JTEG Joint Technology Exchange Group

Joint Solutions for Depot Maintenance

Welcome to the JTEG Monthly Teleconference

Topic:

Corrosion Prevention and Repair

30 March 2015

AGENDA

1300-1310: Welcome and JTEG Background - Greg Kilchenstein (OSD-MPP)

1310-1311: Administrative Notes – Debbie Lilu (NCMS)

1311-1325: Effects of Corrosion on DoD Equipment- Rich Hays (OSD-CPO)

1325-1345: OSD Corrosion Policy and Oversight Overview
Rich Hays (OSD-CPO)

1345-1405: Army Corrosion Control and Prevention Executive Overview
Dr. Roger Hamerlinck

1405-1425: Navy Corrosion Control and Prevention Executive Overview
Mr. Matt Koch

1425-1445: Air Force Corrosion Control and Prevention Executive Overview
Dr. David Robertson

1445-1500: Review & Wrap Up – JTEG Principals

Joint Technologies Exchange Group (JTEG)

- Provide a forum for the exchange of information on new technology, processes, and equipment developments
- Collect, analyze, and disseminate depot maintenance requirements for new technology, processes and equipment
- Advocate for new technology or equipment with cross-service potential to increase efficiency
- Facilitate joint service technology development

Technology Forum Protocol

- Please keep your phones on mute unless you are presenting. Should you have to temporarily drop off please hang up and call back
- Questions will be addressed via Q&A on DCO
- Presenters - slides will be advanced by Greg / Ray
- Briefs (when cleared for public release) and Q&A will be posted on JTEG website

http://jteg.ncms.org

IMPACT OF CORROSION

OFFICE OF THE UNDERSECRETARY OF DEFENSE
FOR ACQUISITION, TECHNOLOGY, AND LOGISTICS

Presentation to Joint Technology Exchange Group
30 March 2015

Rich Hays
Deputy Director, Corrosion Policy and Oversight Office

DoD Cost of Corrosion Results to Date
(Most recent studies - $ in billions)

Study year baseline	Study segment	Annual cost of corrosion	Corrosion as a percentage of maintenance	Data
2009-2010	Army aviation and missiles	$1.5	20.9%	FY2007 and FY2008
	Marine Corps ground vehicles	$0.3	12.3%	FY2007 and FY2008
	Navy and Marine Corps aviation	$2.7	23.0%	FY2008 and FY2009
2010-2011	Air Force aircraft and missiles	$5.1	23.9%	FY2008 and FY2009
	Navy ships	$3.3	21.6%	FY2008 thru FY2010
2011-2012	Army ground vehicles	$1.7	12.3%	FY2008 thru FY2010
	Marine Corps ground vehicles	$0.3	14.3%	FY2009 thru FY2011
2012-2013	DoD facilities and infrastructure	$3.0	14.4%	FY2009 thru FY2011
	All other DoD segments	$3.6	17.9%	FY2009 thru FY2011
	Army aviation and missiles	$1.9	21.9%	FY2009 thru FY2011
2013-2014	Navy and Marine Corps aviation	$3.6	28.2%	FY2010 thru FY2012
	Air Force aircraft and missiles	$6.0	24.9%	FY2010 thru FY2013
Total DoD annual corrosion cost		**$23.4 billion**	**20.7%**	

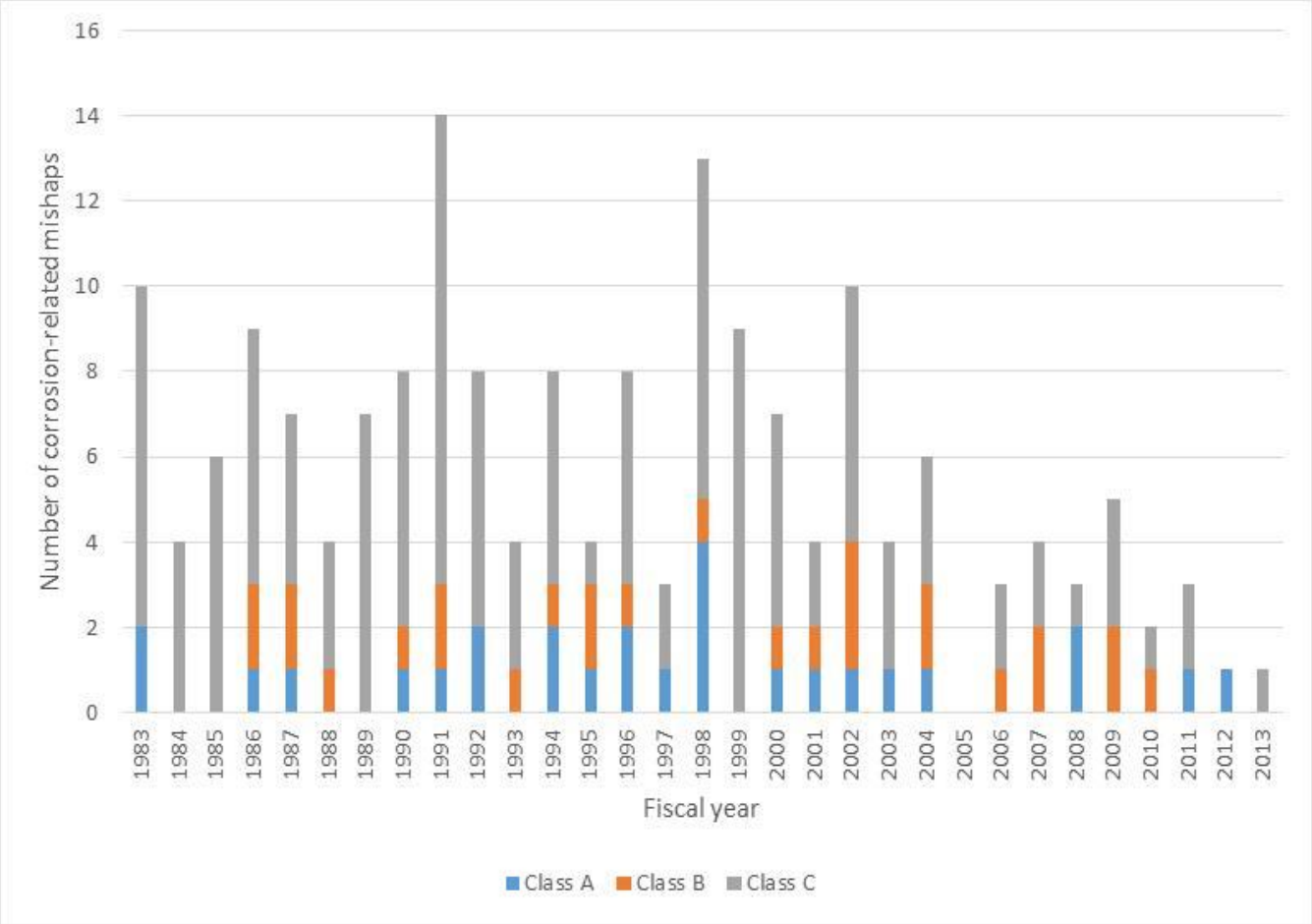
DoD Corrosion Impact on Availability

Results to Date

Study year	Study segment	Annual non-available time attributable to corrosion	Average non-availability per end item attributable to corrosion	Data baseline
2010–2011	Army aviation and missiles	1,717,898 hours	17.4 days	FY2008 and FY2009
	Navy and Marine Corps aviation	95,237 days	26.5 days	FY2008 and FY2009
	Air Force	2,102,476 hours	15.9 days	FY2008 and FY2009
2011–2012	Army ground vehicles	662,649 days	1.7 days	FY2008–FY2010
2012–2013	Marine Corps ground vehicles	209,115 days	3.3 days	FY2009–FY2011
	Army aviation and missiles	2,028,590 hours	19.7 days	FY2010–FY2012
2013–2014	Navy and Marine Corps aviation	116,484 days	29.9 days	FY2010–FY2012
	Air Force	2,259,412 hours	16.6 days	FY2010–FY2013

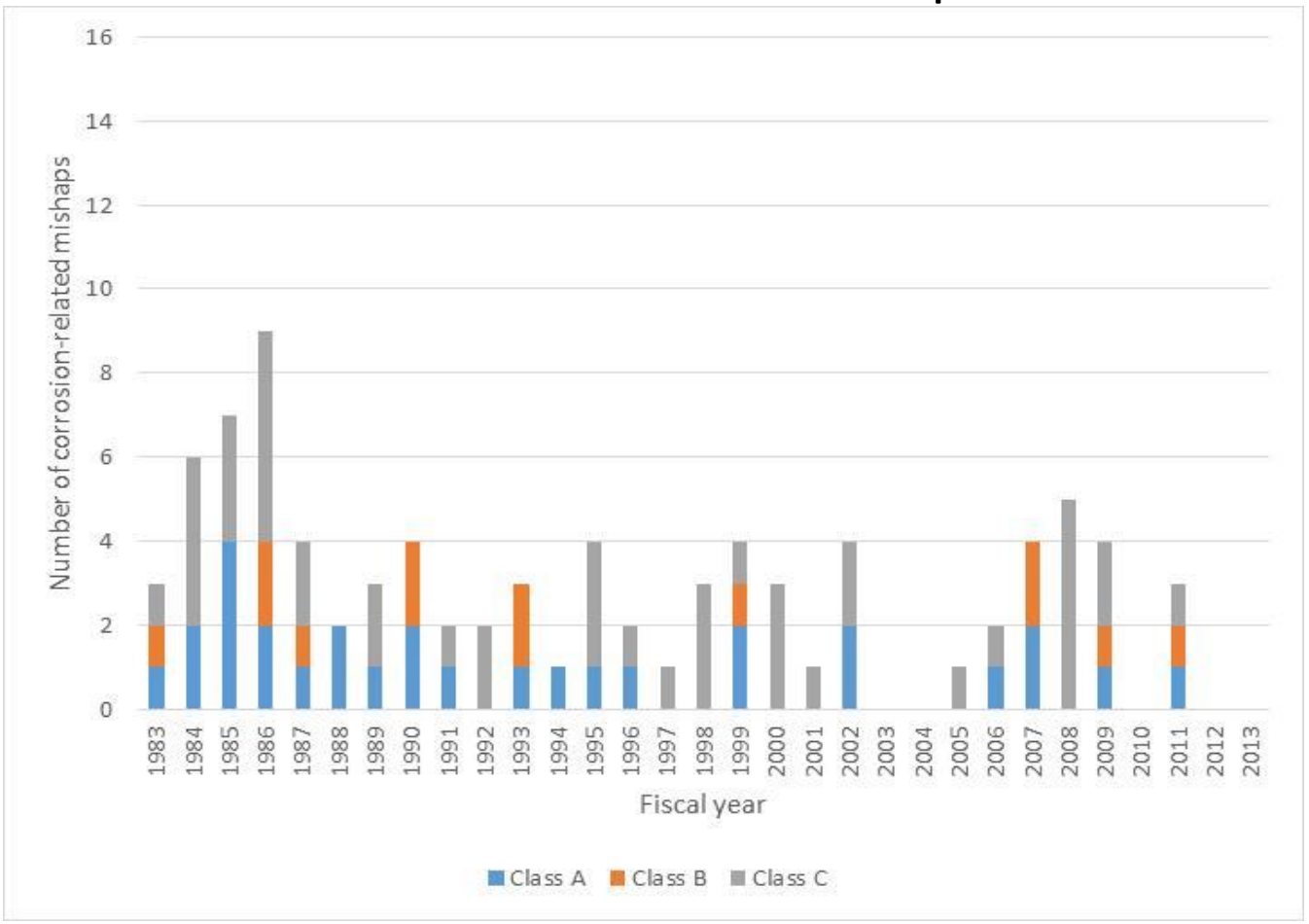
DoD Corrosion Impact on Safety

Army Aviation
Corrosion-related Mishaps



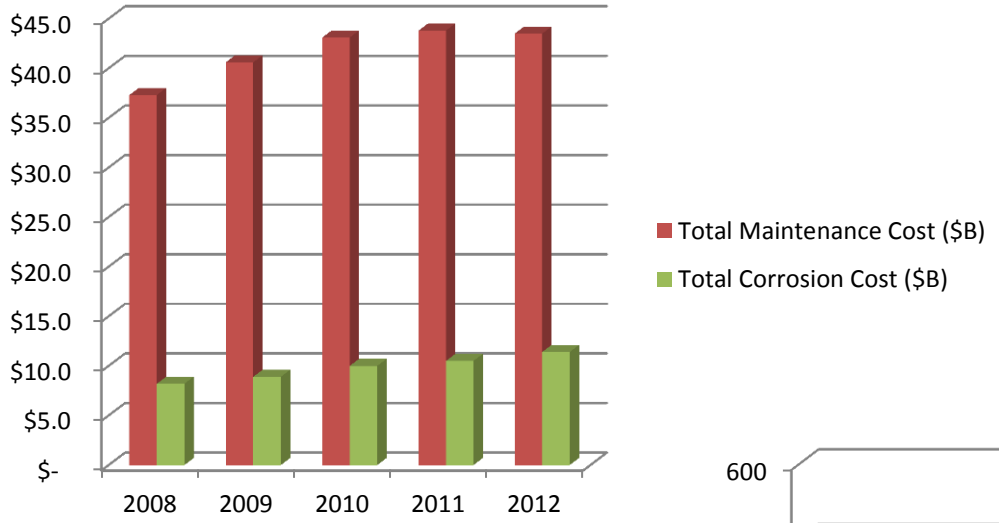
DoD Corrosion Impact on Safety

Department of Navy Aviation Corrosion-related Mishaps

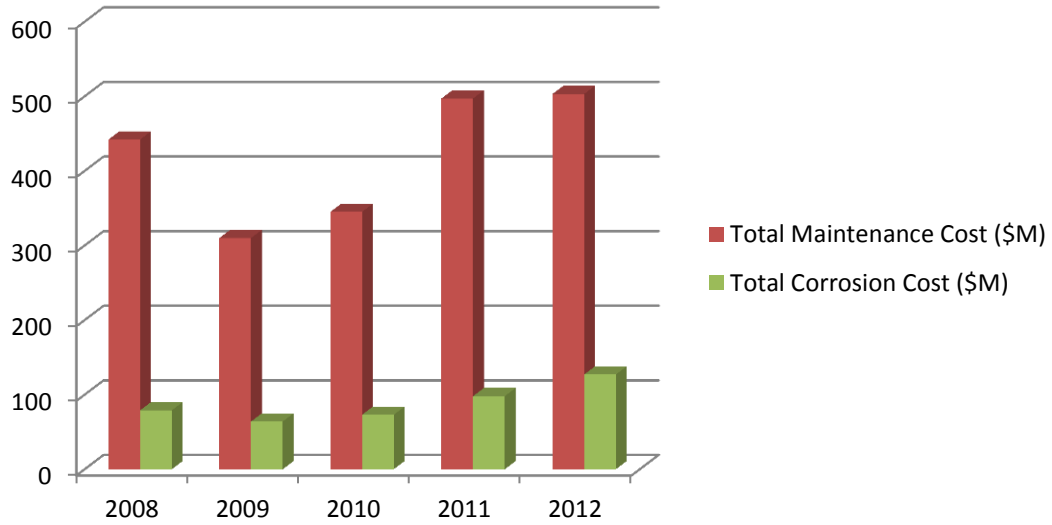


Corrosion Impact on Cost

All Aviation



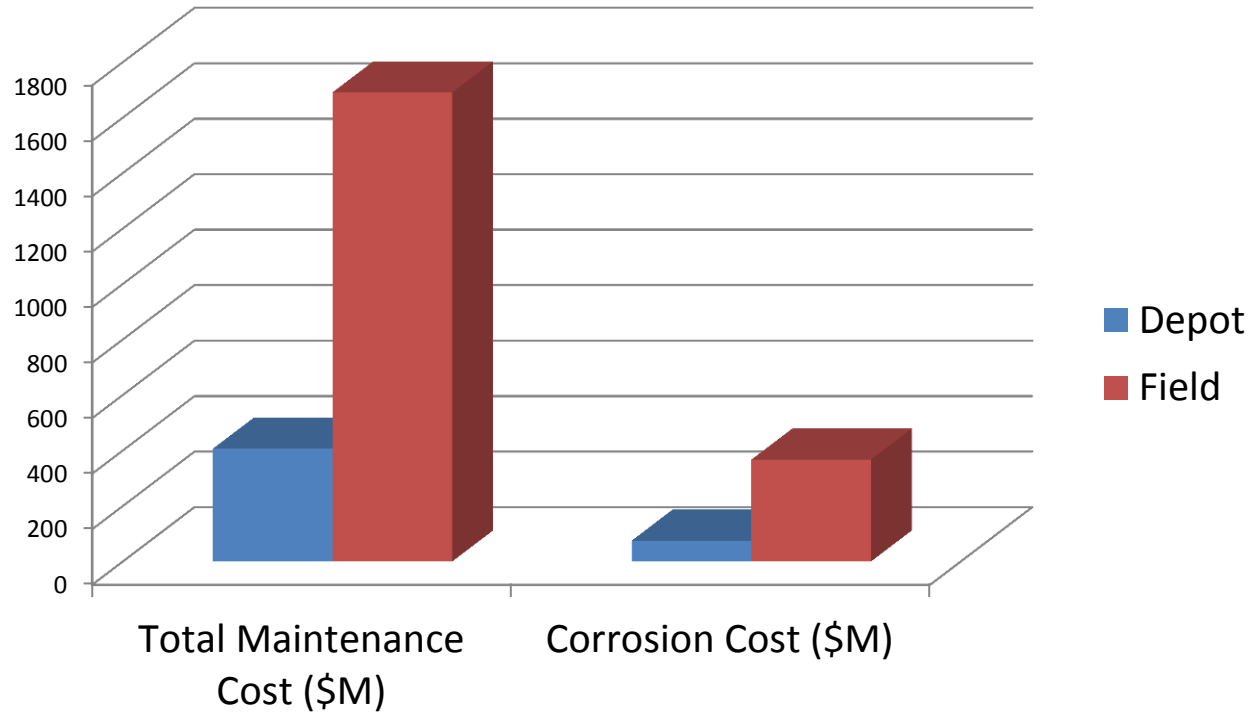
HH-60



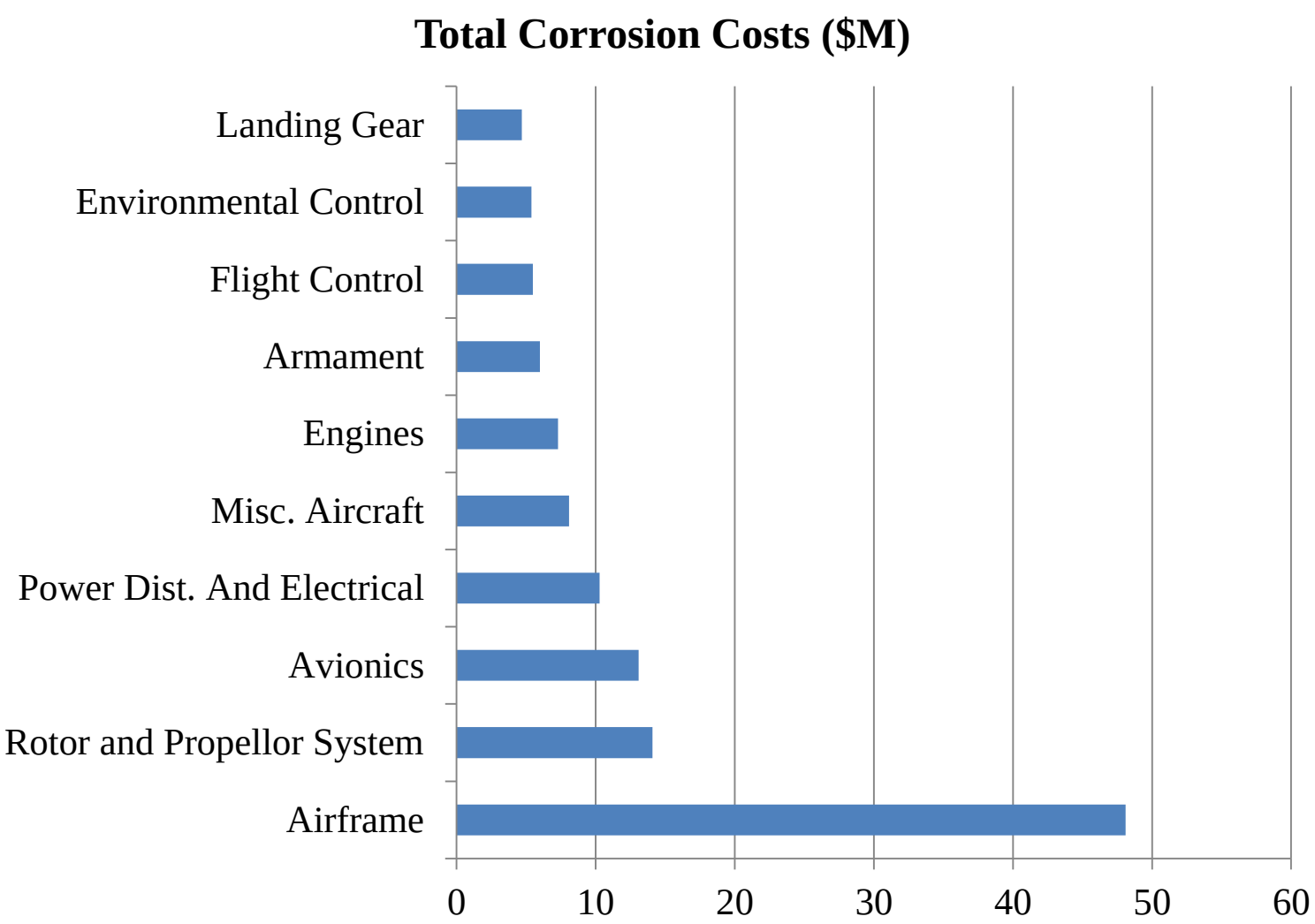
Corrosion Impact on Cost – All HH-60 Assets

($ in millions)

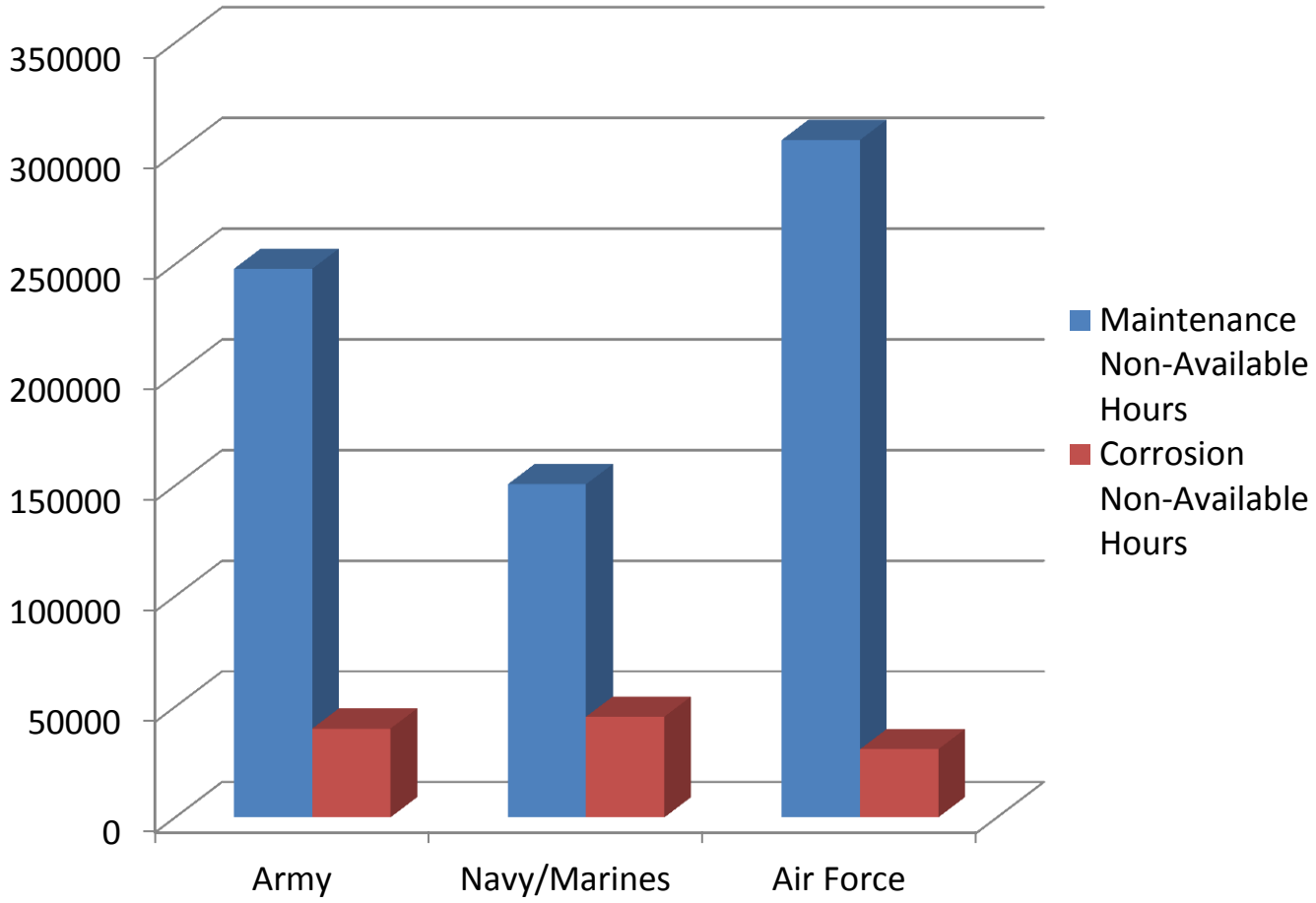
Level of maintenance	Model	Maintenance cost	Corrosion cost	Percent corrosion
Depot	HH-60	$406.8	$75.4	18.5%
Field	HH-60	$1,690.5	$366.7	21.7%
Total	HH-60	$2,097.3	$442.1	21.1%



Corrosion Impact on Cost – All HH-60 Assets



Corrosion Impact on Availability – All HH-60 Assets



Environment Matters!

Take Aways

- Between 10% and 30% of every maintenance dollar is spent to prevent or correct corrosion problems
- Corrosion has a measurable and significant impact on system availability
- Corrosion directly causes, or is a factor in, many safety mishaps
- CPO-sponsored “Impact of Corrosion” studies can be used as a tool to identify and prioritize areas that need to be addressed

CORROSION POLICY AND OVERSIGHT

OFFICE OF THE UNDERSECRETARY OF DEFENSE
FOR ACQUISITION, TECHNOLOGY, AND LOGISTICS

Presentation to Joint Technology Exchange Group
30 March 2015

Rich Hays
Deputy Director, Corrosion Policy and Oversight Office

How Many Laws Govern Corrosion?

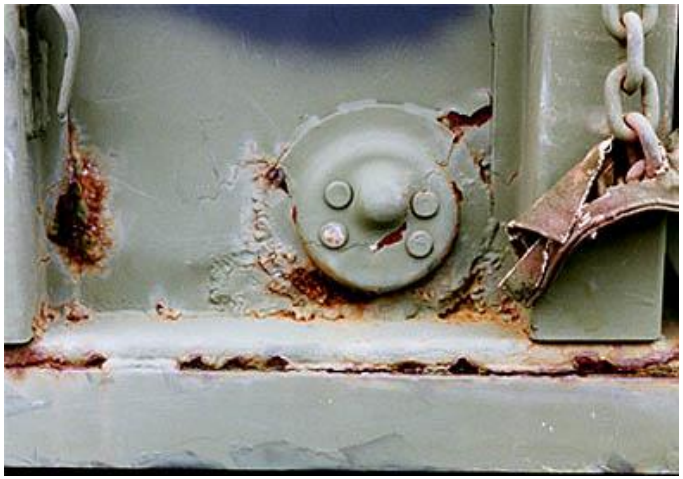
- **2nd Law of Thermodynamics**

  "Every process occurring in nature proceeds in the sense in which the sum of the entropies of all bodies taking part in the process is increased. In the limit, i.e. *for reversible processes, the sum of the entropies remains unchanged."* (Planck)

- **10 U.S.C. 2228**

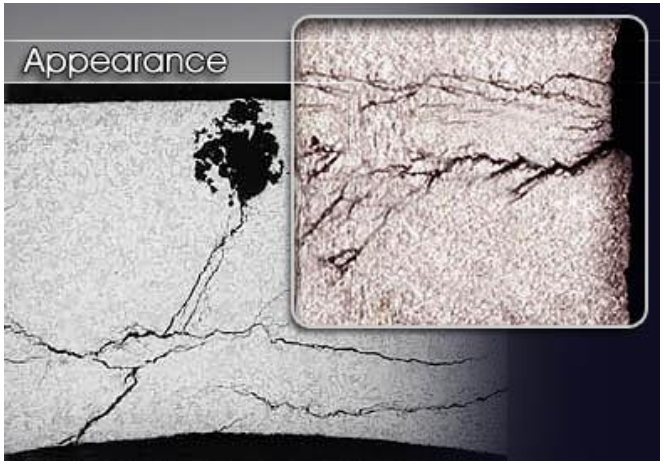
  "…the deterioration of a material or its properties due to a reaction of that material with its chemical environment."

Corrosion Examples



General and Crevice Corrosion of Steel

Alkali-Silica Reaction in Concrete

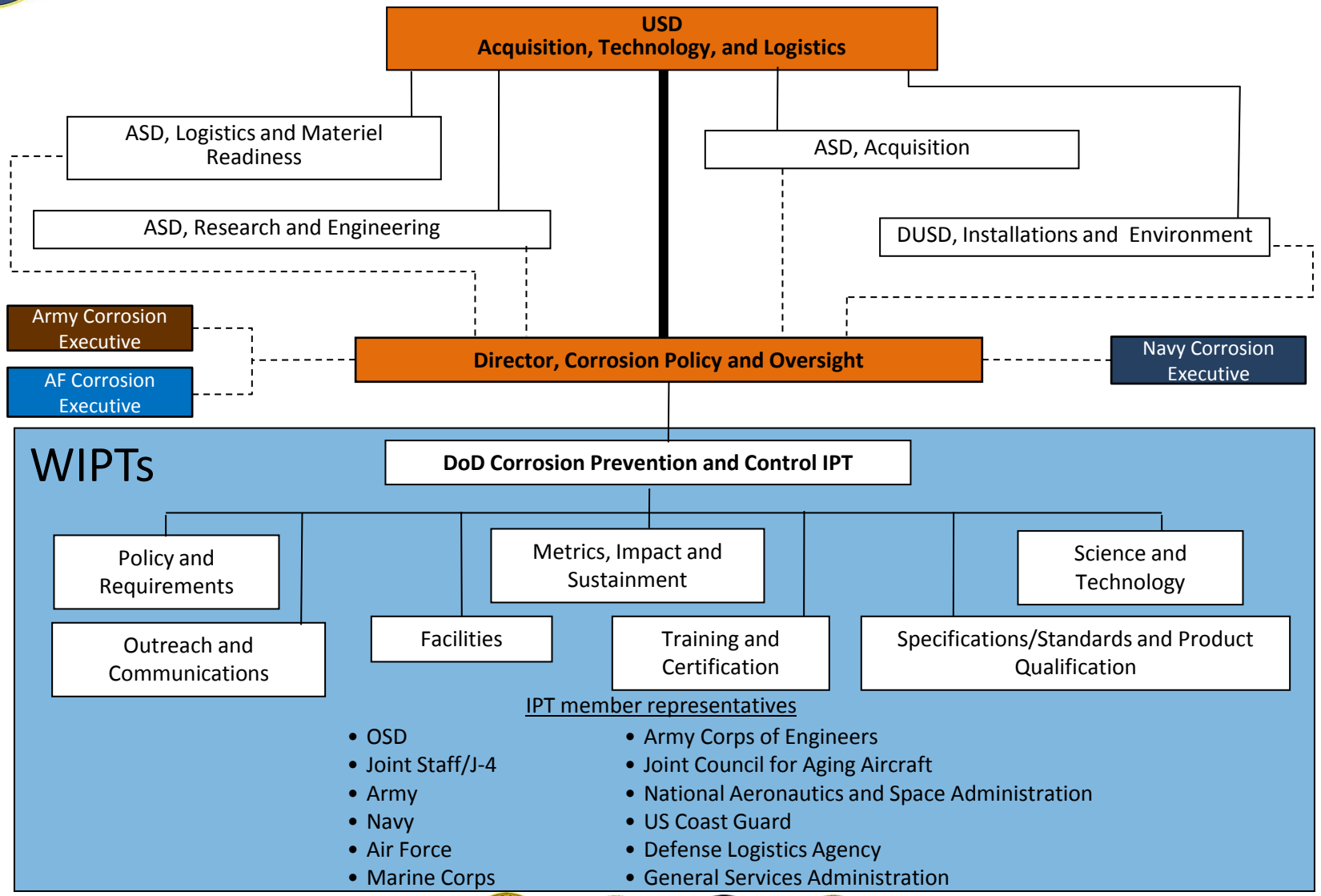


Environmentally Influenced Cracking

uV Degradation of Organic Coating System

DoD Corrosion Organization

CORROSION POLICY AND OVERSIGHT



What We Do

- **Activities**
  - Policy Development and Implementation
  - Weapon System and Major Facility Program Reviews
  - Workforce Development
  - Corrosion Metrics Collection and Analysis
  - Specifications and Standards
  - Communication and Outreach
- **Project and Research Sponsorship**
  - Demonstration/Implementation Projects through Military Departments
  - Technical Corrosion Collaboration

Policy

CORROSION POLICY AND OVERSIGHT

- **Draft DoDI 5000.02** – *Operation of the Defense Acquisition System* – requires CPC planning for all systems (including MAIS, COTS, and GOTS) throughout the lifecycle
  - "…..planning for and establishing 1) a management structure for CPC, and 2) the technical considerations and requirements in order to implement an effective CPC regime throughout the life cycle of a program."
  - Planning documented in the Systems Engineering Plan and the Life Cycle Sustainment Plan
- **DoDI 5000.67 -** *Prevention and Mitigation of Corrosion on DoD Military Equipment and Infrastructure* – establishes structure of DoD Corrosion Program and responsibilities
- **DoDD 4151.18 -** *Maintenance of Military Materiel* – requires that corrosion prevention and control programs and preservation techniques be established throughout the system life cycle.

70% of sustainment costs are locked in by initial design

Oversight of Major Acquisition Programs

Specifications and Standards

- **Most corrosion-related specs and standards eliminated during acquisition reform in the 1990's**
  - Causes corrosion requirements to be negotiated individually during acquisition
- **Working with MilDeps to reestablish some needed Specs & Stds**
  - MIL-STD-1568C, *Materials and Processes for Corrosion Prevention and Control in Aerospace Weapon Systems* – newly reinstituted as a Mil Std
    - Supported by DI-MFFP-81403, *Corrosion Prevention and Control Plan*, and DI-MFFP-81402, *Metal Finishes and Finishing Processes and Procedures* (a.k.a. finish specification)
  - MIL-HDBK-502A, *Product Support Analysis* – includes CPC planning
- **Migrating some requirements to commercial standards**
  - Developing new standards with non-governmental standards bodies (e.g. SAE)
  - TA-STD-0017, *Product Support Analysis* (previously LSA)
  - Assisting in development of Joint SSPC-NACE Std for CPC Planning

Workforce Development

- **DAU CLM-038,** *Corrosion Prevention and Control Overview*
- **DAU CLE-070,** *Corrosion and Polymeric Coatings*
- **Web-based training modules** (www.corrconnect.org)
- **Strategic partnership with NACE and SSPC** – delivering training to active duty military and government employees
- **University of Akron** – BSc. in Corrosion Engineering
- **University of Florida** – developed Distance Learning Course

Communication and Outreach

CORROSION POLICY AND OVERSIGHT

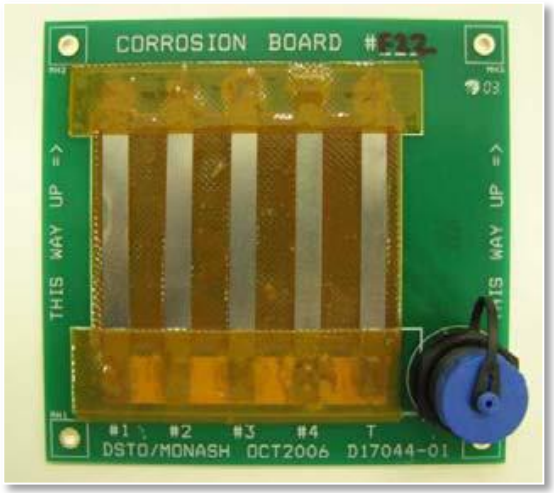
- www.CorrDefense.org – program and technical information
- **DoD and Allied Nations Corrosion Conference**
- **Series of "awareness" videos for leadership and general public**
- **Educational gaming** – *"CorrSim"*
- **CorrDefense e-magazine**
- www.CorrConnect.org – web-based training

CorrDefense DoD News about Preserving Military Assets

Technology Demonstration/Implementation Projects

Objective – Implement mature corrosion control technologies in new and existing weapon systems and facilities

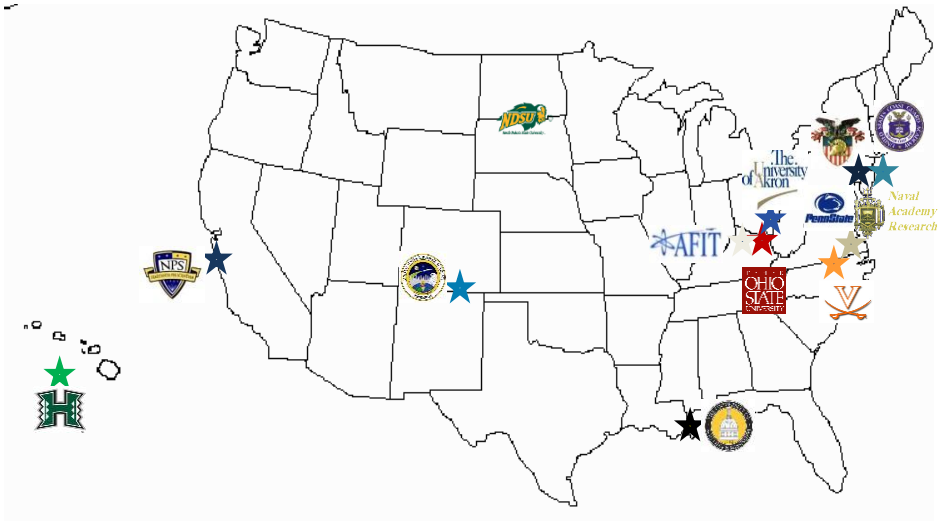
- Military Department-generated projects to qualify products and processes
- Demonstrate effectiveness in operational systems
- Update technical and logistics documentation



Technical Corrosion Collaboration (TCC)

Objectives

- Produce solutions (knowledge, technologies, processes, materials, etc.) that tangibly reduce the impact of corrosion on DoD weapons systems and infrastructure.
- Produce individuals with education, training and experience, who will form the future core of the corrosion prevention and control technical community within DoD, its support network, and its suppliers.

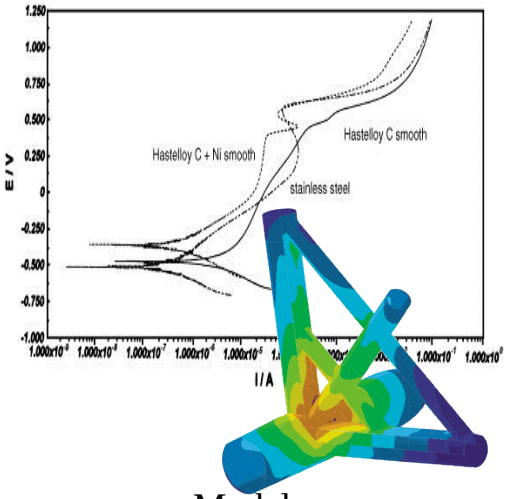


>$90M Investment Since 2008

TCC Technology Investment Categories

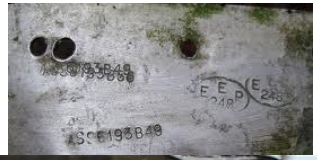
CORROSION POLICY AND OVERSIGHT

Performance Prediction



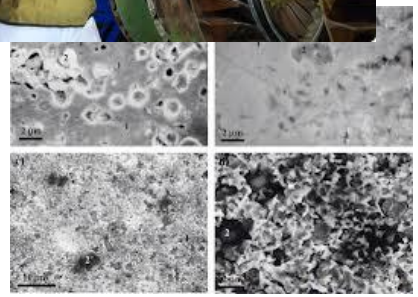
- Models
- Accelerated Testing
- Validation
- Design Tools

Assessment of Finish



- Mechanical Properties
- Integrity
- Galvanic Interaction
- Degradation Mechanisms

Surface Engineering



- Mechanical
  - Coating removal
  - Substrate damage
- Adhesion Promotion
- Sacrificial
- Cleanliness Requirements

Product Support

- Packaging/Storage
- Shelf-life
- Energy
- Maintenance

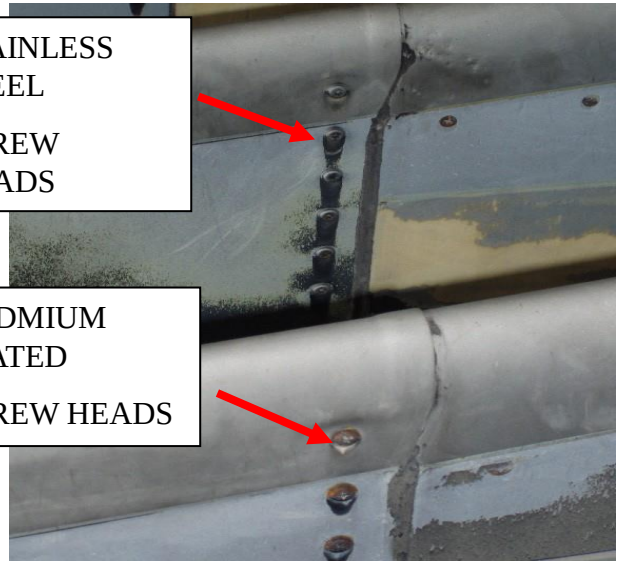
CPC Resources

- **Corrosion Prevention and Control Guidebook for Military Systems and Equipment**
  - Guidance for all military systems and equipment – including MAIS and COTS/modified-COTS
  - Beyond general guidance, provides more specific assistance prior to each acquisition phase milestone for six areas of emphasis:
    - Management
    - Systems Engineering
    - Life Cycle Logistics
    - Test & Evaluation
    - Contracting
    - Cost Estimating and Budget
- **SEP and LCSP Outlines**
- **DAG CH 4 and CH 5**
- **Military Department Corrosion Control and Prevention Executives (CCPE's)**

Some Final Thoughts

- **Corrosion is rarely just a technical problem**
  - Prevent
  - Detect
  - Mitigate
  - Manage
- **Corrosion doesn't hurt today but it hurts tomorrow**
  - Easier to invest in corrective than preventive maintenance
  - Hard to maintain leadership focus
- **Corrosion is often a "people" problem**
- **Successful corrosion control requires**
  - Awareness and buy-in from leadership
  - Teamwork between subject matter experts, designers, and maintainers – "Corrosion control is not the most important thing we do."
  - Tools, training, and time for the personnel implementing the processes

Questions?



Magnesium Engine Housing

Rotor Blades

Trunion Bearings

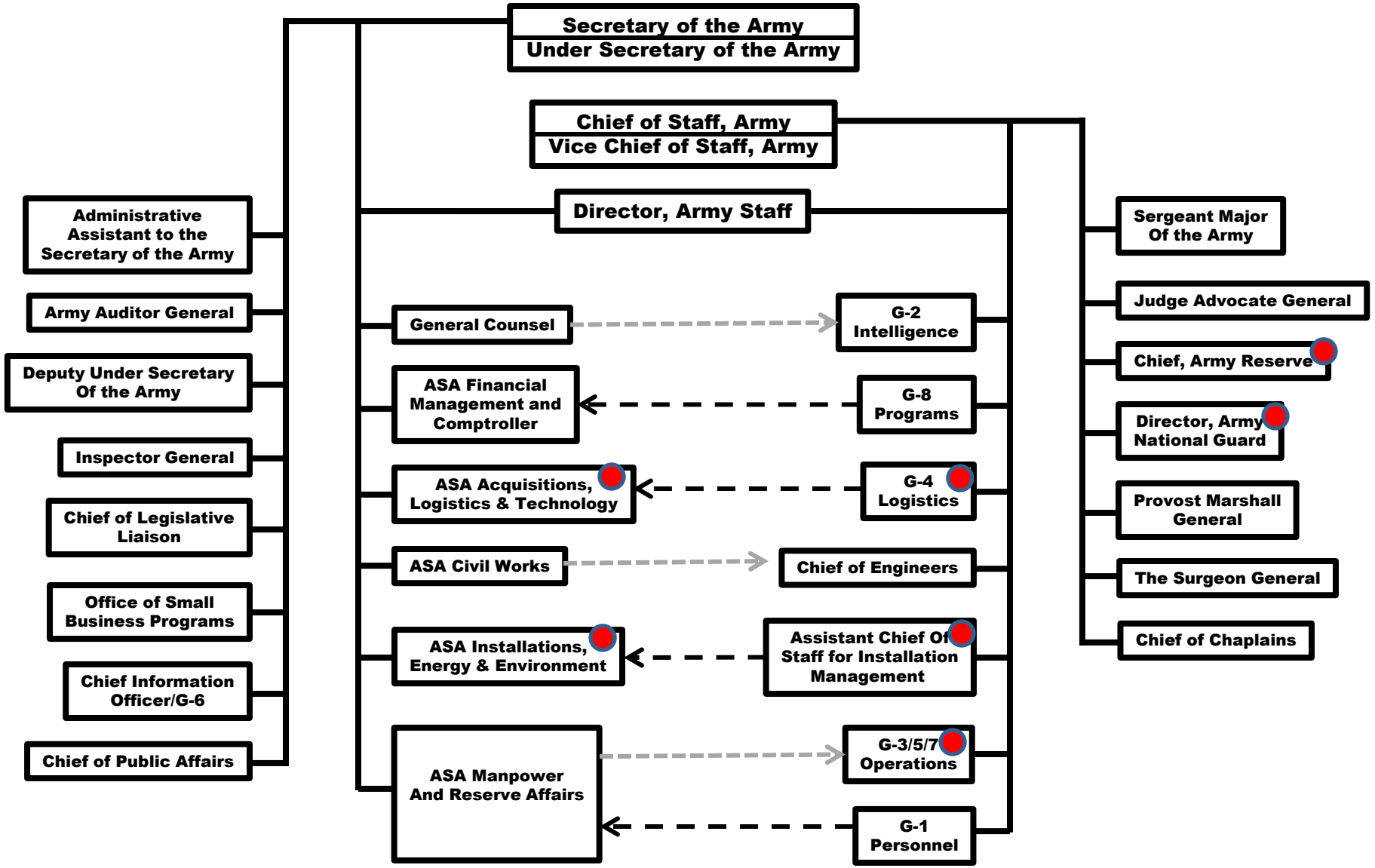
Main Landing Gear Brake Assembly

Briefing to the JTEG
30 March 2015

U.S. Army Corrosion Prevention and Control Program

Dr. Roger D. Hamerlinck
OASA(ALT), SAAL-PA
roger.d.hamerlinck.civ@mail.mil
(703) 617-0250

DEPARTMENT OF THE ARMY



Indicates that they are a member of the Army Corrosion Board and Army Corrosion Integrated Product Team

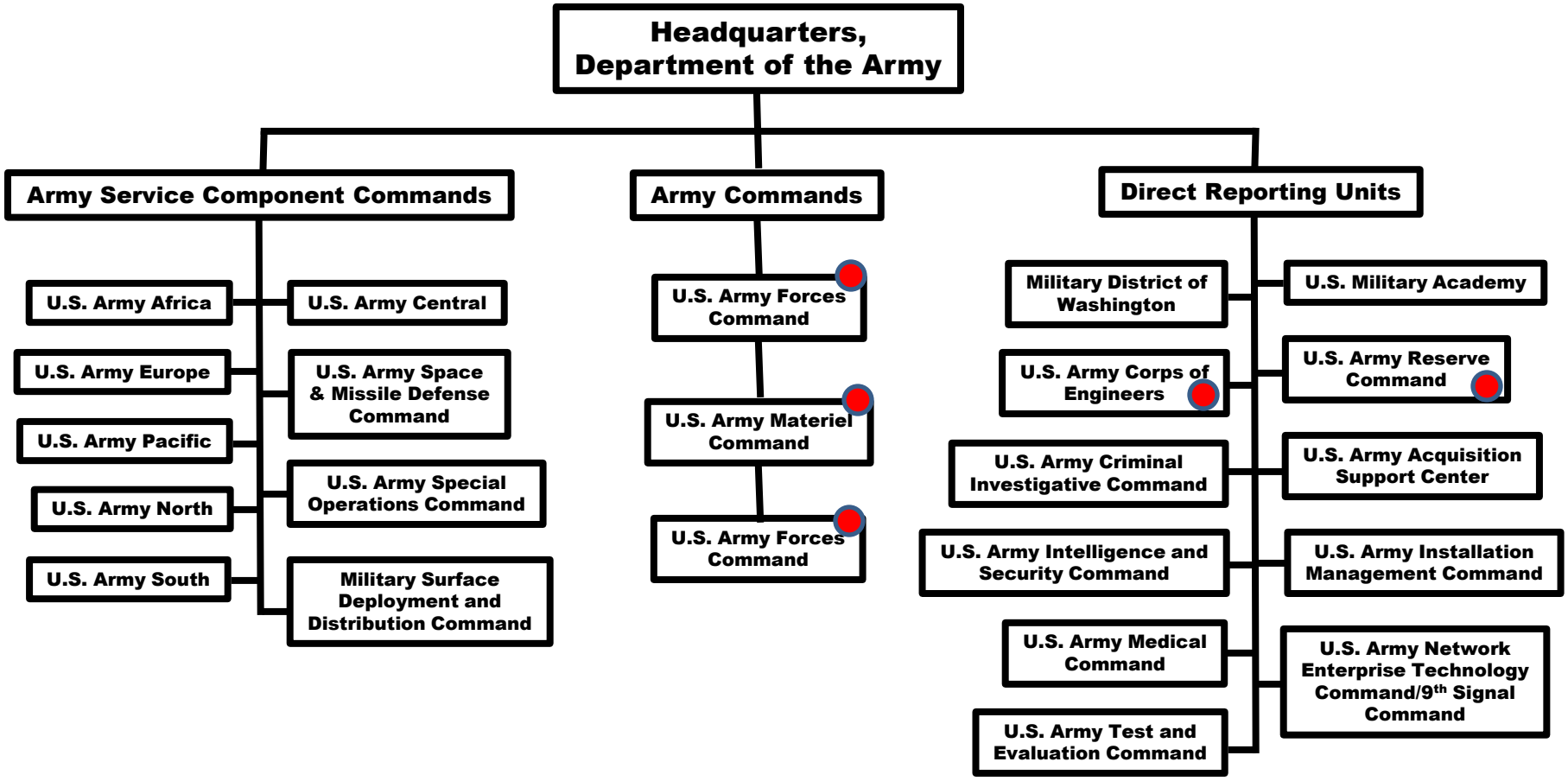
ASA - Assistant Secretary of the Army

Defined Responsibilities to ASAs

Oversight

SOURCE: Profile of the U.S. Army a reference handbook 2014/2015

ARMY COMMAND STRUCTURE



Indicates that they are a member of the Army Corrosion Board and Army Corrosion Integrated Product Team

SOURCE: Profile of the U.S. Army a reference handbook 2014/2015

CHALLENGES TO TECHNOLOGY INSERTION

- Not needed for every TOE/TDA – environment dependent
- How should these solutions be authorized/assigned to the end item
  - Associated Support Item of Equipment (ASIOE)
    - ✓ Separately authorized, separately type classified
  - Component of End Item (COEI)
    - ✓ Looses it visibility when installed on the end item – just another part
  - Basic Issue Item (BII)
    - ✓ Emergency maintenance
    - ✓ Put into operation
    - ✓ Must be transferred with the item
  - Additional Authorized List (AAL) Item
    - ✓ Discretionary item
    - ✓ Unit funds the acquisition and re-procurement
- These solutions need maintenance and parts – Added resource requirements
- Availability of funding – affordability
- Does technology truly resolve the root cause for why it corroded

TOE = Table of Organization and Equipment
TDA = Table of Distribution and Allowances

CONCLUSION

If the Army is to succeed in reducing the cost, readiness, and safety impacts of corrosion, I need you to:

- **Be the example – perform preventive maintenance**
- **Establish a command culture that emphasizes prevention of corrosion**
- **Take the time to file Quality Deficiency Reports (QDRs) and Storage Deficiency Reports (SDRs)**
- **When you have a "good" idea, let us know, but remember we need the analysis too!**

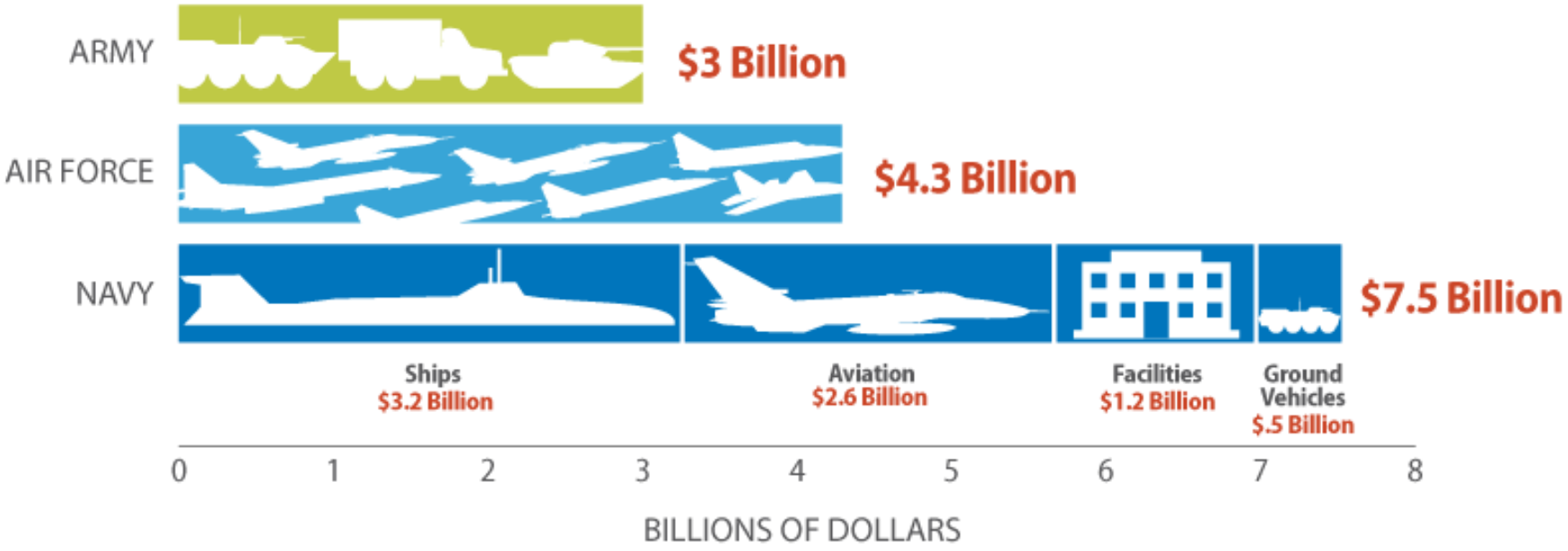
DON CORROSION PREVENTION AND CONTROL EXECUTIVE

JTEG Brief

Mr. Matthew Koch
DON Corrosion Control & Prevention Executive
ASN RD&A-DASN RDT&E

IMPACT OF CORROSION

- $22.4 Billion/Year Problem for DoD



ACTIONS TO ADDRESS CORROSION

- Congress enacted legislation to address corrosion and DoD has developed policy and guidance

- GAO audits military departments on compliance with USC § 2228 requirements and reports findings to Congress

2003	Congress establishes DoD Corrosion Executive (P.L. 107-314, 10 USC § 2228
2005	DoD implements corrosion planning requirements (DoDI 5000.02
2008	Congress establishes Service Corrosion Executives (P.L. 110-417, 10 USC § 2228
2009	DON appoints Corrosion Executive, stands up Corrosion Cross-Functional Team, and delivers first annual report to Congress
2010	DoD requires Corrosion Prevention and Control Plan (CPCP) for all ACAT I program (DoDI 5000.02)
2013	Corrosion Planning requirement expanded to both the Systems Engineering Plan (SEP) and the Life Cycle Sustainment Plan (LCSP)—(Interim DODI 5000.02)

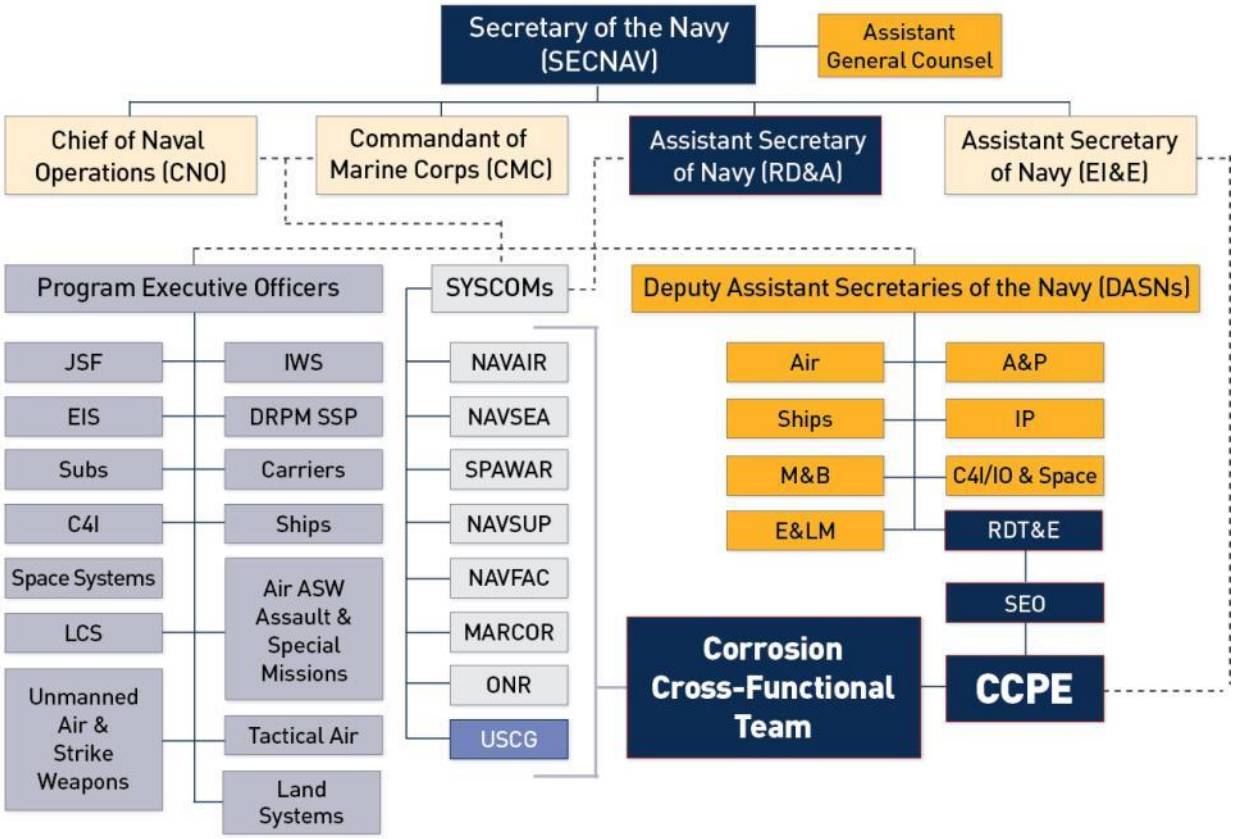
ROLE OF NAVY CORROSION EXECUTIVE

- Policy (DON-Level and Alignment with OSD & SYSCOM Policies)
- Develop Strategic Plan for Addressing Corrosion in the DON
- Annual Report to Congress on DON Corrosion Health, Needs, and Initiatives
- Corrosion Planning Review in SEP, LCSP, CPCP during Acquisition
- Annual Assessment of Department CPC Program(s)
- Hex- Chrome Waiver Authorization

ROLE OF NAVY CORROSION EXECUTIVE

- Primary POC for Interaction with OSD AT&L Corrosion Policy & Oversight – (Projects, Reports, etc.)
- Lead Cross-DON CPC Communication (Chair Corrosion CFT)
- Facilitate Cross-DOD CPC Standards/Specifications
- Adjudication of Cross-DON CPC Issues
- Response to DON Corrosion-Related Congressional Inquires executed by GAO

DON CORROSION ORGANIZATION



Corrosion Cross Functional Team (CFT) is chartered by Flag Officer panel and represented by SYSCOM SME

CORROSION CROSS FUNCTIONAL TEAM

- The Corrosion Cross Functional Team (CFT) includes members from OPNAV, SYSCOMS, ONR, and US Coast Guard
- Meets Bi-Monthly to ensure ongoing and up to date forum on the state of corrosion health and challenges in the Navy
- Encourages cross talk between acquisition, research, logistics, and sustainment communities
- CFT members provide a direct link between the corrosion office and various activities, program managers, engineers, and assets
- Creates an up to date, knowledgeable community capable of identifying and addressing systematic corrosion issues

ORGANIZATIONAL-LEVEL CORROSION SUSTAINMENT EFFORTS IN DON

- **AIR – Maintenance Readiness Teams (MRT)**
  - Provides Organizational-level corrosion prevention, detection and repair at fleet aviation command locations
- **SHIPS – Corrosion Control Assistance Teams (CCAT)**
  - Provides ship-board tools, training and technical expertise on organizational level corrosion repair
- **GROUND VEHICLES – Corrosion Service Teams (CST)**
  - Rate the current corrosion condition of the asset
  - Provides on-the-lot organizational level corrosion repair and application of corrosion preventative compounds

EXAMPLES OF ORGANIZATIONAL-LEVEL CORROSION MITIGATION TECHNOLOGIES (NAVAIR)

Bristle discs

Alodine pens

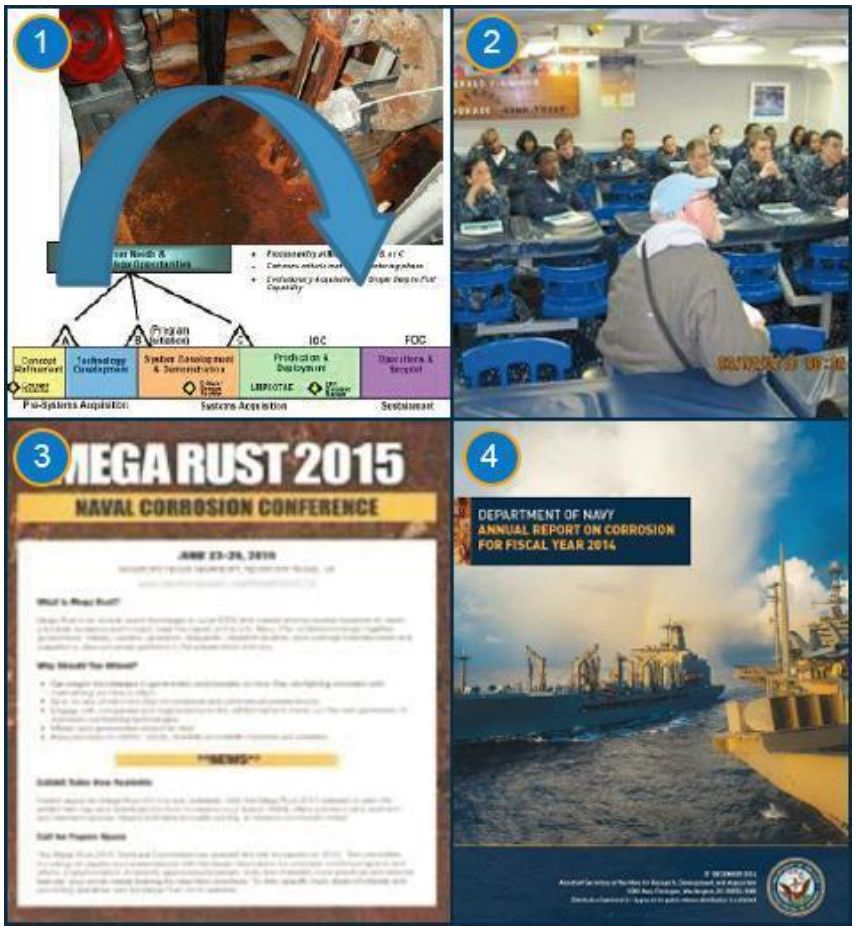
Mildew cleaning

Water diverter

Wash pads

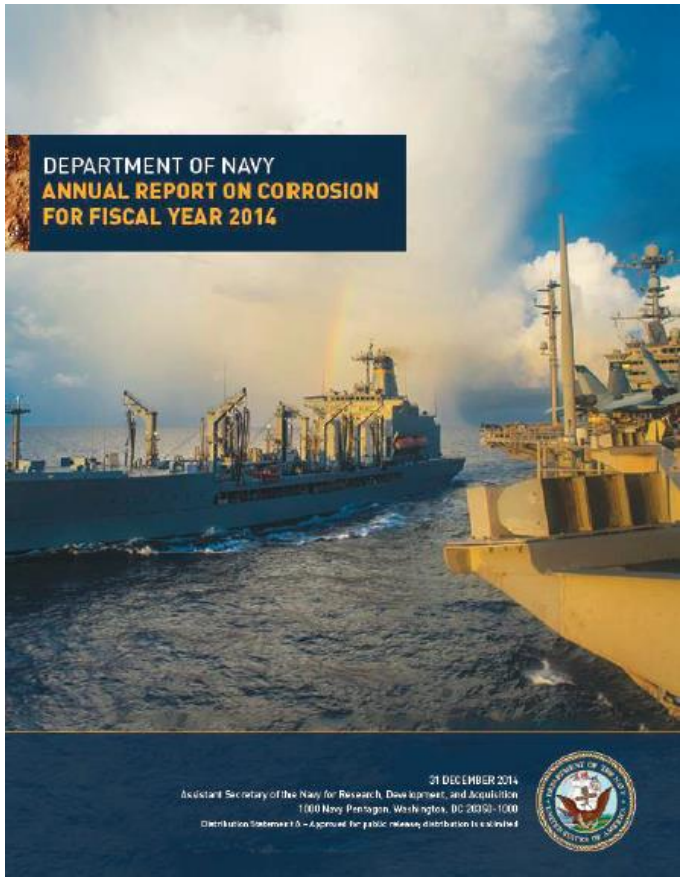
Aerosol cleaners

CORROSION EXECUTIVE FOCUS AREAS



1. **Feedback into Acquisition**
2. **Training and education opportunities**
3. **Communication and Collaboration**
4. **Proper representation in Annual reporting**

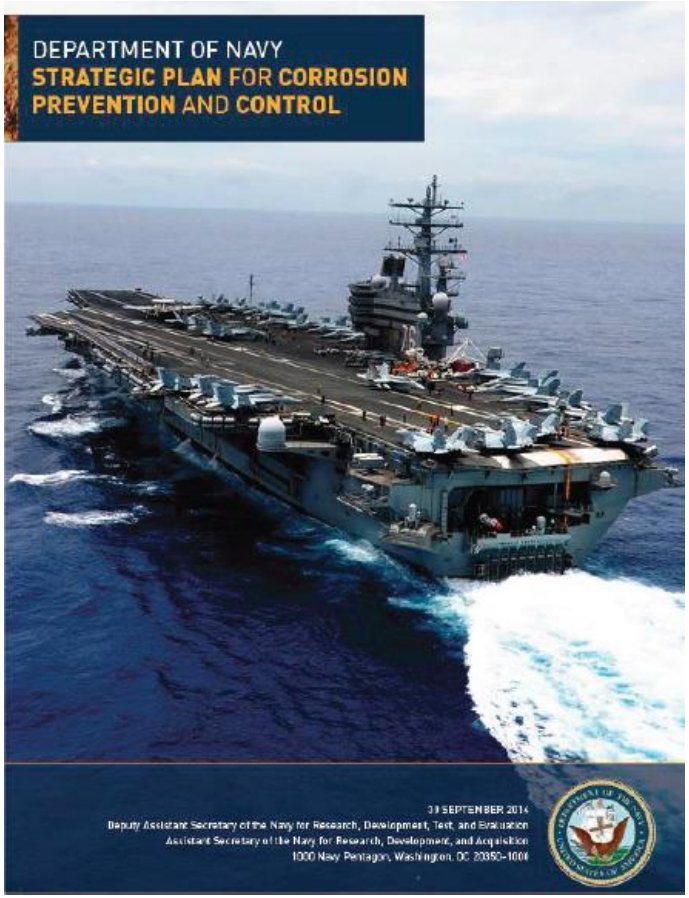
DON FY-14 ANNUAL REPORT ON CORROSION



- **Requirement**
  - Title 10 USC § 2228
- **Scope**
  - CPC accomplishments & activities
  - Current FY focus areas & funding levels
- **Recommendations pertaining to Department CPC activities**
  - Audience
  - Department of the Navy
  - Secretary of Defense
  - United States Congress

DON FY-15 STRATEGIC PLAN FOR CORROSION

- **Requirement**
  - Title 10 USC § 2228
- **Goals & Objectives**
  - Institutionalize Corrosion Prevention & Control
  - CPC in Policy & Guidance
  - CPC in Technology Development & Integration
  - Education & Training for CPC Workforce
  - Communication & Collaboration as a Tool
- **Performance Metrics**
  - Quantifiable metrics for success
- **Audience**
  - Department of the Navy
  - Secretary of Defense
  - United States Congress



MEGA RUST 2015

JUNE 23-25, 2015 | NEWPORT NEWS , VA

AMERCIAN SOCIETY OF NAVAL ENGINEERS

The most current Navy-wide preservation issues will be discussed by a wide range of key leaders and practitioners in the government, military, shipyards, intermediate and depot level repair activities, research facilities, ship owners/operators, and coatings manufacturers & suppliers.

DON Corrosion Executive is orchestrating Government approvals for conference travel to facilitate this event. For 2015, this event encompasses all Navy.

Newport News Marriott
740 Town Center Drive
Newport News, VA 23606

Questions: meetings@navalengineers.org (703) 836-6727

CORROSION EXECUTIVE STAFF

Mr. Matthew Koch
DEPARTMENT OF NAVY
Corrosion Control & Prevention Executive
Pentagon BF963
Washington, DC 20350
Cell: 302-723-9268 (best option)
Pentagon: 703-614-3440
Quantico: 703-432-3471
Matthew.E.Koch@navy.mil

Ms. Elena Lucas
DEPARTMENT OF NAVY
Deputy Corrosion Control & Prevention Executive, Program Assessments
Pentagon BF963
Washington, DC 20350
Cell: 202-834-3483
Pentagon: 703-614-0097
NRL: 202-767-4294 (best option)
Elena.Lucas@navy.mil

DON CCPE Staff

Lauren Paladino
Chief of Staff
LPaladino@elzly.com

Stephen Spadafora
Advisor, CCPE 2011-2014
Stephen.J.Spadafora@leidos.com

Dail Thomas
Advisor, CCPE 2009-2011
Elvin.D.Thomas@leidos.com

Headquarters U.S. Air Force

Integrity - Service - Excellence

JTEG Overview of Air Force Corrosion Prevention and Control

Dr. David Robertson
Air Force Corrosion Control and Prevention Executive
SAF/AQR

U.S. AIR FORCE

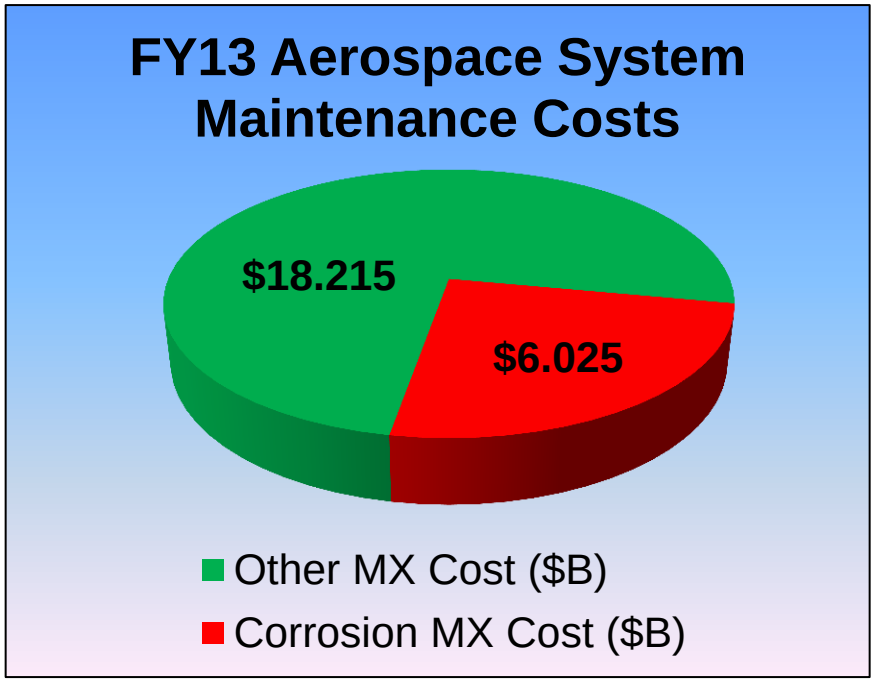
U.S. AIR FORCE

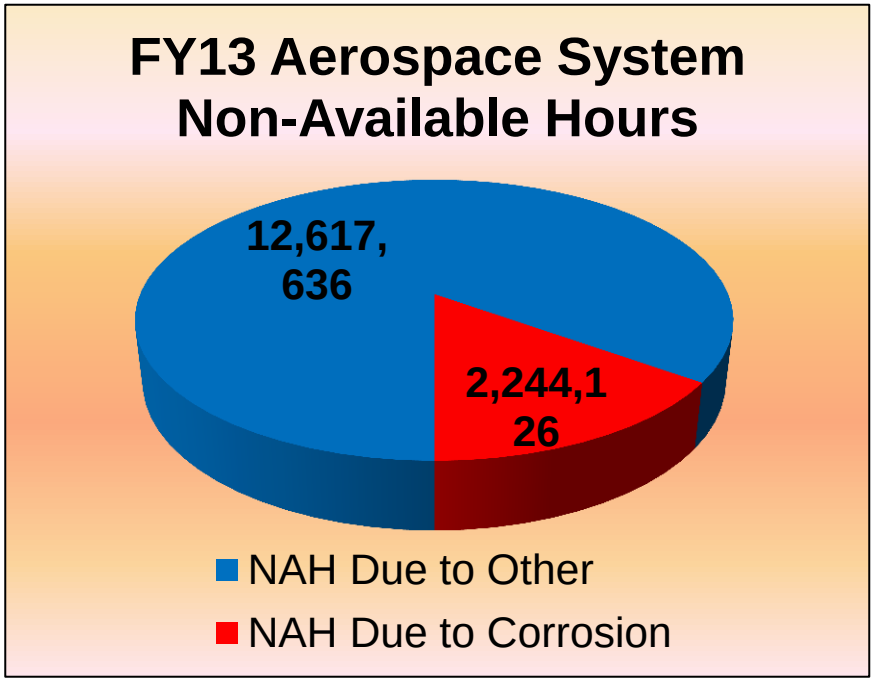
Agenda

- Impact to AF
- AF Organization
- Strategic Plan and Policies
- Technology Implementation Example

U.S. AIR FORCE

Impact

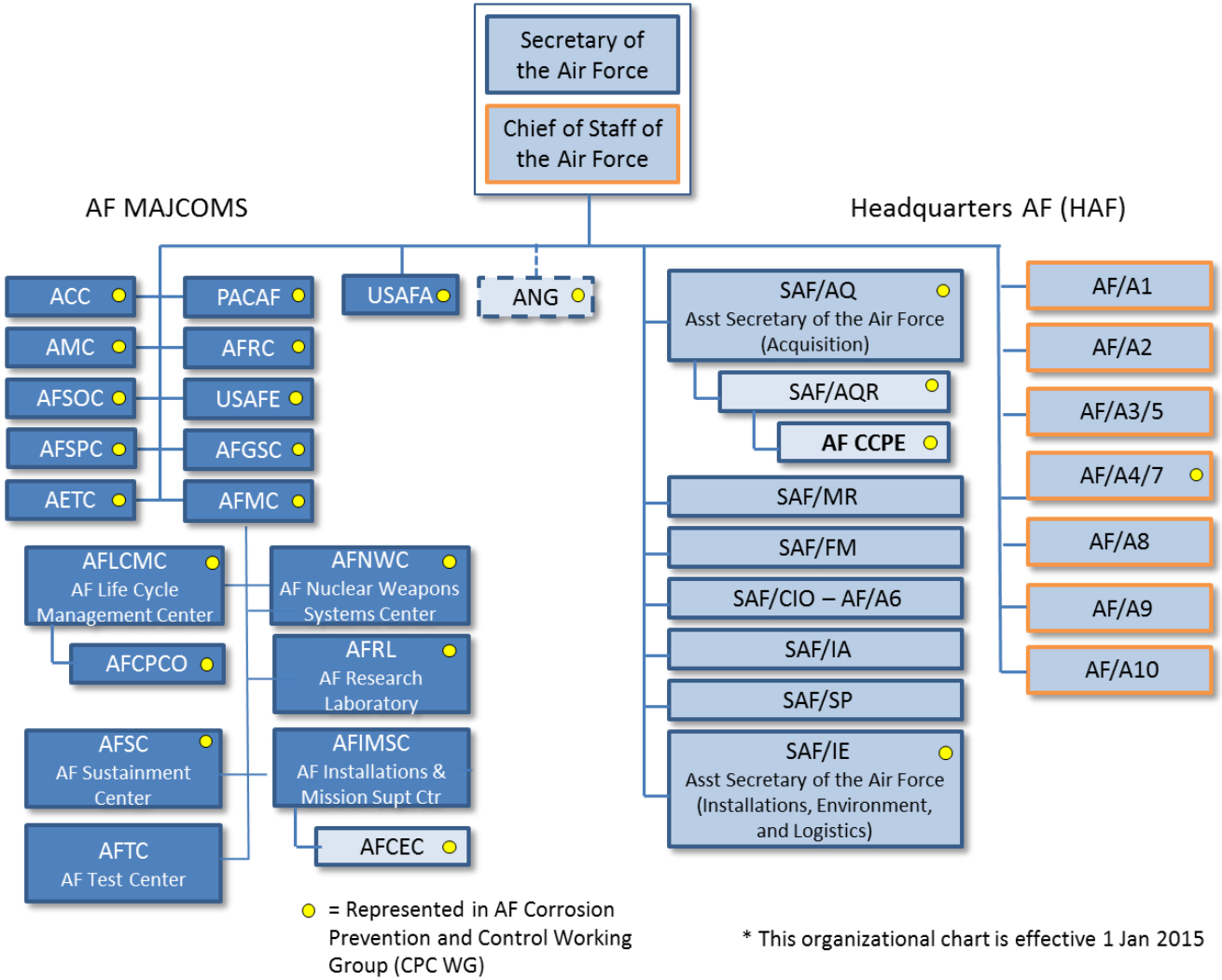




The depot portion of corrosion MX is $3.4B

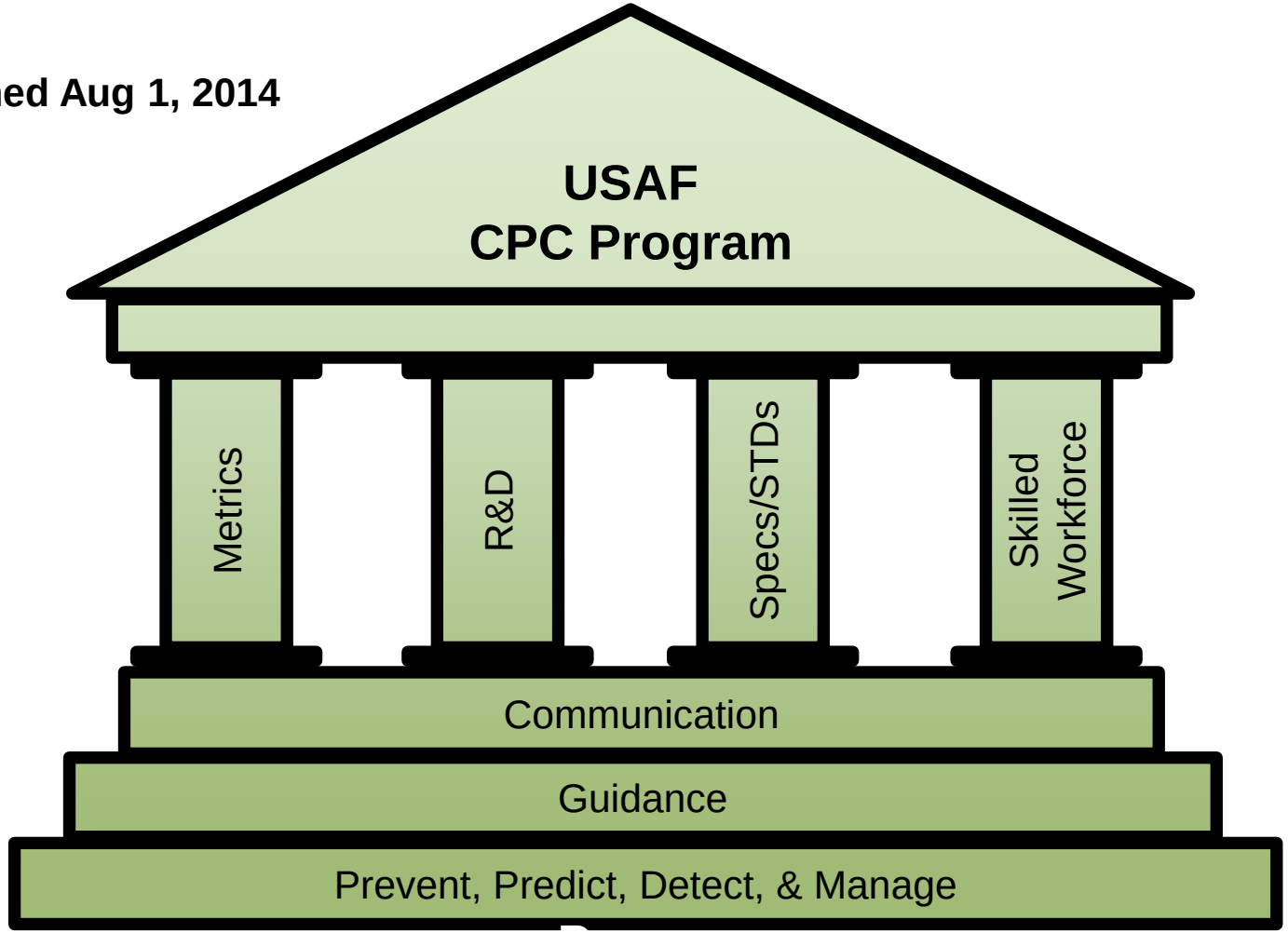
U.S. AIR FORCE

Organization



AF Corrosion Strategic Plan

Published Aug 1, 2014



U.S. AIR FORCE

Acquisition Oversight Weapon Systems

- AF Policy AFI 63-101, Integrated Life Cycle Management
  - Requires a CPCP approved by PEO (ACAT 1 to 3) (Table 4.1)
  - Lead Systems Engineer is to ensure the RFP considers corrosion (5.1.4.1.2)
  - PM is to integrate CPC into the program integrity efforts (5.4.1.3.1)
  - CPC planning is to be integrated into the SEP and LCSP (5.4.6)
  - For ACAT 1, PM must include CPC Planning in the MS A SEP under "Design Considerations" and prepare a CPC Plan at MS B and C. PM must provide the CPC Plan to the CCPE prior to PEO approval (5.4.6.1)
  - For new starts, the PM is to obtain early CCPE involvement (5.4.6.3)
  - PM must obtain PEO approval and CCPE coordination for Cr6+ use (5.4.6.4 and DFARS reference)
  - PSM is accountable to the PM for CPC (6.1.1)
- Mil-Std-1568C, Materials and Processes for CPC in Aerospace Weapon Systems
- Mil-Std-1530C, Aircraft Structural Integrity Program
- ASIP Reviews

U.S. AIR FORCE

AF CPC Enterprise On-going Activities

- **Implementation of improved materials and processes**
  - Assessment and assistance for field implementation of new materials (AFLCMC, AFRL)
  - Military standard for CPC of aerospace systems (AFRL, other MilDeps, AQR, OSD, AFLCMC)
  - Electronics CPC standard with SAE (OSD, other MilDeps, AFRL, AQR)
  - Integration of corrosion with the Aircraft Structural Integrity Program (AFLCMC, AQR)
  - MAJCOM corrosion surveys (AFLCMC/CPCO, MAJCOMs)
- **Communication and collaboration**
  - AF CPC Working Group telecons (HAF, MAJCOMs, AFMC Centers)
  - DoD CPC IPT and supporting WIPTs (OSD, other MilDeps, AQR, AFRL, AFLCMC/CPCO)
  - Technical Corrosion Collaboration program (OSD, other MilDeps, AFRL, AQR, various universities, USAFA, AFIT)
- **Information and training**
  - Technical Order updates for improved materials and processes (AFLCMC/CPCO)
  - Information clearinghouse for maintainers and engineers (AFLCMC/CPCO)
  - Training development and implementation (AFLCMC/CPCO)
- **Research**
  - Technologies that track aircraft exposure, enabling CBM and improved depot workload planning (AFRL, AFLCMC)
  - Coatings development, testing, and integration (AFLCMC, AFRL)
  - Corrosion-conscious engineering design tools (AFRL)
  - Structural integrity effects of corrosion (AFRL, USAFA, AFIT)
  - Realistic accelerated corrosion testing (AFRL)

U.S. AIR FORCE

Example of Focused Technology Implementation Effort

- The AF CPC enterprise recognizes that coating – decoating activities are among the biggest drivers of depot cost and risk
- CrVI is a big ESOH risk and cost for the depots
- CPC enterprise is utilizing a balanced, risk-based approach, to implement CrVI replacements
- Initial focus is on replacements for CrVI with biggest sustainability impacts and low corrosion risk

U.S. AIR FORCE

AF CPC Risk-Based Prioritization Framework

(Hexavalent Chromium Replacement)

		Corrosion and Mishap Risk Posed by this Application Area *(Green indicates application area will tolerate less capable alternatives)*		Risk Assessment of the Use of CrVI in this Application Area *(Green indicates application poses lower ESOH risks to AF personnel and installation environment)*		Risk Assessment of the Use of Alternatives in this Application Area *(Green indicates adoption of alternatives would not increase risk in these areas)*		
	CrVI Applications	**Life Cycle Corrosion**	**Life Cycle Mishap**	**DoD Worker Exposure Risk if CrVI Used**	**ESOH Life Cycle Cost**	**Corrosion Prevention Performance**	**Technical Maturity Risk**	**Life Cycle Cost**
Near-term Focus Areas for Implementation	Primer on support equipment and infrastructure	Visible and repairable		Larger source of worker CrVI exposure	Larger source of installation ESOH costs			Some alternatives require more frequent inspection and application; alternatives still require exposure controls
	Aircraft Outer Mold Line (OML) Primer	Sometimes necessary to improve performance of outer mold line replacement						
	Bare metal surface treatments/Conversion Coatings/"Sealers"							
	Sealants							
Longer-term Focus Areas	Adhesive bonding primers	Hidden, difficult to inspect or access Frequent corrosion;	Known life cycle structural integrity risk Known life cycle mishap risk	Limited or no expected worker exposure	Limited or no installation ESOH costs			Higher life cycle probability of loss of aircraft or of availability
	Internal Structural primer							
	Fuel tank primers, coatings, and sealants							

U.S. AIR FORCE

CrVI Replacement

- **Examples of OSD-funded AF CPC projects**
  - **C-130 Non-Chrome Field Test**
  - **Universal Primer on Ground Support Equipment**
  - **F-16 Reduced Chrome Study**
  - **Evaluation of Non-Chrome Paint Systems in Field Environments**
- **AF CPC enterprise partnering with lab, ESOH, product support, life cycle management communities to focus on AF aircraft outer mold line (OML) coating systems**
  - **MIL-PRF-32239A, *Coating System, Advanced Performance, for Aerospace Applications***
  - **Supported by data from outdoor exposure testing**

U.S. AIR FORCE

Summary

- The CPC enterprise in the AF encompasses many organizations and activities
- A strategic plan is in place along with policy to focus the efforts
- Technology transition and implementation is important to realize improved CPC and reduce costs

Questions?

JTEG Joint Technology Exchange Group

Joint Solutions for Depot Maintenance

Corrosion Prevention and Repair Forum

Review & Wrap-Up

30 March 2015