2017 AIR FORCE CORROSION CONFERENCE

Corrosion Legislation, Policy, Guidance & Standards

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Agenda

- Law
- Policy
- Guidance
- Specifications and Standards
“(f) Definitions. - In this section:

“(1) The term "corrosion" means the deterioration of a material or its properties due to a reaction of that material with its chemical environment.

“(2) The term "military equipment" includes all weapon systems, weapon platforms, vehicles, and munitions of the Department of Defense, and the components of such items.”
“Coordinate efforts throughout DoD to prevent and mitigate corrosion of the military equipment and infrastructure”

- Duties include:
  - review the programs and funding levels proposed by each military department for the prevention and mitigation of corrosion
  - provide oversight and coordination of the efforts to prevent or mitigate corrosion during the design, acquisition/construction, and maintenance of military equipment and infrastructure.
  - monitor acquisition practices to ensure use of corrosion prevention technologies and treatments are fully considered during R&D in the acquisition process and incorporated into that program, particularly during the engineering and design phases.

- Additionally authorized to:
  - develop corrosion training, relevant directives and instructions, interact directly with the corrosion prevention industry, trade associations, other government corrosion prevention agencies, academic research and educational institutions, and scientific organizations engaged in corrosion prevention

- Through a long-term strategy to:
  - collect, review, validate, and distribute information on proven methods and products relevant to the prevention of corrosion of military equipment and infrastructure
  - coordinate a research and development program for the prevention and mitigation of corrosion for new and existing military equipment and infrastructure
  - transition new corrosion prevention technologies into operational systems through memoranda of agreement, joint funding agreements, public-private partnerships, university research and education centers, and other cooperative research agreements.

10 U.S.C. 2228 - Directs CPO Efforts

Activities

Research Opportunities

Demonstration-Implementation Projects
Requires each Service to appoint a Corrosion Control and Prevention Executive to ensure that:

- Corrosion control and prevention is maintained in the department’s policy and guidance management regarding system and infrastructure acquisition, research and development, and logistics support;
- Adequate funding is identified to accomplish those activities;
- Resources are provided to sustain, evaluate and manage an effective Service corrosion control and prevention program;
- Coordinate with the DoD Director of Corrosion Planning and Oversight; and
- Submit an annual report of recommended actions and funding levels to the Secretary of Defense.
Significant Law Changes

- **FY16 NDAA**
  - Programs entering acquisition after 1 Oct 2016 will have the SAE as the MDA, unless otherwise designated by the SECDEF

- **FY17 NDAA**
  - Disestablishes AT&L - Divide duties between new USD Research and Engineering (R&E) and USD Management and Support (M&S)
  - Plan for realignment due in Aug 2017
§ 2366b. Major defense acquisition programs: certification required before Milestone B approval

(a) Certification.—A major defense acquisition program may not receive Milestone B approval until the milestone decision authority—

(3) further certifies that—

(E) life-cycle sustainment planning, including corrosion prevention and mitigation planning, has identified and evaluated relevant sustainment costs throughout development, production, operation, sustainment, and disposal of the program, and any alternatives, and that such costs are reasonable and have been accurately estimated;

Policy Result: Require CPC planning early and throughout life-cycle
Key CPC Policy Summary

- **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, as a minimum

- **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
CPC Planning Integrated into Acquisition

- Overarching policy is to integrate CPC into all acquisition and sustainment activities, processes, procedures and documentation
- Doesn’t preclude programs requiring specific CPC activities or documentation (i.e. a CPC Plan)
- Programs must tailor their CPC planning to the requirements of the program through the life-cycle
- Life cycle CPC Planning required and emphasized
  - Strong SEP requirements (management as well as design)
  - CPC Planning required in sustainment planning
  - Applicable to ALL programs (no “ACAT I only” restriction)

- CPC Plan not an OSD-level required document
  - No prohibition for developing, implementing or contracting for a CPC Plan by Services or programs – a CPC Plan is still a best practice

While corrosion-related policy is highlighted here, all direction in the document is applicable to CPC planning, implementation and execution
Enclosure 3, Systems Engineering

15. CORROSION PREVENTION AND CONTROL. The Program Manager will:

▪ identify and evaluate corrosion considerations throughout the acquisition and sustainment phases that reduce, control, or mitigate corrosion in sustainment

▪ perform corrosion prevention and control planning

▪ include corrosion control management and design considerations for corrosion prevention and control in the Systems Engineering Plan (SEP) and Life-Cycle Sustainment Plan (LCSP)

▪ ensure that corrosion control requirements are included in the design and verified as part of test and acceptance programs.
Systems Engineering Plan Outline

- SEP Outline, Version 2.0, June 2, 2015
- Sections to focus CPC input
  1. Introduction – Purpose & Update Plan
  2. Program Technical Requirements
  3. Engineering Resources and Management
     - Technical Schedule and Schedule Risk Assessment
     - Engineering Resources and Cost/Schedule Reporting
     - Technical Risk and Opportunity Management
     - Relationships with External Technical Organizations
     - Technical Performance Measures and Metrics
  4. Technical Activities and Products
     - Results of Previous Phase SE Activities
     - Planned SE Activities for the Next Phase
     - Requirements Development and Change Process
     - Technical Reviews
     - Configuration and Change Management
     - Design Considerations

Design Considerations: Include CPC in “Mapping Key Design Considerations into Contracts”
  - Describe how design minimizes adverse impacts of corrosion and material deterioration on system cost, safety, and availability across the acquisition and sustainment life cycle.
  - Include CPC in, but not limited to, requirements flow-down, contract language, design attributes, risk management, materials selection, manufacturing, test, maintenance, inspection, and modification.
Enclosure 4, Developmental Test and Evaluation (DT&E)

5. DT&E PLANNING CONSIDERATIONS

a. The Program Manager will:

(6) Develop complete resource estimates for T&E to include any special requirements (e.g., corrosion prevention and control).

Resources will:

– reflect the best estimate for conducting all test activities.
– be mapped against the developmental evaluation framework and schedule to ensure adequacy and availability.
SUSTAINMENT ACROSS THE LIFE CYCLE

a. The Program Manager, with the support of the Product Support Manager, will:

(9) **Plan for CPC** in systems engineering and life cycle sustainment as required by DoD Instruction 5000.67. **Product support planning**, especially maintenance planning and sustaining engineering, will incorporate appropriate mitigation of CPC risks inherent in the design to meet sustainment requirements.
Life Cycle Sustainment Plan

- LCSP Outline, Version 2.0, promulgated January 19, 2017
- Revision contains same 10 sections as previous 2011 version
- LCSP Outline sections to focus CPC input
  1. Introduction
  2. Product Support Performance
  3. Product Support Strategy
  4. Program Review Issues and Corrective Actions
  5. Influencing Design and Sustainment
  6. Integrated Schedule
  7. Cost and Funding
  8. Management
  9. Supportability Analysis
  10. LCSP Annexes

- Transition to version 2.0 by 19 October 2017 (9 months)
Spiral 4 issued January 2014 (Living Document)
  – Updated February 2014
  – Another update in progress

Currently being revised due to:
  – DoDI 5000.02
  – DoDI 5000.67 in revision
  – FY17 NDAA AT&L realignment
  – Industry Joint CPC Planning Standard (NACE\SSPC)
Maintain the Intent of Two CPC Planning Tenets

Program Management and Technical Considerations
Maintain the Intent of Two CPC Planning Tenets

- PMs required to accomplish CPC Planning on all acquisition programs
- Establish a management structure to focus CPC efforts
  - Integrate within existing management structure, and/or
  - Establish specialized, focused management structure – Corrosion Prevention Team (CPT – aka CPAT, CPAB, etc.)
  - Evolve based upon the program phase
- Document CPC Planning in SEP and LCSP as a minimum
  - Integrate CPC into all programmatic documentation, processes, plans, activities and reviews
  - CPC Plan is a viable document focused the needs of the program
- MIL-STD-1530C – Aircraft Structural Integrity Program
  - Requires a management structure for corrosion across the life cycle
- Get qualified people on the program – imperative!
Maintain the Intent of Two CPC Planning Tenets

- Investigate Legacy Systems for successes/needed improvements
  - Corrosion Failures
  - Cost/Safety/Availability Impacts

- Fundamental topics for consideration
  - Material Selection
  - Protective Coatings
  - Design Geometries
  - Environmental Mitigation
  - Process/Finish Specification
  - Environmental Factors

- Special Interest Item – Hexavalent Chromium
  - DFARS 48 Code of Federal Regulation (CFR) 223 and 252 Specifications and Standards

- Obtaining corrosion-related deliverables
  - DI-MFFP-81403, Corrosion Prevention and Control Plan
    - Use to deliver the CPC Plan
  - DI-MFFP-81402, Finish Specification
    - Use to deliver the Finish Spec
Five Enclosures – One for Each Acquisition Phase

I. MATERIEL SOLUTION ANALYSIS PHASE AND PRE-MILESTONE A
II. TECHNOLOGY MATURATION AND RISK REDUCTION PHASE AND PRE-MILESTONE B
III. ENGINEERING AND MANUFACTURING DEVELOPMENT PHASE AND PRE-MILESTONE C
IV. PRODUCTION AND DEPLOYMENT PHASE
V. OPERATIONS AND SUPPORT PHASE

Each Enclosure Addresses Six Focus Areas

1.0 MANAGEMENT
2.0 SYSTEM ENGINEERING
3.0 LIFE CYCLE LOGISTICS
4.0 TEST & EVALUATION
5.0 CONTRACTING
6.0 COST ESTIMATING AND BUDGET
Addressing commercial off-the-shelf (COTS), government off-the-shelf (GOTS), Non-Developmental Items (NDI)

- Derivatives of these acquisition strategies may benefit the acquisition program
- Can complicate CPC planning and introduce risk to long-term sustainment
- Critical to exercise due diligence on CPC planning

Regardless of the acquisition strategy, apply good CPC planning and execution principles
Several DAG Chapters address CPC planning

1. Program Management
3. Systems Engineering
4. Life-cycle Sustainment
5. Manpower Planning & Human Systems Interface
6. Information Technology & Business Systems
7. Intelligence Analysis Support & Acquisition
8. Test & Evaluation
9. Program Protection
10. Acquisition of Services
Steve Spadafora
Former Department of the Navy Corrosion Control and Prevention Executive
Aerospace CPC and M&P Standards Efforts

- **MIL-STD-1568D: Aviation Corrosion Prevention and Control:**
  - Standard and Associated Data Item Descriptions Issued 22 Aug 2015 and is being cited in new DoD ACQ programs.

- **MIL-STD-1530D: Aircraft Structural Integrity Program:**
  - Standard updated in Aug 2016 (Change 1 Oct 2016) and is cited in AF ACQ programs.

  - Following formal coordination with the Services, a *modernized version of MIL-STD-1587 was re-instated in June 2017*. Following this release, a *complete technical update of this standard is being executed with formal release targeted for late 2018/early 2019*.

- **MIL-STD-889: Dissimilar Metals**
  - A modernized version of this standard (*MIL-STD-889C* was released 22 Aug 2016). A technical revision effort (new approach and additional materials) began in FY17 with a target completion date in 2018 with the release of MIL-STD-889D.

- **MIL-STD-810: Testing**
  - *MIL-STD-810* (Army Lead) is in the *technical revision process*. Once completed, formal Service coordination followed by comment adjudication & released (Target date: TBD).
Aerospace CPC and M&P Standards Efforts

**NACE SP21412-2016/SSPC CPC-1: Corrosion Prevention & Control Planning**

- NACE & SSPC established a Joint Task Group (JTG-527) which developed a joint Industry Standard describing the Key elements of CPC Planning. The Standard was Approved on 1 Dec 2016 and is available via the NACE and SSPC websites. Adoption by DoD is in progress with NAVAIR serving as the adopting agency (ECD Summer 2017).

**MIL-HDBK-1250: Avionics Corrosion Prevention & Control (SAE-AS-12500)**

- DSC selected SAE Int’l for re-instating this standard. The SAE G-25 Committee (DoD & Industry Electronics, Avionics & Corrosion SMEs) developed the draft *SAE-AS-12500*. Comment adjudication from the Jan 2017 successful Ballot is in progress. *Publication is targeted for late FY17*, with DoD Adoption targeted for late 2017 (Adopting Agency TBD).

**MIL-STD-7179: Aerospace Finish Systems**

- An effort to update MIL-STD-7179 is planned to begin in FY17 in conjunction with the 1587 effort. A technical update revision is planned for completion and release in 2018.

**MIL-HDBK-808: Finish Systems for Support Equipment**

- MIL-HDBK-808 has been assessed and the support equipment requirements could be incorporated into 1587 and 7179. Pursuing concurrence from Service Reps and incorporation during the technical revision processes for these standards.
Aerospace CPC and M&P Standards

**Operations & Sustainment**
- NAVAIR-01-1A-509 (Vol 1-4)
- AF T.O. 1-1-689 (Vol 1,3,5)
  (Joint Service CPC Maintenance Manual)
- MIL-HDBK-6870A
  (NDI Program Requirements: NDI for Aircraft and Missile Materials and Parts)
- AF TO 1-1-700 (CPC Ground Comm & Electrical Equipment)
- AF TO 1-1-691 (CPC Maintenance Manual)
- AF TO 1-1-686 (Preservation)

**Coating/Finishing Systems**
- MIL-DTL-5002E
  (Surface Treatments and Inorganic Coatings for Metal Surfaces of Weapon Systems)
- MIL-DTL-18264E
  (Application and Control of Organic Finishes for Weapon Systems)
- MIL-HDBK-808
  (Finish, Protective & Codes for Finishing Schemes for Ground Support Equipment)
- MIL-STD-7179A
  (Finishes, Coatings & Sealants for Protection of Aerospace Weapon Systems)
- TO 1-1-8
  (Application/Removal of Organic Coatings)

**Overarching A/C Design Requirements**
- MIL-STD-1530
  (A/C Structural Integrity Program (ASIP))
- MIL-STD-1568D
  (Material and Processes for CPC in Aerospace Weapon Systems)
- MIL-STD-810
  (Testing Standard)
- MIL-STD-889C
  (Dissimilar Metals)
- MIL-STD-1587D
  (M&P Requirements for Air Force Weapon Systems)
- MIL-STD-1587D
  (Key Elements of CPC Planning)
- SAE-AS-12500
  (CPC for Electronic Components & Assemblies (MIL_HDBK-1250)}
CPC Planning During System Acquisition

How to Include CPC Requirements in System Acquisition

(Aerospace System example)

**Negotiate Hundreds of Individual Requirements**

- System Finish Specification
- Environmental Testing
- Material & Process Selection Criteria
- Corrosion Team

**HUNDREDS** of Individual M&P Specs for Primers/Coatings, Surface Treatments/Prep, Metals, Composites, Sealants, Dissimilar Couples, Adhesive Bonding, etc...

**CPC Risk Management**

- Legacy Lessons Learned
- Aircraft Structural Integrity
- CPC Verification / Validation Criteria
- Prohibited Materials

**Negotiate Several Consolidated Requirements**

- NACE/SSPC CPC Planning
- 1568 CPC for A/C Design
- 1530 Structural Integrity
- 7179 A/C Finishing Systems
- 1587 M&P for A/C Design

**VERSUS**

- Hundreds of Individual Requirements
- Several Consolidated Requirements

Environmental Testing
Corrosion is rarely only just a technical problem
- Design, Technology, Environment, Materials, Processes, Training, Policy, Funding, Schedule, Availability, Usage, Inspection, Storage, etc…
- Prevent; Detect; Mitigate & Manage

Corrosion may not hurt today, but it hurts tomorrow
- Pushing the problem/issues down the line for someone else…
- Easier to invest in corrective (is) than preventive maintenance (might be).
- Difficulty in quantifying the problem until after it happens.

Corrosion is often a “people” problem
- Hard to maintain leadership focus (Swamp full of Alligators…)

Successful corrosion control requires:
- Awareness and buy-in from leadership
- Teamwork between subject matter experts, designers, and maintainers – “Corrosion prevention and control is not the most important thing we do, but it is important for us to do it…”
- Tools, training, and time for the personnel implementing the processes
BLUF programs entering acquisition after 1 Oct 2016 will have the SAE as the MDA, unless otherwise designated by the SECDEF.

SEC. 825. DESIGNATION OF MILESTONE DECISION AUTHORITY.

(a) IN GENERAL.—Section 2430 of title 10, United States Code, is amended by adding at the end the following new subsection:

“(d)(1) The milestone decision authority for a major defense acquisition program reaching Milestone A after October 1, 2016, shall be the service acquisition executive of the military department that is managing the program, unless the Secretary of Defense designates, under paragraph (2), another official to serve as the milestone decision authority.

“(2) The Secretary of Defense may designate an alternate milestone decision authority for a program with respect to which—

“(A) the Secretary determines that the program is addressing a joint requirement;

“(B) the Secretary determines that the program is best managed by a Defense Agency;

“(C) the program has incurred a unit cost increase greater than the significant cost threshold or critical cost threshold under section 2433 of this title;

“(D) the program is critical to a major interagency requirement or technology development effort, or has significant international partner involvement; or

“(E) the Secretary determines that an alternate official serving as the milestone decision authority will best provide for the program to achieve desired cost, schedule, and performance outcomes.
PREFAE

CONTENTS

EXECUTIVE OVERVIEW

INTRODUCTION

1.0 PURPOSE

2.0 REQUIREMENT

3.0 BACKGROUND

4.0 OVERVIEW OF CORROSION PREVENTION AND CONTROL PLANNING
   4.1 General Program Management Requirements
   4.2 Technical and Design Considerations

5.0 DOCUMENT STRUCTURE
**Purpose** - assist DoD and contractor Program Offices (POs), PMs, and Integrated Product Teams (IPTs) in effectively managing corrosion during the entire acquisition process, including sustainment.

- It is one part of the body of knowledge provided in several policies and other guidance.

**Goal** - assist in reducing ownership costs, and increasing system availability and safety through improved CPC planning and execution.

**Contents** - baseline information and explanation for establishing a well-structured CPC program.

- The management concepts and ideas presented encourage use of time-tested practices and suggest a process to address a CPC program without prescribing specific methods or tools.
Keys to success:

- Good planning and effective execution
- Proper timing, especially focusing on the acquisition phase of the program
- Proper resources and focus, especially the necessary funding and expertise
- Contracting, especially influencing the Request for Proposal (RFP) and its contents
- Integration of CPC planning and execution into other mainstream acquisition processes, such as program management, systems engineering, life cycle logistics, T&E, contracting, and budgeting.
Maintain the Intent of Two CPC Planning Tenets

▪ What does a CPT do? (1 of 2)
  – Throughout system life cycle actively review all design considerations, material selections, costs and documentation affecting CPC
  – Develops and maintains the system CPC Plan
  – Advises the PM on corrosion-related issues, risks and opportunities
  – Confirms adequacy of corrosion maintenance documentation
  – Elevate issues to OSD OIPT as necessary
Maintain the Intent of Two CPC Planning Tenets

- What does a CPT do? (2 of 2)
  - Monitor all activity in design, engineering, testing, production, and sustainment
  - Interface with Contractor Corrosion Team (CCT) to ensure CPC goals are attained
  - Evaluate adequacy of contractor CPC efforts
  - Attend CCT meetings as appropriate
  - Review and resolve discrepancies
  - Schedule reviews as frequently as deemed necessary
Maintain the Intent of Two CPC Planning Tenets

What’s a CCT - Contractor Corrosion Team?

– Primary function: Ensure adequate CPC requirements planned and implemented during all phases of system life cycle

– Put in place once the contract is awarded

– Influence appropriate design reviews, clarifications, resolutions on differences in technical positions, and final approval of documentation

– Sign off on production drawings after review of design geometries, material selection, treatments and finishes

– Develop contract requirements for material procurement or subcontractor design and manufacturing
Maintain the Intent of Two CPC Planning Tenets

▪ **CCT Membership** (meant to be flexible and adaptive to the needs of the program)
  
  – Reps from system design IPTs
  – Materials and processes (M&P) engineering
  – Operations and Mfg
  – QC/QA
  – Material or subcontractor procurement
  – Logistics specialties
  – Contracts
Maintain the Intent of Two CPC Planning Tenets

- Integrate CPC into Sys Eng Processes (Engineering, Supportability, T&E) tied to technical Inputs/Outputs by phase
  - Pay attention to influencing the INPUTS and the OUTPUTS to affect a good CPC program
Maintain the Intent of Two CPC Planning Tenets

- **The CPC Plan** - provide the following information, as a minimum:
  - **Organization, procedures, & responsibilities** for a CPT and/or Contractor Corrosion Team
  - **Roles & responsibilities** of QA, process control, production operations, mfg planning, environmental compliance, personnel safety, and other contractor organizations
  - **CPC techniques employed** in design and how the design will meet the projected environmental spectrum
  - **Specifications** (process/finish specifications in system/equipment) that outline the application of coatings and other corrosion prevention compounds (if any) and that address personnel training and qualification, material inspection, surface preparation, and coating or compound application procedures
  - **Test planning & execution** to assure proper and effective testing is accomplished at all levels of design, manufacture, and verification;
  - Any **test data** developed, or to be developed, for coatings or other corrosion-related materials and processes;
  - Recommended specific corrosion control **maintenance**