

NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering
Materials Laboratory Division
Washington, D.C. 20594



February 24, 2017

MATERIALS LABORATORY FACTUAL REPORT

Report No. 17-023

A. ACCIDENT INFORMATION

Place : Cameron, North Carolina
Date : November 1, 2016
Vehicle : Bell OH-58C, N139RD
NTSB No. : ERA17LA032
Investigator : Chihoon Shin, AS-40

B. COMPONENTS EXAMINED

Main rotor blade (2 pieces).

C. DETAILS OF THE EXAMINATION

Overall views of the submitted main rotor blade pieces are shown in figure 1. The piece with the yellow end included the tip face of the blade, and fracture occurred at a location 27.75 inches from the tip end. The inboard blade piece was cut as indicated. The leading edge spar was missing from the length of the outboard piece, and the leading side of the remaining trailing skin and core was crushed and bent toward the trailing edge.

According to the investigator submitting the parts, the blade was the white blade with part number 206-011-250-3 and serial number TLK-9054. The blade had approximately 3,218.8 hours time in service (TIS) at the time of the accident. Retirement life as listed on the component log sheets was 3,600 hours TIS.

An overall view of the fracture surface is shown in figure 2. The fracture in the leading edge spar intersected the inertia weight attachment hole as shown in figures 1 through 3. The lower side of the inertia weight attachment hole was cone-shaped consistent with a countersunk attachment. The surface of the inertia weight hole in the countersunk face appeared rough and oxidized consistent with fretting contact damage with the inertia weight attachment screw head.

Closer views of the fracture surface are shown in figure 4. A portion of the fracture surface in the leading edge spar and the lower skin were in a plane perpendicular to the surface and had curving crack arrest lines, features consistent with fatigue. Fatigue features emanated from multiple origins in the fretted area of the inertia weight attachment hole. In the detail image in figure 4, a bracket at the leading side of the attachment hole and an arrow at the trailing side of the hole indicate primary fatigue crack origin areas located at the inertia weight attachment hole. A bracket at the trailing side of the hole

indicates a secondary fatigue origin area that initiated from the edge of the primary fatigue region that had initiated from the location indicated by the arrow.

The fatigue region extended up to the boundary indicated with a dashed line on the leading edge spar in the upper image in figure 4 and along the entire lower side of the spar to the trailing edge of the spar. The fatigue region also extended into the lower skin from the leading edge of the lower skin to the trailing boundary location indicated in figure 4. The total length of the fatigue region measured at the lower surface of the blade was 1.4 inches from the leading edge of the inertia weight attachment hole to the leading boundary (dashed line in figure 4) and 3.0 inches from the trailing edge of the hole to the trailing boundary.

Bell Helicopter Textron, Inc., published Military Alert Bulletin (MAB) USA-OH-58-87-1, revision B, originally dated August 12, 1987, and revised April 12, 2007. The purpose of the revised MAB USA-OH-58-87-1 was to notify military operators of model OH-58A, OH-58B, OH-58C and 206B-1 model helicopters with part numbers 206-011-250-003/113 main rotor blades would be required to conduct initial and recurring visual inspections before returning the blades to service and subsequently at intervals of 8 hours or 32 flights, whichever came first. The inspection with a 10x power scope was focused on the area of the inertia weight screw heads. Paint was to be removed prior to the first inspection, and a clear-coat finish was to be applied to facilitate subsequent inspections. On April 12, 2007, Bell also issued Operations Safety Notice OSN-GEN-07-38 to all OH-58 operators referencing the aforementioned MAB and providing a notification of changes incorporated in the revised MAB.

As shown in figure 3, the lower leading edge of the paint had a tapered edge consistent with erosion wear. No evidence of a clear-coat finish was observed on the lower surface.

Matthew R. Fox
Senior Materials Engineer

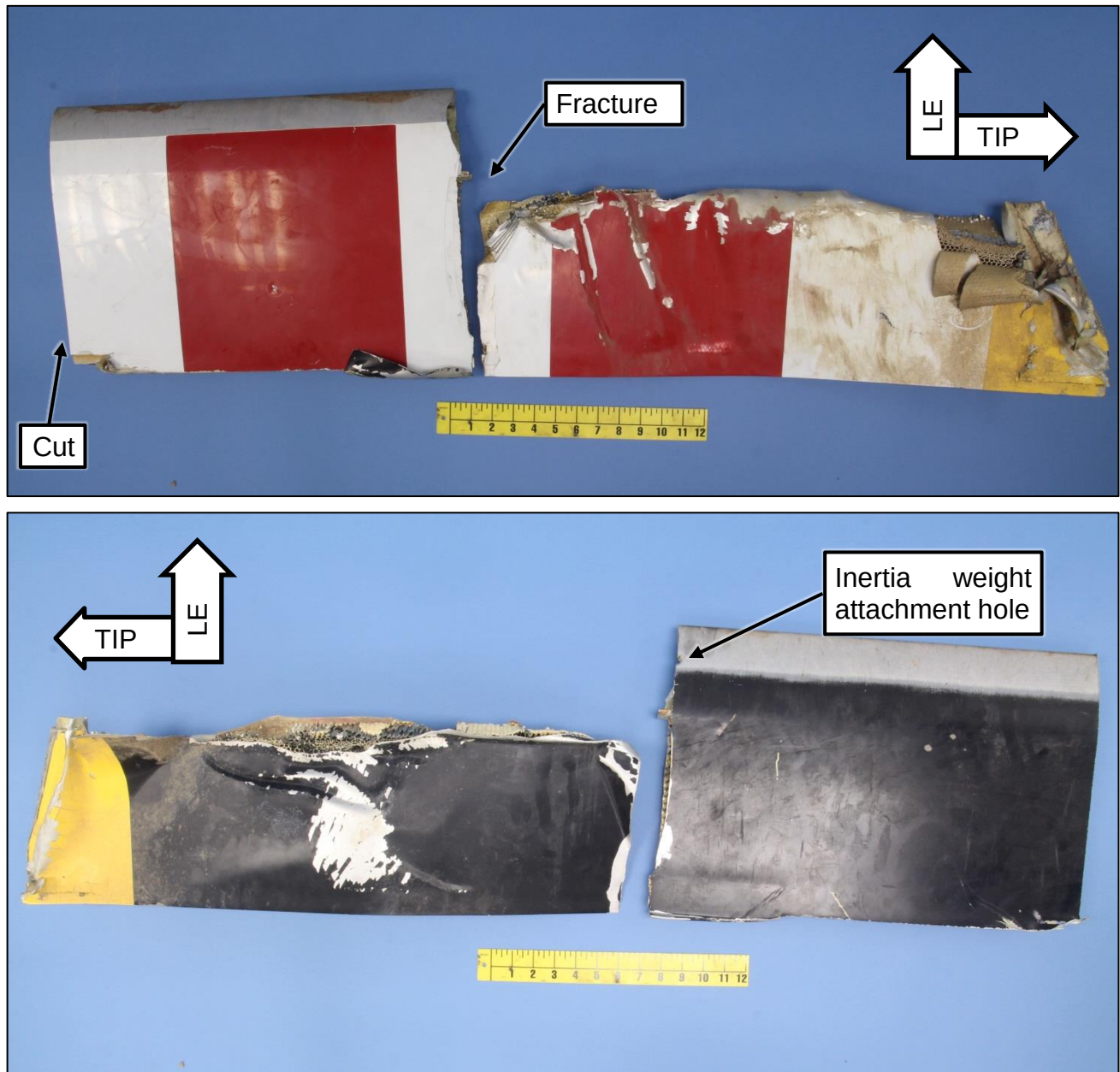


Figure 1. Overall views of the fractured main rotor blade pieces as viewed from above (upper image) and from below (lower image).



Figure 2. View of the fracture on the inboard piece of main rotor blade.

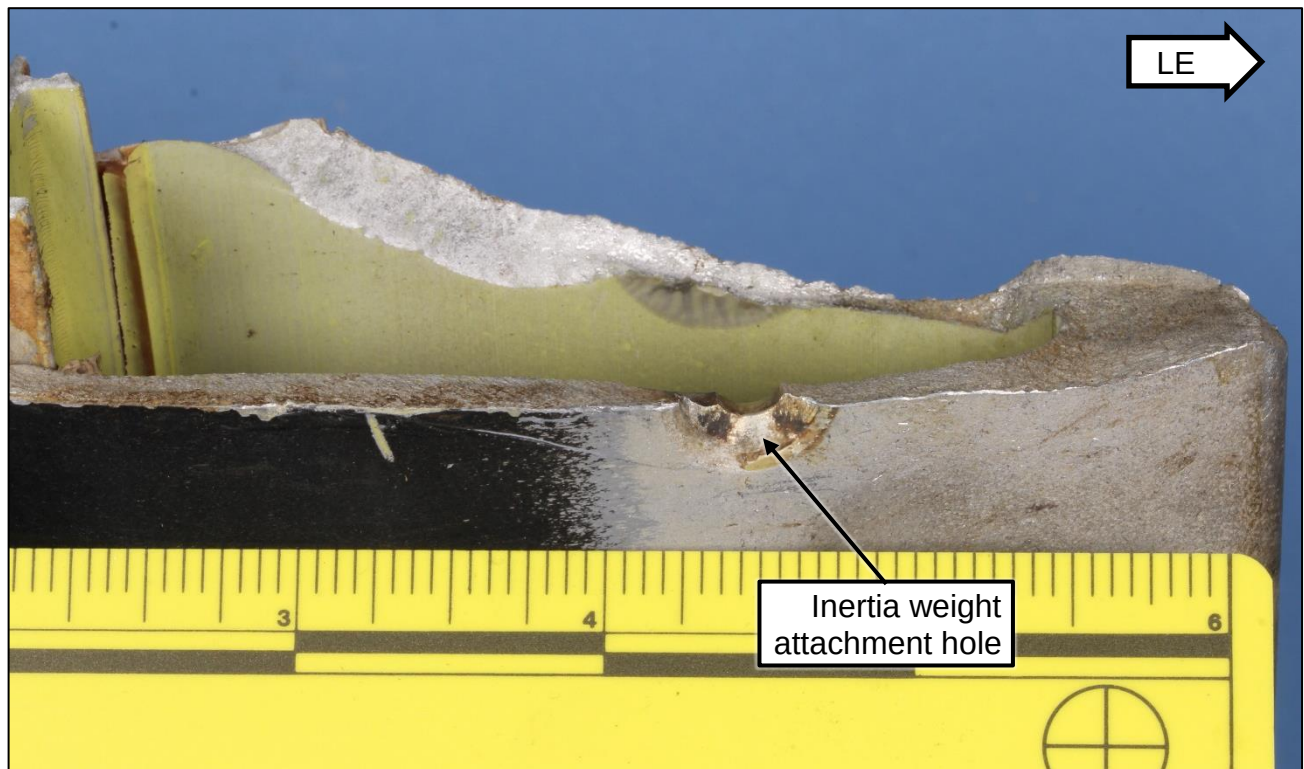


Figure 3. Oblique view of the inertia weight attachment hole on the lower side of the main rotor blade leading edge spar.

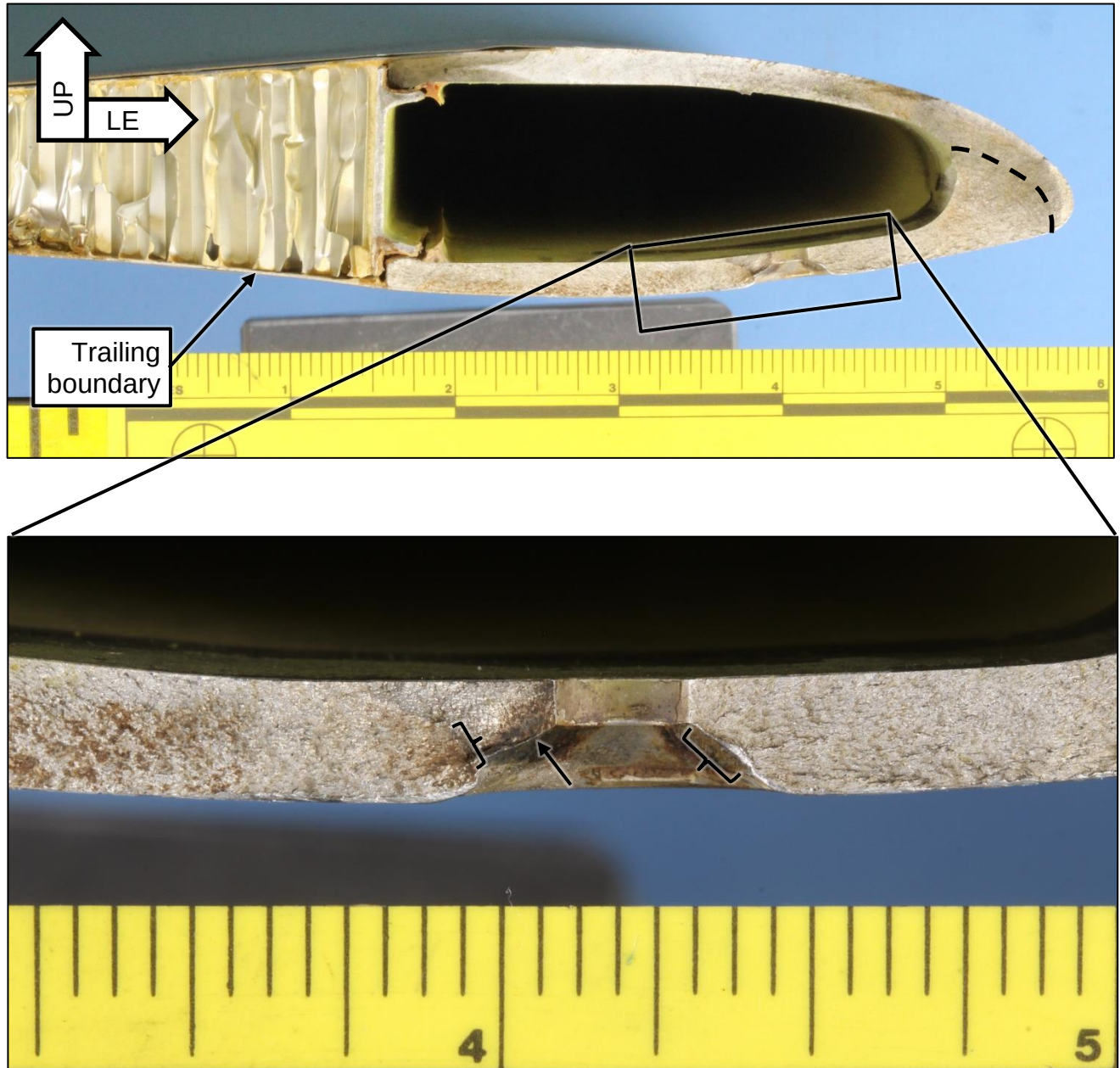


Figure 4. Closer view of the fatigue region in the main rotor blade leading edge spar and adjacent lower skin (upper image) with a detail image of the inertia weight attachment hole. A dashed line in the upper image indicates the leading boundary of the fatigue region, and the trailing boundary in the lower skin is indicated. Unlabeled brackets and an arrow in the detail image of the inertia weight attachment hole indicate fatigue origin areas.