Overview of Corrosion Policy and Corrosion Prevention Efforts

Presented by:

Carl Perazzola
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AFLCMC/EZP Organization

**Technical Disciplines**

**Enterprise Sustainment Technologies Support Branch**
- Condition Based Maintenance Plus (CBM+)
- AF Additive Manufacturing Strategic Implementation Plan
- Robotics/Lasers/Tech Assessment
- Metals Technology Office (MTO)
- Non-Destructive Inspection Office (NDIO)
- Advanced Composites Office (ACO)
- Corrosion Prevention & Control Office (CPCO)
- Airworthiness New Materials and Substitution Lead
- Weapon System Sustainment Technology Enterprise Program (WS-STEP)
- Chromium Risk Mitigation Initiative
- Cadmium Risk Mitigation Initiative
- Sustaining Engineering Requirements Support
- Aircraft Battle Damage Repair Engineering (ABDRE)

**Reliability & Maintainability (R&M) Branch**
- Reliability Analysis, Planning, Tracking, & Reporting
- Reliability Centered Maintenance (RCM)
- Engineering Technical Assistance Reports (ETARs)
- Critical Safety Items (CSIs)
- Aircraft Structural Integrity Management Information System (ASIMIS)
- Center Test Authorities (CTAs)

**Applied Engineering & Technology Branch**
- Packaging Engineering
- Mechanized Materials Handling Systems (MMHS)
AFCPCO Personnel

Military and Government Civilians
- Cynthia Dallis, NH-04: Office Chief
- Carl Perazzola, NH-04: Sr. Technical Program Manager
- Capt Scott Ruggiero: Aerospace Corrosion Engr
- Capt Brock Andrews: Aerospace Corrosion Engr
- 1st Lt Joshua Guy: Corrosion Engr / ABDR Engineer
- MSgt Matt Dowden: Air Force Corrosion Manager
- David Ellicks, NH-03: Lead Materials Engineer
- Jarquees Williams, NH-03: Materials Engineer

Engineering and Technical Support Contractors
- Lindsay Davis: Team Lead/Corrosion Engineer (UDRI)
- Dan Mars (CMSgt Ret): Research Corrosion Analyst (UDRI)
- Rob Madsen (MSgt Ret): Research Corrosion Analyst (UDRI)
- Pamela Carlisle: Program Manager (UDRI)
- Sierra Zanchetta: Administrative Assistant (UDRI)
Covering three focus areas

• Consolidating AFI on ASIP and Air and Space Structural Equipment Management

• Promoting a OUSD Aviation WIPT

• Institutionalizing System Program Offices (SPO) visit
• AFI 63-140 and AFI 20-114 were consolidated
  • In last committee before approval
• Enhance status of AFCPCO recommendations under the ASIP authority umbrella
**Promoting a OUSD Aviation WIPT**

- **History**
  - 2009 Aircraft Frame Corrosion Prevention Working Group (ACPWG)
    - 2012 GSA scandal, all travel stopped
  - Resurrected April 2019

- Need to leverage resources, knowledge, and technologies still exists

- Requested formal WIPT status from OUSD/CPO
  - Dovetails into OUSD new focus on sustainment
  - Enthusiasm proliferates
  - Interest in dehumidification, hex chrome reduction, cross-feed/lessons learned

- Planning next meeting at NIAR (Wichita State) in April
Institutionalizing System Program Offices (SPO) visit

- Enhance communication with the customer
- Validate LMI data base with MDS specific database
- Raise corrosion awareness through all levels
- Leverage resources and best practices
- Ensure appropriate reference standards and military specifications are incorporated
MAJCOM Surveys

- Each MAJCOM surveyed every 5 years, or upon request, per AFI 20-114
- Assists MAJCOM/SPO in assessing and Improving their CPC programs
- Advisory in nature – Not an “INSPECTION”
  - On-the-Spot technical assistance/training given
- Promotes cross flow of information between sections, wings and MAJCOM’s
- Observation, findings, and field inputs drive T.O. changes, revisions and updates
- Supports AF Corrosion Control Program Executive (CCPE) for inputs on the Annual Congressional Report
MAJCOM Surveys

• **Trends**
  - Aircraft condition: OML satisfactory to excellent
  - AGE condition: improving
  - Facilities: degraded or shut down, needs attention
  - Use of unauthorized materials
  - Poor washes: typically better results with contractor
  - Wing Corrosion Manager Programs: improved but inconsistent

• **Upcoming**
  - AMC
  - AFMC (ALC)
  - ANG
Aircraft Specific Surveys

**By SPO Request**

**Focus on Specific Weapons Systems**
- Overall aircraft condition
- Adequacy of CPC program
- CPC issues, roadblocks, resourcing constraints
- Effectiveness and thoroughness of training
- Adequacy of tools and equipment
- Adequacy of technical guidance and AF Policy
- Operational and maintenance conditions

**Approach**
- Data-Mine REMIS to identify trends and anomalies
- Correlate data with on-site evaluations

**Typical Deliverables**
- Out-Brief Maintenance Groups/CC at each site
- Summary report with overall observations, trends and recommendations (to SPO and MAJCOM A4s)
- Brief at CPAB and AF Corrosion Conference (all SPOs, MAJCOM CPC Functionals)
- Fleet assessment rolled up into Annual Congressional Report
Hand Held Laser Technology

Hand Held Lasers (HHL) have been used in industry for a wide variety of applications

- Paint, corrosion, and oxide removal
- Bonding pre-treatment
- Manufacturing mold cleaning
- Surface restoration
Laser Ablation Process

- Laser Source
- Scanning Mirror
- Aperture Lens
- Crack Network
- Plasma
- Vapors Mainly CO₂
- H₂O & Coating Flakes
- Fume Extraction
- Filter Unit HEPA Carbon Filters
- Target Surface
- Base material
- Laser Ablation Process
Field Demonstrations

Field demos on AGE at the following locations:

- Travis AFB
- Patrick AFB
- Hickam AFB
- Kadena AB
- Nellis AFB
- Hill AFB
- Anderson AFB

300W Hand Held Laser and End Effector
1000W Hand Held Laser and End Effector
Non-Chrome

- Good participation from multiple SPOs
- Many SPOs still not evaluating Non-Cr primers
- Several Non-Cr alternatives
- F-15 is the only full Non-Cr system fleet wide
- Most problems attributed to application
- Likely way forward is recommendation from CPCO/AFRL to each SPO
Approved Non-Cr Materials

- Pre-Kote - Magnesium Rich Primer – Topcoat

- Rare Earth Technology
  **Coating Stack-Up (Multiple Vendors Available)**
  1. RECC1015 DeOX
  2. RECC3021 Non-Chromate Conversion Coating
  3. 02GN093 (Deft) Non-Chromate Epoxy Primer
  4. 99GY013 (Deft APC/ELT) Topcoat (applicable color)

- Pre-Kote – MgRP/53022 Type IV – Topcoat

- Pre-Kote – 53022 Type IV – Topcoat

- Pre-Kote – Electrocoat (E-Coat) – Topcoat

- Future Investigation(s)
  - Metal Rich coatings (Li, Zn, Al)
  - Non-chrome systems on AM substrates
E-Coat Update

- CET Approved
- E-Coat Training Available
Corrosion Monitoring Systems

- Luna LS2A: 5 Sensors in 1 system
  - Relative Humidity (RH)
  - Air Temperature (Tair)
  - Surface Temperature (Tsurf)
  - Conductance ($\alpha$)
  - Corrosivity ($\mu$)

- Luna CorRES
  - Adds galvanic corrosion assessment
  - Designed for coating evaluation
  - Supports three sets of Conductance and Corrosivity Interdigitated Electrodes (IDEs)

Wash Instructions:

- Aircraft will follow current wash procedures in TO 1-1-691 (per environmental severity index (ESI) classification)
- Test article stands washed per TO 35-1-3 instruction, but per the following cycles

<table>
<thead>
<tr>
<th>Site ESI</th>
<th>Wash Cycles by Test Stand</th>
</tr>
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<tbody>
<tr>
<td>Mild</td>
<td>No wash = 0 days</td>
</tr>
<tr>
<td></td>
<td>$1.0X = 180$ days</td>
</tr>
<tr>
<td></td>
<td>$1.5X = 270$ days</td>
</tr>
<tr>
<td>Moderate</td>
<td>No wash = 0 days</td>
</tr>
<tr>
<td></td>
<td>$1.0X = 90$ days</td>
</tr>
<tr>
<td></td>
<td>$1.5X = 135$ days</td>
</tr>
<tr>
<td></td>
<td>$2.0X = 180$ days</td>
</tr>
<tr>
<td>Severe</td>
<td>No wash = 0 days</td>
</tr>
<tr>
<td></td>
<td>$1.0X = 30$ days</td>
</tr>
<tr>
<td></td>
<td>$1.5X = 45$ days</td>
</tr>
<tr>
<td></td>
<td>$2.0X = 60$ days</td>
</tr>
</tbody>
</table>
Additional CPCO Efforts

AFLMC... Providing the Warfighter’s Edge

Predictive Corrosion for Condition Based Maintenance Plus (CBM+)

Technology/Methodology Description

- Actual weather data from base weather stations and NOAA to provide data input
  - Eliminates need for onboard sensors
More Information

- **Public Releasable .com Site**
  - Primarily used for conference registration
  - Facility Guide
  - [http://www.afcpco.com](http://www.afcpco.com)

- **Air Force Portal Corrosion Website**
  - Training References and Links
  - Wing Corrosion Programs
  - Publications
  - Technical Orders
  - Qualified Products Lists
  - Paint Facility Guide
  - Multimedia Links

- **AFCPCO SharePoint**
  - Upcoming Events
  - Survey Reports
  - Projects
  - Qualified Products Lists
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