



## **Air Technology Engines, Inc. T53 Engineering Product Support Notice – Engine Storage**

January 15, 2020

Operators have asked us of the importance to run the Bell 205 and KMax every 30 days while they are in storage for several months. Turbine engines utilizing a free power turbine to drive the main rotor transmission actually reduced the pilot workload and were a natural fit for the helicopter. A turbine engine is a small light weight package with an excessive amount of power. A comparable reciprocating engine is many times heavier and impossible to use in larger helicopters. However a turbine engine requires more TLC (Tender Loving Care).

Bearings, seals and gears have to be of the finest quality and that means they require more TLC. When a turbine sits unused for more than a month, there is a danger of moisture that could result in rust occurring on parts made from tool steel. The rust could contaminate small oil jets that can be as small as 0.023 inch. The fuel system contains 22 fuel nozzles and each fuel nozzle has three rectangular orifices that are 0.003 inch by 0.007 inch. Internal fuel nozzle orifice coking can occur over time, and fuel manifold functional testing by a licensed service center is suggested every 300-600 hours depending on severity of engine operating environment.

The best prevention is either to preserve the engine using preservation procedures that meet the Honeywell requirements or to run the engine once a month, and long enough to bring the oil system up to normal operating temperatures.

The main concern for an engine that is not run is the power turbine governor. The flyweight shaft has an "O-ring that can and does dry out. It is normally wetted with fuel, and providing the engine fuel system is activated once a month (as the governor is activated), there has not been any O-ring issues. The real issue usually occurs during rotor tracking when the rotor is brought up to an overspeed condition and the governor forces a reduction in fuel flow. As soon as the overspeed condition is halted by pulling up on the collective, the governor recovers before the engine reaches minimum speed (30% N1). When the governor does NOT recover because the "O" ring has dried out, the pilot has no choice but to enter an auto-rotation. Unfortunately a few instances have occurred when rotor tracking was being done over populated areas.

In instances that our senior engineer Ed Pease has investigated, causes like a PT governor sitting on a shelf for a substantial amount of time had been installed on an engine or a governor left uncapped on a bench for several months was installed on the engine. Unfortunately when an incident occurs and there is damage to the aircraft or loss of life, the pilot gets the blame for not having made a proper auto rotation. His professional opinion has always been that the "weakest links" in the T53 engine are the engines alignment and the power turbine governor. When an aircraft sits for more than a month, there is a possibility of excessive friction between a dry "O-ring and the power turbine flyweight shaft.