Aviation Investigation Final Report

Location:	MILTONFREEWATER, Oregon	**Accident Number:**	SEA97LA117
Date & Time:	May 21, 1997, 10:51 Local	**Registration:**	N3005J
Aircraft:	Hiller UH-12E	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	1 Fatal
Flight Conducted Under:	Part 137: Agricultural		

Analysis

A witness reported that as he was watching the helicopter maneuver for the aerial application flight, one of the main rotor blades separated from the helicopter. The helicopter then nosed down and collided with the terrain. Examination of the separated sections of the main rotor blade found that the origin area contained a few crack arrest positions and small ratchet marks, indicating that fatigue cracking initiated from multiple locations. The thickness of the larger spar was measured and found to be slightly below the specified manufacturer's measurements. Scratches or scoring marks, similar to a sanded appearance, were noted on the lower surface where the thickness was reduced. The thickness of the spar wall continued to decrease further outboard of the fracture. Corrosion was also visible. The applicable Airworthiness Directive (AD) requires performance of inspections per the Service Bulletin (SB) to prevent main rotor blade failure due to cracking of the spar or delamination of the trailing edge skin from the spar. The SB specifies the different types of inspections to be accomplished, the intervals for accomplishment of the inspections, and how the inspections are to be performed to detect for cracks or delamination. The SB indicates that a chemical compound is to be used to strip the paint from the surface to accomplish the inspection. Maintenance records indicate that inspections were performed, however, no cracks were detected.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The main rotor blade separated due to fatigue. Factors were: an Airworthiness Directive was not properly performed, and inadequate inspection of the main rotor blades.

Findings

Occurrence #1: ROTOR FAILURE/MALFUNCTION
Phase of Operation: MANEUVERING - AERIAL APPLICATION

Findings
1. (C) ROTOR SYSTEM,MAIN ROTOR - FATIGUE
2. (F) MAINTENANCE,COMPLIANCE WITH AD - NOT PERFORMED - OTHER MAINTENANCE PERSONNEL
3. (F) MAINTENANCE,INSPECTION - INADEQUATE - OTHER MAINTENANCE PERSONNEL

Occurrence #2: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

Factual Information

HISTORY OF FLIGHT

On May 21, 1997, at 1051 Pacific daylight time, a Hiller UH-12E, N3005J, registered to and operated by Blue Mountain Aviation as a 14 CFR Part 137 aerial application flight, collided with the terrain near Milton Freewater, Oregon. Visual meteorological conditions prevailed at the time and no flight plan was filed for the local flight. The helicopter was substantially damaged and the commercial pilot, the sole occupant, was fatally injured. The flight had originated from Walla Walla, Washington, earlier in the day.

A witness reported that he was watching the helicopter spray the field. The helicopter was flying at about 500 to 800 feet above the ground and was maneuvering for a spray run. The witness reported that as the helicopter was leveling, he heard a loud bang and saw debris fly off the helicopter. The helicopter then dropped almost straight to the ground, turning slightly to the right in a nose down attitude. The helicopter collided with the terrain in a nose down attitude and on its right side.

At the time of the accident, the helicopter was loaded with Dimethoate, an insecticide, that did spill and cover the accident site.

AIRCRAFT INFORMATION

Evidence found at the accident site indicates that one of the main rotor blades separated prior to the collision with the ground. The separated section of blade was not found until about six weeks after the accident. The blade was located in a field some distance away from the accident site. The blade had separated about 34 inches from the blade root.

Maintenance records indicate that the last annual inspection performed on the helicopter was on July 10, 1996. At the time of the accident, a total time of 491.4 hours had been accumulated since the annual inspection.

The main rotor blade that separated was last overhauled on May 7, 1996, with a total time of 4,186 hours. Airworthiness Directive (AD) 86-22-04, effective November 3, 1986, indicates that the main rotor blades are to be overhauled every 1,000 hours. Approximately 29 hours remained until the next scheduled overhaul.

The AD indicates that "to prevent main rotor blade failure due to cracking of the spar or delamination of the trailing edge skin from the spar...," a visual check of the main rotor blades for cracks in the leading edge is to be accomplished prior to the first flight of the day. The AD also requires a dye penetrant or magnaflux inspection of the blade for cracks in accordance

with paragraph IIB of Rogerson Hiller Service Bulletin (SB) No. 51-6, dated December 19, 1985, at intervals not to exceed 25 hours time in service; conduct a visual and coin tap inspection of the spar to trailing-edge-skin bond line for corrosion and voids in accordance with paragraph IIC of SB No. 51-6; and a dye penetrant check required by paragraph (b) of the AD at intervals not to exceed 100 hours time in service.

The maintenance records indicate that the last daily inspection sign-off was on May 19, 1997, at a Hobbs time of 691.0 hours. There was no sign-off indicated on the day of the accident. Approximately 11.4 hours had been accumulated on the helicopter from May 19, 1997, to the day of the accident.

The last 100-hour dye penetrant inspection was conducted on May 12, 1997, at a Hobbs time of 663.4 hours. The work order indicates that no defects were found.

Service Bulletin No. 51-6 states "In certain instances, bond separation has been found between the leading edge steel spar and the aluminum skin, and sometimes the separation will progress to the extent that the steel spar cracked just outboard of the brazed doublers."

The SB requires a four to six-power magnifying glass for the daily visual inspection. The inspection should be performed with the tip of the blade supported in a manner to remove all droop.

The 25-hour inspection requires inspection of the area at the outboard end of the root doubler on both the top and bottom sides of the blade for doubler separation or signs of cracks in the area at the end of the doubler which is blazed to the leading edge spar. The paint should be removed by first degreasing with P-D-680 solvent and then removal of the paint with C-19 Haviland Products. A one-inch wide strip of paint is to be removed chordwise around the leading edge of the blade from .5 inches aft of the upper doubler to .5 inches aft of the lower doubler. Manufacturer recommendations are to be used for applying dye penetrant and developer. The SB states that "Any dye-penetrant indications of a crack is sufficient to retire the main rotor blade from service." After the inspection, a light coat of zinc chromate primer is to be applied to the area that was stripped of paint.

In addition to the 25-hour crack inspection, the 100-hour inspection checks the blade for bond separation and voids between the steel spar and the aluminum skin by tapping lightly with a light blunt object. The fill compound along the aft edge of steel spar is to be examined for any indications of rust.

MEDICAL AND PATHOLOGICAL INFORMATION

An autopsy was performed by Blue Mountain Pathology, Inc. Dr. SallyAnn Clausen reported that the pilot's cause of death was due to multiple traumatic injuries. The autopsy report also notes that severe atherosclerotic cardiovascular disease with a significant area of scarring was noted.

Toxicological samples were sent to the Federal Aviation Administration Civil Aeromedical Institute, Oklahoma City, Oklahoma, for analysis. The results of the analysis were negative.

TEST AND RESEARCH

The separated section ends of the main rotor blade were sent to the National Transportation Safety Board Materials Laboratory for examination. The metallurgist reported that a chordwise fracture was located in the blade about 33.5 inches from the blade's inboard end, and near the outboard end of the stepped doublers on the upper and lower surfaces near the leading edge. A major portion of the leading edge "D" spar fracture was on the flat plane with "faint crack arrest positions, indicative of fatigue cracking." The upper and lower surfaces had been painted black in the area of the fracture. The metallurgist reported that high magnification of the origin area contained a "few crack arrest positions and small ratchet marks, indicating that the fatigue cracking initiated from multiple locations." The thickness of the larger spar was measured and found to be slightly below the specified manufacturer's measurement.

A scanning electron microscope (SEM) was used for higher magnification and found that the finer details of the fracture were obscured by corrosion products and other deposits. The area was cleaned, and an examination of the blade piece revealed the presence of multiple scratches or scoring marks on the exterior surface of the blade around the outboard tip of the stepped doubler. The metallurgist reported that "several portions of the origin area were on a plane that was slightly offset from the overall plane of the fatigue crack. These offset planes were separated by ratchet marks on the fracture and intersected the blade exterior surface along lines that appeared to be extensions of the scratches located to the right of the origin area."

A metallographic section through the origin area of the fatigue cracking was examined. The metallurgist found that the lower surface of the blade "had been reduced in thickness outboard of the end of the brazing for the doubler. Corrosion attack to the steel doubler and to the fracture and exposed portion of the lower surface were also visible." The metallurgist reported that the thickness of the spar wall continued to decrease further outboard of the fracture.

Pilot Information

Certificate:	Commercial	**Age:**	51,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane single-engine	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 Valid Medical--w/ waivers/lim	**Last FAA Medical Exam:**	August 6, 1996
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	7950 hours (Total, all aircraft), 3200 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Make:	Hiller	**Registration:**	N3005J
Model/Series:	UH-12E UH-12E	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Restricted (Special)	**Serial Number:**	5024
Landing Gear Type:	Skid	**Seats:**	3
Date/Type of Last Inspection:	July 10, 1996 Annual	**Certified Max Gross Wt.:**	2750 lbs
Time Since Last Inspection:	490 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	4196 Hrs	**Engine Manufacturer:**	Lycoming
ELT:	Not installed	**Engine Model/Series:**	VO-540-C2A
Registered Owner:	BLUE MOUNTAIN AVIATION	**Rated Power:**	305 Horsepower
Operator:		**Operating Certificate(s) Held:**	
Operator Does Business As:		**Operator Designator Code:**	GMMG

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	ALW ,1205 ft msl	**Distance from Accident Site:**	10 Nautical Miles
Observation Time:	10:50 Local	**Direction from Accident Site:**	7°
Lowest Cloud Condition:	Clear	**Visibility**	35 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	10 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	220°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29 inches Hg	**Temperature/Dew Point:**	18°C / 6°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	WALLA WALLA , WA (ALW)	**Type of Flight Plan Filed:**	None
Destination:		**Type of Clearance:**	None
Departure Time:	09:00 Local	**Type of Airspace:**	Class G

Airport Information

Airport:		**Runway Surface Type:**	
Airport Elevation:		**Runway Surface Condition:**	
Runway Used:	0	**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal	**Latitude, Longitude:**	45.899803,-118.340354(est)

Administrative Information

Investigator In Charge (IIC):	Eckrote, Debra
Additional Participating Persons:	TAMRA THOMPSON; HILLSBORO , OR
Original Publish Date:	April 24, 1998
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=42611