

Automation Of Rotorblade Erosion Coating Application

Maximize rotor blade erosion coating uniformity and minimize material waste by automating the application process. Provide a flexible solution for multiple aircraft platforms and multiple coatings.

OBJECTIVE / SOLUTION

Helicopter main rotor blades are experiencing unacceptable removal rates due to erosion from sand and moisture. The current manual UH-60 Utility Helicopter erosion protection coating process has the potential to exhibit out of tolerance coating thickness and can waste coating due to inefficient material transfer.

The automated coating system will be designed to accommodate multiple coating technologies and multiple aviation platforms. Erosion protection is dependent on uniformity of application of three separate materials (primer, basecoat, topcoat) within strict thickness tolerances. Transfer efficiency that minimizes material waste is difficult given required applicator distance from coating source and geometry of coating coverage area. A multi-purpose solution requires interfaces for a variety of spray gun types, flexible fixturing, and an innovative coating delivery system. Consistent coating thickness will be achieved by utilizing system control feedback for automated process adjustments. The material source will be located at the best location to maximize effective material delivery to rotor blades. "State of the Market" automated spray gun technology will be utilized to achieve precision spray pattern.

ACHIEVEMENTS

- Project results will contribute to meeting Air Maneuver Force Operating Capabilities (FOC) including FOC-04-01, Responsive and Sustainable Aviation Support (Tier 1) and FOC-04-02, Effective Aviation Operations in the Contemporary Operating Environment (Tier 1)
- Improved system components that maximize coating transfer efficiency
- System controls to include process monitoring, defect detection, and self adjustment
- Flexible automation to accommodate various coating materials and blade configurations
- Rotor blade fixtures with precision mounting points for automated process and mobility for material handling
- Increased throughput, reduction in coating material usage, reduced cost due to a more efficient process

BENEFITS

- Fleet-wide increase in operational readiness for the Soldier due to longer lasting protection from sand and rain
- Reduction in number of blades that are deemed unserviceable, currently resulting in Aviation Units being required to replace blades
- Increased capability for organic industrial base to provide erosion coating protection on Army aviation platforms



UH-60 Black Hawk Helicopter



Rotorblade Damage by Erosion

STATUS

- Program is in its second year of funding (FY11)
- Robotic System Integrator source selection completed (FY11)
- System Integrator developing and testing automated erosion coating process (FY11)
- Leverages ATO-D (D.R0.2008.01) Rotor Durability for application to future adoption of erosion coating material

WEAPON SYSTEMS / SECONDARY ITEMS IMPACTED

- UH-60/HH-60 Black Hawk Helicopter family
- Other rotorcraft programs such as Army AH-64 Apache, CH-47 Chinook, UH-72 Lakota and Navy CH-53 Sea Stallion and CH-46 Sea Knight Helicopters

POTENTIAL COST AVOIDANCE

- Return on Investment of 16.7 to 1 with a cost benefit of \$81.3M

POC: Army ManTech Manager, U.S. Army Research, Development, and Engineering Command (RDECOM), Aviation Missile Research, Development and Engineering Center (AMRDEC), Manufacturing Science & Technology Division, ATTN: RDMR-SEM, 5400 Fowler Road, Redstone Arsenal, AL 35898-5000