U.S. AIR FORCE

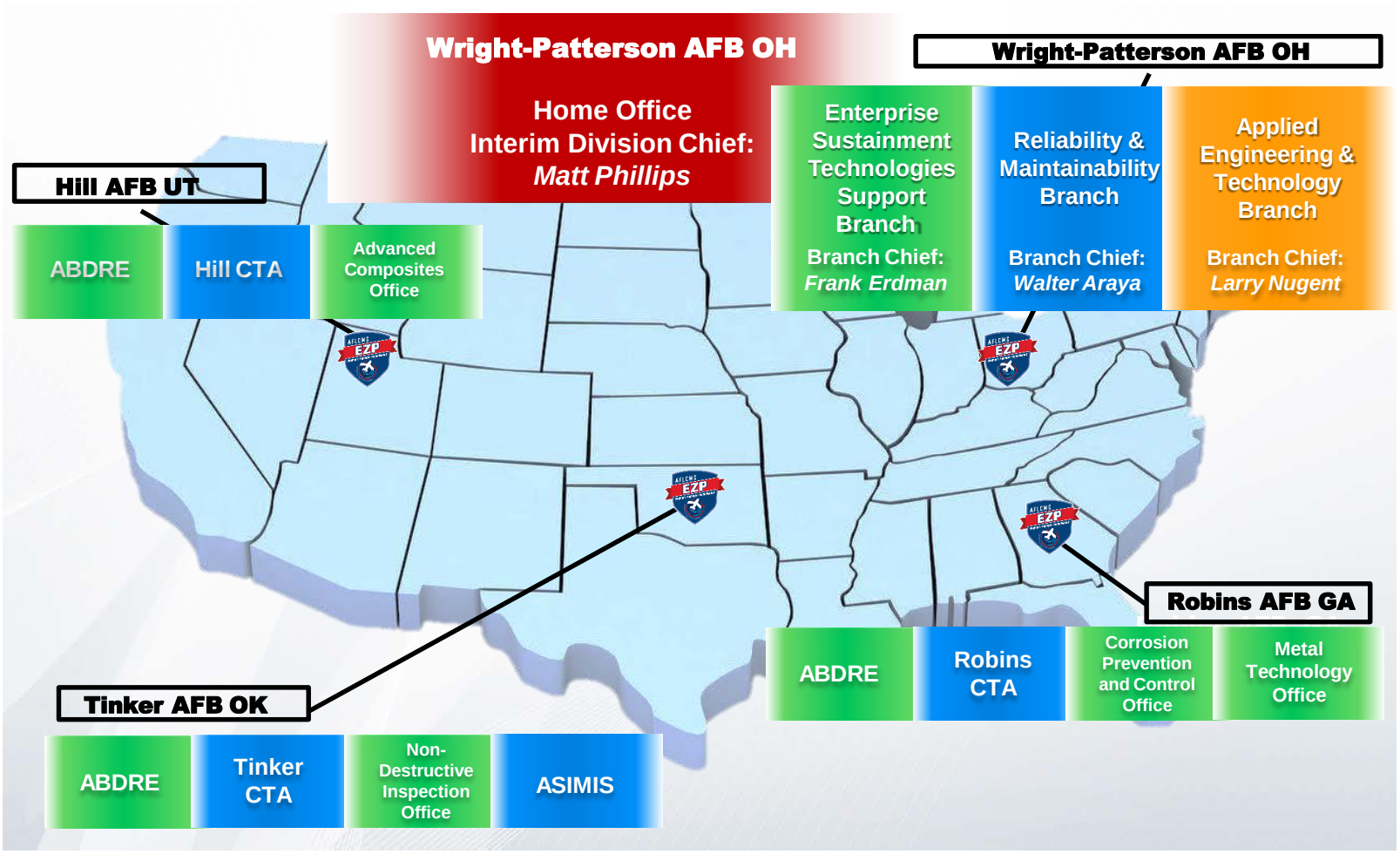
AIR FORCE LCMC

Overview of Corrosion Policy and Corrosion Prevention Efforts

Presented by:

Carl Perazzola
Jarquees Williams
Capt. Brock Andrews

AFLCMC/EZP Geo Locations



AFLCMC/EZP Organization

U.S. AIR FORCE

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Product Support Engineering Division

Division Chief: Matt Phillips

Enterprise Sustainment Technologies Support Branch

Branch Chief: Frank Erdman

Reliability & Maintainability Branch

Branch Chief: Walter Araya

Applied Engineering & Technology Branch

Branch Chief: Larry Nugent

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

Consolidating AFI on ASIP and Air and Space Structural Equipment Management

- 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

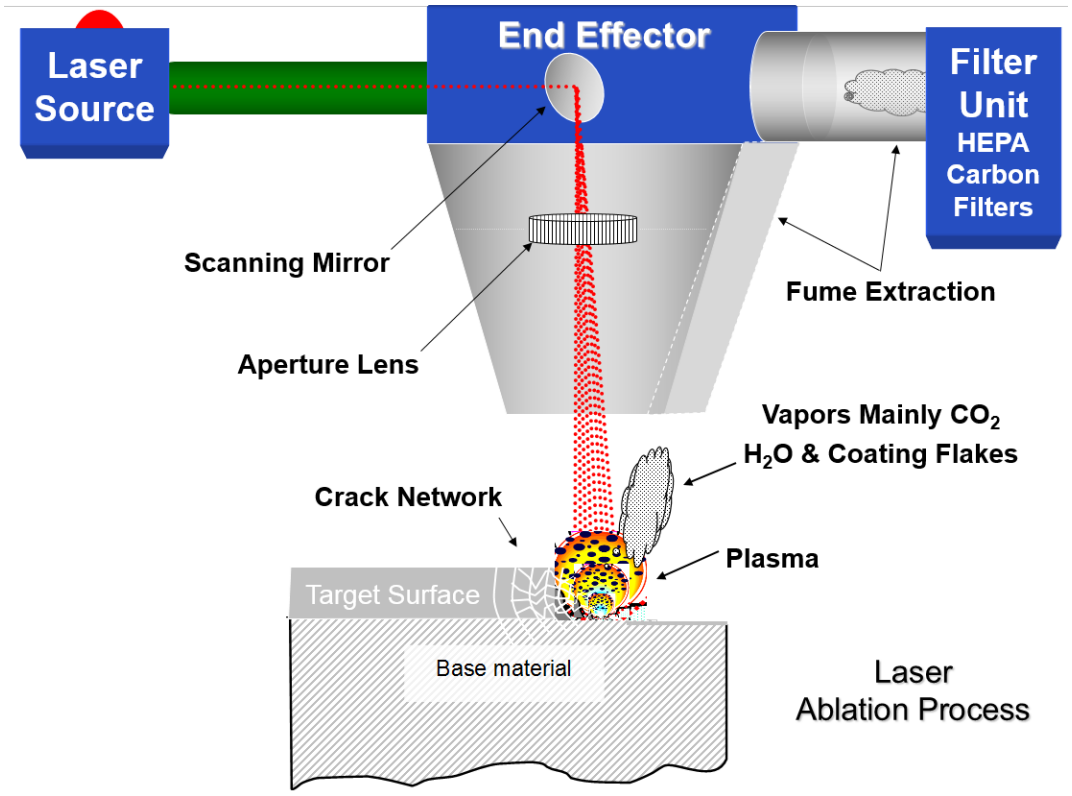
- **Typical Deliverables**
  - Out-Brief Maintenance Groups/CC at each site
  - Summary report with overall observations, trends and recommendations (to SPO and MAJCOM A4s)
  - Brief at CPAB and AF Corrosion Conference (all SPOs, MAJCOM CPC Functionals)
  - Fleet assessment rolled up into Annual Congressional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



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**
  <u>Coating Stack-Up (Multiple Vendors Available)</u>
  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**

E-Coater

E-Coat Prep Room

Condition Based Maintenance CBM+

Corrosion Monitoring Systems

- Luna LS2A: 5 Sensors in 1 system
  - Relative Humidity (RH)
  - Air Temperature (Tair)
  - Surface Temperature (Tsurf)
  - Conductance (α)
  - Corrosivity (μ)

- 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

Site ESI	Wash Cycles by Test Stand
Mild	No wash = 0 days 1.0X = 180 days 1.5X = 270 days
Moderate	No wash = 0 days 1.0X = 90 days 1.5X = 135 days 2.0X = 180 days
Severe	No wash = 0 days 1.0X = 30 days 1.5X = 45 days 2.0X = 60 days

Additional CPCO Efforts

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**

Input: NOAA / Weather Station Data → **Exposure Algorithm**

More Information

- **Public Releasable .com Site**
  - Primarily used for conference registration
  - Facility Guide
  - 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

Contact Us

AFCPCO
afcorr@us.af.mil
DSN: (312) 468-3284
Comm: (478) 926-3284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