

Statement of
Mark Jennings

Aviation Safety Inspector, Richmond FSDO

On June 2, 2020, I conducted the on-scene accident investigation on N5948P a Piper PA-24-250. The aircraft engine encountered a sudden inflight engine failure. The pilot unsuccessfully attempted restart the engine and subsequently landed short of runway 19 at William M Tuck Airfield (W78). During the power off approach to landing, the right hand stabilator sustained structural damage when it struck an airport obstruction marker. The aircraft landed in the grass short of runway 19 on airport property. The landing gear remained in the up position, which resulted in landing gear fairing damage, belly skin damage, main landing gear linkage damage, lower cowling damage, and bend propeller blades. The task that were performed to determine the root cause of the engine failure are as follows.

The selector valve was moved throughout its detents and found to operate satisfactorily. The electric boost pump filters were examined; no contaminants found. The carburetor fuel inlet screen was examined; no contaminants found. The operation of the fuel system was tested with the electric boost pumps energized; no defects noted. The general exterior of the engine was sound; throttle linkages and mixture linkages were sound and made their stops. The Bendix ignition switch was tested and found satisfactory. The spark plugs were removed and found satisfactory. The oil sump suction screen was examined; no metal particles noted. The main engine oil filter screen was examined; no contaminants noted. Upon rotation of the propeller, it was noted that the impulse couplings were not snapping. The number one cylinder valve cover was removed; when the propeller was rotated there was no valve actuation. The accessories were removed to facilitate the removal of the accessory gearbox. Upon removal, when the propeller was rotated, the crankshaft gear did not rotate. The crankshaft gear retaining bolt was found unsecured and loose. The retaining bolt was removed with the remaining remnants of the locking tab washer. The crankshaft gear was removed. It was noted that the dowel pin that keys into the crankshaft gear and the mating surface/recess of the crankshaft was sheared. The crankshaft retaining bolt locking tab was found damaged; one half was sound and the other half broken into several pieces. The sound side of the locking tab was compared to a new locking tab; the profile of the accident locking tab had the same profile as a new un-bent locking tab. This indicated the locking tab on the accident engine had not been bent to the crankshaft gear retaining bolt head; thus preventing its loosening.

The loosening of the crankshaft gear-retaining bolt caused the "working" of the crankshaft gear, which subsequently caused the dowel pin to shear. When the dowel pin sheered, there no longer was a direct connection between the crankshaft and the crankshaft gear. The crankshaft gear drives two idler gears in the accessory gearbox, which drive the camshaft, engine driven fuel pump, vacuum pump and the magneto drive couplings.

The pilot statement aligns with the nature of the failure. He stated the engine suddenly shut down without any warning inherent to fuel starvation or mechanical abnormality. The separation of the crankshaft gear resulted in the loss of ignition and valve actuation causing the sudden failure.

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