March/April 2015

WAVES

Upgrade to the basin

Replacement of the Test Model Servicing Device underway in the David Taylor Model Basin

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WAVES

A shipyard worker performs maintenance on the aircraft carrier USS Dwight D. Eisenhower (CVN 69) in Portsmouth, Va., July 23, 2014. Dwight D. Eisenhower is undergoing a scheduled docking planned incremental availability at Norfolk Naval Shipyard. (U.S. Navy photo by Mass Communication Specialist Seaman Apprentice Ryan U. Kledzik/Released)

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COVER

Naval Surface Warfare Center, Carderock Division Facility Engineering and Operations Division engineers continue replacement of the Test Model Servicing Device in the David Taylor Model Basin in West Bethesda, Md., March 26, 2015. (U.S. Navy photo by Nicholas Malay/Released)

Dr. Joseph T. (Tim) Arcano Jr.
NSWC Carderock Division Technical Director

Knowledge transfer and wikis

Several times this year I've touched on the idea of knowledge transfer. I've put it in context by mentioning the various methods we currently use to pass along our knowledge, particularly to our new colleagues. The mentoring program, brown-bag sessions, and the papers and patents we produce are all effective methods to transfer knowledge within or out of our knowledge base.

This raises a new question however: How do we capture our knowledge to ensure it isn't lost, rather than rely on word of mouth or a traditional library setup? We all read peer journals, take classes, work with colleagues at other sites or universities when time permits, but have we considered any other sources or methods? What would they be? How do we break out of the old thinking and dig out things we didn't know were actually very relevant and important to pass on?

One method of information capture I believe has great promise is the wiki. An excellent example of this potential is the Central Intelligence Agency's success with their Intellipedia, a wiki to share and collect intelligence. The United States Court of Appeals for the Seventh Circuit uses a wiki to post court rules and allow practitioners to comment and ask questions. The United States Patent and Trademark Office operates a peer-to-patent wiki that allows the public to collaborate on examination of pending patent applications. These few examples show us how wikis are used, but they also act as catalysts for collaboration and information gathering activities. To this end, wikis have several characteristics that are useful for our purposes as a research institution.

- There is an open-ended peer review. Everyone who comes to read an entry can ask follow-on questions, add more information, correct errors, or simply use the wiki as a place to compile links from other relevant sites or scan the bibliography for more research materials.
- Capture of the existing knowledge base naturally happens through active management of wiki entries. Discussions and applications of what is currently known are also generated as entries and are challenged and corrected to keep them both current and accurate.
- Areas of knowledge that are not being adequately covered are identified and addressed. Anyone who has ever done research knows that new ideas are constantly generated. A wiki is an outstanding place to capture these ideas as they develop by creating a single point of capture that develops a more complete definition of the idea under exploration.
- Obviously, this requires that both senior and junior members be involved in wiki creation for an effective transfer of knowledge to happen. Here is where senior team members also create a "legacy" as I've mentioned in earlier columns.

A bonus gain occurs if the wiki happens to be open to the outside world as well. Other researchers will come for answers and potentially add new knowledge to the wiki, making it a win-win for both us and the visitor.

We all have a natural tendency, inertia if you will, to keep doing things the old way. This will produce the sort of results we have come to expect. However, because they are familiar to us we tend to take them for granted. "Gah! I have to get that paper ready for presentation," you might say. Do you really look forward to sitting through lectures? The old ways become a burden. They take you away from what we really love – the chase. As engineers we love to find solutions, not have them tossed to us in the daily rush to find solutions to the problems each of us have to solve ourselves. Let's admit it – our own research is much more interesting to us than someone else's, unless it helps us solve our own problems. On the other hand, having a wiki available can help us be more effective as researchers, as well as more productive.

Like most technology, wikis present a variety of challenges as well. For us, one of the most obvious and important concerns is security. As a concept, wikis were meant to be an open forum – a place to share ideas. However, in our business openness can be dangerous. By their very nature, our information products can be easily used against us.

Though wikis sound fairly dictionary-like, they are so much more than a simple encyclopedia. What makes wikis truly important is the conversation they facilitate among us. What makes them work is an active engagement by the users. Sharing ideas becomes almost an addiction once you start. The surprise and excitement of finding a new, potentially useful tidbit is satisfying for researchers and with tools like wikis the process becomes faster and more open to discovery in ways that classroom lectures and academic papers do not allow due to the accepted constraints of the environment.

Think of it as a day fishing – capture and release so to speak. Capture your idea, put it in the wiki pond. Others come and fish for information, add their ideas and so on. The wiki grows – pond, lake, sea, ocean…

So ask yourself; do you find the idea of contributing to wiki a waste of your time? Ask yourself why. Are you stuck in a groove? Explore the wiki and see if any new ideas pop up. Do you find yourself repeatedly answering the same question? Consider creating a wiki entry and make your mark.

Test Model Servicing Device capability upgraded in David Taylor Model Basin

By Nicholas Malay, NSWCCD Public Affairs

Naval Surface Warfare Center, Carderock Division Facility Engineering and Operations Division engineers continue replacement of the Test Model Servicing Device (TMSD) in the David Taylor Model Basin in West Bethesda, Md. March 26, 2015. The concrete was poured in layers surrounding the area where the moveable platform sits to help accommodate the tremendous pressures generated by 23 feet of concrete. (U.S. Navy photo by Nicholas Malay/Released)

Naval Surface Warfare Center, Carderock Division (NSWCCD) Facility Engineering and Operations Division engineers continued replacement of the Test Model Servicing Device (TMSD) in the David Taylor Model Basin in West Bethesda, Maryland, March 26.

The David Taylor Model Basin's TMSD was constructed in 1949 to service small-scale models being tested above and below the water's surface. A TMSD is a piece of equipment that comprises a walled-off compartment at the east end of the basin with a door and pumps that allows a test model to be towed inside of the compartment, the door closed and the water drained from that compartment to allow testers access to the model in a dry environment for servicing and adjustments. The lower floor of the compartment comprises a movable platform to raise and lower the models.

"The TMSD replacement includes increased capabilities such as the ability to handle longer and heavier models, as well as vastly increase work and rigging areas around the new TMSD," NSWCCD Mechanical Engineer and Test Model Servicing Device Project Manager Scott Carpenter of the Facility Engineering and Operations Division said.

The David Taylor Model Basin building is 3,200 feet long and houses the Shallow Water Basin, Deep Water Basin and High-Speed Basin. The facility is enclosed by an arched reinforced concrete roof with a span of 110 feet.

"The new 45-foot long servicing device will provide sponsors with the capability to test larger scale ratio models, thus reducing the impact of scaling effects and increasing the confidence of test results used in developing new submarines and surface ships for the future fleet," NSWCCD Hydro Facility Engineering Division Head Joe Moeller said. "Additionally, the new servicing device will provide a lifting platform capacity of over 20,000 pounds allowing the handling of not only longer, but heavier models."

Towing carriages run along rails which follow the curvature of the earth's surface. The tops of the rails lie parallel with the still water surface throughout the length of the basins. The rail foundation rests upon bedrock.

Wavemakers in the joint Shallow Water and Deep Water basin produce head and following waves. This allows engineers and scientists to determine the seakeeping qualities and propulsion characteristics of models in either uniform or irregular waves.

"The Test Model Servicing Device's original moveable platform was approximately 23 feet long and made of steel," Carpenter said. "After 66 years of use, the Test Model Servicing Device's supporting structure began to corrode and work platforms were deteriorating as well."

NSWCCD mechanical engineer and Test Model Servicing Device (TMSD) Project Manager Scott Carpenter with the Facility Engineering and Operations Division explains the upgraded TMSD's increased capabilities within 3-D animation software in the David Taylor Model Basin in West Bethesda, Md. March 26 2015. (U.S. Navy photo by Nicholas Malay/Released)

The upgraded Model Testing Service Device's moveable platform is nearly twice the length, measuring 45 feet.

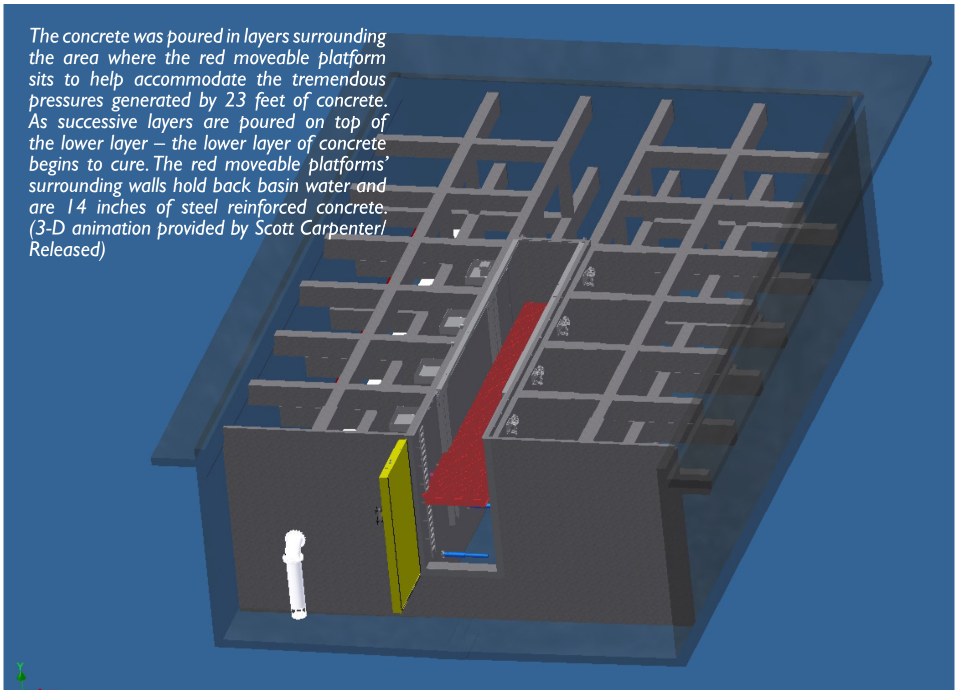
The preliminary planning for this project began in 2003 to replace the TMSD, and the design effort was undertaken by NSWCCD Hydro Facilities Engineer Tracey Rhodes who spent 10 years to optimize the new TMSD design before retiring from Carderock Division in 2013.

The new TMSD walls hold back basin water and are made with 14 inches of steel reinforced concrete. These "wet walls" are supported by beams that transfer the load from the new wet walls to the existing walls of the basin. Below the moveable platform are four pumps used to drain and submerge the area.

"In order to avoid draining 16 million gallons of water to install, make changes or alter models and then derig - the TMSD allows Carderock scientists and engineers to more efficiently utilize limited research dollars," Carpenter said. "This replacement of old equipment, while useful, was necessary because it had outlived its design life."

The TMSD's replacement is just in time for the 2015 International Submarine Races (ISR) to be held during the week of June 22-26 at NSWCCD.

Research into hull forms, propulsion and ship dynamics provides the foundation for new ship and submarine designs for the U.S. Navy. "This research is also critical in helping the Navy to better understand the performance of existing assets to gain undiscovered efficiencies and reduce operational and maintenance costs as well," Carpenter said.



The concrete was poured in layers surrounding the area where the red moveable platform sits to help accommodate the tremendous pressures generated by 23 feet of concrete. As successive layers are poured on top of the lower layer – the lower layer of concrete begins to cure. The red moveable platforms' surrounding walls hold back basin water and are 14 inches of steel reinforced concrete. (3-D animation provided by Scott Carpenter/ Released)

NAVSSES and NASA engineers engage in collaborative effort to improve the atmosphere in closed environments

By Joseph Battista, NAVSSES Public Affairs

Lead Test Engineer Alan McCarrick (back row second from left), Chemical Engineer John Crockett (front row right) and Chemical Engineer Josh Manney (back row, third from right), with Life Support and Compressed Air Systems Branch at NAVSSES tour NASA's Neutral Buoyancy Laboratory at the Johnson Space Center in Houston, Jan. 27, 2015. The facility is used for astronaut training. (Photo courtesy of NASA)

Three Naval Ship Systems Engineering Station (NAVSSES) engineers recently traveled to NASA's Johnson Space Center in Houston and White Sands Testing Facility (WSTF) in Las Cruces, New Mexico, to meet with NASA engineers to discuss ways the two agencies can combine efforts to improve atmospheric conditions in a closed environment – NAVSSES in submarines and NASA in space exploration vehicles and the International Space Station (ISS).

"We have a lot in common with the NASA engineers," said Josh Manney, chemical engineer with Life Support and Compressed Air Systems Branch at NAVSSES. "We both work on monitoring and controlling the atmosphere within closed environments. We met to discuss similar areas of interest and to determine potential areas of collaboration."

This face-to-face meeting between both organizations included a third party – representatives of the British Royal Navy. Manney and his colleagues in the branch Alan McCarrick, lead test engineer, and John Crockett, chemical engineer, said they have met NASA engineers during previous test and evaluation work at WSTF and at conferences, but this was a chance to discuss in detail how to support each other's efforts.

During the information exchange meeting, NASA briefed the NAVSSES engineers on several portable gas detectors. Manney said, "One potential area of collaboration involves evaluating and testing these portable gas detectors developed by NASA on an active submarine. Testing on a submarine offers us the opportunity to evaluate the use and performance of this monitoring technology in an actual submarine environment, and it offers

NASA the ability to demonstrate operation of their analyzers in a relevant environment more readily available than a space flight. It is difficult and expensive for NASA to test their equipment in their actual closed environment because their prime test bed is located in space with limited and costly transportation opportunities."

NAVSSES engineers presented on various technologies the Navy currently uses or plans to use on submarines. Crockett delved deep into the portable and fixed atmosphere monitors on submarines and covered aspects of training and installation. Manney discussed the recent installation of the newly developed Central Atmosphere Monitoring System (CAMS) IIA and the Distributed Atmosphere Monitoring System (DAMS) planned for future submarine platforms. Additionally, McCarrick presented on Navy oxygen candles, which are closely related to those used on the ISS, and the Disabled Submarine (DISSUB) non-power life support.

McCarrick explained there are differences between the atmospheric conditions of a submarine and space station. "We don't have to deal with the physiological issues of microgravity like NASA does, such as bone density loss," he said. "Being in microgravity has significant effects on the body."

NASA also showed interested in the Navy investigating the so far only anecdotally documented extent to which submariners rarely exhibit illness while serving on submarines. Sickness has been a minimal problem during spaceflight, but the conditions and astronauts are more carefully controlled and selected.

"People rarely get sick while on submarines. It's the ultimate closed building, and we are just in the preliminary stages of investigating the possible reasons for it," said McCarrick. "It is possible the years of perfecting the unplanned ability to sterilize mold, bacteria and other foreign substances in the air by the atmosphere control equipment contributes to this, but there have been no actual studies done to prove it. It's conceivable our atmospheric control systems contribute to the overall health of the crew, but this would need to be investigated and documented."

The three engineers are working with the Naval Submarine Medical Research Laboratory to begin researching the topic in an effort to benefit the Navy and potentially NASA's astronauts.

McCarrick said the Navy has been working with atmospheric limits longer than NASA and are able to provide much more data to support them.

This graphic designed by NASA was used to promote the technical exchange meeting NAVSSES engineers from Life Support and Compressed Air Systems Branch attended. The meeting was an opportunity for engineers to discuss ways the two agencies can work together to improve atmospheric conditions on submarines and spacecraft. (Graphic provided by NASA)

"Navy limits listed in the Nuclear Submarine Atmosphere Control Manual are available for NASA consideration," said McCarrick. Crockett added, "And conversely, we can look at NASA's spacecraft maximum allowable concentrations known as "SMACs." McCarrick furthered the discussion stating, "Collaboration helps both agencies reduce research costs."

Despite differences between closed environments in both space and onboard a submarine, Manney said he learned one important similarity from NASA astronaut and Navy Capt. Stephen Bowen who also served on submarines. "He told us that when he stepped on the International Space Station for the first time he exclaimed, 'It smells just like a submarine'."

Manney said they plan to hold similar face-to-face meetings with NASA at least once every two years to formally establish this ongoing exchange of information via a Technical Interchange Meeting.

New dry dock cleaning vehicle tested

Timothy E. Hunt, NSWCCD Public Affairs

The new cleaning vehicle was developed to reduce the time, water and hazards associated with the dry dock cleaning process. The current cleaning method includes a water wash-down performed using fire hoses, followed by shoveling or sweeping the accumulated sediment from collection points. This produces a large volume of contaminated water. This method is both time-consuming and heightens the potential for injury. (U.S. Navy photo/Released)

From Sep. 30 - Oct. 4, 2014, Patrick Morrow and Tracy Harasti from the Environmental Quality Division of Naval Surface Warfare Center, Carderock Division (NSWCCD) conducted an evaluation of a commercially available municipal cleaning and contaminant recovery vehicle at Puget Sound Naval Shipyard (PSNS).

The purpose of the testing was to demonstrate the effectiveness of the technology for cleaning dry docks following the docking or undocking of a ship. The need for this technology is being driven by environmental requirements established by the Environmental Protection Agency (EPA) and enforced through the National Permit Discharge Elimination System (NPDES).

The new cleaning vehicle was developed to reduce the time, water and hazards associated with the cleaning process. This system is based upon a commercial street sweeper named the Municipal Cleaning Vehicle (MCV), modified to meet the more stringent requirements of operating in a shipyard environment.

When a ship enters or exits dry dock, the dry dock closure gate must be removed, allowing ambient sediment to enter the dock and settle on the dry dock floor. This sediment contains contaminants from decades of industrial work at the shipyard, and it must be collected and disposed of to prevent their reintroduction into the surrounding waterway, which is a violation of the shipyard's NPDES permit. Sediment collection and disposal is critical to the schedule at the shipyard because industrial work on a ship cannot commence until the dock is determined to be clean.

The cleaning is currently performed by PSNS Shop 99, and includes a water wash-down performed using fire hoses, followed by shoveling or sweeping the accumulated sediment from collection points. This produces a large volume of contaminated water. This water must then be pumped and filtered to remove the sediment. This current method is both time-consuming and heightens the potential for injury.

This round of testing evaluated the vehicle's ability to recover residual dry dock sediment and reduce water consumption normally required to clean the dry dock deck. In addition to scrubbing and flushing the deck surface, the vehicle was tested to determine if the vehicle can effectively clear sand traps of solids and be easily incorporated into current cleaning routines.

The volume of water used in a typical cleaning evolution depends on a number of variables including the size of the dock, length of time that the dock was left open to the surrounding waterway, wind and wave action, and other weather conditions. Generally, two to three fire hoses are used at 100 gallons per minute to perform cleaning for three to five days.

Following the floor wash-down, sediment is shoveled out of the sand traps and other low points in the dry dock and placed in 55-gallon drums, generally resulting in one to 10 drums. A system called the Process Water Collection System (PWCS) is also pumped free of sediment. Currently, the dewatered sediment is disposed of as solid waste, but future categorization by new regulations may require that the containerized solids be disposed of as hazardous waste, which will increase disposal cost.

The vehicle successfully demonstrated the ability to effectively clean the dry dock surface, as well as contain and concentrate waste of all typical sizes down to the microscopic. The system also demonstrated the capability to remove waste from below-grade cracks and drainage channels with improved throughput and less waste generation than current cleaning methods. However, the team found the commercial configuration was unable to clean a very fine layer of hardened waste from cross channels in the dock deck. It was determined that this may require that additional pre-agitation capability be incorporated into the vehicle to address this need.

The cleaning rate achieved in this demonstration was between 7,500 and 10,000 square feet per hour, which included fire main cleaning operations, emptying vehicle waste tanks and filling cleaning water tanks. Cleaning an area of approximately 20,000 square feet resulted in 600 gallons of raw waste water that could be filtered to 30 gallons of sludge.

Samples were taken at each step of the cleaning process to determine the particle size and concentration of metal contamination in the raw sediment deposited in the dock, the wastewater effluent from the MCV and the high-solids sludge from the waste tank in the MCV. A high-powered slurry pump was also tested, which was successfully run using the auxiliary hydraulics of the MCV to remove sludge from the sand trap at a depth of 4 feet.

The current cleaning method includes a water wash-down performed using fire hoses, followed by shoveling or sweeping the accumulated sediment into 55-gallon storage barrels. This operation produces a large volume of contaminated water. The method is both time-consuming and heightens the potential for injury. (U.S. Navy photo/Released)

The testing, as well as observation of numerous docking and undocking evolutions, has made clear that the most important features of a sediment collection tool are flexibility, cleaning rate and effective waste management. The system must be able to effectively operate in a variety of configurations. Lay-down materials, keel blocks and the vessel itself all complicate the cleaning process. To address this, a spray bar manifold will be added to the stock vehicle to assist with cleaning around obstructions and other areas challenging to access. A "walk-away" hose will be added to enable collection of liquid and sediment by an operator on foot in areas that the vehicle cannot access.

The amphibious assault ship USS Kearsarge (LHD 3) during a dry dock flooding operation at Norfolk Naval Shipyard, Sept. 8, 2009. (U.S. Navy photo by Mass Communication Specialist 1st Class Emmitt J. Hawks//Released)

To speed the recovery phase of the cleaning, a large rotary brush and collection container will be added as an alternative to the water jet/air recovery system. This brush will be used when bulk solids such as shells, kelp and other sea life must be collected before the fine sediment removal can take place.

To streamline tank emptying, all pumps will be powered by the onboard diesel engine to eliminate the need for connections to shore power. This will enable waste collection containers to be staged anywhere in the dry dock.

Additional testing may be required to determine the upper limit of performance for the slurry pump and necessary power requirements. Discussions will continue with PSNS Shop 99 to determine if any additional modifications to the vehicle will be required for successful integration of the technology into a dry dock operating environment.

Aerosol Test Facility upgrade at NAVSSES to support combustion air separation system testing

By Joseph Battista, NAVSSES Public Affairs

Engineers at Naval Ship Systems Engineering Station (NAVSSES) Naval Surface Warfare Center, Carderock Division (NSWCCD) are nearing completion of an upgrade to the Aerosol Test Facility, which includes the addition of a bulk water system, computer upgrades, recalibrating equipment and replacing components.

The facility is designed to test gas turbine intake filtration systems for the Navy. Testing at the site determines if filtration systems are adequately capable of removing bulk water, saltwater and sand from the intake air stream.

The test site is receiving a makeover by engineers with NAVSSES' Auxiliary Ships/Acquisition Support Branch to support future testing of a combustion air separation system (CASS) for use with a gas turbine engine on a future vehicle for the Marine Corps.

"It's important to keep clean air moving through a gas turbine to ensure proper operation," said Thomai Gastopoulos, mechanical engineer with Auxiliary Ships/Acquisition Support Branch, who is overseeing the upgrade. "If seawater, bulk water or sand gets into the turbine it can corrode the blades. Because the Marine Corps vehicle will need to achieve high water speeds, we need to test the filtration systems at the Aerosol Test Facility to ensure the foreign substances don't get in and degrade performance."

According to Gastopoulos, the filtration systems, including the CASS, are placed in a wind tunnel downstream from where saltwater, bulk water and sand are injected. A newly installed data acquisition system then collects the information for analysis by NAVSSES engineers.

"We have installed three instruments upstream and downstream of the filtration system in the wind tunnel to detect particles to determine filter efficiency," said Gastopoulos, who holds a bachelor and master's degree in mechanical engineering from the University of Pennsylvania. "The three detectors measure the particle concentration and the particle size."

The wind tunnel utilizes a 12,000 cubic feet per minute (CFM) fan. The system includes pitot tubes to measure the velocity of the simulated gas turbine airflow and pressure transducers to detect any drop in pressure of the filtration system after the foreign substance introduction.

Gastopoulos said only one substance is pumped into the system with each test – each test lasting approximately 20-30 minutes. She said they will run multiple tests with each contaminant including the new capability of bulk water intrusion.

Thomai Gastopoulos, mechanical engineer with Auxiliary Ships/Acquisition Support Branch, monitors the controls for operating the Aerosol Test Facility at Naval Ship Systems Engineering Station (NAVSSES) March 12, 2015. (U.S. Navy photo by Joseph Battista/Released)

"We then analyze the data from the multiple tests to determine what recommendations to make in regards to the specific filtration system undergoing testing," said Gastopoulos.

Gastopoulos said they will start testing after completing the Mission Readiness Panel (MRP) process. According to NAVSSES Instruction 3900.3F, all machinery and hull mechanical and electrical tests carried out by NAVSSES, regardless of size or location shall be submitted for MRP review before initial light-off. This ensures all tests are carried out with sufficient control and under conditions that minimize risk of personnel injury or equipment failure (see related story about the MRP process on p. 11).

"We should be ready for MRP review in May, which will allow us to start running tests on the CASS in July," said Gastopoulos.

Thomai Gastopoulos, mechanical engineer with Auxiliary Ships/Acquisition Support Branch, adjusts a valve on the Aerosol Test Facility at Naval Ship Systems Engineering Station (NAVSSES) March 12, 2015. (U.S. Navy photo by Joseph Battista/Released)

Mission Readiness Panel process: Not as daunting as it first appears

By Joseph Battista, NAVSSES Public Affairs

According to Naval Ship Systems Engineering Station (NAVSSES) instruction 3900.3F, "All machinery and hull, mechanical and electrical tests carried out by [NAVSSES], regardless of size or location shall be submitted for MRP (Mission Readiness Panel) review before initial light-off."

The process may seem daunting after reading the 15-page instruction and its enclosures, but Brian Barnabie, MRP lead engineer for the past seven years, says it is not, and he works to make sure NAVSSES employees successfully navigate through the process to ensure their tests are safe, meet test requirements and commence on time in order to support the Navy.

More than 50 active tests are conducted in over 30 active test sites at NAVSSES. Every one of those tests obtained MRP approval – a process culminating with the NAVSSES commanding officer's (CO) authorization. Leading up to the CO's approval is a series of steps, which starts with an initial conference with Barnabie. The preliminary documents developed and submitted for review are a test abstract and Operational Risk Management (ORM) analysis. The abstract provides a general overview of the test and the risk analysis is a tool used to identify/assess and manage risks in order to minimize the risk of personnel injury or equipment failure.

"My role is to conduct the initial meetings with the technical codes to make sure they understand the process requirements and identify any possible obstacles with the tests they want to conduct," said Barnabie. "We look at safety issues, schedule/time, and do they have the expertise and people required to be successful."

Barnabie said there are a number of requirements to obtain the MRP approval, but having a thorough MRP review process helps to manage risk and ensure safe operation of the high-volume of tests at NAVSSES.

The instruction reads, "The mission of the MRP is to ensure that all tests conducted by (NAVSSES) are carried out with sufficient control and under such conditions, to minimize the risk of personnel injury or equipment failure, and ensure that the test conduct supports the test requirements. The MRP process shall document to the chain of command the careful and deliberate planning process that accompanies a prudent engineering effort." The original instruction was instituted at NAVSSES circa 1985. There have been multiple revisions to the instruction, including required annual self-assessments, unmanned testing criteria, and updates to the MRP Package Check-Off List, which clearly outlines all the steps required for approval.

The engineers for the test gather the required information and encapsulate it in a binder with guidance from Barnabie. The panel reviews each binder and makes suggestions. After Barnabie's initial review, he gives the binder to the MRP chairman, currently Tom Perotti, Major Programs Branch head, for review. After the MRP chairman completes his review, the binder goes to the commanding officer for review.

Barnabie, Perotti and Capt. Walter Coppeans, NAVSSES commanding officer, along with representatives from the technical code, meet to review the binder and discuss any discrepancies prior to the required walkthrough of the test site. For the walkthrough, test engineers provide a detailed overview of the facility and the test for the CO and chairman. After, if all actions required by the NAVSSES MRP instruction are met, the CO provides the technical code authorization to commence testing via an authorization email from the MRP chairman.

"The biggest obstacle I face in this role is helping engineers to understand the requirements, why we have them, and that if they stick to the process everything will work out," said Barnabie. "When they first look at the instruction it seems like a daunting and imposing task, but really it's just simply following the steps.

The steps: Attend initial conference with Barnabie, develop the MRP plan, submit the binder documenting the MRP package and receive authorization. The completed MRP package includes documentation of a safety analysis, environmental review, test site operations plan, equipment and systems check procedure, and final review accepting all the aforementioned documentation. Guidance, templates and "spotlight" examples to complete a MRP package are also accessible on the my90 SharePoint site.

Barnabie said the MRP panel has reviewed an average of 13 new test submissions annually over the last seven years, in addition to reviewing annual assessments of all 50-plus active tests at NAVSSES. The MRP instruction requires branch managers complete an annual self-assessment of their tests to ensure they are still compliant with all MRP requirements. Major changes to the site, inactivity, outdated equipment and deferred maintenance can cause an active test to become non-compliant and require completion of the entire MRP review, including chairman and CO approval, to resume testing.

"The best advice I can give to employees about to enter the MRP process is to be available for the duration, dedicate yourself to the process and leverage off people who have gone through it before – they can be a great source of information," said Barnabie.

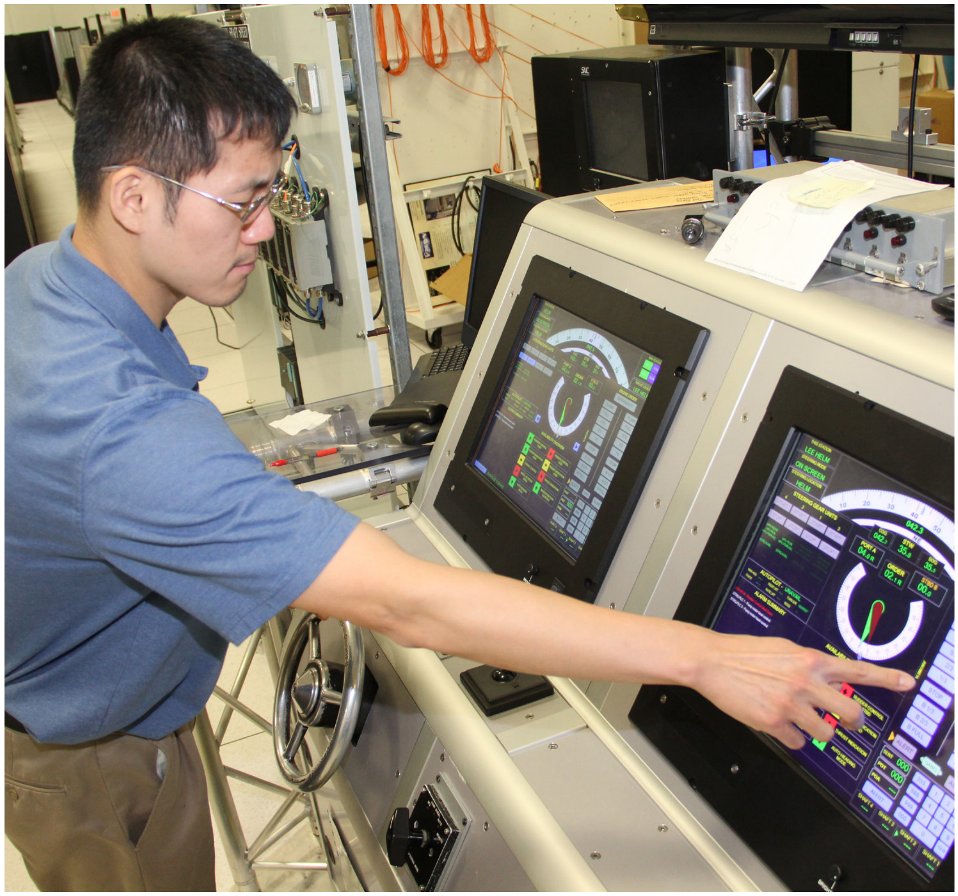
To read the MRP instruction, go to https://crbewebappdev.dt.navy.mil/intranet/instr/s3900-3f.pdf.

The Tow Cable Test Site at Naval Ship Systems Engineering Station, Naval Surface Warfare Center Carderock Division completed the Mission Readiness Panel process in March 2014. (U.S. Navy photo by Joseph Battista/Released)

NAVSSES engineers streamline steering system alarm management on aircraft carriers

By Joseph Battista, NAVSSES Public Affairs

Engineers with CVN Networks, Navigation and Ship Controls Branch at Naval Ship Systems Engineering Station (NAVSSES) recently completed installation of a new alarm management feature within the steering control software on USS Ronald Reagan (CVN 76). The new system streamlines the alarm system to make it easier for the Helmsman to identify complete failures of equipment that affect steering the ship.



Doug Jih, electrical engineer with CVN Networks, Navigation and Ship Controls Branch at Naval Ship Systems Engineering Station (NAVSSES), tests the new alarm management feature within the steering control software on aircraft carriers on March 23, 2015. (U.S. Navy photo by Joseph Battista/Released)

"We were getting complaints from the Helmsman on carriers about constantly getting hit with alarms anytime there was a problem with hardware," said Dan Kelly, the Ship Control System – Government (SCS-Gov) development team lead supporting CVN Networks, Navigation and Ship Controls Branch at Naval Ship Systems Engineering Station (NAVSSES). "The Helmsman needs to know if they have control of the steering, not if there is a problem with hardware that does not affect his ability to steer the ship."

Kelly and his team (Maureen Altenau, George Betts, Andy Gliddon, Charley Gowen, Rob Hooper, Doug Jih and Brian McClure) set out in 2010 to develop a new alarm management infrastructure of SCS-Gov. – a system capable of, "providing the correct alarm, to the correct user, at the correct time," he said.

In previous versions, a single hardware failure caused multiple alarms to go off on the Helmsman's Ship Control System - Human Machine Interface (HMI). According to Kelly, it was difficult for the Helmsman to determine what was actually broken, functional or degraded.

"The System Engineering Team was instrumental in the design of the alarm database and the 'business logic' of translating the raw alarm signals into the availability status information presented to the Helmsman," said Kelly.

The team fixed the problem by developing an alarm infrastructure within SCS-Gov with an easy to assess color-coded display that shows the Helmsman whether rudder control, thrust control and the wheel network at the five steering control points on the carrier are good (green indicator), operational but with problems (yellow) or broken (red).

Instantly, the Helmsman can determine the status of any steering function in all locations and make an assessment as to what, if anything, he needs to do to in regards to steering the ship. A few simple taps on the touch screen allows the Helmsman to navigate through many levels of information to find out the specifics of the alarm.

The same display is available to the technicians located throughout the ship. If there is a steering alarm, a technician can go to the nearest Navigation Management Display Terminal (NMDT) and pull up the alarm management feature of SCS-Gov to begin investigating the specific problem then take action to remedy the problem using the diagnostic display.

"The technician no longer has to go to the Helmsman to find out the details of the alarm now that the information is available on all NMDTs," said Kelly. "We moved the alarm information from the bridge to all the NMDT displays. This is a user-centric approach to help the techs get the correct information quickly to help trouble shoot the problem."

All alarms, and steps taken to remedy the alarms, are logged in the system for future reference. In addition, alarm information can be transmitted to NAVSSES for engineers to assist ship's crews troubleshoot problems.

Kelly said the branch's engineers at the Norfolk Fleet, Training and Modernization Support Office were the primary interface with the ship's force. They solicited valuable feedback regarding difficulties they were having and ideas for improvements. The office also tested the new interface and demonstrated it to Sailors.

Kelly said all aircraft carriers currently in service will receive the alarm management system upgrade.

NAVSSES engineer develops safe way to program ship ventilation fan motor controllers

By Joseph Battista, NAVSSES Public Affairs

Naval Ship Systems Engineering Station (NAVSSES) mechanical engineer David Belch recently began testing a way for Sailors to program ventilation fan motor controllers (VFMCs) on ships without risking exposure to 440 volts of alternating current (VAC).

The VFMCs start, stop and protect ventilation fan motors on ships. Just like any other electronic device, they require routine and sometimes emergency maintenance. Due to the design of the controllers, programming ports and diagnostic light emitting diodes (LEDs) are located within the motor controller enclosure. Sailors must open the VFMC cover to view diagnostic information to access these ports. Furthermore, the VFMCs must be energized to be fully programmed, potentially exposing Sailors to 440 VAC. In order to safely program VFMCs, numerous Sailors must work in tandem, utilize cumbersome safety gear and execute multiple tag-outs/tag-ins to properly program a single VFMC. The process is time consuming and requires elevated approval.

In response to these issues, Belch developed a connector that allows Sailors to safely attach programming tools, such as a laptop computer, to the VFMC from the exterior of the energized enclosure. By using this device, Sailors would no longer need to open the VFMC and connect a programming laptop to a connector inside the controller enclosure.

"Because of safety requirements in NSTM Chapter 300, obtaining approval to perform energized work on equipment is time consuming and requires approval from the chief engineer or the commanding officer," said Belch, who has worked on this project for the last year. "Because the VFMC needs to be energized to do maintenance, there are strict safety precautions in place that take time and additional manpower."

Essentially, Belch developed a box mounted connector and adaptor cable that allows a Sailor to plug into the VFMC externally. Sailors can then diagnose internal ventilation issues and possibly correct them without opening the VFMC.

"There will still be some instances where after a diagnosis the fix will require Sailors to open the enclosure to perform the maintenance," said Belch, who holds a bachelor's degree in mechanical engineering from Drexel University. "But when you consider the time consuming process to perform maintenance and troubleshooting on the interior of the motor controller enclosure, we are really helping crews out by allowing them to at least diagnose the problem from the outside first and in most cases fix the problem without having to open the box."

Currently, under NSTM Chapter 300, when working inside of energized 440 volt controllers:

- Sailors cannot work on the equipment alone.
- One of the people present must be certified to perform CPR and be designated as the safety observer.
- Sailors must wear protective leather gloves over a pair of rubber gloves at all times.
- An insulated mat must be placed under the feet of the worker.
- Workers must wear a protective, impact-resistant arc flash-rated face shield, coat, overalls, and hood.
- Barriers and warning signs must be erected around the area to keep others away from the open VFMC.
- Sailors must use electrically insulated tools.
- A safety line must be tied around the Sailor doing the work should they need to be pulled away from the work area.
- All workers must carry communications equipment to have the circuit de-energized in an emergency.
- An extensive safety brief must be conducted for everyone doing the work.
- Written permission from the commanding officer must be obtained before commencing with work.

With more than 300 VFMCs on a ship like USS Makin Island (LHD 8), Belch said it is easy to see how installing the safe connector saves time and reduces exposure to energized equipment. Moving the work to the exterior of the VFMC reduces the working voltage from a dangerous 440 VAC, to a much safer 5 VDC. This reduction in voltage relaxes or eliminates many of the above requirements, and reduces the required manpower from three to one person. One worker now faces a task that takes about one quarter of the time and reduces their potential exposure.

A prototype connector was installed on an LHD 8 VFMC in July 2014. Local testing was successful, but final network testing must wait until the next installation of updated machinery control system (MCS) software. The connector has also successfully been laboratory tested at NAVSSES.

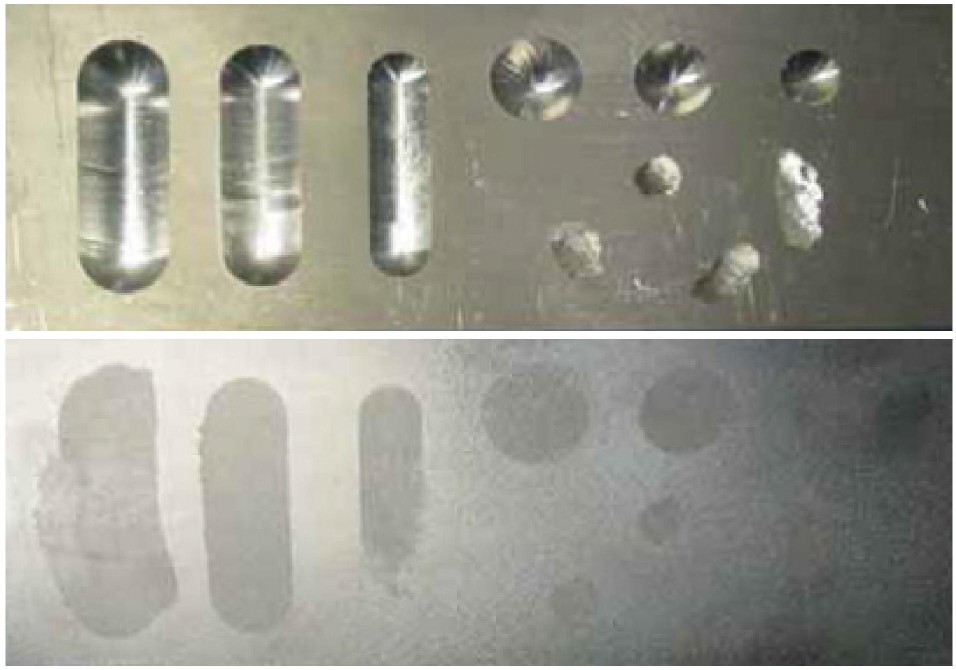
Belch said the connector assembly components will be purchased in bulk and pre-assembled as an installation kit. The premade kits will simplify installation and reduce installation time. The idea is to lower the total cost to the Navy.

"We are close to putting in an SCD (ship change document) for the VFMC connector," said Belch. "Once we get it approved, I think this will really take off because of the benefits to ship's crews."

This photo shows the ventilation fan motor controller (VFMC) with the safety connector that Naval Ship Systems Engineering Station, Naval Surface Warfare Center Carderock Division mechanical engineer David Belch developed to reduce a Sailor's exposure to 440 volts of alternating current when performing maintenance on the VFMC. (Official Navy photo by David Belch/Released)

Exchange program with NAVAIR advances aluminum repair technology

Timothy E. Hunt, NSWCCD Public Affairs



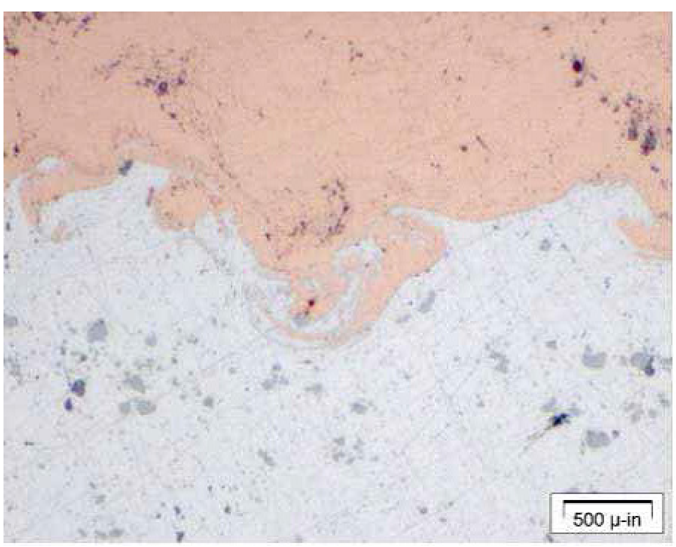
Top: Aluminum test plate before application of repair material using cold spray equipment. Bottom: Aluminum test plate after application of repair material using cold spray equipment and finishing using standard grinding and polishing techniques. (Photo courtesy of Innovative Materials and Processing Team, U.S. Army Research Laboratory/Released)

A lot of attention has been given to the process of additive manufacturing (AM) in Navy and commercial materials research, but little has been said about a process that is, in many ways, the precursor to AM. This process is called gas dynamic cold spray (GDCS), or "cold spray."

Cold spray is a process that basically "shoots" metal powder particles onto a damaged surface to fill cracks and add material to rebuild surfaces that have lost material due to corrosion, abrasions and wear. The rebuilt materials can then be shaped and ground as any other metal surface. It has been tested and found to be reliable in repairing cracks in materials one-quarter inch thick and one-half inch wide.

The process uses a gas stream, typically nitrogen, helium or air, to propel particles at speeds ranging from 300 to 2,500 meters per second towards a base material. The powder particles plastically deform upon impact, interlocking with the base material and creating an intertwining of the two materials. The resulting bonds between materials using cold spray technology have proven to be stronger than welded repairs in many cases. This bond quality is achieved without the use of high temperature methods such as welding, which can induce further cracking due to the high temperatures and distortion.

The process has been under evaluation at Naval Surface Warfare Center, Carderock Division (NSWCCD) and Naval Air Systems Command (NAVAIR) since 2004 for use in aircraft and ship repair. In 2006, NAVAIR – Patuxent River (NAVAIR-PAX) AIR 4.3.4.6 hosted Dr. Jennifer Wolk, NSWCCD materials engineer for Survivability, Structures and Materials Department, as part of a Professional Development Exchange program. The goal of the program was to create a collaboration to leverage knowledge and resources with NAVAIR-PAX to evaluate and develop methods and techniques for the use of cold spray technology by the Navy.



Microscopic close-up at the 500 micrometer level showing the mechanical mixing that occurs between dissimilar materials using the cold spray bonding technique. (Photo courtesy of Innovative Materials and Processing Team, U.S. Army Research Laboratory/Released)

Cold spray technology has been successfully implemented on NAVAIR components such as magnesium gear boxes and other high-cost aircraft parts. However, further testing is needed for widespread fleet use. The areas of research are many. Everything from material reliability to application processes to quality assurance is under development. These needs are not NAVAIR specific, but necessary in advancing the technology for Navy use.

Cold spray technology was first developed by Russian scientists in the 1980s. Off the shelf, portable systems are now commercially available and have been demonstrated on aviation components by the Army Research Laboratory (ARL) and NAVAIR. This has already led to the creation of MIL-STD-3021, a manual that defines and develops the military manufacturing process controls for cold spray operations. The widespread interest in developing the technology led to research done by NSWCCD and NAVAIR that is funded through the Department of Defense (Army, NADEP-Cherry Point, Office of Naval Research, Naval Undersea Warfare Center-Keyport as well as industry partners, and university efforts by Pennsylvania State University, U.S. Naval Academy and South Dakota School of Mines.

The cold spray process is also undergoing qualification for repair of cast magnesium components and has been demonstrated on Blackhawk helicopter medical evacuation litters and mast supports. There has been extensive work using cold spray to apply coatings onto various aluminum and magnesium components. Cold spray use is already qualified by Sikorsky Aircraft as an alternative to thermal spray for repair of the wear strip on a key H-60 helicopter component and is being instituted for current repairs to mitigate thermal damage on this component. Six F/A-18E/F gearboxes have been repaired for fretting corrosion and are being returned to the fleet at a savings of $85,000 each. This approach is also being investigated as a potential repair technology for F/A-18 radar racks and has also shown promise for the V-22 tiltrotor aircraft cabin windowsill – both are manufactured out of aircraft grade aluminum.

Cold spray technology has also proven superior in its ability to create a watertight repair over other cold bonding techniques, which have not been able to maintain acceptable water tightness in between ship service availabilities.

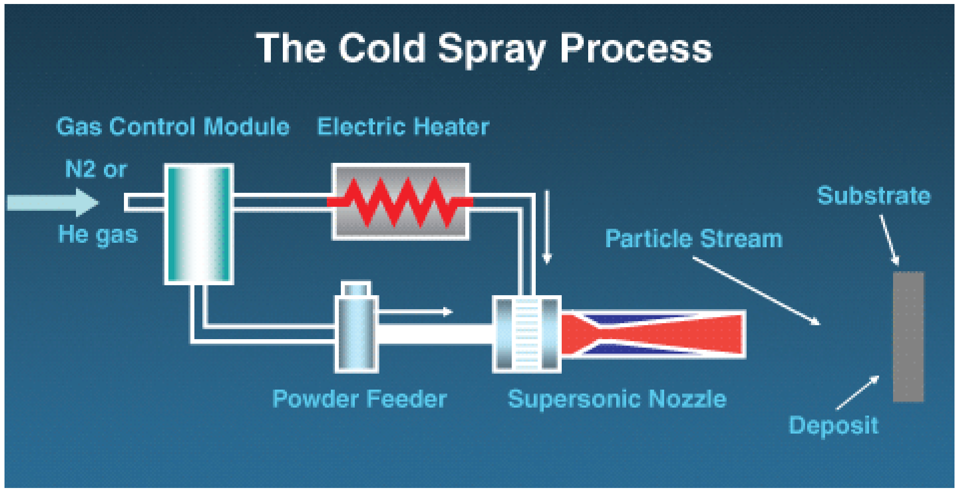


Diagram of the cold spray process. The simplicity and cost savings make this process ideal for fast, cost effective and reliable repairs of mission-critical aircraft and ship components. (Diagram courtesy of Army Research Laboratory/ Released)

With the growing use of aluminum in the Navy, and the susceptibility of certain aluminum alloys to cracking, cold sprayed metallic coatings show potential for onsite crack repair that does not require extensive downtime to perform and can be easily performed by assigned ship personnel. This is why one of the main applications the process is currently targeted for is the ongoing CG 47 Ticonderoga-class superstructure cracking problem.

The process has applicability to other watercrafts constructed of aluminum, such as Littoral Combat Ship (LCS) used by the Navy, and the Landing Craft Air Cushion (LCAC) craft and Ship-to-Shore Connector craft used by the Marine Corps. This potential for crack repair is also applicable to NAVAIR applications for repair of wing spar cracks and flaking corrosion in aircraft. NAVAIR currently repairs similar cracks through the use of a "doubler" that requires the addition of a sheet metal patch that is riveted into place and then bonded in place using the cold spray method.

Advancement of this technology for ship applications is supported by the Naval Sea Systems Command (NAVSEA) technical warrant holder in non-ferrous materials, Dr. Catherine Wong, who worked on cold spray research at NAVSEA. This technology falls under the Affordability, Maintainability and Reliability Naval Science and Technology Strategic Plan Focus Area for platform affordability and reduction of maintenance and life cycle costs in structural materials.

The most recent research performed in 2014 was targeted at a more in-depth study on the nature of the bond that occurs when using cold spray methods and optimizing cold spray solid state repairs, addressing field system requirements for repair on ship. The effort focused on the use of compressed air as a carrier gas in a low pressure system since compressed air is simpler and less costly than other gases to produce onboard a ship. The study of cold spray technology application has also had impact on other areas of material, repair and manufacturing processes, in particular in additive manufacturing, advanced microscopy and non-destructive evaluation.

Savings example - UH-60 Lubricant Sump:

Unit cost: $11K

Annual demand: 85

Repair cost: $880

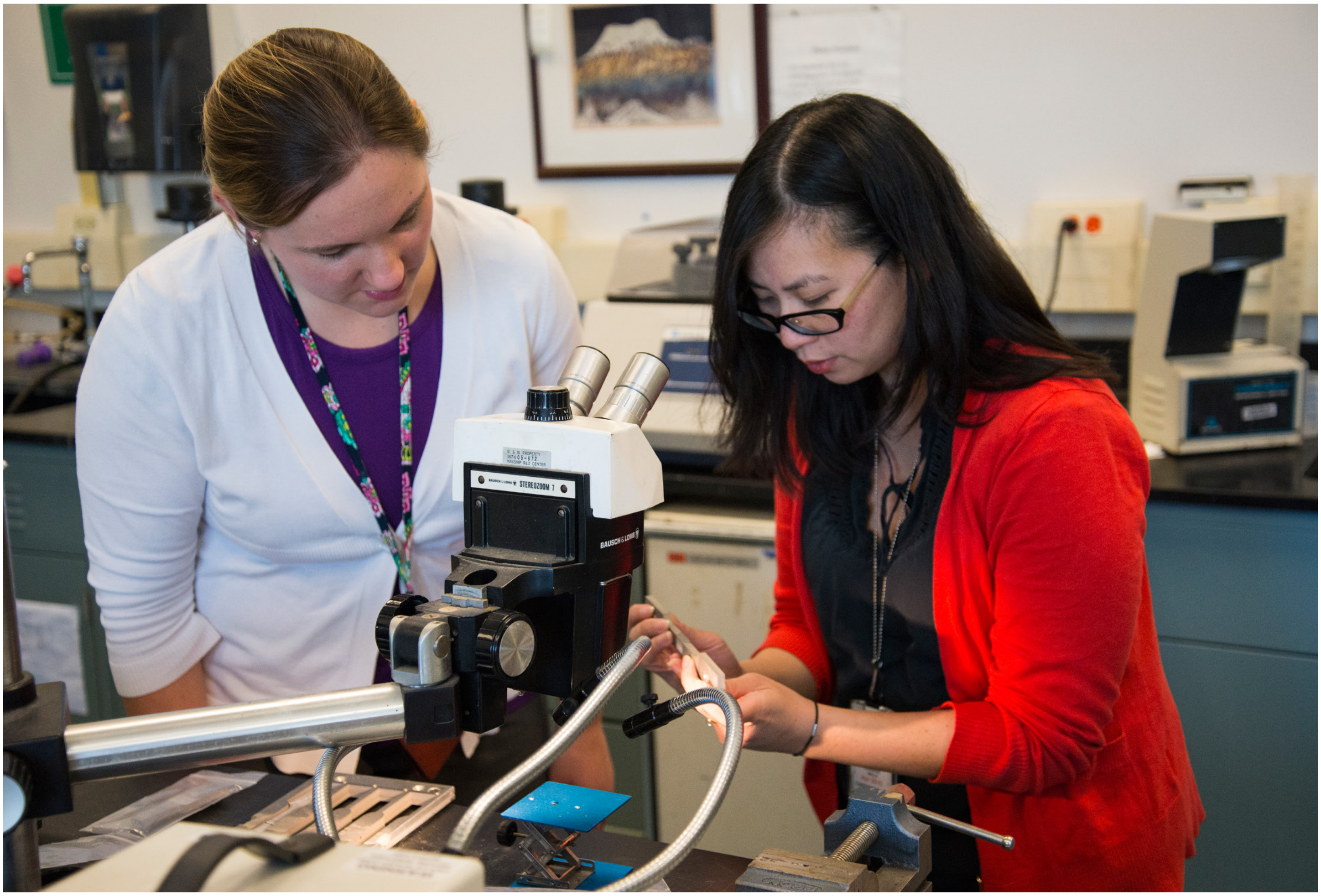
Investment: $60K

Annual savings: $860K

The UH-60 Lubricant Sump (shown) is cast from magnesium and is commonly affected by corrosion. Army and Navy rotorcraft and Air Force fighters each have 20 or more magnesium parts. Considering 4,550 rotorcraft in the Army and Navy inventory and up to 20 percent of the inventory typically affected at any one time by this issue, cold spray technologies can have a large impact on readiness. (Photo courtesy of Innovative Materials and Processing Team, U.S. Army Research Laboratory/Released)

Exchange program strengthens collaboration with NAVAIR

Timothy E. Hunt, NSWCCD Public Affairs



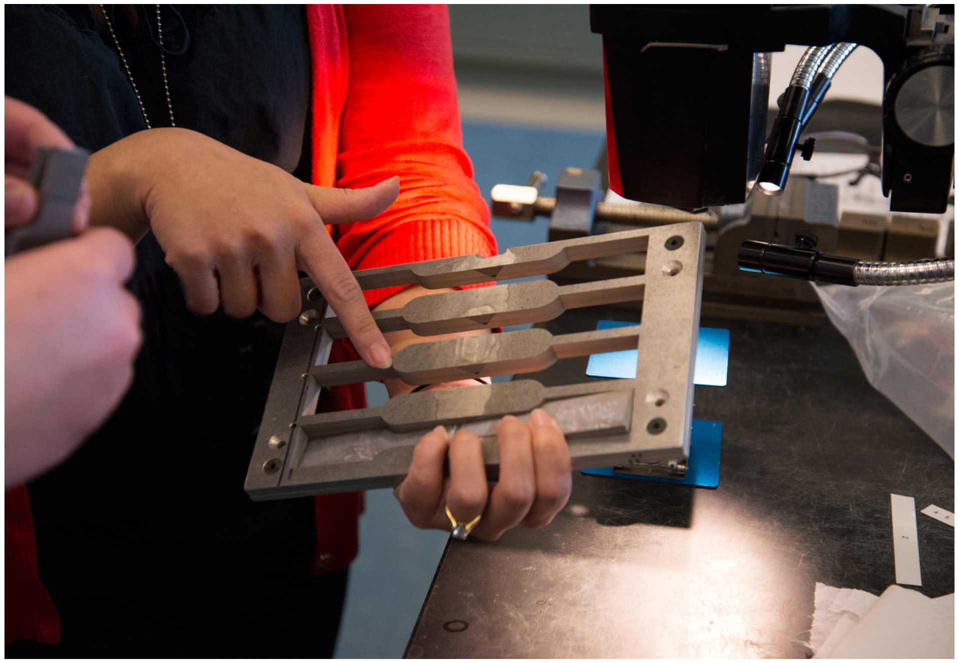
Material scientists Dr. Jennifer Wolk (right) and Susan Hovanec examine stress test samples of cold spray material at Naval Surface Warfare Center, Carderock Division. Wolk and Hovanec began their collaboration on naval applications of cold spray technology as part of the NSWCCD/NAVAIR Professional Development Exchange program in 2012. (U.S. Navy photo by Timothy E. Hunt/Released)

From April 2012 to February 2014, Naval Air Systems Command – Patuxent River (NAVAIR-PAX) AIR 4.3.4.6 hosted Dr. Jennifer Wolk, materials engineer for Naval Surface Warfare Center, Carderock Division's (NSWCCD) Survivability, Structures and Materials Department, as part of a Professional Development Exchange program.

The idea for the exchange began with NSWCCD's Director of Research Dr. Jack Price and retired Chief Technology Officer Steve Rosch, who saw an opportunity to address the developing need to explore many key issues of interest in the area of cold spray technology for naval air and ship applications. The goal was to create a collaboration that would leverage knowledge and resources with NAVAIR-PAX to evaluate and develop methods and techniques for the use of cold spray technology by the Navy since the needs for both NAVAIR and NSWCCD are very closely aligned in all but the system specific systems.

Price approached Wolk as the first candidate for the program due to her background in non-ferrous metals and her interest in evaluating cold spray technology for naval ship applications. The alignment of her research with cold spray technology was also a factor. When Wolk was told about the program she was quick to see the value, both in terms of expanding her knowledge and expanding her network of fellow researchers. "I thought the idea of the exchange was a great one from the start. I saw it as a chance to put myself outside the box to see new connections and paths for my research. I learned a great deal about the cultural differences between the naval air and surface in terms of what they were looking to achieve with the research we were doing as well. Probably my favorite part of the whole experience was that I was able to do a lot of research. I love my time in the lab. For me, the experience has paid off many times over."

The relationship continues to grow. In 2014, NAVAIR committed to an exchange of three researchers over the course of the next three years. Susan Hovanec, one of the program exchange participants, attributes her participation in the exchange to her experience working with Wolk during her time with the NAVAIR team. "She's been a true mentor to me, both with her technical knowledge, as well as her broader perspective on what the Navy needs regarding both cold spray technology and



The samples shown above demonstrate the size of crack repairs possible using cold spray techniques and materials. The darker "v" shape of materials fills the test gap between the plates. The ability to repair cracks such as this is one of many capabilities that illustrate the importance of continued study of cold spray technology. (U.S. Navy photo by Timothy E. Hunt/Released)

additive manufacturing and how to implement these technologies in the fleet. She plays a critical role in understanding the full spectrum of possibilities with the system's materials, processes and limitations. Having Jenn with us at Pax (NAVAIR-PAX) was definitely the catalyst for developing a long-term collaboration."

Another important aspect of the exchange lies in the area of resource sharing. The researchers now essentially have two labs and a broader range of testing equipment to do their work. "NSWCCD's unique testing and fabrication capabilities have benefited NAVAIR and we hope it will continue to help foster a long partnership between NSWCCD and NAVAIR," said Frederick Lancaster, Science and Technology Lead for the AIR 4.3.4 Materials Engineering Division.

The collaboration has gone beyond simply sharing data, personnel and resources between NAVAIR and NSWCCD. The research that began during Wolk's tenure has grown to include work leveraging knowledge developed from NSWCCD, the Army Research Laboratory (ARL) and NAVAIR, as well as capabilities at the Naval Postgraduate School, NSWCCD, and NAVAIR-PAX. To date, technology development has been funded through a growing number of interested organizations outside the Navy; the Department of Defense (Army, Naval Air Depot-Cherry Point, Office of Naval Research, Naval Undersea Warfare Center-Keyport as well as industry partners and university efforts by Pennsylvania State University, U.S. Naval Academy and South Dakota School of Mines.

The exchange program has also created opportunities of further collaboration in research projects not directly associated with cold spray technology, in particular in additive manufacturing, advanced microscopy and non-destructive evaluation.

In light of the success of the exchange program, NAVAIR continues to consult and collaborate with Wolk. Lancaster had this to say about Wolk's contributions: "During Dr. Wolk's time at NAVAIR-PAX, she has been critical in developing the necessary science and technology for fleet use and providing technical support as a subject matter expert in cold spray technology. Even though Dr. Wolk's time with us in our lab is over, she continues to aid us in addressing many of the key issues of interest to our work here at NAVAIR-PAX. Our collaboration with Dr. Wolk has proven invaluable to our research and development."

Dr. Jennifer Wolk (right) and Susan Hovanec discuss the shear and bonding characteristics of a cold spray material sample at Naval Surface Warfare Center, Carderock Division. The materials are being studied to confirm the reliability of cold spray repairs for both naval aircraft and ships. Their collaboration produced results that provide significant savings in both time and money in areas beyond Navy air and ship repairs. (U.S. Navy photo by Timothy E. Hunt/Released)

Award-winning employees at NSWCCD

By Rebecca Grapsy, NSWCCD Public Affairs

Naval Surface Warfare Center, Carderock Division (NSWCCD) employees are regularly recognized and rewarded by the industry for their expertise and success in their fields. In February and March, six awards were made to engineers working at Carderock.

Dr. Paul Shang, head of the Signatures Department, was named the Asian American Executive Engineer of the Year by the Asian American Engineer of the Year Award Committee. The committee recognizes outstanding Asian American professionals from corporate America, academia and government entities for their leadership, technical achievements and public service. Shang received the award Feb. 28 in Los Angeles as part of the 2015 National Engineers Week celebration.

Naval architects Adrian Mackenna and Dr. Chris Bassler received awards from the American Society of Naval Engineers (ASNE) at the organization's annual awards gala in Arlington, Virginia, March 4. Mackenna, head of the Future Ship and Submarine Concepts Branch, was the 2014 recipient of the Gold Medal Award, ASNE's oldest and most prestigious honor, presented by Rear Adm. Bryant Fuller, Naval Sea Systems Command deputy commander for Ship Design, Integration and Naval Engineering, and ASNE president retired Capt. Glenn M. Ashe. Mackenna was selected for the honor based on his "exemplary technical leadership in improving the Navy's warship concept design capabilities and his exceptional contributions to major ship acquisition programs and to our profession of naval engineering," according to the citation.

Bassler, the team lead for Future Surface Combatants in the Future Ship and Submarine Concepts Branch, was chosen for the Solberg Award for naval engineering research. Bassler's accomplishments were noted in the citation for his pursuit of "a comprehensive effort to markedly improve the U.S. Navy's advanced ship design capability for surface combatants." The Solberg Award was presented by Naval Surface Warfare Center Commander Rear Adm. Lorin Selby and Ashe.

Jeff Hough, director of the U.S. Navy Center for Innovation in Ship Design and head of the Future Concepts and Design Integration Process Division, was named recipient of the D.C. Council of Engineering and Architectural

Adrian Mackenna, a naval architect at Naval Surface Warfare Center, Carderock Division, in West Bethesda, Md., receives the American Society of Naval Engineers (ASNE) Gold Medal Award from Rear Adm. Bryant Fuller, Naval Sea Systems Command deputy commander for Ship Design, Integration and Naval Engineering, at a ceremony during ASNE Day 2015 in Arlington, Va., March 4. The Gold Medal is the highest award ASNE presents. It is given to an individual who has made a significant naval engineering contribution in a particular area during the past five years. (Courtesy photo provided by Scott Gabriel)

Naval Surface Warfare Center Commander Rear Adm. Lorin Selby presents Naval Surface Warfare Center, Carderock Division naval architect Dr. Christopher Bassler with the American Society of Naval Engineers (ASNE) Solberg Award at an awards ceremony during ASNE Day 2015 in Arlington, Va., March 4. From left: Rear Adm. Selby, Bassler and ASNE President Glenn M. Ashe. (Courtesy photo provided by Scott Gabriel)

Societies 2015 Engineer of the Year Award. Hough was nominated by ASNE for the award on the criteria of dedication, effort, quality and achievements in advancing the technical and professional aims of the engineering profession. Hough received his award at the organization's award ceremony Feb. 28 in Silver Spring, Maryland.

William Harney, site director at the Southeast Alaska Acoustic Measurement Facility (SEAFAC) in Ketchikan, Alaska, and Brian Caine, program manager with the Signatures Department, were selected for 2014 awards by the Department of the Navy Test and Evaluation Awards Program. Harney received the Department of the Navy (DON) Award for Technical Excellence at a Training and Education Facility or Range. Caine was selected as the DON Small Program Outstanding Tester in the civilian category, nominated for his contributions to testing sonar and acoustic systems and signatures for submarines. They will be presented their awards at a ceremony at the Pentagon later this spring.

Dr. Paul Shang (front row, fourth from right), Naval Surface Warfare Center, Carderock Division's Signatures Department head, receives the Asian American Engineer of the Year award from the Asian American Engineer of the Year Committee at a ceremony Feb. 28 in Los Angeles as part of 2015 National Engineers Week. (Courtesy photo provided)

Jeffrey Hough (second from right), director, U.S. Navy Center for Innovation in Ship Design and head, Future Concepts and Design Integration Process Division, receives the D.C. Council of Engineering and Architectural Societies 2015 Engineer of the Year Award at an awards banquet in Silver Spring, Md., Feb. 28., 2015. (Courtesy photo provided)

Planting a STEM seed – The SeaPerch Challenge 10-year anniversary

By Stephen Michetti, NAVSSES Cargo/Weapons Handling and Stowage Systems Branch head

It was 11 years ago when the Office of Naval Research (ONR) first introduced SeaPerch, an underwater robot build kit, to Naval Ship Systems Engineering Station (NAVSSES) and the American Society of Naval Engineers-Delaware Valley Section (ASNE-DV). The kit came with a construction manual, list of tools and all the parts necessary to build an underwater robot and was to be used as a hands-on activity for engineering outreach for middle and high school students. It sparked the interest of NAVSSES engineers, and an enthusiastic response from students as it was introduced at several local schools.

But no one could have predicted the growth and evolution of SeaPerch since then. From the initial feedback that, "students can't wait to come to school to work on SeaPerch," it was clear that this was a fun, educational and challenging way to get students interested in science, technology, engineering and math (STEM).

NAVSSES and ASNE-DV reached out to Drexel University and the School District of Philadelphia to advance the concept of using SeaPerch for outreach, and one year later the Greater Philadelphia SeaPerch Challenge (GPSPC) was conceived and implemented.

The challenge consists of a three-month design, build and test period that culminates in a four -part design and performance competition at Drexel University. The birth of the GPSPC effectively planted the seeds for what would yield interest and enthusiasm for STEM by tens of thousands of students across the country for the next 10 years, and its popularity continues to grow.

Amanda Gaetano has been working as a mechanical engineer at the Naval Ship Systems Engineering Station (NAVSSES) since graduating Rutgers University in 2012.

"I think one of the greatest strengths of the SeaPerch program is the relationship between mentors and their schools/teams," said Gaetano, mechanical engineer with Cargo/Weapons Handling and Stowage Systems Branch. "I've had the opportunity to go back to Paul VI High School, and every year I spend a couple minutes giving a short talk on the work we do here. It's great to see some eyes light up, and answer the team's questions – it's clear that SeaPerch is working."

As the 10-year anniversary of the GPSPC

Morgan Watson (back right), from Sustainment and Modernization Branch, judges the Delcroft School team during The Heist portion of the 9th Annual Greater Philadelphia SeaPerch Challenge at Drexel University April 25, 2014. Watson, along with other Naval Ship Systems Engineering Station, Naval Surface Warfare Center Carderock Division employees, volunteered as judges, helped organize the competition or mentored a competing team. (U.S. Navy photo by Public Affairs Specialist Joseph Battista/Released) approaches, almost 10,000 students from Philadelphia and the surrounding Pennsylvania and New Jersey areas have been directly involved in either SeaPerch or the GPSPC.

Hundreds of NAVSSES and ASNE-DV engineers, industry engineers, and Drexel faculty, staff and alumni have served as organizers, mentors, judges and volunteers. GPSPC participants and student volunteers have successfully pursued employment opportunities with the Navy under the Science and Engineering Apprentice Program (SEAP) at the high school level, as college engineering interns and co-ops, and as naval engineers upon graduation from college. GPSPC has spawned and/or supported other regional events including a Naval Air Systems Command (NAVAIR)/Rowan University SeaPerch Challenge in southern New Jersey, a Navy City Outreach/New York City SeaPerch challenge, a Stockton College/ United States Coast Guard/Friends of American Engineering and Science (AES) Atlantic City, New Jersey SeaPerch initiative, a NAVSSES/ Temple University SeaPerch Summer Camp and underwater Battle-Bots competition, a NAVSSES/Philadelphia University Girl Scout STEM Summer Camp and more.

Demetrios Pousatis, from Corporate Information Services Division at Naval Ship Systems Engineering Station, Naval Surface Warfare Center Carderock Division, listens to the middle school team from STEMnasium Learning Academy explain how they built their underwater remotely operated vehicle (ROV) for the ninth annual Greater Philadelphia SeaPerch Challenge at Drexel University, April 25, 2014. (U.S. Navy photo by Joseph Battista/Released)

Inspired by the success of the GPSPC, ONR initiated a National SeaPerch Challenge Program, which approaches its fifth year of national competition in 2015. Now managed by the Association for Unmanned Vehicle Systems International (AUVSI), the national program now has over 200,000 students participating in SeaPerch from all 50 states and Puerto Rico.

"Tasked with creating a national SeaPerch program, I learned of Steve Michetti and his team at the Greater Philadelphia SeaPerch Challenge through ONR and visited the 2007 GPSPC at Drexel," said Susan G. Nelson, executive director of SeaPerch and the AUVSI Foundation. "By the end of the day, I had a template of our National SeaPerch Challenge, and it was based on the outstanding event I observed that day. The GPSPC folks, beginning with Steve Michetti, have been allies, advisers, friends and colleagues as the national SeaPerch organization has grown. Our most recent National SeaPerch Challenge, held at the University of Southern Mississippi, had a record 108 teams and 1,000 attendees, and we can thank the Philadelphia organization for helping us get started."

The SeaPerch Challenge places significant emphasis on naval engineering and the design process, includes an integrated and extensive mentor program, and has an effective technical society/industry/academia/government partnership model.

Each year approximately 50 NAVSSES/ ASNE-DV and other local engineers, as well as Drexel engineering students serve as mentors supporting the teams. Mentors go through orientation and training and learn tips on how to help inspire teams to think creatively and problem solve without giving teams direct help or solutions.

SeaPerch appeals to a broad range of students because it provides levels of challenge and commitment that can vary based upon the goals set by each team. Teams involved in multiple structured engineering or robotics clubs can explore and learn more advanced engineering concepts and innovations as they design and build their SeaPerch. Middle school teams and teams with little to no prior experience with robotics or hands on activities can follow the construction manual and learning modules and build a working SeaPerch while learning more rudimentary engineering concepts.

Since almost all of the costs for GPSPC are covered by sponsorship, SeaPerch can also reach those schools that do not have financial resources to pay for more expensive robotics programs. And for those schools that don't have the personnel resources with experience in robotics, GPSPC provides teacher training and mentors to facilitate their participation.

GPSPC doesn't just appeal to brick and mortar schools, it includes home school teams, Police Athletic League teams, as well as both Boy Scout and Girl Scout teams. These factors resulted in increasing interest in the program to the point where registration was closed after just two days for several consecutive years after reaching the maximum capacity of about 55 teams.

Many GPSPC sponsors, organizers, mentors, judges and volunteers can reflect on the past 10 years and the impact that each one had on helping to shape thousands of youth that are part of what some refer to as "the iGeneration."

While not all of GPSPC student alumni aspire to become engineers or pursue careers as naval engineers, all of them benefited from the program. They learned teamwork, technical process, business process, time management, presentation skills, overcoming failure and much more.

For more information on the GPSPC, visit www.phillyseaperch.org. For information about the National SeaPerch Program, visit www.seaperch.org.

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