Aviation Investigation Final Report

Location:	Las Vegas, Nevada	**Incident Number:**	LAX04IA133
Date & Time:	February 19, 2004, 17:59 Local	**Registration:**	N358NT
Aircraft:	Eurocopter AS 350B	**Aircraft Damage:**	Minor
Defining Event:		**Injuries:**	6 None
Flight Conducted Under:	Part 135: Air taxi & commuter - Non-scheduled - Sightseeing		

Analysis

The helicopter experienced an in-flight loss of tail rotor control due to the fatigue fracture and failure of the tail rotor pitch change lever (SN MA 3671). The purpose of this part is to translate forward and aft movement from the tail rotor controls to change the pitch of the tail rotor. The operator had removed the component from the helicopter prior to the arrival of Federal Aviation Administration inspectors, and so the condition of the part as installed could not be determined. Following the incident, the operator discovered a crack on an additional lever (SN MA 3010) in their fleet. The Safety Board Materials Laboratory determined that the fatigue cracks in the two levers were not due to material or manufacturing defects, but were caused by improper installation of the component on the tail rotor gear box. Service Bulletin (SB) No. 65.00.42 was issued in response to cracks found in other levers where the cracks were determined to have been caused by improper installation of the tail rotor gear box pitch control lever bolt. The condition of the incident lever and the second one were found to be identical to the prior cases that triggered the issuance of the service bulletin. The tail rotor gearbox assembly had 3,148.5 hours. The lever is an on-condition part, which is inspected during overhaul of the tail rotor gear box. The overhauls are completed at a normal interval of 3,000 hours; the manufacturer allows a tolerance of 10 percent over the recommended overhaul schedule. When the tail rotor gearbox assembly was submitted for overhaul, a tail rotor pitch change lever different from the one involved in the incident was submitted for inspection. There are no tracking requirements on this part and the time and history of the tail rotor pitch change lever involved in the incident could not be determined.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this incident to be: the tail rotor pitch change lever failed in fatigue due to improper installation by company

maintenance personnel.

Findings

Occurrence #1: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION
Phase of Operation: CRUISE - NORMAL

Findings
1. (C) MISC ROTORCRAFT - FATIGUE
2. (C) MAINTENANCE,INSTALLATION - IMPROPER - COMPANY MAINTENANCE PERSONNEL
3. MAINTENANCE,SERVICE BULLETIN/LETTER - NOT COMPLIED WITH - COMPANY MAINTENANCE PERSONNEL

Factual Information

On February 19, 2004, at 1759 Pacific standard time, a Eurocopter AS 350B, N358NT, experienced an in-flight loss of tail rotor control about 15 miles from the McCarran International Airport, Las Vegas, Nevada. Heli USA Airways, Inc., also the registered owner, was operating the helicopter under the provisions of 14 CFR Part 135. The commercial pilot and five passengers were not injured; the helicopter sustained minor damage. The flight departed the Grand Canyon Airport, Grand Canyon, Arizona, at 1715, for the on-demand air tour flight. Visual meteorological conditions prevailed, and a company flight plan was in effect.

Federal Aviation Administration (FAA) inspectors responded to the operator's facility to examine the helicopter. Prior to their arrival, the tail rotor pitch change lever had been removed from the helicopter so its condition as installed could not be determined by the inspectors.

Post accident examination revealed that the tail rotor pitch change lever (SN MA 3671) fractured. The purpose of this part is to translate forward and aft movement from the tail rotor controls to change the pitch of the tail rotor. Following the accident, the operator discovered a crack on an additional lever (SN MA 3010). Both the incident lever and the lever discovered following the incident were submitted to the National Transportation Safety Board Materials Laboratory for examination.

According to the metallurgist, the incident lever was fractured at the transition between the short arm clevis and the I-beam section. The origin area for the primary fatigue crack was located on the lower inboard portion of the arm. Two additional origins were observed on both upper corners of the arm. No evidence of material defects or mechanical damage was observed on the exterior surface in the vicinity of the origin area for the primary fatigue crack, and the primary origin area itself contained multiple initiation sites on the surface. Energy dispersive spectroscopy (EDS) analysis of the fracture surface revealed a composition consistent with aluminum alloy 2618, with the addition of sulfur, carbon, and oxygen. The hardness of the material was consistent with specified requirements. On the short arm clevis significant wear was observed on internal surfaces of both of the lugs. On the long arm clevis significant wear was observed on the inside surfaces of the lugs, preferentially on the left side of the lower lug, and to a much less degree on the right side of the upper lug.

The cracked lever was cracked in the lower inboard corner to an approximate depth of 0.2 inch. This was in a similar location and orientation to the origin area portion of the primary crack on the fractured lever. The crack contained features similar to the origin area portion of the primary crack on the other lever, with flat features in a plane perpendicular to the surface with a thumbnail shape indicative of fatigue. Scanning electron microscope (SEM) analysis of the fracture surface showed that the crack initiated from the surface with multiple individual origin sites where no material or mechanical defects were observed. The EDS analysis

revealed a spectrum consistent with 2618 aluminum with the addition of sulfur, carbon, oxygen, potassium, and calcium. The hardness of the material was consistent with specified requirements. On the short arm clevis minor wear was observed on the internal surfaces of both of the lugs. On the long arm clevis significant wear was observed on the inside surfaces of both of the lugs, with preferential wear on the left side of the lower lug and on the right side of the upper lug.

According to the manufacturer, the total time on the helicopter was 9,915.6 hours. The tail rotor gearbox assembly had 3,148.5 hours. The lever is an on-condition part, which calls for inspection during the overhaul. The overhauls are completed at a normal interval of 3,000 hours; the manufacturer allows a tolerance of 10 percent over the recommended overhaul schedule.

The lever is a component of the tail rotor gear box assembly. Although it does not have an hourly life-limit, the part is to be inspected at the overhaul of the tail rotor gear box assembly. If the lever passes the inspection, it remains with the assembly. If the lever does not pass the inspection, it is replaced. There is currently no hourly tracking requirement for the lever, nor is there guidance from Eurocopter regarding interchanging the lever.

The tail rotor gearbox assembly was overhauled by Acro Aerospace, Inc., on July 19, 2001. A tail rotor pitch change lever (SN MA 1901) was submitted for overhaul with the assembly. This lever was not the lever involved in the incident.

On October 7, 2003, Eurocopter issued Service Bulletin (SB) No. 65.00.42. The SB was issued as a result of two cases of cracked pitch control bellcranks having been discovered in service with the same operator. The cracks were formed due to improper installation of the tail rotor gear box pitch control lever bolt. Compliance with the SB was to be noted on the tail rotor gear box equipment log card. The record of compliance with the SB was not recorded on the tail rotor gear box equipment log card.

In Eurocopter literature reviewed by the Safety Board investigator-in-charge, the lever was identified by three different names. In the Illustrated Parts Catalog, it is called a lever. In the Airworthiness Limitations, it is called a blade horn. In SB 65.00.42 it is called a bellcrank. In the Illustrated Parts Catalog, the lever is listed directly below the tail rotor gear box and is specified as a sub-assembly through the use of a marking to the left of the word "lever." In the Master Servicing Recommendations, it states that the tail rotor gearbox is to be overhauled every 3,000 hours. On the airworthiness limitations, page it states "INF" for the blade horn, which indicates that the part has an infinite life.

Pilot Information

Certificate:	Commercial; Flight instructor	**Age:**	34,Male
Airplane Rating(s):	None	**Seat Occupied:**	Right
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	
Instrument Rating(s):	Helicopter	**Second Pilot Present:**	No
Instructor Rating(s):	Helicopter; Instrument helicopter	**Toxicology Performed:**	No
Medical Certification:	Class 1 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	November 1, 2003
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	December 1, 2003
Flight Time:	1932 hours (Total, all aircraft), 475 hours (Total, this make and model), 1852 hours (Pilot In Command, all aircraft), 206 hours (Last 90 days, all aircraft), 71 hours (Last 30 days, all aircraft), 6 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Eurocopter	**Registration:**	N358NT
Model/Series:	AS 350B	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	1016
Landing Gear Type:	Skid	**Seats:**	7
Date/Type of Last Inspection:	February 18, 2004 100 hour	**Certified Max Gross Wt.:**	4630 lbs
Time Since Last Inspection:	8.8 Hrs	**Engines:**	1 Turbo shaft
Airframe Total Time:	4426.6 Hrs at time of accident	**Engine Manufacturer:**	Turbomeca
ELT:	Installed, not activated	**Engine Model/Series:**	Aeriel 1B
Registered Owner:	Heli USA Airways, Inc.	**Rated Power:**	650 Horsepower
Operator:	HELI USA INC	**Operating Certificate(s) Held:**	On-demand air taxi (135)
Operator Does Business As:		**Operator Designator Code:**	H6UA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Night
Observation Facility, Elevation:	LAS,2181 ft msl	**Distance from Accident Site:**	
Observation Time:	17:56 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Scattered / 10000 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	Broken / 25000 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	7 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	290°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.96 inches Hg	**Temperature/Dew Point:**	17°C / -2°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Grand Canyon, AZ (KGCN)	**Type of Flight Plan Filed:**	Company VFR
Destination:	Las Vegas, NV (LAS)	**Type of Clearance:**	VFR
Departure Time:	17:15 Local	**Type of Airspace:**	Class B

Airport Information

Airport:	McCarran International Airport LAS	**Runway Surface Type:**	Asphalt
Airport Elevation:	2181 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	1L	**IFR Approach:**	None
Runway Length/Width:	9765 ft / 150 ft	**VFR Approach/Landing:**	Precautionary landing

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Minor
Passenger Injuries:	5 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	6 None	**Latitude, Longitude:**	36.080276,-115.152221

Administrative Information

Investigator In Charge (IIC):	Petterson, George
Additional Participating Persons:	Carlos Flores; Federal Aviation Administration; Las Vegas, NV Joe Syslo; American Eurocopter; Grand Prarie, TX
Original Publish Date:	January 31, 2006
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=58788