



Aviation Investigation Final Report

Location:	Kalapana, Hawaii	Accident Number:	ANC20LA028
Date & Time:	March 5, 2020, 11:30 Local	Registration:	N11QK
Aircraft:	Eurocopter EC130	Aircraft Damage:	Substantial
Defining Event:	Loss of control in flight	Injuries:	2 Minor, 4 None
Flight Conducted Under:	Part 135: Air taxi & commuter - Non-scheduled - Sightseeing		

Analysis

The pilot was conducting a precautionary landing following the onset of a significant, high frequency vibration. As the helicopter slowed, he raised the collective and applied right tail rotor pedal, but the nose of the helicopter veered to the left. The pilot eventually applied full right tail rotor pedal, but the nose of the helicopter continued to the left. About 200 feet above ground level, with the right tail rotor pedal fully depressed, the helicopter began to spin to the left. The pilot attempted to stop the spin to no avail and eventually closed the throttle and performed a hovering autorotation. He stated that the helicopter descended, touched down hard, and subsequently rolled onto its right side, sustaining substantial damage.

A postaccident examination revealed that one of the 10 tail rotor fenestron blades had been liberated at the blade root, at the level of the blade’s drain port; the blade root remained attached and installed to the fenestron hub. Visual examination of the nine remaining blades revealed three that had cracks aligned with the drain hole with features consistent with fatigue.

The investigation determined that the ruptured blade failure was a fatigue fracture that originated near the blade’s drain hole; however, the fracture surface’s origins were damaged, and the type of failure near the point of origin could not be determined. The water drain hole geometry and rib thickness were determined by the manufacturer to be the main factors in the development of the crack. Additional factors include blade loading stresses that were not anticipated during certification, and helicopter operations that involve sideslip maneuvers.

Probable Cause and Findings

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

A loss of control due to the fatigue fracture of a tail rotor fenestron blade due to the geometry of the water drain hole positioning on the rib.

Findings

Aircraft	Tail rotor blade - Failure
Aircraft	Tail rotor blade - Fatigue/wear/corrosion

Factual Information

History of Flight

Enroute-cruise	Emergency descent initiated
Landing-flare/touchdown	Loss of tail rotor effectiveness
Landing-flare/touchdown	Loss of control in flight (Defining event)

On March 5, 2020, about 1130 Hawaii-Aleutian standard time, an Airbus EC130 B4 helicopter, N11QK, was substantially damaged when it was involved in an accident near Kalapana, Hawaii. Of the six occupants on board, the commercial pilot and three passengers were uninjured, and two passengers sustained minor injuries. The helicopter was operated as a Title 14 *Code of Federal Regulations* Part 135 air tour flight.

The pilot reported that the accident helicopter was the second of two commercial air tour helicopters departing Hilo International Airport (PHTO). After departure, they flew in a southerly direction and remained slightly offshore for a short time before turning west along the shoreline. The two helicopters proceeded to a geographic area known as the "Old Ocean Entry." As the helicopter passed over the shoreline, the pilot noticed a significant, high frequency airframe vibration. He said that as soon as the vibration started, the tail rotor chip annunciator light briefly illuminated, and as the vibration continued, the tail rotor chip light "flickered." The vibration and noise stopped after a few seconds and the chip light extinguished.

The pilot selected a large open area as a precautionary landing site and slowed the helicopter on the approach. As the helicopter slowed, he raised the collective, and applied right tail rotor pedal, but the nose of the helicopter veered to the left. The pilot noted that he eventually applied full right tail rotor pedal, but the nose of the helicopter continued to the left. About 200 feet above ground level, with the right tail rotor pedal fully depressed, the helicopter began to spin to the left. To stop the spin, he attempted to gain forward airspeed but eventually closed the engine throttle and performed a hovering autorotation. He stated that the helicopter descended, touched down hard, and subsequently rolled onto its right side, sustaining substantial damage to the fuselage, tail boom, and the main rotor drive system.

A postaccident examination revealed that one of the 10 tail rotor fenestron blades had been liberated at the blade root, at the level of the blade's drain port; the blade root remained attached and installed to the fenestron hub. The liberated blade section was located within the fenestron outer fairing/shell. The fracture surface was flat starting at the aft end of the blade, up until about two-thirds of the distance to the leading edge, while the forward section exhibited shear lips. The tail rotor chip detector cannon plug was found to have an intermittent connection.

Further examination of the ruptured blade's fracture surface found that the failure initiated from two separate origin areas, one on either side of the drain hole at or near its intersection with the aft rib face and grew progressively along the blade chord through about 60% of the blade before fracturing in overstress. The origin areas had been damaged with no identifiable features. Further from the origin, variable-spaced fatigue striations were observed, consistent with high cycle fatigue crack growth. The blade exhibited some geometric anomalies, its rib thickness was measured at 1.27-1.70 mm and the drain hole offset measured 0.23 mm. The acceptable engineering limit specified on the technical drawing was 2.3 ± 0.3 mm and ± 0.2 mm respectively.

Examination of the remaining nine blades revealed three additional blades that had cracks aligned with the blade drain hole on the suction side of the blade. The cracks were opened and revealed fracture features consistent with fatigue.

Airbus Helicopters engineers performed a root cause analysis that identified numerous factors that contributed to the crack development; water drain hole geometry and rib thickness were determined to be the main factors that preceded crack development. Additional factors were attributed to underestimated blade load predictions at the time of aircraft certification, and customer flight data has demonstrated more flight conditions that involve sideslip maneuvers than previously anticipated. Airbus Helicopters has issued Alert Service Bulletin No. EC130-05A033 to identify and replace fenestron blades that meet criteria for which they are susceptible to developing a crack.

Pilot Information

Certificate:	Commercial; Flight instructor	Age:	42, Male
Airplane Rating(s):	None	Seat Occupied:	Left
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 With waivers/limitations	Last FAA Medical Exam:	October 24, 2019
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	May 23, 2019
Flight Time:	7878 hours (Total, all aircraft), 1969 hours (Total, this make and model), 7843 hours (Pilot In Command, all aircraft), 144 hours (Last 90 days, all aircraft), 36 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Eurocopter	Registration:	N11QK
Model/Series:	EC130 B4	Aircraft Category:	Helicopter
Year of Manufacture:	2002	Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	3639
Landing Gear Type:	Skid	Seats:	7
Date/Type of Last Inspection:	March 4, 2020 100 hour	Certified Max Gross Wt.:	5350 lbs
Time Since Last Inspection:		Engines:	Turbo shaft
Airframe Total Time:	23034.5 Hrs as of last inspection	Engine Manufacturer:	Turbomeca
ELT:	C126 installed, activated, aided in locating accident	Engine Model/Series:	Arriel
Registered Owner:	Nevada Helicopter Leasing LLC	Rated Power:	848 Horsepower
Operator:	Helicopter Consultanats of Maui LLC	Operating Certificate(s) Held:	Rotorcraft external load (133), On-demand air taxi (135), Commercial air tour (136), Agricultural aircraft (137)
Operator Does Business As:	Blue Hawaiian Helicopters	Operator Designator Code:	

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	PHTO	Distance from Accident Site:	18 Nautical Miles
Observation Time:	21:53 Local	Direction from Accident Site:	165°
Lowest Cloud Condition:	Few / 2500 ft AGL	Visibility	10 miles
Lowest Ceiling:	Overcast / 3800 ft AGL	Visibility (RVR):	
Wind Speed/Gusts:	6 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	80°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	30.06 inches Hg	Temperature/Dew Point:	26°C / 18°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Hilo, HI (PHTO)	Type of Flight Plan Filed:	None
Destination:	Hilo, HI (PHTO)	Type of Clearance:	None
Departure Time:	10:55 Local	Type of Airspace:	Class G

Wreckage and Impact Information

Crew Injuries:	1 None	Aircraft Damage:	Substantial
Passenger Injuries:	2 Minor, 3 None	Aircraft Fire:	None
Ground Injuries:		Aircraft Explosion:	None
Total Injuries:	2 Minor, 4 None	Latitude, Longitude:	19.438611,-155(est)

Administrative Information

Investigator In Charge (IIC):	Banning, David
Additional Participating Persons:	John Chicosky; Blue Hawaiian Helicopters; Hilo, HI Eric Hamp; Blue Hawaiian Helicopters; Hilo, HI Leonard T Spencer; Federal Aviation Administration; Honolulu, HI
Original Publish Date:	August 16, 2022
Last Revision Date:	
Investigation Class:	Class 3
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=101039

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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](#).