



May 2013

# DEFENSE INFRASTRUCTURE

## DOD Should Improve Reporting and Communication on Its Corrosion Prevention and Control Activities

# GAO Highlights

Highlights of [GAO-13-270](#), a report to congressional requesters

## Why GAO Did This Study

According to DOD, corrosion can significantly affect the cost of facility maintenance and the expected service life of DOD facilities. While corrosion is not always highly visible, it can lead to structural failure, loss of capital investment, and environmental damage. In response to a congressional request, GAO reviewed DOD's corrosion prevention and control program for facilities and infrastructure. In this report, GAO assessed the extent that DOD (1) met reporting requirements, (2) maintained accurate return-on-investment data in its records, and (3) fully informed relevant officials of its corrosion-control efforts. GAO reviewed DOD policies and plans, met with corrosion-control officials, and visited and interviewed officials at 32 installations.

## What GAO Recommends

GAO recommends five actions to improve DOD's project reporting and tracking, the accuracy of its return-on-investment data, and its communication with stakeholders on corrosion-control activities for facilities and other infrastructure. DOD partially concurred with three recommendations and did not agree with two. DOD plans to implement a web-based tracking tool to improve data timeliness and standardization, among other actions. GAO continues to believe that its recommendations to improve project reporting are warranted, that the Corrosion Office should use its existing authorities to identify and implement other incentives for project managers to meet reporting milestones and that DOD should revise its guidance so that Corrosion Executives would assist with the oversight of project reporting.

View [GAO-13-270](#). For more information, contact James R. McTigue Jr. at (202) 512-7968 or [mctiguej@gao.gov](mailto:mctiguej@gao.gov).

May 2013

## DEFENSE INFRASTRUCTURE

### DOD Should Improve Reporting and Communication on Its Corrosion Prevention and Control Activities

## What GAO Found

The Department of Defense (DOD) has invested more than \$68 million in 80 projects in fiscal years 2005 through 2010 to demonstrate new technology addressing infrastructure-related corrosion, but project managers have not submitted all required reports on the results of these efforts to the Corrosion Policy and Oversight Office (Corrosion Office). The *DOD Corrosion Prevention and Mitigation Strategic Plan* requires project managers to submit a final report when a project is complete, and submit a follow-on report within two years after the military department implements the technology. As of November 2012, GAO found that project managers had not submitted final reports for 50 of the 80 projects (63 percent) funded in fiscal years 2005 through 2010. Also, project managers had not submitted follow-on reports for 15 of the 41 projects (37 percent) funded in fiscal years 2005 through 2007. GAO found that the Corrosion Office's tracking system lacks key information to help ensure that project managers meet reporting requirements. Furthermore, the Corrosion Office is not fully exercising its authority to identify and implement options or incentives to address funding and other reasons given for not meeting reporting milestones. Also, GAO found inconsistency among the military departments' Corrosion Control and Prevention Executives' (Corrosion Executives) in holding project managers accountable for submitting the required reports. Without effective actions to ensure timely submission of final and follow-on reports, decision makers may be unaware of potentially useful technologies to address corrosion.

The Corrosion Office maintains records on its infrastructure-related corrosion projects, including initial and reassessed return-on-investment estimates, for internal and external reporting, such as in DOD's annual budget report to Congress. GAO found that the Corrosion Office's records showed updates to the initial estimates for the proposed projects, but the office has not consistently updated its records to show the reassessed estimates included in the follow-on reports. Specifically, GAO found that the Corrosion Office did not update data in its records for 5 of 25 projects (20 percent) with completed follow-on reports. Federal internal control standards require agencies to use internal controls to provide assurance that they have reliable financial and other reports for internal and external use. Without accurate and timely data, Congress and DOD managers may not have reliable information on the estimated return on investment as they oversee corrosion projects.

DOD's Corrosion Executives use mechanisms, such as briefings and site visits, to collect and disseminate information on corrosion-control activities in their departments; however, GAO found that slightly more than half of public works officials interviewed at 32 installations were unaware of DOD's corrosion-related offices and resources. Under federal statute, Corrosion Executives are tasked with coordinating corrosion activities in their departments. GAO found that many relevant service officials interviewed did not receive key corrosion-control information because their Corrosion Executives do not have targeted communication strategies and accompanying action plans. Without a strategy and action plan, managers of facilities and infrastructure may not have access to all available information on efficient methods for corrosion prevention and control.

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## Abbreviation

DOD	Department of Defense
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May 31, 2013

The Honorable Robert Wittman  
Chairman  
The Honorable Madeleine Z. Bordallo  
Ranking Member  
Subcommittee on Readiness  
Committee on Armed Services  
House of Representatives

The Honorable J. Randy Forbes  
House of Representatives

In 2013 the Department of Defense (DOD) reported that the estimated cost of corrosion was about \$20.8 billion annually to prevent and mitigate corrosion of all of its assets, including military equipment, weapons, and facilities and other infrastructure.<sup>1</sup> While the vast majority of these costs are related to corrosion issues on military equipment and weapons, the cost of corrosion at DOD facilities and other infrastructure<sup>2</sup> was estimated to be about \$1.9 billion annually.<sup>3</sup> The vast size of DOD's real-estate portfolio of more than 555,000 facilities—including barracks, commissaries, data centers, office buildings, laboratories, maintenance depots, storage tanks, and piers—and linear structures, such as pipelines, roads, and runways, on more than 28-million acres provides additional challenges for DOD in preventing and repairing damage from corrosion of its infrastructure. Corrosion is defined in Section 2228 of Title 10 of the United States Code as the deterioration of a material or its properties due to a reaction of that material with its chemical

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<sup>1</sup>This cost estimate, which was produced by a DOD contractor and is based on data from fiscal years 2006 through 2010, is the latest estimate available on DOD corrosion costs.

<sup>2</sup>Infrastructure is defined in Section 2228 of Title 10 of the United States Code as all buildings, structures, airfields, port facilities, surface and subterranean utility systems, heating and cooling systems, fuel tanks, pavements, and bridges.

<sup>3</sup>The estimate of the annual cost of corrosion for DOD facilities and other infrastructure was produced by a DOD contractor and is based on data from fiscal years 2007 and 2008. This is the latest estimate available on DOD corrosion costs for facilities and other infrastructure.

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environment.<sup>4</sup> Corrosion is not always highly visible; nevertheless, it can lead to structural failure, loss of capital investment, and environmental damage.

Congress has taken a series of legislative actions aimed at enhancing DOD's ability to effectively address corrosion prevention and mitigation and provide the Congress with greater transparency over the department's efforts. In 2002, Congress passed legislation that led to the creation of the Office of Corrosion Policy and Oversight (hereafter referred to as the Corrosion Office) within the Office of the Under Secretary of Defense for Acquisition, Technology and Logistics. The Corrosion Office is responsible for the prevention and mitigation of corrosion of military equipment and infrastructure.<sup>5</sup> Among other things, Section 2228 of Title 10 of the United States Code requires the Secretary of Defense to develop and implement a long-term strategy to reduce corrosion and the effects of corrosion on the military equipment and infrastructure of the department, including, among other things, (1) expansion of emphasis on corrosion prevention and mitigation to include infrastructure; (2) uniform application of requirements and criteria for testing and certifying new technologies for equipment and infrastructure with similar characteristics, missions or operating environments; and (3) implementation of programs to ensure a focused and coordinated approach to collect, review, validate, and distribute information on proven corrosion prevention methods and products. Additionally, the statute requires the Secretary of Defense to annually submit, along with the defense budget materials, a report to Congress on corrosion funding, including funding requirements for the long-term

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<sup>4</sup>Corrosion takes varied forms such as rusting; pitting; galvanic reaction; calcium or other mineral buildup; degradation due to ultraviolet light exposure; and mold, mildew, or other organic decay.

<sup>5</sup>The *Bob Stump National Defense Authorization Act for Fiscal Year 2003* required the Secretary of Defense to designate an officer, employee, board, or committee as the individual or office with this responsibility. See Pub. L. No. 107-314, § 1067 (2002) (codified at 10 U.S.C. § 2228). The *National Defense Authorization Act for Fiscal Year 2008* amended this requirement by designating the Director of Corrosion Policy and Oversight as the official with these responsibilities. See Pub. L. No. 110-181, § 371 (2008) (amending 10 U.S.C. § 2228).

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strategy, and including the returns on investment<sup>6</sup> for corrosion-control technology demonstration projects.

In 2008, section 903 of the Duncan Hunter National Defense Authorization Act for Fiscal Year 2009 required the Departments of Army, Navy and Air Force to each designate a Corrosion Control and Prevention Executive (hereafter referred to as Corrosion Executive) to be the senior official in each military department with responsibility for coordinating department-level corrosion prevention and control program activities.<sup>7</sup> Section 903, among other things, assigned responsibility to the three Corrosion Executives for (1) coordinating department-level corrosion prevention and control activities (including budget programming) with the Office of the Secretary of Defense, the program executive officers of the military departments, and relevant major subordinate commands of each military department; (2) ensuring that corrosion prevention and control is maintained in each department's policy and guidance, including military infrastructure design, construction, and maintenance; (3) identifying the funding levels necessary for accomplishing certain corrosion-related priorities in each department, and (4) submitting an annual report to the Secretary of Defense with recommendations pertaining to the corrosion prevention and control program of each department. Section 903 also designated each military department's Corrosion Executive as that department's principal point of contact with the Director of the Corrosion Office.

To carry out its responsibilities, the Corrosion Office took a number of actions, including the development of an instruction to establish policy, assign responsibilities and provide guidance for corrosion prevention and control within DOD; and development of a strategic plan to describe policies, strategies, objectives and plans aimed toward an effective DOD-wide approach to prevent and mitigate corrosion of military equipment and infrastructure. Additionally, the Corrosion Office and military departments have identified and funded corrosion projects in which the military departments demonstrated new technology to address

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<sup>6</sup>While the statute does not define "return on investment" for its corrosion-control technology demonstration projects, DOD defines the estimated return on investment as the ratio of the present value of benefits to the present value of the project's total cost.

<sup>7</sup>The Duncan Hunter National Defense Authorization Act for Fiscal Year 2009, Pub. L. No. 110-417, § 903 (2008).

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corrosion, and the Corrosion Office has required military departments' project managers to submit periodic reports on the status and outcomes of these projects.

We have examined DOD's corrosion issues for a number of years and this is our first report focusing on DOD's corrosion-control activities for DOD facilities and other infrastructure, including projects to demonstrate new technology that can prevent or mitigate corrosion.<sup>8</sup> In response to your request, GAO reviewed DOD's corrosion prevention and mitigation program for facilities and other infrastructure. This report addresses (1) the extent to which the military services have met DOD requirements to submit reports on corrosion technology demonstration projects; (2) the extent to which the return-on-investment data submitted by the military departments is accurately reflected in records maintained by the Corrosion Office; and (3) the extent to which DOD's corrosion-control officials have fully informed relevant officials within each department about efforts to prevent and mitigate corrosion of facilities and other infrastructure. We also provide information on the results of the Corrosion Office-sponsored cost-of-corrosion studies of DOD facilities and other infrastructure (see app. I).<sup>9</sup>

To address our first objective, we obtained project information on 80 infrastructure-related corrosion projects proposed by the military departments and approved for funding by the Corrosion Office for fiscal years 2005 through 2010.<sup>10</sup> We reviewed project documentation—project plans, bimonthly or quarterly status reports, final project reports, and project follow-on reports—to determine if reports were submitted and the data met the Corrosion Office's reporting requirements. To assess the reliability of the data, we met with Corrosion Office officials to identify the

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<sup>8</sup>This review of corrosion issues related to DOD's facilities and other infrastructure is part of a larger body of work that we are doing on DOD's corrosion-control program. GAO also has an ongoing review to examine DOD's corrosion projects involving military equipment.

<sup>9</sup>DOD's Corrosion Office sponsors a series of studies to assess the cost of corrosion throughout the department, including how much is spent on DOD's corrosion activities for facilities and other infrastructure. These studies are conducted by LMI, a private, not-for-profit corporation, using a method approved by the Corrosion Office's Corrosion Prevention and Control Integrated Product Team. We did not, however, independently review the methodology used by LMI or identify any limitations of these studies.

<sup>10</sup>There are an additional 25 corrosion projects funded in fiscal years 2011 and 2012, which were not yet completed.



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process by which DOD generated and tracked project data, and we reviewed the documents for any missing data, outliers, or other errors. If the military departments did not provide the required information, we interviewed the Corrosion Executives and the military departments' research and development officials (project managers)—who were the principal authors and points of contact for the facilities and other infrastructure projects—to determine their rationale for not completing the required reports. According to the *DOD Corrosion Prevention and Mitigation Strategic Plan*, a final report must be submitted when each demonstration project is completed. According to Corrosion Office officials, each demonstration project typically is completed within two years after the receipt of funding. For the purposes of our work in reviewing projects funded in fiscal years 2005 through 2010, we considered a final report to be submitted if the Corrosion Office had a copy of the report in its records system. We did not consider the timeliness of the submitted reports. Additionally, the DOD strategic plan requires that follow-on reports be submitted for completed projects within two years after the projects have been completed and transitioned to use within the military departments. According to Corrosion Office officials, the transition period to implement the demonstrated technology in a military department can be up to one year. As a result, for follow-on reports, we could assess only the projects funded in fiscal years 2005 through 2007 (41 of the 80 projects). For completed projects, we documented the initial return-on-investment estimates shown in the project plans and the resulting change, if any, shown in the follow-on reports. We determined that the project reporting data was sufficiently reliable for the purposes of determining the extent to which the military departments met the Corrosion Office's reporting requirements, but we did not determine the timeliness of the reports or assess elements of reports.

The DOD strategic plan uses the phrase “return-on-investment validation” to describe how project managers recompute the return-on-investment estimate included in a project's follow-on report. This recomputation is based on revised cost data after the project has been completed and the new technology has been transitioned to the services' use and tracked for two years. We are using the terms “reassessment” or “reassessed” rather than “validation” or “validated” because they more closely describe the process that the project managers are to use to review and update, if necessary, the assumptions used to recompute the initial return-on-investment estimate. Additionally, Corrosion Office officials told us that they are planning to use the term “reassessment” in the revised DOD strategic plan. The reassessment is not an update based on actual results of the cost savings achieved by the project.

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To address our second objective, for all 105 infrastructure-related corrosion projects funded in fiscal years 2005 through 2012, we compared the return-on-investment estimates found in the project plans with the return-on-investment estimates maintained in the Corrosion Office's records to determine if any inconsistencies existed in the data. When we found inconsistencies between the return-on-investment estimates in the project plans and the Corrosion Office's records, we asked the Corrosion Office to explain the inconsistencies and provide additional information to help reconcile the differences in the estimates. Further, we compared the return-on-investment estimates maintained in the Corrosion Office's records for projects funded in fiscal years 2005 through 2007 with the return-on-investment estimates contained in the military departments' follow-on reports to check for any differences between the two sets of records.

To address our third objective, we reviewed related guidance, documents, policies, and procedures regarding the management of DOD's corrosion prevention and mitigation program. We interviewed officials at various levels within DOD—Corrosion Office officials, Corrosion Executives, the military services' installation management commands, and facility and infrastructure managers within the services' civil engineering and public works components—to discuss their corrosion prevention and control efforts, including challenges and successes in implementing new corrosion technologies. We selected a nonprobability sample of 32 installations; conducted site visits with 6 of these 32 military installations<sup>11</sup> and completed semistructured interviews via conference calls with the other 26 military installations to collect information and views from facility and infrastructure management officials about their corrosion management efforts. In selecting the 32 installations for our nonprobability sample,<sup>12</sup> we limited the installations for selection to those active-duty installations with at least 25 buildings owned by the federal government and ensured a range of locations were selected from each of the four military services and across the geographic regions of the United

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<sup>11</sup>Site visits to three of the installations were completed prior to the development of our semistructured interview questionnaire.

<sup>12</sup>Results from nonprobability samples cannot be used to make inferences about a population because in a nonprobability sample some elements of the population being studied have no chance or an unknown chance of being selected as part of the sample.

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States.<sup>13</sup> Our selection criteria also included the selection of installations with different environmental conditions,<sup>14</sup> some joint bases, and installations that participated in the Corrosion Office's corrosion technologies demonstration projects. The purpose of our semistructured interviews was to understand how the installation officials (1) use policies, plans, and procedures to identify and address corrosion; (2) address corrosion prevention and mitigation; (3) determine their maintenance and sustainment priorities; and (4) receive and disseminate information on relevant corrosion topics.<sup>15</sup> We determined that the data used to select the installations included in our review were sufficiently reliable for the purposes of selecting our nonprobability sample. We provide more details about installation selection methodology and data-collection efforts in our scope and methodology section in appendix II.

We conducted this performance audit from November 2011 to May 2013 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

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<sup>13</sup>We used the four geographic regions of the United States as defined by the U. S. Census Bureau.

<sup>14</sup>The Corrosion Office provided an environmental severity index level for each installation. The environmental severity index is derived from a database developed by the research firm Battelle with the corrosion rates of various metals exposed to different environmental conditions found at military bases throughout the world. The DOD Corrosion Office, for its fiscal year 2012 cost of corrosion study of DOD facilities and other infrastructure, utilized the corrosion rates for steel and developed an environmental severity index on a scale of 1 through 20 to show the impact of corrosion in different locations, with 1 being least severe and 20 being the most severe environmental conditions.

<sup>15</sup>The results of the semistructured interviews are not generalizable because we used a nonprobability sample to select participants for these interviews.

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## Background

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### DOD's Strategic Planning and Guidance for Corrosion Prevention and Control

DOD submitted the first version of its long-term corrosion strategy to Congress in December 2003. DOD developed this long-term strategy in response to direction in the Bob Stump National Defense Authorization Act for Fiscal Year 2003.<sup>16</sup> In November 2004, DOD revised its long-term corrosion strategy and issued its *DOD Corrosion Prevention and Mitigation Strategic Plan*. DOD strives to update its strategic plan periodically, most recently in February 2011, and officials stated the next update is planned for 2013. The purpose of DOD's strategic plan is to articulate policies, strategies, objectives and plans that will ensure an effective, standardized, affordable DOD-wide approach to prevent, detect and treat corrosion and its effects on military equipment and infrastructure.

In January 2008, the department first issued DOD Instruction 5000.67, *Prevention and Mitigation of Corrosion on DOD Military Equipment and Infrastructure*, which was canceled and reissued with the same title in February 2010.<sup>17</sup> The stated purpose of the instruction is to establish policy, assign responsibilities, and provide guidance for the establishment and management of programs to prevent or mitigate corrosion of DOD's military equipment and infrastructure. This instruction describes legislative requirements and assigns the Corrosion Executives responsibility for certain corrosion prevention and control activities in their respective military departments. It requires the Corrosion Executives to submit information on proposed corrosion projects to the Corrosion Office with coordination through the proper military department's chain of command, as well as to develop support, and provide the rationale for resources to initiate and sustain effective corrosion prevention and mitigation programs in each military department.

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### Corrosion Office Operations

According to statute and DOD guidance, the Director of the Corrosion Office is responsible for the prevention and mitigation of corrosion of DOD equipment and infrastructure. The Director's duties include developing

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<sup>16</sup>Pub. L. 107-314, § 1067.

<sup>17</sup>Department of Defense Instruction 5000.67, *Prevention and Mitigation of Corrosion on DOD Military Equipment and Infrastructure* (Feb. 1, 2010).

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and recommending policy guidance on corrosion control, reviewing the corrosion-control programs and funding levels proposed by the Secretary of each military department during DOD's internal annual budget review, and submitting recommendations to the Secretary of Defense regarding those programs and proposed funding levels. In addition, the Director of the Corrosion Office periodically holds meetings with the DOD Corrosion Board of Directors and serves as the lead on the Corrosion Prevention and Control Integrated Product Team.<sup>18</sup> The Corrosion Prevention and Control Integrated Product Team includes representatives from the military departments, the Joint Staff, and other stakeholders who help accomplish the various corrosion-control goals and objectives. This team also includes the seven Working Integrated Product Teams which implement corrosion prevention and control activities. These seven product teams are organized to address the following areas: corrosion policy, processes, procedures and oversight; metrics, impact, and sustainment; specifications, standards, and qualification process; training and certification; communications and outreach; science and technology; and facilities. Appendix A of the *DOD Corrosion Prevention and Mitigation Strategic Plan* contains action plans for each product team, including policies, objectives, strategies, planned actions and results to date.

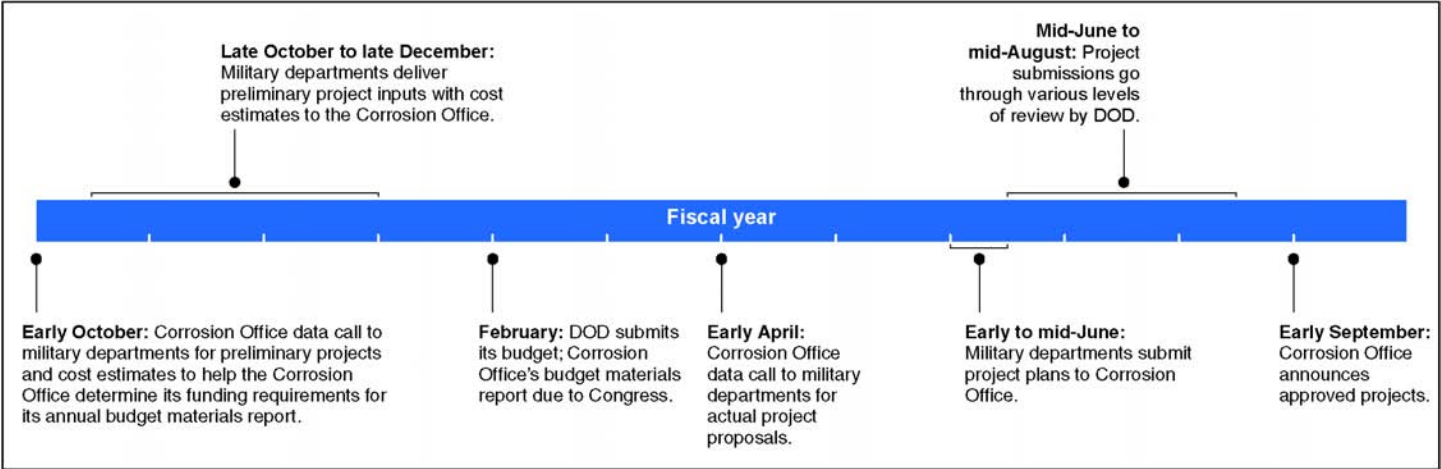
To accomplish its oversight and coordination responsibilities, the Corrosion Office has ongoing efforts to improve the awareness, prevention and mitigation of corrosion of military equipment and infrastructure, including (1) hosting triannual corrosion forums; (2) conducting cost-of-corrosion studies; (3) operating two corrosion websites; (4) publishing an electronic newsletter; (5) working with industry and academia to develop training courses and new corrosion technologies; and (6) providing funding for corrosion-control demonstration projects proposed and implemented by the military departments. According to the Corrosion Office, these corrosion activities enhance and institutionalize the corrosion prevention and mitigation program within DOD.

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<sup>18</sup>The Corrosion Executives for each of the military departments are members of the Corrosion Board of Directors, and they or their delegates are participants on DOD's Corrosion Prevention and Control Integrated Product Team. The Corrosion Board of Directors is not identified in the DOD strategic plan; however, Army and Navy corrosion documents acknowledge their Corrosion Executives' membership on the Corrosion Board.

To receive funding from the Corrosion Office, the military departments submit project plans for their proposed projects that are evaluated by a panel of experts assembled by the Director of the Corrosion Office. The Corrosion Office generally funds up to \$500,000 per project, and the military departments generally pledge matching funding for each project that they propose.<sup>19</sup> The level of funding by each military department and the estimated return on investment are two of the criteria used to evaluate the proposed projects. Appendix D of the *DOD Corrosion Prevention and Mitigation Strategic Plan* includes instructions for submitting project plans, along with instructions for submission of final and follow-on reports. For the project selection process, the military departments submit preliminary project proposals in the fall and final project proposals in the spring, and the Corrosion Office considers the final proposals for funding. Projects that meet the Corrosion Office's criteria for funding are announced at the end of the fiscal year. Figure 1 provides additional details of the project selection process for a given fiscal year.

**Figure 1: Timeline for Project Submissions**



Source: GAO analysis of DOD data.

As part of the project selection process, DOD's strategic plan states that the estimated return on investment, among other things, must be

<sup>19</sup>According to officials of the Corrosion Office and the Corrosion Executives, the military departments' matching funds may be more or less than 50 percent of total costs.

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documented for each proposed project. The total cost for each project is based on both the funding requested from the Corrosion Office and the funding provided by the military departments. DOD records reflect varying estimated returns on investment and savings for each proposed project submitted by the military departments. According to the Corrosion Office, a senior official within each military department reviews the proposed projects, including the estimated return on investment, before the project plans are submitted to the Corrosion Office. Section 2228 of Title 10 of the United States Code requires the Secretary of Defense to include the expected return on investment that would be achieved by implementing the department's long-term strategy for corrosion, including available validated data on return on investment for completed corrosion projects and activities, in his annual corrosion-control budget report to Congress.

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## Reporting Requirements

DOD's strategic plan stipulates three reporting requirements for approved projects. According to Corrosion Office officials, the project managers typically are responsible for completing the reporting requirements. The requirements are to: (1) provide bimonthly or quarterly project updates until the project is completed,<sup>20</sup> (2) submit a final report as soon as each project is completed,<sup>21</sup> and (3) submit a follow-on report within two years after a project is completed and the technology has transitioned to use within the military department.<sup>22</sup>

Figure 2 provides a breakout of the number of projects that have reached various reporting milestones as of November 2012. There were 105 infrastructure-related corrosion projects funded from fiscal years 2005 through 2012, in which

- 41 projects had reached the milestone for submitting final and follow-on reports, including return-on-investment reassessments;

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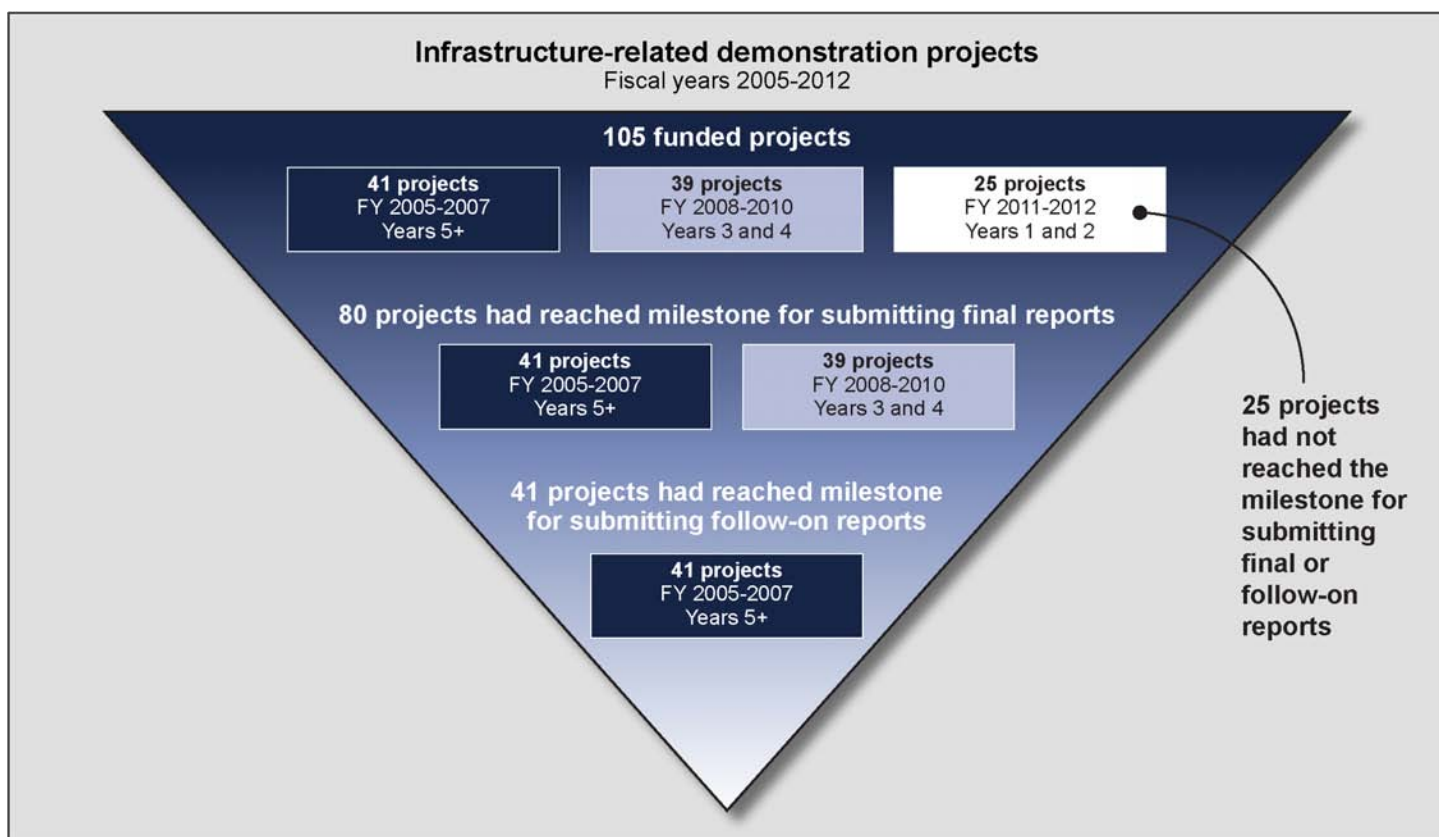
<sup>20</sup>From fiscal years 2005 through 2009, DOD's strategic plan required the military departments to provide bimonthly updates for all incomplete corrosion projects. Since fiscal year 2010, the Corrosion Office has required updates on a quarterly basis.

<sup>21</sup>Corrosion Office officials stated that these reports typically are due within two years after each demonstration project receives funding.

<sup>22</sup>According to Corrosion Office officials, the transition period to implement the demonstrated technology in a military department can be up to one year and that they expect the follow-on reports to be completed within five years of a project receiving initial funding.

- 39 projects had reached only the milestone for submitting final reports; and
- 25 projects were not yet complete, thus they have not reached the milestone for submitting final or follow-on reports.

**Figure 2: Breakout of the Number of Projects That Reached Various Reporting Milestones (as of November 2012)**



Source: GAO analysis of DOD data.



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## Prior GAO Work on DOD's Corrosion Prevention and Control Program

In September 2012, we reported that the Corrosion Office performs an analysis to determine the average return-on-investment estimates for projects that it cites in its annual corrosion-control budget report to Congress.<sup>23</sup> Additionally, we reported that the Corrosion Office did not use the most up-to-date data for the projects' returns on investment or provide support for the projects' average return on investment that was cited in its fiscal year 2013 corrosion-control budget report to Congress. We recommended that DOD provide an explanation of its return-on-investment methodology and analysis, including the initial and, to the extent available, the reassessed return-on-investment estimates. However, DOD did not agree with our recommendation. In its written comments, DOD generally restated the methodology in its strategic plan, which the military departments use to estimate the projected return on investment of each project. DOD did not provide any additional reasons why it did not use current return-on-investment estimates in its report to Congress. Additionally, in our December 2010 review, we recommended that DOD update applicable guidance, such as Instruction 5000.67, to further define the responsibilities of the Corrosion Executives to include more specific oversight and review of corrosion project plans before and during the selection process.<sup>24</sup> However, DOD did not agree with our recommendation and stated that DOD-level policy documents are high-level documents that delineate responsibilities to carry out the policy and that specific implementing guidance is provided through separate documentation. Further, in some of our earlier work, we reported that the secretaries of the military departments did not have procedures and milestones to hold major commands and program offices accountable for achieving strategic goals to address corrosion regarding facilities and weapons systems.<sup>25</sup> DOD agreed with our recommendations to define and incorporate measurable, outcome-oriented objectives and performance measures into its long-term corrosion mitigation strategy that show progress toward achieving results. Additionally, in May 2013 GAO

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<sup>23</sup>GAO, *Defense Management: The Department of Defense's Annual Corrosion Budget Report Does Not Include Some Required Information*, [GAO-12-823R](#) (Washington, D.C.: Sept. 10, 2012).

<sup>24</sup>GAO, *Defense Management: DOD Has a Rigorous Process to Select Corrosion Prevention Projects, but Would Benefit from Clearer Guidance and Validation of Returns on Investment*, [GAO-11-84](#) (Washington, D.C.: Dec. 8, 2010).

<sup>25</sup>GAO, *Defense Management: Opportunities to Reduce Corrosion Costs and Increase Readiness*, [GAO-03-753](#) (Washington, D.C.: July 7, 2003).

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issued a separate report assessing DOD's and the military departments' strategic plans.<sup>26</sup> All the related GAO products are listed at the end of this report.

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## DOD Has Not Ensured the Submission of All Reports on the Results of Its Infrastructure-Related Corrosion Projects

DOD has not ensured that all final and follow-on reports on the results of its infrastructure-related corrosion projects were submitted as required by its strategic plan. As of November 2012, our review found that project managers had not submitted the required final reports for 50 of the 80 projects (over 60 percent) funded from fiscal years 2005 through 2010. Also, for 41 of the 80 projects that were funded from 2005 through 2007, we found that the project managers had not submitted the required follow-on reports for more than a third of the projects (15 of the 41 projects). DOD's Corrosion Office, the military departments' Corrosion Executives, and the military departments' project managers cited various reasons for not meeting reporting milestones. DOD's Corrosion Office has not effectively used its existing authority to hold project management offices accountable for submitting required reports at prescribed milestones and the office lacks an effective method for tracking reports submitted by the project managers. Moreover, DOD has not provided clear guidance to the military departments' Corrosion Executives on their responsibilities and authorities for assisting the Corrosion Office in holding their project management offices accountable for submitting reports for their infrastructure-related corrosion projects.

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## Project Managers Have Not Submitted Many Final and Follow-On Reports

DOD has invested more than \$68 million in 80 infrastructure-related corrosion projects funded from fiscal years 2005 through 2010, but project managers have not submitted all of the required reports on whether the corrosion-control technologies are effective.<sup>27</sup> DOD's strategic plan<sup>28</sup> states that project plans should include a milestone schedule for reporting, including quarterly status reports, final reports and follow-on

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<sup>26</sup>GAO, *Defense Management: Additional Information Needed to Improve Military Departments' Corrosion Prevention Strategies*, [GAO-13-379](#) (Washington, D.C.: May 16, 2013).

<sup>27</sup>DOD also invested \$13 million in 25 additional corrosion projects funded in fiscal years 2011 and 2012. These DOD expenditures have not been adjusted for inflation. We did not review these 25 projects because their reporting milestones had not occurred.

<sup>28</sup>Department of Defense, *Department of Defense Corrosion Prevention and Mitigation Strategic Plan, Appendix D* (Washington, D.C.: 2011).

Over 60 Percent of Final Reports Have Not Been Submitted

reports. According to Corrosion Office officials, if a project is approved, a quarterly status report is required starting the first week of the fiscal quarter after the contract award and every three months thereafter until the final report is submitted.<sup>29</sup> Also, DOD's strategic plan requires a final report at project completion, and requires a follow-on report two years after project completion and transition to use within the military departments. According to Corrosion Office officials, these reports provide valuable information on the results of corrosion projects and in planning future projects.

Corrosion Office officials stated that project managers must submit final reports at project completion, which is typically within two years after the receipt of the funding of each project. As stipulated in DOD's strategic plan, final reports should include certain content, such as an executive summary, lessons learned, recommendations, and conclusions. However, we found that 50 of the 80 required final reports (63 percent) for projects funded in fiscal years 2005 through 2010 had not been submitted. Table 1 shows the status of final reports submitted by each service for infrastructure-related projects.

**Table 1: Status of Final Reports for the 80 Infrastructure-Related Corrosion Projects Funded in Fiscal Years 2005 through 2010**

Military department	Total number of projects	Number of submitted final reports	Number of outstanding final reports	Percent of outstanding final reports
Army	55	21	34	62
Navy	24	9	15	63
Air Force	1	0	1	100
<b>Total</b>	<b>80</b>	<b>30</b>	<b>50</b>	<b>63</b>

Source: GAO analysis of DOD data.

Note: Data as of November 2012.

<sup>29</sup>From fiscal years 2005 through 2009, DOD's strategic plan required the military departments to provide bimonthly updates for all incomplete corrosion projects. Since fiscal year 2010, the Corrosion Office has required updates on a quarterly basis. Our limited review of the projects that required the bimonthly/quarterly updates found that the updates were submitted as required.

More than a Third of Follow-On Reports Have Not Been Submitted

DOD’s strategic plan also requires that follow-on reports be submitted within two years after a project is completed and transitioned to use in the military department. According to Corrosion Office officials, this transition period includes up to one year to implement the technology in a military department. Corrosion Office officials also told us that they expected the follow-on reports to be submitted within five years of a project’s initial funding. Therefore, follow-on reports for 41 completed projects funded in fiscal years 2005 through 2007 were due on or before the end of fiscal year 2012. We found that project managers had not submitted 15 of the 41 required follow-on reports (37 percent). DOD’s strategic plan states that the follow-on reports should include an assessment of the following areas: project documentation, project assumptions, responses to mission requirements, performance expectations, and a comparison between the initial return-on-investment estimate included in the project plan with the new estimate. Table 2 shows the status of follow-on reports submitted by each service. In Appendix III of this report, we provide details of the returns on investment for all follow-on reports that were submitted.<sup>30</sup>

Table 2: Status of Follow-On Reports for the 41 Infrastructure-Related Corrosion Projects Funded in Fiscal Years 2005 through 2007

Military department	Total number of projects	Number of submitted follow-on reports	Number of outstanding follow-on reports	Percent of outstanding follow-on reports
Army	28	15	13	46
Navy	12	11	1	8
Air Force	1	0	1	100
Total	41	26	15	37

Source: GAO analysis of DOD data.  
Note: The total of 26 submitted follow-on reports includes one Army project that did not warrant the completion of a follow-on report, according to its final report. Data as of November 2012.

According to officials in the Corrosion Office, final and follow-on reports are used to assess the effectiveness of the corrosion projects and determine if continued implementation of the technology is useful. As Corrosion Office officials review project managers’ final reports, they stated that they focus on any lessons learned, technical findings,

<sup>30</sup>For its corrosion-control technology demonstration projects, DOD defines the estimated return on investment as the ratio of the present value of benefits to the present value of the project’s total cost.

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conclusions and recommendations, and whether the results from the report should trigger follow-on investigations of specific technology and a review for broader applications of the technology. Officials stated that they review follow-on reports to assure that necessary implementation actions have been taken and to review changes in the return-on-investment estimates.

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### Corrosion Office and Military Departments Cited Various Reasons for Project Managers Not Submitting Reports

The military departments and Corrosion Office provided various reasons to explain why project managers did not complete and submit mandatory final and follow-on reports within expected timeframes. For example, officials at the Army Engineering Research Development Center, Construction Engineering Research Laboratory—who are the project managers for Army infrastructure projects—stated that funding challenges, problems with contractor performance, and personnel issues contributed to delays in completing the final reports, but acknowledged that it was their responsibility to reduce their longstanding backlog. Additionally, according to the Navy’s Corrosion Executive, officials of the Naval Facilities Engineering Command (Engineering Support Center)—who are the project managers for Navy infrastructure projects—did not have sufficient funding to complete and submit all required reports. Finally, according to a Corrosion Office official, the final report for the one Air Force fiscal year 2005 project was not submitted because the project manager did not complete it before retiring.

Additionally, Corrosion Office officials cited other reasons that a project manager may be late in completing the required reports, such as lengthy coordination processes and the lack of priority that military departments’ officials place on completing required reports. The officials stated that they expect the military departments’ project managers to complete final reports within two years after receipt of funds, and it is the military departments’ responsibility to plan so that funding is available to complete all required reports. To assist the military departments with their responsibility, the Corrosion Office in fiscal year 2011 offered personnel and funding resources to the military departments to conduct the return-on-investment reassessments needed to complete follow-on reports. According to the Corrosion Office, only the Navy accepted the funds to complete all but one return-on-investment reassessment. According to an official in the Army Corrosion Executive’s office, he informed the project managers about the additional funding, but no one accepted the offer. We found at least four fiscal year 2006 projects where Army project managers did not use the available funding to complete and submit the required reports. Officials from the Army’s project management office told us that

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the project managers did not accept the additional funding to complete the 2006 projects because they had some work performance issues with the contractor assigned to complete the return-on-investment reassessments. In April 2012, these officials told us that follow-on reports for three projects were written but have not been submitted to the Corrosion Office, and the remaining follow-on report was still under development. As of November 2012, we found that these reports, which were due by the end of fiscal year 2011, still had not been submitted to the Corrosion Office. Further, the Air Force did not complete the follow-on report for its one corrosion project funded in fiscal year 2005. According to Corrosion Office officials, they did not require the Air Force to complete the follow-on report for this project because the demonstration was successful and the technology was implemented elsewhere within DOD.

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### Corrosion Office's Tracking System Does Not Ensure That Project Managers Submit Required Reports

Corrosion Office officials told us that they track each corrosion project's progress and review submitted final and follow-on reports for findings and broad application of corrosion-prevention techniques and approaches, including changes in the project's initial and reassessed return-on-investment estimates. However, the Corrosion Office's tracking system is limited and does not record the reason for late reporting or set new reporting deadlines. According to Section 2228 of Title 10 of the United States Code, the Secretary of Defense is required to report specific information including the expected return on investment that would be achieved by implementing the department's long-term strategy for corrosion, including available validated data on return on investment for completed corrosion projects and activities, in his annual corrosion-control budget report to Congress. The *Standards for Internal Control in the Federal Government* require federal managers to establish internal control activities, such as controls over information processing, segregation of duties, and accurate and timely recording of transactions and events—including pertinent information to determine whether they are meeting their goals—to help ensure that management's directives are carried out and managers achieve desired results through effective stewardship of public resources.<sup>31</sup>

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<sup>31</sup>GAO, *Standards for Internal Control in the Federal Government*, [GAO/AIMD-00-21.3.1](#) (Washington, D.C.: Nov. 1, 1999).

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Specifically, the Corrosion Office employs a contractor to maintain electronic records about all corrosion projects. Corrosion Office officials stated that project managers submit copies of their reports to the Corrosion Office and to the respective Corrosion Executive. On a monthly basis, the contractor checks each project's records to determine if the project managers have submitted the required reports. If a project manager has not submitted a required report, the contractor notifies the Corrosion Office and that office contacts the relevant project manager and that manager's Corrosion Executive. At that point, a Corrosion Office official encourages project managers to submit the report as soon as possible, but the Corrosion Office does not record a reason for late reporting and does not set a new reporting deadline. Also, the Corrosion Office officials stated that they elevate discussions about late filers in the three forums held each year that include meetings between Corrosion Office officials and Corrosion Executives. However, the Corrosion Office's tracking system does not require that the project managers include certain information, such as stating reasons for missing a reporting deadline and identifying a revised deadline for submitting their reports. Additionally, the format developed by the Corrosion Office for completing the follow-on reports does not include a data field that would document when the project managers submitted their follow-on reports to the office. By not adopting an enhanced tracking system that includes revised deadlines, among other things, the Corrosion Office is unable to effectively monitor whether project managers are working toward new timeframes to complete overdue reports. Without effective tracking, the Corrosion Office will allow a number of project managers to continue the practice of not submitting the required reports and project managers will not fully inform decision makers of the latest outcomes of the corrosion-control projects.

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**Corrosion Office Uses Routine Communication Methods to Encourage Project Management Offices to Submit Required Reports, but Has Not Employed Other Options**

Section 2228 of Title 10 of the United States Code requires the Secretary of Defense to develop and implement a long-term corrosion strategy that should include, among other things, implementation of programs to ensure a focused and coordinated approach to collect, review, validate, and distribute information on proven corrosion prevention methods and products. In response to this requirement, the Corrosion Office oversees corrosion projects and uses routine communication methods and follow-up to encourage the project management offices to submit the required reports, but the office is not employing other options that would hold project management offices accountable for reporting milestones. For example, Corrosion Office officials stated that they have initiated telephone conversations and e-mails to project managers to reemphasize

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reporting requirements and have had limited success in obtaining some of the outstanding reports. However, there are other options beyond routine communications that the Corrosion Office could take to make project managers accountable for submitting timely reports, such as using funding incentives or changing evaluation criteria for project selection. Corrosion Office officials told us that they considered holding back funding for future projects from project management organizations that missed reporting deadlines, but they chose not to implement this action because it could delay progress in addressing corrosion control within the department. Although the Corrosion Office in 2011 offered the military departments additional funding to complete and submit follow-on reports, Corrosion Office officials stated that they would not set aside a portion of its annual funds in the future to assist project management offices in the completion of outstanding reports due to uncertainty in annual funding.

Further, a senior Corrosion Office official stated that the office has considered but not adopted criteria for new projects that would include a project management office's past reporting performance as an indicator for assessing corrosion project plans. DOD's strategic plan refers to factors that are used by the evaluation panel to assess project plans and determine which to approve and fund. The evaluation factors, among other things, include whether the proposed project can be completed within a two-year timeframe, the risk associated with the project, and the estimated return on investment. The senior Corrosion Office official told us that the office has considered including a factor that would assess a project management office's history of reporting performance as a criterion for deciding whether to approve and fund the office's future projects; however, the office decided not to do so. The official stated that a successful project is one that reduces the impact of corrosion on weapon systems and/or infrastructure, and a project's report in and of itself does not contribute to the success of the project. However, late submissions of reports could delay communication of project outcomes as planners are considering funding new projects, as well as limit key information that should be included in the annual corrosion-control budget report to Congress. The Corrosion Office has not implemented other options to better ensure that project managers consistently submit required reports. Internal control standards emphasize the importance of performance-based management to ensure program effectiveness, efficiency, and good stewardship of government resources. Without using its existing authorities for oversight and coordination to identify and implement possible options or incentives for addressing the various funding, personnel, or other reasons cited by project management offices for not meeting reporting milestones, the Corrosion Office may be missing



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opportunities to effectively reduce the number of outstanding reports, enforce requirements, and ensure that the valuable information in past projects is known and appropriately documented.

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### Corrosion Executives Have Not Taken Consistent Actions to Ensure Timely Submission of Required Reports

The three military departments' Corrosion Executives work with project managers for the infrastructure-related corrosion projects to ensure that the reporting requirements are being met; however, they have not taken effective actions to ensure that all project managers submit their required reports on a timely basis. DOD Instruction 5000.67 describes responsibilities for Corrosion Executives, such as being the principal points of contact for each military department to the Director of the Corrosion Office, developing, supporting, and providing the rationale for resources for initiating and sustaining effective corrosion prevention and control in the department, evaluating the effectiveness of each department's program, and establishing a process to collect information on the results of corrosion prevention and control activities.

While DOD's strategic plan and other guidance—such as its corrosion instruction—identify the Corrosion Executives' overall role in the management of each military department's corrosion prevention and control program, the Corrosion Executives do not have clearly defined roles for holding their project managers accountable for submitting required reports. During our discussions with the military departments' Corrosion Executives, we found that each executive varied in describing the extent of his work with corrosion project managers to ensure that the required reports are completed. For example, officials within the office of the Army's Corrosion Executive told us that they are involved in all aspects of the corrosion demonstration project and receive updates and reports from the Army's project managers. Also, these officials stated that they are in the process of developing additional policy on facilities and other infrastructure to improve the corrosion project process and provide an Army funding mechanism to cover costs of reporting after expiration of initial project funding. However, for the infrastructure-related corrosion projects, the other two military departments have not been as involved as the Army in ensuring that project managers submit required reports. For example, the Air Force's Corrosion Executive stated that he coordinates with the Corrosion Office to track outstanding reports and can task the project managers to complete the required reports by going through the appropriate chain of command. Also, the Navy's Corrosion Executive told us that he maintains a level of awareness on the status of projects' reports, but does not play an active role in the submission of project

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reports because project managers have the responsibility to submit reports to the Corrosion Office.

DOD's strategic plan and instruction assign specific responsibilities to the Corrosion Executives; however, these documents do not clearly define a role for the Corrosion Executives in ensuring that all project managers submit mandatory reports. Without clearly defined responsibilities for the Corrosion Executives to help ensure required reporting, the Corrosion Executives may not take a leading role in holding project managers accountable for completing and submitting mandatory reports. If a number of project managers continue to be late in completing mandatory reports, decision makers are unlikely to be fully informed about whether implemented projects used effective technology to address corrosion issues and whether this technology could have broader uses throughout the military departments' installations.

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## Corrosion Office Has Not Updated All Records to Accurately Reflect the Return-On-Investment Estimates in the Military Departments' Follow-On Reports

The Corrosion Office maintains data for its infrastructure-related corrosion projects, but the office has not updated all of its records to accurately reflect the return-on-investment estimates that are provided in the military departments' follow-on reports. The data maintained by the Corrosion Office includes the financial investments provided by the Corrosion Office and the military departments, the estimated savings expected, and the calculated return-on-investment estimates for all of the military departments' funded and unfunded corrosion projects. Additionally, for each project, the Corrosion Office maintains data on whether the project managers have completed and submitted the required follow-on report and the value of the reassessed return-on-investment estimate in that follow-on report. The follow-on report shows, among other things, a comparison of the new estimate and the initial return-on-investment estimate included in the project plan. According to Corrosion Office officials, the data contained in its records system are used for reporting purposes, both internally and externally, such as the stated estimated returns on investment that are summarized in DOD's annual corrosion budget report to Congress. According to *Standards for Internal Control in the Federal Government*,<sup>32</sup> agencies should use internal controls that provide a reasonable assurance that the agencies have effective and efficient operations, and have reliable financial reports and other reports

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<sup>32</sup>[GAO/AIMD-00-21.3.1](#).

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for internal and external use. Further, this guidance requires, in part, controls over information processing, and accurate and timely recording of transactions and events, to help ensure that management's directives are carried out and managers achieve desired results through effective stewardship of public resources.

During our review, we found differences between the initial return-on-investment estimates included in project plans and the initial estimates in the Corrosion Office's records for 44 of the 105 projects (42 percent). The Corrosion Office provided reasons for correcting data. Specifically, according to the Corrosion Office officials, there were two main reasons for these differences: (1) funding-level changes between the estimate included in initial project plan and funding provided when the project was approved; and (2) incorrect computations of the estimated returns on investment by the project managers that required the Corrosion Office to recalculate the estimate to ensure consistency and accuracy. However, when comparing the reassessed return-on-investment estimates included in the projects' follow-on reports with the reassessed estimates in the Corrosion Office's records, we found that the Corrosion Office had not updated all of its records with the return-on-investment estimates from the follow-on reports. Specifically, we found that for 5 of 25 projects (20 percent) funded in fiscal years 2005 through 2007, the Corrosion Office had not updated its records to reflect the reassessed return-on-investment estimates included in the projects' follow-on reports. The return-on-investment estimates for these 5 projects were from outdated sources, such as project plans and final reports.<sup>33</sup> Specifically, the return-on-investment estimates for 3 Army projects were taken from final reports that had been submitted to the Corrosion Office in June 2007. Also, the return-on-investment estimates for one Army and one Navy project were from the project plans that had been submitted to the Corrosion Office in June 2004 and October 2004, respectively. Table 3 identifies the 5 projects funded in 2005 that had discrepancies in data.

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<sup>33</sup>According to the final report for one Army project, a follow-on report was not warranted due to the nature of the project.

**Table 3: Infrastructure-Related Corrosion Projects That Had Discrepancies between the Reassessed Return-on-Investment Estimates in the Follow-on Reports and the Estimates Contained in Corrosion Office Records**

<b>Funded projects</b>	<b>Project number</b>	<b>Reassessed return-on-investment estimates in follow-on reports from the military departments</b>	<b>Return-on-investment estimates contained in the Corrosion Office's records</b>
<b>Army</b>			
Leak Detection for Pipes and Tanks	AR-F-313	7.3	10.42
Surface Tolerant Coatings for Aircraft Hangars, Flight Control Towers, etc.	AR-F-320	6.96	11.8
Remote Monitoring of Cathodic Protection Systems	AR-F-321	13.5	14.41
Cathodic Protection of Hot Water Storage Tanks Using Ceramics	AR-F-322	8.56	10.11
<b>Navy</b>			
Internal Pipeline Corrosion Inspection Red Hill Tunnel Fuel Lines	N-F-222	10.78	6.86

Source: GAO analysis of DOD data.

Note: Data for projects funded in fiscal year 2005, as of November 2012.

While the Corrosion Office has created records to track the estimated returns on investment of infrastructure-related corrosion projects, we found that the office has not adopted a best practice to maintain reliable data with accurate and timely information throughout its records. The Corrosion Office may use this return-on-investment data in its reporting, both internally and externally, such as in DOD's annual corrosion budget report to Congress. Additionally, in September 2012, we reported that the Corrosion Office did not use current data for the projects' returns on investment or provide support for the projects' average return on investment.<sup>34</sup> Without accurate and timely return-on-investment estimates maintained in the Corrosion Office's records for corrosion projects, Congress and DOD corrosion-control managers may not have sufficient and reliable information about returns on investment for their oversight of completed projects.

<sup>34</sup> [GAO-12-823R](#).

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## Corrosion Executives Have Mechanisms to Disseminate Information, but Have Not Ensured That All Relevant Service Officials Receive Key Corrosion-Control Information

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### Corrosion Executives Use Various Mechanisms to Collect and Share Corrosion-Control Information

All the military departments' Corrosion Executives use mechanisms—such as product team meetings, briefings, conferences, and site visits—to collect and disseminate information on infrastructure-related corrosion activities within their departments. Additionally, the Corrosion Executives host information sessions during the triannual DOD corrosion forums to discuss their corrosion-related issues. However, in our interviews with installation officials who were involved with corrosion work, slightly more than half of the officials were unaware of DOD's Corrosion Office, their respective Corrosion Executive, or the training, information, and other resources available through the related offices. According to the Duncan Hunter National Defense Authorization Act for Fiscal Year 2009, Section 903,<sup>35</sup> the Corrosion Executive at each military department is, among other things, responsible for coordinating corrosion prevention and control activities with the military department and the Office of the Secretary of Defense, the program executive officers, and relevant major subordinate commands. Additionally, DOD Instruction 5000.67 directs each Corrosion Executive, in coordination with the proper chain of command, to establish and maintain a process to collect information on the results of corrosion-control activities for infrastructure within its department. Further, the *DOD Corrosion Prevention and Mitigation Strategic Plan* includes a communications goal to fully inform all levels of DOD about all aspects of

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<sup>35</sup>Pub. L. No.110-417, § 903 (2008).

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corrosion work<sup>36</sup> and states that the rapid and reliable exchange of information is the core of DOD's new corrosion-control culture. Also, each military department developed documents for corrosion control and prevention that acknowledged the importance of communication on corrosion control. Likewise, internal controls have shown that organizations benefit from communicating timely information to management and others to help them achieve their responsibilities.<sup>37</sup>

During this review, we found that the military departments' Corrosion Executives use various mechanisms to collect and disseminate corrosion-related information within each department's chain of command. Additionally, we learned that the Corrosion Executives have encountered challenges in ensuring that information about their infrastructure-related corrosion-control initiatives reaches all relevant service-level officials. Specifically, each military department identified the following mechanisms and challenges:

**Army**—In the 2012 *U.S. Army Corrosion Prevention and Control Strategic Plan*, the department established an Army Corrosion Board and an Army Corrosion Integrated Product Team to address corrosion issues. According to officials in the Corrosion Executive's office, the board has held its first organizational meeting and the integrated product team meets as needed, often virtually. Additionally, the officials explained that they communicate key information on corrosion of Army facilities and other infrastructure through the relevant Army offices in the chain of command for installations, using data calls. However, one Corrosion Executive official stated that the Army does not have a formal process to communicate directly to officials in the field about lessons learned or best practices for addressing corrosion of facilities and other infrastructure. The Army's strategic plan includes the goal to address poor communication and outreach that may hinder corrosion-control solutions from being implemented in the field.

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<sup>36</sup>The DOD strategic plan includes a goal to "use every available communication channel to receive and convey all aspects of corrosion—nature, impact, approaches and results—from and to every organization within the broad Department of Defense and industry sectors as well as national and international communities." Appendix A of the plan includes an action plan for the Corrosion Office's Communications and Outreach Working Integrated Product Team.

<sup>37</sup>[GAO/AIMD-00-21.3.1.](#)

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**Navy**—The Navy’s *Annual Report on Corrosion for Fiscal Year 2011* states that a concerted awareness program is one of the cornerstones of improving communications about corrosion control and prevention within the Department of the Navy, which includes the United States Navy and the United States Marine Corps. The Corrosion Executive chairs the department’s Corrosion Cross-Functional Team, an internal group of subject matter experts and relevant command officials, to serve as the primary method for coordinating within the department. Additionally, the Navy’s Corrosion Executive noted that he works within the department’s applicable chain of command for corrosion issues for facilities and other infrastructure. Further, the Corrosion Executive stated that the office communicated its roles and responsibilities through information provided in regular department communications, such as bulletins, briefings and conferences; and also through site visits and assessments. However, he noted that the frequency of opportunities for conferences and site visits will be limited in the future due to budget constraints. The Navy’s strategic plan for corrosion notes that it will continue to use communications as a tool in its corrosion-control efforts.

**Air Force**—In the May 2012 *Air Force Enterprise Corrosion Prevention and Control Strategic Plan*, the department acknowledged that facilities and other infrastructure organizations have not been integrated into the department’s corrosion program. In its strategic plan, the Air Force highlighted the need to establish lines of communication, structures, and process to ensure that facilities incorporate appropriate corrosion control throughout each life cycle. Also, the Corrosion Executive<sup>38</sup> stated that the department in June 2012 created a Corrosion Control and Prevention Working Group in which he serves as the lead and meets regularly with the working group members from the Air Force’s major commands and relevant components. According to the Corrosion Executive, the means for disseminating and collecting information from the department’s installations are the service organizations within the chain of command for the affected facilities and other infrastructure. He also stated that the service’s training curriculum will incorporate important information as needed.

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<sup>38</sup>In April 2012, the current Corrosion Executive filled the position, which had been vacant for more than a year and a half.

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## All Relevant Officials Have Not Received Key Corrosion-Control Information

During our review, managers and other public works officials at 16 of 31 installations stated that they were not familiar with the Corrosion Office.<sup>39</sup> Officials also told us that their installations could benefit from the additional information on corrosion control and prevention offered by these offices. However, Corrosion Executives stated in interviews that they disseminate corrosion information through each department's chain of command. In response to our questions, installation officials provided views in the following areas:

- Awareness of corrosion offices—In response to our questions of officials who are responsible for installation maintenance and would be involved in corrosion-control activities, officials at 16 of 31 installations stated that prior to our work they were not aware of the Corrosion Office or the relevant military department's Corrosion Executive.<sup>40</sup> In addition, officials at 24 of 29 installations stated they had not contacted the Corrosion Office about their corrosion work in the last three years.<sup>41</sup> Also, officials at 25 of 29 installations stated that they had not contacted the respective Corrosion Executive during the same period. However, officials at 23 of 29 installations stated that they had contacted their services' installation management command or major commands about corrosion work in the last three years.
- Knowledge of documents—Officials interviewed at 26 of 29 installations<sup>42</sup> stated that they were unfamiliar with the *DOD Corrosion Prevention and Mitigation Strategic Plan* and DOD Instruction 5000.67, which addresses prevention and mitigation of corrosion for DOD equipment and infrastructure. Additionally, officials interviewed at 17 of 29 installations responded that they were unfamiliar with service corrosion-control plans or strategies.

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<sup>39</sup>We spoke with the managers of the public works offices and their staff at 32 installations, representing each military service, and asked them a series of questions about corrosion and corrosion control efforts at their locations. For additional information about these interviews, see appendix II. One installation did not respond to this question.

<sup>40</sup>One installation did not respond to this question. Officials at 13 of the remaining 15 installations responded that since the establishment of these corrosion-control offices there was no change or they were unaware of any related changes at their installations.

<sup>41</sup>We interviewed officials at 32 installations; however, three interviews took place before development of the semistructured interview template that included this question.

<sup>42</sup>At least four officials qualified their responses to this question by stating that other officials might be more knowledgeable about specific documents due to the nature of their positions.



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- Interest in additional information—Many installation officials stated interest in receiving additional information about corrosion resources. For example, more than half of the interviewed officials (17 of 31) stated that the Corrosion Office or the relevant military department's Corrosion Executive could provide more communications and enhance awareness about corrosion issues or corrosion-related resources. An identical number of officials stated that DOD's and the military departments' corrosion-control offices could support corrosion-related training as a useful resource for installations. Specifically, an Army installation official noted that it would be beneficial for the military services and DOD to disseminate information about the Corrosion Office and the military departments' Corrosion Executives, including their roles and responsibilities, and the assistance they can provide.
  - Other suggestions—Officials at installations noted other suggestions for exchanging information about installations, such as: holding regular forums and highlighting opportunities for contact with counterparts at other installations, having a centralized source for accessing corrosion-related information, disseminating case studies or best practices relevant to DOD, enhanced use of existing service-issued newsletters, and planning conferences or communities of practice. In addition, five respondents suggested providing important corrosion-related information to the service headquarters, regional command, or management commands for distribution to the installations.

Additionally, in interviews at the services' installation management commands, we found officials who stated similar concerns about communications.<sup>43</sup> Officials from installation management commands stated that they had little contact with Corrosion Executives. For example, during our interview with one Air Force major command, a command official stated that the most recent information he had about the Air Force's Corrosion Executive was from 2008. Another major command's response did not include the Corrosion Executive as an organization it interacts with on corrosion issues. Similarly, officials at three different locations—the Commander of Navy Installations Command, the Marine Corps Installation Command, and the Army's Installation Management Command Headquarters—stated that they had limited or no interaction on infrastructure issues with the Corrosion Office and their respective

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<sup>43</sup>The term "management commands" refers to the services' installation commands (Army and Navy) and major commands (Air Force) responsible for overseeing DOD installations.

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Corrosion Executive.<sup>44</sup> In addition, the Army official stated that he would like to receive information on training by the Corrosion Office regarding corrosion of infrastructure, and that the best channel for the information would be through the Assistant Chief of Staff for Installation Management, an office that works with the Army's Corrosion Executive.

In evaluating communications for corrosion issues for facilities and other infrastructure, we found that all relevant service officials do not receive key information because the military departments' Corrosion Executives do not have a targeted communication strategy for their military department and an accompanying action plan to ensure frequent communications between Corrosion Executives and all service officials involved in corrosion activities for facilities and other infrastructure. The military departments mention communication in their strategic plans, but they do not have specific steps for communicating corrosion-control information for facilities and other infrastructure at every level. Our prior work on federal organizations identified key practices and implementation steps for establishing a communication strategy to create shared expectations and report related progress.<sup>45</sup> Without a targeted communication strategy and accompanying action plan, the Corrosion Executives cannot ensure that service managers of facilities and other infrastructure will have access to all information and resources available for dealing with corrosion and are aware of the most effective and efficient methods for corrosion control.

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## Conclusions

The Department of Defense relies on the outcomes of its corrosion projects to reduce the life-cycle costs of its facilities and infrastructure through the timely sharing of information about the successful projects with all relevant corrosion-control managers. While the Office of Corrosion Policy and Oversight (Corrosion Office) requires project managers to submit reports on corrosion projects, many reports have not been

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<sup>44</sup>The Department of Navy officials noted that the technical experts from the Naval Facilities Engineering Command may have more interaction with these offices. For example, the Naval Facilities Engineering Command is a member of the Navy's Corrosion Cross-Functional Team. The Army official noted that he works through his chain of command, specifically the Office of the Assistant Chief of Staff for Installation Management, on infrastructure issues.

<sup>45</sup>GAO, *Results-Oriented Cultures: Implementation Steps to Assist Mergers and Organizational Transformations*, [GAO-03-669](#) (Washington, D.C.: July 2, 2003).

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submitted when due. In fact, the Corrosion Office has not adopted methods to enhance tracking, such as recording the reasons for missed reporting deadlines, new reporting deadlines, and the submission dates for follow-on reports. Further, although the Corrosion Office encourages project managers to complete outstanding reports, it has not exercised its existing oversight and coordination authorities to identify and implement possible options or incentives for addressing the various funding, personnel, or other reasons cited by project management offices for not meeting reporting milestones. Also, DOD's strategic plan and other guidance do not clearly define a role for the military departments' Corrosion Control and Prevention Executives (Corrosion Executives), who could assist the Corrosion Office, in holding the military departments' project management offices accountable for submitting infrastructure-related reports in accordance with DOD's strategic plan. Without effective actions to ensure timely submission of reports, decision makers may be unaware of potentially useful technologies to address corrosion. Moreover, the Corrosion Office is not always updating its records to ensure accurate information is maintained on reassessed return-on-investment estimates for infrastructure-related corrosion projects. Without accurate return-on-investment estimates for corrosion projects, Congress and DOD corrosion-control managers may not have sufficient information about returns on investment for their oversight of completed projects.

Finally, slightly more than half of the installation officials (16 of 31 officials) whom we interviewed were unaware of DOD's Corrosion Office, their respective Corrosion Executive, or the training, information, and other resources available through the related offices. Without a targeted communication strategy and accompanying action plan, the military departments' Corrosion Executives cannot ensure that managers of facilities and other infrastructure will have access to all information and resources available for dealing with corrosion and are aware of the most effective and efficient methods for corrosion control.

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## Recommendations for Executive Action

We are making five recommendations to improve DOD's corrosion prevention and control program:

To improve accountability for reporting the results of corrosion-control demonstration projects affecting DOD infrastructure, we recommend that the Under Secretary of Defense for Acquisition, Technology, and Logistics direct the Director of the Office of Corrosion Policy and Oversight to take steps to enhance reporting and project tracking, such as noting the reasons why project management offices missed a reporting

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deadline and including any revised reporting deadlines for final and follow-on reports.

To improve the military departments' submission of completed reports for infrastructure-related corrosion-control demonstration projects at prescribed milestones, we recommend that the Under Secretary of Defense for Acquisition, Technology, and Logistics direct the Director of the Office of Corrosion Policy and Oversight to use the office's existing authority to identify and implement possible options or incentives for addressing the various funding, personnel, and other reasons cited by project management offices for not meeting reporting milestones.

Further, to provide greater assurance that the military departments will meet reporting milestones for future projects, we recommend that the Under Secretary of Defense for Acquisition, Technology, and Logistics—in coordination with the Director of the Office of Corrosion Policy and Oversight—revise corrosion-related guidance to clearly define a role for the military departments' Corrosion Control and Prevention Executives to assist the Office of Corrosion Policy and Oversight in holding their departments' project management offices accountable for submitting infrastructure-related reports in accordance with the *DOD Corrosion Prevention and Mitigation Strategic Plan*.

To ensure that Congress, DOD and officials of the military departments' infrastructure-related corrosion activities have the most complete and up-to-date information, we recommend that the Under Secretary of Defense for Acquisition, Technology, and Logistics direct the Director of the Office of Corrosion Policy and Oversight to take actions to ensure that its records reflect complete, timely, and accurate data of the projects' return-on-investment estimates.

To ensure that all relevant infrastructure officials receive pertinent corrosion information, we recommend that the Secretaries of the Army, Navy, and Air Force departments direct their assistant secretaries responsible for acquisitions, technology and logistics to require the military departments' Corrosion Control and Prevention Executives—in coordination with their installation management commands and in consultation with the Office of Corrosion Policy and Oversight—to develop a targeted communication strategy and an accompanying action plan for their departments to ensure the timely flow of key information to all relevant service officials, particularly to officials at the installation level, about corrosion-control activities and initiatives, such as training

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opportunities and outcomes of the infrastructure-related corrosion projects.

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## Agency Comments and Our Evaluation

We provided a draft of this report to DOD for comment. In its written comments, reprinted in appendix IV, DOD partially concurred with three of our recommendations and did not agree with two recommendations.

DOD partially concurred with our first recommendation to take steps to enhance the tracking and reporting of its infrastructure-related corrosion projects. In its comments, DOD stated that it is developing a web-based tracking tool for the Corrosion Office, Corrosion Executives, and project managers to input and extract project-related data, and DOD expects the change to result in increased timeliness and standardization of project data to include revised reporting deadlines for final and follow-on reports. While this system may address our recommendation, DOD did not state when the new system would be available for use. In response to our fourth recommendation that DOD take action to ensure that its records reflect complete, timely and accurate data on the projects' return on investment, DOD partially concurred with the recommendation and stated that this new web-based system would provide data including return-on-investment estimates, and would be accessible to other parties, including the Corrosion Office, Corrosion Executives and project managers.

DOD did not agree with our second recommendation that the Corrosion Office use its existing authority to identify and implement possible options or incentives for addressing the various funding, personnel, and other reasons cited by project management offices for not meeting reporting milestones. In its written comments, DOD disagreed with our recommendation, but did not state what actions it would take to improve submission of completed reports from the military services that DOD's strategic plan requires for infrastructure-related corrosion projects. DOD stated that prior positive incentives to complete project reports were largely ineffective. However, as our report states, there are examples of military departments responding to incentives, such as the Navy completing 11 of 12 return-on-investment reassessments after the Corrosion Office provided funding as an incentive. The reassessments are the main focus of follow-on reports. Also, DOD stated that its project management offices occasionally miss reporting milestones and generally have done an excellent job of meeting their reporting obligations. However, as our report clearly shows, the project management offices had not submitted 50 of the 80 required final reports (63 percent) and had not submitted 15 of the 41 required follow-on reports (37 percent) to the Corrosion Office. Without timely submission of reports, decision makers may be unaware of potentially useful technologies to address corrosion.

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We continue to believe that the Corrosion Office could use its existing authorities to identify and implement other incentives or methods to address reasons that project management offices cite for not meeting reporting milestones.

DOD did not agree to our third recommendation to revise guidance to clearly define the role of Corrosion Executives to assist the Corrosion Office in holding departments' project management offices accountable for submitting reports in accordance with DOD's strategic plan. DOD stated that further guidance is not necessary as the requirements are clearly stated in the strategic plan. DOD also stated that Corrosion Executives are given the freedom to manage their programs in the most efficient and effective manner. However, DOD's strategic plan and guidance do not define a role for the Corrosion Executives in assisting the Corrosion Office in the project reporting process. Our recommendation was intended to fortify the role of Corrosion Executives in ensuring that project management offices within the Corrosion Executives' respective military departments submit project reports as required in the strategic plan. We continue to believe that the Corrosion Executives could provide the additional management oversight necessary to strengthen corrosion project reporting.

DOD partially concurred with our last recommendation that the Secretaries of the Army, Navy and Air Force direct the relevant assistant secretaries to require the military departments' Corrosion Executives—in coordination with their installation management commands and in consultation with the Corrosion Office—to develop a targeted communication strategy and an action plan for their departments to ensure the timely flow of key information to all relevant service officials about corrosion-control activities and initiatives, such as training opportunities and outcomes of infrastructure-related corrosion projects. DOD commented that information flow to installations follows the chain of command to ensure that appropriate individuals receive information necessary for successful mission completion. The department further stated that the Corrosion Office would ensure that training information and project outcomes would be available to all relevant officials via publication in appropriate media; also, DOD stated that during the next review cycle the Corrosion Office would evaluate the military department corrosion prevention and control strategic plans to determine if they adequately address the flow of information. However, we continue to believe that each military department should have a targeted communication strategy, developed in consultation with the Corrosion Office and coordinated with the installation management commands

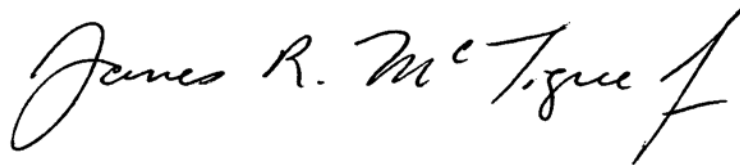
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within the military departments, and that strategy should go beyond the publication of information in appropriate media and provide specific steps for communicating corrosion-control information to all relevant service corrosion officials. Such a strategy is important because, as our report states, we found that all corrosion officials within each military department, particularly at the installation level, were not receiving relevant corrosion prevention and control information. Also, we continue to believe that without a targeted communication strategy and action plan, Corrosion Executives cannot ensure that service managers of facilities and other infrastructure will have access to all information and resources for dealing with corrosion and are aware of the most effective and efficient methods for corrosion control.

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We are sending copies of this report to appropriate congressional committees and to the Secretary of Defense; the Secretaries of the Army, the Navy, and the Air Force; Director of the DOD Office of Corrosion Policy and Oversight, and the Director of the Office of Management and Budget. In addition, this letter will be made available at no charge on the GAO website at <http://www.gao.gov>.

Should you or your staff have any questions concerning this report, please contact me at (202) 512-7968 or [mctiguej@gao.gov](mailto:mctiguej@gao.gov). Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this letter. GAO staff who made key contributions to this report are listed in appendix V.

A handwritten signature in black ink, reading "James R. McTigue Jr." with a stylized flourish at the end.

James R. McTigue Jr.  
Director, Defense Capabilities  
and Management

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# Appendix I: DOD Studies on the Cost of Corrosion for Facilities and Other Infrastructure

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DOD's Office of Corrosion Policy and Oversight (Corrosion Office) sponsors a series of studies to assess the cost of corrosion throughout the department, including three studies—two completed and one ongoing—to determine how much money DOD spends on corrosion activities for its facilities and other infrastructure. These studies are conducted by LMI using a method approved by the Corrosion Office's Corrosion Prevention and Control Integrated Product Team.<sup>1</sup> According to LMI, its estimation methodology includes construction costs and actual maintenance expenditures for sustainment, restoration, and modernization that are known or can be identified, and focuses on tangible, direct material and labor costs as well as some indirect costs, such as research and development and training. In its studies, LMI noted that although corrosion maintenance costs are a subset of sustainment, restoration, and modernization costs, the tools and analysis methods used by planners to estimate sustainment, restoration, and modernization requirements do not specifically identify corrosion.

In its first report in May 2007, LMI determined that spending on corrosion prevention and control for DOD facilities and other infrastructure for fiscal year 2005 was \$1.8 billion.<sup>2</sup> In its second report in July 2010 report,<sup>3</sup> LMI found that spending on corrosion at DOD facilities and other infrastructure decreased from \$1.8 billion to \$1.6 billion between fiscal years 2005 and 2007,<sup>4</sup> and then increased to \$1.9 billion in fiscal year 2008.<sup>5</sup> In its 2010 report, LMI reported that spending on corrosion as a percent of spending on maintenance dropped from 15.1 percent in fiscal year 2005 to 10.7 percent in fiscal year 2007 and increased to 11.7 percent in fiscal year 2008.

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<sup>1</sup>LMI, located in McLean, VA, is a private, not-for-profit corporation that provides management consulting, research, and analysis to governments and other nonprofit organizations.

<sup>2</sup>LMI, *The Annual Cost of Corrosion for the Department of Defense Facilities and Infrastructure*, (McLean, VA: May 2007).

<sup>3</sup>LMI, *The Annual Cost of Corrosion for the Department of Defense Facilities and Infrastructure, 2007-2008 Update* (McLean, VA: July 2010).

<sup>4</sup>LMI did not assess the cost of corrosion for fiscal year 2006.

<sup>5</sup>Throughout this section, we cite the dollar figures from the LMI reports published in 2007 and 2010. We did not adjust these figures for inflation.



Further, in its 2010 report, LMI reported that DOD spent more on corrosion-related maintenance for facilities and other infrastructure than it did on corrosion work related to military construction. Specifically, LMI reported that spending on corrosion for maintenance is three to four times higher than corrosion spending associated with construction, even though overall construction expenditures were nearly double that of overall maintenance expenditures. LMI provided two main reasons for this occurrence: (1) corrosion is rarely identified as a justification for the construction of a new facility; and (2) if estimated construction costs need to be reduced to obtain funding of the project, measures to prevent corrosion are among the first costs to be removed from the estimated costs. Additionally, LMI reported that DOD spent almost twice as much on corrective measures to address corrosion (\$1,263 million) as it did on preventive measures to avoid corrosion (\$640 million).

LMI's 2010 report shows installations' estimated expenditures in eight categories of corrective and preventive maintenance for facilities and other infrastructure. Table 4 shows information from that 2010 report about the estimated expenditures for facilities and other infrastructure by maintenance category for fiscal year 2008.

**Table 4: Estimated Expenditures to Address Corrosion of DOD Facilities and Other Infrastructure (by Maintenance Categories for Fiscal Year 2008; \$ in Millions)**

Category	Corrective measures to address corrosion	Preventive measures to avoid corrosion	Total expenditures on corrosion-related work	All Corrective maintenance	All Preventive maintenance	Total expenditures on all maintenance	Corrosion-related work as a percentage of total maintenance
General building maintenance	\$285	\$306	\$591	\$3,232	\$410	\$3,642	16%
Exterior plumbing	\$82	\$47	\$129	\$737	\$87	\$824	16%
Interior plumbing	\$106	\$39	\$145	\$1,208	\$93	\$1,301	11%
Fuels	\$12	\$6	\$18	\$151	\$17	\$168	11%
HVAC	\$157	\$58	\$215	\$1,946	\$136	\$2,082	10%
Exterior electric	\$101	\$60	\$161	\$1,494	\$126	\$1,620	10%
Roads and grounds	\$86	\$56	\$142	\$1,345	\$142	\$1,487	10%
Interior electric	\$51	\$48	\$99	\$1,623	\$129	\$1,752	6%

Source: LMI.

In August 2012, LMI began its third study of the cost of corrosion at DOD facilities and other infrastructure to analyze corrosion-related spending for

fiscal year 2009 through fiscal year 2011. For this report, the LMI official told us that the methodology for classifying the environmental conditions of the installations that are included in their cost-of-corrosion studies would be the major difference between the 2012 assessment and the prior reports. LMI also acknowledged that there are some challenges and limitations to the methodology and data used in its analysis. These challenges and limitations include, but are not limited to: (1) limited quality controls in the services' facilities and other infrastructure work order data in which approximately 25 percent of the records obtained from the military services' maintenance systems could not be used due to missing key data elements that could not be recreated; (2) the lack of tracking and maintaining of asset availability data for facilities and other infrastructure; and (3) the three-year period between the cost of corrosion studies, which means there will be a significant period before data can be updated.

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# Appendix II: Scope and Methodology

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To address our first objective to determine the extent that project managers submitted required reports to the DOD Office of Corrosion Policy and Oversight (hereafter referred to as Corrosion Office), we reviewed the February 2011 *DOD Corrosion Prevention and Mitigation Strategic Plan* and used the reporting milestones outlined in the plan to identify types of reports required for each project. We obtained project information for the 80 infrastructure-related corrosion demonstration projects funded by the Corrosion Office for fiscal years 2005 through 2010.<sup>1</sup> We requested and reviewed the project documentation— project plans, bimonthly or quarterly reports, final reports and follow-on reports—to determine if the data and related reports met the Corrosion Office’s reporting requirements. We reviewed the corrosion project documentation for these projects for missing data, outliers, or other errors, and documented where we found incomplete data and computation errors. For the purposes of our work in reviewing projects funded in fiscal years 2005 through 2010, we considered a final report to be submitted as required if the Corrosion Office had a copy of the report in its records system. We did not consider the timeliness of the submitted reports. Additionally, for follow-on reports, we could assess only the projects funded in fiscal years 2005 through 2007 (41 of the 80 projects) because the DOD strategic plan’s milestone requires that follow-on reports be submitted for completed projects within two years after the projects have been completed and transitioned to use within the military departments. For completed projects, we documented the initial return-on-investment estimates shown in the project plans and the resulting change, if any, shown in the follow-on reports. We determined that the project reporting data was sufficiently reliable for the purposes of determining the extent to which the military departments met the Corrosion Office’s reporting requirements, but we did not determine the timeliness of the report or assess elements of the actual report.

After identifying the projects that required further review because the project managers had not completed and submitted the required reports, we interviewed and obtained documentation from the Corrosion Office, the military departments’ Corrosion Control and Prevention Executives (hereafter referred to as Corrosion Executives) and the respective project managers to determine why the required reports were not submitted at

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<sup>1</sup>We did not review the remaining 25 corrosion projects funded for fiscal years 2011 and 2012 because their reporting milestones had not occurred.

the prescribed deadlines. Also, we determined what actions, if any, they planned to take to complete the reports. Specifically, to complete this task, we met with corrosion-control officials from the following organizations: the Corrosion Office, Army Corrosion Executive, Navy Corrosion Executive, Air Force Corrosion Executive, Army Engineering Research Development Center, Construction Engineering Research Laboratory, Naval Facilities Engineering Command (Engineering Support Center), Office of the Air Force Logistics, Installations and Mission Support, and the Air Force Civil Engineer Support Agency. We also reviewed prior GAO work on DOD's corrosion prevention and control program.

To address our second objective to assess the extent to which the return-on-investment data submitted by the military departments is accurately reflected in records maintained by the Corrosion Office, for the 105 infrastructure-related corrosion demonstration projects funded from fiscal years 2005 through 2012, we reviewed the return-on-investment estimates found in the project plans and the return-on-investment estimates maintained in the Corrosion Office's records. We then compared the data from these two sources to determine if any differences existed in the estimated return on investment. Upon completion of this comparison, we provided a list of projects with discrepancies in the estimated return on investment to the Corrosion Office and asked the officials to explain why the inconsistencies existed and requested that they provide additional information to reconcile the differences in the two estimates. Further, we compared the return-on-investment estimates maintained in the Corrosion Office's records for projects funded in fiscal years 2005 through 2007 with the return-on-investment estimates contained in the military departments' follow-on reports to check for any differences between the two sets of records.

To address our third objective to assess the extent to which DOD's corrosion-control officials have fully informed all relevant officials within each department about efforts to prevent and mitigate corrosion of facilities and other infrastructure, we reviewed relevant legislation and guidance, DOD policies and publications, and the DOD and the military departments' strategic plans to obtain information on the management of DOD's corrosion prevention and control program. In addition, we interviewed officials at all levels within DOD—Corrosion Office officials, Corrosion Executives, the military services' management commands for installations, and facility and infrastructure managers within the services—to discuss their corrosion prevention and control efforts, including challenges and successes in implementing new corrosion

technologies. We interviewed officials across each of the military services and reviewed relevant service documentation to gather information about corrosion prevention and control programs within the services. We spoke with each military department's designated Corrosion Executive as well as officials in the Corrosion Executives' offices to discuss corrosion control and prevention activities for facilities and other infrastructure across the departments. We also interviewed officials from the installation management commands of the Army, Navy and Marine Corps, including the Office of the Army Chief of Staff for Installations Management, the U.S. Army Installations Management Command, the Commander of Navy Installations Command, and the U. S. Marine Corps Installations Command. We also interviewed officials within the civil engineering or facilities branches at two Air Force major commands—Air Mobility Command and Air Combat Command. We reviewed relevant service documentation, including each military department's strategic plan for corrosion control and prevention, to identify efforts related to facilities and other infrastructure. During our review, we also met with the manager of a Defense Logistics Agency program for cathodic protection and corrosion control of submerged or underground steel structures. Other defense agencies were not evaluated as part of our work.

We used data obtained from Office of the Deputy Under Secretary of Defense for Installations and Environment to identify all DOD facilities and other infrastructure by military service and geographic location. Using a nonprobability sample,<sup>2</sup> we limited the installations for selection to those active-duty installations with at least 25 buildings owned by the federal government and ensured that a range of locations were selected from each of the four military services and across geographic regions of the United States.<sup>3</sup> From the 390 installations that met these criteria, we

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<sup>2</sup>Results from nonprobability samples cannot be used to make inferences about a population because in a nonprobability sample some elements of the population being studied have no chance or an unknown chance of being selected as part of the sample.

<sup>3</sup>We used the four geographic regions of the United States as defined by the U. S. Census Bureau.

selected installations with different environmental conditions,<sup>4</sup> some joint military installations, and installations that did or did not participate in the Corrosion Office's corrosion-technology demonstration projects. We determined that the data used to select the installations for our review were sufficiently reliable for the purposes of selecting our nonprobability sample.

From April to October 2012, we conducted semistructured interviews with management officials of facilities and other infrastructure from 32 DOD installations to gather information and views about their corrosion control and management efforts.<sup>5</sup> Figure 3 identifies the 32 selected installations where GAO interviewed officials for this review. The purpose of the semistructured interviews was to understand how the installation officials (1) use policies, plans, and procedures to identify and address corrosion; (2) address corrosion prevention and mitigation; (3) determine their maintenance and sustainment priorities; and (4) receive and disseminate information on relevant corrosion topics. We visited and interviewed officials at 6 of the 32 military installations,<sup>6</sup> and conducted audio conference calls with officials at 26 of the 32 military installations. Although our findings from the interviews of officials of the 32 installations are not generalizable to the entire universe of installations, we feel our findings provide a range of issues related to corrosion that are experienced at installations.

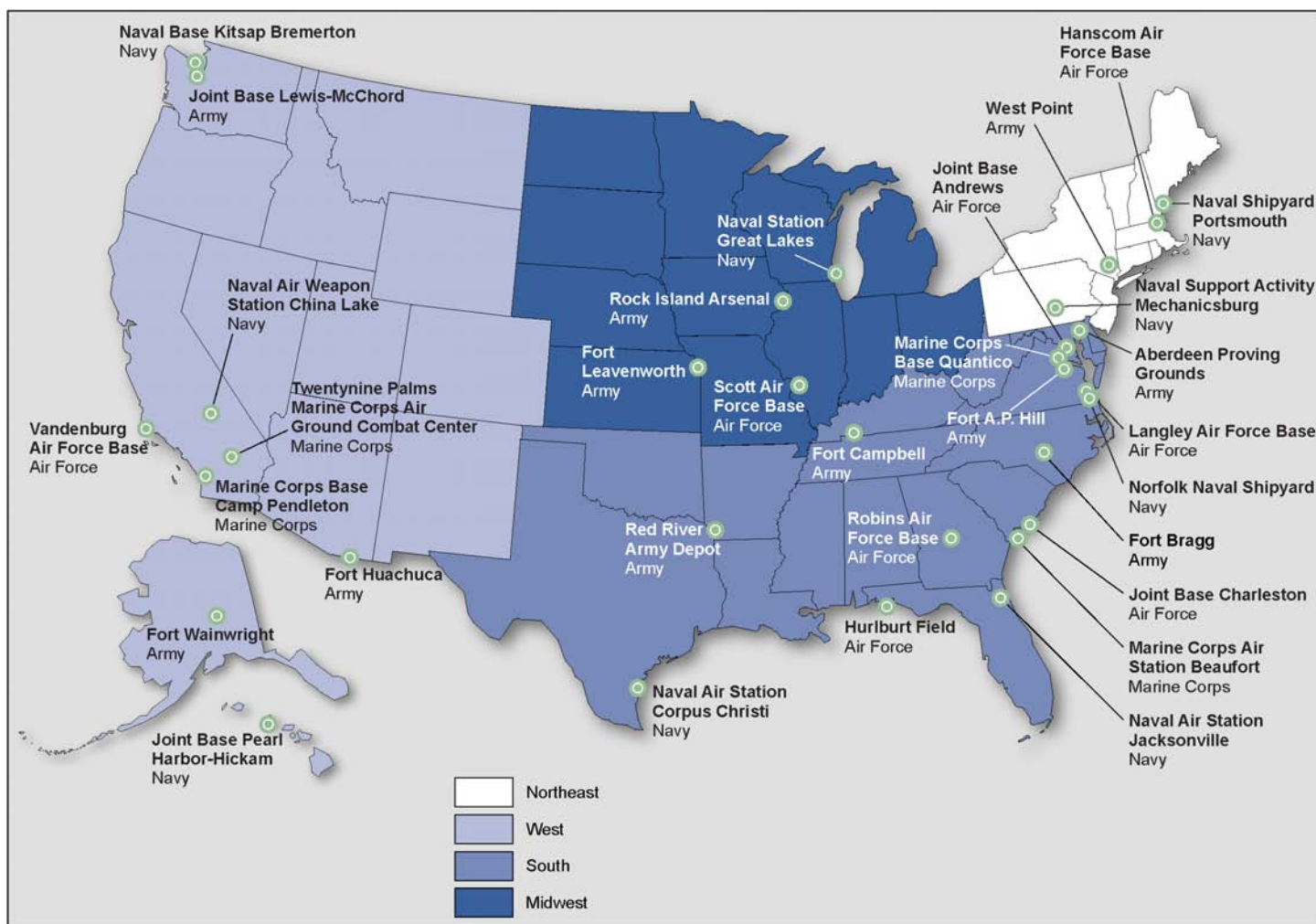
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<sup>4</sup>The Corrosion Office provided an environmental severity index level for each installation. The environmental severity index is derived from a database developed by the research firm Battelle with the corrosion rates of various metals exposed to different environmental conditions found at military bases throughout the world. The DOD Corrosion Office, for its fiscal year 2012 cost of corrosion study of DOD facilities and other infrastructure, used the corrosion rates for steel and developed an environmental severity index on a scale of 1 through 20 to show the impact of corrosion in different locations, with 1 being least severe and 20 being the most severe environmental conditions.

<sup>5</sup>The results of the semistructured interviews are not generalizable because we used a nonprobability sample to select participants for these interviews.

<sup>6</sup>Site visits to 3 of the installations were completed prior to the development of our questionnaire for the semistructured interviews.

Figure 3: Selected Installations Where GAO Interviewed Facilities and Other Infrastructure Officials



Source: DOD, Map Resources (map).

We conducted this performance audit from November 2011 to May 2013 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

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# Appendix III: Returns on Investment for DOD's Infrastructure-Related Corrosion Technology Demonstration Projects

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As defined by DOD for its corrosion technology demonstration projects, the estimated return on investment is the ratio of the present value of benefits to the present value of the project's total cost. In our December 2010 report,<sup>1</sup> we recommended that the Secretary of Defense direct the Under Secretary of Defense (Acquisition, Technology and Logistics), in coordination with the Corrosion Executives, develop and implement a plan to ensure that return-on-investment reassessments are completed as scheduled.<sup>2</sup> Specifically, we recommended that this plan include information on the timeframe and source of funding required to complete the return-on-investment reassessments. DOD concurred with our recommendation and stated that plans were underway to address this requirement. As of July 2012, DOD had not developed or implemented a formal plan that addresses this requirement.

During our review, we found that the Corrosion Office required project managers of 41 projects to submit follow-on reports, and reports were completed and submitted for 25<sup>3</sup> of the 41 projects funded for fiscal years 2005 through 2007.<sup>4</sup> Of the 25 follow-on reports, 23 contained return-on-investment estimates. We found that although follow-on reports were completed and submitted for the remaining 2 projects, return-on-investment estimates were not calculated for the projects because the respective Army and Navy reports noted that such a calculation was not required. For the 23 projects that have completed and submitted the required follow-on reports, Table 5 provides the military departments' return-on-investment estimates included in the original project plans and the resulting change, if any, included in the follow-on reports. We did not review the military departments' calculations or their methods for estimating the cost and benefits of the estimated returns on investment.

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<sup>1</sup>[GAO-11-84](#).

<sup>2</sup>According to the DOD strategic plan, the return-on-investment reassessment is the focus of the corrosion projects' follow-on reports.

<sup>3</sup>There was another Army project in which its project manager reported that a return-on-investment computation and subsequent follow-on report was not warranted.

<sup>4</sup>Since follow-on reporting milestones have not occurred for corrosion projects funded after 2007, we do not have reassessed return-on-investment data to compare to the initial return-on-investment estimates for the 64 projects funded in fiscal years 2008 through 2012.



**Appendix III: Returns on Investment for DOD's  
Infrastructure-Related Corrosion Technology  
Demonstration Projects**

**Table 5: Military Departments' Original Return-on-Investment Estimates in Project Plans Compared to Return on Investment Shown in Follow-on Reports**

<b>Military Department</b>	<b>Count</b>	<b>Project number</b>	<b>Project description</b>	<b>Return-on-investment estimates from project plan</b>	<b>Return-on-investment estimates from follow-on report</b>
<b>Army</b>					
2005	1	AR-F-313	Leak Detection for Pipes	10.2	7.3
	2	AR-F-314	Non-hazardous Corrosion Inhibitors/SMART Control Systems for Heating and Cooling	8.8	13.0
	3	AR-F-317	Pipe Corrosion Sensors	16.1	21.6
	4	AR-F-318	Ice Free Cathodic Protection Systems for Water Storage Tanks	20.6	11.8
	5	AR-F-319	Corrosion Resistant Materials for Water and Wastewater Treatment Plants	15.0	14.6
	6	AR-F-320	Surface Tolerant Coatings for Aircraft Hangars, Flight Control Tower, and Deluge Tanks	11.6	7.0
	7	AR-F-321	Remote Monitoring of Cathodic Protection Systems and Cathodic Protection System Upgrades for Tanks and Pipelines	15.3	13.5
	8	AR-F-322	Cathodic Protection of Hot Water Storage Tanks Using Ceramic Anodes	10.1	8.6
2006	9	FAR02	Smart Fluorescent and Self-Healing Coatings for Severely Corrosive Environments at Vehicle Wash Facilities	14.9	14.9
	10	FAR11	Innovative Thermal Barrier Coatings to Prevent Corrosive Environmental Effects and Improve Energy Efficiency in Heat Distribution Manholes	9.8	72.7
	11	FAR15	Development of Corrosion Indices and Life Cycle Prediction for Equipment and Facilities	33.1	33.1
	12	FAR16	Corrosion Prevention of Rebar in Concrete in Critical Facilities Located in Coastal Environments	12.9	12.9
	13	FAR20	Ceramic Anode Upgrades and Remote Monitoring of Cathodic Protection Systems for Utilities in Severely Corrosive Environments	14.7	14.7
<b>Navy</b>					
2005	14	N-F-221	Self-Priming Cladding for Splash Zone Steel	23.7	23.7
	15	N-F-222	Internal Pipeline Corrosion Inspection Red Hill Tunnel Fuel Lines	6.9	10.8

**Appendix III: Returns on Investment for DOD's  
Infrastructure-Related Corrosion Technology  
Demonstration Projects**

	16	N-F-229	Integrated Concrete Pier Piling Repair and Corrosion Protection System	1.9	1.9
2006	17	FNV01	Corrosion Protection Utilizing IR Drop Free Sensors and In-Situ Data Acquisition for Cross Country Pipelines	13.3	11.4
	18	FNV04	Modeling of Advanced Waterfront Metallic Material Corrosion and Protection	6.2	1.1
	19	FNV06	Wire Rope Corrosion for Guyed Antenna Towers	36.6	36.0
	20	FNV07	Solar Powered Cathodic Protection System	3.4	3.0
2007	21	F07NV03	Corrosion Inhibitor Evaluation for Concrete Repairs	16.8	16.8
	22	F07NV04	Satellite Based Remote Monitoring Systems for Cathodic Protection Systems in Remote Locations	21.0	17.4
	23	F07NV07	Low Cost Stainless Steel Reinforcing for Concrete Structures	2.9	2.9

Source: GAO analysis of DOD data.

Note: Projects Were Funded in Fiscal Years 2005 through 2007.

# Appendix IV: Comments from the Department of Defense



OFFICE OF THE UNDER SECRETARY OF DEFENSE  
3000 DEFENSE PENTAGON  
WASHINGTON, DC 20301-3000

MAY 15 2013

Mr. James R. McTigue, Jr.  
Acting Director, Defense Capabilities and Management  
U.S. Government Accountability Office  
441 G Street, NW  
Washington, DC 20548.

Dear Mr. McTigue,

This is the Department of Defense response to the GAO draft report, GAO-13-270, "DEFENSE INFRASTRUCTURE: DOD Should Improve Reporting and Communication on Its Corrosion Prevention and Control Activities," dated April 19, 2013 GAO Code (351691).

We have reviewed GAO Draft Report, GAO-13-270 and partially concur with three of the recommendations and non-concur with two of the recommendations. Written comments addressing each recommendation are provided as an enclosure to this letter. We appreciate the GAO team's engagement and feedback as we are continuously trying to improve the DoD Corrosion Program.

Sincerely,

A handwritten signature in black ink, appearing to read "Daniel J. Dunmire".

Daniel J. Dunmire  
Director,  
DoD Corrosion Policy and Oversight

Enclosure:  
As Stated

**GAO DRAFT REPORT DATED APRIL 19, 2013  
GAO-13-270 (GAO CODE 351691)**

**“DEFENSE INFRASTRUCTURE: DOD SHOULD IMPROVE REPORTING  
AND COMMUNICATION ON ITS CORROSION PREVENTION AND  
CONTROL ACTIVITIES”**

**DEPARTMENT OF DEFENSE COMMENTS  
TO THE GAO RECOMMENDATIONS**

**RECOMMENDATION 1:** The GAO recommends that the Under Secretary of Defense for Acquisition, Technology, and Logistics direct the Director of the Office of Corrosion Policy and Oversight to take steps to enhance reporting and project tracking, such as noting the reasons why project management offices missed a reporting deadline and including any revised reporting deadlines for final and follow-on reports.

**DoD RESPONSE:** Partially concur. The Corrosion Policy and Oversight Office believes that its current processes for project tracking are sufficient to maintain cognizance and control of required reports but that enhancements are possible. To that end, the Corrosion Policy and Oversight Office is developing a web-based tracking tool that will enable all parties involved in projects (The Corrosion Policy and Oversight Office, Military Department Corrosion Control and Prevention Executives, and project managers) to input and extract project related data. This will result in increased timeliness and standardization of project data to include revised reporting deadlines for final and follow-on reports.

**RECOMMENDATION 2:** The GAO recommends that the Under Secretary of Defense for Acquisition, Technology, and Logistics direct the Director of the Office of Corrosion Policy and Oversight to use the Office’s existing authority to identify and implement possible options or incentives for addressing the various funding, personnel, and other reasons cited by program management offices for not meeting reporting milestones.

**DoD RESPONSE:** Non-concur. Prior positive incentives of additional funding to complete project reports were largely ineffective. Negative incentives such as penalizing future project submittals from project offices that fail to submit on-time reports would be contrary to program objectives of reducing the impact of corrosion on DoD weapon systems and infrastructure by de-incentivizing potential technological improvements. While program management offices occasionally miss reporting milestones, they have generally done an excellent job of project execution and are committed to meeting their reporting obligations.

**RECOMMENDATION 3:** The GAO recommends that the Under Secretary of Defense for Acquisition, Technology, and Logistics, in coordination with the Director of the Office of Corrosion Policy and Oversight, revise corrosion-related guidance to clearly define the role of the military departments’ Corrosion Control and Prevention Executives-in assisting the Office of Corrosion Policy and Oversight-in holding their departments’ project management offices accountable for submitting infrastructure-related reports in accordance with the DOD Corrosion Prevention and Mitigation Strategic Plan.

**DoD RESPONSE:** Non-concur. The Military Department Corrosion Control and Prevention Executives are given the freedom to manage their programs in the most efficient and effective manner for their respective departments. The Corrosion Control and Prevention Executives know the reporting requirements and are working closely with the Corrosion Policy and Oversight Office and the project managers to ensure reports are submitted in accordance with the DoD Corrosion Prevention and Mitigation Strategic Plan. Further guidance is not necessary as the requirements are already clearly stated in the DoD Corrosion Prevention and Mitigation Strategic Plan.

**RECOMMENDATION 4:** The GAO recommends that the Under Secretary of Defense for Acquisition, Technology, and Logistics, direct the Director of the Office of Corrosion Policy and Oversight to take actions to ensure that its records reflect complete, timely, and accurate data of the projects' return-on-investment estimates.

**DoD RESPONSE:** Partially concur. The Corrosion Policy and Oversight Office is developing a web-based tracking tool that will enable all parties involved in projects (the Corrosion Policy and Oversight Office, Military Department Corrosion Control and Prevention Executives, and project managers) to input and extract project related data including return-on-investment estimates.

**RECOMMENDATION 5:** The GAO recommends that the Secretary of the Army, Navy, and Air Force departments direct their assistant secretaries responsible for acquisitions, technology, and logistics to require the military departments' Corrosion Control and Prevention Executives-in coordination with their installation management commands and in consultation with the Office of Corrosion Policy and Oversight-to develop a targeted communication strategy and an accompanying action plan for their departments to ensure the timely flow of key information to all relevant service officials, particularly to those officials at the installation-level, about corrosion-control activities and initiatives, such as training opportunities and outcomes of the infrastructure-related corrosion projects.

**DoD RESPONSE:** Partially concur. Information flow to the installation level follows the chain of command to ensure that appropriate individuals receive the critical and authoritative information necessary for successful mission completion. Neither the Corrosion Policy and Oversight Office nor the Corrosion Prevention and Control Executives are in the installation chain of command. The Corrosion Policy and Oversight Office will ensure that information on the DoD Corrosion Program, including training opportunities and outcomes of corrosion projects, is available to all relevant service officials including the Corrosion Control and Prevention Executives and installation level personnel via publication in appropriate media. During the next review cycle the Corrosion Policy and Oversight Office will evaluate the military department corrosion prevention and control strategic plans and, where appropriate, recommend they adequately address the flow of key information.

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# Appendix V: GAO Contact and Staff Acknowledgments

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## GAO Contact

James R. McTigue Jr. 202-512-7968, [mctiguej@gao.gov](mailto:mctiguej@gao.gov)

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## Staff Acknowledgments

In addition to the contact name above, the following staff members made key contributions to this report: Mark J. Wielgoszynski, Assistant Director; Rebekah Boone; Randolph DeLeon; Jacqueline McColl; Charles Perdue; Carol Petersen; Richard Powelson; Terry Richardson; Amie Steele and Michael Willems.

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# Related GAO Products

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*Defense Management: Additional Information Needed to Improve Military Departments' Corrosion Prevention Strategies.* [GAO-13-379](#). Washington, D.C.: May 16, 2013.

*Defense Management: The Department of Defense's Annual Corrosion Budget Report Does Not Include Some Required Information.* [GAO-12-823R](#). Washington, D.C.: September 10, 2012.

*Defense Management: The Department of Defense's Fiscal Year 2012 Corrosion Prevention and Control Budget Request.* [GAO-11-490R](#). Washington, D.C.: April 13, 2011.

*Opportunities to Reduce Potential Duplication in Government Programs, Save Tax Dollars, and Enhance Revenue.* [GAO-11-318SP](#). Washington, D.C.: March 1, 2011.

*Defense Management: DOD Needs to Monitor and Assess Corrective Actions Resulting from Its Corrosion Study of the F-35 Joint Strike Fighter.* [GAO-11-171R](#). Washington, D.C.: December 16, 2010.

*Defense Management: DOD Has a Rigorous Process to Select Corrosion Prevention Projects, but Would Benefit from Clearer Guidance and Validation of Returns on Investment.* [GAO-11-84](#). Washington, D.C.: December 8, 2010.

*Defense Management: Observations on Department of Defense and Military Service Fiscal Year 2011 Requirements for Corrosion Prevention and Control.* [GAO-10-608R](#). Washington, D.C.: April 15, 2010.

*Defense Management: Observations on the Department of Defense's Fiscal Year 2011 Budget Request for Corrosion Prevention and Control.* [GAO-10-607R](#). Washington, D.C.: April 15, 2010.

*Defense Management: Observations on DOD's Fiscal Year 2010 Budget Request for Corrosion Prevention and Control.* [GAO-09-732R](#). Washington, D.C.: June 1, 2009.

*Defense Management: Observations on DOD's Analysis of Options for Improving Corrosion Prevention and Control through Earlier Planning in the Requirements and Acquisition Processes.* [GAO-09-694R](#). Washington, D.C.: May 29, 2009.

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*Defense Management: Observations on DOD's FY 2009 Budget Request for Corrosion Prevention and Control.* [GAO-08-663R](#). Washington, D.C.: April 15, 2008.

*Defense Management: High-Level Leadership Commitment and Actions Are Needed to Address Corrosion Issues.* [GAO-07-618](#). Washington, D.C.: April 30, 2007.

*Defense Management: Additional Measures to Reduce Corrosion of Prepositioned Military Assets Could Achieve Cost Savings.* [GAO-06-709](#). Washington, D.C.: June 14, 2006.

*Defense Management: Opportunities Exist to Improve Implementation of DOD's Long-Term Corrosion Strategy.* [GAO-04-640](#). Washington, D.C.: June 23, 2004.

*Defense Management: Opportunities to Reduce Corrosion Costs and Increase Readiness.* [GAO-03-753](#). Washington, D.C.: July 7, 2003.

*Defense Infrastructure: Changes in Funding Priorities and Strategic Planning Needed to Improve the Condition of Military Facilities.* [GAO-03-274](#). Washington, D.C.: February 19, 2003.



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