United States Government Accountability Office

Report to Congressional Requesters

May 2014

# DEFENSE RESEARCH

# Improved Management of DOD's Technical Corrosion Collaboration Program Needed

GAO-14-437

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## Improved Management of DOD's Technical Corrosion Collaboration Program Needed

GAO Highlights

Highlights of GAO-14-437, a report to congressional requesters

### Why GAO Did This Study

According to DOD, corrosion can significantly affect maintenance cost, service life of equipment, and military readiness by diminishing the operations of critical systems and creating safety hazards. Pursuant to Section 2228 of Title 10 of the U.S. Code, DOD's Corrosion Office is responsible for prevention and mitigation of corrosion of military equipment and infrastructure. To help identify technology to prevent or mitigate corrosion and educate personnel about corrosion prevention and control, DOD funds universities and military labs in the TCC program.

GAO was asked to review DOD's TCC program and its goals. In this report, GAO addressed the extent to which DOD (1) has established procedures for managing the TCC program, (2) can provide information on the amount of funds spent on the program to date, and (3) has established goals for the TCC program and transitioned demonstrated results from projects to military departments. GAO reviewed DOD policies and plans and met with DOD corrosion officials and TCC participants.

### What GAO Recommends

GAO recommends five actions to improve DOD's management of the TCC program. DOD partially agreed with two actions: to document procedures to select and approve labs, and to track and maintain accurate funding data. DOD did not agree with three recommendations to document procedures to select and approve projects, and to establish a process to transition project results to the military departments. GAO believes that these recommendations remain valid.

View GAO-14-437. For more information, contact Zina Merritt at (202) 512-5257 or merrittz@gao.gov.

### What GAO Found

The Department of Defense's (DOD) Office of Corrosion Policy and Oversight (Corrosion Office) has documented some, but not all, key procedures for the Technical Corrosion Collaboration (TCC) program. For civilian institutions, the Corrosion Office documented procedures for selecting projects, but has not done so for approving these projects. In addition, for military academic institutions, the office has not documented procedures for selecting and approving projects. Corrosion Office officials stated that procedures for some aspects of the TCC program are not documented because the program is still evolving and they would like flexibility to enable innovation in determining how to manage the program. However, without fully documenting its decision-making procedures for selecting and approving projects, the Corrosion Office cannot demonstrate how projects were selected and approved for the TCC program.

Corrosion Office officials provided data on the amount of funds spent on the TCC program for fiscal years 2008 through 2013, but in some cases the data were not readily available and were inconsistent for the same time frame. As a result, it is unclear what the Corrosion Office has spent on the TCC program. Section 2228 requires the Corrosion Office to include a description of the amount of funds used for the TCC program in its annual corrosion budget report to Congress. However, because the Corrosion Office does not track and maintain accurate records, it is unable to determine the amount of funds spent. In the absence of fully documented funding data that are readily available for examination, Corrosion Office officials cannot ensure that they will accurately account for and report TCC costs in the annual budget report to Congress.

DOD has set goals for the TCC program, but has not developed a process to transition demonstrated results from projects to military departments. According to the *DOD Corrosion Prevention and Mitigation Strategic Plan*, TCC program goals are to: (1) develop individuals with education, training, and experience who will form the future core of the technical community within DOD and private industry; and (2) produce solutions that will reduce the effect of corrosion on DOD infrastructure and weapon systems. To track the goal of developing people, the Corrosion Office cited, among other things, the research papers that have been produced as a result of the TCC program. Section 2228 requires that the Corrosion Office coordinate a research and development program that includes a plan for the transition of new corrosion-prevention technologies to the military departments. To track the goal to produce solutions that will reduce corrosion, the Corrosion Office monitors TCC projects' results; however, the office has not established a process to transition demonstrated results of the research projects to the military departments. Corrosion Office officials stated that it is difficult to transition results because outputs of TCC research are in the early stages of technology evolution and thus are not mature enough to be used by the military departments. Therefore, Corrosion Office officials acknowledge the need to establish a process to transition TCC results to the military departments. Until the Corrosion Office establishes a process to study and determine what, if any, TCC results could transition to the military departments, DOD will not be able to demonstrate the success of the TCC program and the extent to which TCC results are helping to prevent or mitigate corrosion.

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## Abbreviations

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| BAA | Broad Agency Announcement |
| Corrosion Executive | Corrosion Control and Prevention Executive |
| Corrosion Office | Office of Corrosion Policy and Oversight |
| DOD | Department of Defense |
| NCERCAMP | National Center for Education and Research on Corrosion and Material Performance |
| TCC | Technical Corrosion Collaboration |
| UCC | University Corrosion Collaboration |

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May 29, 2014

The Honorable Robert J. 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 spending an estimated $20.8 billion[1] annually to prevent and mitigate corrosion of all of its assets, including military equipment,[2] weapons, facilities, and other infrastructure.[3] 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 environment.[4] Corrosion affects military readiness by taking critical systems out of action and creating safety hazards. DOD implements several programs to help prevent and mitigate the costs of corrosion. To help identify technology or methods to prevent or mitigate corrosion, and educate personnel about corrosion prevention and mitigation, DOD funds research by universities and military research labs that participate in DOD's Technical Corrosion Collaboration (TCC) program, a research and development program.

[1]The $20.8 billion 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's corrosion costs.

[2]Military equipment includes all weapon systems, weapon platforms, vehicles, and munitions of DOD and the components of such items.

[3]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.

[4]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.

Congress has taken a series of legislative actions aimed at enhancing DOD's ability to effectively address corrosion prevention and mitigation, and to provide Congress with greater transparency over the department's corrosion-prevention and mitigation efforts. In 2002, Congress passed legislation—codified at Section 2228 of Title 10 of the United States Code—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.[5] According to Section 2228 and DOD Instruction 5000.67,[6] the Director of the Corrosion Office is responsible for the prevention and mitigation of corrosion of DOD equipment and infrastructure. The statute requires the Secretary of Defense to, among other things, implement a long-term strategy to reduce corrosion and the effects of corrosion on military equipment and infrastructure, including, among other things, the establishment of a coordinated research and development program for the prevention and mitigation of corrosion for new and existing military equipment and infrastructure that includes a plan to transition new corrosion-prevention technologies into the military departments' systems. Additionally, the statute requires the Secretary of Defense to annually submit, along with defense budget materials, a report to Congress on corrosion funding, including funding requirements for the coordinated research and development program, also known as TCC projects.[7] The Corrosion Office also coordinates DOD-wide corrosion-prevention activities such as operating the Corrosion Office website (hereafter

[5]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).

[6]In January 2008, the department first issued DOD Instruction 5000.67, *Prevention and Mitigation of Corrosion on DOD Military Equipment and Infrastructure*, which was revised and reissued with the same title in February 2010.

[7]TCC project examples include testing corrosion of materials in different environments and developing a training video or curriculum about corrosion prevention for use by universities and other entities.

referred to as other corrosion-prevention and mitigation activities),[8] and projects proposed by the military departments such as testing a protective covering for cable connectors on a missile system (hereafter referred to as military demonstration projects).[9]

In 2013, Congress amended Section 2228 of Title 10 of the United States Code to require the Corrosion Office to include the amount it spent on TCC projects in its annual corrosion budget report.[10] From fiscal year 2008 through fiscal year 2013, according to Corrosion Office officials, the office has provided approximately $88.3 million to universities and military research labs to support the TCC program.[11] In its fiscal year 2014 annual corrosion budget report to Congress, the Corrosion Office requested $9.1 million, including $1.4 million for the TCC program.[12]

We were requested to review the TCC program and its goals. This report addresses to what extent DOD (1) has established procedures for managing the TCC program, (2) can provide information on the amount of funds spent on the program since inception, and (3) has established

[8]Among DOD's corrosion-prevention and mitigation activities are conducting corrosion studies and operating DOD's corrosion website. The Corrosion Office identifies these as "required activities" that are essential to the success and institutionalization of the corrosion program within DOD. According to Corrosion Office officials, prior to the 2013 annual budget report to Congress on corrosion funding, DOD grouped the TCC program, including its projects, under the corrosion-prevention and mitigation activities category.

[9]The projects are military department technology-demonstration projects for both equipment and infrastructure that meet the Corrosion Office's criteria for funding. The projects are jointly funded by the Corrosion Office and the military departments. See GAO, *Defense Management: DOD Should Enhance Oversight of Equipment-Related Corrosion Projects*, GAO-13-661 (Washington, D.C.: Sept. 9, 2013); and *Defense Infrastructure: DOD Should Improve Reporting and Communication on Its Corrosion Prevention and Control Activities*, GAO-13-270 (Washington, D.C.: May 31, 2013).

[10]In January 2013, the 2013 National Defense Authorization Act amended Section 2228(e) for Title 10, United States Code to add a requirement for a description of specific amount of funds used for the TCC program and other corrosion-related activities.

[11]TCC funding amounts for fiscal years 2008 to 2013 were not available for us to independently verify because prior to fiscal year 2013, Congress did not require the Corrosion Office to separate TCC funding in its budget report. In addition, the Corrosion Office was only required to report current and 1-year-prior funding.

[12]*Department of Defense Report to Congress on Corrosion Policy and Oversight Budget Materials for Fiscal Year 2014* (February 2013).

goals for the TCC program and transitioned demonstrated results from projects to the military departments.

To determine the extent to which DOD has developed procedures for managing the TCC program, we reviewed DOD's guidance—the 2014 *DOD Corrosion Prevention and Mitigation Strategic Plan*.[13] We also reviewed the TCC Definitions Document to identify DOD's procedures for selecting and approving TCC projects. We compared DOD's procedures for managing the TCC program with criteria in federal standards for internal control.[14] We obtained information from universities participating in the TCC program regarding projects funded by the Corrosion Office for fiscal years 2008 through 2013. We selected a nongeneralizable sample[15] of projects for further review. Specifically, we chose seven projects conducted by the five universities that received the most funding from the Corrosion Office. We used a semistructured interview tool to obtain information from project managers at selected universities to further understand the Corrosion Office's procedures and their implementation, and to identify successes and challenges, if any. We requested and reviewed project-related documents, such as white papers,[16] formal project proposals,[17] purchase requests, cooperative agreements, grants,

[13]Corrosion Policy and Oversight Office, Department of Defense, *DOD Corrosion Prevention and Mitigation Strategic Plan*. The strategic plan was first issued in November 2004, and was subsequently revised in 2007, 2008, 2009, 2011, and 2014.

[14]GAO, *Standards for Internal Control in the Federal Government*, GAO/AIMD-00-21.3.1 (Washington, D.C.: November 1999). Internal control is an integral component of an organization's management that provides reasonable assurance that the following objectives are being achieved: effectiveness and efficiency of operations, reliability of financial reporting, and compliance with applicable laws and regulations.

[15]Our nongeneralizable sample-selection methodology ensured selection of a variety of projects over various years and types of projects. Results from nongeneralizable samples cannot be used to make inferences about a population, because in a nongeneralizable sample some elements of the population being studied have no chance or an unknown chance of being selected as part of the sample. See app. I for more details on the sample-selection methodology.

[16]According to Corrosion Office officials, the white papers briefly explain how potential TCC participants would address military needs to prevent or mitigate corrosion. The papers include background information about the project, technical approach for conducting the project, and collaborating entities, such as universities.

[17]Formal proposals are more detailed than white papers. The proposals include information such as the technical issue to be addressed and the objective for the project, and describe university and military collaborations.

and contracts to determine how projects were selected, approved, and funded. We also interviewed officials from the Corrosion Office, as well as representatives from each of the military departments to understand how the procedures were implemented.

To determine the extent to which DOD can provide information on the amount of funds it spent on the TCC program, we reviewed financial records such as documents that show funds the Corrosion Office provided to the universities and military research labs, and Military Interdepartmental Purchase Requests.[18] We compared the Corrosion Office's funding data with the purchase requests for fiscal years 2009 through 2013 to identify any differences. We also examined Section 2228 of Title 10 of the United States Code that requires the Corrosion Office to submit an annual corrosion budget report that includes funds used for the TCC program. We further interviewed Corrosion Office officials to discuss the amount of funds DOD spent on TCC projects. Although we determined that data from the Corrosion Office were sufficiently reliable for selecting a nongeneralizable sample of universities and projects for further review, we found some funding data discrepancies and documentation issues, which we discuss in this report and make recommendations for corrective action.

To determine the extent to which DOD established goals for TCC and transitioned demonstrated results from projects to the military departments, we reviewed DOD documents, such as DOD's TCC Definitions Document and the 2014 *DOD Corrosion Prevention and Mitigation Strategic Plan,* to identify goals of the TCC program, as well as any successes to date cited by DOD. We also examined Section 2228 of Title 10 of the United States Code that requires the Secretary of Defense to develop and implement a long-term strategy that includes a plan to transition new corrosion-prevention technologies to military departments. We reviewed status reports obtained from Corrosion Office officials. We also attended the 2013 Annual TCC Review to obtain information on the status of projects from TCC participants, including researchers at universities and military research labs. We further interviewed corrosion-

[18]The Military Interdepartmental Purchase Request is a form used by a DOD requesting agency, such as the U.S. Air Force Academy, to place an order for, among other things, services, such as conducting research, with entities including military academic institutions.

program officials to discuss the status of DOD's efforts to transition project results to military departments.

We conducted this performance audit from April 2013 to May 2014 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.

## Background

In 2011, according to Corrosion Office officials, the Corrosion Office established the TCC program, a research and development program that is the successor to the University Corrosion Collaboration (UCC) pilot program, established in 2008. The TCC program builds on efforts of the UCC pilot program by expanding and formalizing the role of military personnel, such as representatives at military research labs, in problem identification, research project development, project monitoring, and product transition.[19] DOD relies, in part, on researchers at universities and military research labs to identify, pursue, and develop new technologies that address the prevention or mitigation of corrosion affecting military assets. The Corrosion Office oversees the TCC program, advocates for TCC funding as part of the President's annual budget, funds TCC projects based on available budget, convenes and chairs the panel that selects projects, and regularly communicates progress and status of the TCC program to the Corrosion Control and Prevention Executives (hereafter referred to as Corrosion Executives).[20] The Corrosion Office's 2014 *DOD Corrosion Prevention and Mitigation*

[19]According to corrosion-program officials, they did not conduct an analysis to assess the merit of going from a pilot to a full program. They indicated that the UCC pilot program naturally evolved into the TCC pilot program in 2011, and the pilot ended in June 2013, creating a formal TCC program. The UCC pilot program was a national partnership of faculty and students from five universities—University of Southern Mississippi, University of Virginia, University of Hawaii, Ohio State University, and University of Akron—working with representatives from military research labs on an ad hoc basis.

[20]Section 903 of the Duncan Hunter National Defense Authorization Act for Fiscal Year 2009, Pub. L. No. 110-417 (2008), required the Departments of the Army, Navy, and Air Force to each designate a Corrosion Executive to be the senior official in each military department with responsibility for coordinating department-level program activities to prevent or control corrosion.

*Strategic Plan* includes an objective to increase the number of people educated in corrosion engineering and management. With regard to the TCC program, the strategic plan cites the education goal of producing individuals with education and skills that will form the future core of DOD's corrosion community.[21]

The current TCC program includes 15 universities—civilian institutions and military academic institutions to conduct projects in corrosion issues[22]—and nine military research labs that support the universities. Appendix II shows the current list of TCC-affiliated universities and labs, as of February 2014. As of February 2014, according to the Corrosion Office, it has provided funding to universities and labs for 126 projects since the program began in 2008.

The universities associated with the TCC program are responsible for, among other things, assisting in the identification of research and development opportunities; conducting TCC projects in collaboration with other universities and DOD technical personnel at the military research labs; and producing products that can be transitioned to systems development, or prototype demonstration.[23] Additionally, military research labs are responsible for, among other things, identifying areas of research and development that can mitigate current DOD corrosion problems or address future problems; working with the universities participating in the TCC program to develop sound and focused research and development projects; and monitoring and guiding work in progress at the universities.

[21]According to a 2001 National Academy of Sciences study, there has been a lack of in-house corrosion experts.

[22]The term "university" includes civilian institutions and military academic institutions. Civilian institutions include public universities, a private university, and a commercial organization that conduct research. SAFE Inc. is the commercial organization that, among other things, conducts TCC projects for the U.S. Air Force Academy. Military academic institutions include military service academies (i.e., the U.S. Military Academy at West Point; the Naval Postgraduate School; and the Air Force Institute of Technology, a graduate school).

[23]The evolution of technology comprises four main phases: (1) Understanding the concept/obtaining a better understanding of the concept (i.e., research), (2) Technology Product Development, (3) Technology Demonstration, and (4) Implementation. The TCC program falls under the first phase and the military demonstration projects, which we previously reported on, fall under phase 3. Military demonstration projects differ from the TCC projects because they are more mature than TCC projects.

The Corrosion Office oversees processes to select, approve, and fund projects within the TCC program.

- **Selection**: According to the Corrosion Office, the office convened a panel of experts chaired by the Deputy Director of the Corrosion Office and including personnel from the Corrosion Office and the Director of the research center at the U.S. Air Force Academy. The panel of experts evaluates civilian institutions' white papers and more-detailed formal proposals to select institutions' project proposals for final approval by the Corrosion Office. The Corrosion Office directly evaluates proposals submitted by military academic institutions and labs to select entities for approval.
- **Approval**: The Corrosion Office's Deputy Director approves the final list of TCC projects to be conducted by civilian institutions and military academic institutions, and the final list of military research labs that support the institutions.
- **Funding**: When civilian institutions' proposals are approved, the Corrosion Office provides funds—primarily using Research, Development, Test, and Evaluation funds, and some Operation and Maintenance funds—to the contracting division within the U.S. Air Force Academy, which pays the researchers at the civilian institutions to conduct research. Researchers at the military academic institutions and military research labs receive funding directly from the Corrosion Office.

The Corrosion Office monitors the projects through, among other things, TCC annual reviews and status reports. Corrosion Office officials stated that when a university completes its research, university project managers send a final report about the results to the Corrosion Office.

## DOD Has Procedures for Managing Some Aspects of the TCC Program, but Lacks Documented Procedures for Approving TCC Projects

DOD's Corrosion Office has established procedures for managing some aspects of the TCC program, but it has not documented procedures for approving TCC projects.[24] Specifically, for civilian institutions, the Corrosion Office has documented procedures for selecting projects, but it has not documented procedures for approving these projects. Additionally, the Corrosion Office has not documented procedures for selecting and approving projects for military academic institutions that conduct the research and military research labs that support civilian and military institutions. The Corrosion Office revised its *DOD Corrosion Prevention and Mitigation Strategic Plan*[25] in January 2014 to include the minimum requirements and other factors to consider when selecting projects to be funded under the TCC program.[26] Prior to the revised 2014 strategic plan, according to Corrosion Office officials, they included the process for selecting projects in the TCC Definitions Document,[27] which was created and shared with the participants of the TCC program in 2010. Corrosion Office officials stated that they updated the contents of the definitions document and included the information in the revised strategic plan. However, we found that procedures for managing key aspects of the TCC program, such as procedures for selecting and

[24]For purposes of this report, we refer to the TCC procedures as selection and approval procedures. However, Corrosion Office officials stated that they include the procedures associated with approving projects by the office under the procedures associated with selecting projects.

[25]Corrosion Policy and Oversight Office, Department of Defense, *DOD Corrosion Prevention and Mitigation Strategic Plan*. The stated purpose of the 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.

[26]According to the 2014 *DOD Corrosion Prevention and Mitigation Strategic Plan*, the minimum requirements for a research project to be funded under the TCC program include, among other things: (1) linkage to the identified advanced development opportunities and to the cost of corrosion and/or materiel availability studies; (2) a formalized collaboration agreement between a minimum of two TCC member universities and one government activity; and (3) inclusion of a student or students who are eligible to work for DOD following graduation.

[27]The TCC Definitions Document defines, among other things, the (1) TCC concept; (2) TCC goals; (3) TCC participants' roles and responsibilities; and (4) TCC processes for, among other things: (a) identifying advanced development opportunities; (b) selecting projects to be funded under the TCC program, including linkage to the Science and Technology roadmap, which is a framework for identifying the research needed to prevent and mitigate corrosion of military assets, according to Corrosion Office officials; (c) monitoring projects; and (d) identifying products to be delivered under the program.

approving TCC projects, are not fully documented in the 2014 revised strategic plan or other documentation, such as management directives, administrative policies, or operating manuals for some projects. According to the *Standards for Internal Control in the Federal Government*, all transactions and other significant events, such as the procedures for managing the TCC program, need to be clearly documented and readily available for examination. As part of internal control standards, documentation should appear in management directives, administrative policies, or operating manuals, and may be in paper or electronic form. In addition, these standards state that all documentation and records should be properly managed and maintained.

For civilian institutions, Corrosion Office officials stated that they use the U.S. Air Force Academy's documented process, called the Broad Agency Announcement (hereafter referred to as the BAA process), which includes written instructions or procedures for selecting projects, but the office has not documented how the Deputy Director of the Corrosion Office approves the final list of projects.[28] These officials stated that under the BAA process, the U.S. Air Force Academy publicly announces the Corrosion Office's intent to fund TCC projects that focus on researching technologies to help prevent and mitigate corrosion affecting military assets. Corrosion Office officials stated that they use the BAA process to review and evaluate white papers and formal proposals. According to representatives from civilian institutions, they provide white papers and formal proposals in response to the BAA. A Corrosion Office official stated that procedures associated with selecting projects, such as identifying that the Corrosion Office will convene and chair the project selection panel, are partially documented in the TCC Definitions Document. Corrosion Office officials also stated that their 2014 strategic plan identifies that the office will convene and chair the panel. According to Corrosion Office officials, to review the white papers, the Corrosion Office convenes a panel of experts, and the panel uses requirements identified in the BAA to evaluate which civilian institutions will be notified

[28]According to Corrosion Office officials, the U.S. Air Force Academy administers contracts to civilian institutions to conduct corrosion research because the Corrosion Office does not have the resources to administer the process to announce the need for corrosion-technology research.

to submit formal proposals.[29] These officials stated that the panel selects white papers for additional development, requests the civilian institutions to provide formal proposals, and evaluates formal proposals based on requirements published in the BAA. Specifically, the panel identifies which formal proposals will be considered for final approval by the Corrosion Office and sends the selected proposals to the Corrosion Office's Deputy Director for final approval. Once the projects are approved, according to agency officials, the Corrosion Office provides TCC funds to the U.S. Air Force Academy, which pays the researchers at the civilian institutions through cooperative agreements and grants.

For military academic institutions, Corrosion Office officials stated that they have established a process for selecting projects, which is identified in DOD's TCC Definitions Document and its 2014 strategic plan that include requirements and other factors to consider when selecting some TCC projects for approval. Officials stated that the requirements apply to both civilian institutions and military academic institutions. However, the Corrosion Office has not documented the type of information required from military academic institutions, including project proposals and steps taken by decision makers to select and approve projects. The Corrosion Office evaluates military proposals to select some projects for approval based on requirements identified in the definitions document and 2014 revised strategic plan. The Corrosion Office approves the final list of TCC projects based on the proposals it receives from the military academic institutions and provides funds directly to the researchers at the military academic institutions to conduct research. The Corrosion Office uses Military Interdepartmental Purchase Requests to transfer funds between the Corrosion Office and the military academic institutions.

For military research labs, the Corrosion Office described how it selects and approves the labs to, among other things, work with the civilian and military academic institutions participating in the TCC program to develop sound and focused research and development projects, and to monitor and guide work in progress at the civilian and military institutions.

[29]The selection official may consider the following program policy factors in the selection process: potential recipients that (1) collaborate with other potential recipients such as for-profit and non-profit organizations, and universities with research supported through the announcement/call; and (2) support and collaborate with a military service, as demonstrated by supporting documentation such as a 1-page letter of support, and expected collaboration from a representative of a military service.

However, the Corrosion Office has not documented procedures, such as steps taken by decision makers to select and approve the military research labs, in the Corrosion Office's documents or guidance, such as the strategic plan. According to Corrosion Office officials, they review information from the labs regarding an explanation of how the labs plan to assist the civilian and military institutions in conducting TCC projects and select the highest priority activities within the available budget. For example, according to a military research lab representative, it reviews the civilian institutions that participated in the program and their TCC efforts and indicates to the Corrosion Office which institutions it can best support. The Corrosion Office determines the final list of labs that will receive funding and provides funds directly to the researchers at the military research labs to pay for their participation in the TCC research. As previously stated, according to the *Standards for Internal Control in the Federal Government*, all transactions and other significant events, such as the procedures for managing the program, need to be clearly documented.

We found that the Corrosion Office has documented its procedures for selecting military demonstration projects in its 2014 strategic plan but has not fully documented its procedures for managing key aspects of the TCC program in keeping with federal standards for internal control. According to Corrosion Office officials, the procedures for some aspects of the TCC program are not documented because the program is still evolving and they would like flexibility to enable innovation in determining how to manage the program. Corrosion Office officials acknowledged that their procedures for selecting TCC projects could be included in their definitions document. Without fully documenting its decision-making procedures for selecting and approving projects, the Corrosion Office cannot demonstrate how projects were selected and approved for the TCC program.

## The Corrosion Office Lacks Readily Available and Consistent Documentation on the Amount of Funds Used for the TCC Program

Corrosion Office officials provided the amount of funds for the TCC program for fiscal years 2008 to 2013, but lacked readily available or consistent documentation to support some of the funding data. As a result, it is unclear what the Corrosion Office has spent on the TCC program. Section 2228 of Title 10 of the United States Code requires the Corrosion Office to include a description of the specific amount of funds used for the TCC program and other corrosion-prevention and mitigation activities (for the prior year) in its annual corrosion budget report. In addition, *Standards for Internal Controls in the Federal Government* state that agencies should clearly document transactions and other significant events and the documentation should be readily available for examination.[30] Also, federal internal control standards state that agencies should have accurate and timely recording of transactions and events. Specifically, we found that the Corrosion Office could not fully support or readily show documentation for some of the TCC funding data it provided us. For fiscal year 2008, Corrosion Office officials could not provide supporting documentation for the approximate $6.8 million that it reported spending on the TCC program in that year. Corrosion Office officials stated that they used a different financial management system in 2008 and did not maintain documents from that time frame. For fiscal years 2009 to 2013, we attempted to verify the office's funding data using the Military Interdepartmental Purchase Requests that the Corrosion Office uses to transfer TCC funding to the military institutions. However, some of the documentation the officials provided did not fully reconcile with the final funding data they provided. For example, purchase requests for fiscal years 2012 and 2013 showed amounts greater (by $1.3 million and $15,000, respectively) than the figures the Corrosion Office provided. According to the Corrosion Office, the purchase requests they provided may not fully document specific TCC funding because in some cases the purchase requests included funds for other corrosion efforts comingled with these funds. Further, officials said that one would have to review other supporting documents, such as statements of work, to isolate TCC funds.

Regarding the inconsistent funding amounts for the same time frame, in a prior GAO mandated review of the Corrosion Office's 2013 budget report, we obtained information from the Corrosion Office and found that it spent

[30] GAO/AIMD-00-21.3.1.

$69.5 million for the TCC program from fiscal years 2009 to 2012.[31] In May 2013 (at the beginning of our current review), the Corrosion Office briefed us that it spent $67.7 million on the TCC program for fiscal years 2009 through 2012. When we brought it to the office's attention that this figure differed, officials asked for additional time to verify their data. In February 2014, officials provided us a revised funding amount of $67.5 million for fiscal years 2009 through 2012, and in March 2014, they provided us a funding amount of $72 million for these same years. Overall, the difference from the first amount and the final amount is about $2.5 million for these same years. According to Corrosion Office officials, the funding amounts differed because prior to 2013, the office was not required to track and report TCC funds separately from other corrosion-related activity funds. The office also cited a lack of resources to track and maintain funding data when the program was initiated.

We also attempted to independently verify TCC funding by comparing the funding data the Corrosion Office provided us with data provided from a recipient of some of the funds. Specifically, we obtained funding information from a university that managed some projects that the Corrosion Office included in its TCC funding from fiscal years 2008 to 2012.[32] We found that some funding data did not match for these years. For example, for fiscal year 2010, the Corrosion Office indicated that it provided $6.3 million to the university for education projects, but the university presented documents showing that the Corrosion Office provided $6.4 million (a difference of about $70,000). When we brought this to the attention of Corrosion Office officials, they agreed to follow up with the university to reconcile the differences in the funds, but have not provided an explanation. Overall, we were unable to verify what the

[31]We documented the information in internal records, but did not cite the dollar amount in our final report. *See* 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).

[32]According to Corrosion Office officials, these education projects—known as National Center for Education and Research on Corrosion and Materials Performance (NCERCAMP) projects—were conducted at the University of Akron. NCERCAMP projects include research, training, and program integration activities. For fiscal years 2008 to 2013, all of the funds the Corrosion Office provided the university for NCERCAMP projects were accounted for as part of TCC funding. However, Corrosion Office officials stated that they have reconsidered how they account for these funds and for current and future budgets they plan to account for some NCERCAMP funds under other corrosion-prevention and mitigation activities.

Corrosion Office has spent on the TCC program. Without tracking and maintaining accurate records and fully documenting funding information that is readily available for examination, Corrosion Office officials cannot ensure that they accurately account for and report the TCC program costs in the annual budget report to Congress.

## DOD Has Set Goals for the TCC Program, but Lacks a Process to Address Its Requirement to Transition Demonstrated Project Results to Military Departments

### The Corrosion Office Has Established Two Goals for the TCC Program

DOD's Corrosion Office has established two goals for the TCC program, and has a process in place to monitor the results of the program. According to the 2014 *DOD Corrosion Prevention and Mitigation Strategic Plan*, TCC has the following goals: (1) develop individuals with education, training, and experience who will form the future core of the technical community within DOD and private industry that specializes in work on corrosion prevention or control; and (2) produce solutions (i.e., knowledge, technologies, processes, and materials) that tangibly reduce the effect of corrosion on DOD infrastructure and weapon systems.

### TCC Has Helped Support the Education of Individuals on Corrosion Issues

To address its goal of developing individuals through education, training, and experience, the Corrosion Office monitors TCC projects that include involving students in corrosion research. The TCC program provides students with the opportunity to pursue advanced education that will form the future core of the technical community within DOD and private industry that specializes in work on corrosion prevention or control. Corrosion Office officials track results and have cited the number of

students and research papers[33] that have been produced as a result of receiving TCC funds. The Corrosion Office cited these results as success stories. According to the Corrosion Office, as of January 2014, the TCC program has funded 64 graduate students, and 63 undergraduate students. In addition, TCC funding has resulted in 52 research articles. (App. III provides additional details of the number of graduates and research articles, by TCC participant). Corrosion Office officials stated that it is difficult to measure the success of research and purposely did not set target numbers for students or research papers because sheer numbers would not show the full extent of the benefits received from the number of students educated or the research papers published. We acknowledge that it can be difficult to measure the success of research. For example, we previously found that evaluating the effectiveness of research programs can be difficult and noted challenges, such as research results may take a long time and research may not achieve its intended results but can lead to unexpected discoveries that provide potentially more-interesting and valuable results.[34]

## The Corrosion Office Lacks a Process for Transitioning TCC's Demonstrated Project Results to the Military Departments

The Corrosion Office has established a research goal for producing solutions that tangibly reduce the effect of corrosion on DOD infrastructure and weapon systems; however, the office has not established a process for transitioning any results of the demonstrated research projects to the military departments. DOD Instruction 5000.67, which implements Section 2228 of Title 10 of the United States Code, establishes policy, assigns responsibilities, and provides guidance for corrosion prevention and control within DOD. The instruction requires the Corrosion Office to develop a long-term strategy for corrosion prevention and mitigation that, among other things, provides for a coordinated research and development program that includes the transition of new corrosion-prevention technologies to military departments. In addition, federal internal control standards state that agencies should establish procedures and mechanisms that enforce management's directives, such

[33]Officials also tracked success stories in terms of corrosion presentations made at conferences and the establishment of corrosion course curriculum.

[34]GAO, *America COMPETES Act: It Is Too Early to Evaluate Programs Long-Term Effectiveness, but Agencies Could Improve Reporting of High-Risk, High-Reward Research Priorities* GAO-11-127R (Washington, D.C.: Oct. 7, 2010).

as the process of adhering to requirements, which in this case is the requirement to transition TCC results to the military departments.

The Corrosion Office has a process to monitor that the contractual agreements of the TCC research projects are being accomplished. Specifically, according to Corrosion Office officials, the Corrosion Office, among other things, periodically tracks the status of the TCC projects.[35] However, the office's ultimate goal, officials stated, is to transition results of the demonstrated TCC projects, when possible, to the military departments. Corrosion Office officials defined success as the production of products or knowledge that can be used by the military departments as they develop and implement corrosion-control technologies within their services.[36] For example, officials cited one ongoing project as an example of a success story: the project has identified important information about a technique of using fasteners to accelerate corrosion during outdoor exposures.[37]Accelerated testing is an approach that expedites the corrosion of material or its properties and will allow officials to obtain more information from a given test time than would normally be possible. According to Corrosion Office officials, this project will provide information that the military departments can use as they design and conduct their future tests. However, the Corrosion Office does not have a process for how it will transition the results of this project to the military departments in accordance with the Section 2228 of Title 10 of the United States Code and DOD Instruction 5000.67.

The military departments' Corrosion Executives, who are assigned to be the principal points of contact on corrosion issues, stated that none of the results from TCC projects have transitioned to the military departments. While there are no specific examples of TCC program results that have transitioned to Air Force operational systems, the Air Force's Corrosion Executive stated there are cases where the results of TCC projects have revealed areas that the Air Force needs to further review, such as the

[35]The Corrosion Office tracks the status of the TCC projects through reports it calls "quad charts," which are provided periodically and contain information, including project description, accomplishments, applicability, anticipated work, accomplishments for the upcoming quarter, and challenges and lessons learned.

[36]The products are technologies, such as predictive models and new coating systems, or processes, such as new test techniques or methods for investigating corrosion.

[37]The name of the project is Acceleration of Corrosion Exposures for Coatings Evaluation.

effects of corrosion on structural integrity. A spokesman for the Army's Corrosion Executive stated that the Army is unaware of any TCC project that has been incorporated into any specific military system or that has specifically affected the Army's corrosion-prevention and control performance. The Navy's Corrosion Executive stated it is anticipated that at the conclusion of TCC projects, military research labs will continue development of any resulting technologies (to support future platform demonstration, validation, and implementation). However, the Navy does not expect that the technology from TCC's efforts will be transitioned directly to the Navy's use but rather to the Technology Product Development phase of technology evolution. Further, the Navy considers knowledge and technical expertise to be the key outputs of TCC efforts, and sees the development of knowledge and technology as long-term efforts. Thus, although the Navy expects tangible benefits from TCC, the Navy believes that it may be too early to visualize potential benefits.

Corrosion Office officials stated that it is difficult to transition results of the TCC projects to the military departments because outputs of TCC research are in the early stages of technology evolution and thus are not mature enough to be used by the military departments. Therefore, Corrosion Office officials acknowledged the need to establish a process to transition TCC results to the military departments. Until the Corrosion Office establishes a process to study and determine what, if any, TCC results could transition to the military departments, DOD will not be able to demonstrate the success of the TCC program and the extent to which TCC results are helping to prevent or mitigate corrosion.

## Conclusions

To help reduce the billions of dollars in annual costs from the effects of corrosion on DOD's infrastructure and military equipment, the department's Corrosion Office has been collaborating with universities and military research labs on research for solutions and to educate personnel about corrosion. The Corrosion Office has provided an overview of its management process, including minimum requirements for selecting TCC projects, and uses the Broad Agency Announcement process to select some TCC projects; however, officials have not fully documented some key procedures for selecting and approving projects for funding. Documenting this information would be consistent with *Standards for Internal Control in the Federal Government*, which states that all transactions and other significant events, such as the procedures for managing a program, need to be clearly documented. Without fully documenting its decision-making procedures for selecting and approving projects, the Corrosion Office cannot demonstrate how projects were

selected and approved for the TCC program. Internal control standards also state that agencies should clearly document transactions and documentation should be readily available for examination. Section 2228 of Title 10 of the United States Code also requires that DOD annually report the amount of funds used for the TCC program to Congress. We determined that the Corrosion Office did not maintain accurate records, or have supporting documents readily available for examination. Without tracking and maintaining accurate records and fully documenting funding information that is readily available for examination, Corrosion Office officials cannot ensure that they accurately account for and report the TCC program costs in the annual budget report to Congress.

DOD is continuing to support millions of dollars worth of corrosion-related research at universities and labs in anticipation of eventually transitioning the results of projects to benefit the military departments. The Corrosion Office has established a TCC goal to produce solutions that will tangibly reduce the effect of corrosion on DOD systems. However, DOD's Corrosion Office has not established a process for transitioning TCC program results to benefit the military departments, which is required by Section 2228. Without the establishment of a process for transitioning results to the military departments, DOD will not be able to further demonstrate the success of the TCC program and the extent to which TCC results are helping to prevent or mitigate corrosion.

## Recommendations for Executive Action

We are making five recommendations to help ensure that DOD strengthens the management of the TCC program.

To enhance DOD's ability to make consistent and informed decisions in its management of the TCC program in accordance with internal control standards, we recommend that the Under Secretary of Defense for Acquisition, Technology and Logistics require the Director, Corrosion Policy and Oversight Office, to

- document the procedures for approving projects within the TCC program for civilian institutions;
- document the procedures for selecting and approving projects within the TCC program for military academic institutions;
- document the procedures for selecting and approving military research labs supporting civilian and military institutions in conducting projects within the TCC program; and

- track and maintain accurate records that include amounts of funds used for the TCC program, and have them readily available for examination to ensure that funding data will be accurately accounted for and reported in future reports, such as the annual budget report to Congress.

To better ensure that DOD can demonstrate the success of the TCC program and the extent to which TCC results will help to prevent or mitigate corrosion, we recommend that the Under Secretary of Defense for Acquisition, Technology and Logistics require the Director, Corrosion Policy and Oversight Office, to establish a process for transitioning demonstrated results of TCC projects to the military departments as required by the Section 2228 of Title 10 of the United States Code.

## Agency Comments and Our Evaluation

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

DOD partially concurred with our third recommendation that the Director, Corrosion Policy and Oversight Office, document the procedures for selecting and approving military research labs supporting civilian and military institutions in conducting projects within the TCC program. DOD stated that the *DOD Corrosion Prevention and Mitigation Strategic Plan* adequately documents the procedure for selecting and approving military research labs that support projects conducted by civilian and military institutions within the TCC program, but agreed to add additional details to its documentation. DOD also stated that the strategic plan notes that it will fund projects based on available budget, and funding will be provided to both military research labs and universities. However, we do not agree that this information represents documentation for selecting and approving military research labs, as we have recommended. As we noted in our report, we found that the 2014 strategic plan and TCC Definitions Document provide some information about the requirements and factors for selecting projects, but the documents do not mention the steps taken by decision makers to select and approve the military research labs. Although DOD's response agreed to add details to its 2014 strategic plan, it did not specify what type of information will be added. Thus, we maintain that DOD could enhance its oversight of corrosion projects by documenting how it selects and then approves military research labs supporting civilian and military institutions. Additionally, documenting these procedures would help ensure that the Corrosion Office's leaders

consistently follow procedures for selecting and approving labs that support the institutions within the TCC program.

DOD partially concurred with our fourth recommendation that the Director, Corrosion Policy and Oversight Office, track and maintain accurate records that include amounts of funds used for the TCC program, and have them readily available for examination to ensure the funding data will be accurately accounted for and reported in future reports, such as the annual budget report to Congress. DOD stated that GAO was provided a complete and accurate set of financial records during the course of this engagement, but DOD acknowledged, in its comments and during the review, that there was initially some inconsistency in financial reporting. DOD cited the following reasons for inconsistent financial reporting: (1) some projects funded early in the program, under the University Corrosion Collaboration program, would not be considered under the current TCC program; and (2) in 2013, Congress required the Corrosion Office to call out funding for research opportunities separately from activity requirements and project opportunities. Further, in its response, DOD stated that it has now implemented internal controls to identify and document budget categories for each financial transaction executed, which it says will improve timeliness of reporting. In effect, this would meet the intent of our recommendation, if implemented. However, the reasons that DOD cited above, which we also noted in our report, do not negate the need for DOD to track and maintain accurate funding information. We maintain that DOD should track and maintain accurate records that include amounts of funds used for the TCC program, and have them readily available for examination to ensure the funding data will be accurately accounted for and reported in future reports, such as the annual budget report to Congress.

DOD did not concur with our first and second recommendations that the Director, Corrosion Policy and Oversight Office, document the procedures for approving projects for civilian institutions, and for selecting and approving projects for military academic institutions. In its response, DOD stated that the process is adequately documented in the *DOD Corrosion Prevention and Mitigation Strategic Plan* and TCC Definitions Document. DOD noted that the plan and definitions document (1) provide five primary and six secondary project-selection requirements, and (2) state that the Corrosion Office will convene and chair the project-selection panel. Additionally, DOD noted that it did not make a distinction in the documents regarding the type of institution (civilian or military) because the requirements are applicable across the TCC program. We agree and noted in our report that the TCC Definitions Document and its 2014

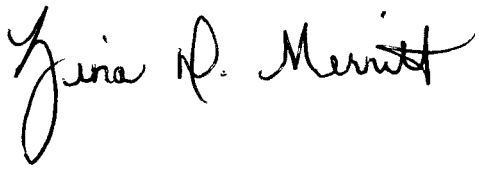
strategic plan include requirements (i.e., primary requirements) and other factors to consider (i.e., secondary requirements) when selecting some TCC projects. Although DOD states these requirements in its definitions document and strategic plan, it has not documented how it applies these requirements to approve projects for civilian institutions, and to select and approve projects for military academic institutions. The selection of projects is partially documented for civilian institutions (i.e., a panel convenes). However, during our discussions with officials, they acknowledged that a panel was not involved in the procedures for selecting and approving military academic institutions. Instead, the Deputy Director makes selection and approval decisions, but these procedures are not documented. We maintain that DOD could enhance its oversight of corrosion projects by documenting how it approves projects for civilian institutions and selects and approves TCC projects for military academic institutions. Additionally, documenting these procedures would help ensure that the Corrosion Office's leaders consistently follow procedures for approving projects for the civilian institutions, and for selecting and approving projects for military academic institutions.

DOD did not concur with our fifth recommendation that the Director, Corrosion Policy and Oversight Office, establish a process for transitioning demonstrated results of TCC projects to the military departments as required by Section 2228 of Title 10 of the United States Code. In its response, DOD stated that the process for transitioning demonstrated results of TCC projects to the military departments is appropriately developed and documented in the *DOD Corrosion Prevention and Mitigation Strategic Plan* and the TCC Definitions Document. DOD also stated that the TCC program is specifically designed to improve the probability of technology transition by ensuring early and close collaboration between the research institutions and the military department laboratories. Additionally, DOD stated that the *DOD Corrosion Prevention and Mitigation Strategic Plan* describes this collaborative effort. Specifically, a figure within the plan illustrates that as the research matures to the "System Development/Prototype Demonstration" phase, military department personnel resume the primary role in transitioning the technology to their respective departments with the goal being implementation of the technology. We noted in our report that DOD Instruction 5000.67, which implements Section 2228 of Title 10 of the United States Code, requires the Corrosion Office to develop a long-term strategy for corrosion prevention and mitigation that, among other things, provides for a coordinated research and development program that includes the transition of new corrosion-prevention technologies to the military departments. However, we did not identify a

process for transitioning project results to the military departments in DOD documents, such as its strategic plan, which states that the project results should transition to the military departments. Further, we also found that the figure referenced does not illustrate a process for how the Corrosion Office transitions project results to the military departments but shows, as Corrosion Office officials stated, the collaborative efforts of the parties involved in the TCC program. We also noted in our report that Corrosion Office officials stated that it is difficult to transition results of the TCC projects to the military departments because outputs of TCC research are in the early stages of technology evolution and thus are not mature enough to be used by the military departments. Therefore, Corrosion Office officials acknowledged the need to establish a process to transition TCC results to the military departments. Furthermore, military departments' Corrosion Executives, who are assigned to be the principal points of contact on corrosion issues, stated that none of the results from TCC projects have transitioned to the military departments. We maintain that the Corrosion Office should establish a process for transitioning demonstrated results of TCC projects to the military departments to allow the office to demonstrate the success of the TCC program and the extent to which the program results will help prevent or mitigate corrosion.

We are sending copies of this report to appropriate congressional committees; the Secretary of Defense; the Secretaries of the Army, Navy, and Air Force and the Commandant of the Marine Corps; the Director of the DOD Office of Corrosion Policy and Oversight; and other interested parties. In addition, the report is available at no charge on the GAO website at http://www.gao.gov/.

If you or your staff have any questions about this report, please contact me at (202) 512-5257 or merrittz@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made contributions to this report are listed in appendix V.



Zina D. Merritt
Director
Defense Capabilities and Management

# Appendix I: Scope and Methodology

To determine the extent to which the Department of Defense (DOD) has developed procedures for managing the Technical Corrosion Collaboration (TCC) program, we reviewed DOD's guidance—the 2014 *DOD Corrosion Prevention and Mitigation Strategic Plan*.[1] We also reviewed the TCC Definitions Document to identify DOD's procedures for selecting and approving TCC projects. We compared DOD's procedures for managing the TCC program with criteria in federal standards for internal control.[2] We obtained information from universities participating in the TCC program regarding projects funded by the Office of Corrosion Policy and Oversight (hereafter referred to as the Corrosion Office) for fiscal years 2008 through 2013. We selected a nongeneralizable sample[3] of projects for further review. Specifically, we chose seven projects conducted by the five universities that received the most funding from the Corrosion Office. We determined that funding data from the Corrosion Office were sufficiently reliable for selecting a nongeneralizable sample of universities and projects for further review. The projects we reviewed were research projects that included examples of university project managers working with students to test corrosion of materials in different environments. We did not review the universities' and other entities' management of the corrosion projects. We used a semistructured interview tool to obtain information from project managers at the selected universities to further understand the Corrosion Office's procedures and their implementation, and to identify successes and challenges, if any.

[1]Corrosion Policy and Oversight Office, Department of Defense, *DOD Corrosion Prevention and Mitigation Strategic Plan*. The strategic plan was first issued in November 2004, and was subsequently revised in 2007, 2008, 2009, 2011, and 2014.

[2]GAO, *Standards for Internal Control in the Federal Government*, GAO/AIMD-00-21.3.1 (Washington, D.C.: November 1999). Internal control is an integral component of an organization's management that provides reasonable assurance that the following objectives are being achieved: effectiveness and efficiency of operations, reliability of financial reporting, and compliance with applicable laws and regulations.

[3]Our nongeneralizable sample-selection methodology ensured selection of a variety of projects over various years and types of projects. Results from nongeneralizable samples cannot be used to make inferences about a population, because in a nongeneralizable sample some elements of the population being studied have no chance or an unknown chance of being selected as part of the sample.

We requested and reviewed project-related documents, such as white papers,[4] formal project proposals,[5] purchase requests, cooperative agreements, grants, and contracts to determine how projects were selected, approved, and funded. We also interviewed officials from the Corrosion Office, as well as representatives from each of the military departments, to understand how the procedures were implemented.

To determine the extent to which DOD can provide information on the amount of funds it spent on the TCC program, we reviewed financial records such as documents that show funds the Corrosion Office provided to the universities and military research labs, and Military Interdepartmental Purchase Requests.[6] We compared the Corrosion Office's funding data with the purchase requests for fiscal years 2009 through 2013 to identify any differences. We also examined Section 2228 of Title 10 of the United States Code, which requires the Corrosion Office to submit an annual corrosion budget report that includes funds used for the TCC program. We further interviewed Corrosion Office officials to discuss the amount of funds DOD spent on TCC projects. Although we determined that data from the Corrosion Office were sufficiently reliable for selecting a nongeneralizable sample of universities and projects for further review, we found some funding data discrepancies and documentation issues, which we discuss in this report and make recommendations for corrective action.

To determine the extent to which DOD established goals for TCC and transitioned demonstrated results from projects to the military departments, we reviewed DOD documents, such as DOD's TCC Definitions Document and the 2014 *DOD Corrosion Prevention and Mitigation Strategic Plan* to identify goals of the TCC program, as well as

[4]According to Corrosion Office officials, the white papers briefly explain how potential TCC participants would address military needs to prevent or mitigate corrosion. The papers include background information about the project, the technical approach for conducting the project, and collaborating entities, such as universities.

[5]Formal proposals are more detailed than white papers. The proposals include information such as the technical issue to be addressed and the objective for the project, and describe university and military collaborations.

[6]The Military Interdepartmental Purchase Request is a form used by a DOD requesting agency, such as the U.S. Air Force Academy, to place an order for, among other things, services, such as conducting research, with entities, including military academic institutions.

any successes to date cited by DOD. We also examined Section 2228 of Title 10 of the United States Code, which requires the Secretary of Defense to develop and implement a long-term strategy that includes a plan to transition new corrosion-prevention technologies to military departments. We reviewed status reports obtained from Corrosion Office officials. We also attended the 2013 Annual TCC Review to obtain information on the status of projects from TCC participants, including researchers at universities and military research labs. We further interviewed corrosion-program officials to discuss the status of DOD's efforts to transition project results to military departments.

We visited or contacted the following offices during our review. Unless otherwise specified, these organizations are located in or near Washington, D.C.

**Department of Defense**

- Office of Corrosion Policy and Oversight

**Air Force**

- Air Force Corrosion Control and Prevention Executive
- U.S. Air Force Academy, Colorado
- Air Force Institute of Technology, Wright-Patterson Air Force Base, Ohio

**Army**

- Army Corrosion Control and Prevention Executive
- Army Construction Engineering Research Laboratory, Champaign, Illinois
- Army Research Laboratory, Aberdeen Proving Ground, Maryland

**Marine Corps / Navy**

- Navy Corrosion Control and Prevention Executive
- U.S. Naval Academy
- Naval Postgraduate School, Monterey, California
- Navy Research Laboratory

### Civilian Institutions

- University of Virginia, Charlottesville, Virginia
- University of Akron, Akron, Ohio
- University of Southern Mississippi, Hattiesburg, Mississippi
- Ohio State University, Columbus, Ohio
- University of Hawaii, Honolulu, Hawaii
- SAFE, Inc., Monument, Colorado

We conducted this performance audit from April 2013 to May 2014 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.

# Appendix II: Current List of Technical Corrosion Collaboration (TCC)–Affiliated Universities and Labs, as of February 2014

**Universities:**[1] **Civilian institutions**

- University of Akron
- University of Southern Mississippi
- Ohio State University
- University of Virginia
- University of Hawaii
- Pennsylvania State University
- North Dakota State University
- SAFE, Inc.
- John Hopkins University

**Universities: Military academic institutions**

- U.S. Air Force Academy
- Air Force Institute of Technology
- Naval Postgraduate School
- U.S. Naval Academy
- U.S. Military Academy at West Point
- U.S. Coast Guard Academy

**Military research labs**

- U.S. Army Construction Engineering Research Laboratory
- U.S. Army Research Laboratory
- U.S. Army Aviation and Missile Research Development and Engineering Center

[1]The term "universities" includes civilian institutions and military academic institutions. Civilian institutions include public universities, a private university, and a commercial organization that conduct research. SAFE Inc. is the commercial organization that, among other things, conducts TCC projects for the U.S. Air Force Academy. Military academic institutions include military service academies (i.e., the U.S. Military Academy at West Point; the Naval Postgraduate School; and the Air Force Institute of Technology, a graduate school).

- U.S. Army Armament Research, Development and Engineering Center
- U.S. Air Force Research Laboratory
- U.S. Naval Research Laboratory
- Naval Air Systems Command
- Naval Surface Warfare Center Carderock Division
- Naval Facilities Engineering and Expeditionary Warfare Center

# Appendix III: Number of Students and Research Articles Produced as a Result of Technical Corrosion Collaboration (TCC) Program Funding, as of January 2014

| TCC program participants (year initial funding received) | Number of graduate[a] students who received TCC funding | Number of undergraduate[b] students who received TCC funding | Number of research articles produced by recipients of TCC funding |
|---|---|---|---|
| Air Force Institute of Technology (2012) | 1 | 0 | 2 |
| U.S. Naval Academy (2012) | 0 | 2 | 0 |
| SAFE, Inc. (2009) | 5 | 0 | 9 |
| U.S. Air Force Academy (2011) | 0 | 22 | 0 |
| Ohio State University (2008) | 20 | 5 | 8 |
| University of Virginia (2008) | 16 | 5 | 16 |
| University of Hawaii (2008) | 3 | 5 | 2 |
| University of Southern Mississippi (2008) | 10 | 9 | 10 |
| University of Akron (2008) | 9 | 15 | 5 |
| **Total** | **64** | **63** | **52** |

Source: GAO analysis of Office of Corrosion Policy and Oversight data.

Notes: Corrosion Office officials provided other examples produced as a result of TCC funding, which they cite as success stories, such as corrosion presentations made at conferences and the establishment of corrosion course curriculum at some learning institutions. For example, the University of Akron currently has an additional 60 students who are pursuing a corrosion engineering degree.

[a]Graduate students' degrees are more corrosion-focused than undergraduate students' degrees. For example, they may be obtaining a "Materials Science" degree.

[b]Undergraduate students are pursing degrees other than corrosion. The University of Akron is the only university that has an undergraduate corrosion degree program.

# Appendix IV: Comments from the Department of Defense

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

ACQUISITION, TECHNOLOGY AND LOGISTICS

MAY 07 2014

Ms. Zina Merritt
Director, Defense Capabilities and Management
U.S. Government Accountability Office
441 G Street, N.W.
Washington, DC 20548

Dear Ms. Merritt:

This is the Department of Defense (DoD) response to the GAO Draft Report, GAO-14-437, "DEFENSE RESEARCH: Improved Management of DOD's Technical Corrosion Collaboration Program Needed," dated April 24, 2014 (GAO Code 351814). Detailed comments on the report recommendations are enclosed.

Sincerely,

Daniel J. Dunmire
Director,
DoD Corrosion Policy and Oversight

Enclosure:
As stated

**GAO Draft Report Dated APRIL 24, 2014**
**GAO-14-437 (GAO CODE 351814)**

**"DEFENSE RESEARCH: IMPROVED MANAGEMENT OF DOD'S TECHNICAL CORROSION COLLABORATION PROGRAM NEEDED"**

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

**RECOMMENDATION 1**: The GAO recommends that the Under Secretary of Defense for Acquisition, Technology and Logistics require the Director, Corrosion Policy and Oversight Office to document the procedures for approving projects within the TCC program for civilian institutions.

**DoD RESPONSE**: **Non-Concur** – The process is adequately documented in the DoD Corrosion Prevention and Mitigation Strategic Plan which is available to the general public on www.corrdefense.org and the Technical Corrosion Collaboration (TCC) Definitions Document which has been provided to all TCC participants. These documents provide five (5) primary and six (6) secondary project selection requirements. These documents also state that the Corrosion Policy and Oversight Office (CPO) will, "Convene and chair the project selection panel." No distinction regarding the type of institution (civilian or military) is made in these documents as the requirements are applicable across the TCC program.

**RECOMMENDATION 2**: The GAO recommends that the Under Secretary of Defense for Acquisition, Technology and Logistics require the Director, Corrosion Policy and Oversight Office to document the procedures for selecting and approving projects within the TCC program for military academic institutions.

**DoD RESPONSE**: **Non-Concur** – The process is adequately documented in the DoD Corrosion Prevention and Mitigation Strategic Plan which is available to the general public on www.corrdefense.org and the Technical Corrosion Collaboration (TCC) Definitions Document which has been provided to all TCC participants. These documents provide five (5) primary and six (6) secondary project selection requirements. These documents also state that the Corrosion Policy and Oversight Office (CPO) will, "Convene and chair the project selection panel." No distinction regarding the type of institution (civilian or military) is made in these documents as the requirements are applicable across the TCC program.

**RECOMMENDATION 3:** The GAO recommends that the Under Secretary of Defense for Acquisition, Technology and Logistics require the Director, Corrosion Policy and Oversight

Office to document the procedures for selecting and approving military research labs supporting civilian and military institutions in conducting projects within the TCC program.

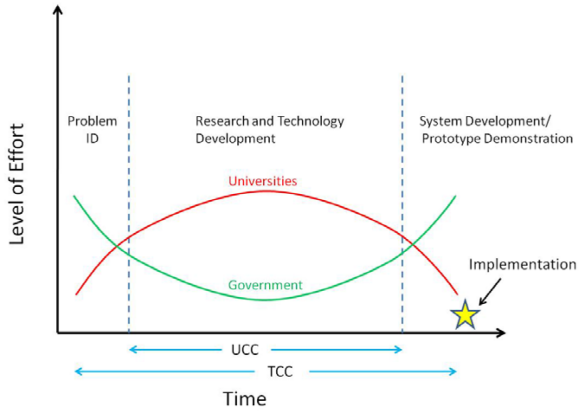
**DoD RESPONSE**: **Partially Concur** – The DoD Corrosion Prevention and Mitigation Strategic Plan documents the procedure for selecting and approving military research labs supporting civilian and military institutions in conducting projects within the Technical Corrosion Collaboration (TCC) program. Specifically, it states that the Corrosion Policy and Oversight Office (CPO) will, "Fund TCC projects based on the available budget. Funding will be provided to both the DoD technical personnel and the universities commensurate with their roles in the projects." While CPO considers this adequate documentation, additional details will be added.

**RECOMMENDATION 4**: The GAO recommends that the Under Secretary of Defense for Acquisition, Technology and Logistics require the Director, Corrosion Policy and Oversight Office to track and maintain accurate records that include amounts of funds used for the TCC program, and have them readily available for examination to ensure the funding data will be accurately accounted for and reported in future reports, such as the annual budget report to Congress.

**DoD RESPONSE**: **Partially Concur**: The GAO was provided with a complete and accurate set of financial records during the course of this engagement. It is true, however, that there was initially some inconsistency in financial reporting. This stems from two sources. First, the Technical Corrosion Collaboration (TCC) Program was evolving between its inception as the University Corrosion Collaboration (UCC) in 2008 and its current form. As such, some projects funded early in the program would not be considered under the current TCC program. Second, in 2013, congress required the Corrosion Policy and Oversight Office (CPO) to call out funding for research opportunities separately from activity requirements and project opportunities. CPO has now implemented internal controls to identify and document budget categories for each financial transaction executed. This will improve timeliness of reporting.

**RECOMMENDATION 5**: The GAO recommends that the Under Secretary of Defense for Acquisition, Technology and Logistics require the Director, Corrosion Policy and Oversight Office to establish a process for transitioning demonstrated results of TCC projects to the military departments as required by the Section 2228 of Title 10 of the United States Code.

**DoD RESPONSE**: **Non-Concur** – The process for transitioning demonstrated results of Technical Corrosion Collaboration (TCC) projects to the Military Departments is appropriately developed and documented in the DoD Corrosion Prevention and Mitigation Strategic Plan and the Technical Corrosion Collaboration Definitions Document. In fact, the TCC Program is specifically designed to improve the probability of technology transition by insuring early and close collaboration between the research institutions and the Military Department laboratories. Figure C-1 (see below) in the DoD Corrosion Prevention and Mitigation Strategic Plan describes this collaborative effort.




As depicted in the figure, Military Department personnel play the primary role during the "Problem Identification" phase of a project since they are most aware of the technology needs of the DoD. The research institutions play the primary role during execution of the "Research and Technology Development" phase. During this time, the Military Department personnel monitor the research and provide guidance to the research institutions. As the research matures to the "System Development/Prototype Demonstration" phase, Military Department personnel resume the primary role in transitioning the technology to their respective Departments with the goal being implementation of the technology. Educated people, journal articles, and technical papers are examples of products produced by the TCC.

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# Appendix V: GAO Contact and Staff Acknowledgments

## GAO Contact

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## Staff Acknowledgments

In addition to the contact named above, Carleen Bennett, Assistant Director; DuEwa Kamara; Gustavo Crosetto; Elizabeth Curda; Mark Dowling; Melissa Emrey-Arras; Dawn Godfrey; Lisa McMillen; Madhav Panwar; Richard Powelson; Terry Richardson; George Scott; Ryan Siegel; John Van Schaik; and Angela Watson made contributions to this report.

# Related GAO Products

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