Aviation Investigation Final Report

Location:	Liberty, Washington	**Accident Number:**	SEA04LA043
Date & Time:	February 23, 2004, 13:30 Local	**Registration:**	N6257P
Aircraft:	Garlick UH-1H	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	1 Serious
Flight Conducted Under:	Part 133: Rotorcraft ext. load		

Analysis

The pilot was conducting a long-line logging operation in a restricted category helicopter. During the second logging cycle of the day, which included fifty turns, the pilot was setting a load of logs down when he heard a loud bang from the rear of the helicopter. The aircraft began spinning to the left, and after the second turn the pilot chopped the throttle in an attempt to land between the loading deck and the loader. The helicopter landed hard and flat, resulting in the aircraft's main rotor blades striking the log deck and the loader, ripping out the helicopter's transmission. During an inspection of the aircraft wreckage it was observed that both of the tail rotor slider's lugs were fractured where they become tangent to the slider barrel. A subsequent examination of the tail rotor slider assembly revealed that the slider lugs had failed due to fatigue. The fatigue origin was determined to be rough machining marks.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The failure of the tail rotor slider lugs due to fatigue while the helicopter was maneuvering.

Findings

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

Findings
1. (C) MISCELLANEOUS,BOLT/NUT/FASTENER/CLAMP/SPRING - FATIGUE

Occurrence #2: FORCED LANDING
Phase of Operation: DESCENT - EMERGENCY

Occurrence #3: HARD LANDING
Phase of Operation: EMERGENCY LANDING

Factual Information

On February 23, 2004, approximately 1330 Pacific standard time, a Garlick UH-1H (originally manufactured by Bell Helicopter) restricted-category rotorcraft, N6257P, sustained substantial damage after impacting objects following a loss of control near Liberty, Washington. The helicopter was being operated as an external-load (logging) flight by Skyline Helicopters of College Place, Washington, under the provisions of 14 CFR Part 133. The airline transport pilot, sole occupant of the helicopter, sustained serious injuries. Visual meteorological conditions prevailed and a flight plan was not filed for the local flight. The flight departed the local operations area about 1300.
According to the pilot, this was the second logging cycle of the day that lasted about 3 hours and included fifty turns. The pilot stated that as he was setting down a load of logs, he heard a loud bang which came from the aft end of the helicopter, and the helicopter began spinning to the left. After the second turn he "chopped the throttle" and steered the helicopter to the last opening between the loading deck and the loader where the helicopter landed hard but flat. The main rotor blades struck the log deck and the loader, ripping out the transmission. The pilot also reported, "...[the] incident began at about 200 feet, spinning down to 100 feet, cushion from there through impact."

A representative from the Federal Aviation Administration's (FAA) Spokane, Washington, 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 skids were bent upward, the main and tail rotor blades were damaged, the transmission was separated from its mounts, and the tail rotor drive shaft was broken. The inspector also observed that both lugs of the tail rotor slider were broken off where they become tangent to the slider barrel. During the recovery of the helicopter FAA personnel retained various component parts of the tail rotor assembly for future examination.

On April 26, 2004, representatives from the FAA's Rotorcraft Directorate Division, Rotorcraft Standards Staff, Forth Worth, Texas, supervised an examination of various parts of the tail rotor assembly. The examination was conducted by representatives of the Bell Helicopter Textron Incorporated (BHTI) field investigations laboratory in Euless, Texas. Components received for examination included the tail rotor hub, crosshead, retention nut, slider and supporting hardware.
According to the NTSB Materials Laboratory, Washington, D.C., an examination of the tail rotor slider revealed that the lugs were separated from the body due to fatigue. One of the fracture faces, the primary fracture, was highly polished from the fracture faces rubbing together, indicating cracking had been present for some time. The primary fatigue fracture was in the lug-to-barrel radius and had multiple origins where the radius became tangent with the barrel. The origins were in rough machining marks. The fatigue cracking grew through to the splines on the inside diameter and finally fractured in overload. The fatigue fracture had an overall

length of 1.4 inches (30 mm). The secondary fatigue fracture in the other lug had multiple origins in reverse bending where the radius became tangent with the lug, with the origins in rough machining marks. The fatigue grew 0.12 inch (3.0 mm) in the lug from the radius side and 0.04 inch (1.0 mm) into the lug from the other side. The fatigue cracking grew through the lug thickness. The lug's thicknesses were within limits. The surface roughness of the fractured slider was also within limits.

The general lug-to-barrel radius was 0.170 inch (4.32 mm), but the radius at the fatigue fracture was 0.060 (1.52 mm), due to the rough surface finish. The slider's hardness was over the appropriate specifications. A chemical analysis performed on the slider found it to be made of 4340 steel per Mil-S-5000 which was outside the appropriate standards. A metallurgical section near the primary origins showed a white-colored layer (decarburization) on the surface of the lug and into the radius. The layer was 0.001 inch (0.03 mm) deep and softer than the underlying material.

The cadmium plate on the primary fatigue fractured lug had an average thickness of 0.00096 inch (0.0244 mm). The cadmium plate average thickness on the secondary fatigue fractured lug was 0.00105 inch (0.0267 mm).

The operator of the helicopter advised that the company had purchased 6 tail rotor sliders from Strube, Incorporated, Marietta, Pennsylvania, on October 9, 2001. The operator maintained that the accident slider was one of the 6 purchased from Strube which was installed on October 23, 2001, in accordance with TM 55-1520-210-23-1.

At the time of the accident it was reported that the slider had accumulated a total time of 2,234.2 hours. The FAA inspector reported that the operator was keeping track of this slider's hours on a Historical Record Card. According to TM 55-1520-210-23-1, Table 1-8, Overhaul and Retirement Schedule, Change 41, page 1-111, the retirement interval listed for "Slider, Tail Rotor" was 3,000 hours.

In addition to the accident slider, the operator provided a second unused slider for examination. The operator stated that the unused slider was one of the 6 sliders the company purchased from Strube on October 9, 2001. Placed inside the barrel was a piece of paper with information that included United States government contract number which corresponded to Forest Scientific, of North Lindenhurst, New York, as the contractor. According to the Government Procurement History, in 1974 the United Stated government purchased 7,004 sliders from Forest Scientific. BHTI reported that it had no records indicating Forest Scientific Inc. was a BHTI approved vendor for manufacturing the slider.

The helicopter was released to the owner's representative on April 15, 2004.

Pilot Information

Certificate:	Airline transport; Commercial; Flight instructor	**Age:**	54,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	
Instrument Rating(s):	Airplane; Helicopter	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane single-engine; Helicopter	**Toxicology Performed:**	No
Medical Certification:	Class 2 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	May 5, 2003
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	February 3, 2004
Flight Time:	13435 hours (Total, all aircraft), 1800 hours (Total, this make and model), 10000 hours (Pilot In Command, all aircraft), 162 hours (Last 90 days, all aircraft), 58 hours (Last 30 days, all aircraft), 6 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Garlick	**Registration:**	N6257P
Model/Series:	UH-1H	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Restricted (Special)	**Serial Number:**	63-8807
Landing Gear Type:	Skid	**Seats:**	6
Date/Type of Last Inspection:	AAIP	**Certified Max Gross Wt.:**	9600 lbs
Time Since Last Inspection:		**Engines:**	1 Turbo shaft
Airframe Total Time:		**Engine Manufacturer:**	Lycoming
ELT:	Installed, not activated	**Engine Model/Series:**	T-53
Registered Owner:	Michael J. Ragenovich	**Rated Power:**	1400 Horsepower
Operator:	Skyline Helicopters	**Operating Certificate(s) Held:**	
Operator Does Business As:		**Operator Designator Code:**	SXHL

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:	Few	**Visibility**	10 miles
Lowest Ceiling:	Overcast / 4000 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	5 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	135°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.78 inches Hg	**Temperature/Dew Point:**	4°C / -1°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Liberty, WA	**Type of Flight Plan Filed:**	None
Destination:	Liberty, WA	**Type of Clearance:**	None
Departure Time:	13:00 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:**	47.237499,-120.641944

Administrative Information

Investigator In Charge (IIC):	Little, Thomas
Additional Participating Persons:	James P Black; Federal Aviation Administration; Spokane, WA
Original Publish Date:	August 11, 2011
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=58791