personal items were recovered in the debris field.

All four seat belt buckles remained in their latches.

The removable collective and cyclic controls were not installed. The removable pedals were installed.

The manifold pressure gauge was damaged, and the face was separated. The face had a slap mark aligned with the high side of the red line.

The Hobbs meter showed 987.71 hours.

The navigation light switch and the strobe light switch were both found in the on positions.

The helicopter did not have a radar altimeter installed.

All the cockpit warning lights were found intact, and the filaments were checked with no concerns noticed.

There were no bags, backpacks, purses, or suitcases found in the wreckage.

A Garmin Aera 796 unit (that sustained impact damage but no fire damage) was secured and submitted to the NTSB Vehicle Recorders Laboratory.

Airframe

The steel tube frames were severely distorted and thermally damage. The main rotor gearbox mounts were fractured and separated from the upper frame.

The engine was separated from the lower frame mounts.

The forward end of the tail cone sustained thermal damage and separated from the upper frame. The anti-collision light (strobe) mounted on the top of the tail cone was found installed and intact.

The horizontal stabilizer was bent upward. The vertical stabilizers were undamaged.

The tail skid was undamaged.

The fuselage and cowlings were mostly consumed by fire.

An unknown make and model ELT was found with fire damage. The ELT was destroyed. The ELT antenna was found connected and the ELT was found in its mount attached to the airframe. According to the Texas Department of Emergency

Management, they did not receive any telephone calls from the U.S. Air Force about the ELT from the helicopter being activated.

Drive

The lower sheave was undamaged. The v-belts were consumed by fire. The upper sheave grooves were undamaged. The upper sheave sustained thermal damage and would not rotate on the shaft. The upper actuator bearing sustained thermal damage and would not rotate. The lower actuator bearing rotated smoothly by hand. The actuator sustained thermal damage and was fractured at the upper bearing mount. The actuator was extended 1.4" between the scissor mounts.

The forward flex coupling was bent and fractured at the MRGB input yoke. The MRGB was separated from the airframe. Oil, blue in color, was visible in the sight glass. The mast tube and driveshaft were straight. The main rotor was rotated by hand more than 360° with no anomalies.

Both elastomeric teeter stops were smashed across the center. The droop stops were undamaged.

The blue MR blade was bowed downward and forward (in the direction of rotation) midspan with a fracture from the trailing edge up to the spar along with a crease further outboard. The trailing edge of the outboard section was folded upward. The entire lower surface had a layer of dried dirt/sand and some small areas of impact damage (punctures).

The red MR blade was bowed and fractured in several places. The surface of the fractures were angular and jagged. All the upper and lower skin fragments were recovered. Approximately 8 ft of the outboard section of spar was not recovered.

The intermediate flex coupling was bent slightly.

The tail rotor driveshaft sustained severe thermal damage at the forward end. The tail rotor damper bearing rotated smoothly by hand. The damper support bracket was bent and sustained some thermal damage.

The aft flex coupling was undamaged.

The tail rotor gearbox remained secure to the tail cone. Oil, blue in color, was visible in the sight glass. The input shaft was rotated more than 360° of the tail rotor by hand with no anomalies. The output shaft was straight.

The tail rotor blades had no damage.

Powerplant Controls

The mixture control knob was consumed by fire. The control wire on the knob end was in the full rich position. The fuel mixture arm on the fuel control unit was separated from its shaft, tethered by the control wire.

The throttle control linkage was mostly consumed by fire. All the control rod ends were recovered and attached to their attachment points.

Due to fire and impact damage, airframe to engine control continuity could not be established.

Flight Controls

Portions of the flight controls were consumed by fire. All the control rod ends were recovered and secure to their attachment points. All the fracture surfaces sustained thermal damage except the disconnects in the lower vertical tubes which were crushed, and the surface was angular and jagged. Also, at the upper end of the MR pitch links. One was separated from the ball and the attachment bolt was sheared. The other ball remained attached to the pitch horn and the housing was fractured and distorted.

Airframe flight continuity was established.

Fuel

The main fuel tank was separated from the airframe. The outer shell was crushed and punctured; the bladder was uncompromised. No fuel remained in the tank. The filler cap was secure to the neck. The finger screen was clear. The rollover valve remained secure and operated properly. The supply line and crossover hoses were disconnected.

The auxiliary fuel tank was mostly consumed by fire. The filler cap remained secure to the filler neck. The finger screen was clear.

The vent tubes were clear when blown thru.

The gascolator bowl was crushed and the housing sustained thermal damage.

A fuel sample could not be obtained from the airframe, as no fuel was observed.

Landing Gear

The landing gear was separated from the airframe. Both cross tubes were straight. The front cross tube was fractured at the left elbow. The aft cross tube was separated from the left elbow. The struts remained attached to the left skid although the aft strut was bent, lower end aft. The right side struts were fractured from the right skid. Both skid toe sections were fractured at the forward strut mounts. The surface of the fractures were angular and jagged.

A float system was not installed on the skids.

Powerplant

The engine was separated from the airframe and sustained thermal damage.

The forward face of the upper sheave had deep score marks on the outer edge. The frame tubes adjacent to the forward face had deep score marks running in the direction of sheave rotation.

The cooling fan sustained minor thermal damage but no impact damage. The scroll was consumed by fire.

The starter ring gear did not contact the cooling panels or oil coolers.

3.0 Engine Examination (Lycoming Engines, IO-540-AE1A5 serial number L-30347-48A)

All fracture surfaces with the engine observed were consistent with overstress signatures.

There were no preimpact mechanical malfunctions or failures noted with the engine.

As first viewed, the engine was fire damaged, separated from the airframe and laying inverted between the helicopter cabin and the separated rotor system. The engine exhaust muffler and tailpipe assembly were impact damaged and separated from the engine. The inside of the engine exhaust tubes, and muffler exhibited light brown to gray exhaust deposits and were unobstructed. The oil sump was partially impact separated from the engine and impact damaged. The lower portion of the engine accessory case was fragmented. The right magneto, oil filter, engine driven fuel pump and fuel servo were separated from the engine. All the engine accessories were fire damaged.

The engine was photographed and then stood up to stand on the engine cooling scroll. It was partially disassembled to facilitate the examination. The crankshaft was rotated by turning the engine around the cooling fan. Continuity of the crankshaft to

the rear gear and to the valve train was confirmed. Compression and suction were observed from all six engine cylinders. The interiors of the cylinders were viewed using a lighted borescope and no damage to the pistons, cylinder walls or valves observed.

Fuel system

The fuel servo was separated from the engine and was fire and impact damaged. The fuel inlet hose was separated. The fuel outlet hose remained attached. The throttle cable was separated from the servo throttle control arm at the fractured throttle cable ball joint and the arm assembly impact damaged. The mixture control cable was separated from the servo mixture control arm and the arm impact damaged. The servo fuel regulator section was partially disassembled, and the rubber diaphragms observed fire damaged. The servo fuel inlet screen was absent of debris.

The flow divider remained attached to the engine and the fuel lines secure. It was partially disassembled, and the rubber diaphragm observed intact.
The 2-piece fuel injector nozzles remained attached to the engines. The #2 and #4 nozzle orifices were not observed in the nozzle bodies and may have been dropped in the ashes around the engine during disassembly.

The remaining nozzle orifices were unobstructed.

The engine driven fuel pump was impact separated from the engine and fire and impact damaged. It was partially disassembled, and the rubber diaphragms observed burned. No damage was observed to the internal check valves.

A fuel sample could not be obtained from the engine, as no fuel was observed.

Magnetos

The left magneto was partially impact separated from the engine and fire destroyed. The right magneto was impact separated from the engine and fire destroyed.

Spark Plugs

The spark plugs electrodes exhibited brown to gray coloration and worn normal condition. The #6 bottom spark plug was impact damage and not removed.

Ignition Harness

The engine ignition harness was fire destroyed.

Starter

The starter remained attached to the engine, was fire damage and was not removed.

Alternator

The alternator remained attached to the engine, was fire damage and impact damaged. It was not removed.

Oil System

Oil was observed in the engine. The oil suction screen was absent of debris. The oil filter media was charred but no metallic debris was observed among the charred remains.

4.0 Maintenance Records Review

The maintenance records were not located at the accident site.

Per the pilot's family members, they searched the pilot's home on March 9, 2023 (located in the neighborhood of the accident site), and they did not locate them or the pilot records. The family reported that if they find any maintenance or pilot records, they will submit them to the NTSB. The Bay City Regional Airport (BYY) manager (James Mason) checked the pilot's hangar and the pilot's vehicle on March 8, 2023, and did not find any maintenance records (or pilot records). James Mason reported that the pilot had a hangar and the pilot also received fuel from BYY on the day of the accident. James forwarded the fuel receipt to the NTSB.

The historical FAA airworthiness and registration records were retrieved.

Submitted by:

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Investigator-In-Charge