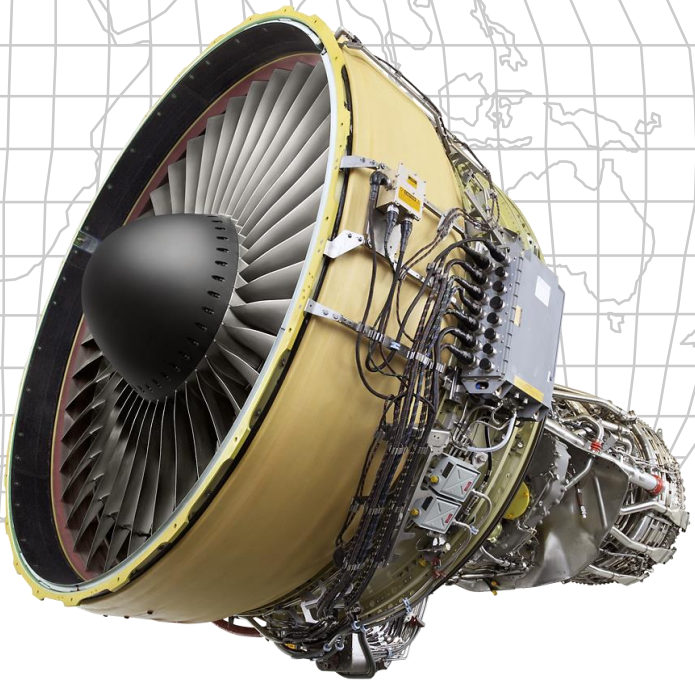
Metallurgical Investigation Report FA2017-18058

METALLURGICAL EVALUATION OF ATI 718 BILLET DWS FINDINGS

4/28/2017



imagination at work

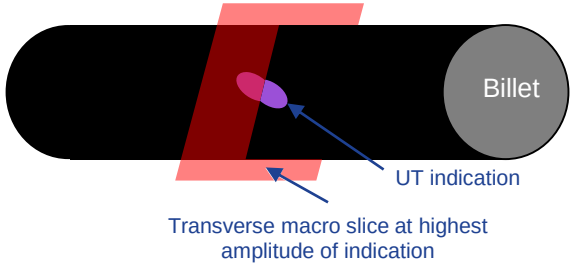
Background:

GE and ATI conducted a study of Dirty White Spots (DWS) to better understand their ultrasonic response characteristics.

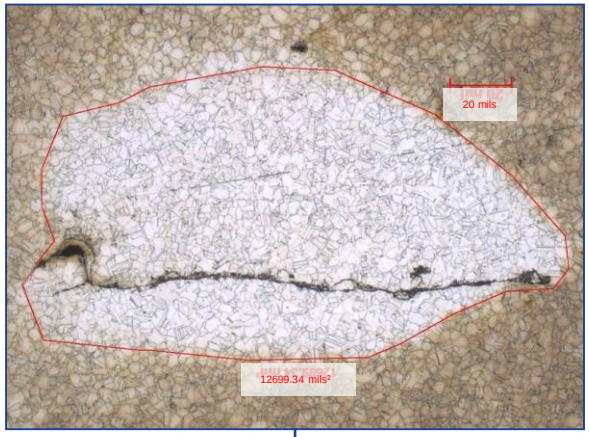
- Six (6) discrete DWS found by ultrasonic inspection (UTI) of TM 718 billet during the past 30 months were selected and characterized by ATI. The sample represented a typical range of sizes, shapes, stringer distribution, and radial position observed historically.
- The procedure utilized by ATI when evaluating the ultrasonic indications included:
  - As shown in the sketch below, a transverse macro slice is made at the highest amplitude of the indication
  - Surface examination of the transverse macro plate for micro specimen location and extraction
  - A micro specimen was taken from one side of the indication and mounted, the other side was not processed
  - Further polishing was not done once the anomaly was revealed
- The mounted micro specimen of the DWS's were sent to GE-Aviation for further characterization including metallographic examination
  - The mounts were etched to show overall condition of the DWS

Conclusions:

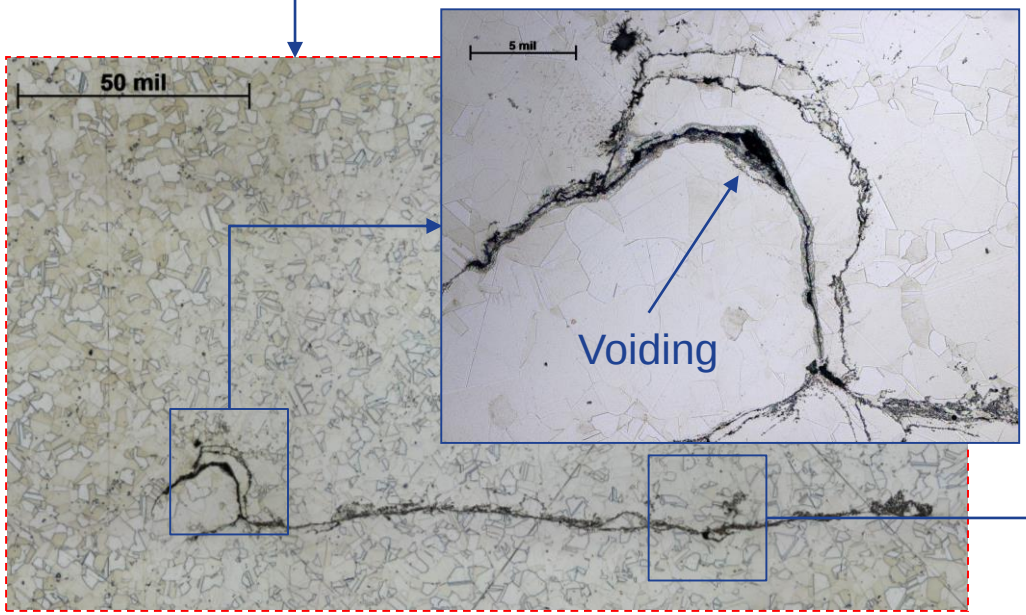
- Voids/cracks were found in five (5) of the six (6) DWS samples
- Findings on the sixth sample were inconclusive –it is possible that voids were present on the remaining part of the DWS which was not microstructurally evaluated
- The voids/cracks in the DWS may provide a reflection surface that is more conducive to ultrasonic detection. An example of one of the specimens with voids detected during UT inspection is shown on the following slide
  - Cross sections through the DWS in the event disk S/N MUNBB592 revealed similar particle stringers with neither voiding nor cracks that were associated with the manufacturing of the disk supporting that the DWS without voiding/cracking may not be detectable at new make

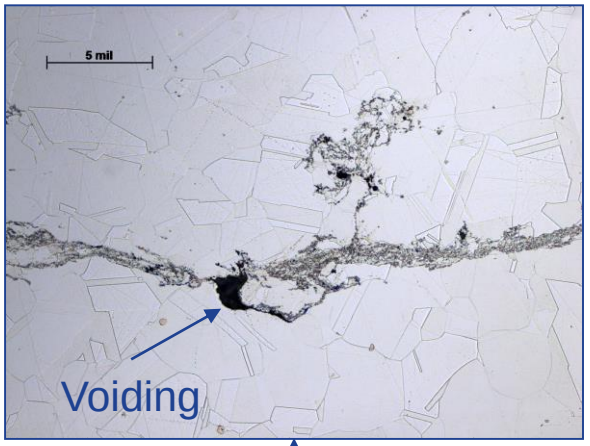


Example DWS Specimen

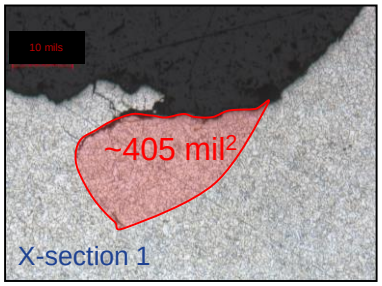


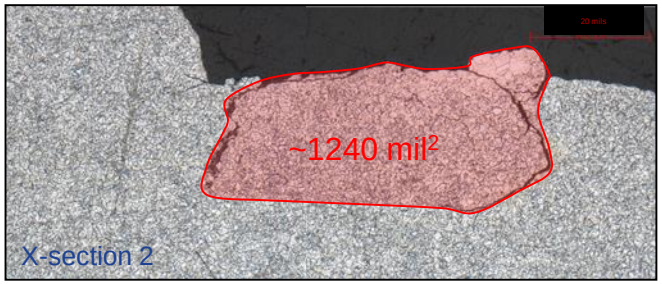
- This is an example of one of the six (6) discrete DWS's provided by ATI that was mounted, polished, and etched
- Multiple voids exist along the stringer which made detection via UTI more likely

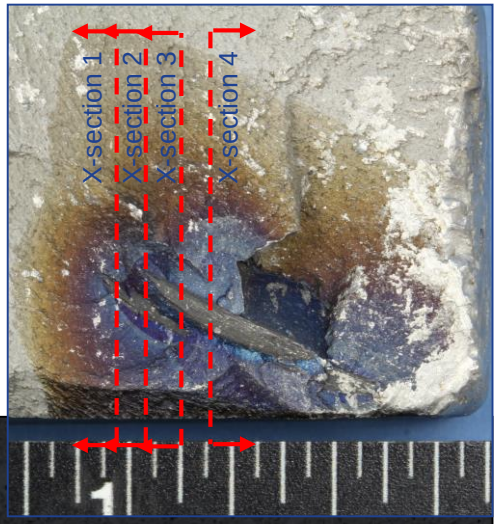




Event DWS

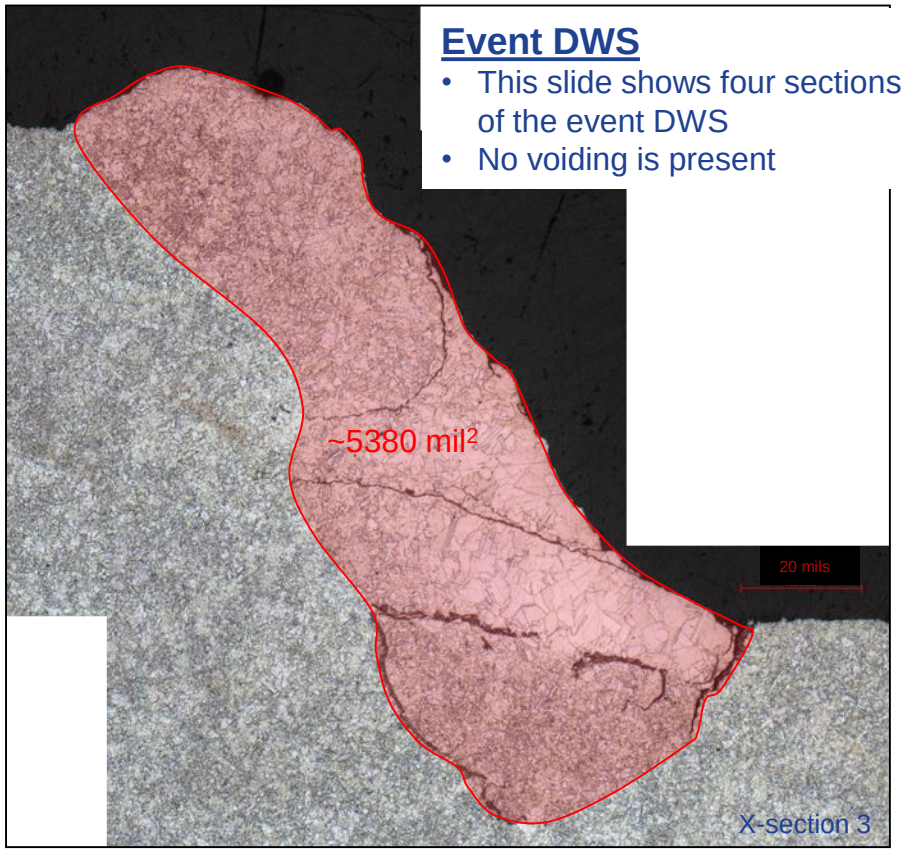


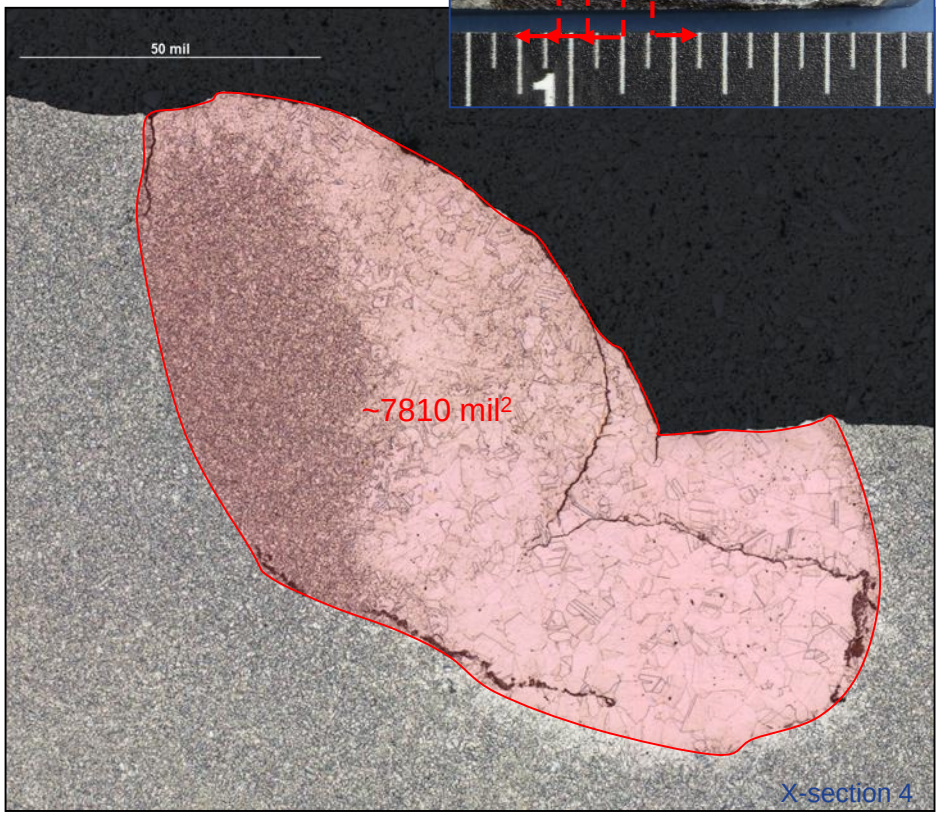




Event DWS

- This slide shows four sections of the event DWS
- No voiding is present





Note: Images comparable in scale

Multiple sections of fracture surface side #2 were made to show the DWS morphology along its length.