

NATIONAL TRANSPORTATION SAFETY BOARD

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



April 16, 2021

MATERIALS LABORATORY FACTUAL REPORT

Report No. 21-027

1. ACCIDENT INFORMATION

Place : Cash, Arkansas
Date : January 4, 2021
Vehicle : Hawker Beechcraft G58, N325GC
NTSB No. : CEN21LA107
Investigator : Michael Hodges, AS-CEN

2. COMPONENTS EXAMINED

Propeller remnant

3. DETAILS OF THE EXAMINATION

On January 4, 2021, about 0933 central standard time, a Hawker Beechcraft Corporation G58 airplane was destroyed in an accident near Cash, AR. The private pilot and passenger sustained fatal injuries. The airplane impacted a muddy rice field and was destroyed from a postimpact fire. Two Federal Aviation Administration (FAA) aviation safety inspectors and an air safety investigator from Textron Aviation traveled to the accident site to conduct documentation activities. The wreckage was recovered from the accident site, and the airplane was retained for further investigation. A propeller remnant was sent to the NTSB Materials Laboratory for additional examination.

Figure 1 shows the propeller remnant from opposite sides, as received. The remnant had fractured between 4.93 and 5.24 inches above the root flange outboard surface. The fracture surface is depicted in Figure 2, as received. This fracture surface exhibited a general cup shape, with the outer surface protruding upward and the inner regions recessed around the internal cavity. The aft side exhibited a small flatter region, as shown on the bottom of Figure 2b.

Figure 3 shows the inboard face of the propeller blade root. This face exhibited three sets of markings, stating:

DES. FC7663-2R
SER. NO. K61394

HARTZELL PC. NO. 10

DEPTH 5 3/8
KNOB 12°

In addition, the number '17' had been handwritten on this face. Of note was the condition of the pitch-change pin, which had fractured as highlighted in Figure 4. Most of the pin fracture surface exhibited a smooth reflective luster with parallel streaks. These features were consistent with post-fracture smearing damage. The remainder of the pin fracture exhibited a rough, flat texture with a dull gray luster.

The fracture surfaces were cleaned using a mild soap detergent in an ultrasonic bath. In addition, the caked and packed dirt in the internal blade cavity was removed. The cleaned fracture surface is shown in Figure 5. This fracture surface exhibited features such as river patterns and flow marks consistent with the direction of fracture. These features were consistent with fracture from the forward face of the propeller towards the aft. The cup-shaped fracture surface exhibited shear lips around much of the periphery. The lower portion (aft side) of the fracture surface in Figure 5 exhibited a protruding ridge, consistent with a cantilever curl. The aftmost flat surface was consistent with localized compression. These features were consistent with bending stresses toward the aft direction.

The origin on the forward edge of the blade fracture surface and the inboard pin fracture surface were excised and inspected using a scanning electron microscope (SEM). A typical area of the forward edge of the propeller remnant fracture surface is shown in Figure 6. The surface exhibited a rough undulating surface texture. Closer examination of this region revealed dimpled rupture, as illustrated in Figure 7. These features were consistent with overstress fracture and were found throughout the examined fracture surface. There were no indications of features consistent with other fracture modes.

Figure 8 shows a typical region of the undamaged portion of the pin fracture surface. As shown in Figures 9 and 10, this fracture surface exhibited dimpled rupture, consistent with overstress fracture.

The features on the blade fracture surface were consistent with fracture of the propeller in bending overstress. The fracture direction was consistent with bending aft ward. The pin on the inboard face exhibited features consistent with having fractured from shear overstress.

The chemical composition of the dowel remnant was examined using energy dispersive x-ray spectroscopy (EDS) in a SEM. From the data obtained using these techniques, the remnant was found to be consistent with a 2000-series aluminum alloy.

Erik M Mueller
Materials Research Engineer

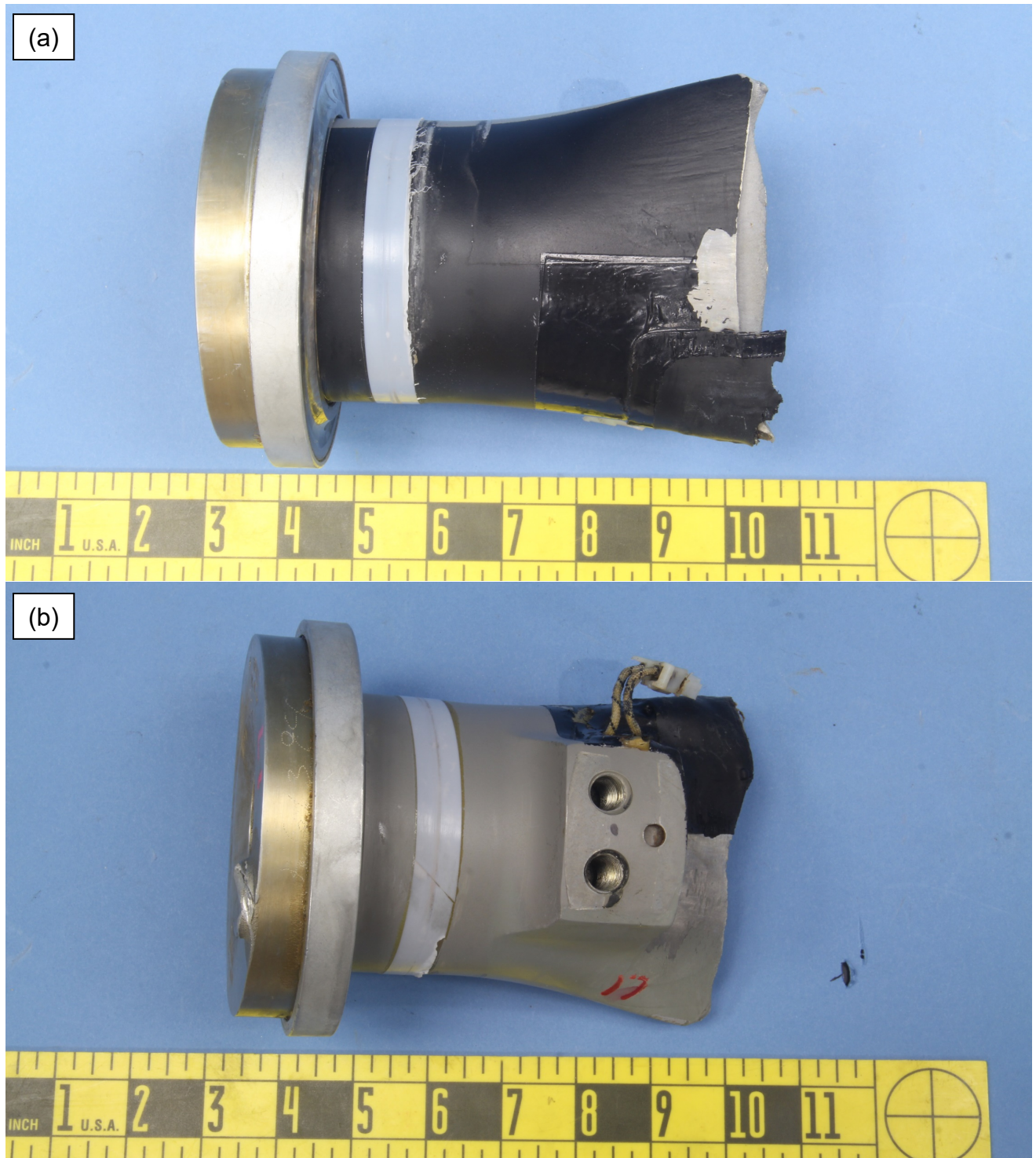


Figure 1 – View of the propeller fragment as received from (a) the aft face and (b) the forward face.

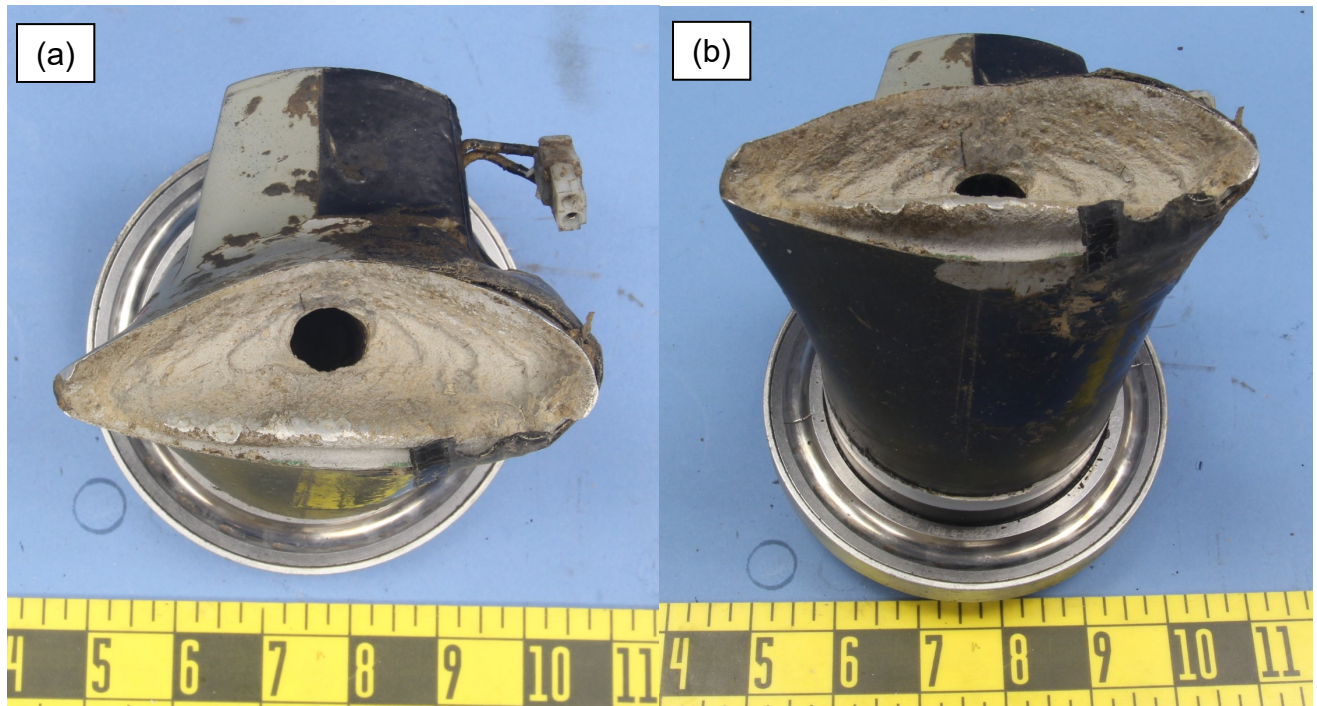


Figure 2 – View of the propeller remnant fracture surface from (a) an oblong view and (b) an angled view.

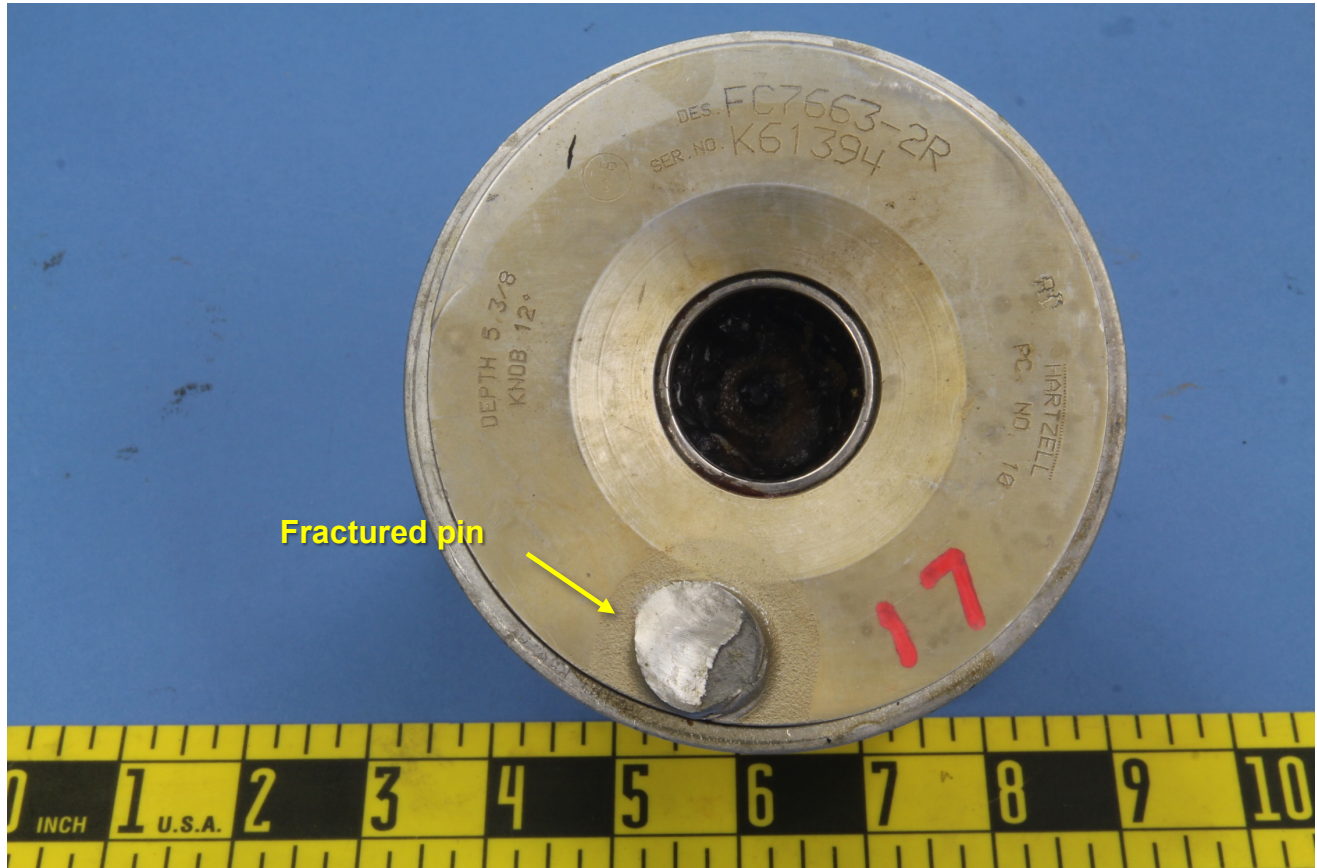


Figure 3 – View of the inner flange root face of the propeller remnant, as received.

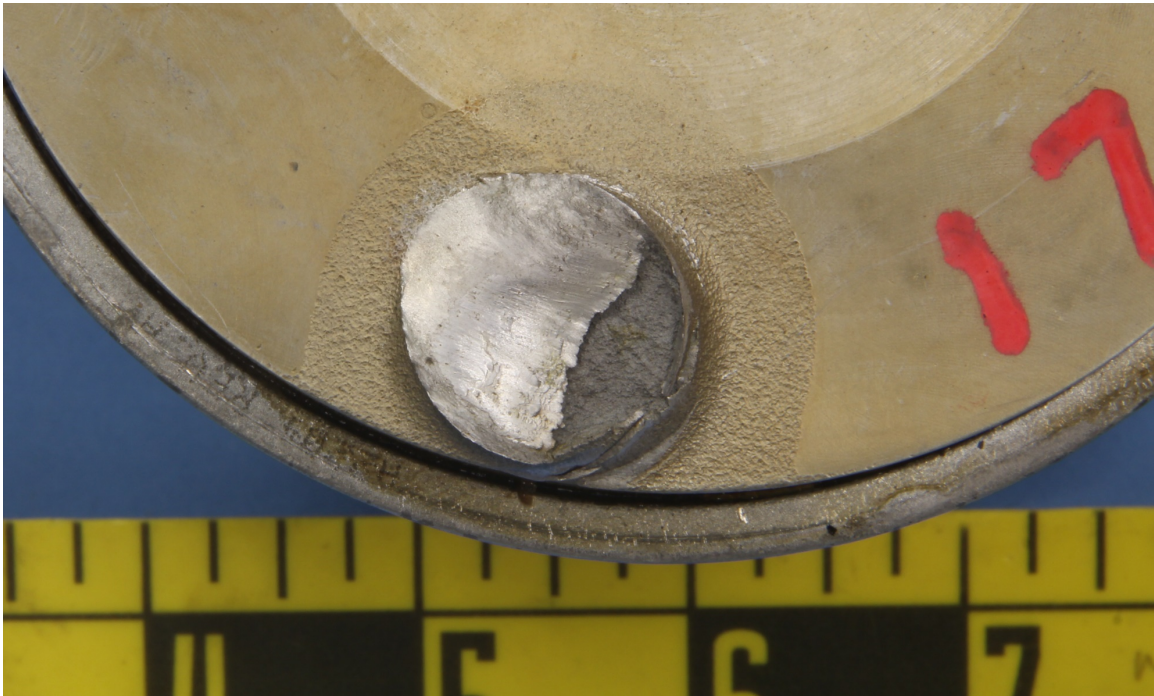


Figure 4 – Closer view of the fractured pin on the blade root shown in Figure 3.

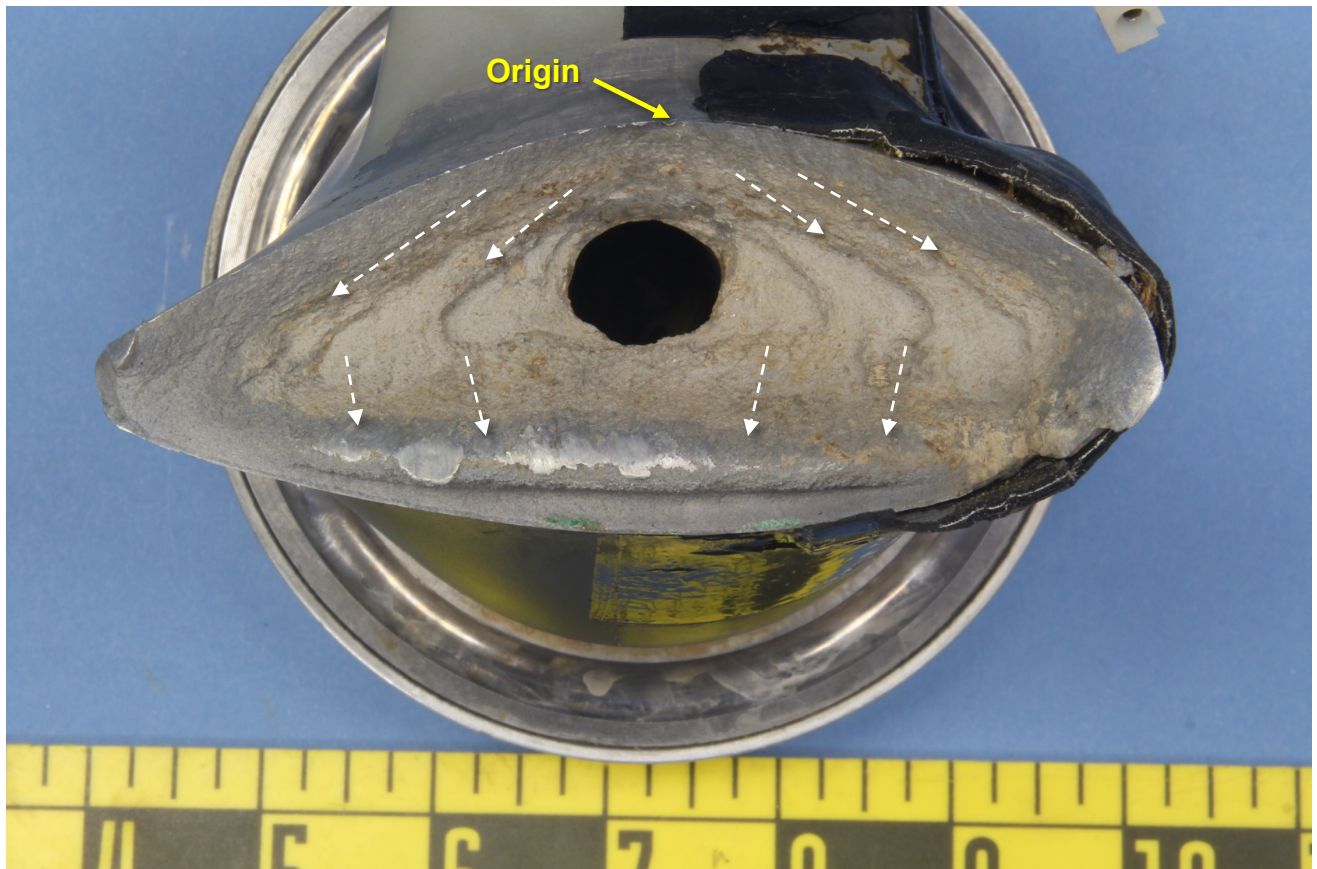


Figure 5 – View of the propeller remnant fracture after cleaning, annotated to show the general fracture directions as exemplified by the river patterns.

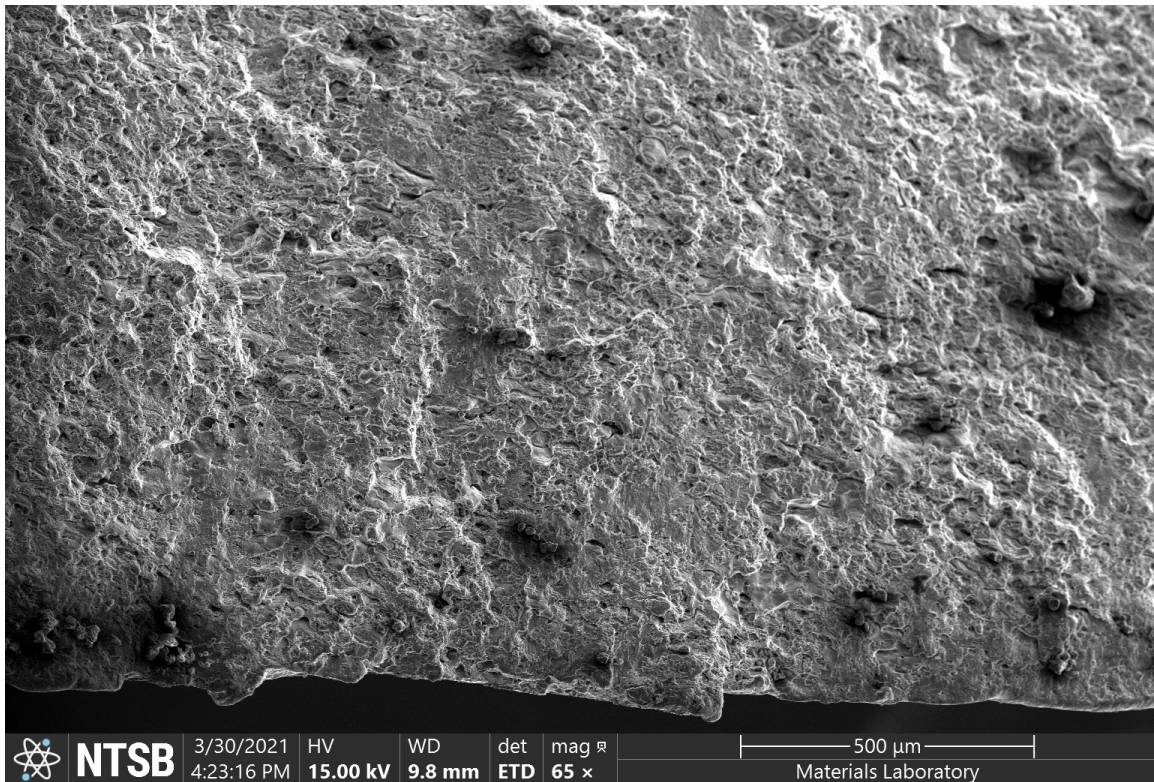


Figure 6 – Secondary electron (SE) micrograph of the beginning of the remnant fracture on the forward edge.

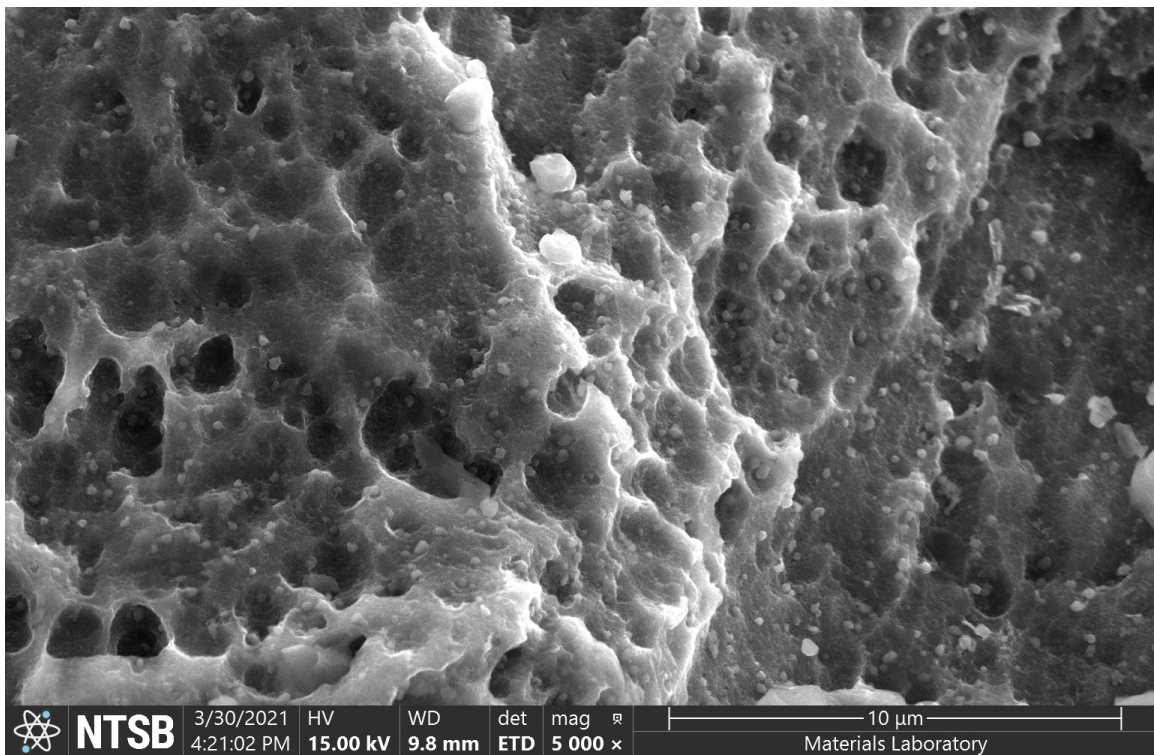


Figure 7 – SE micrograph of a closer view of the Figure 6 fracture surface, showing dimpled rupture.

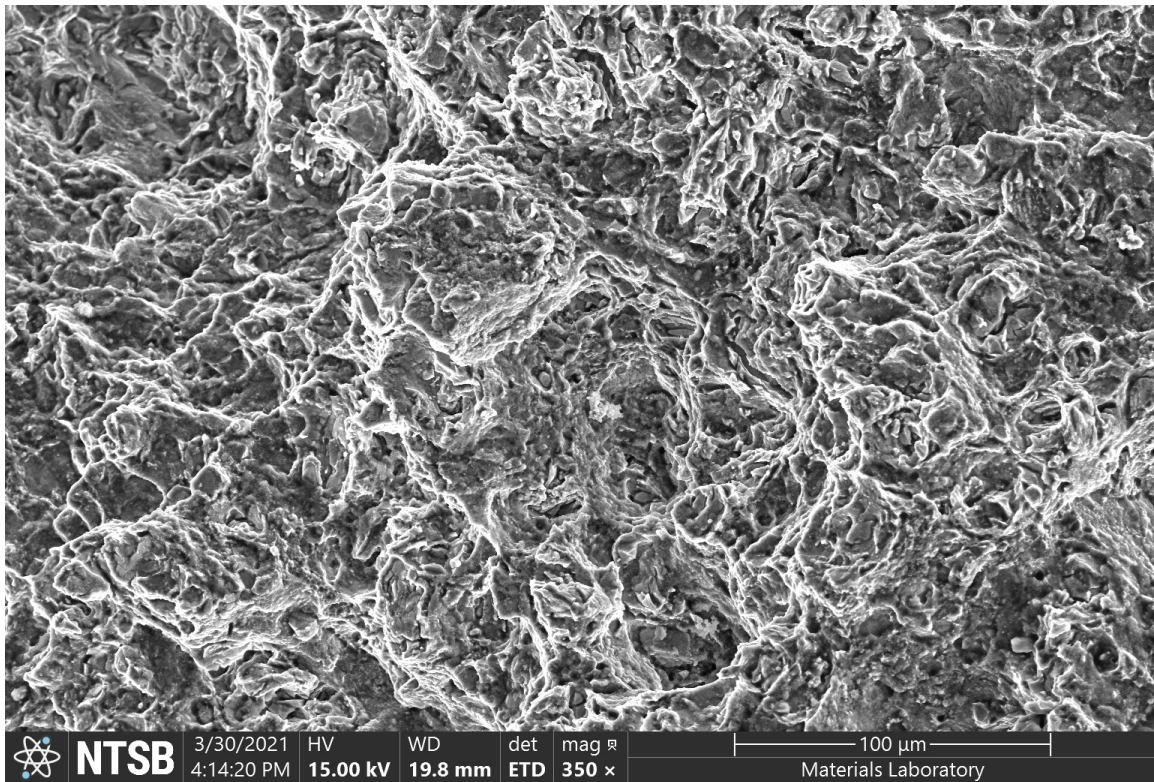


Figure 8 – SE micrograph of a typical area of the undamaged pin fracture surface.

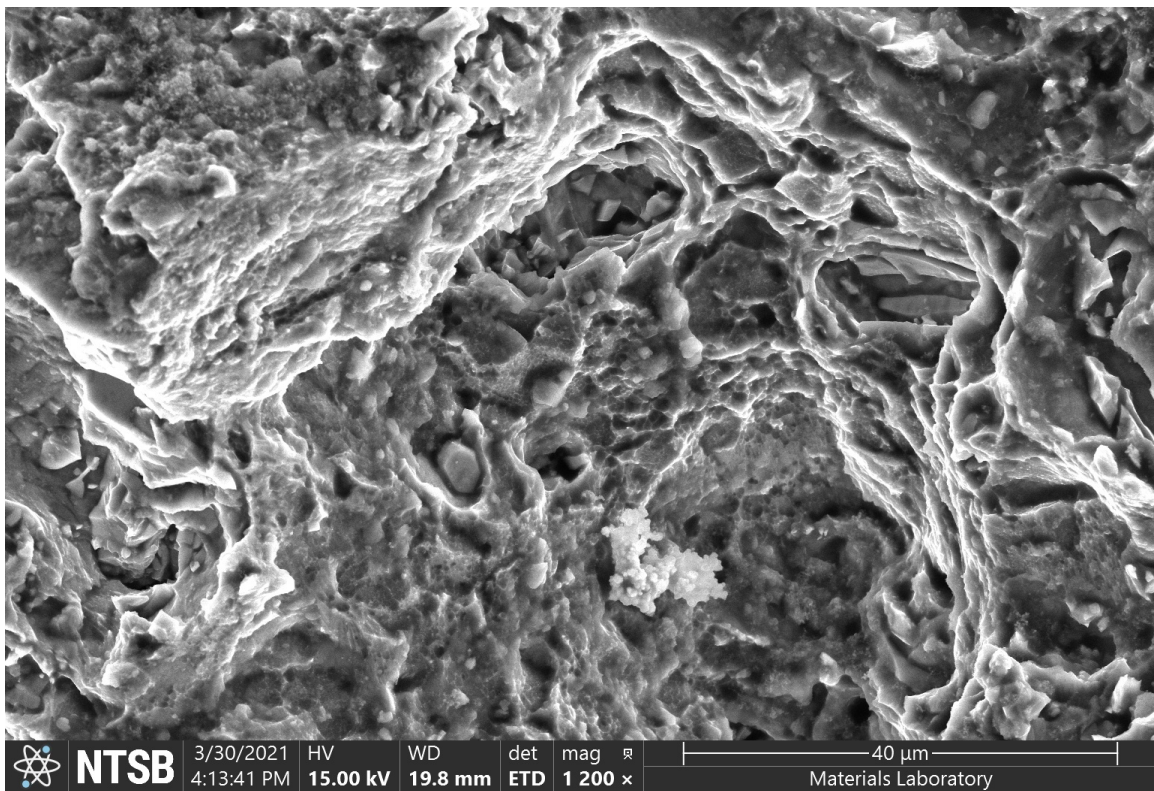


Figure 9 – SE micrograph of a closer view of Figure 8, showing dimpled rupture.

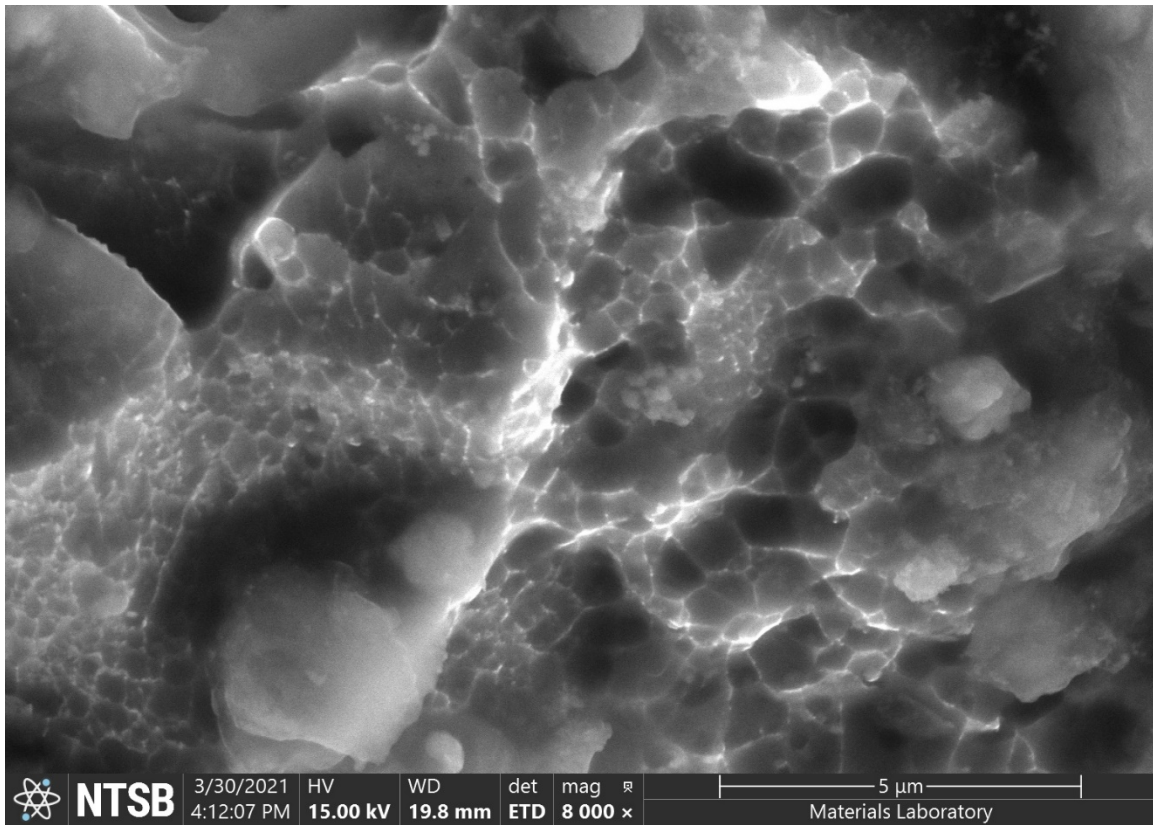


Figure 10 – SE micrograph of dimpled rupture at a higher magnification from Figure 9.