

NATIONAL TRANSPORTATION SAFETY BOARD

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



April 22, 2014

MATERIALS LABORATORY FACTUAL REPORT

Report No. 14-018

A. ACCIDENT INFORMATION

Place : Soldotna, Alaska
Date : July 7, 2013
Vehicle : de Havilland DHC-3, N93PC
NTSB No. : DCA13MA121
Investigator : Clinton Crookshanks, AS-40

B. COMPONENTS EXAMINED

Engine Mount, Supplemental Type Certificate (STC) SA09866SC

C. DETAILS OF THE EXAMINATION

An overall right side view of the as received engine mount is displayed in figure 1. The mount contained multiple fractures and was saw cut into several pieces for shipping. Figure 2 displays left side and top view drawings of the mount. The mount was a welded tubular steel assembly that converted aircraft for use with a turbine engine instead of the original reciprocating engine.

Initial examinations of the mount in the Materials Laboratory occurred on January 28, 2014. Representative of the FAA, Texas Turbine Conversions (STC Holder) and Rediske Air were present.

Visual examinations uncovered 8 fractures and three cracks in the assembly, all associated with assembly welds. The fracture and crack locations are indicated on the illustration of figure 2. Many areas on the mount displayed fire damage with the original paint burnt off and the tubing oxidized.

Closer examinations of the fractures and cracks revealed indications of overstress separations with no indications of progressive cracking or corrosion. The fracture paths in most cases were along the edges of the weld beads (fusion zones) with many also showing fracturing of the weld beads. Two examples of fractures are shown in figure 3.

A representative of the manufacturer indicated that all tube to tube welds were specified as fillet welds. Close examination of the fractured welds found that almost all welds showed complete penetration to the root of the weld with only one weld showing a short (<1/4 inch) length of incomplete penetration.

One intact weld was cross sectioned longitudinally and transversely as shown in figure 4. The fillet weld (yellow arrows) displayed complete penetration as shown, however fit-up between the tubes was not perfect and some separations between mating tubes were visible. The separations between tubes are indicated by opposed red arrows.

Joe Epperson
Senior Metallurgist

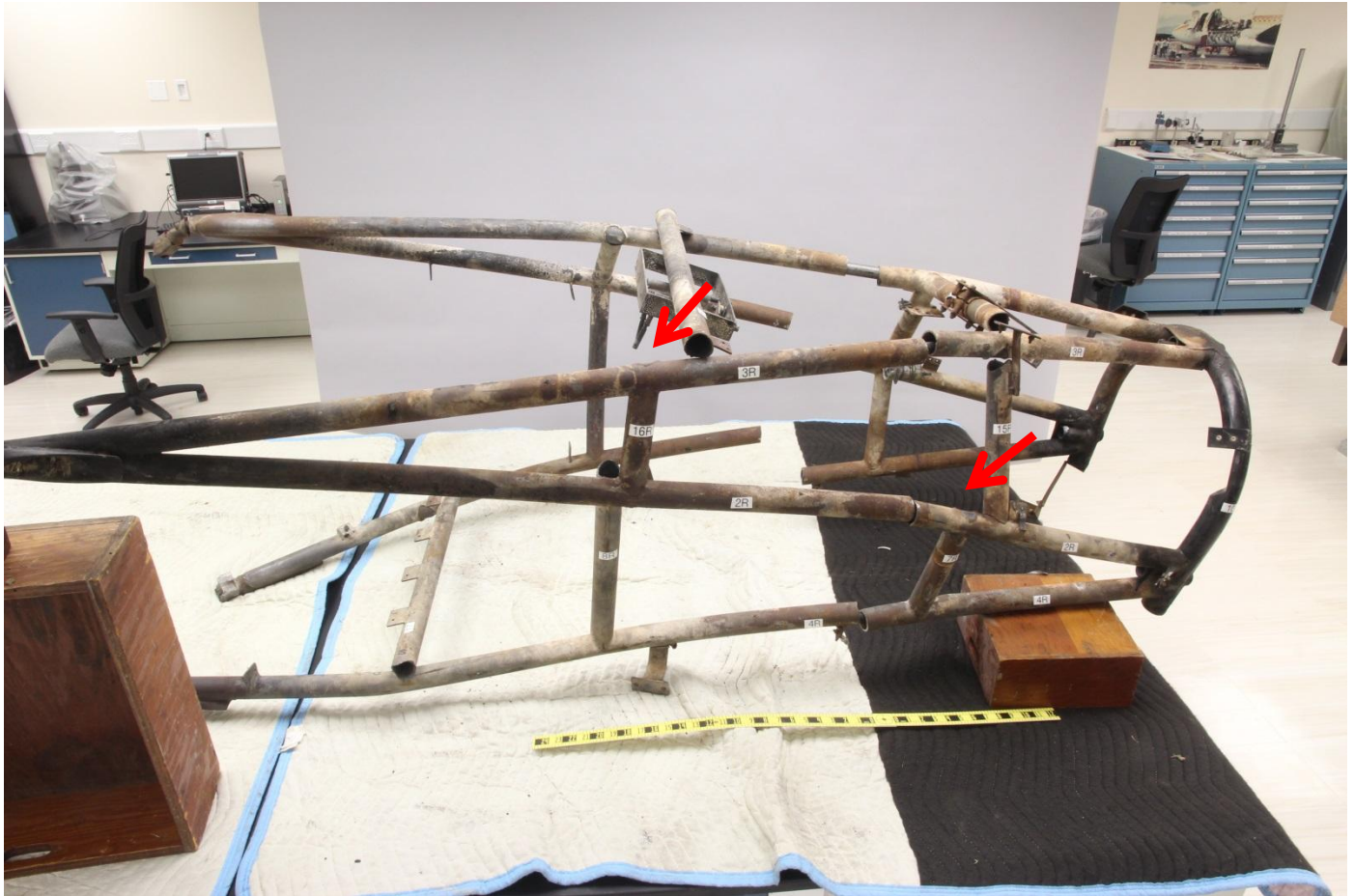


Figure 1. A right side view of the as-received engine mount with tubes in approximate original positions. Numbers on tubes refer to individual items numbers as listed on the drawing with "R" and "L" used to indicate right and left sides. Red arrows indicate areas shown in figure 3.

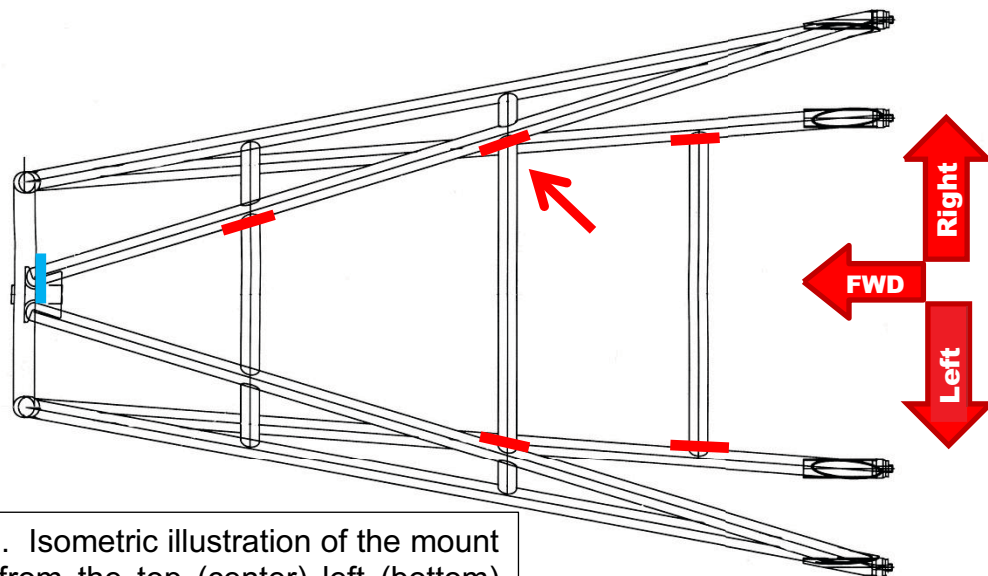
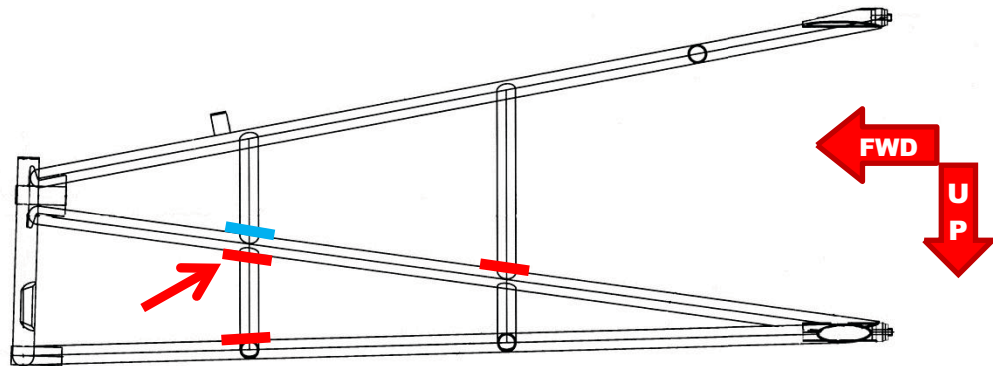


Figure 2. Isometric illustration of the mount viewed from the top (center) left (bottom) and right (top) perspectives. Red lines denote fractures, Blue lines cracks. Red arrow areas are shown in figure 3.

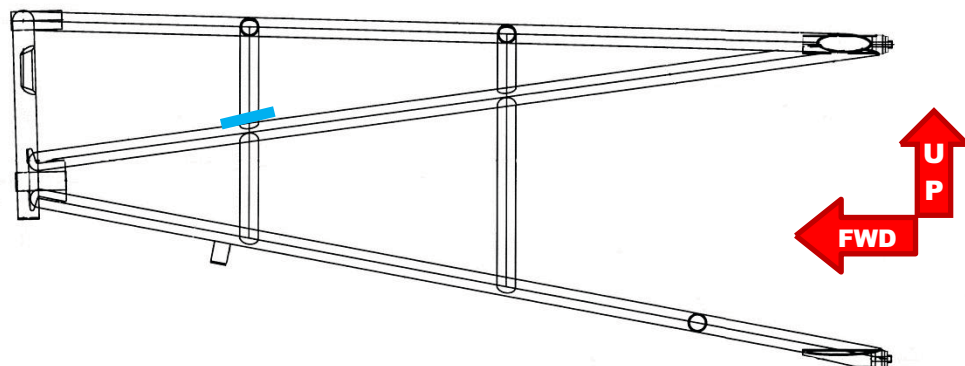




Figure 3. Two views of typical fractures and crack in the engine mount assembly.

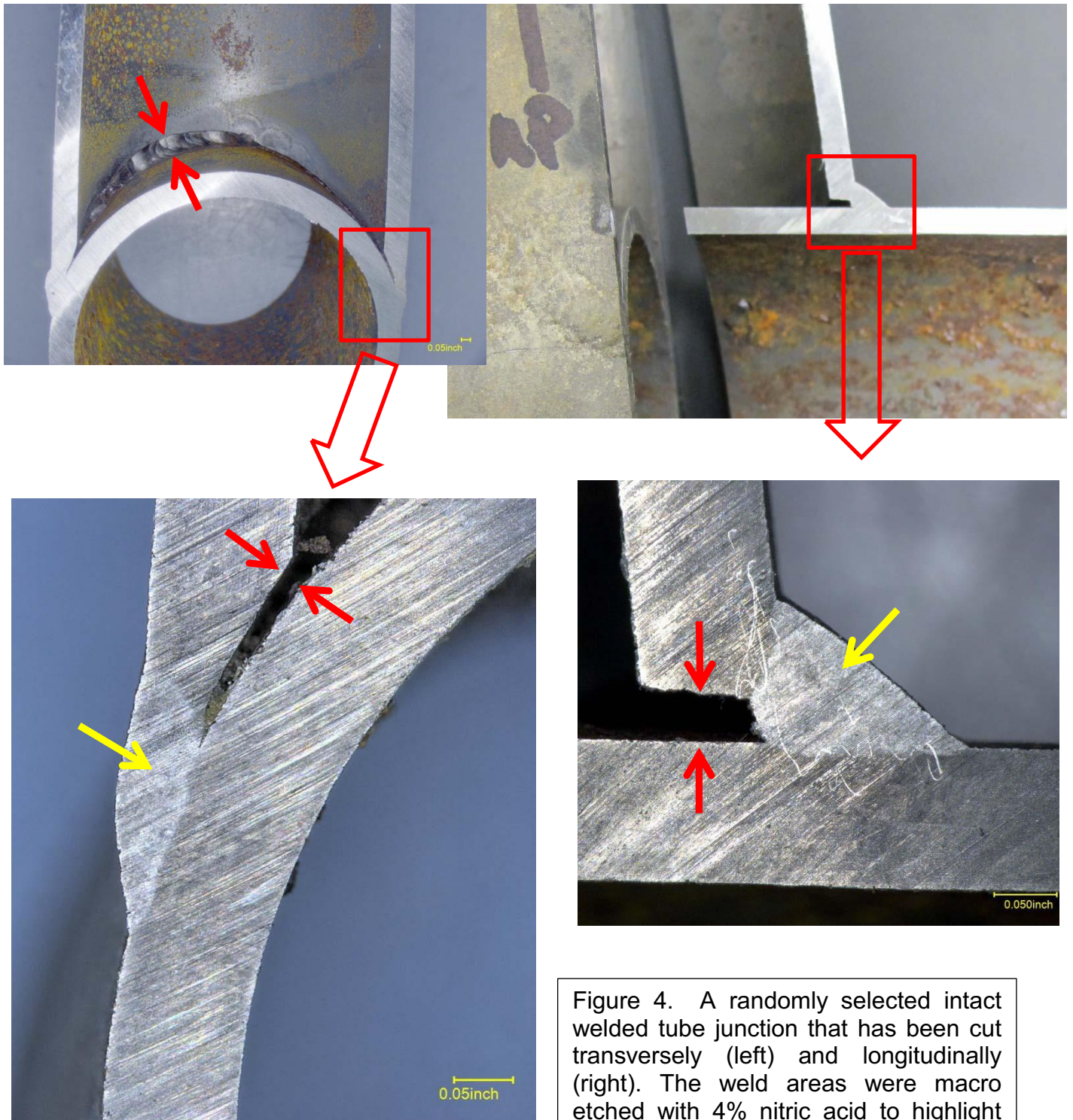


Figure 4. A randomly selected intact welded tube junction that has been cut transversely (left) and longitudinally (right). The weld areas were macro etched with 4% nitric acid to highlight the fusion zones (yellow arrows). Tube to tube separations are indicated by opposed red arrows.