# Aviation Investigation Final Report

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| **Location:** | Cokeville, Wyoming | **Accident Number:** | CEN16LA330 |
| **Date & Time:** | August 23, 2016, 07:45 Local | **Registration:** | N97TH |
| **Aircraft:** | Hiller UH 12D | **Aircraft Damage:** | Substantial |
| **Defining Event:** | Part(s) separation from AC | **Injuries:** | 1 Minor |
| **Flight Conducted Under:** | Part 137: Agricultural | | |

## Analysis

The commercial pilot was conducting an agricultural spray run in the helicopter when he felt a "bump" in the cyclic. The helicopter began to shake violently, and the pilot tried to conduct a forced landing; however, the skid caught on bushes and the helicopter impacted terrain. A control rotor cuff was located about 150 ft from the main wreckage. Examination of the component at the NTSB materials laboratory found a fatigue crack starting at the cuff's bolt hole and progressing until the part separated from overload. A review of maintenance records revealed that the cuff was overhauled at 988.7 hours and had accumulated 131.9 hours since overhaul. The rotor cuff was subject to an airworthiness directive (AD) which required repetitive inspections, though the investigation was unable to determine whether the AD had been complied with. The investigation also noted ambiguity with the wording used in the AD; it was unclear whether the part was subject to replacement at 225 hours total time in service, or if the 225-hour replacement was only applicable to components without known service history. The accident is consistent with an in-flight separation of the control rotor cuff due to fatigue failure.

## Probable Cause and Findings

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

Failure of the control rotor cuff due to fatigue.

## Findings

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| **Aircraft** | Main rotor head system - Fatigue/wear/corrosion |

# Factual Information

## History of Flight

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| **Maneuvering-low-alt flying** | Part(s) separation from AC (Defining event) |
| **Maneuvering-low-alt flying** | Loss of control in flight |
| **Uncontrolled descent** | Collision with terr/obj (non-CFIT) |

On August 23, 2016, about 0745 mountain daylight time, a Hiller UH-12D helicopter, N97TH, impacted terrain near Cokeville, Wyoming. The pilot received minor injuries and the helicopter was substantially damaged during the accident. The helicopter was registered to and operated by Wyoming Helicopters, Inc., Boulder, Wyoming, under the provisions of 14 Code of Federal Regulations Part 137 as an agricultural flight. Visual meteorological conditions prevailed at the time.

The pilot reported that he started a spray application run and was about 15 ft agl (above ground level) and at 50 mph when he felt a "bump" in the cyclic control. The helicopter began to shake violently and the pilot tried to slow the helicopter down for a landing. However, the helicopter's skid caught on some bushes, and the helicopter rolled over, coming to rest on its side. During the accident, the tail boom and right skid tube were torn from the fuselage and the rotor head separated from the mast. An outboard section of the rotor cuff/paddle was located about 150 ft from the helicopter wreckage. The rotor cuff's spar had separated near a bolted part of a joint.

The separated section of the rotor cuff was sent to the NTSB materials laboratory in Washington D.C. for examination. The examination found fatigue cracks, starting at a bolt hole, that progressed around the rotor cuff spar tube.

The specialist's full materials laboratory factual report is located in the docket for this accident.

A review of the Federal Aviation Administration (FAA) airworthiness directives (AD) notes AD 97-10-16 applicable to the Hiller UH-12 helicopter. The AD requires (in part) that the control rotor blade spar tube be inspected "… for corrosion or cracks, or elongation, corrosion, burrs, pitting or fretting of the bolts holes…" "During the annual inspection, not to exceed 100 hours and every 100-hours, thereafter."

The AD also specifies for helicopters with cuff part number 36124:

(d) For cuffs, P/N 36124, without a complete prior service history, within the next 25 hours TIS, unless already accomplished within the last 25 hours TIS prior to the effective date of this AD, and at intervals not to exceed 50 hours TIS, perform a dye penetrant inspection of the cuff in accordance with paragraph G of the Accomplishment Instructions of Hiller Aviation Service Bulletin, No. 36-1, Revision 3, dated October 24, 1979. If a crack is discovered, remove the cracked cuff from service prior to further flight. A cuff for which the prior service history cannot be documented cannot be used as a replacement part. Remove from service all cuffs prior to the accumulation of 225 hours total TIS since April 7, 1977.

A review of the helicopter's maintenance records indicated that a rotor cuff (part number 36124) was installed on February 11, 2013 with a component total time of 988.7 hours, and 0 since overhaul. A component listing dated September 28, 2015, noted the helicopter's Hobbs time of 1,093.3 hours. At the time of the accident, the Hobbs meter read 1,225.2 hours; 131.9 hours had accumulated on the part since the September 2015 listing. The pilot reported that the helicopter was on an annual inspection program, and its last 100-hour inspection was done on August 5, 2016.

## Pilot Information

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| **Certificate:** | Commercial | **Age:** | 55 |
| **Airplane Rating(s):** | None | **Seat Occupied:** | Center |
| **Other Aircraft Rating(s):** | Helicopter | **Restraint Used:** | 3-point |
| **Instrument Rating(s):** | None | **Second Pilot Present:** | No |
| **Instructor Rating(s):** | None | **Toxicology Performed:** | No |
| **Medical Certification:** | Class 2 With waivers/limitations | **Last FAA Medical Exam:** | December 21, 2015 |
| **Occupational Pilot:** | Yes | **Last Flight Review or Equivalent:** | December 9, 2014 |
| **Flight Time:** | 3965.8 hours (Total, all aircraft), 3007.1 hours (Total, this make and model) | | |

## Aircraft and Owner/Operator Information

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| **Aircraft Make:** | Hiller | **Registration:** | N97TH |
| **Model/Series:** | UH 12D NO SERIES | **Aircraft Category:** | Helicopter |
| **Year of Manufacture:** | 1960 | **Amateur Built:** | |
| **Airworthiness Certificate:** | Normal | **Serial Number:** | 1165 |
| **Landing Gear Type:** | Skid | **Seats:** | |
| **Date/Type of Last Inspection:** | August 5, 2016 Annual | **Certified Max Gross Wt.:** | |
| **Time Since Last Inspection:** | | **Engines:** | |
| **Airframe Total Time:** | 14494 Hrs at time of accident | **Engine Manufacturer:** | |
| **ELT:** | | **Engine Model/Series:** | |
| **Registered Owner:** | WYOMING HELICOPTERS INC DBA | **Rated Power:** | |
| **Operator:** | WYOMING HELICOPTERS INC DBA | **Operating Certificate(s) Held:** | Agricultural aircraft (137) |

## Meteorological Information and Flight Plan

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| **Conditions at Accident Site:** | Visual (VMC) | **Condition of Light:** | Day |
| **Observation Facility, Elevation:** | KAFO | **Distance from Accident Site:** | |
| **Observation Time:** | 07:35 Local | **Direction from Accident Site:** | |
| **Lowest Cloud Condition:** | Clear | **Visibility** | 10 miles |
| **Lowest Ceiling:** | None | **Visibility (RVR):** | |
| **Wind Speed/Gusts:** | / | **Turbulence Type Forecast/Actual:** | / |
| **Wind Direction:** | | **Turbulence Severity Forecast/Actual:** | / |
| **Altimeter Setting:** | 30.19 inches Hg | **Temperature/Dew Point:** | 0°C / -3°C |
| **Precipitation and Obscuration:** | No Obscuration; No Precipitation | | |
| **Departure Point:** | Cokeville, WY | **Type of Flight Plan Filed:** | None |
| **Destination:** | Cokeville, WY | **Type of Clearance:** | None |
| **Departure Time:** | | **Type of Airspace:** | |

## Wreckage and Impact Information

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| **Crew Injuries:** | 1 Minor | **Aircraft Damage:** | Substantial |
| **Passenger Injuries:** | | **Aircraft Fire:** | None |
| **Ground Injuries:** | N/A | **Aircraft Explosion:** | None |
| **Total Injuries:** | 1 Minor | **Latitude, Longitude:** | 42.066944,-110.946945(est) |

## Administrative Information

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| **Investigator In Charge (IIC):** | Hatch, Craig |
| **Additional Participating Persons:** | Bruce Hanson; FAA FSDO; Denver, CO |
| **Original Publish Date:** | November 14, 2017 |
| **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=93876 |