



# Aviation Investigation Final Report

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<b>Location:</b>	Cape May Court House, New Jersey	<b>Accident Number:</b>	ERA14LA405
<b>Date &amp; Time:</b>	August 25, 2014, 10:26 Local	<b>Registration:</b>	N4035A
<b>Aircraft:</b>	Hiller UH 12E	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>	Powerplant sys/comp malf/fail	<b>Injuries:</b>	1 Minor, 1 None
<b>Flight Conducted Under:</b>	Public aircraft		

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## Analysis

The pilot reported that, at 300 ft above the ground while climbing the helicopter out of a marshy area during mosquito control operations, he heard a loud, metallic "bang" and then felt an "immediate significant rhythmic vibration." He immediately performed an autorotation to the nearest clear area. The helicopter collided with trees and then the ground and came to rest on its right side.

A postaccident examination of the engine revealed that the engine's antivibration snubbers were fractured. Subsequent examination of the snubbers revealed that the vibration reported by the pilot was likely due to a fracture of the lateral snubber assembly's vibration mount outboard of the mounting plate. The location of the fracture combined with the deformed outboard edge of the circumferential band indicate that the lateral snubber assembly moved both outboard and inboard relative to the mounting plate and, thus, that the fracture likely did not result from motion in one direction when the helicopter came to rest on its side. Additionally, dark red oxide was found on the steel surfaces that should have been encapsulated by elastomer, which indicates that relatively long-term oxidation of the surfaces had occurred due to environmental exposure. Further, areas of the lateral snubber vibration mount were separated from the elastomer, and only a little elastomer was adhered to the surface. The oxidation and lack of adhered elastomer suggest that preexisting cracks were present at or near the interface between the elastomer and the mounting plate. Circumferential cracks with a slight opening displacement were also observed at the inboard face of the elastomer, indicating that the elastomer was degraded.

According to the helicopter manufacturer, specific inspections of the vibration mount assemblies are required at 50- and 100-hour intervals. An annual/100-hour inspection of the airframe and engine was completed about 6 weeks before the accident; the engine had operated about 18 hours since the inspection. The mechanic who performed the inspection stated that the snubber assemblies appeared airworthy at the time of the inspection. However, given the condition of the lateral snubber vibration mount, the mechanic should have been able to detect the wear on the mount and then replaced the vibration mount assembly.

## Probable Cause and Findings

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

The mechanic's failure to detect excessive wear on the engine's lateral snubber vibration mount during the latest annual inspection, which resulted in an in-flight engine failure and a subsequent forced landing.

### Findings

<b>Aircraft</b>	(general) - Fatigue/wear/corrosion
<b>Aircraft</b>	(general) - Inadequate inspection
<b>Personnel issues</b>	Scheduled/routine inspection - Maintenance personnel

## Factual Information

### History of Flight

<b>Enroute-climb to cruise</b>	Powerplant sys/comp malf/fail (Defining event)
<b>Autorotation</b>	Collision with terr/obj (non-CFIT)

On August 25, 2014, about 1026 eastern daylight time, a Hiller UH-12E, N4035A, collided with trees and terrain during a forced landing at Cape May Court House, New Jersey. The commercial pilot was not injured, while one passenger had minor injuries. The helicopter was substantially damaged. The helicopter was operated by Cape May County Mosquito Control. Day, visual meteorological conditions prevailed for the local, public use, aerial observation flight, and no flight plan was filed. The local flight originated at a staging area at Cape May Court House about 0845.

According to the pilot, he was assigned to mosquito observation and evaluation in the local area. While climbing out of a marsh, at 300 feet above the ground, a loud, metallic "bang," followed by "immediate significant rhythmic vibration" was observed. He immediately performed an autorotation to the nearest clear area. The helicopter collided with trees and then the ground. There was no fire.

An inspector with the Federal Aviation Administration responded to the accident site and examined the wreckage. Structural damage to the fuselage and main rotor system was confirmed. The helicopter came to rest on its right side. Approximately 15 gallons of fuel were recovered from the fuel tank, which was not breached. Continuity was established from the main rotor and tail rotor systems to the engine and transmission.

The wreckage was recovered to an aircraft storage facility where the engine and airframe could be examined under the direction of the NTSB. The engine was intact and most of the accessories remained attached and intact. The engine snubber assemblies were impact-separated from their respective snubber mount brackets.

The engine starter was attached to a generator and about 40 amps were applied. The engine ran normally at a low rpm and thumb compression was confirmed on all six cylinders. All rocker arms and valves operated normally during crankshaft rotation. Valve train continuity was confirmed on all of the cylinders and to the accessory drive gears. The magneto leads all exhibited normal sparking.

Both the top and bottom spark plugs were removed and examined. Top plugs numbers 4 and 6 contained light oil as well as bottom plug number 3. All spark plugs exhibited signatures consistent with normal wear.

The cylinders were examined using a borescope. The pistons and cylinder bores exhibited signs of normal combustion and most of the valve faces and seats were in place. The cylinder 6 exhaust valve seat was covered in oil and its position could not be confirmed.

The fuel filter was free of debris and contaminants. The right carburetor was cracked and partially separated and the left carburetor was intact. The master and slave carburetor screens were removed and inspected. Both screens were free of debris and contaminants.

The lower engine snubber assemblies were forwarded to the NTSB Materials Laboratory, Washington, DC, for further examination.

An examination of the lateral snubber assembly's vibration mount revealed that, around approximately ½ of the circumference, elastomer was fractured and separated from the rest of the piece around the outer diameter outboard of the space where the mounting plate was located. Mating pieces of the fractured elastomer remained bonded to the outboard side of the mounting plate around the lower aft quadrant. Another smaller area of fractured and missing elastomer was located on the inboard side of the outer diameter of the elastomer. The outboard edge of the circumferential steel band was exposed in areas where the elastomer was fractured and either missing or had remained attached to the mounting plate, and portions of the exposed edges were deformed outward and inboard. The face of the circumferential steel band where it had mated to the mounting plate was mostly oxidized with dark red oxides and isolated areas of light orange oxides.

The interior face of the lateral vibration mount assembly mounting plate was mostly covered in dark red oxides. Some areas of the interior face had sliding contact damage that disturbed the oxides. Corresponding out-of-plane deformation was also observed on the mounting plate.

An examination of the inboard face of the lateral vibration mount elastomer revealed a white deposit on the exterior surfaces of the elastomer. A sample of the white deposit was analyzed using energy dispersive x-ray spectrometry and wavelength dispersive x-ray spectrometry. Results of the analysis showed the white deposits had a spectrum consisting of a large peak of carbon and a smaller peak of oxygen. A sample of the white deposit was further analyzed using fourier-transform infrared spectroscopy (FTIR). The resulting FTIR spectrum was indicative of a paraffin or polyethylene wax which had a strong match with spectra for several mold release compounds in the FTIR spectrum library. A network of closed cracks was present on the inboard face of the elastomer. Circumferential cracks with a slight opening displacement were also present at the inboard face of the elastomer.

According to the Instructions for Continued Airworthiness for the UH-12E and UH-12E4 series helicopters, the lateral and longitudinal snubber assemblies are life-limited parts with a mandatory replacement at 4,650 hours. In addition, specific inspections of the vibration mount assemblies are required at 50-hour and at 100-hour intervals. The 50-hour inspection includes checking the "mount rubber for delamination cracks and excessive surface checking." The 100-hour inspection includes checking "snubbers for cracks, damage, distortion, excessive play and security; condition of rubber mounts." The engine snubber mounts are also inspected following a sudden stoppage of the main rotor or following a hard landing.

An examination of the longitudinal snubber did not reveal evidence of an in-flight fracture. For additional details of the lateral and longitudinal snubber examinations, refer to the NTSB Materials Laboratory Factual Report 15-063, found in the public docket for this investigation.

According to maintenance records, an annual inspection was completed on the airframe and engine on July 16, 2014. The Hobbs meter reading at the time of the inspection was 3,959.0 hours, and the total airframe time was 4,845.0 hours. The Hobbs reading at the time of the accident was 3,976.8 hours.

## Pilot Information

<b>Certificate:</b>	Commercial; Flight instructor	<b>Age:</b>	55
<b>Airplane Rating(s):</b>	Single-engine land	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	Helicopter	<b>Restraint Used:</b>	4-point
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	Airplane single-engine; Instrument airplane	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 2 With waivers/limitations	<b>Last FAA Medical Exam:</b>	June 19, 2014
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	April 24, 2014
<b>Flight Time:</b>	2043 hours (Total, all aircraft), 106 hours (Total, this make and model), 77 hours (Last 90 days, all aircraft), 22 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	Hiller	<b>Registration:</b>	N4035A
<b>Model/Series:</b>	UH 12E	<b>Aircraft Category:</b>	Helicopter
<b>Year of Manufacture:</b>	1982	<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Restricted (Special)	<b>Serial Number:</b>	5195
<b>Landing Gear Type:</b>	Skid	<b>Seats:</b>	3
<b>Date/Type of Last Inspection:</b>	July 15, 2014 Annual	<b>Certified Max Gross Wt.:</b>	3100 lbs
<b>Time Since Last Inspection:</b>	18 Hrs	<b>Engines:</b>	1 Reciprocating
<b>Airframe Total Time:</b>	4845 Hrs as of last inspection	<b>Engine Manufacturer:</b>	Lycoming
<b>ELT:</b>	Installed	<b>Engine Model/Series:</b>	VO-540-C2A
<b>Registered Owner:</b>	CAPE MAY COUNTY MOSQUITO	<b>Rated Power:</b>	305 Horsepower
<b>Operator:</b>	CAPE MAY COUNTY MOSQUITO	<b>Operating Certificate(s) Held:</b>	None

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual (VMC)	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	WWD,21 ft msl	<b>Distance from Accident Site:</b>	6 Nautical Miles
<b>Observation Time:</b>	10:35 Local	<b>Direction from Accident Site:</b>	240°
<b>Lowest Cloud Condition:</b>	Clear	<b>Visibility</b>	10 miles
<b>Lowest Ceiling:</b>	None	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	11 knots /	<b>Turbulence Type Forecast/Actual:</b>	/ None
<b>Wind Direction:</b>	50°	<b>Turbulence Severity Forecast/Actual:</b>	/ N/A
<b>Altimeter Setting:</b>	30.18 inches Hg	<b>Temperature/Dew Point:</b>	23°C / 15°C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	Cape May CH, NJ (H309)	<b>Type of Flight Plan Filed:</b>	None
<b>Destination:</b>	Cape May CH, NJ (H309)	<b>Type of Clearance:</b>	None
<b>Departure Time:</b>	08:45 Local	<b>Type of Airspace:</b>	

## Wreckage and Impact Information

<b>Crew Injuries:</b>	1 None	<b>Aircraft Damage:</b>	Substantial
<b>Passenger Injuries:</b>	1 Minor	<b>Aircraft Fire:</b>	None
<b>Ground Injuries:</b>	N/A	<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	1 Minor, 1 None	<b>Latitude, Longitude:</b>	39.080554,-74.826942

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Hicks, Ralph
<b>Additional Participating Persons:</b>	Gregory Mihalyak; FAA/FSDO; Philadelphia, PA
<b>Original Publish Date:</b>	September 8, 2015
<b>Last Revision Date:</b>	
<b>Investigation Class:</b>	<a href="#">Class</a>
<b>Note:</b>	The NTSB did not travel to the scene of this accident.
<b>Investigation Docket:</b>	<a href="https://data.nts.gov/Docket?ProjectID=89943">https://data.nts.gov/Docket?ProjectID=89943</a>

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](#).