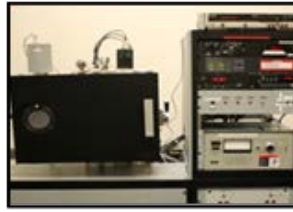


## ManTech for Advanced Nanocomposite Coatings

### PROBLEM / OBJECTIVE

Wear of mechanical and optical weapon systems components affects readiness and maintenance. Advanced nanocomposite coatings have shown promise of reducing weapon system sustainment costs. However, throughput of the Plasma Assisted Chemical Vapor Deposition (PACVD) nanocomposite coating process was limited and manufacturing process improvements were needed to cost effectively apply the new coatings to a variety of process configurations.

The objective of this Army ManTech project was to improve manufacturing processes to efficiently implement nanocrystalline diamond/amorphous carbon coatings on critical Army components.



**Original Chamber**



**Prototype System 3**



**PACVD Process**



**Automated Clean Line**

### ACCOMPLISHMENTS / PAYOFF

**Process Improvement:** This project demonstrated a coating system on aviation and missile components that improves optics durability, decreases component wear, reduces friction and prevents corrosion. Manufacturing improvements included:

- Implemented dual chamber design with dramatically increased chamber capacity
- Improved part capacity of deposition chambers by utilizing flexible fixtures
- Increased coating process throughput with reduced vacuum chamber pump down-time
- Automated deposition system controls and standardized data management
- Automated component clean line that reduces throughput time and improves part quality

### **Implementation and Technology Transfer:**

This process has been implemented on components and parts to include: Navy P-8 brake actuator components, Advanced Threat Infrared Countermeasures (ATIRCM) optical windows for CH-47. There is potential implementation on thousands of optical and mechanical parts for systems such as Reaper Unmanned Air Vehicle (UAV), AH 64 Apache, UH 60 Blackhawk, Hellfire (Joint Attack Munitions System PM), Joint Strike Fighter, M24 gun mounts for CH-47, Navy H-53 and Marine V-22.

### **Expected Benefits and Warfighter Impact:**

Benefits include 500X more durability and 10X improvement in surface hardness using SP<sup>3</sup>EC™ nanocrystalline diamond/amorphous carbon coatings. This process results in reduced friction and increased wear performance of up to 200% while improving corrosion resistance on mechanical parts. Cost to coat per square inch reduced by 66% over baseline. SP<sup>3</sup>EC™ is a green alternative to toxic Hexavalent Chrome.

Warfighter impact is improved optical transmission and durability of optical devices and mechanical components.

Return On Investment (ROI) is ~ 6:1 on demonstrated aviation system components alone, with estimated cost benefit of \$46.5M.

### TIME LINE / MILESTONE

Start Date	March 2011
End Date	July 2016

### FUNDING

U.S. Army ManTech	\$9.93M
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### PARTICIPANTS

U.S. Army RDECOM Aviation and Missile Research, Development and Engineering Center (AMRDEC)  
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