Affordable Helicopter Drive Train Housings

Manufacturing processes to fabricate composite material transmission housings that are lighter in weight and which significantly reduce operating and support costs.3

OBJECTIVE / SOLUTION

This Housings ATO-M focuses on the core issues of weight reduction, increased performance, rapid and affordable manufacturing processes, and improved sustainment for composite housings in fielding current and future Army weapon systems. It is developing advanced manufacturing processes and technologies that significantly improve the likelihood of fielding components with requisite performance and within desired cost parameters and on schedule. A need exists to develop higher performance drive train components and manufacturing processes for flight critical hardware utilizing composites, metals, and new coatings. The optimal selection will be demonstrated on existing drive train housings.

These demonstrations with rotary wing drive train prime contractors and key suppliers will ensure that current and future (FCS/Future Modular Force) drive train components are more robust, lighter in weight, require lower acquisition and sustainment costs, and provide increased reliability. The Housings ATO-M will also ensure that these components that provide greater benefits will be available to support FCS and current systems.

ACHIEVEMENTS

Three separate contracts were awarded supporting this effort, two to Sikorsky Aircraft, Stratford, CT, manufacturer of the UH-60 Black Hawk, and one to the Boeing Company, Mesa, AZ, producer of the AH-64 Apache. Under the Sikorsky contract, processes to fabricate helicopter transmissions housings were developed and demonstrated. The Boeing contract has implemented new material coating processes to inhibit corrosion on magnesium drive train housings. As a result Boeing has returned over 70 (otherwise scrapped) Apache Tail Rotors and Intermediate Gearboxes to service on the AH-64 Re-Manufacturing line by applying the Magnesium Corrosion Parts with Protective Process (MCPP) enhanced corrosion protection system.

BENEFITS

- **Magnesium Corrosion Protection:** Advanced coating reduces corrosion of magnesium housings, O&S costs are reduced, and a 73% reduction in boxes lost to corrosion on AH-64 ($7.7 million already saved in Apache program with initial technology implementation).
- **Composite Transmission Housings:** Affordable composite housing eliminates corrosion, reduces O&S costs by 90%, and weight is reduced by 25%.

STATUS

- **Magnesium Corrosion Protection:** Project completed with Best Combined Finish Systems developed for Overhaul and Repair for both internal and external surfaces as well as recommendations for new magnesium component protection.
- **Composite Transmission Housings:** Project demonstrated design, manufacturing, tooling, and evaluation techniques and processes by fabricating and destructively evaluating full-scale upper and lower helicopter transmission housings. Demonstrated technology is available for UAV/ Rotary Wing applications for qualification and flight testing. Final Technical Report in process.

WEAPON SYSTEMS / SECONDARY ITEMS IMPACTED

Magnesium Corrosion Protection:

- Validated Enhanced Corrosion Protection System now available for application to multiple components
- Insertion on ECP AH-64 Apache Longbow conversion and overhaul
- Boeing has transitioned corrosion protection system to Overhaul and Repair of Intermediate Gearbox
- Final Report on MCPP available on request

Composite Transmission Housings:

- Manufacturing processes and technology available to FCS/FF aircraft drive train and gas turbine engine gearbox designers.

POTENTIAL COST AVOIDANCE

- A cost avoidance in the range of 49-90% across elements of the entire project is expected.

AH-64 Apache Helicopter

Tailrotor Gearbox Before Repair

Tailrotor Gearbox After Repair

Helicopter Transmission Composite Upper Housing