Aviation Investigation Final Report

Location:	Waimea, Hawaii	**Accident Number:**	WPR17LA005
Date & Time:	October 4, 2016, 09:10 Local	**Registration:**	N311VT
Aircraft:	McDonnell Douglas Helicopter 369E	**Aircraft Damage:**	Substantial
Defining Event:	Unknown or undetermined	**Injuries:**	3 None
Flight Conducted Under:	Part 135: Air taxi & commuter - Non-scheduled		

Analysis

The commercial pilot reported that, after completing an external cargo lift operation, he landed at a remote location to jettison the lift cable and to board the two ground workers for a ferry flight back to their home base. Shortly after liftoff, the pilot felt a moderate aberration in the cyclic flight control, followed by a significant vertical vibration. The pilot subsequently observed that the main rotor (MR) blade track had a substantial blade spread. Subsequently, the pilot conducted a forced emergency landing to a nearby suitable area.

A postaccident examination of the helicopter revealed that one MR blade was missing about 9 inches of its blade tip, consistent with impact with an object of substantial mass, possibly a cable; the damage was not consistent with separation of the blade end due to a preexisting condition. Two other MR blades exhibited scuff marks and scratches along their leading edges with areas that had defined parallel scratches, consistent with cable impact.

The pilot reported that he released the lift cable before the flight, and it was not recovered. The pilot added that, after he released the cable, the ground crew placed the coiled cable in the rear compartment that had no doors. Examination of the lift cable release mechanism revealed no damage to the component, and additional testing revealed no anomalies that would have precluded normal operation of the lift cable mechanism.

There is no evidence that the lift cable remained attached to the hook during the accident flight; therefore, it was likely in the passenger compartment at liftoff as reported by the pilot. Therefore, based on the damage to the MR blades, it is likely that the cable exited the helicopter during liftoff and subsequently impacted the MR, which resulted in the separation of an MR blade tip and the vertical vibration of the helicopter.

Probable Cause and Findings

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

Impact of the lift cable after it exited the helicopter during liftoff with the main rotor (MR) blades, which resulted in the separation of an MR blade tip and the vertical vibration of the helicopter.

Findings

Environmental issues	(general) - Effect on operation

Factual Information

History of Flight

Initial climb	Unknown or undetermined (Defining event)

On October 4, 2016, about 0910 Hawaiian standard time, a McDonnell Douglas Helicopter (MDHI), 369E N311VT, sustained substantial damage to the main rotor during initial climb from a remote location at Kohala Mountains near Waimea, Hawaii. The commercial pilot and 2 passengers were not injured. The helicopter was registered to, and operated by Volcano Helicopters Inc., under the provision of 14 *Code of Federal Regulations* Part 135. Visual meteorological conditions prevailed for the flight, which operated on a company flight plan.

In his initial statement, the pilot reported that the purpose of the flight was to provide multiple external cargo lift deliveries between a construction project site located on the Kohala Mountain and various locations within the project boundary.

At 0745, the helicopter took off from Hilo International Airport (ITO), Hilo, Hawaii with only the pilot on board and no cargo. Enroute to the Kohala Mountain project site, the pilot landed at the Hawaii Board of Water Supply's Kamuela reservoir to board two ground workers who manned a ground procedure of the external cargo tasks (connect, disconnect and handling of the cargo), and then flew to the construction site. Two passengers disembarked, after which the helicopter successfully completed an external cargo lift assignment. The helicopter then returned to a cargo platform at the construction site to jettison the 20-foot lift cable and to board the two ground workers and their accompanying baggage for the return ferry flight. The pilot reported that he pressed an electrical "Release" switch located on the cyclic to jettison the lift cable prior to takeoff. After the ground workers loaded their equipment and boarded the helicopter, they conveyed to the pilot via the helicopter's intercom system the completion of the loading, boarding and secure seating

The lift-off and departure into forward flight (climb and acceleration of speed) proceeded within instrument parameters specified in the operating manuals, with no indication of malfunction. The helicopter was established in stable departure on the enroute course and heading for the cruise altitude and speed.

During the initial climb, about 75 feet above ground level, and speed of about 20-25 knots, the pilot experienced a moderate aberration in the cyclic flight control, followed by a significant vertical vibration, and observed that the main rotor blade track had a substantial blade spread. The pilot performed a forced emergency landing to a nearby suitable area.

The Federal Aviation Administration (FAA) Inspector conducted an examination and noted that one main rotor blade was missing about 6 inches of the blade tip, two other blades exhibited small impact serrations on their respective leading edges, and the remaining two blades were not damaged. No organic bird material was observed on the blades, but the inspector reported that it appeared as if "something metallic-like had struck the blades, however that object was not located." Other damages

appeared to be post-impact, which included a cracked instrument panel at the bottom edge on both sides, left and right side of the fuselage above the engine area, tail rotor blades, vertical stabilizer damage at the upper end, and horizontal stabilizer damage on the right side, to include the vertical winglet. He also stated that the lift cable was not found in the helicopter or at the site. Furthermore, the inspector tested and confirmed no malfunction of the jettison switch used to release the cable.

After the helicopter was released to the insurance company, the pilot conducted an examination of the wreckage, and submitted a written addendum to the initial report of his finding. The addendum is appended to the docket.

In the addendum, the pilot confirmed that the lift cable and the main rotor blade tip were missing. The pilot again stated that after the completion of the airlift operation, he used the "Eject" switch to jettison the cable, and added that the ground crew of the external load operation coiled and loaded the cable on the floor of the rear cabin of the helicopter for the return ferry flight to base. Due to a necessity to continuously remain on the flight controls during the final loading, the pilot did not personally conduct an exterior preflight check. In addition, the helicopter was configured without the left and right rear cabin doors. The pilot inspected and tested the electric cargo hook system, and found no anomalies or malfunctions.

The National Transportation Safety Board structural engineer examined the photos and concluded that one of the main rotor blades suffered extensive damage. The outboard 9 inches was separated, the blade spar was deformed aft, and the trailing edge was buckled along about half its length. Two other main rotor blades were scuffed/scratched in localized areas. The aft fuselage around the tailboom attach point was buckled and fractured. The horizontal stabilizer and vertical stabilizer also sustained impact damage.

In the addendum report, the pilot reported that debriefing of procedures of the operation and emergency landing identified three additions to the current Pilot's Standard Operating Procedures.

1. Pre-flight Aircraft Exterior Check: The check of the tail and main rotor blade's leading edge protection tape shall be a requirement of the preflight checklist as an individual and separate listing.

2. Flight in "rear Doors Off" Configuration: All material or item loaded on the floor for a flight in the 'Rear door off' configuration shall be required to be physically secured to a tie-down fixture to prevent movement and loss from the cabin.

3. Unimproved field loading and departure procedures: In operations that require the pilot to continually remain at the flight controls, clearance is an advisory of the ground crew. The pilot shall validate the advisory with routine signal or voice communications reports on individual item, function or procedure.

Pilot Information

Certificate:	Commercial	**Age:**	54,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Front
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	4-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	July 2, 2016
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	October 27, 2015
Flight Time:	(Estimated) 28500 hours (Total, all aircraft), 26500 hours (Total, this make and model), 28400 hours (Pilot In Command, all aircraft), 270 hours (Last 90 days, all aircraft), 100 hours (Last 30 days, all aircraft), 5 hours (Last 24 hours, all aircraft)		

Passenger Information

Certificate:		**Age:**	
Airplane Rating(s):		**Seat Occupied:**	Left
Other Aircraft Rating(s):		**Restraint Used:**	
Instrument Rating(s):		**Second Pilot Present:**	No
Instructor Rating(s):		**Toxicology Performed:**	No
Medical Certification:		**Last FAA Medical Exam:**	
Occupational Pilot:		**Last Flight Review or Equivalent:**	
Flight Time:			

Passenger Information

Certificate:		**Age:**	Male
Airplane Rating(s):		**Seat Occupied:**	Right
Other Aircraft Rating(s):		**Restraint Used:**	
Instrument Rating(s):		**Second Pilot Present:**	No
Instructor Rating(s):		**Toxicology Performed:**	No
Medical Certification:		**Last FAA Medical Exam:**	
Occupational Pilot:		**Last Flight Review or Equivalent:**	
Flight Time:			

Aircraft and Owner/Operator Information

Aircraft Make:	McDonnell Douglas Helicopter	**Registration:**	N311VT
Model/Series:	369E E	**Aircraft Category:**	Helicopter
Year of Manufacture:	1987	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	0229E
Landing Gear Type:	Skid	**Seats:**	5
Date/Type of Last Inspection:	September 16, 2016 100 hour	**Certified Max Gross Wt.:**	3000 lbs
Time Since Last Inspection:		**Engines:**	1 Turbo shaft
Airframe Total Time:	17334 Hrs as of last inspection	**Engine Manufacturer:**	Rolls Royce
ELT:	C126 installed, not activated	**Engine Model/Series:**	250 C20R/2
Registered Owner:	VOLCANO HELICOPTERS INC	**Rated Power:**	450 Horsepower
Operator:	VOLCANO HELICOPTERS INC	**Operating Certificate(s) Held:**	Rotorcraft external load (133), Agricultural aircraft (137)

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	PHMU,2671 ft msl	**Distance from Accident Site:**	7 Nautical Miles
Observation Time:	08:56 Local	**Direction from Accident Site:**	171°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	8 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	140°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.37 inches Hg	**Temperature/Dew Point:**	17°C / 13°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Hilo, HI (ITO)	**Type of Flight Plan Filed:**	Company VFR
Destination:	Hilo, HI (ITO)	**Type of Clearance:**	None
Departure Time:	07:45 Local	**Type of Airspace:**	Class G

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	2 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	3 None	**Latitude, Longitude:**	20.112222,-155.685836(est)

Administrative Information

Investigator In Charge (IIC):	Smith, Maja
Additional Participating Persons:	Merritte H Wilson; FAA FSDO; Honolulu, HI
Original Publish Date:	January 25, 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=94196