

NATIONAL TRANSPORTATION SAFETY BOARD

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



August 16, 2019

MATERIALS LABORATORY STUDY REPORT

Report No. 19-052

A. ACCIDENT INFORMATION

Place : Brazoria, TX
Date : July 23, 2018
Vehicle : Grumman AA-5B (N74420)
NTSB No. : CEN18LA292
Investigator : Todd Fox (AS-CEN)

B. COMPONENTS EXAMINED

Propeller with separated blade

C. DETAILS OF THE STUDY

The submitted propeller is shown in Figure 1. The propeller was a two-blade model manufactured by McCauley Propeller Systems. The following part markings were observed on a face of the propeller hub:

FFA7563
Ser. No. P77410

Approximately half of one blade had separated and was missing. The fracture surface was flat from the trailing edge through roughly two-thirds of the chord length, before angling from the center outwards adjacent to the blade surface.

The fracture surface was sectioned from the blade and examined using a digital microscope and a Zeiss Auriga 40 field emission (FE) scanning electron microscope (SEM). A digital microscope image of the flat area on the fracture surface is shown in the top of Figure 2. SEM images of the fracture surface are shown in Figures 3 and 4. Yellow arrows in Figures 2 and 3 point to faint crack arrest lines observed within the flat area. The pattern of the crack arrest lines emanated from the trailing edge tip of the blade. Post-separation damage was observed on the fracture surface at this location (bottom image of Figure 2).

The finer features on the fracture surface were feathery and transgranular, which is consistent with fatigue cracking. Striations were observed on the fracture surface in some locations. Exemplar striations are shown in Figure 4.

The flat fracture surface, crack arrest lines, and striations are consistent with fatigue cracking. The pattern of the crack arrest lines indicated the fatigue cracking

emanated from the trailing edge tip of the blade. The white arrow in Figure 2 indicates the direction of fatigue cracking propagation. The damage on the fracture surface at the trailing edge tip of the blade obscured the exact initiation of the fatigue cracking.

Adrienne V. Lamm
Materials Engineer

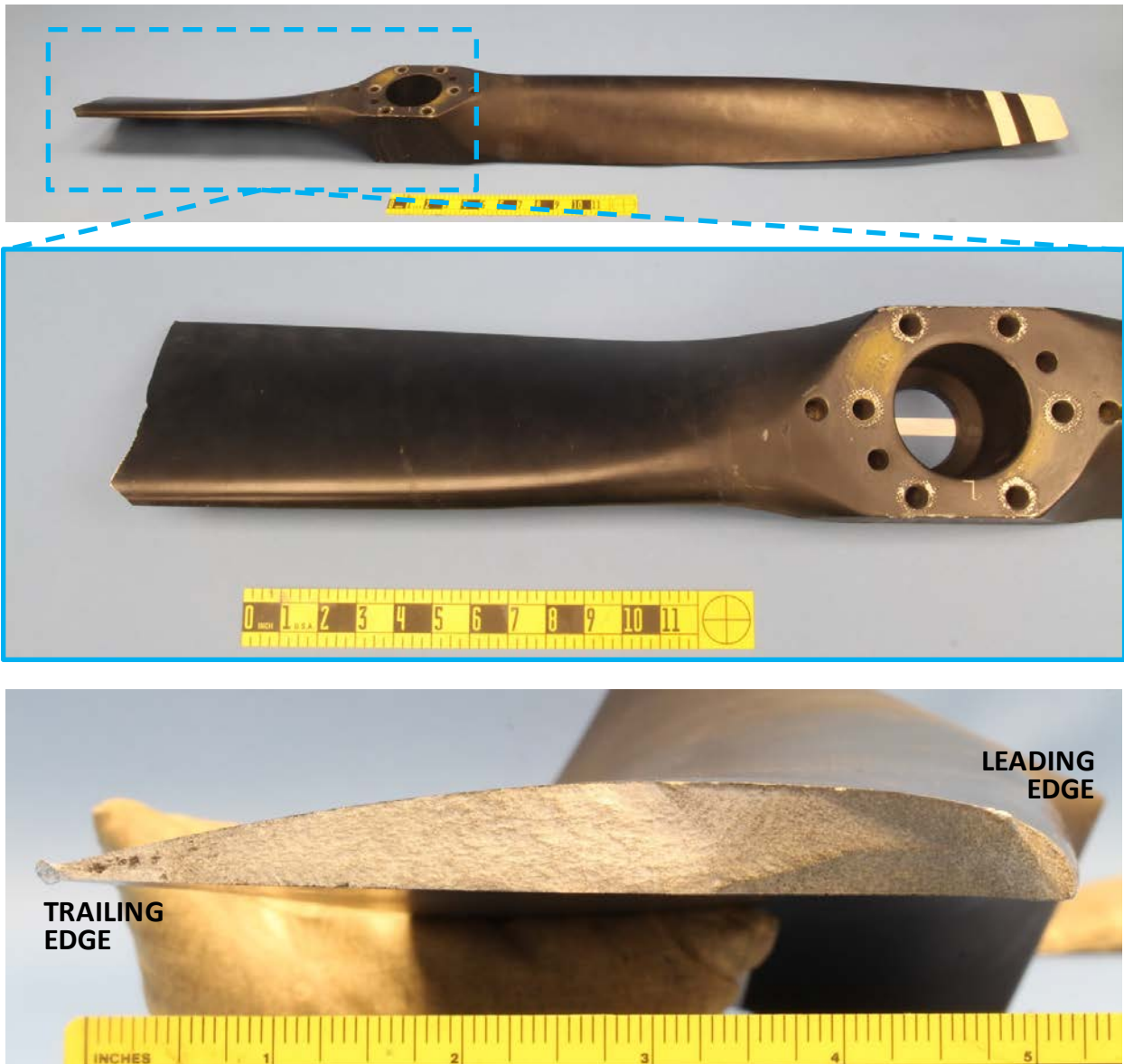
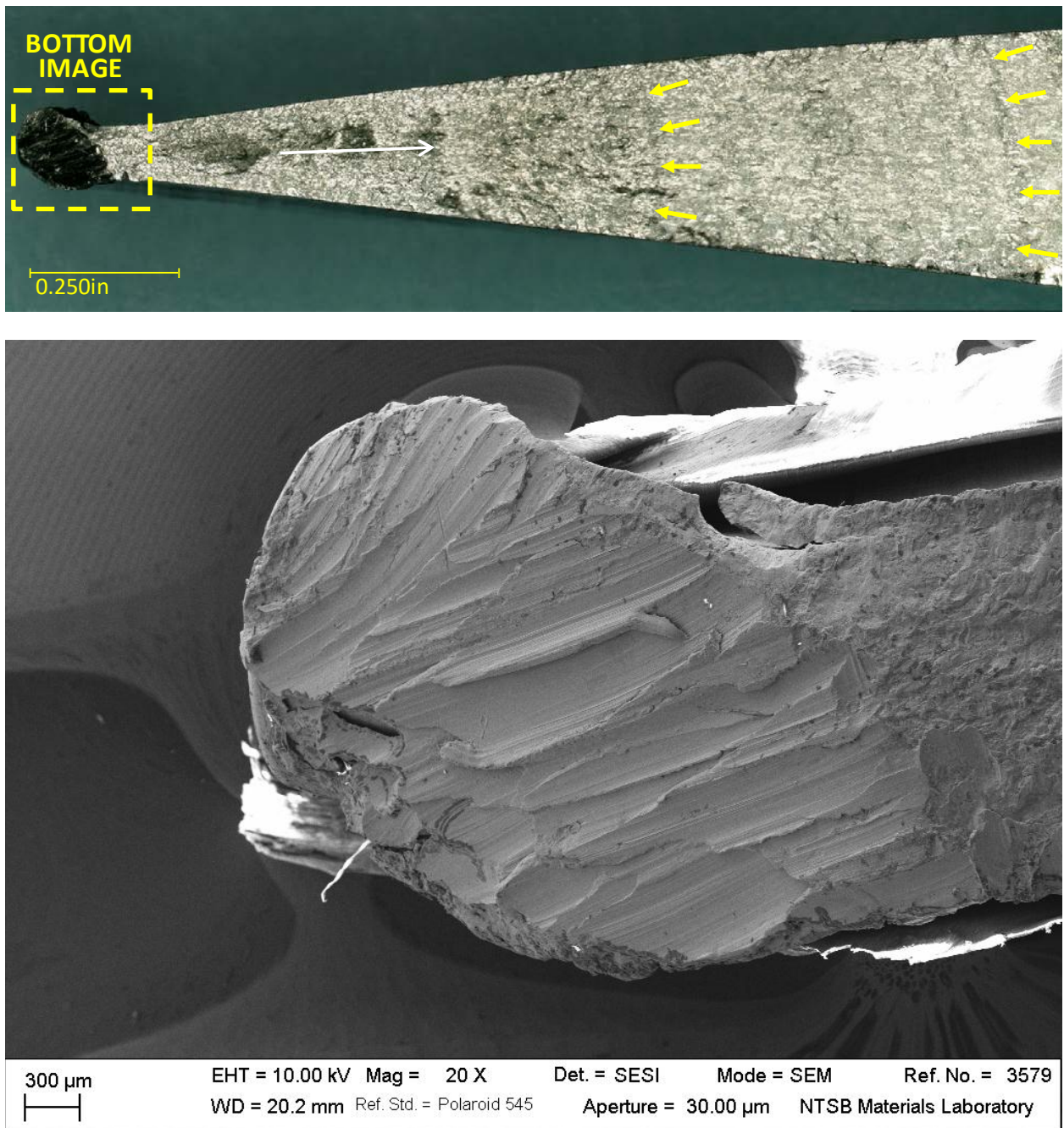


Figure 1: Macro photos of the submitted propeller with the separated blade.



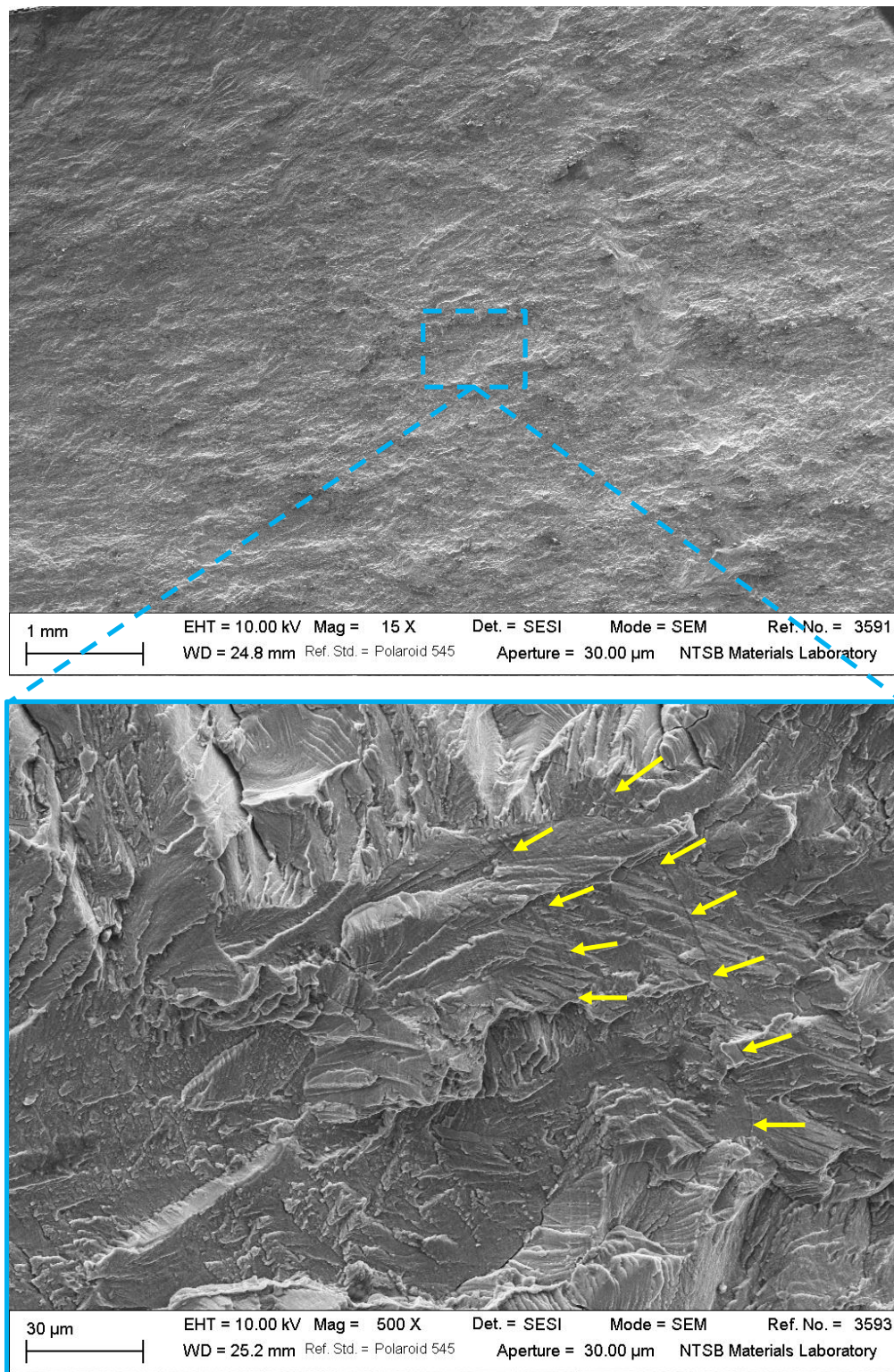


Figure 3: SEM images of feathery, transgranular features on the separated blade fracture surface. The yellow arrows in the bottom image point to crack arrest lines.

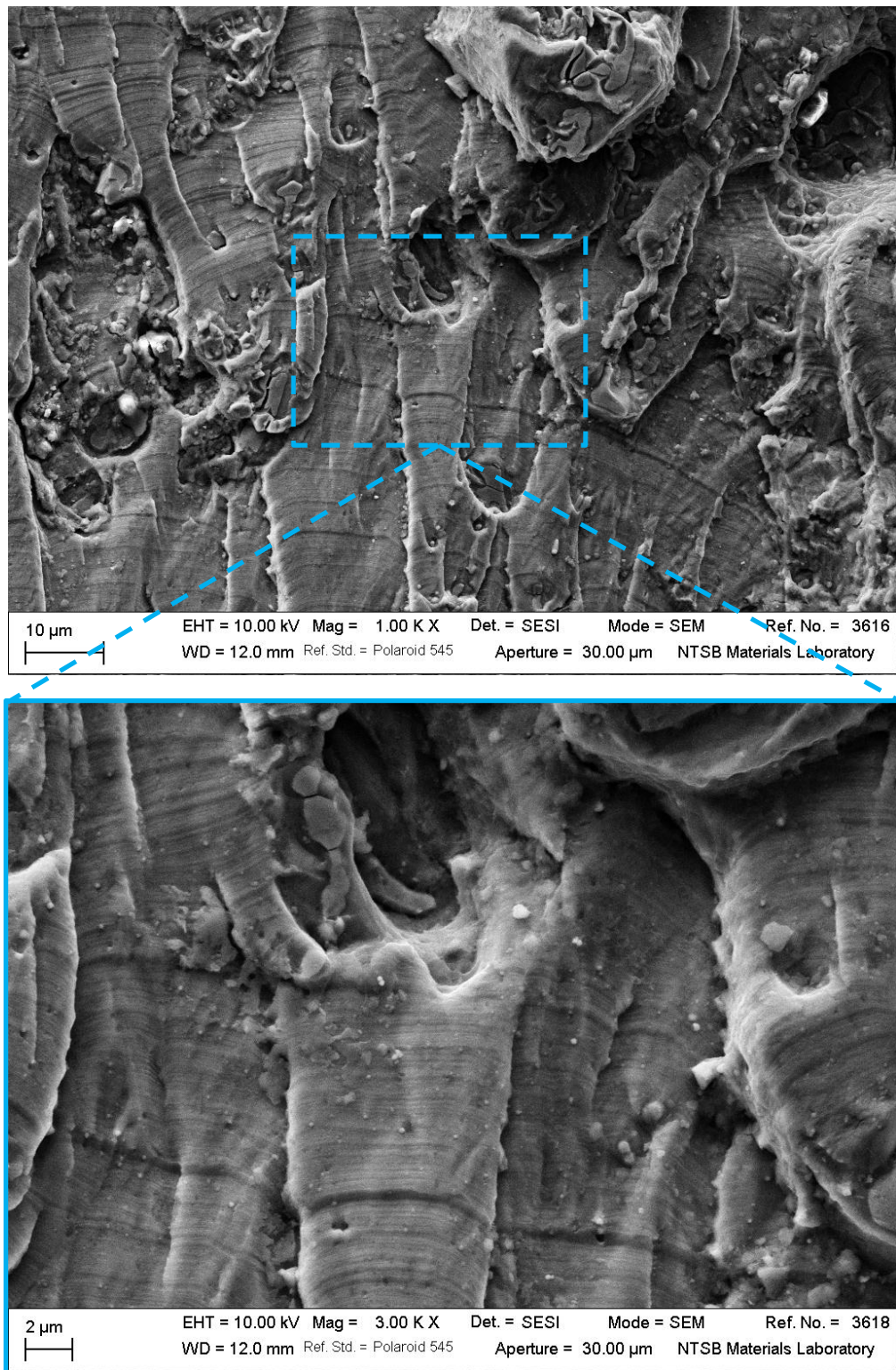


Figure 4: SEM images of striations on the separated blade fracture surface.