Aviation Investigation Final Report

Location:	COEUR D'ALENE, Idaho	**Accident Number:**	SEA96FA187
Date & Time:	August 12, 1996, 11:30 Local	**Registration:**	N97NW
Aircraft:	Garlick UH-1H	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	1 Serious
Flight Conducted Under:	Part 133: Rotorcraft ext. load		

Analysis

The aircraft, originally manufactured by Bell as a military helicopter, had received civil type certification under a different manufacturer. While conducting external load logging operations, the helicopter's vertical fin and tail rotor separated from the tail boom and the helicopter subsequently crashed. Postaccident investigation revealed that the left side of the forward vertical fin spar had a fatigue fracture originating at the first rivet hole above the intersection of the tail boom and the vertical fin. Between March and November 1996, two other similar helicopters (a Bell 205A-1 and a Garlick TH-1L) also crashed during external load operations after their vertical fins separated due to fatigue at the same location on the spar. An existing airworthiness directive (AD) on the Bell 205A-1, AD 71-21-02, contained procedures for checking the fracture area on these aircraft for cracks, but did not apply to any of the aircraft as the 205A-1 which crashed had modifications which exempted it from the AD, and the UH-1H and TH-1L were type-certificated as different make and model aircraft.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: Fatigue fracture of the left forward vertical stabilizer spar, resulting in loss of the vertical stabilizer and tail rotor and subsequent loss of control. A factor was insufficient applicability (by make and model) of an existing FAA airworthiness directive (AD 71-21-02) which mandated repetitive crack inspections in the area of the fracture.

Findings

Occurrence #1: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION
Phase of Operation: HOVER

Findings
1. (C) VERTICAL STABILIZER - FATIGUE
2. (F) INSUFFICIENT STANDARDS/REQUIREMENTS,AIRCRAFT - FAA(ORGANIZATION)
3. VERTICAL STABILIZER - SEPARATION
4. ROTOR SYSTEM,TAIL ROTOR - SEPARATION

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

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

Factual Information

HISTORY OF FLIGHT

On August 12, 1996, about 1130 Pacific daylight time, a Garlick UH-1H helicopter, N97NW, operated by Northwest Helicopters of Olympia, Washington under 14 CFR 133, was observed by witnesses to experience a structural failure in the vertical fin area of the tail boom while hovering during an external load operation being conducted approximately 4 miles north of Fourth of July Pass, east of Coeur d'Alene, Idaho. The helicopter subsequently entered an uncontrolled rotation and crashed. The aircraft was substantially damaged and the commercial pilot, its sole occupant, was seriously injured. Visual meteorological conditions existed and no flight plan had been filed.

Witnesses in the helicopter's operating area stated that the helicopter had just released its load and was hovering at 100 to 200 feet above ground level at the time of the malfunction. They stated that they observed the vertical fin lean to the right of the helicopter, and that the helicopter then began to spin to the right before crashing. The pilot, who sustained serious head injuries in the accident, did not furnish a statement to investigators.

The accident occurred during the hours of daylight at approximately 47 degrees 42 minutes North and 116 degrees 32 minutes West.

AIRCRAFT INFORMATION

The helicopter was originally manufactured by the Bell Helicopter Company in 1966 as a military UH-1D and was subsequently modified to UH-1H model specification by the U.S. military. It received FAA civil airworthiness certification in August 1994 as a restricted category aircraft under Garlick's FAA type certificate H13WE. The operator reported the airframe total time as 8,762.4 hours. Review of the aircraft maintenance records indicated compliance with all required inspections including FAA Airworthiness Directive (AD) 83-03-03, which mandates visual and X-ray inspections of certain areas of the tail boom at specified intervals.

WRECKAGE

FAA investigators who responded to the accident scene reported that the tail rotor, 90 degree gearbox, and vertical fin were separated from the tail boom as a unit. The separation point was approximately at the intersection of the vertical fin and tail boom, just aft of the 42-degree gearbox.

A follow-up examination of the helicopter wreckage was subsequently conducted at the

Northwest Helicopters facility in Olympia, Washington. Investigators from the NTSB, FAA, and Bell Helicopter Textron participated in this examination. This examination revealed a fracture of the left side vertical fin spar doubler at fin station 70.3 and tail boom station 206.17, to the left rear of the 42 degree gearbox. A series of three slashes to the aft portion of the airframe (one on the vertical fin, above the fracture location, and two to the tail boom forward of the fracture) were also observed, with associated cuts of the tail rotor drive shaft. No other evidence of preimpact abnormalities of the helicopter's airframe, engine, or systems was identified.

TESTS AND RESEARCH

The fractured left side vertical fin spar doubler was sent to Bell Helicopter Textron's field investigation laboratory in Fort Worth, Texas, for examination under the supervision of personnel from the NTSB's South Central Regional Office, Arlington, Texas. Bell Helicopter Textron's laboratory report of this examination stated that the vertical fin spar had fractured as a result of fatigue and overstress. The report stated that the fatigue cracking originated on the left side of the spar at the first rivet above the intersection of the tail boom with the vertical fin spar, and that the fatigue cracking had originated at the outside hole corner (where a burr was present) and on the outside surface.

ADDITIONAL INFORMATION

To visually inspect the vertical fin spar in the area where the fracture occurred, the 42-degree gearbox cover must be removed. AD 83-03-03, which is applicable to Garlick and other UH-1 restricted-category helicopters, directs inspections at stations forward and aft of the fracture location and does not pertain to the area of the tail boom where the fracture occurred.

On March 21, 1996, a Bell 205A-1 (a standard airworthiness category civil helicopter with a vertical fin of similar design to that of the UH-1H), N68HJ, crashed while conducting an external-lift operation at Grove Hill, Alabama after its vertical fin separated from the tail boom in the same location as the fracture on N97NW's tail boom (NTSB accident number ATL96LA068.) The NTSB determined the probable cause of that accident to be "fatigue failure of the vertical fin forward spar in an area that was not accessible to inspection", and also stated that guidance for inspection of the area where the fatigue occurred was insufficiently defined by the manufacturer. The FAA subsequently issued a General Aviation Airworthiness Alert pertaining to Bell models 204B, 205A, 205A-1, 205B, and UH-1 in the March 1997 issue of FAA Advisory Circular (AC) 43-16. In that alert, the FAA recommended "that operators pay special attention to the vertical fin spar cap and inspect the discrepant area before the first flight of each day until more effective corrective action is available."

FAA AD 71-21-02, which is applicable to Bell 205A and 205A-1 helicopters, mandates inspections of the subject rivet hole and surrounding area for cracks, along with replacement of the tail boom and vertical fin with an uncracked tail boom and vertical fin if cracks are found. These inspections include a visual check of the area before the first flight of each day,

which may be accomplished by the pilot, as well as a more detailed repetitive (100-hour) inspection which requires removal of the rivet and cleaning of paint from around the rivet hole and surrounding area. However, aircraft whose vertical fin forward spars have been modified per Bell Technical Bulletin 205-01-73-1 and Service Bulletin 205A-6 are exempt from the requirements of this AD. The Bell 205A-1 which crashed at Grove Hill, Alabama had been modified during original manufacture incorporating the applicable service bulletins, and was thus exempt from the AD requirements. AD 71-21-02 was also not applicable to the Garlick UH-1H, as the UH-1H is type-certificated as a different make and model aircraft and not as a Bell 205A or 205A-1.

On November 5, 1996, a Garlick TH-1L restricted-category former military helicopter, N465JR, also crashed during an external-load logging operation near Leavenworth, Washington (NTSB accident number SEA97LA025), after its vertical fin separated from the tail boom in the same location as the vertical fin separations on N68HJ and N97NW. In that accident, the pilot of the helicopter was fatally injured. Metallurgical examination of N465JR's fractured vertical fin spar at the NTSB Materials Laboratory, Washington, DC, again revealed a fatigue fracture of the spar. Approximately three weeks after the Leavenworth accident, on November 27, 1996, Garlick Helicopters Inc. (the type certificate holder for the UH-1H and TH-1L helicopters) issued a mandatory Alert Service Bulletin (No. UH1-96-04) on all UH-1B, UH-1E, UH-1L, TH-1L, HH-1K, UH-1H, UH-1F, UH-1P, and TH-1F helicopters certificated under type certificates H13WE, H5NM, H10NM, H12NM, and H3NM. This service bulletin specified inspection requirements for the vertical fin forward spar rivet hole area that were substantially identical to those contained in AD 71-21-02. As with the UH-1H, AD 71-21-02 does not apply to the Garlick TH-1L as the TH-1L is type-certificated as a different make and model aircraft and not as a Bell 205A or 205A-1.

The helicopter wreckage was released to Mr. Tracy Barrus of Barrus & Stiger, Bellevue, Washington, on June 11, 1997. Barrus & Stiger is the insurance adjuster firm representing Northwest Helicopters.

Pilot Information

Certificate:	Commercial	**Age:**	39,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--no waivers/lim.	**Last FAA Medical Exam:**	October 19, 1995
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	4930 hours (Total, all aircraft), 1730 hours (Total, this make and model), 160 hours (Last 90 days, all aircraft), 69 hours (Last 30 days, all aircraft), 5 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Garlick	**Registration:**	N97NW
Model/Series:	UH-1H UH-1H	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Restricted (Special)	**Serial Number:**	65-09823
Landing Gear Type:	Skid	**Seats:**	2
Date/Type of Last Inspection:	August 1, 1996 AAIP	**Certified Max Gross Wt.:**	9500 lbs
Time Since Last Inspection:	24 Hrs	**Engines:**	1 Turbo shaft
Airframe Total Time:	8763 Hrs	**Engine Manufacturer:**	Lycoming
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	T53-L-13B
Registered Owner:	REYNOLDS AVIATION INC.	**Rated Power:**	1400 Horsepower
Operator:		**Operating Certificate(s) Held:**	On-demand air taxi (135)
Operator Does Business As:	NORTHWEST HELICOPTERS INC.	**Operator Designator Code:**	WYFL

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:	Clear	**Visibility**	3 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	0°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:		**Temperature/Dew Point:**	21°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	4TH OF JUL PASS, ID	**Type of Flight Plan Filed:**	None
Destination:		**Type of Clearance:**	None
Departure Time:	06:30 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 Serious	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Serious	**Latitude, Longitude:**	47.589687,-116.909584(est)

Administrative Information

Investigator In Charge (IIC):	Nesemeier, Gregg
Additional Participating Persons:	DAVID C AVEY; SPOKANE , WA DALLES ST. JOHN; FT. WORTH , TX
Original Publish Date:	March 31, 1998
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=42287