Helicopter Dynamic Components Project

Presented at:
HCAT Meeting
March 2005
**Helicopter Dynamic Components Project**

**25th Replacement of Hard Chrome and Cadmium Plating Program Review Meeting, March 15-17, 2005, Greensboro, NC. Sponsored by SERDP/ESTCP.**
Contracts with Sikorsky, Boeing Philadelphia and Bell Helicopter

- Contracts awarded to Sikorsky (H60); Boeing (H46/H47) and Bell (UH-1/AH-1) in 2003

OEMs Performed Following Tasks:

- Conducted analysis of helicopter dynamic components onto which hard chrome is applied by OEM or in repair
- Identified materials and rig tests that would be required to qualify HVOF coatings as replacement for chrome on their components
- Submitted reports on results of analysis and designation of required tests
- Participated in stakeholders meeting to complete Joint Test Protocol and discuss potential component rig tests
Stakeholders Meeting

- Meeting held 17-18 March 2004 in Baltimore
- 25 attendees representing three OEMs, NAVAIR, NADEP Cherry Point, Army AMCOM, Army Research Lab, HCAT, Hill AFB, NAVFAC, thermal spray experts
- OEMs made presentations related to hard chrome usage on their helicopters, material test requirements, and component test requirements
- NADEP Cherry Point made presentation on scheduled component testing
- Extensive discussion on materials testing that makes up Joint Test Protocol
Development of Materials JTP

- **Base Materials**
  - 4340 steel (200-220 ksi strength)
  - PH13-8Mo stainless steel
  - 9310 carburized steel
  - Aluminum 7075-T73 alloy

- **Coatings**
  - WC/17Co and WC/10Co4Cr
  - Tribaloy 400
  - WC/17Co plus T400 bond layer for Al alloy only

- Axial high-cycle fatigue testing, load control, both tension/tension and fully reversed stress

- Crevice corrosion testing only since ASTM B117 has proven to be unreliable (using Sikorsky-designed crevice corrosion test)
Fretting fatigue (combination of high cycle, short-stroke sliding wear with alternating stress); United Technologies test rig will be utilized

ASTM F519 environmental embrittlement testing

Fluid compatibility weight loss tests (for fluids not already evaluated in landing gear and actuator projects)
Component Testing Being Considered

- H1 brake disk adapter flange and tail rotor control tube (Bell)
- H-47 transmission test (Army)
- H-60 dummy gearbox test (Sikorsky)
- H-60 tail takeoff flange, rotor flange sleeve and swash plate guide for lead-the-fleet flight testing (Sikorsky and NAVAIR)
Component Testing in HDC Project

- H-46 generator gears coated with HVOF WC/Co and subjected to 200-hour endurance test at Boeing; no problems encountered
- Two additional gears coated with WC/Co for 900-hour lead-the-fleet flight test
- Flight clearance has been obtained from NAVAIR
- Gears in production shop at Cherry Point awaiting installation; once installed, will be inspected every 100 hours