

NATIONAL TRANSPORTATION SAFETY BOARD

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



August 6, 2019

MATERIALS LABORATORY STUDY REPORT

Report No. 19-048

A. ACCIDENT INFORMATION

Place : Phoenix, AZ
Date : June 26, 2018
Vehicle : Cessna 172SP (N154ME)
NTSB No. : WPR18LA181
Investigator : Andrew Swick (AS-WPR)

B. COMPONENTS EXAMINED

Crankshaft and nos. 3 and 4 connecting rods.

C. DETAILS OF THE STUDY

The crankshaft was submitted separated through the no. 4 bearing journal, as indicated by the red arrows in Figure 1. Figures 2 – 4 show images of the fracture surface on the crankshaft. The fracture surface was relatively flat, with crack arrest lines extending from close to the outer diameter of the journal on the web side. The crack arrest lines propagated from a subsurface location approximately 0.05 inches inboard of the outer diameter. The direction of crack propagation outward from the subsurface location is indicated by the white arrows in Figures 3 and 4. The flat fracture surface and crack arrest lines were consistent with fatigue fracture.

The fracture surface was examined using a Zeiss Auriga 40 field emission (FE) scanning electron microscope (SEM). SEM images of the fracture surface are shown in Figures 5 and 6. The fatigue initiation area was confirmed to be subsurface. No flaws or embedded particles were observed at the site of the fatigue initiation.

The separation through the stem of the no. 4 connecting rod was consistent with overstress.

Adrienne V. Lamm
Materials Engineer



Figure 1: Overall photo showing the crankshaft and mating no. 3 and no. 4 connecting rods. The crankshaft had separated through the no. 4 bearing journal.

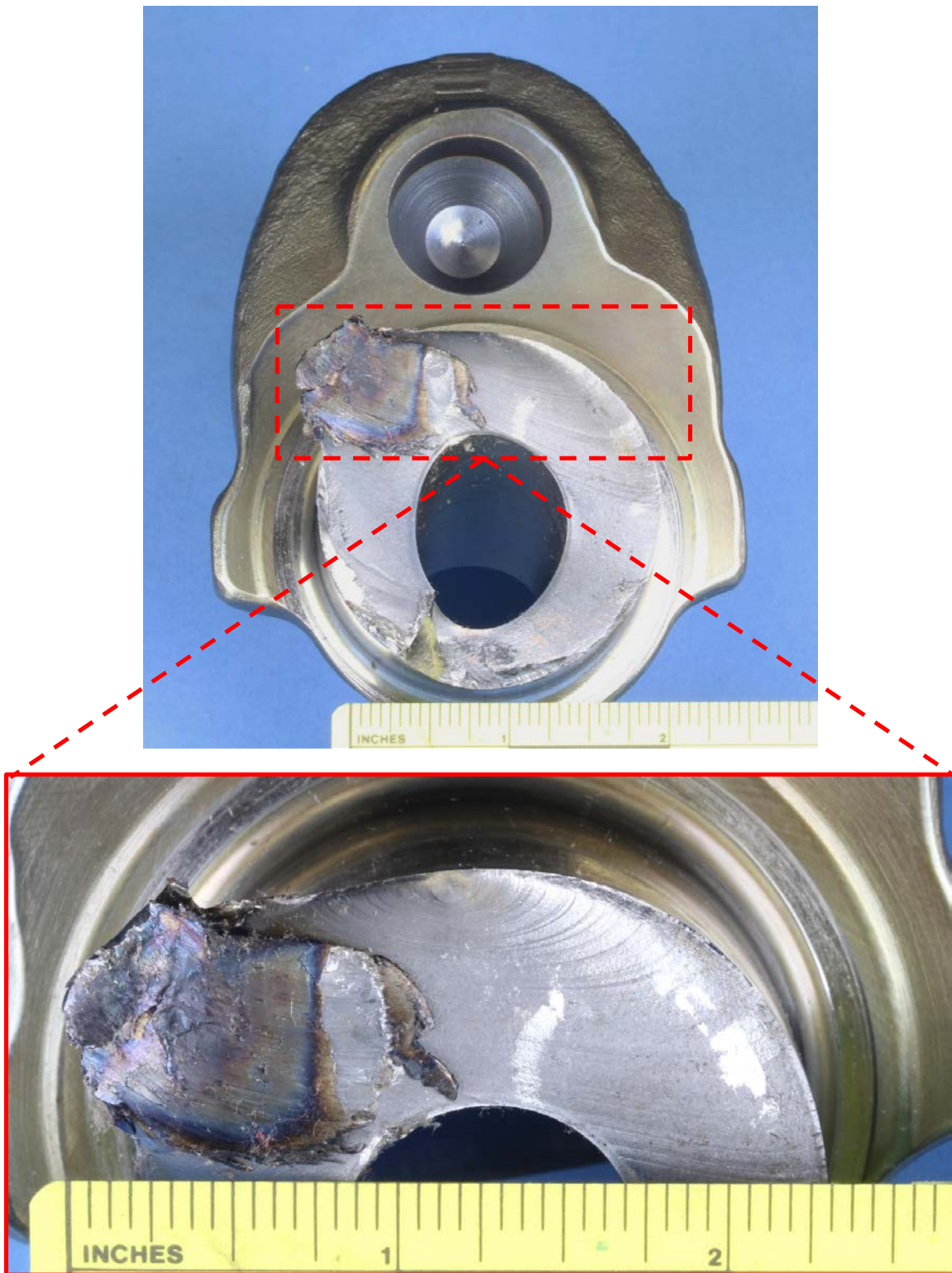


Figure 2: Overall (top) and close-up (bottom) photos of the crankshaft fracture surface.

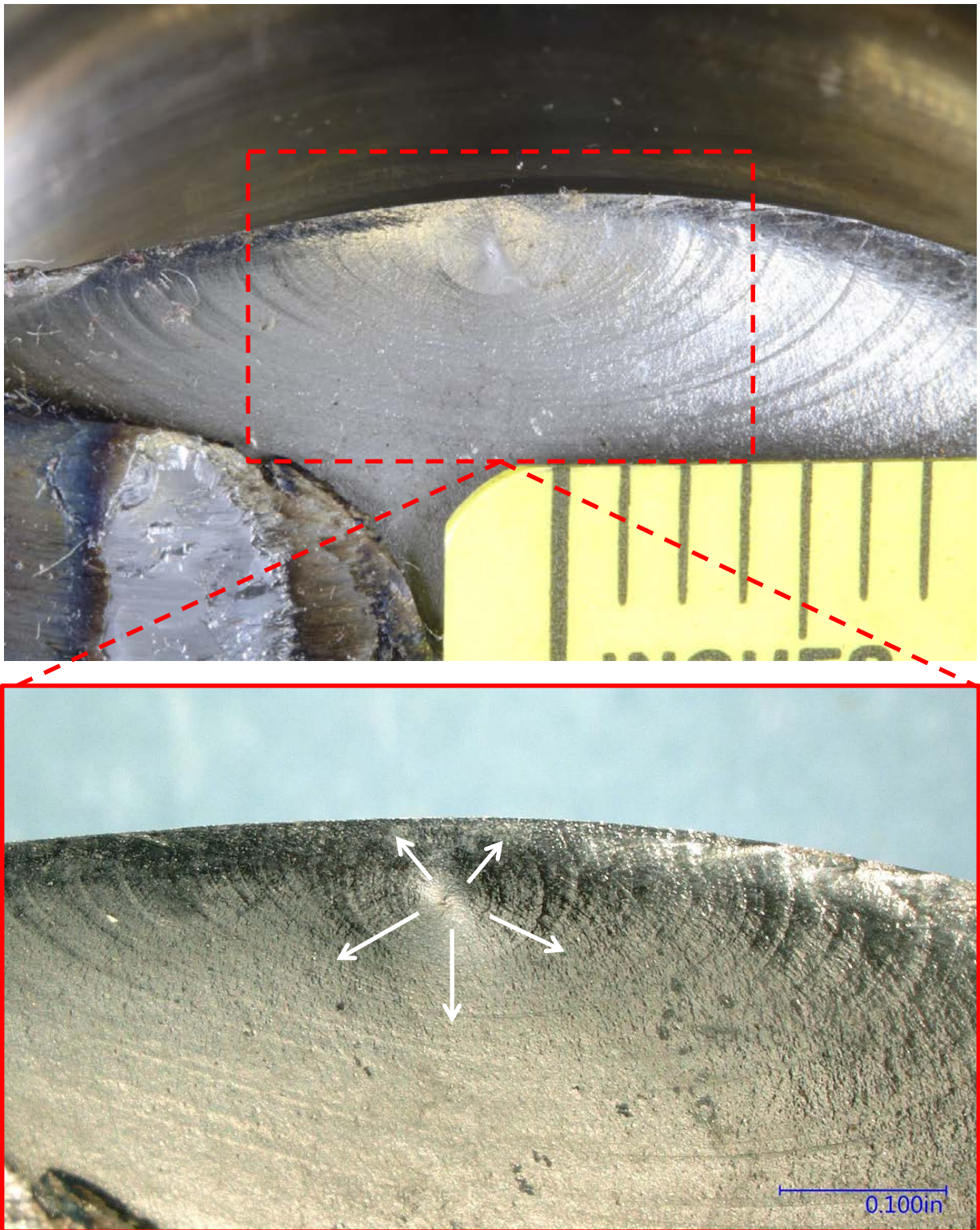


Figure 3: Close-up photo (top) and digital microscope image (bottom) of the crankshaft fracture surface. The white arrows indicate the direction of fatigue propagation from the subsurface fatigue initiation site.

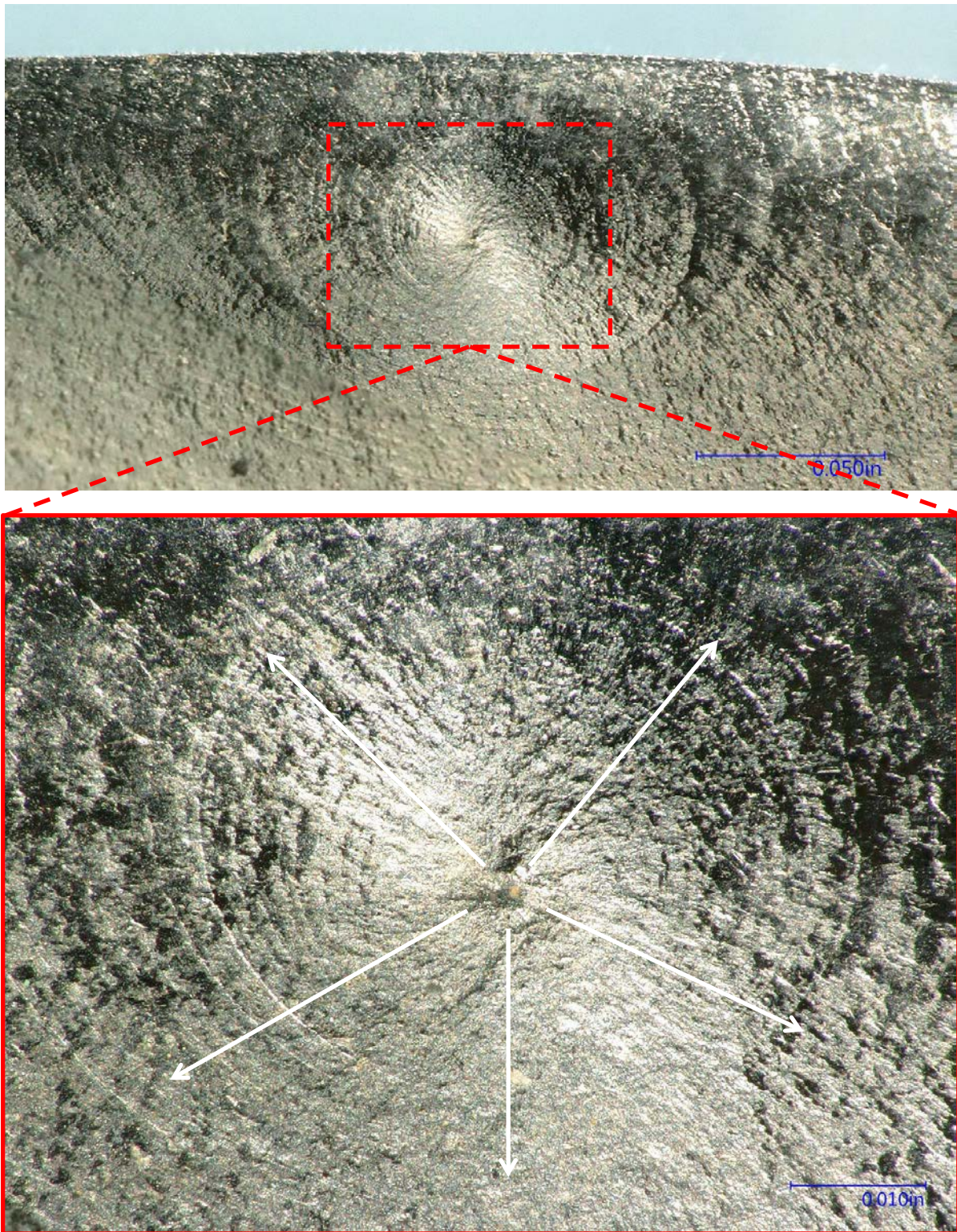


Figure 4: Digital microscope images of the crankshaft fracture surface. The white arrows indicate the direction of fatigue propagation from the subsurface fatigue initiation site.

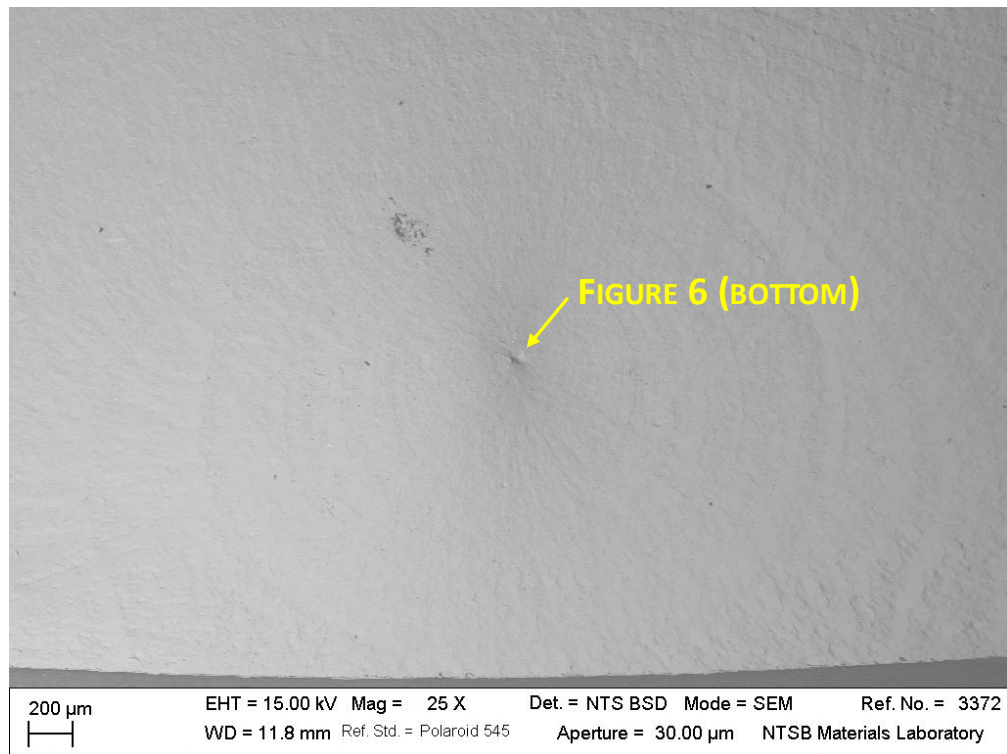
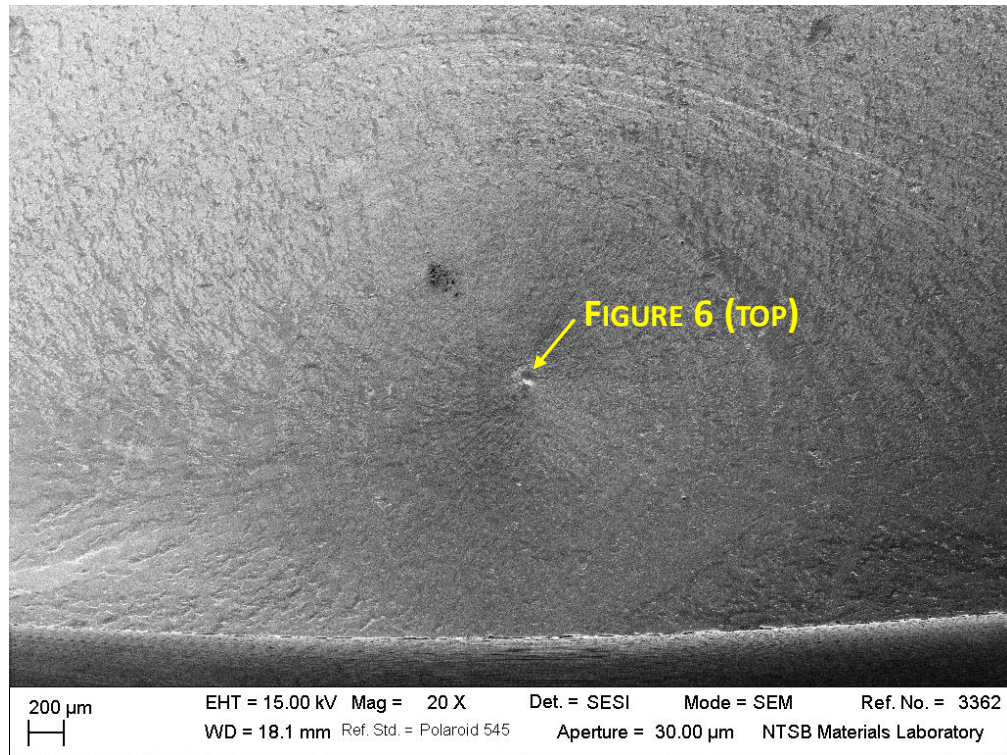


Figure 5: Secondary electron (top) and backscattered electron (bottom) SEM images of the crankshaft fracture surface.

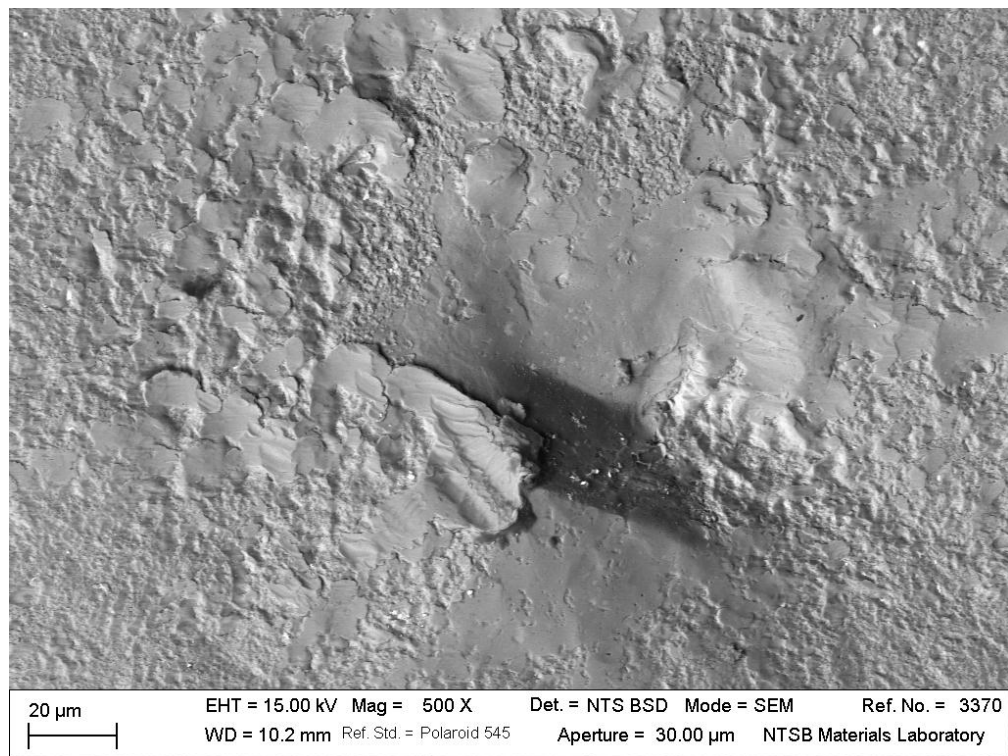
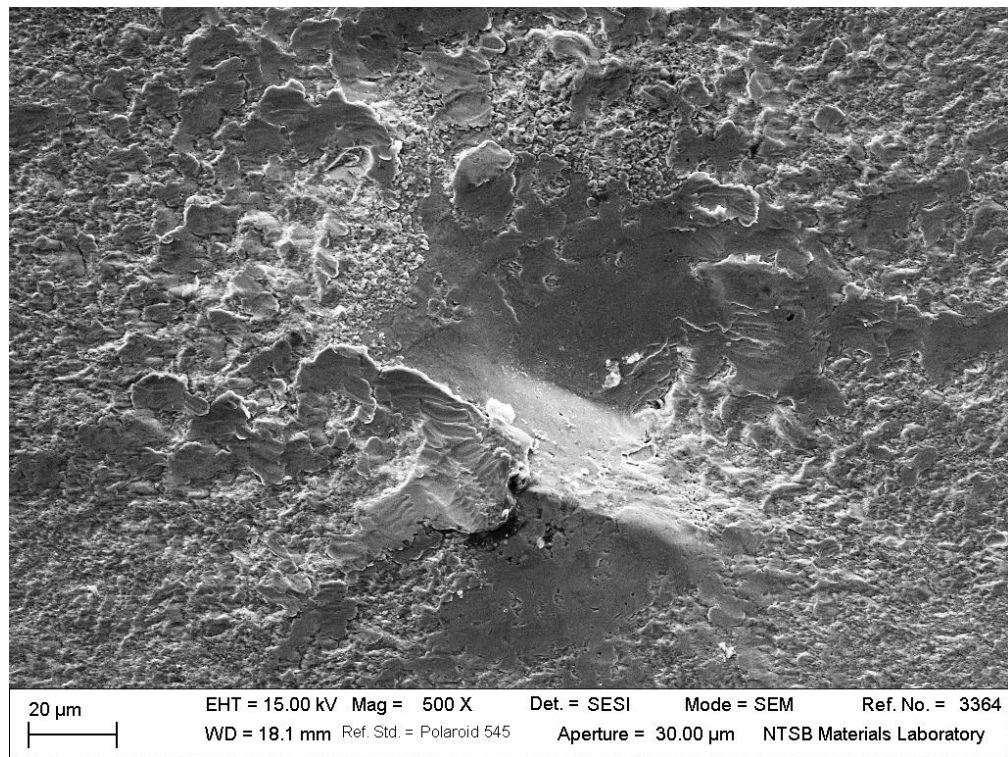


Figure 6: Secondary electron (top) and backscattered electron (bottom) SEM images of the fatigue initiation site on the crankshaft fracture surface.