



# National Transportation Safety Board

Washington, D.C. 20594

## Safety Recommendation

Log # 2597

Adopted 5/3/96

Date: May 14, 1996

In reply refer to: A-96-8

ST-1

Honorable David R. Hinson  
Administrator  
Federal Aviation Administration  
Washington, D.C. 20591

On April 4, 1996, at 1019 eastern standard time, a Bell 206L-1 helicopter, N79SP, owned and operated by the West Virginia State Police, was destroyed as a result of an in-flight break-up and collision with terrain, 2.5 miles west of the Yeager Airport, Charleston, West Virginia. The commercial pilot and passenger were fatally injured. Visual meteorological conditions prevailed for the positioning flight that originated at the Yeager Airport at 1016. No flight plan had been filed for the flight conducted under 14 CFR Part 91.

Witnesses observed the helicopter in level flight, about 300 feet above a hill. The witnesses stated that they observed something depart from the tail of the helicopter, followed by the helicopter entering a spin and descending into trees. The main rotor separated from the helicopter in flight, and the helicopter struck the ground inverted. A fire erupted after the helicopter struck the ground.

Examination of the wreckage revealed that the tail assembly, which included the vertical stabilizer, and the tail rotor gear box and blades had separated from the tail boom. The tail assembly was located along the helicopter's flight path about 450 feet preceding the main wreckage.

Examination of the tail boom at the Safety Board's materials laboratory disclosed evidence of preexisting cracking. The cracking probably initiated in the tail boom skin at the nutplate<sup>1</sup> rivet attachment for the most forward bolt that fastens the gearbox fairing to the tail boom on the left side of the helicopter. This attachment is close to the aft left quick release fastener that attaches the tail rotor driveshaft cover to the tail boom skin.

<sup>1</sup> A nutplate is a small threaded attachment that is riveted to sheet metal that acts as a nut for a bolt attachment.

In the area of the separation, the tail boom is made of two semicircular pieces of skin that are overlapped and longitudinally riveted. Looking forward, one piece of the tail boom skin extends from about the 7:30 o'clock position to about the 1:30 o'clock position along the left and top surface of the boom and is referred to as the top skin section. There was extensive rubbing of the tail boom skin from both the gearbox fairing and the tail rotor driveshaft cover on the left upper side of the tail boom. The tail boom fractures in this area were flat and transverse, indicative of fatigue fracture planes. However, extensive rubbing and oxidization obliterated the original fracture features. Farther away from the rubbed areas were indications of fatigue fracture in the skin. Fatigue cracking was limited to the top skin portion of the tail boom skin on the left side, with probable fatigue propagation 4 to 5 inches in opposite circumferential directions from the fairing fastener nutplate location.

Since the mid-1980s, cracks in the tail boom have been reported by the operators of the 206L (Long Ranger) series. Bell Helicopter Textron (BHT) Alert Service Bulletin (ASB) 206L-87-47 was issued by BHT on August 12, 1987, and subsequently revised, to inspect the tail booms of the Bell 206L, 206L-1, and 206L-3 helicopters. The ASB was issued after BHT received several reports of severe upper skin cracks in tail booms in the area of the aft most drive shaft cover retention clip. The ASB also stated that failure to locate and repair skin damage on tail booms "could result in tail boom failure."

ASB 206L-87-47 listed the compliance requirements in three parts. Part I described the modification required to the tail boom. Part II described the interim inspection of unmodified tail booms every 50 flight hours, and Part III described the inspection of the field-modified tail booms to be accomplished every 100 flight hours.

A review of the maintenance records for N79SP revealed that it had been modified<sup>2</sup> in accordance with the ASB Revision "C" on December 20, 1989, and received regular maintenance in accordance with the manufacturer's annual and 100-hour inspection programs. The helicopter received its last annual inspection in July 1995 and last 100-hour inspection in November 1995, at an airframe total time of 2,790.4 hours. At the time of the accident the aircraft had accumulated an estimated 2,898 airframe hours, about 108 hours since the last 100-hour inspection.

The Bell 206 Jet Ranger series of helicopters was first produced in 1967, and there are over 8,000 in use worldwide in various models. The Bell 206L (Long Ranger) has been in production since 1975, of which there are about 1,575 currently in service worldwide. The major extension of the model 206L helicopter, compared to the original 206, occurred in the area of the fuselage where the cabin was stretched. The aft portion of the tail boom design remained the same as the original 206, with a slight extension added to the tail boom where it attached to the main fuselage.

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<sup>2</sup> Addition of a doubler in the area forward of the separation point. Examination of the accident tail boom showed that this doubler had been added. The fatigue cracking was not in the area of this doubler.

A typical 206 Jet Ranger has a factory empty weight of less than 1,600 pounds, with a maximum gross weight of 3,000 pounds. The 206L-1 has a much heavier empty weight of 2,156 pounds, and an increased maximum gross weight of 4,150 pounds. The 206L has become popular with commercial operators due to its increased engine power and gross weight, while still retaining its basic design.

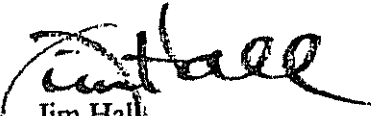
In recent years, television stations have added stabilized cameras, and police departments have added spotlights and forward looking infrared units. These types of installations typically require the helicopter to operate at or near its maximum gross weight at all times, and many times the missions require the aircraft to hover out of ground effect. This type of maneuvering at or near maximum gross weight requires maximum power and concurrently maximum anti-torque application, which significantly increases the stress on the tail boom. The left side of the boom receives the highest tensile stress from normal anti-torque loads produced by the tail rotor, and the top of the tail boom is normally in tension as a result of the weight of the tail rotor assembly. These forces result in maximum tension in the area of the left upper portion of the tail boom, making this area more susceptible to initiation of fatigue cracking.

BHT is aware of the tail boom cracking and has recommended modification to existing helicopters. The manufacturer also instituted production changes to later model L series helicopters by placing doublers (reinforcement sheets riveted to the skin) in areas where cracking has been found to occur in service. As previously indicated, one cracking area was just forward of the failure area on the accident helicopter, and examination showed that the accident aircraft tail boom had been modified with this doubler. This forward doubler did not include the failure area on the accident helicopter; however, representatives of BHT indicated that 206L-3 models having S/N 51284 or higher and all 206L-4 models have doublers incorporated in production that cover the failure area.

The Safety Board believes that the 206L, L-1, and L-3 models that do not include a doubler in the gearbox fairing attachment area of the tail boom are susceptible to premature fatigue cracking, and that there is a need to immediately and periodically inspect the tail boom to prevent these cracks from becoming critical and causing tail boom failure in flight. Based on 108 hours flown since the last inspection of the accident helicopter, the current 100-hour inspection interval does not appear to be adequate to detect cracks in time. A tail boom failure in flight will result in a dramatic change in the center of gravity and loss of control, which will likely result in a loss of life. To reduce the possibility of additional tail boom separations, the National Transportation Safety Board recommends that the Federal Aviation Administration:

Issue an emergency Airworthiness Directive for Bell Helicopter Textron 206L, L-1, and L-3 model helicopters that do not have doublers in the gearbox fairing attachment areas to require immediate and recurring inspections for cracks in the tail boom in the areas specified in Bell Helicopter Textron Alert Service Bulletin 206L-87-47, with inspection intervals to be no more than 50 hours. (Class I, Urgent Action) (A-96-8)

Chairman HALL, Vice Chairman FRANCIS, and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred in this recommendation.

  
By Jim Hall  
Chairman