



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety

Western Pacific Region

January 5, 2020

HELICOPTER EXAMINATION

WPR17LA143

This document contains 8 embedded photographs.

Ronan, Montana

July 6, 2017

1645 MDT

Robinson R-44; N442DR

EXAMINATION PARTICIPANTS

Stephen Stein
Air Safety Investigator (IIC)
National Transportation Safety Board
Federal Way, Washington

Clifford Carpenter
FAA Aviation Safety Inspector
Federal Aviation Administration
Helena, Montana

Thom Webster
Technical Investigator
Robinson Helicopter Company
Torrance, California

HISTORY OF FLIGHT

On July 6, 2017, about 1645 mountain daylight time, a Robinson R-44, N442DR, was substantially damaged during an emergency landing in Ronan, Montana. The private pilot was seriously injured and the passenger received minor injuries. The helicopter was owned and operated by a private individual and operated by the pilot under the provisions of *14 Code of Federal Regulations Part 91*. Visual meteorological conditions prevailed and no flight plan was filed for the local flight. The personal flight departed Ronan Airport (7S0), Ronan, Montana about 1600.

The pilot reported that he departed on a tour of the town with a family member. About 45 minutes into the flight at an approximate altitude of 350 feet above ground level, the pilot suddenly experienced a loss of tail rotor authority. The helicopter started spinning slowly at approximately one revolution every five seconds and the use of the anti-torque pedals did not stop the rotations. The pilot lowered the collective control and made small adjustments with both the collective and cyclic as the helicopter descended towards the ground. He subsequently lowered the collective from an approximate altitude of about five feet above the ground to

descend the helicopter rapidly. The helicopter then impacted the ground hard, which resulted in substantial damage to the tail rotor. According to his recount, the pilot did not observe any aural or visual warning indications, nor did he experience any vibrations. The engine continued to run normally after the helicopter came to rest.

Postaccident examination by a Federal Aviation Administration inspector revealed multiple dents and protrusions throughout the tailcone that appear to have originated from within the tailcone section.

The wreckage was retained for further examination.

PERSONNEL INFORMATION

The pilot, age 68, held a private pilot certificate with ratings for airplane single-engine land and rotorcraft. The pilot's most recent third-class medical certificate was issued on May 25, 2017, which one limitation, "glasses available for near vision." According to his personal logbook records, which were current as of April 29, 2017, the pilot accumulated a total of 1,033 total flight hours and 936 hours in the helicopter make and model. Most of the pilot's single-engine flight time was accrued in a Cirrus SR-22 airplane and some of his helicopter flight experience was accrued in the accident helicopter. The pilot's most recent flight review was completed on November 23, 2015.

AIRCRAFT INFORMATION

According to Federal Aviation Administration (FAA) records, the helicopter was manufactured in 2004 and registered to Trilock USA, Inc. on July 15, 2004. The helicopter was powered by a Lycoming IO-540-AE1A5, a direct drive, air cooled, 260 hp engine. A review of the logbooks revealed that the helicopter's most recent annual airframe and engine inspections were completed on August 1, 2016 at an accumulated flight time of 240 total flight hours. At the time of the accident the helicopter had accrued 246.8 hours total time in service.

METEOROLOGICAL INFORMATION

The recorded weather was captured from a weather station at Missoula International Airport (MSO), Missoula, Montana, located approximately 33 nm south of the accident site.

The 1655 recorded weather observation at MSO included calm winds, visibility 10 statute miles, clear skies, temperature 15° C, dew point 09° C, and an altimeter setting of 30.16 inches of mercury.

Additionally observations were collected by a Remote Automatic Weather Station (RAWS) observation about 3.5 nm northwest of the accident site, and an approximate 30 foot higher elevation than the accident site.

According to the 1631 RAWs recorded weather observation, the sustained wind was 050° at 3 kts sustained, gusting to 6 kts. The wind direction changed to a direction of 270° approximately 1 hour later.

WITNESS REPORTS

According to an eyewitness who was one quarter miles from the accident site, the helicopter was about 150 feet above ground level flying north when it turned west, flew over them and made a full 360 degree turn. As the helicopter returned to a northern heading, he heard the engine “rev” once and then observed the helicopter make two full 360° counterclockwise rotations before it descended behind the tree line. The engine harmonic sounded continuous and uninterrupted with the exception of the “rev” moment. The witness heard the helicopter impact terrain and the engine continue to run.

During a subsequent conversation, the passenger remarked that they had turned towards the witness to observe a black haired cow, which they had mistaken for a black bear. The witness drained about 10 gallons of fuel from the aircraft.

In their written statements, which were documented separately, both the pilot and passenger stated that the helicopter rotated clockwise.

AIRFRAME

Airframe Examination

Flight Controls

Cyclic control movement was confirmed from the cyclic to the main rotor blades and collective control was verified from the collective to the main rotor blades. Both rudder pedals were seized in the forward position; however, continuity was traced from the rudder pedals to the aft portion of the -15 push/pull tube. An overload separation of the -17 push/pull tube was observed at the no. 3 bulkhead in the tailcone. Movement of the push/pull tube was verified from the no. 3 bulkhead to the tail rotor blades through the tail rotor gearbox.

Drive System

The main rotor drive shaft was continuous from the aft end of the clutch shaft through the transmission to the main rotor. Both the main rotor and tail rotors rotated smoothly and oil was present.

Tailcone

Bays no. 1 and 2 were impact damaged and bay nos. 4, 5, and 6 displayed multiple dents and protrusions from within the inside diameter of the tailcone. Multiple dents were observed on the lower left side of the tailcone accompanied by a white paint transfer mark consistent with tail rotor blade contact. The damper bearing hangar bracket separated into pieces (Figure 1), which

allowed the bearing to rotate inside the tail cone and fracture the -17 push/pull tube (Figure 2) and damage the inside diameter of the tail cone (Figure 3). Rotational scoring was observed throughout the inside diameter of the tailcone cavity. The no. 3 bulkhead was damaged and the 6, 7 bulkhead were both fragmented and deformed (Figures 4 and 5). The tailcone strobe light had separated from its housing.

Tail Rotor Drive Shaft

The drive shaft exhibited two notable bends in the forward section and one bow in the aft section (Figure 6). The forward flex plate displayed rub marks adjacent to the yokes. Both the forward and aft flex couplings were straight. The damper bearing support was fractured (Figure 7) and the bearing had shifted about 1/10 in. The damper bearing rotated freely. Gouge marks were observed throughout the drive shaft and strobe light wires were found wrapped around the aft section of the shaft near the no. 6, 7 bulkhead accompanied by a dent in the shaft. The strobe light adel clamp had separated from the bulkhead and the strobe wire was wrapped around the circumference of the drive shaft (Figure 8).

Main Rotor and Tail Rotor Blades

The tail rotor blades separated at the blade roots and one blade displayed minor damage at the leading edge. The main rotor blades exhibited damage at the blade tips and a crease on one blade about midspan.

The main rotor spindle bearings were smooth and did not exhibit any indication of brinelling.

Cockpit

The forward left seat structure collapsed, but both seat belt inertia reels were intact and the belts were not damaged. Both the auxiliary fuel pump and hydraulic circuit breakers were popped.

Tail

The tail striker had separated and the lower vertical stabilizer was bent to the right consistent with nose right yaw.

APPENDIX A



Figure 1 – Damper Bearing Secured to Bent Drive Shaft Without Hangar Bracket (red arrow shows severed -17 push/pull tube)

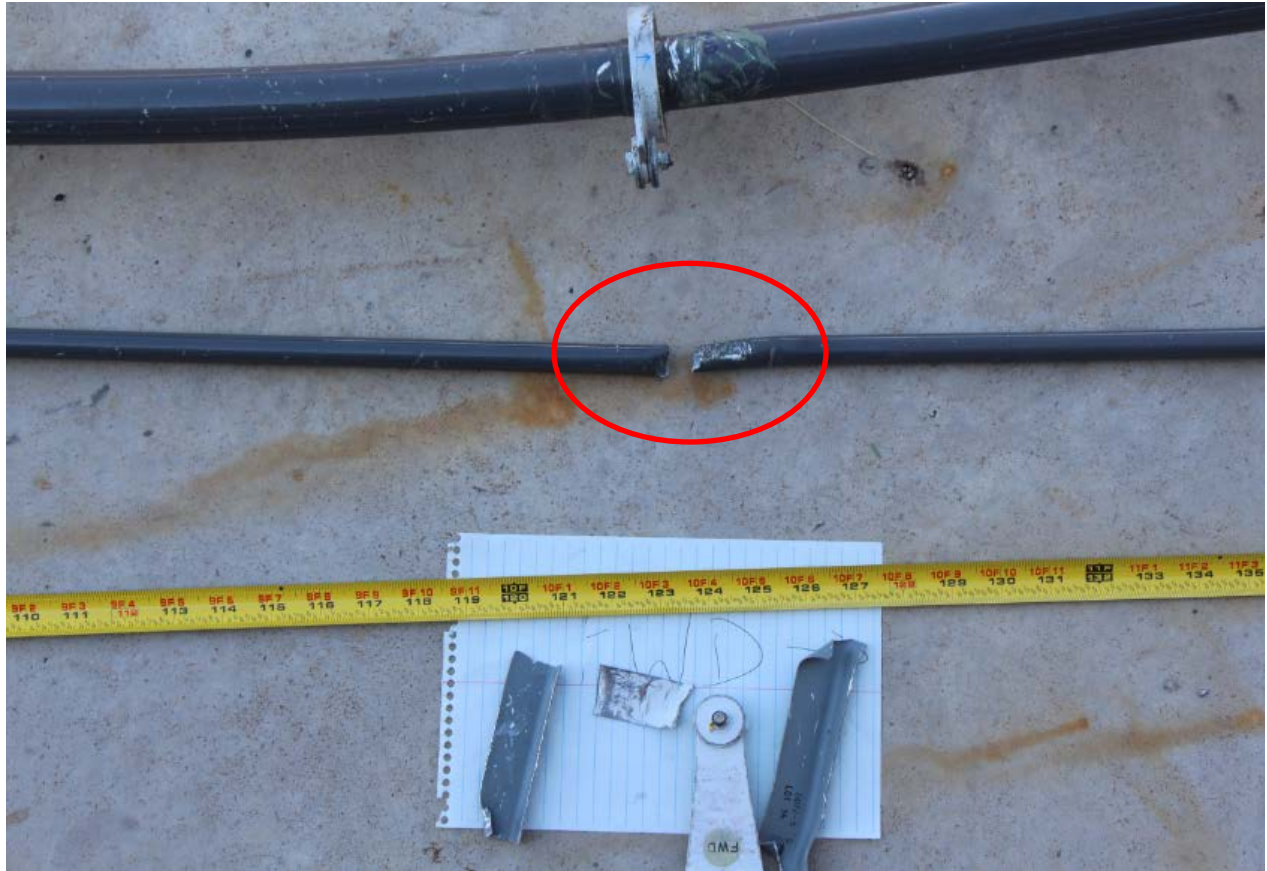


Figure 2 – Separated -17 Push/Pull Tube (noted by red circle), Damper Bearing, and Hangar Bracket Pieces



Figure 3 – Inside Diameter of Tailcone, No. 3 Bulkhead



Figure 4 – Inside Diameter of Tailcone, No. 6 Bulkhead



Figure 5 – Inside Diameter of Tailcone, No. 7 Bulkhead

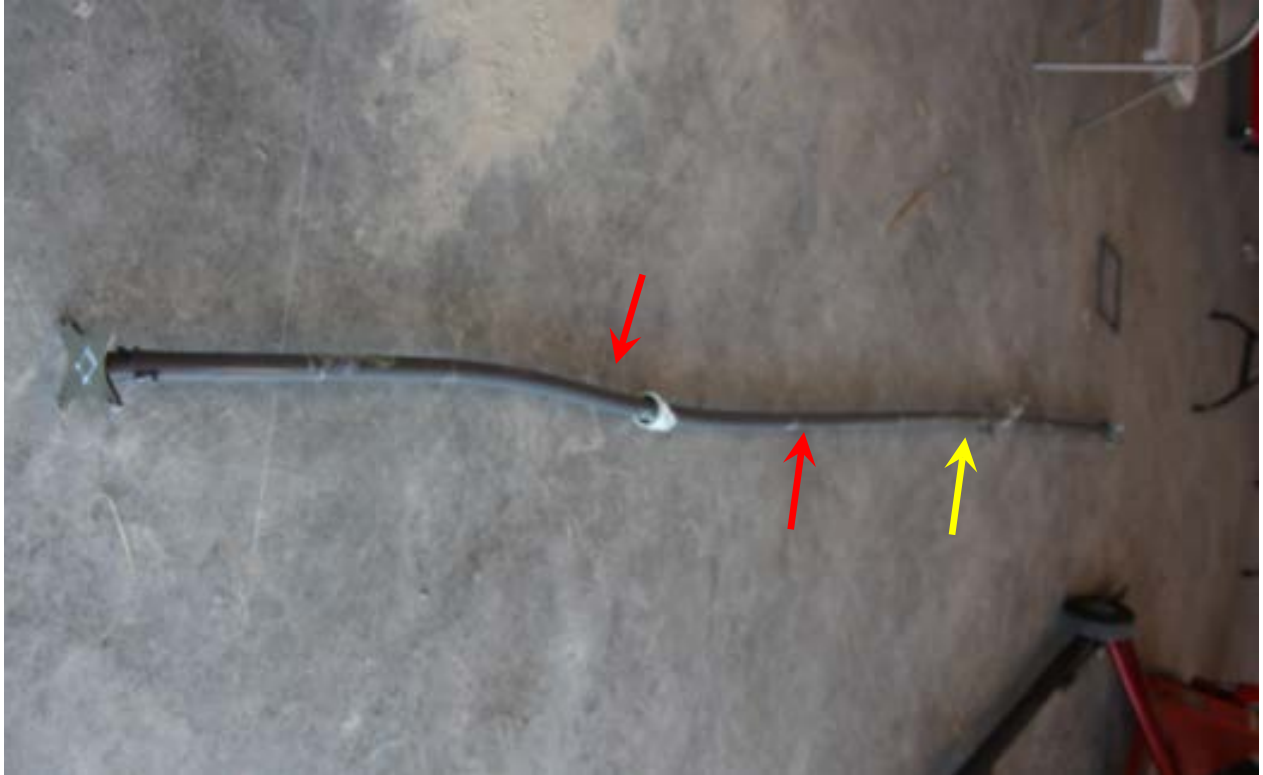


Figure 6 – Bends in Tail Rotor Drive Shaft (indicated by red arrows) and Bow (indicated by yellow arrow)



Figure 7 – Broken Hangar Bearing Support Bracket



Figure 8 – Strobe Wire Wrapped Around Circumference of Drive Shaft