

Helicopter Engines and Desert Environments— **Who Wins?**

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You don't have to tell a pilot or engine mechanic that operating in a harsh, desert environment is mechanically unforgiving. Sand erosion and build-up of dirt detract from engine performance and maintainability. Can an engine be maintained throughout a six-month deployment? Can a pilot be confident of engine-power availability? Can we reduce the number of failed engines? Can rotary aircraft win the dirt battle? The answer is yes!

Low power is the major cause for engine removal in the Navy's H-60 fleet. For SH-60B, SH-60F and HH-60H aircraft, powered by two T700-GE-401C turbo-shaft engines, if you spend time on preventive maintenance (such as engine washing), aircraft readiness and engine performance will improve. The T700 engine is unique in that it has a built-in integrated particle separator (IPS) blower as part of the engine's accessory gearbox. It was designed to separate sand and dirt from inlet air and blow the particles out before enter-

ing the compressor inlet. However, operating in desert environments has posed a major problem: Too much debris makes it past the IPS and enters the compressor. These tiny particles erode compressor blades and coat hot section (gas generator turbine) parts, which plugs cooling air holes, therefore decreasing hot-section efficiency.

NAVAIR and the T700 engine team have been working to improve engine life in this environment. We have found that preventive-maintenance washing procedures are critically important. Based on lessons learned during Desert Storm and Desert Shield, a hot-section wash-sprayer nozzle was developed to perform hot-section cleaning in the T700 engine. Hot-section cleaning is done by installing a wash nozzle into one of the engine's igniter plug ports and spraying soap solution (engine gas path cleaner) on the hot-section parts, while the engine is motored. During 2003 for the H-60, and last year for the Marine's AH-1W Super Cobra



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T700 Engine Stage 1 Gas Generator Rotor



No washing performed



Washing performed

T700 Engine Stage 1 Nozzle (leading edge vanes)



No washing performed



Washing performed

Adhering to engine-washing procedures is one of the preventive maintenance measures that can never be overemphasized.

(T700-GE-401 engine), the T700 fleet support team (FST) at the Naval Aviation Depot, Cherry Point, N.C., investigated the engine-wash procedures, clarified the procedures, and updated locally manufactured tools and support equipment needed to support wash requirements.

A conditional requirement was established to perform hot-section cleaning after the last flight of the day if flying in a desert environment. The timeframe allowed some flexibility so there was no interference with the aircraft's schedule during the day. Making it a requirement to perform the hot-section wash in a desert environment is one of the steps the T700-engine team has taken to preserve the fleet's T700-engine life and improve readiness.

Who Wins? Several Navy H-60 squadrons that consistently followed these procedures didn't have to remove a single engine because of low power during

their six-month deployment. Results also revealed that, in some cases, engine performance was increased. While this was not always the case, there have been fewer engines removed for low power, compared to previous years, and we expect to see more improvement in the future. Based on the positive results from the Navy's H-60 fleet, the same cleaning cycle has been applied to the Marine's AH-1W Super Cobra.

Maintaining engine readiness by preventive maintenance increases engine availability and allows the aircraft to be available for mission accomplishment. Navy and Marine Corps aircraft continue to battle harsh flying environments, but hot-section washes have proven to be successful by improving engine life. Hot-section washing after operating in a desert environment has become an effective aircraft-readiness tool for the T700-engine program. 🌿