

Report number: ML467211	
Date: 3/17/20	
<i>Powering Aircraft Since 1929</i>  METALLURGICAL REPORT	<u>Distribution</u> Phillip Grice
Subject: Crankshaft from engine serial 467211, Cessna 182P N182EF	

A fractured crankshaft was presented for metallurgical inspection. The crankshaft serial number B805 had been installed in an engine model O-470 U3A serial 467211 and fractured in service 150 hours after installation. The engine had been modified to an O470-50 P-Ponk conversion, and the crankshaft had been turned 0.010" undersize during overhaul. The history of the crankshaft prior to this installation was not reported.

Figure 1 shows the crankshaft fracture location at the third main and fifth rod bearing. Inspection of the fracture surface shows the initiation below the surface, as shown in figure 2. Crack arrest lines or beach marks radiate from the origin below the surface. The nitride case appears normal and can also be seen in figure 2.

The shaft was made from steel that was not vacuum arc remelted (VAR), which is allowed in O-470 applications. This steel is commonly referred to as airmelt, though all Continental crankshaft steel is airmelt. The vacuum arc remelt process is a further refining process applied to VAR steel.

Figures 3 and 4 show the origin area using a scanning electron microscope with an energy dispersive spectrometer. There are oxide inclusions in the area of fracture origin, as is shown in figure 4.

CONCLUSIONS:

- 1] The fracture initiated below the surface, originating near an oxide inclusion within the metal.
- 2] Contributors to increased stress include
 - A. The addition of a super charger
 - B. The larger cylinders in the conversion
 - C. The inclusions naturally occurring in the non-VAR steel



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Figure 1 Fractured aft portion of the crankshaft (arrow to fracture surface)

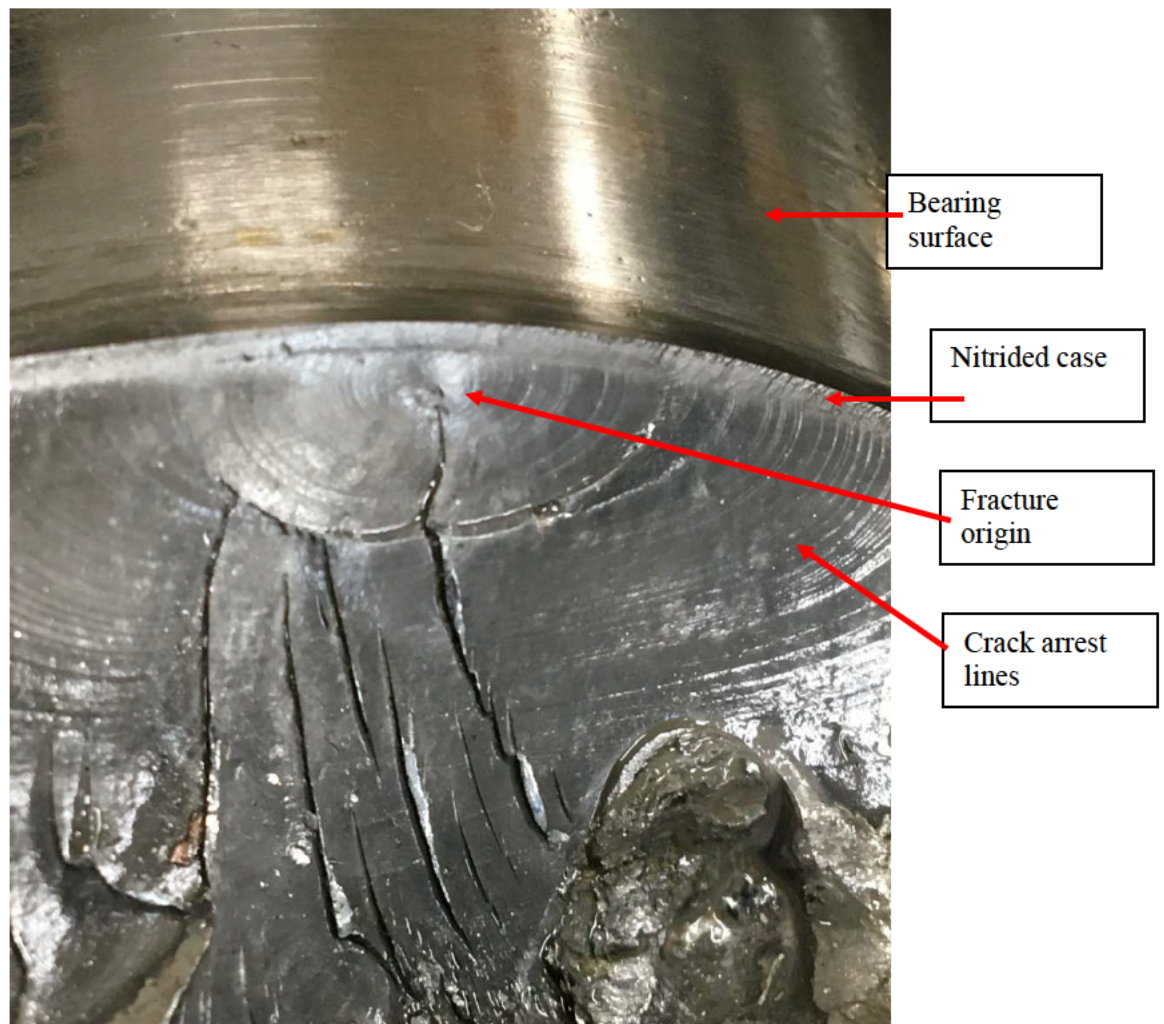


Figure 2 Fracture surface showing subsurface crack origin

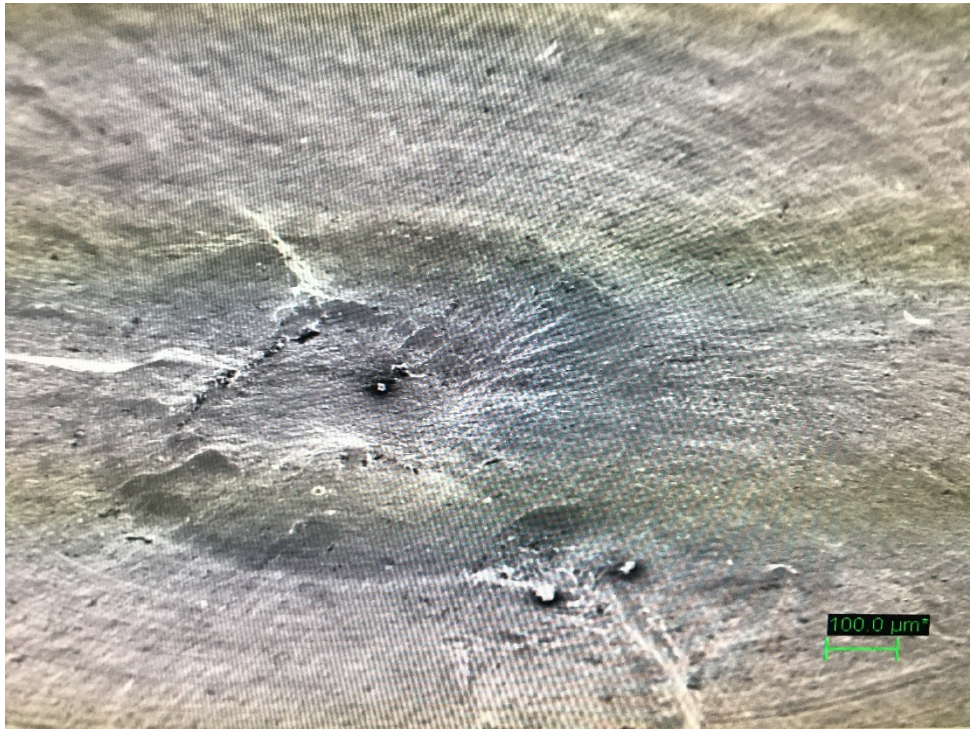


Figure 3 Scanning electron image of fracture origin



Figure 4 Oxide inclusions near fracture origin