Demonstration/Validation of High Performance Corrosion Preventive Compound For Interior Aircraft Applications

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### Demonstration/Validation of High Performance Corrosion Preventive Compound For Interior Aircraft Applications

**Naval Air Systems Command, 47123 Buse Road, Patuxent River, MD, 20670**

**Surface Finishing and Repair Issues for Sustaining New Military Aircraft Workshop, February 26-28, 2008, Tempe, AZ. Sponsored by SERDP/ESTCP.**

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**LIMITATION OF ABSTRACT:** Same as Report (SAR)

**NUMBER OF PAGES:** 33
What is it?

Problem

Existing CPC products require reaplication every 6 - 9 months, which results in an increase in the cost due to air pollution, maintenance, labor, down time, and the number of inspections.
Objectives

– Demonstrate/validate a newly developed high performance corrosion preventive compound (Navguard) on fleet aircraft and weapon systems.

– Demonstrate long-term protection to reduce environmental pollution caused by HAPs and VOCs and corrosion maintenance.
Why are we doing it?

- Reduce environmental pollution caused by HAPs (Hazardous Air Pollutants) and VOCs (Volatile Organic Compounds)

- Improve the fleet readiness through the following:
  - Extend maintenance inspection intervals
  - Reduce the number of CPC applications

- Reduce waste and disposal costs
## Regulatory Impact to the Navy

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Priority</th>
<th>Requirement Title</th>
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<tbody>
<tr>
<td>2.I.01.q</td>
<td>High</td>
<td>Control of VOC and HAP Emissions</td>
</tr>
<tr>
<td>3.II.03.a</td>
<td>High</td>
<td>Non-VOC/ODS Solvents and Cleaning Systems for Aircraft/Weapon systems</td>
</tr>
<tr>
<td>2.1.01.g</td>
<td>High</td>
<td>Control/Reduce Emissions from Cleaning, Stripping, and Cleaning Operations.</td>
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</table>
Deliverables

- New high-performance, long-lasting (two years) CPC product (Navguard) for internal airframe applications

- Complete field test evaluation on several Army, Navy, and Marine Corps aircraft in various operational environments

- A new qualified product to MIL-PRF-81309 F specification for internal aircraft applications

- Recommend changes to aircraft Maintenance Manuals and Maintenance Requirement Cards (MRC)

- Final report
Who is Involved?

• Testing Sites
  – NAVAIR, PAX River, MD
  – FRC, Cherry Point, NC (H-46)
  – FRC, North Island, CA (F-18)
  – NAS, Oceana, VA (F-18)
  - NAS, Whidbey Island, WA (EA-6B)
  – US Marine, Camp Pendleton, CA (EFV)
  – Army Aviation, Ft. Rucker, AL (H-60)

• Funding Agents
  – ESTCP, OSD Corrosion IPT, AERMIP (Aircraft Reliability and Maintainability Improvement Program)
Properties of Navguard Product

- Foggable (by aerosolizing nozzle)
- Low VOC content
- Compatible with metal and non-metallic components
- Water displacing agent
- Corrosion inhibition of aluminum and steel alloys
- Reaplication does not add significant weight to aircraft
- Exhibits significant improvement upon corrosion inspections
Navguard Formulation (Patent Pending, Navy Case 95904)

› Corrosion Inhibitors

› Oil (Paraffinic or Naphthenic)

› Solvents

› Water Displacing Agent

› Metal Deactivator Agent

› Antioxidant
Neutral Salt Spray Test Results for Navguard compared to Commercial CPC Products

New CPC Formulations and Control

- Aluminum
- Steel
Navguard Type II and Type III (Armick Chemical)
E-7 Port For EFV Without Parker Seal and Cover
New Parker Seal with Navguard Installed in EFV
Corroded Port Panel Frame with Defected Seal, EFV E-7
Panel Frame After Six Months With and Without Navguard CPC, EFV E-7

Without Navguard

With Navguard
Door #3, Field Test on F-18/B Aircraft
(Twenty-Four Months Exposure)
Navguard Application on F-18/B Compartment After Twenty-Four Months

After 24 Months

Initial Application
### Summary of the Dem/Val of Navguard CPC on Different Platforms

<table>
<thead>
<tr>
<th>Location</th>
<th># Aircraft</th>
<th>Type of Aircraft</th>
<th>Schedule</th>
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<tbody>
<tr>
<td>FRC, North Island, CA</td>
<td>5</td>
<td>F-18</td>
<td>Started June 2007</td>
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<tr>
<td>NAS Oceana, VA</td>
<td>12</td>
<td>F-18</td>
<td>Started May 2007</td>
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<tr>
<td>FRC, Cherry Point, NC</td>
<td>4</td>
<td>H-46</td>
<td>Started January 2007</td>
</tr>
<tr>
<td>NAS Whidbey Island, WA</td>
<td>5</td>
<td>EA-6B</td>
<td>Started May 2007</td>
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<tr>
<td>AMCOM, Red Stone, AL</td>
<td>1</td>
<td>H-60</td>
<td>Started September 2007</td>
</tr>
<tr>
<td>US Marine Corps, Camp Pendleton, CA</td>
<td>8 Units</td>
<td>EFV</td>
<td>Started November 2006</td>
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### Demonstration Design

<table>
<thead>
<tr>
<th>All Panels/Compartments will be the same per TMS</th>
<th><strong>Aircraft #1</strong></th>
<th><strong>Aircraft #2</strong></th>
<th><strong>Aircraft #3</strong></th>
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<tbody>
<tr>
<td><strong>General Access Panel #1</strong> Panel ID TBD</td>
<td>Control 81309 Type II</td>
<td>NAVGUARD Type III</td>
<td>NAVGUARD Type II</td>
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<tr>
<td><strong>General Access Panel #2</strong> Panel ID TBD</td>
<td>NAVGUARD Type II</td>
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<td>Control 81309 Type III</td>
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<td>NAVGUARD Type III</td>
<td>Control 81309 Type III</td>
<td>NAVGUARD Type III</td>
</tr>
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</table>
Application of Navguard on F-18 Platform, NI, CA
Navguard Type III Applied on the Bilge Areas, H-46, FRC, Cherry Point, NC
Fluid Film (Control) Applied as Control on H-46, FRC, Cherry Point, NC
A Laboratory Evaluation of Corrosion Preventive Compounds and Mildew Inhibitors in the Presence of Fungi

Richard I. Ray and Brenda J. Little
Naval Research Laboratory
Stennis Space Center, MS 39529
Navguard CPC with Mildew Inhibitor Additives

Al Panel/hydraulic Fluid Only/Fungi 50X (35 Days)

Al Panel/Navguard with Mildew Inhibitor/Fungi 50X (100 Days)
<table>
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<th>TASK</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
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<td>Assemble Technical Working Group</td>
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<tr>
<td>Establish testing requirements</td>
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<td>Technology Demonstration Plan</td>
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<td>Testing the product to specification</td>
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<tr>
<td>Side by Side Testing</td>
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<td>Treated versus untreated testing</td>
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<td>Training Depot personnel</td>
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<td>Platform evaluation</td>
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<tr>
<td>Final Report</td>
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<tr>
<td>Cost and Performance Summary Reports</td>
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Transition Plan

• Stakeholders approval of the new technology

• Evaluate the scaled-up product (Navguard) to MIL-PRF-81309F Specification requirements to be included in the QPL

• Dem/Val of the new technology on different platforms at several testing sites

• Assign a National Stock Number (NSN) to be listed with the DLA

• Issue NAVAIR (AF/AMCOM/ other) authorization letter to implement changes to the Cleaning and Corrosion Control Manual (NAVAIR 01-1A-509) and other applicable documents
1- Licensing Navguard to Commercial Vendors


3- Lead-the-fleet demonstrations for Navguard on F-18 and EFV

4- Applying Navguard on Weapon systems (H-46, F-18, EA-6B, H-60, and EFV)

5- Stakeholders Approval of Navguard for Dem/Val Plan

6- Qualification of Navguard to MIL-PRF-81309F Specification
Expected DoD Benefits

1. Corrosion preventive compound CPC with potentially 2 to 3 times greater corrosion resistance

2. Reduce maintenance and corrosion repair cost

3. Decrease aircraft and other weapon systems down time due to fewer scheduled maintenance and inspection

4. Reduce environmental pollution caused by HAPs and VOCs

5. Reduce waste and disposal costs

6. Increase aircraft/vehicle availability
### Project Performers

<table>
<thead>
<tr>
<th>Organization and Contact</th>
<th>Phone/e-mail</th>
<th>Contribution</th>
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<td>Project Coordinator</td>
</tr>
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