

## **Prop Strikes and Sudden Stoppage –**

By Kas Thomas, **The Major Overhaul** A Guide for Pilots TBO Advisor Books 10/94

Prop strikes and sudden stoppages are extremely common. Prevailing folk wisdom says that when an engine is putting out idle power at the time of the sudden stoppage, there is no need to do anything but dial-check the front of the crankshaft (to make sure the prop flange is not bent) and replace the bent prop. But folk wisdom is often wrong. The leverage of a prop over a crankshaft is great; and the leverage of a crankshaft over a drive gear on a gear-driven prop governor, alternator, or magneto is even greater. Many Continental engines have gear-driven alternators mounted on the forward starboard side of the crankcase. At 1,000 rpm crankshaft speed the alternator is turning at 3,000 rpm and the alternator armature contains something like 600 foot-lbs of kinetic energy. When a sudden stop occurs, this kinetic energy must be 100% dissipated within a few milliseconds. The energy goes into the gear teeth of the alternator drive, where it can cause small, invisible to the naked eye cracks in the crankshaft drive gear flange- cracks that can spell disaster hours later. There is, of course, no way to detect such cracks without complete engine disassembly and Magnafluxing of the crankshaft.

The same considerations apply to the gear train at the rear of the engine, which possesses a large aggregate kinetic energy because of all the accessories (vacuum pump, magnetos, etc.) that derive their motion from crankshaft rotation. Sudden stoppage quite often causes cracks to appear in the gear teeth of the camshaft drive gear at the rear of the crank. There is no way to adequately detect such cracks but to disassemble the engine and Magnaflux all steel parts.

Many sudden stoppages (such as runway overruns) involve low crankshaft rpm but significant forward speed. The forward speed impact shoves the crankshaft rearward, causing the oil slinger portion of the crank to slam against the crankcase, giving rise-in-turn to hidden cracks (hidden, that is, until somebody removes the crankshaft and Magnafluxing-inspects it).

Many engines contain crankshaft counterweights. These massive weights ride on small shafts and bushings which (you guessed it) are easily damaged by a sudden-stop event. Even if no actual cracking occurs, dents in the counterweight's bushings will tend to detune the counterweights, defeating their vibration-dampening action. Increased wear and vibration are inevitable if the engine is continued in service.

Hidden sudden-stop damage can also occur in connecting rod bolts. These bolts which are already operating at or near the elastic limit of the metal in normal service, frequently stretch as a result of stresses imposed by sudden stoppage. Once the bolts stretch, it is only a matter of time before the rod cap comes loose- in which case you may well be able to inspect your rods without disassembling the crankcase. They will make their own exit holes on the way out.

Dial checking the front flange of the crankshaft detects none of these conditions, so even if an engine was turning at low rpm at the time of the impact, a sudden stoppage should mean complete engine disassembly. And complete engine disassembly should mean major overhaul.