Aviation Investigation Final Report

Location:	Monmouth, Oregon	**Accident Number:**	SEA04LA018
Date & Time:	November 18, 2003, 14:52 Local	**Registration:**	N7825S
Aircraft:	Bell 47G-3B-2	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	1 Serious
Flight Conducted Under:	Part 133: Rotorcraft ext. load		

Analysis

The pilot was conducting long-line operations (utilizing a 50 foot long-line) in support of a Christmas tree harvest when the accident occurred. The pilot reported he was hovering, into the wind, over the "drop off point" when he heard a loud noise emanating from the rear of the helicopter. He described that the helicopter "instantly" began to rotate around its vertical axis and shortly after jettisoning the load the helicopter impacted terrain. During the post accident examination of the wreckage it was noted that the tail rotor blades and tail rotor gearbox were separated from the helicopters tail assembly. The tail rotor gearbox and one of the tail rotor blades was later located in a ditch near the accident site. The second tail rotor blade was located underneath a conifer tree approximately 100 feet east of the wreckage. Examination of the fractured tail rotor revealed that the blade fractured as a result of fatigue. The fatigue crack had multiple origins on the inside surface of the skin near the outboard end of the butt block (approximately 7.6 inches from the inboard end and 1.38-1.6 inches from the leading edge). Several of the origins were in pitted areas measuring no deeper than .00033 inches. Logbook records indicated that the tail rotor blade had accumulated approximately 1,723 hours since new. The life limit for the tail rotor blade is 2,500 hours

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: Fatigue failure of a tail rotor blade during hover operations.

Findings

Occurrence #1: ROTOR FAILURE/MALFUNCTION
Phase of Operation: HOVER

Findings
1. (C) ROTOR SYSTEM,TAIL ROTOR BLADE - FRACTURED
2. (C) ROTOR SYSTEM,TAIL ROTOR BLADE - FATIGUE

Occurrence #2: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: HOVER

Findings
3. DIRECTIONAL CONTROL - NOT POSSIBLE

Occurrence #3: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

Factual Information

On November 18, 2003, about 1452 Pacific standard time, a Bell/Soloy 47G-3B-2 helicopter, N7825S, which was converted to accommodate a Rolls Royce 250-C20 series turbine engine, sustained substantial damage during a forced landing following an in-flight loss of a tail rotor blade, about 6 miles south of Monmouth, Oregon. The helicopter was being operated under the provisions of Title 14, CFR Part 133, conducting external load operations (utilizing a 50 foot long-line) in support of a Christmas tree harvest when the accident occurred. The helicopter is registered to, and operated by, Farm and Forest Helicopter Service of Napavine, Washington. The certificated commercial pilot, the solo occupant, received serious injuries.

Following the accident the pilot told local law enforcement personnel that while in a stable hover, about 40-50 feet above ground level (AGL), he lost tail rotor control authority, and was unable to maintain directional control.

A witness to the accident reported that he observed a section of tail rotor blade depart the helicopter during the hover operation just before the accident sequence. He reported the helicopter subsequently entered a series of 360-degree rotations just before impacting terrain in a nose low attitude.

In a written statement dated November 24, 2003, the pilot reported he was hovering, into the wind, over the "drop off point" when he heard a loud noise emanating from the rear of the helicopter. He described that the helicopter "instantly" began to rotate around its vertical axis and shortly after jettisoning the load the helicopter impacted terrain.

An FAA representative from the Portland, Oregon, Flight Standards District Office conducted the post accident onsite examination of the wreckage. The inspector reported the helicopter sustained substantial damage consistent with a hard landing. Both main rotor blades struck the ground, but remained attached. One of the blades struck and bent the pylon. The skids were spread and broken. The engine and transmission were displaced from their mounts. The cockpit bubble was broken and the pilot's seat was buckled upward and forward.

During the examination it was noted that the tail rotor blades and tail rotor gearbox were separated from the helicopter's tail assembly. The tail rotor gearbox and one of the tail rotor blades was later located in a ditch near the accident site. The second tail rotor blade was located underneath a conifer tree approximately 100 feet east of the wreckage.

Following the onsite examination, the tail rotor hub, 90-degree gearbox and blade assembly was shipped to Bell Helicopter, Fort Worth, Texas, for further examination and testing.

Examination of the fractured tail rotor blade (S/N A-2522) by personnel from Bell Helicopter

and NTSB revealed that the blade fractured as a result of fatigue. According to the engineering laboratory report submitted by Bell Helicopter, the fatigue had multiple origins on the inside surface of the skin near the outboard end of the butt block (approximately 7.6 inches from the inboard end and 1.38-1.6 inches from the leading edge). Several of the origins were in pitted areas measuring no deeper than .00033 inches. The pits are the result of an etching process used to prepare the surface for bonding. The report concludes that the surface condition was "typical of properly prepared surface and no abnormalities were found."

Examination of the opposing blade (S/N A-2500) revealed fatigue cracking on the bottom skin in a similar location as blade A-2522. The origins of the cracks were in areas of pitting attributed to the etching process. The pits measured no deeper than .00017 inches and according to the manufacture were consistent with a properly prepared surface with no anomalies.

The 90-degree gearbox was evaluated during the tail rotor assembly examination. According to the engineering report, wear patterns on the spiral bevel gear was consistent with heavy loading.

Logbook records indicated that the tail rotor blades had accumulated approximately 1,723 hours since new. The life limit for the tail rotor blades is 2,500 hours.

Bell Helicopters manufactured the tail rotor blades on January 26, 1999.

Pilot Information

Certificate:	Commercial; Private	**Age:**	48,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 2 Valid Medical--w/ waivers/lim	**Last FAA Medical Exam:**	February 21, 2003
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	October 30, 2002
Flight Time:	12855 hours (Total, all aircraft), 11361 hours (Total, this make and model), 12750 hours (Pilot In Command, all aircraft), 226 hours (Last 90 days, all aircraft), 93 hours (Last 30 days, all aircraft), 8 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Bell	**Registration:**	N7825S
Model/Series:	47G-3B-2	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Restricted (Special)	**Serial Number:**	6688
Landing Gear Type:	None	**Seats:**	3
Date/Type of Last Inspection:	October 27, 2003 Annual	**Certified Max Gross Wt.:**	3250 lbs
Time Since Last Inspection:	97 Hrs	**Engines:**	1 Turbo shaft
Airframe Total Time:	11774 Hrs as of last inspection	**Engine Manufacturer:**	Allison
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	C-20-B
Registered Owner:	FARM AND FOREST HELICOPTER SERVICE INC	**Rated Power:**	420 Horsepower
Operator:		**Operating Certificate(s) Held:**	
Operator Does Business As:		**Operator Designator Code:**	GJDL

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:		**Distance from Accident Site:**	
Observation Time:		**Direction from Accident Site:**	
Lowest Cloud Condition:		**Visibility**	
Lowest Ceiling:	Unknown	**Visibility (RVR):**	
Wind Speed/Gusts:	8 knots / 10 knots	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	180°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:		**Temperature/Dew Point:**	12°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Monmouth, OR	**Type of Flight Plan Filed:**	None
Destination:	Monmouth, OR	**Type of Clearance:**	None
Departure Time:	14:30 Local	**Type of Airspace:**	Class G

Wreckage and Impact Information

Crew Injuries:	1 Serious	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Serious	**Latitude, Longitude:**	44.833332,-123.233329

Administrative Information

Investigator In Charge (IIC):	Hogenson, Dennis
Additional Participating Persons:	Gordon A Read; FAA FSDO; Hillsboro, OR Jack Suttle; Bell Helicopter ; Fort Worth , TX
Original Publish Date:	December 28, 2004
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=58359

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