

Corrosion Prevention and Control: Status and Update

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Editor's note: *The following is excerpted and adapted from an address given by Wynne on Nov. 20, 2003, to the Tri-Service Corrosion Conference, Las Vegas, Nev.*

We have made a lot of progress in corrosion control in modern vehicles, which can now last about as long in my original home, humid Florida, as here in the dry desert. Technology infusion into design and manufacturing has made a difference in the products we buy and in controlling corrosion in military equipment and facilities. Although we have put a lot of emphasis on this subject in the past, what we want to do during the next year is continue this effort, embedding and incentivizing corrosion control in all our activities. For instance, I commend the Defense Department's Joint Council on Aging Aircraft for recently identifying corrosion as one of its top 12 concerns.

Back in February, I had the honor of addressing the U.S. Army Corrosion Summit, discussing some plans and actions that we planned to take to improve our understanding and management of corrosion. That was a timely meeting, for shortly afterward, we began a successful military operation in an extraordinarily difficult environment with admirable readiness rates and commendable performance from equipment and personnel, including the maintenance, motor pool, and flight-line personnel. I salute them all and the training that helped make high readiness possible. Our personnel are out there performing their part of the fundamental mission of the De-



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partment of Defense (DoD), which is national security. Our job is to provide them durable, reliable equipment.

DoD Report to Congress on Corrosion

In February [2003], I emphasized that we in the DoD would be addressing the issue of corrosion in a more intensive and corporate manner and would be providing Congress with a report on our progress in December 2003 as requested. Congress asked us to identify a Pentagon executive to be the corrosion official, and I took on that job. I have been ably assisted by Daniel Dunmire and by Air Force Col. Larry Lee, who constitute our entire office of corrosion policy and oversight. Dr. Lewis Slotter of Defense Research and Engineering has been our technical conscience. They have been working with all the key players in the military services, DoD agencies, and with other stakeholders to pull together a corrosion plan and help to demonstrate to Congress that we are dealing with the problem of corrosion responsibly and efficiently and with an acceleration component.

Congress also asked the General Accounting Office (GAO) to independently assess the Department's corrosion situation and the approaches that were being taken to minimize the impact of corrosion. The GAO report was published in early July [2003]. I commend the GAO team for diligently and professionally looking into this intricate problem and for providing an independent assessment of the magnitude of the corrosion problem. Although we could not agree with all the findings and assertions in the work, we did concur with its recom-

recommendations, which were parallel to the congressional direction and coincident with my own opinion that there are many things that we in the DoD can and should do better in dealing with this problem.

Five Key Areas Identified

Let's quickly review what we talked about then, the progress made, and conclusions that can be drawn. The five key areas were:

- How big is the problem of corrosion in terms of money and impact on readiness and other measurable attributes?
- How could we save by the elimination of unnecessary corrosion control through accelerated modernization and the elimination of unnecessary infrastructure?
- Provide a review of current efforts and the establishment of a consolidated corrosion control strategy and plan.
- Develop better information sharing and outreach efforts and ensure that all our performers became better educated about corrosion and its control.
- Respond to me with what specific policy actions should we take to help you in the Services and the commercial sector help yourselves to help the warfighter.

Impact and Cost of Corrosion

First, consider the impact of corrosion in terms of cost, readiness, and safety. These issues are inseparable. We fund preventative and remedial maintenance to make sure that our equipment is safely available to support our mission. Studies indicate that the direct cost of maintenance for aging systems, such as the Navy P-3 aircraft, is increasing. Determining, managing, and ultimately reducing the cost of corrosion while maintaining or improving safety and readiness are the central components of the Department's prevention and mitigation strategy. To quantify improvement—an indispensable metric—an accepted baseline must be established. In addition, reliable corrosion cost and impact estimates are necessary to identify areas requiring aggressive action and to justify the expenditure of scarce resources.

Our corrosion team completed an excellent study based on existing data and engineering judgment. Their estimate for corrosion cost fell within the \$10 billion to \$20 billion range generally cited and provides support for previous estimates. Their effort is the first step of an in-depth process that we have begun to identify and assess cost of corrosion to the Department. If you consider that this year's budget is a little over \$400 billion, then corrosion costs are close to 5 percent of this value. I firmly believe that we pay the most attention to the things that are measurable and measured. We need to determine what the preventable costs of corrosion are and then prevent them or mitigate them, depending on the better approach.

Second, the next base realignment and closure (BRAC) round is just beginning. It is the most aggressive we have ever considered. The secretary of defense wants to eliminate the estimated 25 percent overhang from our asset base that we have scattered around the world. All previous rounds of BRAC summed were less than this target. Today, not only do we have to keep up unneeded infrastructure, but also, more than ever before, we have to provide force protection to these facilities. The savings in operations and maintenance costs from reduced infrastructure are potentially enormous. The process is just under way and meeting its deadlines. We will know the real answer in FY05 when all the studies are completed and the recommendations are forwarded to the Commission. We will continue to follow the cost of corrosion control and savings as a part of this process.

Fleet Modernization

Modernization of our fleets is another opportunity for savings. By fleets, I mean all of our equipment, not just ships but aircraft, ground vehicles, and surface and subsurface ships. Research and development have provided new materials, coatings, inspection techniques, and other processes to reduce the impact of corrosion in modern systems. Although we cannot yet provide an estimate of aggregate savings potential, one study conducted for the Air Force on the C-5 Galaxy and C-130 transport aircraft is illustrative. Aircraft upgrades and substitutions included more corrosion-resistant aluminum alloys in the wings and other structures, better sealants on faying surfaces, wet installations of fasteners, and use of corrosion-resistant topcoats in critical interior areas. The impacts of these actions were followed for 10 years. (It takes time to assess such effects and get good, defensible data.) For the C-5 there was a reduction in repair costs of 56 percent and a reduction in total corrosion maintenance cost of 53 percent. For the C-130, the results were even more impressive: reduction in repair costs of 83 percent and a reduction in total corrosion maintenance cost of 82 percent. These results provide just one example of the advantage of incorporating newer technology in existing systems, and they support my belief that upfront investment in corrosion-resistant materials and corrosion-preventing manufacturing processes produces a much higher payoff than treatment, repair, or replacement of corroded materials. As I review all these good studies and the potential for overall cost saving, I struggle with how to capture the true costs and incentivize the commanders so that they will appreciate that they can benefit directly from the return-on-investment of corrosion control. Through our new business initiatives, this comptroller is willing to consider and make it possible for the Services to retain some of the savings of smart business practices. I want to incentivize the commanders by making them effectively the retail owners of their equipment. Of course, in keeping with our efforts to transform our military, we do not intend to purchase just newer versions of older

systems. We want to acquire new kinds of systems wherever possible—systems that incorporate the best approaches based on commercial and military practice. Starting the corrosion control process in the factory or in the rework facility is far better than trying to do it later in the field.

Communications and Outreach

As I have said many times, in complex problem areas like corrosion, there is no substitute for teamwork and for learning from the successes and failures of others. This brings us to our fourth key area: communications. There are several major parts to our communication and outreach activities:

- The establishment of a Web-based DoD Corrosion Exchange for information sharing and archiving
- The development of targeted corrosion courses and course content in our acquisition-workforce training to highlight to our program managers and maintainers the importance of corrosion control
- Outreach to private-sector corrosion stakeholders and the forging of partnerships with them.

The DoD Corrosion Exchange Web site is being developed to enhance communication within the entire DoD corrosion prevention and control community and to provide a two-way street for information exchange with commercial, academic, and other corrosion stakeholders and potential partners. **[Editor's note: The site is now operational at <www.dodcorrosionexchange.org> .]** It is our desire that this exchange be the first stop for those needing or desiring corrosion-related information on DoD assets. It will be open, available, and, I believe, useful to the entire community—program manager through system maintainer, major system integrator through individual product vendor. Among the things to be found on the Web site are the latest DoD policy documents on corrosion, such as a memo to the Service secretaries that I signed on Nov. 12, 2003 [page 73]. The site also contains the new corrosion prevention and control guidebook [see "New Publication Provides Corrosion Prevention and Control Guidance" on page 36] that can be used by program managers to help design corrosion-resistant systems before they are fielded. I encourage you to become a using member and to contribute to the collaboration. I want to note that there are other corrosion sites and information sources that



Smart corrosion control in sustainment provides efficiency in logistics.

we will be linking to in partnership with industry counterparts.

As part of our communication and outreach activities, we want to focus on corrosion-related training of our workforce. As we identify shortfalls in corrosion training and certification, we will develop a "Corrosion 101" course and identify qualified trainers. As a start, we plan to include corrosion-related training for non-corrosion engineers, contract specialists, and program managers in the fundamental training curricula provided through the Defense Acquisition University. We will also ensure that the users learn more about corrosion prevention and that our maintainers are exposed to more basic knowledge on corrosion and its effects.

Partnerships

I am a firm believer in the value of partnerships between government and private industry. That is why I am very pleased that NACE International—The Corrosion Society has become a full-fledged participant in our planning and deliberations. NACE has already agreed to take some actions

that should provide value and augment what we are doing on the government side. For instance, NACE is going to help us connect to other standards and educational associations and societies and even provide us access to all NACE standards and recent conference papers at no cost. In the training area, NACE will apply its great experience and successful history in corrosion continuing education by helping us develop appropriate career enhancement courses in corrosion. This is not an endorsement of NACE, of course, although I note that many DoD personnel are already members, but it is an idea for the future.

As you know, the DoD now relies on commercial and consensus standards for corrosion control processes and products. This makes it very important that our needs are covered by those standards. As a part of our Web-based communications and other partnering activities, we will endeavor to improve the understanding and access of corrosion product suppliers and qualifiers to DoD needs and markets and especially to minimize the burden of re-qualification of corrosion prevention products by providers.

Corrosion control is also an ideal area for small business to make a positive contribution. To give you some feel for our current outreach to small business, there are 22 cor-

rosion research topics in the small business innovation research program solicitation released in October 2003. This means that about one in every 20 topics addresses corrosion.

Policy Actions

Now let me discuss the fifth key area, involving some policy actions we have taken. I have directed that all programs that come before the Defense Acquisition Board (DAB) should be able to assure me that they have fully considered corrosion prevention and control planning and have addressed any conflicts or issues that arose in the pre-DAB reviews. This planning will provide an objective and disciplined way to assure ourselves that corrosion is getting the attention it deserves in acquisition programs. It will help us make conscious, objective trade-offs between up-front investments and life cycle costs. To help implement this policy, we are using a corrosion prevention and control planning guidebook, which will help program managers in corrosion planning.

Let me be very clear on an important point: the new policy is not mandating that programs submit formal corrosion prevention and control plans. Acquisition reform has for the most part, discouraged formal plans as well as prescriptive requirements. On the other hand, in preparation for their appearance before the DAB, programs will be encouraged to include corrosion in overall planning and to demonstrate that they have accounted for potential corrosion risks in the design, development, manufacture, deployment, and sustainment of their systems. We will also encourage program management to establish corrosion prevention and control teams to assist in the planning process and to help ensure that corrosion is given due consideration.

Objectives for Defense Acquisition and Logistics

Let me begin my wrap-up by putting corrosion in the larger context of defense acquisition and logistics. I would like to help the Department accomplish seven objectives:

- Acquisition excellence with integrity
- Logistics integrated and efficient
- Systems engineering philosophy restored
- Technology dominance
- Resources rationalized
- Industrial base strengthened
- Motivated, agile workforce.

I want to emphasize the motivated and agile workforce. It takes a trained and ready force to accomplish our missions. It takes a trained and ready force of maintainers, and it takes a trained and agile force of managers and executives, all of whom are really motivated, to make it work. I often said to my industrial brethren that it is not the value of the equipment that we provide but the training, the tac-

tics, and techniques of our brave men and women who turn valueless machines into effective military products. I feel the same way about corrosion prevention. It takes professionals to energize everyone to provide highly valued, reliable equipment to our warfighters. Corrosion assessment and life cycle cost analysis are critical to making intelligent acquisition. Doing assessments openly and honestly maintains integrity. Smart corrosion control in sustainment provides efficiency in logistics. The future logistics enterprise is going to rely on condition-based maintenance and prognostics to improve readiness and availability with corrosion prediction playing an important part. Finally, anything we do through small business, big business, or civic-minded organizations strengthens the industrial base and strengthens us all.

I think we have a pretty good idea of what to do in corrosion. We're asking you to ask yourselves how you can help us bound, then improve, this corrosion program. Knowing that everyone has objectives, I wrote some down for us to accomplish as a joint team. I know that there are already good objectives being worked by our teams, but let me add to the list.

- First, continue to bound the cost of corrosion. Our fleet—air, land, and sea—and our infrastructure are not getting any younger.
- Second, focus your effort by segmenting the problem. Air, land, sea, and infrastructure may not do it. Consider thinking about structure, mechanical interfaces, exterior surfaces, and electronics as they go across our fleet.
- Third, start a cross-Service pilot program that demonstrates real progress, and try to figure out the cost of corrosion and how you minimize the cost for at least that system and how you incentivize its owner.
- Fourth, develop a financial strategy that allows retention of savings (half or more) for more pilot programs and more investment.
- Fifth, continue to share best practices and lessons learned with the development and acquisition professionals.

As I mentioned, we have recently fought successfully for future peace and stability in two faraway lands. You have provided to the warfighter the best equipment that the world has ever seen—equipment with reliability even greater than was seen in Desert Storm only about a decade ago. As to the transformation impact, you have redesigned maintenance with a greater eye towards prevention and attention to mission cycle. One of my own goals is to reduce the need for spares and the need for field change-out. I will continue to ask manufacturers to produce things that don't break.

Editor's note: For more information, go to www.dodcorrosionexchange.org > .