



Aviation Investigation Final Report

Location:	Canon City, Colorado	Accident Number:	CEN17LA192
Date & Time:	May 20, 2017, 13:40 Local	Registration:	N778TL
Aircraft:	ROBINSON HELICOPTER CO R66	Aircraft Damage:	Substantial
Defining Event:	Settling with power/vortex ring state	Injuries:	5 None
Flight Conducted Under:	Part 91: General aviation - Other work use		

Analysis

The commercial pilot reported that, after completing the local air tour flight in the helicopter, he approached the private helipad location from the south. On approach and about 50-60 kts, the pilot began to arrest the helicopter's descent to view the windsock and determine the proper approach to the helipad. The pilot reported that the wind was from the south, so he decided to make the final approach from the north. About 200 ft above ground level and west of the helipad, the pilot initiated a left turn, and the helicopter started an uncommanded descent. The pilot applied power to stop the descent, but the helicopter continued sinking toward terrain. Due to the low altitude, the pilot committed to land and leveled the helicopter. During the landing, the back of the landing gear skids struck the terrain, which resulted in the main rotor blades contacting and severing the tail boom. Postaccident examination did not reveal any anomalies with the airframe or engine that would have precluded normal operation, and both the pilot and the operator reported that there were no mechanical malfunctions or failures. The pilot's calculated weight and balance was within limits at the time of the accident. A video of the accident sequence was consistent with the pilot's statement. It is likely that, during the descent to land, the helicopter encountered a vortex ring state (settling with power) condition, which resulted in a rapid descent and hard landing.

Probable Cause and Findings

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

The pilot's loss of helicopter control on approach to land due to a vortex ring state (settling with power) condition, which resulted in a hard landing.

Findings

Aircraft	Descent rate - Not attained/maintained
Personnel issues	Aircraft control - Pilot

Factual Information

History of Flight

Approach	Settling with power/vortex ring state (Defining event)
Landing-flare/touchdown	Hard landing

On May 20, 2017, about 1340 mountain daylight time, a Robinson Helicopter Company R66 helicopter, N778TL, impacted terrain following a loss of control on approach to landing near Canon City, Colorado. The commercial pilot and four passengers were not injured, and the helicopter sustained substantial damage. The helicopter was registered to Hynes Aviation Industries, Inc, and operated by Colorado Vertical under provisions of Title 14 *Code of Federal Regulations* Part 91 as a local air tour flight. Day visual meteorological conditions prevailed and a company visual flight rules flight plan was filed for the local flight. The flight originated from a private helipad near Canon City about 1335.

The pilot reported to the National Transportation Safety Board (NTSB) investigator-in-charge that after completing the local air tour flight, the helicopter approached the private helipad location from the south near highway route 50. After crossing over route 50 on approach about 50-60 kts, the pilot began to arrest the descent to view the wind sock and determine the proper approach to the helipad. The pilot reported the winds were from the south, so he decided to make the final approach from the north. About 200 ft above ground level and west of the helipad, the pilot initiated a left turn, and the helicopter started an uncommanded descent. The pilot applied power to stop the descent, but the helicopter continued sinking towards the terrain. Due to the low altitude, the pilot then committed to land and leveled the helicopter. During the landing, the back of the landing gear skids struck the terrain, which resulted in the main rotor blades contacting and severing in the tail boom. The helicopter came to rest upright and the occupants exited the helicopter.

Postaccident examination of the helicopter airframe and engine revealed no evidence of mechanical malfunctions or failures that would have precluded normal operation.

The pilot reported that the helicopter weight was 2,580 lbs at the time of the accident, and the pilot's calculated center of gravity was 92.92 inches.

A GoPro HERO3 Silver Edition camera was mounted on the helicopter windshield facing inward into the cabin. The camera was installed on the helicopter to provide passengers a video of their air tour flight. A copy of the accident flight video was recovered by the operator and provided to the NTSB. The video was reviewed by the NTSB's Office of Research and Engineering and a video study was completed. The study goal was to estimate the forward and vertical speeds of the helicopter before the hard landing.

The analysis of the video was based on a mathematical model of the camera. Four parameters, yaw, pitch, roll, and horizontal field of view angle, were estimated from video frames recorded before takeoff,

when the helicopter was on the departure helipad. Parameter estimation was based on several reference points, which were visible through the helicopter windows and aerial images of the accident area.

According to the study calculations, the forward speed was estimated at 34 \pm 3 knots, and the highest estimated vertical descent speed was 570 \pm 60 ft/min. In addition, the helicopter experienced an elevated level of vibrations during a time interval of approximately seven seconds that ended just before ground impact.

Pilot Information

Certificate:	Commercial; Flight instructor	Age:	44, Male
Airplane Rating(s):	None	Seat Occupied:	Right
Other Aircraft Rating(s):	Helicopter	Restraint Used:	4-point
Instrument Rating(s):	Helicopter	Second Pilot Present:	No
Instructor Rating(s):	Helicopter	Toxicology Performed:	No
Medical Certification:	Class 2 Without waivers/limitations	Last FAA Medical Exam:	April 21, 2017
Occupational Pilot:	No	Last Flight Review or Equivalent:	October 31, 2015
Flight Time:	520 hours (Total, all aircraft), 95 hours (Total, this make and model), 412 hours (Pilot In Command, all aircraft), 31 hours (Last 90 days, all aircraft), 7 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	ROBINSON HELICOPTER CO	Registration:	N778TL
Model/Series:	R66 NO SERIES	Aircraft Category:	Helicopter
Year of Manufacture:	2013	Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	0469
Landing Gear Type:	Skid	Seats:	5
Date/Type of Last Inspection:	March 15, 2017 100 hour	Certified Max Gross Wt.:	2700 lbs
Time Since Last Inspection:		Engines:	1 Turbo shaft
Airframe Total Time:	197 Hrs as of last inspection	Engine Manufacturer:	Rolls-Royce
ELT:	Installed, not activated	Engine Model/Series:	250-C300/A1
Registered Owner:	Hynes Aviation Industries, Inc	Rated Power:	300 Horsepower
Operator:	Colorado Vertical	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	1V6	Distance from Accident Site:	10 Nautical Miles
Observation Time:	13:00 Local	Direction from Accident Site:	101°
Lowest Cloud Condition:	Few / 16500 ft AGL	Visibility	10 miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	10 knots /	Turbulence Type Forecast/Actual:	/ None
Wind Direction:	180°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	30.1 inches Hg	Temperature/Dew Point:	16°C / 5°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Canon City, CO	Type of Flight Plan Filed:	Company VFR
Destination:	Canon City, CO	Type of Clearance:	None
Departure Time:	13:35 Local	Type of Airspace:	Class G

Wreckage and Impact Information

Crew Injuries:	1 None	Aircraft Damage:	Substantial
Passenger Injuries:	4 None	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	5 None	Latitude, Longitude:	38.29,-105.190002(est)

Administrative Information

Investigator In Charge (IIC):	Sauer, Aaron
Additional Participating Persons:	Keith Burke; Federal Aviation Administration; Denver, CO Ken Martin; Robinson Helicopter; Torrance , CA
Original Publish Date:	July 5, 2018
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=95202

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

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](#).