

Beyond Paint and Preservatives

Engage with the CPAC Program to stop corrosion before it starts

by Mrs. Desarie Newman and Mrs. Lauren Paladino

The Hidden Enemy in Sustainment

Corrosion has long been recognized as one of the most persistent and costly challenges in military equipment sustainment. While it may be tempting to treat corrosion as a simple cosmetic issue—something that can be painted over, sealed, or covered—in reality, it is a readiness and lifecycle issue that directly affects operational capability.

The Marine Corps, like the rest of the Department of War, continues to rely on preservation techniques such as paint systems, sealants, and protective covers. These methods are effective only in the short term, lasting anywhere from six months to five years under operational conditions. Once they fail, units are left dealing with equipment downtime, increased sustainment requirements, and the need for expensive Engineering Change Proposals.

The challenge becomes even greater under the current environment of rapid acquisition. Compressing acquisition timelines to field equipment quickly often forces program managers to make tradeoffs. Corrosion prevention is one of the first casualties of this accelerated process. Yet ignoring corrosion in the design stage all but guarantees significant sustainment headaches later in the lifecycle.

The Corrosion Prevention and Control (CPAC) Program offers a solution. By engaging early and consistently throughout the acquisition process, CPAC helps program managers design out corrosion where possible and

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mitigate it where it cannot be avoided. This article outlines why early design engagement matters, how CPAC integrates across Marine Corps Systems Command programs, and how these efforts directly improve readiness and reduce sustainment costs.

Why Designing Out Corrosion Matters

Fixing corrosion after equipment has been fielded is like patching a sinking ship—it is a reactive measure that can never fully address the underlying issue. Programs that fail to account for corrosion during design inevitably suffer higher sustainment costs, greater downtime, and more operational risk.

This failure to address corrosion during design, which happens frequently in rapidly acquired systems, has led to newly fielded systems requiring maintenance as soon as they are fielded. Imagine a critical component, such as a vehicle brake system, seizing and no longer functioning as intended at the time of delivery. Or pressing a button and realizing that the electronics controlling a critical

system function are rendered useless by a corroded wiring harness. Even something as simple as a seized hinge keeping you from opening a stowage compartment where your tools are kept. These are all issues that have happened to newly fielded assets, leading to substantially more cost in the form of engineering design changes, increased maintenance requirements, and decreased asset availability.

Valuable insights from a range of fielded systems—from amphibious vehicles to transportation and logistics systems—have consistently demonstrated the benefits of implementing corrosion mitigation best practices early during acquisition. The lessons learned highlight the importance of ensuring material compatibility to maintain the reliability of mechanical components, protecting sensitive electronics, and ensuring the structural integrity of critical frames and hydraulic systems. Each of these experiences reinforces a central truth: It is far more effective—and far less expensive—to address corrosion in the design phase than to fix it after the fact.

The CPAC Engagement Initiative

Recognizing this challenge, the CPAC Program established an engagement model to support nearly every program within Marine Corps Systems Command. The CPAC Program Engagement is the proactive arm of CPAC's Research, Development, Test, and Evaluation effort to deliberately integrate corrosion prevention in the acquisition process. Since 2023, the program has supported over 36 program management offices' major ground combat systems like the ACV and the Joint Light Tactical Vehicle, to radar systems like Ground Air Target Oriented Radar, to unmanned systems such as the Amphibious Unmanned Ground Vehicle. The CPAC is integrated across the acquisition portfolio.

This engagement takes several forms:

- *Engineering Support and Design Reviews:* CPAC engineers participate in system design reviews, ensuring corrosion prevention requirements are considered early.
- *Material Solution Analysis:* Guidance on the best materials and coatings for specific operational environments.
- *Test and Evaluation Input:* CPAC provides test methodologies that replicate real-world corrosion stressors, helping identify vulnerabilities before fielding.
- *Requirements and Documentation Reviews:* CPAC ensures corrosion considerations are written into program requirements and acquisition documents (i.e., performance specifications, contract deliverable requirement list, and statement of work).

Perhaps the most important feature of the CPAC engagement initiative is that it is program-funded, meaning there is no additional cost to program managers. This lowers the barrier to engagement and allows PMs to access expertise without straining program budgets.

One of the most successful implementations of corrosion prevention and control planning was on the Medium Tactical Vehicle Replacement. The program during acquisition conducted testing and analysis to include the incorporation of the Accelerated Corrosion Durability Road Test, which simulates

20 years of wear on the system. The results of this testing informed materials selection decisions, including replacing and redesigning components that were shown to be early failures. Incorporation of materials selection best practices combined with quality and control throughout production leads to the procurement of a system that has been a part of Marine Corps operations for nearly 30 years. Despite its age, the Medium Tactical Vehicle Replacement is still successfully operating, and while headboard and crevice corrosion are commonplace, critical system components have withstood the operating environment.

Mitigation Strategies When Corrosion Cannot Be Designed Out

In some cases, corrosion cannot be eliminated entirely during design. For these situations, CPAC helps program managers plan mitigation strategies to reduce long-term impacts. This includes logistics and sustainment provisions such as protective covers, condition-based monitoring, and field-level preservation actions supported by corrosion service teams (CST). The CPAC also manages a database that tracks corrosion condition reports, providing valuable feedback to both program offices and the fleet.

To help support decision-making for alternatives in the Engineering Change Proposals process, the CPAC program is currently working on Accelerated Corrosion Testing for Informed Acquisitions. The program is designed for rapid testing of complete components or subsystems, mimicking the actual actuation of the part, and subjecting it to degradation mechanisms seen on fielded assets. For instance, a hydraulic cylinder would be able to be actuated while being subjected to environmental stressors, including the ingestion of dirt/debris, which is typically a failure mechanism for those components. This testing allows program offices to rapidly determine best performers from a series of potential replacements, informs component service-life projections, or can assist in the selection of best remediation or sustainment practices.

While mitigation strategies may require upfront investment in time and resources, the long-term payoff is significant. Programs benefit from extended service life, reduced downtime, and lower operations and maintenance (O&M) costs.

Corrosion as a Readiness and Life-cycle Issue

The numbers tell a sobering story. Corrosion costs the Department of War tens of billions of dollars each year in lost readiness and increased operations and maintenance requirements. For the Marine Corps, corrosion can mean the difference between having a vehicle ready for deployment or being sidelined in maintenance. Corrosion degrades performance, reduces safety margins, and increases the burden on maintainers. It is not simply an engineering issue—it is a readiness issue.

Program managers face tough choices when balancing the need to field systems quickly with the imperative to sustain them effectively. The CPAC engagement provides a framework to support those decisions, ensuring corrosion is accounted for without derailing acquisition schedules.

The Way Forward

The Marine Corps cannot afford to ignore corrosion in its acquisition processes. Even under the pressures of rapid acquisition, corrosion planning is essential to ensure long-term readiness and affordability. The CPAC engagement initiative provides program managers with the tools, expertise, and partnership needed to design out corrosion where possible and mitigate it where necessary. These efforts pay dividends in reduced sustainment costs, extended equipment life, and improved operational availability. In short, integrating corrosion prevention into acquisition today ensures combat effectiveness tomorrow. The hidden enemy of corrosion can be defeated only if we confront it head-on, early, and with the right tools in hand.

