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 Continental Motors, Inc. <i>Powering Aircraft Since 1929</i> CONTINENTAL MOTORS METALLURGICAL REPORT	<u>Distribution</u> 1] Phillip Grice
Subject: Engine Serial 305914	

The TSIO360FB engine serial 305914 had severe damage from an internal failure. The engine as received is shown in figure 1. A counterweight was located on the exterior of the engine as also seen in figure 1. This is one of the aft counterweights and is shown again in figure 2. The counterweight pins did not show any unusual wear, as shown in figure 3. The pin retainer plates and snap rings were damaged, but did not appear to have any manufacture anomalies, as shown in figure 4.

The adjacent connecting rods, cylinders, and pistons also showed significant damage. The connecting rod came apart at the bolts. The rod is shown in figures 5 and 6. Figures 7-11 show the fracture surfaces of the bolts.

The liberated counterweight came from the aft counterweight blade of the crankshaft shown in figures 12 and 13. The fracture surfaces indicate crack grown in fatigue, with an origin at the aft blade surface, as shown in figure 14. This is consistent with a crack on the blade on the surface of bushing installation. There is significant damage on the fracture surfaces, however, that masks additional crack features.

The bushing hole adjacent to the fracture in figure 12 shows marks consistent with movement for a period of time, as shown in figure 15. Figure 16 shows the opposite bushing hole without these marks. Figure 18 shows a sketch of the location of the initial cracks.

CONCLUSIONS:

- 1) The fracture on the aft counterweight hanger blade progressed in fatigue.
- 2) The origin of the crack is on the aft face of the blade. There is significant damage on the fracture surfaces that masks additional crack features.
- 3) Other fracture surfaces indicate fracture in overload.



Figure 1 Engine as received



Figure 2 Fractured counterweight



Figure 3 Counterweight retainer pins



Figure 4 Liberated counterweight pin retainer plates and snap rings



Figure 5 Connecting rod



Figure 6 Connecting rod



Figure 7 Rod cap



Figure 8 Rod bolt and nut



Figure 9 Bolt fracture surface



Figure 10 Bolt fracture surface



Figure 11 Rod bolt fracture surface



Figure 12 Fractured crankshaft aft hanger blade



Figure 13 Aft blade with liberated piece



Figure 14 Liberated piece from counterweight blade shows crack growth in fatigue. Initiation area is shown by the arrow.



Figure 15 Bushing hole adjacent to liberated piece of hanger blade



Figure 16 second fractured bushing hole

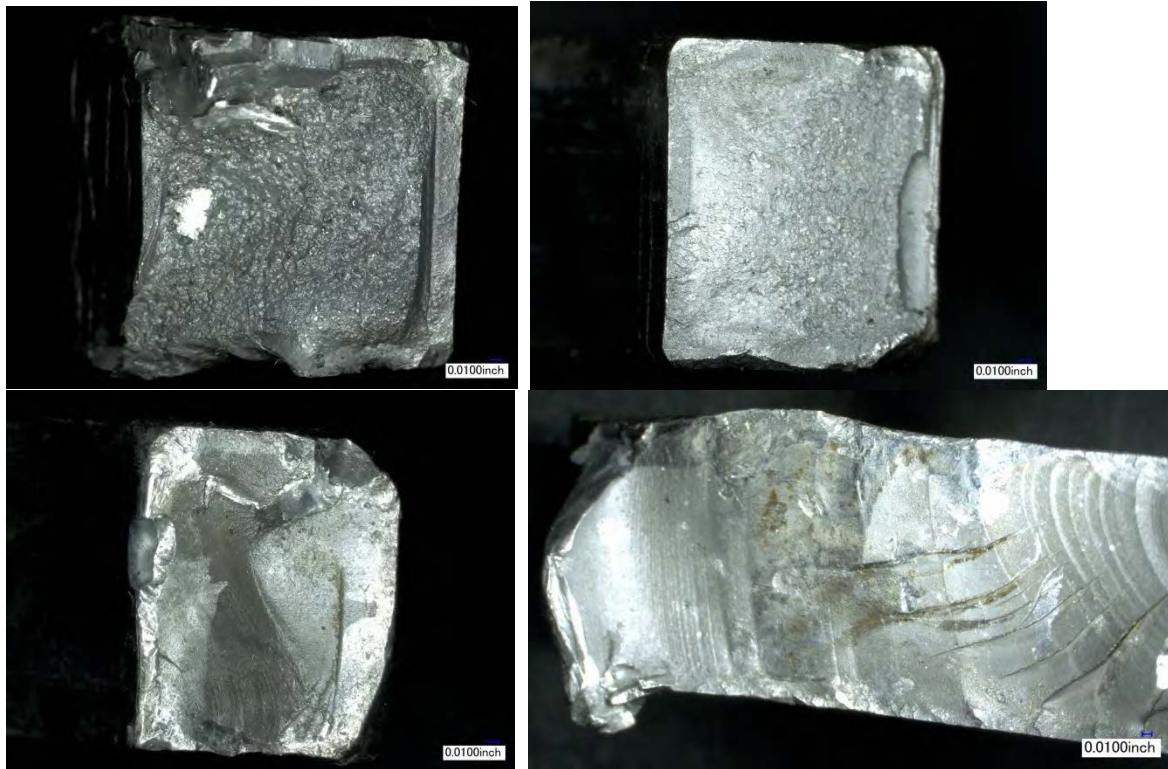


Figure 17 Fractured hanger blade sections. Top two show failure in overload from outer wall of the counterweight hanger blade. The lower two show crack growth in fatigue from the initial cracks depicted in figure 18.

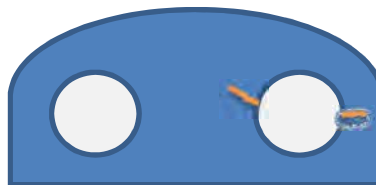


Figure 18 Sketch of initial cracks on aft counterweight hanger blade which grew to fracture