U.S. Marine Corps
Corrosion Prevention and Control (CPAC)
Cost Based Analysis for Program Management

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CPAC PM
MISSION. To establish an effective CPAC program to extend the useful life of all Marine Corps tactical ground and ground support equipment.

OBJECTIVE. Mitigate the impact of corrosion on USMC assets through a comprehensive CPAC program:

- **Existing Assets**: Identify, Correct, and Maintain

- **New Procurements**: Implement corrosion control throughout the acquisition as part of Systems Engineering:
  - Corrosion Planning
  - Contract Wording
  - Design Analysis and Performance Testing

- **Research and Development / Engineering**: Providing improved products and processes to combat corrosion
The key to Operations and Sustainment of Existing Assets – Identify, Correct, Maintain

IDENTIFY - CPAC developed Corrosion Category Codes (CCC) and database to assess the condition of fleet and determine required levels of repair.

**Corrosion Category Codes:**

**Category 1:** Item requires no corrosion repair or preservatives, and has been assessed within the past 12 months.

**Category 2:** Item requires surface preparation, spot paint, and preservation at the operator and/or organizational level.

**Category 3:** Item requires maintenance performed beyond the operator level. The item must be inducted to the C3 program for repair. The goal is to return the item to category 1 condition.

**Category 4:** Item requires repair to sheet metal, major frame components, paint, blasting and undercoating (e.g., replacement or repair of components such as doors, fenders, and chassis frame rails, or battery boxes due to corrosion). The goal is to return the item to a category 1 condition.

**Category 5:** The item is degraded to a degree that requires depot level repair and replacement based on the deterioration caused by corrosion.

**Snapshot of USMC Fleet in 2004**

**2004 CORROSION CATEGORY TOTALS**

**Asset + CCC = Specific Cost**
Comparison of CPAC Operations and Sustainment (O&S)

Organizational

Corrosion Service Teams (CST)

- Preventative Maintenance and minor corrective actions IAW TM-4795-OR/1A
- CST’s are funded by PM-CPAC
- Centrally managed by CPAC Program Office with 7 CST teams and FSR/QAR oversight
- Focused on Corrosion Cat Code (1 & 2) and sustainment of CCC 3 & 4 (ROI 15:1)
- Preventative actions keep equipment from progressively getting worse
- CST’s perform annual assessments to determine Cat Codes and funding requirements

Intermediate

Corrosion Repair Facilities (CRF)

- Intermediate Maintenance primarily blast and repaint IAW TM-3080-50 and TM-4795-34/2
- CRF’s are funded by MARFOR’s Corrosion Prevention line (MCPC 600298)
- Four (4) separate CRF’s Independently managed and operated
- Focused on repair of Corrosion Cat Code (3 & 4)

Depot

Depot Rebuild

- Complete rebuild of vehicle including replacement of major sub-components (cab, cargo bed, etc.)
- Corrosion funding associated with depot maintenance not captured in budget; however, corrosion plays large role
- OSD report on Marine Corps Cost of Corrosion identified corrosion contributing up to 20% of Depot level maintenance

Approximate Cost to perform CPAC on HMMWV

$250 $3,800 (CCC-3)/$5,800 (CCC-4) $62,000
Existing Assets – Maintain (Sustainment)
Controlled Humidity Protection / VCI Covers / CST

- Once corrosion has been corrected, the objective is to maintain condition of equipment by the following methods:
  - Controlled Humidity Protection: On-the-lot temporary structures used for staging of equipment in CHP environment
  - Equipment Protective Covers with Vapor Corrosion Inhibitors (VCI)
  - Corrosion Service Teams (CST) services IAW established service intervals
  - Protect the most expensive to maintain first !!
New Acquisition Support – Program Managers

- Coordinate with Program Managers and Weapon Systems Analysts throughout program life-cycle to provide technical guidance on corrosion control early in the acquisition program

- Establish Government Corrosion Prevention Control Plan (CPCP)
- Contract Wording that requires Contractor Corrosion Planning
- Review of Contractors proposed Corrosion Control Methods
- Production line Audits
- Engineering Change Proposals/ Process Improvements

Laboratory Testing of representative parts / panels
Full Vehicle and Corrosion Durability Testing
Inspection of fielded vehicles resulting in process improvements

Type of Procurement, Inventory and Maintenance Cost help build CPCP Strategy
New Acquisition Support – Program Managers

- MRAPS
- LVSR
- MTVR
- HMMWV
- JLTV
- LAV
- AAV
- MPC
- M777
- HIMARS
- EFSS
- MAC50
- TRAM
- ITV
- G/ATOR
Research and Engineering – CERM

- Corrosion Engineering for Reduced Maintenance (CERM) – Finding solutions for highest cost drivers, problems coming from the Marines
- All products are subject to rigorous test plans that include laboratory and field testing before implementation
- USMC – CPAC Program Office has authority to create and modify Military Specifications
- CPAC Program Office manages all Marine Corps Corrosion Technical Manuals providing flexibility to implement changes rapidly
- OSD Corrosion Policy and Oversight (CPO) has provided matching funding for multiple projects due to high ROI and cross service solution

Use of Cost of Corrosion Data to determine what project to tackle – All Based on ROI
Process Improvements and Technology Upgrades

Automated Wash Racks

Portable Wash Racks

Blast Recovery System

Drying Oven and Paint Booth Upgrades

Paint Sprayer Improvements
CPAC – Metrics

Cost to Correct and metrics used to support operations
Summary

- DoD Cost of Corrosion is $22.4B annually. USMC only Service to reduce cost ($545M in FY05 to $460M in FY08)
- Marine Corps Order 4790.18 established CPAC program and will be updated to reflect consolidated CPAC Program
- CPAC Program has improved the readiness of USMC equipment and significantly reduced the cost of corrosion, a consolidated program increases these benefits
- CPAC Program consolidation ensures the implementation and execution of Standard Operating Procedures and Quality Assurance practices across enterprise
- USMC CPAC uses Cost Analysis to make programmatic decisions and is the model program in the DoD