



Aviation Investigation Final Report

Location:	Myrtle Beach, South Carolina	Accident Number:	ERA22LA168
Date & Time:	March 26, 2022, 17:15 Local	Registration:	N288L
Aircraft:	ROBINSON HELICOPTER R44	Aircraft Damage:	Substantial
Defining Event:	Unknown or undetermined	Injuries:	4 None
Flight Conducted Under:	Part 91: General aviation - Other work use		

Analysis

The pilot and three passengers departed for a short sightseeing tour after the helicopter had flown about 40 preceding tours on the day of the accident. The pilot reported that after takeoff about 500-700 ft above ground level (agl), he experienced a “violent shutter and shaking” of the helicopter flight controls. The pilot described the vibration as “very violent, like a brick in a [clothes] dryer, but three times more violent.” He stated that he noticed the erratic movement of the rpm on the tachometer and that the helicopter was no longer climbing. The pilot entered an autorotation to make an emergency landing in a parking lot. The vibration continued throughout the autorotation all the way to the ground; however, the pilot reported no unusual resistance, binding, or other issues with the flight controls.

During the approach, he flared the helicopter and pulled the collective to cushion the landing; the helicopter landed on its skids and slid on the pavement before impacting a mound of dirt and rolling on its left side. The pilot and passengers were not injured and the helicopter sustained substantial damage to the tail boom and fuselage.

A postaccident examination of the flight controls and engine revealed no evidence of mechanical malfunctions or failures that would have precluded normal operation. The examination of the engine included four successful test runs of the engine. The engine manufacturer had issued a mandatory service bulletin to mitigate an issue with sticking valves. While a stuck valve could not be ruled out, all valves moved freely during the two post-accident examinations, subsequent compression tests were not consistent with an open/stuck valve, and the maintenance records indicated that the manufacturer’s related service bulletin instructions were performed regularly. A “slight” engine vibration was reported during engine warm-up, but it smoothed out during the third and fourth engine runs.

The pilot stated that he noted that the helicopter stopped climbing, which would normally associated with a loss of power. However, it's also possible that when the violent vibrations occurred initially, the pilot inadvertently lowered the collective slightly as he tried to ascertain the reason for the vibrations and the erratic movement of the rpm on the tachometer. He likely interpreted the leveling of the helicopter's altitude as a loss of power as he entered the autorotation due to the violent vibrations. Based on available evidence, the reason for the vibrations described by the pilot could not be determined.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

Vibration in the airframe and flight controls for reasons that could not be determined based on the available evidence.

Findings

Not determined

(general) - Unknown/Not determined

Factual Information

History of Flight

Initial climb	Unknown or undetermined (Defining event)
Initial climb	Off-field or emergency landing
Landing	Hard landing

On March 26, 2022, at 1715 eastern daylight time, a Robinson R44 helicopter, N288L, was substantially damaged when it was involved in an accident near Myrtle Beach, South Carolina. The pilot and three passengers were not injured. The helicopter was operated as a Title 14 *Code of Federal Regulations* Part 91 sightseeing flight.

The pilot reported that he had been flying tours all day on the day of the accident, about 40 flights total; all but two were in another company helicopter. The accident helicopter had also been flown about 40 flights by another company pilot on the day of the accident. After a shift change, the accident pilot performed a preflight inspection on the accident helicopter and then took a break due to the wind conditions. After the break, he completed one uneventful flight in the accident helicopter. On the accident flight, shortly after takeoff about 500-700 ft agl, the helicopter began vibrating. He described the vibration as “very violent, like a brick in a [clothes] dryer, but three times more violent.” The vibration seemed to come from “behind him.” It shook the airframe in all directions and did not seem to be isolated to any one of the helicopter’s controls. He noticed the erratic movement of the rpm on the tachometer and he noted that the helicopter was no longer climbing. The pilot subsequently entered an autorotation and confirmed a full split of the engine/rotor tachometer needles. The vibration continued throughout the autorotation all the way to the ground; however, the pilot reported no unusual resistance, binding, or other issues with the flight controls. During the approach, he flared the helicopter and pulled the collective to cushion the landing; the helicopter landed on its skids and slid on the pavement of a parking lot before impacting a mound of dirt and rolling on its left side. The pilot and passengers were not injured and the helicopter sustained substantial damage to the tail boom and fuselage.

An initial examination of the airframe and engine by a Federal Aviation Administration inspector revealed that the tail boom was separated about 3 ft forward of the tail rotor gearbox. The tail rotor blades remained intact and attached to the gearbox with one blade bent about 8 inches from the tip. The tail rotor gearbox rotated smoothly; the chip detector was absent of debris and the drive shaft and tail rotor controls remained attached and intact aft and forward of a tail boom fracture. The tail rotor drive flex couplings were undamaged. The main rotor blades were bent slightly but mostly undamaged, with no evidence of delamination; the blade weights and tip caps remained attached. Rotation of the main gearbox revealed slight binding when rotated by hand and its mounts appeared undamaged. The main gearbox chip detector was absent of debris. The main rotor blade pitch change links were fractured; the ends remained attached to their respective attach points. The main rotor flight controls

were intact from the cockpit controls to the fractured pitch change links. The upper and lower main drive sheaves and belts appeared undamaged.

The examination of the engine revealed that its mounts were secure; the magnetos operated normally and all valves moved normally (as viewed with the valve covers removed while rotating the engine by hand). The cylinder compression was measured, which ranged from a low of 68 psi (No. 5) to a high of 79 (Nos. 3 and 4). A borescope examination of all cylinders revealed "normal wear and carbon buildup". The engine was test run successfully with a "slight" vibration noted. Fuel samples taken from the main and auxiliary fuel tanks were unremarkable.

A subsequent postaccident examination of the helicopter by the National Transportation Safety Board and representatives from the airframe and engine manufacturers revealed no preimpact anomalies or malfunctions that would have precluded normal operation. No airframe anomalies were noted. A postaccident engine examination was performed. The cylinder valve covers were removed and valve action was observed as the crankshaft was rotated by hand. Valve lift was visually observed to be smooth and consistent for all 12 valves. A borescope examination revealed no damage or excessive heat signatures on the piston domes, cylinder walls or valve heads. Debris was noted on the valve seats in the valve contact area in the left-side cylinders. The engine (which was disconnected from the transmission) was started and run for about 20 minutes. A slight roughness could be heard until the engine warmed up. Exhaust pipe temperatures were observed using a laser/infrared thermometer. All six cylinder exhaust pipes indicated between 650°F to 750°F. An investigator, sitting in the pilot seat and operating the controls, indicated that he could feel some roughness and observed small oscillation in the tachometer needles. An occasional "chuff" could be heard from the engine exhaust as the engine ran at high power. A magneto check was performed and a drop of about 12 percent rpm was noted from each magneto. The engine was shut off and allowed to heat soak for about 5 minutes. It was restarted and run for about 5 minutes and it ran smoother. It was shut off and allowed to heat soak for about 5 minutes and restarted and run another 3 minutes. It was again smoother than the first run. After the engine was shut down and moved into a hangar, a compression check was performed on each cylinder. The test values ranged from a low of 62 psi (No. 4) to a high of 78 psi (No. 1).

A review of the engine maintenance records revealed that at the time of the accident the engine had accrued a total time of 3,318 hours, and 1,118 hours since overhaul. Since the overhaul, there were 3 maintenance entries that indicated the engine's valves were inspected and maintained in accordance with a Lycoming mandatory service bulletin (SB-338C), which was prescribed as preventative maintenance to reduce the likelihood of stuck or broken valves due to excessive carbon build up between the valve guide and valve stem. All were performed within the 400-hour interval noted in the bulletin, the last of which occurred about 5 weeks and 85 flight hours before the accident.

Pilot Information

Certificate:	Commercial	Age:	27, Male
Airplane Rating(s):	None	Seat Occupied:	Right
Other Aircraft Rating(s):	Helicopter	Restraint Used:	3-point
Instrument Rating(s):	None	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	
Medical Certification:	Class 1 None	Last FAA Medical Exam:	June 14, 2021
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	January 14, 2022
Flight Time:	474 hours (Total, all aircraft), 400 hours (Total, this make and model), 434 hours (Pilot In Command, all aircraft), 163 hours (Last 90 days, all aircraft), 93 hours (Last 30 days, all aircraft), 9 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	ROBINSON HELICOPTER	Registration:	N288L
Model/Series:	R44	Aircraft Category:	Helicopter
Year of Manufacture:	2000	Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	0930
Landing Gear Type:	Skid	Seats:	4
Date/Type of Last Inspection:	February 18, 2022 100 hour	Certified Max Gross Wt.:	2400 lbs
Time Since Last Inspection:	83 Hrs	Engines:	1 Reciprocating
Airframe Total Time:	3234 Hrs as of last inspection	Engine Manufacturer:	Lycoming
ELT:	Not installed	Engine Model/Series:	O-540-F1B5
Registered Owner:	EXECUTIVE HELICOPTERS INC	Rated Power:	245 Horsepower
Operator:	EXECUTIVE HELICOPTERS INC	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	MYR,25 ft msl	Distance from Accident Site:	1 Nautical Miles
Observation Time:	16:56 Local	Direction from Accident Site:	296°
Lowest Cloud Condition:	Clear	Visibility	10 miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	21 knots / 30 knots	Turbulence Type Forecast/Actual:	None / None
Wind Direction:	290°	Turbulence Severity Forecast/Actual:	N/A / N/A
Altimeter Setting:	29.67 inches Hg	Temperature/Dew Point:	20°C / -4°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Myrtle Beach, SC	Type of Flight Plan Filed:	None
Destination:	Myrtle Beach, SC	Type of Clearance:	None
Departure Time:		Type of Airspace:	Class D

Airport Information

Airport:	Myrtle Beach International Airport MYR	Runway Surface Type:	
Airport Elevation:	25 ft msl	Runway Surface Condition:	Dry
Runway Used:		IFR Approach:	None
Runway Length/Width:		VFR Approach/Landing:	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 None	Aircraft Damage:	Substantial
Passenger Injuries:	3 None	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	4 None	Latitude, Longitude:	33.67525,-78.91331(est)

Administrative Information

Investigator In Charge (IIC):	Brazy, Douglass
Additional Participating Persons:	James Jackson; FAA/FSDO; Columbia, SC
Original Publish Date:	May 14, 2024
Last Revision Date:	
Investigation Class:	Class 3
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=104830

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The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, “accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties ... and are not conducted for the purpose of determining the rights or liabilities of any person” (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB’s statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available [here](#).