



# National Transportation Safety Board

Washington, D.C. 20594

## Safety Recommendation

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**Date:** January 9, 2006

**In reply refer to:** A-05-36 and -37

Honorable Marion C. Blakey  
Administrator  
Federal Aviation Administration  
Washington, D.C. 20591

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On May 4, 2004, about 1820 eastern daylight time, a Eurocopter AS-350BA helicopter, N4NY, operated by Helinet Aviation Services as WNBC News Chopper 4, was destroyed when it impacted residences in Brooklyn, New York, following the loss of hydraulic system power while hovering.<sup>1</sup> The certificated commercial pilot and a passenger sustained serious injuries, and one passenger sustained minor injuries. Visual meteorological conditions prevailed and no flight plan had been filed for the local 14 *Code of Federal Regulations* Part 91 flight, which departed Teterboro Airport (TEB), Teterboro, New Jersey.

During a postaccident interview, the pilot stated that he recalled hovering at 1,000 to 1,200 feet before the accident and had no specific recollection of the beginning of the accident sequence. He reported that his first memory of the event was of the helicopter in an extreme nose-down position and that, in response, he pulled aft on the cyclic,<sup>2</sup> which caused the helicopter to pitch up. He stated, however, that he felt that the helicopter was not responding to his control inputs “the way it should be” and that he attempted to land on a roof. He did not recall observing any warning lights or hearing any audible warnings.<sup>3</sup>

The National Transportation Safety Board’s investigation determined that the hydraulic pump<sup>4</sup> drive belt (part number [P/N] 704A33690004)<sup>5</sup> failed in flight, approximately 160 flight

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<sup>1</sup> The description for this accident, NYC04FA117, can be found on the National Transportation Safety Board’s Web site at <<http://www.nts.gov>>.

<sup>2</sup> The cyclic changes the pitch of the blades, causing the lift to vary across the plane of the rotor disk, causing the rotor system to tilt and the helicopter to pitch up and down and roll left and right.

<sup>3</sup> A loss of hydraulic system pressure will cause the illumination of the red “HYD” warning light on the front instrument panel’s warning caution advisory panel and produce a continuous tone from the warning horn. During postaccident interviews, the passenger seated in the left seat stated that he heard a warning horn and observed a red or green warning light illuminate. The passenger seated in the rear seat, who is a pilot, also stated that he heard an intermittent warning horn.

<sup>4</sup> The Eurocopter AS-350BA helicopter is equipped with a single gear-type hydraulic pump that supplies hydraulic pressure to drive the main and tail rotor servo actuators and, in turn, assists the pilot with flight control inputs.

hours short of its 600-hour life limit, resulting in a rapid loss of hydraulic system pressure. Review of the helicopter's maintenance records revealed that the airframe was inspected in accordance with a 100-hour inspection on April 19, 2004. At the time of the inspection, the airframe had accumulated 8,377 hours, and the engine had accumulated about 394 hours.

Postaccident examination of the hydraulic pump drive belt at the Safety Board's Materials Laboratory found that the belt had been installed inside out and the exterior surface, as installed, displayed numerous lateral cracks.<sup>6</sup> A query of the Safety Board's accidents and incidents database and the Federal Aviation Administration Service Difficulty Report database found 43 failures/replacements of hydraulic pump drive belts with P/N 704A33690004 that occurred from February 1995 to the present. (About 460 AS-350 helicopters of various models are currently in operation in the United States.) Twenty of these drive belts were replaced because they were found prematurely stretched or worn past their service limits during routine maintenance inspections while the remaining 23 failed in-flight after an average of 277 flight hours,<sup>7</sup> resulting in a total loss of hydraulic system pressure and requiring the pilots to divert their flights for emergency landings. In three cases, including the May 4, 2004, accident in New York, the loss of hydraulic system pressure resulted in an accident.

To improve hydraulic pump drive operation, Eurocopter issued Service Bulletin (SB) AS350, No. 63.00.08 on May 27, 2002, which offered an improved "Poly-V"<sup>8</sup> drive belt with a significantly longer service life of 1,500 hours. The SB recommended that operators of AS-350 type helicopters versions B, B1, B2, B3, BA, BB, D, and L1 replace the hydraulic pump "flat" drive belt with a "Poly-V" belt, as well as replace the hydraulic pump drive pulleys and pulley bearings by September 30, 2004.<sup>9</sup> According to Eurocopter, it has sold about 272 pump-belt-conversion kits to U.S. operators since the SB's release. Eurocopter also reported that the installation of the "Poly-V" belt started on the production line in January 2001.

Following its investigation of a January 21, 2003, fatal accident in Mekatina, Ontario, in which a Eurocopter AS-350B2 helicopter experienced a hydraulic system failure and crashed, the Transportation Safety Board of Canada (TSB) concluded in its final report<sup>10</sup> that the hydraulic pump drive belt failed in flight, causing the hydraulic system to fail. Examination of the drive belt revealed that it failed at the manufacturing seam, similar to the drive belt in the May 2004 event. The TSB's examinations of similar in-service, intact hydraulic pump drive belts revealed extensive cracking in the same location; no cracking was observed on the one new

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<sup>5</sup> The drive belt controls the hydraulic pump through a pulley and coupling assembly. The belt is flat with bonded ends that form a continuous loop about 7 1/4 inches in diameter.

<sup>6</sup> For more information, see Safety Board Materials Laboratory Factual Report Number (No.) 04-139 in the Safety Board's public docket for this accident.

<sup>7</sup> The Safety Board's review of these events revealed that failures occurred between 23 and 675 flight hours, with a standard deviation of 171 hours.

<sup>8</sup> The "Poly-V" drive belt has multiple longitudinal "v" shapes on its inner surface that mate with similar grooves on the pulley. This drive belt cannot be installed inside out.

<sup>9</sup> A May 7, 2004, Eurocopter revision to the SB allowed the use of parts already mounted on the aircraft and did not significantly change the technical substance of the SB.

<sup>10</sup> See Transportation Safety Board of Canada, *Loss of Control—Collision With Terrain, Province of Ontario, Ministry of Natural Resources Eurocopter AS 350 B2 (Helicopter) C-GOGN, Mekatina, Ontario, 21 January 2003*, Aviation Investigation Report A03O0012 (Gatineau, Quebec: Transportation Safety Board of Canada, 2005).

belt that was examined. The TSB also determined that a simple visual inspection of an installed drive belt was not likely to reveal cracking or weakening at the seam and that detecting such cracks would require removing the drive belt, turning it inside out, placing it under some tension, and carefully inspecting it. On April 22, 2004, Transportation Canada issued an airworthiness directive mandating that the “Poly-V” belt be installed in Eurocopter AS-350 series helicopters by September 30, 2004, in accordance with SB AS350, No. 63.00.08, May 27, 2002, or subsequent revisions.

The Safety Board notes that there have not been any reported failures of the “Poly-V” belt since it was placed into service in 2001, which suggests that its in-service reliability is an improvement over the reliability of the older flat belt design. The Board is aware, however, that because Eurocopter’s SB has not been mandated for U.S. operators, Eurocopter continues to manufacture the flat belt for those operators that have not installed the “Poly-V” belt. The Board is concerned that unless U.S. operators are required to comply with Eurocopter’s SB, some will continue to use the flat drive belt, whose service history indicates that it is prone to failure before its rated service life.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

Require operators of Eurocopter AS-350 series helicopters to comply with the provisions of Eurocopter Service Bulletin AS350, No.63.00.08, Revision 1, dated May 7, 2004, or subsequent revisions. (A-05-36)

Identify an appropriate life limit or inspection interval for the existing Eurocopter AS-350 hydraulic pump flat drive belt and require Eurocopter AS-350 operators to comply with this limit/interval until they accomplish Eurocopter Service Bulletin AS350, No.63.00.08, Revision 1, dated May 7, 2004, or subsequent revisions. (A-05-37)

Acting Chairman ROSENKER and Members ENGLEMAN CONNERS and HERSMAN concurred with these recommendations.

*[Original Signed]*

By: Mark V. Rosenker  
Acting Chairman