

NATIONAL TRANSPORTATION SAFETY BOARD

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



March 9, 2015

MATERIALS LABORATORY FACTUAL REPORT

Report No. 15-027

A. ACCIDENT INFORMATION

Place : Takotna, Alaska
Date : August 23, 2013
Vehicle : Cessna 206, N35952
NTSB No. : ANC13LA085
Investigator : Joshua Cawthra, AS-WPR

B. COMPONENTS EXAMINED

Crankshaft from a Continental Motors IO-550-R engine.

C. DETAILS OF THE EXAMINATION

Prior to receiving the fractured crankshaft pieces, the crankshaft had been examined at Continental Motors at the request of the NTSB. This report is a supplemental examination providing additional documentation of crack arrest features on the fracture surface. A portion of the fracture surface had been removed for metallographic examination prior to this fractographic examination, and photographs of the fracture surface prior to sectioning were reviewed during this examination.

The crankshaft was fractured through the cheek at the aft side of main journal M2. Main journals 1, 2, and 3 (numbered from the aft end) showed distress and scoring damage on the journal surfaces and onto the fillet radii at the forward end of journal 1 and the aft ends of journals 2 and 3. The number 2 connecting rod journal also showed damage in the fillet radius and on the cheek face at the forward end of the journal.

A view of the forward face of the fracture surface as received in the NTSB Materials Laboratory is shown in the lower image in figure 1. The mating face was mostly obliterated by post-fracture damage. The fracture surface had mostly smooth features with curving crack arrest lines, features consistent with fatigue. Across most of the fracture surface, fatigue features emanated from an origin area located in the fillet radius between main journal 2 and the cheek at the aft side of the journal as indicated with bracket A. Ratchet marks¹ were observed, consistent with fatigue initiation from multiple origins within the area indicated by bracket A in figure 1. Shorter unlabeled arrows in figure 1 indicate the boundary of relatively smooth crack arrest features

¹ A ratchet mark is a small step in the fracture surface formed when two adjacent fatigue cracks originate on slightly offset planes.

emanating from the origin area A. The smooth features and relative size of this fatigue region are consistent with this region being associated with the primary fatigue crack. A smaller fatigue region with relatively rougher features, consistent with a secondary fatigue crack, was observed emanating from the surface at the forward end of the number 2 connecting rod journal. Bracket B and a dashed line respectively indicate the origin area and boundary of the secondary fatigue crack.

The shorter unlabeled arrows in figure 1 indicate a crack arrest line where the primary fatigue crack features transitioned from relatively smooth features to relatively rough features with prominent crack arrest lines. A longer arrow in figure 1 indicates the direction of crack growth in the region with relatively prominent crack arrest features. These relatively prominent crack arrest features emanated from the crack arrest line bounding the smooth region of the primary fatigue crack within the area indicated by bracket C in figure 1.

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