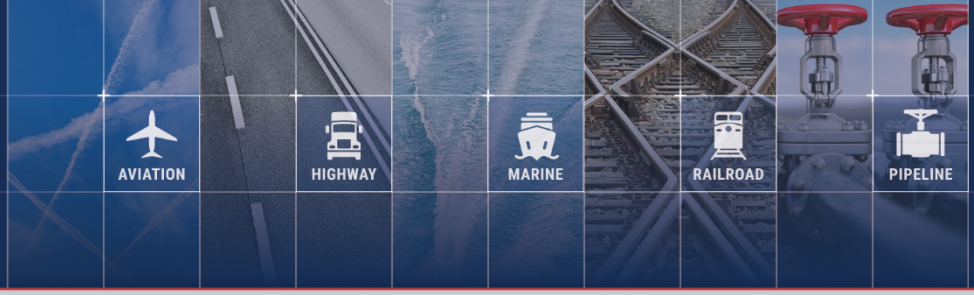

Aviation Investigation Final Report

Location:	Santa Barbara, California	**Accident Number:**	WPR10TA318
Date & Time:	June 24, 2010, 15:30 Local	**Registration:**	N205KS
Aircraft:	Bell UH-1H	**Aircraft Damage:**	Substantial
Defining Event:	Sys/Comp malf/fail (non-power)	**Injuries:**	5 None
Flight Conducted Under:	Public aircraft		

Analysis

The helicopter experienced a structural failure in one of the tailboom attach fittings while hovering near a cliff, about 200 feet above ground level (agl). The pilot heard a loud sound and felt the helicopter yaw slightly. He made a precautionary landing without incident. A postaccident examination of the helicopter revealed the left tailboom upper attachment fitting had fractured as a result of fatigue. The fatigue origin most likely emanated from fretting and/or corrosion pits at the fastener to fitting interface. There was no engineering data showing how the combination of the multiple STC modifications of the helicopter affected the helicopter's structural integrity.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The failure of left tailboom upper attachment fitting as a result of fatigue.

Findings

Aircraft	Rotorcraft tail boom - Failure

Factual Information

History of Flight

Maneuvering-hover	Sys/Comp malf/fail (non-power) (Defining event)

HISTORY OF FLIGHT

On June 24, 2010, about 1530 Pacific daylight time, a Bell UH-1H, N205KS, experienced a structural failure in the tailboom at Lake Cachuma in Santa Barbara, California. The helicopter was being operated by the Santa Barbara County Fire Department, as a public-use flight. The two commercial pilots and three passengers were not injured; the helicopter sustained substantial damage. The training flight originated from Santa Ynez, California, about 1000, and was staged at campground adjacent to the lake, where it departed from throughout the day. Visual meteorological conditions prevailed, and no flight plan was filed.

During a telephone conversation with a Safety Board investigator, the pilot-in-command (PIC) stated that they departed the staging area about 1500 to a cliff at the north area of the lake for the purpose of training rescue personnel. While hovering near the cliff, about 200 feet above ground level (agl), the PIC heard a loud sound and felt the helicopter yaw slightly. He made a precautionary landing without incident. A precursory post-landing examination revealed that the left tail boom upper attachment fitting (part number 205-031-821-1) was fractured.

AIRCRAFT INFORMATION

The aircraft was a Bell UH-1H, serial number 9526/67-17328. According to the operator, the airframe had accumulated a total time in service of 13,609.1 hours. The helicopter was maintained on an Approved Airworthiness Inspection Program (AAIP); the most recent inspection was completed on June 16, 2010. The helicopter was modified with numerous supplemental type certificates (STCs) that included an upgraded engine (Honeywell T58-L-703), FastFin system, strakes, and composite tail rotor blades (positioned on the left side of the airframe).

The maintenance records indicated that the tailboom's upper skin was replaced on January 17, 2007, when the FastFin was installed in conjunction with the STC. The only two accidents recorded were in 1971 where the helicopter sustained major damage to stress panels and the airframe in Vietnam and in 1973, the helicopter experienced a hard landing necessitating the replacement of the skid cross tubes.

TESTS AND RESEARCH

The failed fitting was sent to the National Transportation Safety Board Materials Laboratory for

examination. The complete examination report is contained in the public docket for this accident.

An examination of the aft face of the upper left longeron attach fitting revealed the fracture intersected two rivet holes. The aft face of the fracture contained crack arrest features typical of fatigue cracking that emanated from the upper rivet hole. The longeron was attached by rivets to the upper left fitting. A layer of adhesive that contained scrim cloth was found between the longeron and fitting, indicating that the longeron also was adhesive bonded to the fitting. Examination of the rivets revealed that the fracture faces contained mechanical damage; there was no evidence of corrosion damage.

Bell never performed fatigue analysis on the fitting or surrounding structure and no other fatigue analysis data could be located. Bell additionally had no other design load data available that related to the fitting. A Safety Board structures engineer confirmed that the static strength was congruent to that of the manufacturer's.

ADDITIONAL INFORMATION

Previous Anomalies

A representative from Select Aviation Services, Inc., a company that performs overhauls and refurbishes UH-1H type helicopters, stated that the company had seen numerous failures of the left longeron fittings, one of which was completely cracked through, similar to the accident helicopter. That crack that resulted in a full failure occurred during maintenance when personnel were torquing the fittings. They discovered it occurred due to an improper repair on the fitting and that it was preloaded. The only other cracks (not failures) were aft of this fitting.

The representative further stated that that the main causes for such cracks have been traced back to the following:
-The longeron mounting pads must be shimmed correctly when the tailboom is attached. If there is a misalignment in the pads, or unequal torquing when attached, a failure of the left longeron can occur. This is because it is the most load bearing area by design, since it is subjected to the most torque.
-Operators will often use improper torquing maintenance for the mounting pads; they should be retorqued after the first flight, after 8 hours and after 10 hours.
-When attaching the tailboom many operators will attempt to use personnel to help align the fuselage and tailboom, which can be difficult to properly fit. This process can be awkward with people attempting to get the proper fit.
-The bolts attaching the mounting pads are shimmed with washers in an effort to assure proper fit, where the butt does not contact the skin. If not installed correctly the bolt will contact the skin and give the pad incorrect alignment.
-Placing the helicopter on a trailer for even a short duration can inflict loads on the helicopter that it was not designed for (e.g., shock from the skids to main rotor blades, repetitive flex loading on the tailboom when it is unloaded, etc.).

STCs

There was no engineering data showing how the combination of the STCs affected the helicopter's structural integrity, nor does the Federal Aviation Administration require the engineering work to be done by the STC holder. Rather, the installer of an STC is required to determine the interrelationship between multiple STCs.

Information

Certificate:	Commercial; Private	**Age:**	65,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Glider; Helicopter	**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	March 1, 2010
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	March 8, 2010
Flight Time:	12760 hours (Total, all aircraft), 12200 hours (Pilot In Command, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Bell	**Registration:**	N205KS
Model/Series:	UH-1H	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Unknown	**Serial Number:**	9526
Landing Gear Type:	Skid	**Seats:**	5
Date/Type of Last Inspection:	Condition	**Certified Max Gross Wt.:**	
Time Since Last Inspection:		**Engines:**	1 Turbo shaft
Airframe Total Time:	13609 Hrs	**Engine Manufacturer:**	Honeywell
ELT:	Installed, not activated	**Engine Model/Series:**	T53-L-703
Registered Owner:	USDA FOREST SERVICE FEPP	**Rated Power:**	
Operator:	Santa Barbara County Fire	**Operating Certificate(s) Held:**	None

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**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:		**Temperature/Dew Point:**	21°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Santa Barbara, CA	**Type of Flight Plan Filed:**	None
Destination:	Santa Barbara, CA	**Type of Clearance:**	None
Departure Time:		**Type of Airspace:**	

Wreckage and Impact Information

Crew Injuries:	2 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	3 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	
Total Injuries:	5 None	**Latitude, Longitude:**	34.578887,-119.947776(est)

Administrative Information

Investigator In Charge (IIC):	Keliher, Zoe
Additional Participating Persons:	Victor Goodell; Federal Aviation Administration; Van Nuys, CA
Original Publish Date:	September 19, 2011
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=76483