



# National Transportation Safety Board

Washington, D.C. 20594

## Safety Recommendation

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**Date:** April 29, 2003

**In reply refer to:** A-03-13 and -14

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

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On January 24, 2003, a Beech 95 (Travelair), N2733Y, lost control shortly after takeoff from Cable Airport, Upland, California, after a 2 1/2-foot section of a blade separated from a Hartzell model HC-92ZK-2 propeller installed on the No. 2 (right) engine of the airplane. Witnesses reported observing the airplane's right engine suspended below the right wing,<sup>1</sup> and the airplane entering a steep right bank turn, rolling inverted, and descending until impacting a private residence in Rancho Cucamonga, California. The house was severely damaged, the airplane was destroyed, and the pilot, its sole occupant, was killed. The flight was being conducted under 14 *Code of Federal Regulations* Part 91 and was the first flight following overhauls of both propellers.<sup>2</sup>

The separated section of the Hartzell 8447-12A (Z-shank)<sup>3</sup> blade was recovered about 1 mile from the accident site. Examination of the fracture surfaces at the National Transportation Safety Board's Materials Laboratory revealed that the blade had failed due to fatigue cracking that initiated at corrosion pits on the internal surface of the blade's pilot tube hole (see figure 1). The cracking had progressed through about 60 percent of the blade cross section and around more than half of the pilot tube bore before final overstress separation. According to maintenance records, T&W Propellers, LLC, Chino, California,<sup>4</sup> performed the overhauls for both propeller assemblies. The overhaul entries, dated January 11, 2000, indicated that the overhauls were completed in accordance with Hartzell Manuals 105A (Propeller Model HC-92ZK-2 Overhaul Manual), 133C (Aluminum Propeller Blade Overhaul Manual), and 202A (Hartzell Standard Practices Manual), and all applicable service bulletins, service letters, and

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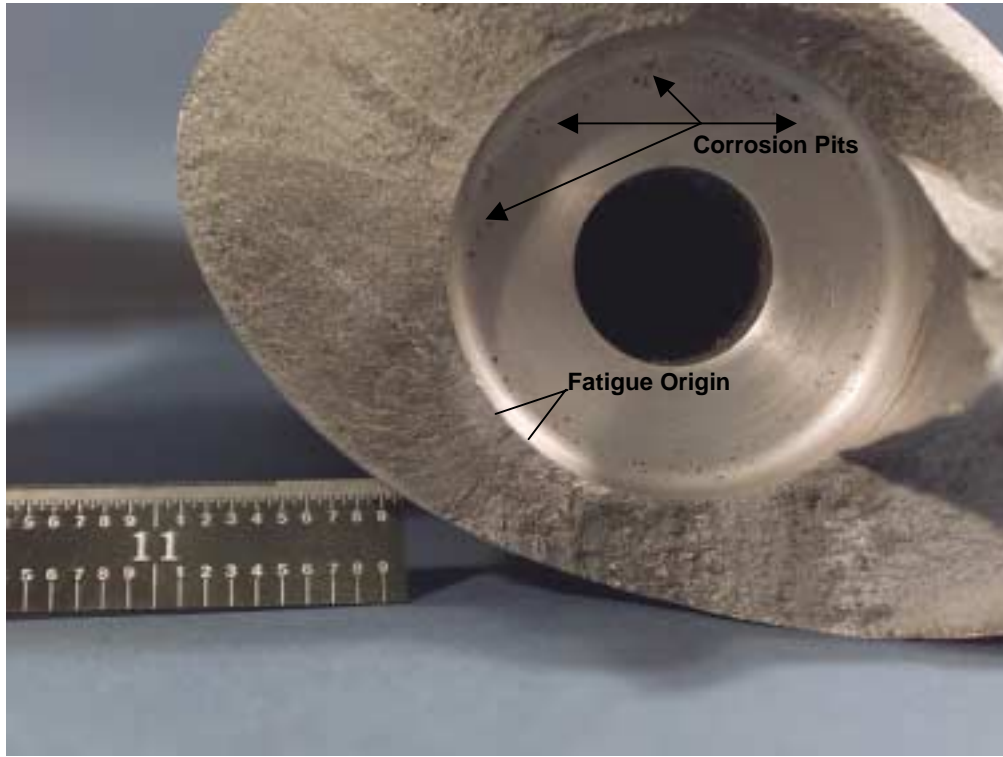
<sup>1</sup> This position is consistent with the engine having separated from its mountings.

<sup>2</sup> The description for this accident, LAX03FA074, can be found on the National Transportation Safety Board's Web site at <<http://www.ntsb.gov>>.

<sup>3</sup> Hartzell refers to 8447-series blades as Z-shank blades, which are mounted on steel hubs through a single retention shoulder and turn on an internal bronze bushing. Z-shank blades are manufactured from a one-piece aluminum forging.

<sup>4</sup> T&W Propellers surrendered its Air Agency Certificate on February 14, 2003, in response to a Letter of Investigation from the Federal Aviation Administration.

airworthiness directives to date. The propellers were installed on the accident airplane on May 16, 2002, and failed on their initial flight after several ground tests.



**Figure 1.** Magnified View of a Portion of the Outboard Fracture Face

Discoloration in the fatigue region of the fracture indicated that corrosion or a staining agent was introduced into the crack when the crack size was about 2 inches long. Safety Board investigators noted that a crack of this size would have been easily detectable by a properly performed dye penetrant inspection, as described in Hartzell overhaul data (Hartzell specifies a dye penetrant inspection of the bore area as part of the overhaul procedures).

Postaccident examination of both propeller blades from the right engine revealed other indications of an improperly performed overhaul. According to the overhaul instructions contained in Hartzell Manual 133C, a smooth, high-quality finish is required in the area where the fatigue cracking initiated. However, both propeller blades showed corrosion pits in this area and on the end face of the pilot tube hole. Hartzell overhaul data also specify that paint be applied to this and adjacent areas of the pilot tube hole. No paint was present on any of these surfaces. Finally, there was no evidence that the pilot tube hole had been chemically conversion coated although this is also required at overhaul. Disassembly and inspections of the blades from the left propeller uncovered similar maintenance discrepancies, with one blade having larger and deeper corrosion pits than the fractured blade.

The Safety Board also learned during its investigation that, on March 7, 2003, personnel at a repair facility in Redding, California, notified the propeller manufacturer that they had received a Z-shank propeller that had been overhauled 6 years earlier but had not been operated in service since the time of overhaul. The serviceable tag attached to this propeller indicated that

it had been overhauled by T&W Propellers on December 29, 1997. The repair shop observed that the propeller was not in compliance with overhaul requirements for inspection, rework, and finishing. Specifically, the shop reported that both blades exhibited severe corrosion pitting in the same bore area and a lack of chemical conversion coating and required paint in specified areas. The shop also noted that a substance that appeared to be wash primer had been painted over areas of significant corrosion.<sup>5</sup>

In summary, the Safety Board's investigation found six propeller blades in a condition that suggests they were improperly overhauled by T&W Propellers, as evidenced by the lack of the necessary corrosion-protective coatings on all blades and the failure to detect a large surface crack in a designated critical area (which led to the January 24, 2003, accident). The Board is concerned that other propeller blades and components overhauled by T&W Propellers may contain similar uncorrected defects. Therefore, the Safety Board believes that the Federal Aviation Administration (FAA) should require the immediate inspection of all propeller parts and assemblies overhauled or inspected by T&W Propellers, Chino, California, to determine if they are airworthy.

Finally, the Safety Board notes that Hartzell's recommended time between overhaul (TBO) for Z-shank propellers is 2,000 hours or 5 years, whichever occurs first. However, most aircraft<sup>6</sup> with Z-shank propellers operate under Part 91, which does not require compliance with manufacturers' recommended TBOs. Five of the six Z-shank blades discussed in this letter exhibited corrosion in critical areas. The Board is concerned that, due to the lack of a requirement to comply with manufacturers' recommended overhaul intervals, corrosion-induced failures of Z-shank propeller blades may continue to occur. Therefore, the Safety Board believes that the FAA should require that all Hartzell Z-shank propellers be overhauled every 2,000 hours or 5 years, whichever comes first, as recommended by the manufacturer.

Because the accident discussed in this letter is the only in-flight Z-shank blade failure that has occurred, the Safety Board has not designated these safety recommendations urgent. However, because the corrosion that was observed on these blades has been found primarily in areas that the manufacturer has designated as safety critical, the Board is concerned that, without immediate action, a similar accident could occur. The Board, therefore, urges the FAA to process these recommendations on an expedited basis.

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<sup>5</sup> The Safety Board's investigation considered the possibility that the corrosion observed could have been the result of inadequate storage since it was last overhauled. However, the repair shop in Redding reported that the grease appeared fresh, that there was no evidence of water contamination, and that no active corrosion was found, which suggests that the corrosion was present when the grease was applied rather than occurring while the propeller was in storage. An absence of oil in the hydraulic area confirmed the propeller had not been operated since overhaul.

<sup>6</sup> Z-shank blades are certified for use on Beech 95 'Travelair' twins and Piper PA24 250 'Comanche' single-engine airplanes. A conservative estimate of the Z-shank population worldwide is fewer than 2,000 blades.

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

Require the immediate inspection of all propeller parts and propeller assemblies overhauled or inspected by T&W Propellers, Chino, California, to determine if they are airworthy. (A-03-13)

Require that all Hartzell Z-shank propellers be overhauled every 2,000 hours or 5 years, whichever comes first, as recommended by the manufacturer. (A-03-14)

Chairman ENGLEMAN, Vice Chairman ROSENKER, and Members CARMODY, GOGLIA, and HEALING concurred with the recommendations.

By: Ellen G. Engleman  
Chairman