

National Transportation Safety Board

Office of Aviation Safety
Central Region



CEN23FA183

WRECKAGE EXAMINATION SUMMARY

INCIDENT

Location: Brady, Texas
Date: May 14, 2023
Time: Exact Time Unknown
Latitude: 31.225932° North
Longitude: 99.358637° West
Helicopter: Robinson R22 Beta, Registration No. N40506

PARTICIPANTS

Investigator-In-Charge	Andrew Todd Fox National Transportation Safety Board Denver, Colorado
Group Member	Brian Rutt National Transportation Safety Board Denver, Colorado
Group Member	Benjamin Huffman Federal Aviation Administration - San Antonio FSDO San Antonio, Texas
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Group Member	Thom Webster Robinson Helicopter Company Torrance, California
Group Member	David Harsanyi Lycoming Engines Williamsport, Pennsylvania

INCIDENT SYNOPSIS

On May 14, 2023, at exact time unknown, a Robinson R22 Beta helicopter, N40506, was substantially damaged during a crash near Brady, Texas. The uncertificated pilot was fatally injured. The helicopter was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

There were no witnesses to the crash. According to one of the pilot's daughters, the pilot regularly attended a Sunday morning church service at 1100 in Brady, Texas, but on the morning of the crash he was not seen at the church service. After several unsuccessful attempts to reach the pilot via phone on the afternoon of May 14th and the morning of May 15th, a family member asked a neighbor to check on the pilot at his residence near Brady, Texas, where the helicopter wreckage and pilot were found near the house. The pilot was reportedly wearing his church clothes and dress boots.

According to one of the pilot's daughters, the pilot purchased the helicopter in March 2016 as an investment and she could not recall the last time he flew the helicopter. She stated that the pilot would occasionally bring the helicopter out of the shed to perform an engine run and, on multiple occasions, he forgot to engage the collective friction which resulted in unintended movement of the helicopter on the ground while the engine was running. The pilot kept the helicopter's battery connected to a charger while the helicopter was stored in the shed and during the engine runs on the concrete pad. Additionally, to move the helicopter while on the ground, the pilot would connect an electric winch cable to a short chain loop on the helicopter's landing skid aft cross tube. The electric winch motor was located at the rear of the shed where the helicopter was normally stored. However, if he intended to fly, the pilot would remove the short chain loop before the flight.

WRECKAGE EXAMINATION TIMELINE

On Tuesday, May 16, 2023, the National Transportation Safety Board (NTSB) Investigator-In-Charge arrived at the crash site and conducted an onsite investigation. The NTSB IIC was assisted by representatives with the Federal Aviation Administration, Robinson Helicopter, and Lycoming Engines.

HELICOPTER DESCRIPTION

The helicopter was a 1991 Robinson R22 Beta, serial number (s/n) 1753, registration number N40506. The helicopter was equipped with a 160 horsepower, normally aspirated, carbureted, Lycoming O-320-B2C engine, s/n L-15949-39A. The engine was derated to 135 horsepower. The helicopter fuselage was of aluminum and fiberglass construction with a welded steel tube frame. The tailcone is of aluminum construction.

The helicopter's empty and maximum takeoff weights were 867.61 lbs and 1,370 lbs, respectively. The helicopter's minimum gross weight is 920 lbs. The minimum pilot weight (solo) is 130 without a full auxiliary fuel tank; otherwise, the minimum pilot weight (solo) is 135 lbs.

The helicopter was equipped with a 30.7-gallon capacity (29.7 gallons usable) fuel system, consisting of a 19.8-gallon main fuel tank (19.2 gallons usable) and a 10.9-gallon (10.5 gallons usable) auxiliary fuel tank. The fuel shutoff valve has two positions: ON and OFF.

MAINTENANCE SUMMARY

Previous Maintenance

According to maintenance documentation, on August 25, 1993, the Lycoming O-320-B2C engine, s/n L-15949-39A, was overhauled by the manufacturer in Williamsport, Pennsylvania, at 2,508.4 hours total time since new. On December 10, 1993, at 2,006.3 total airframe hours, the overhauled engine was installed on the helicopter. At that time, the engine had accumulated 6.6 hours since the overhaul.

The last annual inspection of the helicopter was completed on October 10, 2003, at 3,449.7 total airframe hours, at which time the engine had accumulated 1,450.0 hours since the factory overhaul. The logbook documentation did not reveal any maintenance actions after the October 2003 annual inspection.

The maintenance documentation included two invoices for replacement parts/components dated August 6, 2016, and September 13, 2016; however, there were no logbook entries for any associated maintenance actions on the helicopter during that period.

At the time of the crash, the airframe total time was 3,527.0 hours, and the engine total time since new and time since overhaul were 4,035.7 hours and 1,527.3 hours, respectively.

WRECKAGE EXAMINATION AT CRASH SITE (MAY 16, 2023)

Crash Site Description

The helicopter was found on its right side, facing west, about 15 ft from the north wall of the house, as shown in Figure 1. The helicopter was about 70 ft southwest (232° true) from a concrete pad that the pilot used during ground operations, as shown in Figure 2. The helicopter's ground handling wheels and a hand truck associated with a battery charger were found beside the concrete pad, as shown in Figure 3. The battery charger and its integrated jumper cables were found about 60 ft from the concrete pad against the rear right tire of a white sedan parked beside the helicopter wreckage, as shown in Figure 4. The hood and roof of the white sedan exhibited fresh dirt deposits.

There was a small truck, full-sized recreational vehicle, and two steel drums, located between the concrete pad and the helicopter wreckage, as shown in Figure 5. Based on ground impact marks and the overall wreckage distribution, the helicopter ascended at least 7 ft to clear the obstacles before it impacted the ground near the house.



Figure 1. Main wreckage overview



Figure 2. Location of main wreckage in north side yard of house (red arrows) and concrete pad (yellow arrows) with inset aerial photo depicting property layout.



Figure 3. Concrete pad, hand truck used with battery charger (red boxes), and ground handling wheels (red arrows).



Figure 4. Main wreckage, sedan, and battery charger with jumper cables (red arrow).



Figure 5. Main wreckage with obstacles along projected flight path.

To facilitate the wreckage examination, the helicopter was picked up using a backhoe located on the property and set back onto its skid gear on the concrete pad.

Airframe

The pilot-side cabin door, normally installed on the right side of the helicopter, separated from the fuselage during impact and was found about 20 ft from the main wreckage. The right door hinges did not have retaining rings installed. The passenger-side cabin door remained closed, latched, and undamaged on the helicopter. The passenger-side door hinges also did not have retaining rings installed.

The right windshield was shattered, and the individual pieces were found in the immediate area of the cabin. The entire left windshield was separated from the support frames. The windshield bow was undamaged. The right-side door frame and lower windshield frame was crushed inward along with the chin on the right side.

Both lower frames were bent and fractured at the vertical firewall attachment points. The upper frame appeared undamaged.

The tailcone had several small dents at the forward end.

The lower stabilizer was bent slightly to the left. The horizontal stabilizer was bent downward about 45°.

Cabin

The upper console was separated from the lower console, tethered by wires and hoses. The instruments were undamaged. The hour meter read 3,527.0 hours.

The removable flight controls were installed. The anti-torque pedals were in a neutral position. The collective was positioned mid travel and had resistance when pushed downward due to main rotor gearbox impact-related damage. The cyclic friction was on and, as shown in Figure 6, the collective friction was off.



Figure 6. Collective friction in off position.

According to first responders, the pilot was found in the right side of the cabin with his torso still seated in the right seat, and he was not wearing the available seat restraints. Both seat structures were undamaged. Both seat restraints were unbuckled. Both seat belt inertia reels operated properly.

All circuit breakers were found down/in except the strobe circuit breaker was up/out.

Landing Skids

The landing skids remained attached to the airframe at three points; the forward right-side attachment point was fractured. The heel of the right skid was bent, and the toe was fractured at the strut mount. There was a short loop of chain installed on the landing skid aft cross tube, as shown in Figure 7. As previously noted, the pilot reportedly would connect an electric winch cable to the short chain loop to move the helicopter while on the ground. However, if he intended to fly, the pilot would

remove the short chain loop before the flight. The winch cable was not connected to the chain loop at the time of the crash and was found on the floor of the shed undamaged.



Figure 7. Chain loop around the landing gear skid aft cross tube.

Powerplant Controls

The throttle connector rod was in the idle position as was the throttle arm on the carburetor. The throttle twist grip operated smoothly throughout its travel.

The fuel mixture control knob was in the full rich position. The mixture knob guard was recovered near the console. The fuel mixture arm on the carburetor was in the full rich position and the spring was in place. The mixture control operated smoothly stop-to-stop. The mixture control cable was cut to remove the airbox to gain access to the carburetor.

The carburetor heat control knob was raised about 0.5 inch. The carburetor heat slider valve was slightly open. The carburetor heat control knob moved smoothly.

The governor switch was in the off position.

Fuel System

The helicopter's main fuel tank was dented adjacent to the main rotor mast. The fuel cap remained secure on the filler neck. The main fuel tank contained about 4 gallons

of 100 low-lead aviation fuel. The finger screen in the main tank was clear of debris. The drain fitting was inoperable. The fuel drain line was plugged with dry mud.

The auxiliary fuel tank was slightly dented adjacent to the main rotor mast and only contained unusable fuel. The fuel cap remained secure on the filler neck. The finger screen in the auxiliary tank was clear of debris. The drain fitting was inoperable, and the drain tube was clogged with dirt at the lower end.

The fuel system vent hoses were separated from the upper tube on each tank. The crossover tube remained attached. The upper vent tubes and hoses were clear of debris when blown through.

The gascolator bowl was full of fuel that was blue in color with no water or debris and had the odor of 100 low-lead aviation fuel. The gascolator fuel screen was clear of debris.

The airframe fuel lines were undamaged and remained attached to the carburetor inlet.

The fuel shutoff valve was found open.

Flight Control Continuity

Flight control continuity was confirmed from the cyclic and collective to the swashplate assembly where both ears exhibited fracture features consistent with overstress. Both pitch control links remained intact. The cyclic friction was on, and the collective friction was off.

Tail rotor flight control continuity was confirmed from the anti-torque pedals to the tail rotor blades.

Drive

The main transmission and tail rotor gear box rotated freely by hand. The tail rotor drive shaft remained intact. The lower and upper sheaves appeared undamaged, and the V-belts exhibited no abnormal wear. The V-belts were in place on the lower sheave and positioned one groove forward on the upper sheave. The belt tension actuator was extended 1.25" between the scissor mounts. The upper and lower support bearings rotated smoothly. The upper sheave engaged the clutch shaft when rotated by hand in a counterclockwise direction (looking forward) and rotated smoothly on the shaft when rotated in a clockwise direction.

The main rotor drive shaft was bent at the lower end and the mast tube was fractured in the same area. The surface of the fracture was rough and matte gray in color. Oil, blue in color, was visible in the sight gauge.

The main rotor was rotated by hand more than 360° with the only anomaly the previously mentioned damaged drive shaft and fractured mast tube, confirming drive continuity from upper sheave up through the main rotor drive shaft and back to the tail rotor.

The tail rotor gearbox rotated smoothly by hand. The output shaft was straight. Oil, blue in color, was visible in the sight gauge.

Rotor Blades

Both elastomeric teeter stops were smashed across the center. The droop stops were crushed and the attachment bolt sheared.

Both main rotor blades were bowed upward with chordwise creases throughout their span. Both blades had rough score marks along their leading edge from mid-span out to their respective tip.

The tail rotor blades exhibited normal wear along the leading edge with no impact damage.

Engine

The engine remained attached to the airframe and sustained no impact damage.

While the helicopter was laying on its right-hand side, the airbox was removed to examine the air filter. The air filter and air box had large amounts of dirt, debris, dry mud, and portions of acorn type shells present within.

The engine was rotated through a full engine cycle by rotating the cooling fan with no noted anomalies. The lower plugs were removed, and the lower plugs for cylinder Nos. 2 and 4 were found oil soaked, cleaned using starter fluid, and reinstalled.

Internal engine and valve train continuity were confirmed while the cooling fan was rotated by hand. Cylinder compression was confirmed by placing a finger over the open spark plug holes and feeling suction and expelled air from each cylinder while the crankshaft was rotated.

There was at least 4 quarts of engine oil present within the engine.

The engine was determined to be in a safe condition to conduct an engine run. The V-belts were cut and removed before the engine run. An unsuccessful engine start was made using the aircraft battery, which was found to be depleted, so jumper cables and an automobile battery was attempted. The engine remained unable to turnover fast enough with the jumper cables being used. Ultimately, a new marine 12-volt battery was procured and connected directly to the airframe battery leads. With the new 12-volt battery, the engine started without hesitation and run at various speeds without anomaly. The engine was started at least 4 times and operated at various speeds between idle and maximum sustained RPM. The main engine run was about 6 minutes. The engine oil temperature increased to normal operational values. An engine power decrease of about 10% was observed when each magneto was independently tested at 75% engine power. All cylinder exhaust stacks became hot during the engine run. No leaks were noted throughout the engine run. The engine RPM governor functioned as designed during the engine test runs.

The wreckage examination and engine test runs did not reveal any preimpact mechanical anomalies that would have prevented normal operation of the helicopter.