



National Transportation Safety Board Aviation Accident Final Report

Location:	UMPQUA, OR	Accident Number:	SEA95LA110
Date & Time:	06/01/1995, 0905 PDT	Registration:	N27FL
Aircraft:	GARLICK TH-1L	Aircraft Damage:	Substantial
Defining Event:		Injuries:	1 Fatal
Flight Conducted Under:	Part 133: Rotorcraft Ext. Load		

Analysis

WITNESSES SAW THE HELICOPTER STRIKE ITS TAIL ROTOR ON A TREE WHILE ATTEMPTING TO LIFT A 3,000 POUND LOG SECTION USING A 150-FOOT LIFT LINE. THE TREE STRIKE DISABLED THE TAIL ROTOR, RESULTING IN LOSS OF DIRECTIONAL CONTROL. THE HELICOPTER SUBSEQUENTLY IMPACTED AT THE TOP OF A 150-FOOT-HIGH ROCK BLUFF, THEN SLID OFF THE BLUFF, COMING TO REST IN AN INVERTED ATTITUDE ON A 50 TO 60 PERCENT SLOPE ABOUT 250 FEET BELOW THE INITIAL IMPACT POINT.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: THE PILOT'S FAILURE TO MAINTAIN CLEARANCE WITH A TREE, RESULTING IN A TAIL ROTOR BLADE STRIKE ON THE TREE WHICH DISABLED THE TAIL ROTOR. CONTRIBUTING TO THE ACCIDENT WAS THE 150-FOOT-HIGH ROCK BLUFF.

Findings

Occurrence #1: IN FLIGHT COLLISION WITH OBJECT
Phase of Operation: MANEUVERING

Findings

1. OBJECT - TREE(S)
2. (C) CLEARANCE - NOT MAINTAINED - PILOT IN COMMAND
3. (C) ROTOR SYSTEM, TAIL ROTOR BLADE - BLADE STRIKE

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

Findings

4. (C) ROTOR SYSTEM, TAIL ROTOR - DISABLED
5. LOAD JETTISON - PERFORMED - PILOT IN COMMAND

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

Findings

6. (F) TERRAIN CONDITION - CLIFF

Factual Information

On June 1, 1995, approximately 0905 Pacific daylight time (PDT), N27FL, a Garlick-converted TH-1L former military helicopter, received substantial damage in an inflight collision with a tree and subsequent collision with terrain approximately 6 miles northwest of Umpqua, OR. The commercial pilot, the sole occupant of the restricted-category helicopter, was fatally injured. The helicopter was owned by Garlick Helicopters, Inc. and operated by Intermountain, Inc. The flight was an external-lift logging operation conducted under 14 CFR 133, originating from Myrtle Creek, OR. Visual meteorological conditions existed at the time of the accident, and no flight plan had been filed.

The operator stated in his report of the accident:

We started logging [at] approximately 5:30-6:00 AM.... After about 2 hours we shut the helicopter down to fuel and make a maintenance inspection. The fueling and walk around lasted about 30 minutes. We lifted off about 9:00 AM and resumed logging operations. Before the pilot made one lift (a log) the accident occurred.

...The terrain was very steep with rock outcroppings and 50-100 [foot] bluffs, slopes average 50-100 [percent].

The logging supervisor, who was working under the helicopter at the time of the accident and who hooked the choker (lifting harness) to the helicopter's 150-foot-long lift line, stated the following to the responding deputy:

...he had just rehooked the choker to the long line and started to move out of the way when the long line started falling out of the sky. [He] said he thought the pilot had accidentally released the long line. [He] said he heard a loud pop. He looked up and noticed that the helicopter was going into a spin. The helicopter rotated approximately 1/2 of a turn before impacting the ground. [He] said pieces flew everywhere as the helicopter slid over the bluff backwards.

Three witnesses who saw the accident from a vantage point approximately 3/4 to 1 mile east of, and several hundred feet below, the crash site reported the following to Douglas County sheriff's deputies:

...They saw the helicopter hovering near the trees. The tail rotor ran into the trees and sheared off. [They] saw the blades shear off and the helicopter went toward the river, slamming into the ground...The helicopter had started spinning, then went left side into the cliff.

The helicopter had been working on both sides of a large fir tree that was near the log it was trying to [lift.]

Investigators at the scene found the main wreckage on the slope approximately 250 feet below the point of initial ground impact (the top of a 150-foot-high rock bluff.) The wreckage was inverted and pointing downhill. The on-scene investigators spotted a section of tail rotor, along with freshly cut bare wood scars, in the tree adjacent to the pickup site. They also discovered sections of main rotor blade tip at the site of initial ground impact. The helicopter's lift line was hung up in the tree and was not attached to the helicopter; however, it was attached to the choker which was around a section of Douglas fir with dimensions given in the sheriff's report as approximately 5 feet 6 inches in diameter and 5 feet in length. This section

was one of eight 5-foot sections cut in the middle of a tree 144 feet 6 inches long. The sheriff's report noted that the choker was installed on the log in such a fashion as to cause the log to roll downhill once it was pulled free from the tree. The responding deputy stated in the report that he had inspected the cuts at each end of this log section and that the cuts had been made all the way through.

According to the sheriff's report, the logging supervisor stated to the responding deputy that he estimated the weight of the log section at 3,000 pounds. A separate calculation of the weight of the section, using the dimensions given above and specific gravity of commercial grade fir (0.36) obtained from an engineering reference source, yielded a section weight of 2,669 pounds. The gross weight of the helicopter, based on fuel loading of 700 pounds reported by the operator and a 3,000 pound log section, is estimated to have been approximately 9,200 pounds at the time of the accident. The Garlick Helicopters party representative to the investigation stated that the maximum load on the lift line is 4,000 pounds, and that the helicopter's maximum gross weight is 9,500 pounds.

A later examination of the wreckage at Specialty Aircraft, Inc. of Redmond, OR on June 29, 1995 revealed that both tail rotor blades were broken off approximately 1 to 2 feet out from the blade hinges. One blade was broken back in rounded fashion at approximately a 60-degree angle. The other was broken back squarely at a 90-degree angle. The 90-degree gearbox case was broken apart with the main portion remaining attached to the tail rotor hub and blades. The other portion remained with the tail boom. An exposed gear on this portion of the gearbox displayed machined-off teeth. The tail rotor drive shaft exhibited a torsional overstress deformation, and was fractured at the point of this deformation. The tail boom was buckled approximately 30 degrees toward the right about 3 feet forward of the tail rotor location.

Examination of the helicopter's maintenance history from April 10, 1995 until the accident revealed that the helicopter had experienced engine compressor stalls on two separate occasions. The first occurrence, on April 17, required three attempts to correct (change of fuel control, replacement of bleed band actuator, and a second change of fuel control) before the aircraft was returned to service on April 25. After the first two attempts, a technical-order compressor stall inspection was documented in the maintenance log. This inspection was not documented after the third attempt although a limited maintenance test flight was performed after the second fuel control change. The second occurrence took place on May 15, two weeks before the accident. This was written up as a compressor stall at full power. The corrective action for this was listed as "adjusted bleed band closure...." Between the last compressor stall and the accident, the helicopter underwent two 25-hour maintenance inspections, both of which incorporated engine operation tests. The aircraft maintenance records noted no engine operation anomalies from either of these two inspections.

The helicopter underwent four separate scheduled maintenance inspections between April 10 and the accident: a 25-hour inspection on May 3 at 9,400.6 hours, a Phase AB inspection on May 10 at 9,419.5 hours, a 25-hour inspection at 9,443.8 hours (date unspecified), and a 25-hour inspection at 9,470.4 hours. Some steps in the Phase AB inspection checklist had not been signed, including: notes regarding 90- and 42-degree gearbox oil changes; tail rotor drive shaft covers; hydraulic fluid sampling; note regarding hydraulic fluid replacement; main fuel filter; tail rotor hub and blade; and tail rotor driveshaft.

A table in the maintenance records dated May 1, 1995 indicated that the number 1 hanger bearing, which supports the tail rotor driveshaft, had 79 hours of service left. Between May 1

and May 31, maintenance records indicated the helicopter flew 107.3 hours. The tail rotor driveshaft bearings were signed off as "insp[ected and] found O.K." on the May 10 Phase AB inspection. Maintenance records indicate the tail rotor hanger assemblies have a 1,200 hour service life. The Garlick party representative provided technical data which indicates that exceeding service life by up to 10 percent is allowable.

Representatives from the NTSB and Allied Signal Engines conducted a teardown of the T53-13B engine at Specialty Aircraft, Inc., Redmond, OR, on June 29, 1995. During the teardown, investigators were able to rotate both N1 and N2 sections of the engine freely. The bleed band actuator assembly was tested using 50 p.s.i. shop air and found to function normally.

Movement of variable inlet guide vanes was also normal the entire way around the case. Dirt and grass were packed into the top half of the engine intake. The leading compressor stages contained dirt and foreign object damage around the entire disc. Dirt deposits and foreign object damage decreased progressively from intake to exhaust stages of the engine. The turbine outlet contained a uniform dirt deposit around the outer diameter of the entire disc. All 5th stage compressor blades were curled back about 90 degrees at about mid-blade length. An apparent crack was noted in a bolt hole on the inner liner of the top half of the compressor case at the 5th stage. The bolt head at this hole had been sheared off. The compressor case top half was shipped to the NTSB Materials Laboratory in Washington, DC for examination of the suspected crack. The Materials Laboratory reported that the irregularity was an impact mark, where a rotating compressor blade had apparently dug in and come to a stop, rather than a crack. The compressor case top half was later shipped to AlliedSignal Engines in Phoenix, AZ for further examination. This examination, conducted under supervision of the FAA, noted chipped paint, marks, and a deformed mounting bolt head on the exterior of the compressor case in the area of the 5th stage rub strip impact mark. AlliedSignal characterized this damage to the case exterior as impact damage, stating in its report on its examination:

...it is more apparent that the compressor case received a significant impact in the area of the attachment bolt, depressing the case and the 5th stage rub strip radially inward. When this occurred, the 5th stage blades came in solid contact with the rub strip and were folded over during rundown.

Thus, the damage observed on the 5th stage blades is consistent with impact damage, most likely occurring during the crash.

Investigators removed the fuel control unit from the engine during the teardown and shipped it to the manufacturer, Chandler- Evans Control Systems Division of West Hartford, CT, for a functional test. This unit was found to be functional although not meeting some performance specifications required of a new fuel control unit before shipment from the manufacturer. Chandler-Evans also reported that certain field adjustments appeared to have been made to the unit, including lowering of the governor cut-in speed.

The 42-degree gearbox was examined at the NTSB office in Seattle, WA. It appeared externally intact on visual examination. The shaft rotated freely but was slightly bent out of true.

An autopsy and toxicology tests on the pilot revealed no evidence of pilot impairment or incapacitation.

Pilot Information

Certificate:	Commercial	Age:	50, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	Seat Occupied:	Left
Other Aircraft Rating(s):	Helicopter	Restraint Used:	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	Yes
Medical Certification:	Class 2 Valid Medical--no waivers/lim.	Last FAA Medical Exam:	03/07/1995
Occupational Pilot:	Last Flight Review or Equivalent:		
Flight Time:	8628 hours (Total, all aircraft), 384 hours (Total, this make and model), 6188 hours (Pilot In Command, all aircraft), 204 hours (Last 90 days, all aircraft), 84 hours (Last 30 days, all aircraft), 5 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	GARLICK	Registration:	N27FL
Model/Series:	TH-1L TH-1L	Aircraft Category:	Helicopter
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Restricted	Serial Number:	6439
Landing Gear Type:	Skid	Seats:	6
Date/Type of Last Inspection:	05/28/1995, 100 Hour	Certified Max Gross Wt.:	9500 lbs
Time Since Last Inspection:	24 Hours	Engines:	1 Turbo Shaft
Airframe Total Time:	9492 Hours	Engine Manufacturer:	LYCOMING
ELT:		Engine Model/Series:	T53-13B
Registered Owner:	GARLICK HELICOPTERS	Rated Power:	1400 hp
Operator:	SCHUYLER, SID	Operating Certificate(s) Held:	
Operator Does Business As:	INTERMOUNTAIN, INC.	Operator Designator Code:	12ML

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:	RBG, 525 ft msl	Distance from Accident Site:	14 Nautical Miles
Observation Time:	0846 PDT	Direction from Accident Site:	118°
Lowest Cloud Condition:	Clear / 0 ft agl	Visibility	30 Miles
Lowest Ceiling:	None / 0 ft agl	Visibility (RVR):	0 ft
Wind Speed/Gusts:	Calm /	Turbulence Type Forecast/Actual:	/
Wind Direction:		Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29 inches Hg	Temperature/Dew Point:	18° C / 9° C
Precipitation and Obscuration:			
Departure Point:	MYRTLE CREEK, OR (16S)	Type of Flight Plan Filed:	None
Destination:		Type of Clearance:	None
Departure Time:	0000	Type of Airspace:	Class G

Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Substantial
Passenger Injuries:	N/A	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	1 Fatal	Latitude, Longitude:	

Administrative Information

Investigator In Charge (IIC):	GREGG NESEMEIER	Report Date:	12/19/1995
Additional Participating Persons:	DAVID D JOURDAN; HILLSBORO, OR JERRY SWANSON; HAMILTON, MT WILLIAM G GUDE; PHOENIX, AZ RUSSELL V COMSTOCK; W. HARTFORD, CT		
Publish Date:			
Investigation Docket:	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at pubinq@ntsb.gov , or at 800-877-6799. Dockets released after this date are available at http://dms.nts.gov/pubdms/ .		

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The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).