



# Aviation Investigation Final Report

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<b>Location:</b>	Ashland, Oregon	<b>Accident Number:</b>	WPR16LA081
<b>Date &amp; Time:</b>	February 5, 2016, 14:30 Local	<b>Registration:</b>	N745BW
<b>Aircraft:</b>	McDonnell Douglas Helicopter 600N	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>	Sys/Comp malf/fail (non-power)	<b>Injuries:</b>	1 None
<b>Flight Conducted Under:</b>	Part 91: General aviation - Positioning		

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## Analysis

The commercial pilot reported that, during a cross-country helicopter flight, the main rotor blades seemed minimally out of track. After departing on the last leg of the flight, he noticed a slight "hop" as he made an ascending 180° right turn, but later stated that he had experienced worse with gusting winds and door-off operations. In straight and level flight, the blade track appeared to be no different than on the previous legs. During the descent toward the destination, he noticed that the hop became more apparent when the blades were unloaded. Maintenance personnel subsequently found a crack in one main rotor blade from the trailing edge forward to the spar at a point midspan near the beginning of the trim tab.

Examination revealed a visible crack on the top skin, with an opposing crack on the bottom skin. The crack surfaces were flat and light grey with features indicative of fatigue cracking from the trailing edges of the upper and lower skins forward to an internal "C" channel. No gross mechanical damage was visible, and abrasions visible after stripping paint from the blade appeared to be too small to initiate the fatigue crack. The blade had been in service for about 2/3 of its service hour life and more than half of its cycle life at the time of discovery. The reason for crack initiation could not be determined.

## Probable Cause and Findings

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

Fatigue cracking of a main rotor blade for reasons that could not be determined based on the available information.

## Findings

<b>Aircraft</b>	Main rotor blade system - Fatigue/wear/corrosion
<b>Not determined</b>	(general) - Unknown/Not determined

## Factual Information

### History of Flight

Enroute-cruise	Sys/Comp malf/fail (non-power) (Defining event)
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On February 5, 2016, about 1430 Pacific daylight time, a McDonnell Douglas Helicopter (MDHI) 600N, N745BW, experienced a cracked main rotor blade at Ashland, Oregon. The commercial pilot was not injured; the helicopter sustained substantial damage to a main rotor blade. Brim Aviation was operating the helicopter under the provisions of 14 *Code of Federal Regulations* Part 91. Visual instrument meteorological conditions prevailed, and no flight plan had been filed. The cross-country positioning flight departed Alturas, California, about 1340 and was destined for Ashland.

The pilot reported that he was in one helicopter, while another pilot flew in another helicopter for the ferry flight to Ashland. Three intermediate stops were planned along the route of flight. All flight operations and characteristics had been normal, but he noted that the main rotor blades seemed minimally out of track. After departure from Alturas, he noticed a slight hop as he made an ascending 180° right turn out but stated that he had experienced worse with gusting winds and door off operations. In straight and level flight, blade track appeared to be no different than on the previous legs. During the descent into Ashland, he noticed that the hop had become more apparent when the blades were unloaded. He asked the trailing pilot to look at the rotor system for any abnormalities in flight, and the trail pilot indicated that they looked out of track. After landing, the pilot informed maintenance that the track and balance of both helicopters needed to be checked prior to the next operation. Maintenance personnel reported that there was a crack in one main rotor blade from the trailing edge forward to the spar at a point midspan near the beginning of the trim tab.

After the operator discovered the crack, the blade was initially sent to Helicopter Technology Company for examination. The damage to the rotor blade was reported to the National Transportation Safety Board (NTSB) on March 9, 2016.

## Pilot Information

<b>Certificate:</b>	Commercial	<b>Age:</b>	53, Male
<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>	None	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 2 Without waivers/limitations	<b>Last FAA Medical Exam:</b>	December 21, 2015
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	March 1, 2016
<b>Flight Time:</b>	9400 hours (Total, all aircraft), 3000 hours (Total, this make and model), 9400 hours (Pilot In Command, all aircraft), 115 hours (Last 90 days, all aircraft), 55 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	McDonnell Douglas Helicopter	<b>Registration:</b>	N745BW
<b>Model/Series:</b>	600N	<b>Aircraft Category:</b>	Helicopter
<b>Year of Manufacture:</b>	1998	<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Normal	<b>Serial Number:</b>	RN045
<b>Landing Gear Type:</b>	N/A; Skid	<b>Seats:</b>	
<b>Date/Type of Last Inspection:</b>	March 7, 2016 100 hour	<b>Certified Max Gross Wt.:</b>	4500 lbs
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	1 Turbo shaft
<b>Airframe Total Time:</b>	4672 Hrs as of last inspection	<b>Engine Manufacturer:</b>	ALLISON
<b>ELT:</b>	C126 installed, not activated	<b>Engine Model/Series:</b>	250-M47
<b>Registered Owner:</b>	On file	<b>Rated Power:</b>	808 Horsepower
<b>Operator:</b>	On file	<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>	KMIR	<b>Distance from Accident Site:</b>	
<b>Observation Time:</b>	13:53 Local	<b>Direction from Accident Site:</b>	
<b>Lowest Cloud Condition:</b>	Scattered / 5500 ft AGL	<b>Visibility</b>	10 miles
<b>Lowest Ceiling:</b>	None	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	/	<b>Turbulence Type Forecast/Actual:</b>	/
<b>Wind Direction:</b>		<b>Turbulence Severity Forecast/Actual:</b>	/
<b>Altimeter Setting:</b>	30.21 inches Hg	<b>Temperature/Dew Point:</b>	16°C / 6°C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	Alturas, CA (KAAT)	<b>Type of Flight Plan Filed:</b>	None
<b>Destination:</b>	Ashland, OR (S03 )	<b>Type of Clearance:</b>	None
<b>Departure Time:</b>	13:40 Local	<b>Type of Airspace:</b>	

## Airport Information

<b>Airport:</b>	Ashland S03	<b>Runway Surface Type:</b>	Asphalt
<b>Airport Elevation:</b>	1885 ft msl	<b>Runway Surface Condition:</b>	Dry
<b>Runway Used:</b>	30	<b>IFR Approach:</b>	None
<b>Runway Length/Width:</b>	3603 ft / 75 ft	<b>VFR Approach/Landing:</b>	Full stop

## Wreckage and Impact Information

<b>Crew Injuries:</b>	1 None	<b>Aircraft Damage:</b>	Substantial
<b>Passenger Injuries:</b>		<b>Aircraft Fire:</b>	None
<b>Ground Injuries:</b>	N/A	<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	1 None	<b>Latitude, Longitude:</b>	42.189998,-122.660552(est)

## Tests and Research

The damaged blade was examined by the NTSB Material's Laboratory. The blade had a time in service (TIS) of 2,013.4 hours, 11,065 torque events, and a retirement index number (RIN) of 587,640. The blade's published service life is 3,200 hours or 1 million RIN.

Visual examination revealed a visible crack on the top skin with an opposed crack on the bottom skin. The crack surfaces were flat and light grey with features indicative of fatigue cracking from the trailing edges of the upper and lower skins forward to an internal "C" channel.

Examination using a scanning electron microscope showed striations and other fracture features within the fatigue crack region. The initial area of origin was in the area of the trailing edge of the upper skin, and striation orientations pointed to the vicinity of the upper corner of the skin.

From the origin, the fatigue crack propagated forward in the upper skin to just past the "C" channel. At the "V" strip, the fatigue crack reinitiated at the upper aft corner of the strip and propagated forward in the upper leg of the "V" and down and forward through the lower leg of the "V." In the lower skin crack surface, additional fatigue crack propagation initiated adjacent to the lower aft corner of the "V" strip then propagated forward and aft in the skin. Two additional fatigue crack paths were discovered in the "C" channel. The complete Material Laboratory Report can be found in the public docket.

The other five main rotor blades were sent to the manufacturer for examination, and no anomalies were detected.

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Plagens, Howard
<b>Additional Participating Persons:</b>	Tom Leonetti; Portland FAA-FSDO; Hillsboro, OR Burl Brim; Brim Aviation; Ashland, OR Joan Gregoire; MDHI; Mesa, AZ Gary Burdoff; HTC; Los Angeles, CA
<b>Original Publish Date:</b>	July 16, 2018
<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=92822">https://data.nts.gov/Docket?ProjectID=92822</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](#).