



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

June 17, 2021

EXAMINATION SUMMARY

ERA21LA191

A. ACCIDENT

Location: Forkston, Pennsylvania
Date: April 22, 2021
Time: 2104 EDT
Airplane: Robinson Helicopter R44

B. INVESTIGATION PARTICIPANTS

Leah Read
Senior Air Safety Investigator
Eastern Region Aviation (ERA)
National Transportation Safety Board
Ashburn, Virginia

Thom Webster
Technical Investigator
Robinson Helicopter
Torrance, California

Mike Childers
Senior Air Safety Investigator
Lycoming Engines
Williamsport, Pennsylvania

C. SUMMARY

On April 22, 2021, about 2104 eastern daylight time, a Robinson Helicopter R44, N4055N, was destroyed when it was involved in an accident near Forkston, Pennsylvania. The pilot was fatally injured. The helicopter was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

According to preliminary radar track data from the Federal Aviation Administration, the pilot took off from Allentown Queen City Municipal Airport (XLL), Allentown, Pennsylvania about 2010. The helicopter departed from the north end of the airport and proceeded northwest bound, climbing to a cruise altitude between 3,000 and 4,000 ft msl, remaining closer to 3,000 ft msl for most of the flight. Shortly after passing Kasson Brook, Pennsylvania, the helicopter made a slight right turn, then entered a right, descending spiral until track data was lost about 2104. The last recorded location was near the reported accident site location.

1.0 Wreckage Examination

The follow-up examination of the wreckage was performed at the facilities of AMF Aviation, Southwick, MA on June 17, 2021.

Airframe

The aluminum and fiberglass structure of the fuselage was consumed by the post impact fire. The steel tube frames were severely deformed and some were saw cut during recovery. The forward end of the tailcone was mostly consumed by fire with small portions remaining attached to the upper frame. There was impact damage to tailcone bay 2 and 3, a saw cut at bay 4 and severe thermal damage to bays 5, 6 and 7 along with impact damage. The empennage was mostly consumed by fire. The horizontal and vertical firewalls were severely deformed and sustained significant thermal damage.

Landing Gear

The landing gear sustained impact and thermal damage. The skids were fractured at each strut attachment. The front cross tube was fractured at the right elbow and pulled out of the left elbow. The aft cross tube was fractured at the left elbow. The right skid toe section was not recovered. All fractures appeared to be overload and/or fire damage.

Cabin

The cabin structure was completely consumed by fire. The cyclic, collective and pedals were fractured, deformed, thermally damaged and no longer attached to any structure.

Fuel System

The fuel tank bladders and shells were completely consumed by fire. Both filler caps remained secure on the filler necks. Both finger strainers were clear of any blockages. The fuel hoses were consumed by fire. The remaining fuel lines were distorted. The fuel valve was in the ON position.

Drive System

The lower and upper sheave sustained varying degrees of thermal damage. The V-belts were consumed by fire, leaving small sections of belt in three grooves of the upper sheave. The belt tension actuator sustained impact and thermal damage. Both the upper and lower bearing mounts were fractured. The extension distance between the scissor mounts was 1.2". The lower and upper actuator support bearing rotated smoothly. The upper sheave rotated smoothly on the clutch shaft when rotated in a counterclockwise direction (looking forward) and locked on the shaft when rotated clockwise.

The forward flex coupling was bent and the flex plate was disconnected (overload). The main rotor gearbox housing was fractured into multiple pieces. The gear teeth and bearings were corroded but had no evidence of pre-impact damage. The main rotor driveshaft was bent at the carrier housing.

The main rotor hub remained attached to the driveshaft. The teeter and coning bearing moved smoothly. The elastomeric teeter stops were dented. The droop stops appeared undamaged although one droop stop tusk was bent.

Both main rotor blades were cut near the root and one was cut mid-span during recovery. Both blades sustained impact damage to the leading edges resulting in multiple fractures throughout the length of the blades.

The clutch shaft was fractured aft of the upper sheave (overload). The intermediate flex coupling was bent and fractured at one of the yoke arms (overload). The tail rotor driveshaft was separated in several places associated with tailcone damage (impact and fire). The tail rotor driveshaft damper bearing rotated smoothly and the damper arm friction moved smoothly.

The aft flex coupling sustained slight thermal damage. The tail rotor gearbox housing was fractured into multiple pieces. The gear teeth and bearings were corroded but had no evidence of pre-impact damage. The input shaft would not rotate. The output shaft was straight.

The tail rotor blades sustained impact and thermal damage.

Flight Controls

The majority of the flight control tubes in the cabin and airframe areas were consumed by fire. All the rod ends for the main rotor controls were accounted for and remained secured to their mounting hardware. All but 3 of the rod ends for the tail rotor controls were accounted for and remained secured to their mounting hardware. All of the visible disconnects at the rod ends were either thermal damage or overload fractures.

The hydraulic servos moved smoothly by hand.

Powerplant Controls

The fuel mixture control knob was bent over and in the full rich position. The fuel mixture control wire was separated from any structure and the sheath was stretched out in several places. The wire was no longer attached to the mixture control arm on the carburetor. The attaching hardware was secure on the arm. The arm was separated from the mixture shaft, tethered by the return spring. Position of the shaft could not be determined.

The carburetor heat control knob and linkage was consumed by fire. The carburetor heat control wire was separated from any structure and the sheath was stretched out in several places. The carburetor heat slider valve was separated from the slider housing and it was deformed. The slider housing was separated from the airbox and sustained slight thermal damage but was mostly undamaged.

The throttle linkage sustained impact and thermal damage, only small portions remained identifiable. The throttle arm on the carburetor was in the idle position. The control tube rod end remained secure to the throttle arm.

Powerplant (Robinson Helicopter Description)

The engine was separated from the airframe and sustained impact and thermal damage. Most of the accessories were consumed by fire. The cooling fan had two small dents on its outer circumference at the 2 and 10 o'clock positions and a medium size dent at the 6:30 position. The roll pin alignment mark was not visible. The cooling scroll and panels were consumed by fire. The starter ring gear did not contact the oil cooler. The exhaust system sustained impact damage and mostly separated from the engine. The aft face of the upper sheave had a short gouged area adjacent to the centering strut rod end which was bent. Scoring could not be identified.

Powerplant (Lycoming Engine Description)

As first viewed, the engine was laying inverted in a bag on the floor of a building at the facilities of AMF Aviation in Southwick, MA. The engine exhibited discoloration and soot deposits consistent with exposure to the postimpact fire. The rear-mounted accessories, accessory case, and the upper rear area of the left crankcase half exhibited impact damage. The aft portion of the #5 and #6 cylinder heads exhibited impact damage. All of the engine accessories were fire-damaged. The exhaust system was partially crushed.

The engine was suspended from a lift and partially disassembled to facilitate the examination. The engine accessories were removed and the crankshaft was rotated by turning the cooling fan. All six pistons were observed to move in their respective cylinder bores but the intake and exhaust valves were not observed to move as the crankshaft was rotated. Compression and suction were observed from the cylinders where both the intake and exhaust valves were closed. Observation of the crankshaft gear through the magneto mount openings in the accessory case revealed that the crankshaft gear did not rotate as the crankshaft was rotated. The head of the crankshaft gear bolt was observed raised about 1/8 inch above the crankshaft gear. The bolt safety washer was in place.

The accessory case was removed and the crankshaft gear dowel pin observed sheared consistent with sudden stoppage of the accessory gears at impact. The crankshaft gear bolt was removed

and was unbroken. The bolt head was damaged consistent with contact with the oil pump drive. The first 3/16 inch of the bolt threads were damaged.

The crankshaft gear, crankshaft gear bolt, and safety washer were retained by the NTSB.