

NATIONAL TRANSPORTATION SAFETY BOARD

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



April 6, 2020

MATERIALS LABORATORY STUDY REPORT

Report No. 20-017

A. ACCIDENT INFORMATION

Place : Dublin, GA
Date : April 15, 2019
Vehicle : Bell 206, N395AE
NTSB No. : ERA19LA152
Investigator : Leah Read (AS-ERA)

B. COMPONENTS EXAMINED

Vane assembly

C. DETAILS OF THE STUDY

The vane assembly was submitted with the forward ring separated. The ring had separated through the braze joint at the forward interfaces of the vanes, as shown in Figure 1. The yellow arrows point to orange paint observed on the ring and the vane cross-sectional surfaces in locations where the vanes were supposed to be brazed to the ring. As shown in Figure 2, the amount of orange paint observed varied from thin strips only partially penetrating the vane width to almost the entire cross-section of the vane airfoil. Braze filler metal build-up was observed along the edges of some of the vanes (red arrows, Figure 2).

A metallurgical cross-section was prepared perpendicularly through several vane airfoils. A representative area of the forward interface on an exemplar separated airfoil is shown in Figure 3. Gaps (blue arrows) were observed at the interface between the braze metal (red arrows) and the airfoil surface.

The gaps between the braze metal and the vane surfaces are consistent with incomplete filler metal wetting in the braze joint. The presence of the orange paint on the vane cross-sections indicates areas where the braze metal did not wet the base metal. The separation of the forward ring from the vane assembly was likely due to the large amount of incomplete braze joint surfaces on the vane airfoils. No manufacturer identification markings were observed on the vane assembly pieces.

Adrienne V. Lamm
Materials Engineer

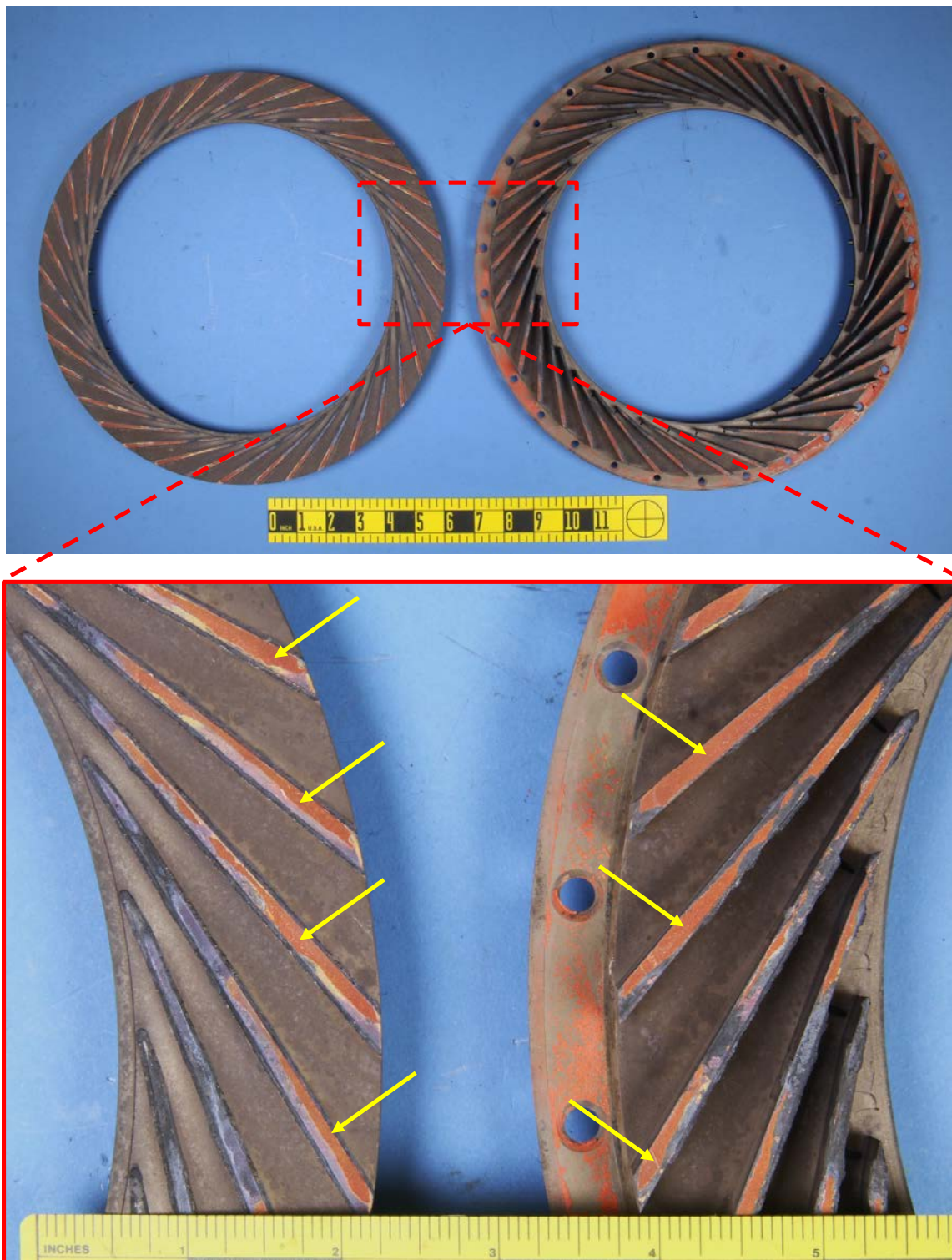


Figure 1: Overall (top) and close-up (bottom) images of the separated mating ring (left) and vane airfoil (right) surfaces. The yellow arrows point to orange paint on the surfaces.

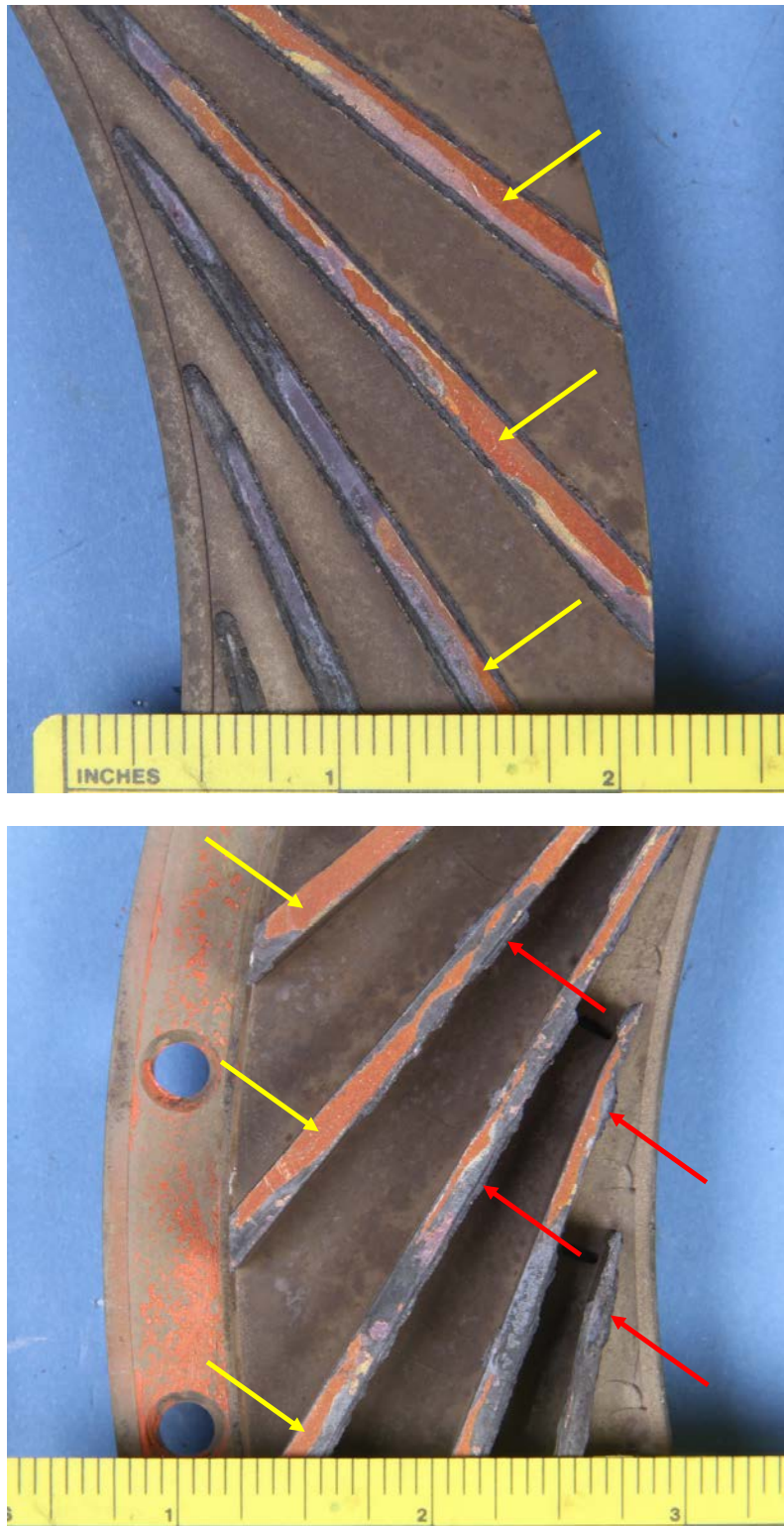


Figure 2: Close-up images of the separated mating ring (top) and vane airfoil (bottom) surfaces. The yellow arrows point to orange paint on the surfaces. The red arrows point to braze metal build-up on the edges of some vanes.

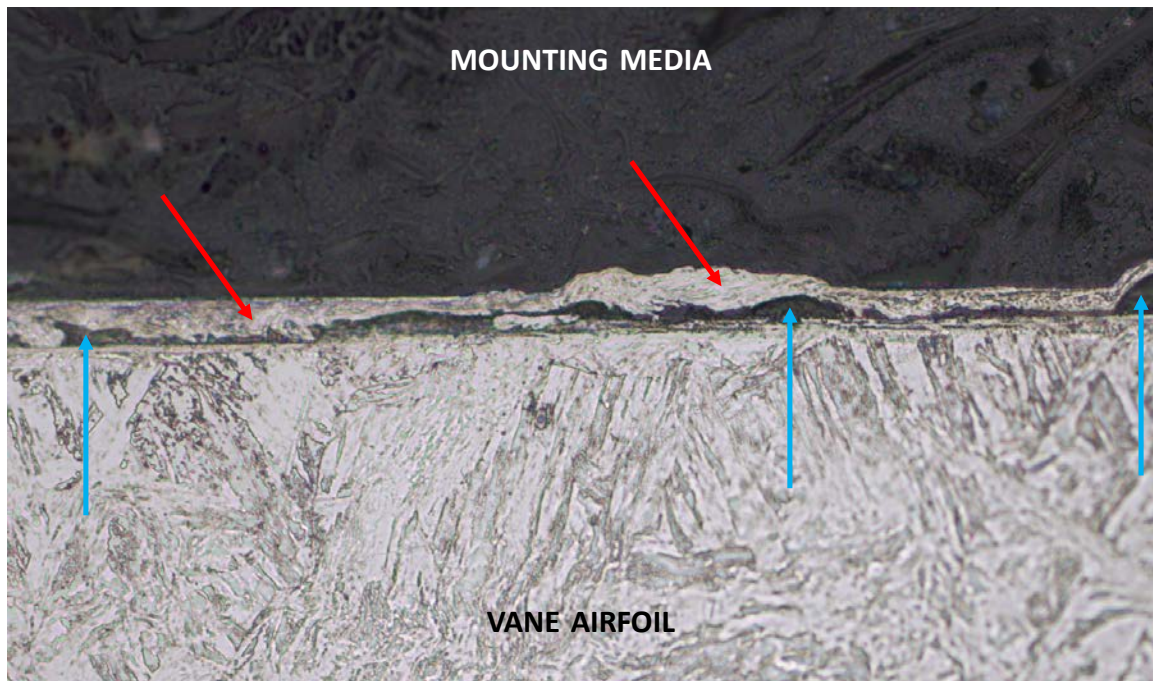


Figure 3: Brightfield metallographic image of a representative area of the forward interface on an exemplar separated airfoil. The red arrows point to braze filler metal on the airfoil surface. The blue arrows point to gaps at the interface between the braze filler metal and the airfoil surface. (Etchant: Kalling's Reagent)