

Volume 8, Number 1
Spring 2012
Featured Projects

University Researchers Discuss How Their Goals are Aligned with the TCC

Corrosion Office Wants More Engineers in the DoD Workforce

As the DoD Corrosion Policy and Oversight Office raises the stakes of its four-year-old program known as the Technical Corrosion Collaboration (TCC), it seeks a closer alignment between the research goals of military corrosion experts and university scientists.

Cynthia Greenwood, *CorrDefense* editor-at-large, asked scientists representing TCC member universities and military academies to discuss how their research and educational goals might be aligned with those of the TCC, a program currently overseen by Deputy Director Rich Hays and the Corrosion Office team. Here are responses by scientists and TCC members Luke Brewer (Naval Postgraduate School); Gerald Frankel (The Ohio State University); Lloyd Hihara (The University of Hawaii); Shankar Mall (Air Force Institute of Technology); Joe Payer (The University of Akron); James Rawlins (The University of Southern Mississippi); Joel Schubbe (U.S. Naval Academy); John Scully (The University of Virginia); and Gregory Shoales (Air Force Academy). (See *Universities in TCC Explore the Merits of Collaboration with DoD and Each Other.*)

Represented on the panel are TCC members Luke Brewer (Naval Postgraduate School); Gerald Frankel (The Ohio State University); Lloyd Hihara (The University of Hawaii); Shankar Mall (Air Force Institute of Technology); Joe Payer (The University of Akron); James Rawlins (The University of Southern Mississippi); Joel Schubbe (U.S. Naval Academy); John Scully (The University of Virginia); and Gregory Shoales (U.S. Air Force Academy).

CorrDefense: The DoD Corrosion Office is pursuing new goals as it works to strengthen research collaborations among members of the TCC. How well are the goals of your institution aligned with the Office's desire to step up and deepen existing research collaborations among TCC member institutions?

John Scully (University of Virginia): From UVA's standpoint, we see a spider web of connections between our professors and researchers and many of our TCC partners, connections that translate into complementary expertise and techniques. We have benefited significantly from The University of Southern Mississippi in the polymer area, and from The University of Hawaii's unique array of environments for our work in atmospheric corrosion. In the corrosion field, there is too much work for any one entity to address. If you consider UVA's and Ohio State's related work on silver and copper coupons to assess corrosion severity, it has been a big success to have them work together or at least complement each other.

Joel Schubbe (U.S. Naval Academy): We're certainly trying to foster more and more collaborations with the military labs because they have such depth and breadth of engineering experience. In addition, the Naval Academy has a lot to offer. We have junior to mid-level professors who can contribute to research in corrosion with these lab teams as well as some state-of-the-art lab facilities. By fostering a good relationship with the labs and AFIT (Air Force Institute of Technology), our younger professors can acquire the experience with industry that our mid-level and senior professors already have.

Lloyd Hihara (University of Hawaii): Our College of Engineering has five research cluster areas, one of which is Recycling, Re-manufacturing and Corrosion. Hence, corrosion research and education is an important area for the college. Partnerships with the DoD are encouraged, especially since all four military services are well represented in Hawaii.

Joe Payer (University of Akron): The collaboration and team-oriented research have been very well received at UA, where we engage in active projects involving students in corrosion, chemical, civil, mechanical, and polymer engineering, as well as related technical sub-specialties.

James Rawlins (University of Southern Mississippi): Our collaborations have included other research groups who needed assistance narrowing down the right group of polymeric materials for testing, and in this area, we've helped our TCC partners a great deal. Within the TCC, we've supported research at Ohio State, UVA, and The University of Akron. The University of Hawaii provides outdoor and environmental testing of materials for our coatings.

Gregory Shoales (Air Force Academy): We have a new collaborative program that partners our USAFA cadets and UVA graduate students. The program, headed by Dr. Fawaz, also includes UVA Professors Richard Gangloff and Jimmy Burns, both of whom have occasionally served as visiting professors here. The focus of the program is on the interaction of corrosion and cracking in aircraft structures. Here our projects include cadets from engineering, chemistry, biology, and management. Because we have this cadet element to our research team that does not require funding (as is the case with university graduate students), we have the flexibility to embark on a variety of research paths in addition to the prescribed paths outlined in the contracted portion of the collaboration.

CorrDefense: As the TCC program overseer, the Corrosion Office team would like to encourage more students at partner universities to consider careers in military corrosion. What progress have you made in this area?

Gerald Frankel (Ohio State University): We take pride in the fact that OSU students tend to have an understanding of real-world problems and firsthand experience of advanced approaches to solving them. The TCC provides them with tremendous exposure to professional experts trying to solve problems. The technical exchange meetings are beneficial because our students get to present their work in front of an interested but critical audience, which motivates them to provide continual feedback to this audience on their progress. They also get to develop relationships with students and professors from other universities and with military lab personnel.

Shankar Mall (Air Force Institute of Technology): AFIT's TCC project will move into an entirely new area with minimum risk, and it is expected to yield very rewarding results. Further, it should motivate young DoD officers to appreciate the corrosion side of aerospace structures within the aging Air Force fleet, a major source of damage and failure. This goes hand in hand with DoD's current focus on maintenance and sustainability and how to manage or limit different types of damage, including damage from corrosion.

Luke Brewer (Naval Postgraduate School): This goal is a perfect fit for us, since we are the primary graduate school for naval officers. Eighty-five percent of the engineering duty officers in the Navy receive the graduate training in mechanical engineering at NPS. There is also ample opportunity for us to align ourselves with TCC's educational goals for new engineers. In addition, our curriculum sponsor, Navy Admiral Thomas Eccles, requires all mechanical engineering students to take courses in failure analysis and in welding or corrosion. This requirement speaks well of the value of corrosion in our curriculum.

Payer (UA): Before the DoD corrosion program was inaugurated, the career corrosion opportunities and technical challenges experienced by the military were virtually unknown to engineering programs such as ours. Now members of the UA Corrosion Squad are actively involved in DoD corrosion projects. UA undergraduate and graduate students have the opportunity to interact with DoD researchers and technical experts and, in doing so, become increasingly aware of internship and full employment opportunities.

Shoales (USAFA): CASTLE (The Center for Aircraft Structural Life Extension) exists here at USAFA because we're always trying to bring real-world experience from our users into the classroom, as well as to our officers on the faculty. That's an overarching goal behind everything we do, and we're always mindful of ways we can turn our research into a cadet project. Consequently, the cadets directly benefit from the unique nature of our research center. Unlike many government labs, we are directly tied to the needs of the Air Force operational community through our customers. This tie-in also greatly enhances cadet awareness of the DoD career opportunities and technical needs.

Scully (UVA): Since the TCC's inception and before, large numbers of UVA students have gone into military careers, which is a key goal of Dan Dunmire and the Corrosion Office. For example, many Naval Research Lab employees come from UVA. Two former UVA students work in a helicopter re-fit facility in Galveston, Texas. Some students with corrosion expertise have gone to work for Alcoa, which provides aluminum alloys and expertise for DoD use. Other students have

gone on to the Department of Energy labs and the Navy Nuclear Reactor labs. Others have joined Los Alamos and Sandia National Laboratories.

Schubbe (USNA): We have a program here called the Bowman Scholar program, sponsored through the submarine community. We've gotten internships that allow midshipmen to spend several weeks in a Navy lab, either working with the nuclear or laboratory community. The internships that I've directed students towards have been corrosion-oriented opportunities at NRL. After completing the internships, the midshipmen spend one or two semesters as seniors doing independent research with a professor. Since 2009, two interns have worked on environmentally assisted cracking, looking at 70XX series, 50XX series, and some 60XX series aluminums in multiple orientations and environments.

CorrDefense: Under the TCC, the Corrosion Office would like to help university partners understand the constraints that DoD engineers work under when they apply new technology in myriad environments. What exposure have you had to such challenges?

Brewer: (NPS): Since my students serve as officers for naval surface vessels and submarines, they have more field experience than I have, so our combined research and field expertise gives us insight into the challenges facing military engineers. Also, our students are interested in applied research and direct technological transfer. There's a strong linkage between our program and the goals of TCC and the Corrosion Office.

Payer (UA): The military/university partnership allows UA students to understand the real-world aspects of research and technology development. The collaboration also focuses the students' activities on meaningful deliverables to reduce corrosion costs and increase reliability.

Scully (UVA): Here we appreciate the constraints that DoD has. When I worked for the Naval Surface Warfare Center, I had exposure to many more constraints than I see now as a professor, so I try to impart some of this at UVA. However, the fresh dialogue fostered by the TCC between academia and the military has been excellent. Even though some of the real-world constraints experienced by DoD don't necessarily change the theoretical approach or fundamental questions that we tackle in our laboratories, it really helps us to be aware of them.

CorrDefense: Through the TCC, Rich Hays is advocating for new areas of high-risk, high-reward research to complement lower-risk, project demonstration efforts currently sponsored by the Corrosion Office. How are your own institution's objectives aligned with this research goal?

Rawlins (USM): The recent, improved funding of the TCC by the Corrosion Office is critical to all of us. A more sustained TCC means that recipient academies that possess a good work ethic are able to engage in and digest real problems and start to chew away at issues that nobody has ever been able to solve from a practical standpoint. Under the TCC's prior one-year funding cycle, it was difficult to completely test a coating system for all its performance properties in 12 months. At USM, we're fortunate to have the drive, passion, and work ethic to generate meaningful results with multi-year funding. Until now, our researchers have engaged at all levels with some TCC university or DoD partner involving coatings, sensors, and other types of technology exchange. As we aim to meet the TCC's upcoming goals, I think you'll see virtually all USM researchers engaged with somebody at a DoD lab.

Scully (UVA): With respect to our niche at UVA, we enjoy doing research that can have a practical impact. And we certainly embrace this same goal of the Corrosion Office. Contrary to the popular perception of universities as "ivory towers," many professors in corrosion, which is an applied science, would be disappointed if their research did not go on to have major technological impact. Besides UVA's status as a great training ground for conducting and interpreting engineering research and writing papers, the TCC provides our students a chance to rub elbows with DoD personnel, which, in turn, helps them make the transition to jobs in the private sector or the military.