

May/June 2015

WAVES



Wave Slam

Testing high-speed planing hulls

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WAVES

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A computer screen aboard the Stiletto shows a high-value target surrendering during an interdiction scenario that was part of a capability demonstration at Joint Expeditionary Base Little Creek-Fort Story, April 22, 2015. (U.S. Navy photo by Nicholas Malay/Released)

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COVER

Naval Surface Warfare Center, Carderock Division (NSWCCD) Combatant Craft Project Engineer Jayson Geiser watches as a ship hull model attached to a high-speed sled moves through waves at NSWCCD's David Taylor Model Basin in West Bethesda, Md. during an Office of Naval Research-sponsored test April 3, 2015. The research studies the fundamental physics of the water-impact of high-speed planing hulls and to measure the slamming loads and resulting motions of the craft upon re-entry into the water. (U.S. Navy photo by John F. Williams/Released)

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TECHNICAL DIRECTOR'S CORNER

Dr. Joseph T. (Tim) Arcano Jr.

NSWC Carderock Division Technical Director

Carderock's role in energy systems development

Where at Carderock have long been involved with energy systems that enable the Navy's ships and submarines, as well as the Marine Corps' ground combat systems. Dramatic changes have taken place in recent years with the system types we are developing and testing. These changes will have broad impact on every aspect of ship and submarine design. As the primary center for testing and design of U.S. Navy ships, it is critical for us to be intimately involved in fostering collaboration in this critical area of research and development.

As part of this effort, on June 2-3, the Materials and Power Systems Branch at Naval Surface Warfare Center, Carderock Division, along with Naval Surface Warfare Center, Crane Division, hosted the second Warfare Center Energy Storage Summit. Participants of the summit included Naval Warfare Center leadership, Department of the Navy customers, the Office of Naval Research and the Department of Energy. This summit continued the collaborative efforts of the Warfare Center energy storage technical community. It leveraged the previous summit held in October 2014 at NSWC Crane, and covered issues relating to the affordability of future energy storage for naval systems. It furthered the fleet's goals by examining ways to reduce the cost of storing energy to support a wide range of future naval capabilities.

Initiatives such as these serve to illustrate how important energy-related research has become. The Navy and Marine Corps need advanced energy storage devices to enable a wide range of capabilities in the air, on land and at sea to effectively and affordably meet mission requirements. Unmanned systems, including those intended to ensure U.S. Navy undersea dominance, encompass a large number of these applications. Energy storage is an enabling capability for many shipboard systems as well. Also, we are moving swiftly toward hybrid systems that are both more efficient and environmentally friendly.

This need has driven a large number of Navy and Marine Corps program offices to invest in the capability offered by lithium-ion batteries and fuel cell systems. Many developmental programs using these technologies are underway, with a handful presently fielded. The demand for more batteries to power new systems, plus the demand to develop more energy dense storage solutions is growing as well. Unfortunately, the cost of energy storage may hamper capability, particularly with future budgets uncertain.

On the positive side, solutions to the problems faced already exist in the commercial sector where we should be "fast followers." The keynote speaker for the summit, Mateo Jaramillo, director, Tesla Energy at Tesla Motors, presented an exciting vision of the future in energy storage, as well as

the near-term solution that Tesla Motors has developed to rapidly field its vision. Tesla's research in energy storage, lithium-ion battery design and transportation applications are nothing less than cutting edge with potential to increase warfighting capability and increase energy security for our Sailors and Marines.

Carderock's Materials and Power Systems Branch is working with the Marine Corps Expeditionary Energy Office to fill gaps in the Marine Corps' power needs, conducting test and evaluation of fuel cell, energy storage and hybrid all-terrain vehicle technologies. Ultimately we expect to get higher energy-density batteries in the hands of Marines faster, and facilitate efforts aimed at supporting longer-term goals, including the commandant of the Marine Corps' strategic vision to reduce fuel consumption and "eliminate non-mobility fuel" from the battlefield by 2025.

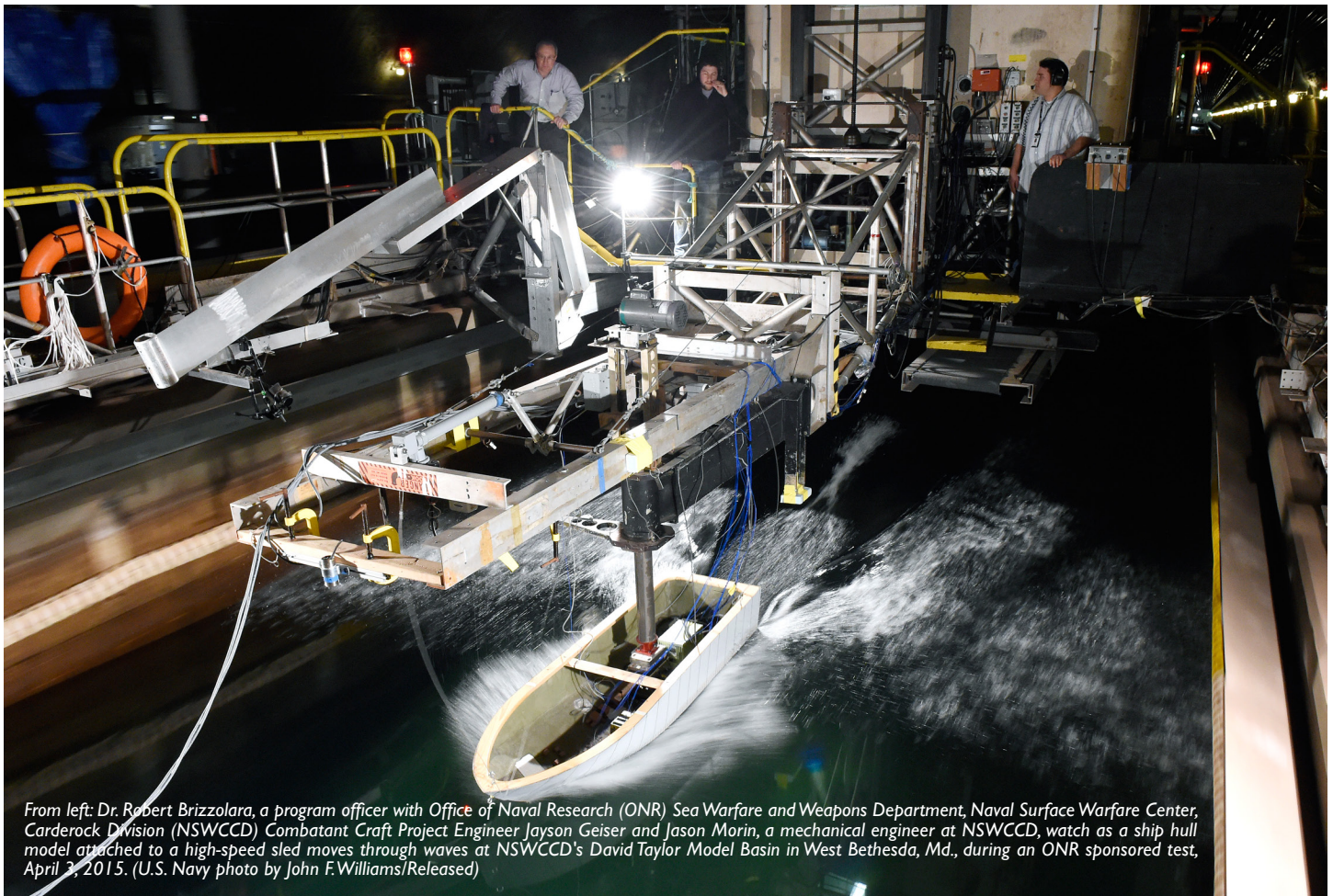
Another example of Carderock's involvement in energy solutions for the military is the alternative fuel testing going on at the Naval Ship Systems Engineering Station (NAVSSS) in Philadelphia. In cooperation with the Defense Logistics Agency, we are testing a 50/50 blend of NATO F-76 shipboard propulsion diesel used on U.S. Navy ships and an alternative fuel derived from algae oil to see how well the blend performs in marine gas turbines. To produce the alternative fuel, algae converted biomass into oil through fermentation. This oil was then refined into hydrocarbon fuel. The alternative fuel blend met the military specification requirements for NATO F-76 (MIL-DTL-16884) and was indistinguishable from the fuel currently in use by all Navy steam, diesel and gas turbine engines.

These projects are only the tip of the iceberg of the continued projects we can expect to support and provide to the fleet and our civilian customers. Carderock is committed to overcoming the energy challenges that stand between today's Navy and the tremendous capabilities of tomorrow. Our future systems will swim longer, move faster, run quieter and operate more efficiently. Our collaboration across the Warfare Centers and with private industry will play a key role in helping to safely and affordably power the next Navy and the Navy after next. I know we are up to the challenges these advancements present. I am proud to be part of the vanguard that you all represent in this area of research and development.



Planing and semi-planing craft analysis tools redefined

By Nicholas Malay, NSWCCD Public Affairs



From left: Dr. Robert Brizzolara, a program officer with Office of Naval Research (ONR) Sea Warfare and Weapons Department, Naval Surface Warfare Center, Carderock Division (NSWCCD) Combatant Craft Project Engineer Jayson Geiser and Jason Morin, a mechanical engineer at NSWCCD, watch as a ship hull model attached to a high-speed sled moves through waves at NSWCCD's David Taylor Model Basin in West Bethesda, Md., during an ONR sponsored test, April 3, 2015. (U.S. Navy photo by John F. Williams/Released)

U.S. Naval Academy Associate Professor of Naval Architecture Carolyn Judge and Naval Surface Warfare Center, Carderock Division (NSWCCD) Combatant Craft Project Engineer Jayson Geiser conducted an Office of Naval Research (ONR) sponsored test to assess the hydrodynamic and structural performance of a planing craft in waves. This test, conducted on the David Taylor Model Basin High Speed Carriage, April 6, collected data that is critical to improving the overall design and design process of high-speed watercraft seaworthiness, structural robustness, and passenger comfort and safety.

“Predicting the hydrodynamic impact loads on a boat supported by dynamic lift in a given sea condition is critical for structural design, powering requirements and personal safety,” Judge said. “Research on wave impacts is a significant area for boat designers because hydrodynamic impact load characteristics are



A ship hull model attached to a high-speed sled moves through waves at Naval Surface Warfare Center, Carderock Division's David Taylor Model Basin in West Bethesda, Md., during an Office of Naval Research sponsored test April 3, 2015. (U.S. Navy photo by John F. Williams/Released)

critical for the structural design of planing boats and personnel safety aboard high-speed vessels and impacts associated with higher boat speeds can have a negative impact on equipment and crew.”

The primary goal of this testing is to develop a more thorough understanding of the physics of wave impacts for rigid bodies hydrodynamically supported due to forward speed.

“Understanding the physics involved in these types of impacts is the first step in developing a tool for predicting these hydrodynamic impact loads,” Judge said. “The use of appropriate numerical tools for design evaluation would significantly reduce the cost of evaluating novel hull forms, as numerical results can be determined prior to building and allow a wide range of operating conditions to be considered.”

“This test supports the overall ONR program goals to determine whether current computational tools and experimental techniques can be used to improve the Navy’s understanding of the dynamic response of semi-planing and planing craft in a seaway; and, to determine whether improved understanding of the dynamic response of semi-planing and planing craft can be used to enhance the current structural design methods for these craft,” said Dr. Brizzolara, a program officer with ONR’s Sea Warfare and Weapons Department.

A semi-planing hull uses a combination of hydrodynamic lift and buoyancy to stay afloat while moving at speed. A planing hull relies primarily on hydrodynamic lift. This difference influences the underwater hull shape with a planing hull having a mostly flat or V-shaped bottom, while a semi-planing hull looks more like a traditional displacement hull although the bottom tends to be flatter towards the transom. Both hull types typically have a flat (cut-off) transom.

“The fundamental hydrodynamics for planing hulls operating in waves are not well understood,” Judge said. “Many factors contribute to the reaction of the hull during these impacts, including the wave height, wave slope, the relative velocity of the body and the water surface, the orientation of the body, the location on the body of the wave impact and the forward speed of the body.”

“Current structural design methods for semi-planing craft rely heavily on empiricism. As a result, an unknown level of conservatism



U.S. Naval Academy Associate Professor of Naval Architecture Carolyn Judge and Naval Surface Warfare Center, Carderock Division (NSWCCD) Combatant Craft Project Engineer Jayson Geiser assess damage from the first high-speed run in waves in NSWCCD’s David Taylor Model Basin, April 6, 2015. (U.S. Navy photo by Timothy E. Hunt/Released)

exists in the prediction of impact loads,” Geiser said. “If the dynamic response of a semi-planing or planing boat is understood and can be predicted using physics-based tools, the Navy will be able to design boat structures capable of withstanding impact loads and responding to seaway forces while minimizing the craft’s structural weight and improving overall vessel performance.”

The data collected during this planing hull model test is still being assessed and compiled into an electronically accessible database. The principal investigators, Judge and Geiser, are developing and pursuing plans for improving understanding of the fundamental physics of planing in waves to continue development of assessment cases for evaluating the physical accuracy of hydrodynamic analysis tools intended for planing and semi-planing hulls.

Hydrodynamic assessment tools such as, Star-CCM+, LAMP and CFD-Ship Iowa are computational fluid dynamics codes that can model the complex flows around the hulls of a planing or semi-planing hull operating in waves.

The team is executing the research in two

parts: experimentally with scale models and using computer simulations. The scale models are tested in the large tow tank at NSWC Carderock. (To watch a video of the testing, click here: <https://youtu.be/Rcg0WWriOgA>).

“With respect to planing, previous work has highlighted the need to collect all available model data that could be used to assess the physical accuracy of numerical predictions for planing hulls, make it readily accessible and determine the suitability of this data for support of current program objectives,” said Dr. Craig Merrill, mechanical engineer with the NSWCCD Combatant Craft Division.

The testing was also documented by Discovery Channel Canada to highlight NSWCCD’s technical capabilities of model planing and semi-planing craft underway. To view, click the following link to the segment: <https://review.bellmedia.ca/view/254041244>.

Vertical Package Conveyor test site receives upgrades to better support aircraft carriers

By Joseph Battista, NAVSSES Public Affairs

Installation of a new Programmable Logic Controller (PLC) and Human Interface Panel (HMI) at the Naval Ship Systems Engineering Station (NAVSSES) Vertical Package Conveyor (VPC) Test Site in late April will help engineers at the land-based test site better support the several VPC configurations currently installed on CVN 68 class aircraft carriers.

The test site has three full-scale shipboard VPCs used as test beds to standardize, test and evaluate components of VPC systems used throughout the fleet. The latest upgrade at the test site is the installation of the same HMI display panel installed on USS Ronald Reagan (CVN 76) in February.

“Like with most technology these days, it needs a refresh every so often, and it was time for the control mechanism of the VPCs to get one,” said Sue Kralle, electrical engineering technician with Aircraft, Vehicle, Ship and Material Handling Branch. “With the new PLC and HMI being installed on CVN 76, we needed to make sure we had the same configuration at our test site in order to be able to support the Sailors if a problem occurs.”



The Naval Ship Systems Engineering Station (NAVSSES) Vertical Package Conveyor (VPC) test site has three full-scale shipboard VPCs used as test beds to standardize, test and evaluate components of VPC systems used throughout the fleet. (U.S. Navy photo by Joseph Battista/Released)

Kralle said NAVSSES built the VPC test site in the late 1980s to support the Conveyor Upgrade Program (CUP) – geared toward improving VPC safety components. Nine of the 10 aircraft carriers in the Nimitz class have 11 VPCs. The tenth ship, USS George H. W. Bush (CVN 77), has seven.

The three VPCs at the test site have capacities of 85, 100 and 175 pounds. VPCs move supplies such as food between decks on a ship.

The VPC test site now has, with Tech Refresh (SCD 9809), an upgraded PLC and HMI, in addition to the previous models still used by CVNs 68 through 75. Kralle said the other carriers will get the upgrade over the next few years, but until then, NAVSSES in-service engineering agents (ISEA) must be able to run tests using combinations of different configurations.

Electrician Joe Patto with Major Programs Branch installed the new HMI underneath the older version. The two HMIs are wired through a switch so testers can operate the site’s conveyors with either HMI or either PLC.

“We are able to switch back and forth between PLCs and/or HMIs so we can simulate what is on any carrier,” said Kralle. “We can use data for any carrier in the fleet and run scenarios to resolve problems or test new ideas on how Sailors can better operate the conveyors. We want Sailors to be able to operate them as safely and efficiently as possible.”

Kralle said the VPCs were notorious for being safety hazards until the CUP in the 1980s with the addition of new safety features. The VPCs on the CVNs received “Smart Carrier” upgrades in the early 2000s to further increase safety and efficiency. This included the installation of a PLC, a variable frequency drive (VFD), safety light curtains, and an automatic chain oiler system. These components were installed at the test site as well.



Installation of a new Programmable Logic Controller (PLC) and Human Interface Panel (HMI) at the Naval Ship Systems Engineering Station (NAVSSES) Vertical Package Conveyor (VPC) Test Site in late April will help engineers at the land-based test site better support the several VPC configurations currently installed on CVN 68 class aircraft carriers. (U.S. Navy photo by Joseph Battista/Released)

In recent years Kralle, Electrical Engineering Technician Mark DiTroia, and Computer Engineer Danielle Tareila have worked to improve the safety of the conveyors. They not only are upgrading the PLCs and HMIs, but they oversaw the installation of an additional safety light curtain at the top level of the VPCs that shuts down the VPCs when a foreign object such as a body part crosses the threshold of the conveyor during operation – similar to the way elevator doors operate.

NAVSSSES Philadelphia Land Based Test Site to support future testing

By Joseph Battista,
NAVSSSES Public Affairs

Engineers at Naval Ship Systems Engineering Station (NAVSSSES) Philadelphia will reconfigure portions of their Land Based Test Site (LBTS) over the next year to create space for DDG 51 Class Flight III shipboard equipment – scheduled for installation and land-based testing in support of the FLT III baseline planned for introduction on a fiscal 2016 ship – as well as to support other power conversion initiatives.

The site, constructed in 2003, includes Integrated Fight through Power test (IFTP) architecture, which is used to test Power Conversion Module (PCM) designs. The IFTP system, comprised of a variety of PCM configurations, is responsible for converting high voltage (HV) power from the ship's gas turbine generators to an assortment of alternating and direct current (AC and DC) voltages for distribution to the ship's auxiliary systems. The IFTP architecture is designed for increased survivability, power continuity, and affordability.

"With a collaborative approach, we developed a reconfiguration plan conducive to the DDG 51 Class Flight III test site design efforts while maintaining site availability for PCM testing," said Nick Silva, electrical engineer with the Advanced Electrical Power Systems Branch who is overseeing the reconfiguration of the space. "The goal is to be efficient, safe, and cost-conscious throughout the project. There is a lot of infrastructure here we can use – a lot of valuable equipment here we can use including cables, which will provide significant savings."

Silva and a team of NAVSSSES engineers began developing a plan in late 2014 to determine the most cost-effective way to reconfigure the site. He said items such as the AC and DC load banks, chilled water system, control room equipment, motor generator sets, and utility



Nick Silva, electrical engineer with the Advanced Electrical Power Systems Branch, studies plans for the reconfiguration of the Integrated Fight Through Power (IFTP) test site at Naval Ship Systems Engineering Station in Philadelphia May 4, 2015. (U.S. Navy photo by Joseph Battista/Released)

power connections can all be used for testing activities at NAVSSSES – specifically in support of NAVSSSES' power conversion initiatives.

Silva said the team recently approved the plan for phase one of the reconfiguration, which includes keeping some of the power conversion equipment in place to support an upcoming test for engineers within the Machinery Research and Silencing Division.

"Reconfiguring and reusing some of the IFTP equipment at NAVSSSES is very useful for supporting both near-term tests, as well as repurposing or modifying parts to support future test beds," said John Heinzel, chemical engineer with the Energy Conversion Research and Development Branch. "The reuse of IFTP equipment is helping to forge a good working relationship between divisions in multiple areas."

Silva said there is a lot of valuable space in the building and has initiated various meetings with other interested engineers, including the weekly Land Based Engineering Site (LBES) design meeting to discuss plans for moving forward with equipment integrations, as well as continued support for testing on all test sites.

"It seems like everyone has new equipment they want to bring in to test, so we have to plan for it and part of that includes moving or removing old infrastructure," said Silva.

The team expended significant effort to acquire previous design artifacts to assist in the new demolition and installation design drawings. Silva said the reconfiguration design team used computer modeling of the test sites to help them determine space requirements when developing the plan.

"Even though it is all laid out in the computer, we still have to come out to the test sites and look at everything to provide feedback and make sure our plan will work," Silva said. "Safety is one of our biggest concerns when it comes to moving equipment."

Silva said it is important to do a thorough study of the space in order to identify: the multiple sources of power to be secured in accordance with lockout/tagout procedures; removal paths for each piece of equipment; and modifications necessary to ensure physical obstacles that could impede installation are removed. It is more than just determining if the doors are wide enough for the equipment to fit through.

Silva said their strategy for the IFTP site supports Heinzel's immediate plans as well as future tests. Additionally, the site will accommodate the new DDG 51 Flight III test equipment while still maintaining space for future test platforms.

A.J. Baylor's structural assessments help keep fleet afloat

By Joseph Battista, NAVSSES Public Affairs



A.J. Baylor, mechanical engineer with the In-Service Structural Engineering Office at Naval Surface Warfare Center Carderock Division in Philadelphia, does a structural assessment of a Navy ship in Japan Aug. 28, 2013. (Official U.S. Navy photo/Released)

Crawling around the bowels of ships in dark and cramped spaces to find out if the hull is structurally sound – then sometimes breaking the news to the ship's captain that there is a problem does not seem like a fun day at the office. For A.J. Baylor, mechanical engineer with the In-Service Structural Engineering Office at Naval Surface Warfare Center Carderock Division in Philadelphia, it is as exciting as living the life of a cinematic action hero.

"The best part of my job is getting to see and learn about every square inch of every class in the fleet," said Baylor, a 2008 graduate from Penn State University with a bachelor's in mechanical engineering. "I'd like to learn as much as I can about each of our Navy's ship classes."

Baylor is part of a small team based in Philadelphia who travels the world visually assessing the hulls of Navy vessels looking for damage and wear due mostly to corrosion from operating in a saltwater environment.

"My job is to make early identification of possible structural impacts from corrosion or overstress so problems can be prevented or repaired to ensure a ship's readiness, seaworthiness, and warfighting capabilities," said Baylor.

He has traveled from coast-to-coast in the United States and to Hawaii. He spent time in multiple locations in Japan. He has been to the islands of Crete, Guam, and Sicily – and worked in the arid environs of Bahrain, Dubai, and Saudi Arabia. Baylor said he is away from home 30 to 60 percent of the year with each

adventure lasting between one-and-a-half and six weeks.

"For me it's a busy, but sustainable schedule," said Baylor, who has worked for the Carderock Division since 2008. "It still allows me enough time in the office to write complete reports on my inspections and plan for the next trip."

Baylor said the schedule was haphazard when he first started doing structural assessments, but since the beginning of fiscal 2015, with the implementation of the Navy's Class Maintenance Plan (CMP) Maintenance Requirement Identification (MRID) 108096, all surface combatants and amphibious ships must be inspected prior to dry dock availability. This allows the team more time to plan their inspection schedule.



"Our purpose is not to sightsee when we go somewhere, but if the opportunity presents itself we try to get out and see things," Baylor said. "There is usually so much going on with our work it consumes most of our time."

Baylor said they do up to 1,000 ultrasonic testing (UT) thickness readings per job. This is a non-destructive testing method requiring no physical penetration of the hull. They use a mathematical equation based on the time it takes the ultrasound wave to travel through the hull to determine its thickness.

Sometimes the work requires being the bearer of bad news. Baylor said the worst part of the job is finding a problem and having to notify the ship's captain of the bad news.

"Sometimes we have to be the bearer of bad news," said Baylor. "That's just part of the job."

Baylor said the In-Service Structural Engineering Office continuously strives to better their process so they can provide finished reports on their structural assessments with a perfect road map for those who will fix the problems they find.

"I enjoy working on Navy ships and meeting the Sailors assigned to them," Baylor said. "It gives me a great deal of respect and admiration for the men and women who are often away from their homes and families for months on end to protect our country and freedoms from our enemies."

"This has given us the opportunity to inspect a ship and for all problems discovered, the maintenance team can then schedule the repairs for the upcoming availability," Baylor said.

Baylor and two of his colleagues, Cody Scheller and Chris Butler, completed a structural assessment under this new requirement for USS Lassen (DDG 82) on May 4 in Yokosuka, Japan. Their assignment included identifying and documenting structural discrepancies, entering the data into the Corrosion Assessment Data Entry Tool (CADET) database along with repair recommendations, and providing data and Objective Quality Evidence (OQE) to support Departure from Specification (DFS) requests for items not repaired prior the ship's next underway period.

Baylor said there are still situations where he will get a call in the middle of the night or on a weekend telling him he needs to pack his bags and travel halfway around the world to assess a ship.

In 2012, while visiting family in northeastern Pennsylvania, he received a call from Naval Sea Systems Command (NAVSEA) Surface Warfare Directorate (SEA 21) about a situation with USS Porter (DDG 78). The ship collided with a Japanese-owned merchant tanker while transiting the Strait of Hormuz. Within five hours of receiving the call, Baylor said good-bye to his family, booked a flight, reserved a hotel room in Dubai, drove back to Philadelphia, stopped at his house to pack, and was at the airport boarding his flight. Within

24 hours he was 7,000 miles from Philadelphia sitting in a meeting with all the parties involved in the repair effort.

"What I like most about the work is the surprises, like the USS Porter incident," said Baylor. "It adds a lot of excitement to the job – you're never doing the same thing every day."

Unfortunately, Baylor said there is not a lot of time to explore when he travels to different places.



A.J. Baylor, mechanical engineer with the In-Service Structural Engineering Office at Naval Surface Warfare Center Carderock Division in Philadelphia, calibrates equipment used to do structural testing of Navy hulls Jan. 16, 2014. (Official U.S. Navy photo/Released)

Innovation in action - adaptive force packages

By Nicholas Malay, NSWCCD Public Affairs



Operations Advisor Don Behr prepares to be transported from an 11-meter rigid-hull inflatable boat to a jet-ski operated by Seaward Services Boat Capt. Sam Calabrese during a high-value target interdiction scenario off the coast of Virginia Beach, Va., April 22, 2015. Over two weeks in April, CNO's Rapid Innovation Cell and Stiletto personnel along with system developers tracked Behr as a simulated target of interest from the Stiletto's Command Information Center to assess adaptive force packages and new concepts for command and control and multi-sensor fusion technologies for smaller vessels. (U.S. Navy photo by Nicholas Malay/Released)

The Stiletto Maritime Demonstration Program conducted a Capability Demonstration April 13-24, in support of the Chief of Naval Operations (CNO) to assess new concepts for command and control and multi-sensor fusion technologies for small vessels. The demonstration was executed through a partnership with the CNO's Rapid Innovation Cell (CRIC) off the Virginia coast near Joint Expeditionary Base Little Creek-Fort Story, in Virginia Beach, Virginia.

During the two-week demonstration, system developers from private industry assembled their components into rapidly reconfigurable mission packages to perform maritime command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR) missions aboard the Stiletto in a realistic maritime environment. The Stiletto program is a maritime demonstration platform that



A land-based tactical operations center on the beach at Joint Expeditionary Base Little Creek-Fort Story, Va., April 21, 2015. The tactical operations center was part of a capability demonstration April 13-24. Navy personnel and private industry were testing the line-of-sight radio and satellite network capabilities from the tactical operations to the littoral operations center aboard Stiletto. (U.S. Navy photo by Devin Pisner/Released)



Jet-skis were used to transfer the high value target to the beach for system developers aboard the Stiletto vessel to track the target's location to capture the threat off the Virginia coast near Joint Expeditionary Base Little Creek-Fort Story, April 22, 2015. The Stiletto Maritime Demonstration and CNO's Rapid Innovation Cell conducted a two-week Capability Demonstration to assess new concepts for command and control and multi-sensor fusion technologies for small vessels. Two scenarios were conducted daily to demonstrate how the Adaptive Force Package Littoral Operations Center (AFP LOC) will help optimize command and control capabilities: a high-value target interdiction scenario and a humanitarian assistance disaster relief scenario. To test rapid reconfigurability, the AFP LOC shifted between these drastically different mission sets within an hour. (U.S. Navy photo by Nicholas Malay/Released)

serves as a prototype demonstration tool for industry, government laboratories and academic institutions.

The Stiletto Maritime Demonstration Program is sponsored by the Rapid Reaction Technology Office in the Deputy Assistant Secretary of Defense for Emerging Capability & Prototyping to rapidly evaluate and mature emerging technologies in a realistic maritime environment. Engineers and technicians with specialized expertise in maritime technology from Naval Surface Warfare Center, Carderock Division's (NSWCCD) Norfolk detachment maintain the craft and operate the program.

Stiletto personnel partnered with the CRIC and coordinated with Navy Expeditionary Combat Command (NECC) to create the Adaptive Force Package Littoral Operations Center (AFP LOC), a configuration of maritime rapidly reconfigurable C4ISR mission packages to perform joint and coalition maritime operations.

AFP LOC provides command and control and multi-source sensor fusion for small vessels and auxiliary maritime platforms that typically do not have these organic capabilities on board. Adaptive force packages are essentially the personnel and their associated analytical equipment, which can be tailored to meet the specific needs of a given mission.

AFP LOC has three primary components: infrastructure (e.g., antenna cabling, patch panels and power); backbone (e.g., computer systems, navigation, radar and weapon systems); and sensor packages, which are mission specific

and may be hardware or software based. All systems are modular and able to be carried on and set up on the AFP LOC infrastructure in less than 24 hours.



CNO's Rapid Innovation Cell Project Lead LT Jason Knudson (right) assesses adaptive force packages on an 11-meter rigid-hulled inflatable boat off the coast of Virginia Beach, Va., April 22, 2015. In the background is the Stiletto Maritime Demonstration vessel, used to conduct a two-week capability demonstration April 13-24, 2015. (U.S. Navy photo by Nicholas Malay/Released)



Pete Kuzdeba from L3 Communications controls the MAX360 technology integrated with Stiletto's gyro cam to provide a 360 degree view of the surrounding maritime environment during a high-value target interdiction scenario, April 22, 2015, off the coast of Virginia Beach, Va., from one of the six shock mitigating seats in the Stiletto Command Information Center. (U.S. Navy photo by Nicholas Malay/Released)



Stiletto and CNO's Rapid Innovation Cell (CRIC) personnel assess new concepts for command and control and multi-sensor fusion technologies for small vessels and demonstrate the ability to communicate and transfer data with a land-based tactical operations center via line-of-sight radio and satellite networks to Stiletto's video-teleconference-area, April 22, 2015, during a two week Capability Demonstration off the Virginia coast near Joint Expeditionary Base Little Creek-Fort Story. (U.S. Navy photo by Nicholas Malay/Released)

However, vessels typically do not have AFP LOC organic capabilities on board. According to Rob Tutton, NSWCCD engineer and manager of the Stiletto Maritime Demonstration Program, "The electrical and security infrastructure must be built into the vessel in advance, which requires time and funding, but once the infrastructure is installed and approved, then the AFP LOC allows for easy installation and removal with minimal impact to the vessel's normal operations," said Tutton. "I believe this is the true genius behind the AFP LOC that will provide savings and increased capability for the Navy that aligns with the CNO's 'Payloads Over Platforms' concept."

The CRIC's AFP LOC Capability Demonstration coincides with the Secretary of the Navy's establishment of Task Force Innovation (TFI) priorities to ensure emerging operational capabilities, such as adaptive force packages, have a clear and expedient path to the fleet. The task force includes subject matter experts who have been charged with developing a comprehensive innovation agenda for the Navy and Marine Corps.

The objectives were to demonstrate the ability



Stiletto off the coast of Virginia Beach, Va., April 21, 2015. The vessel, sponsored by the Office of the Secretary of Defense, was at Joint Expeditionary Base Little Creek-Fort Story, for a two-week capability demonstration program for CNO's Rapid Innovation Cell to assess new concepts for command and control and multi-sensor fusion technologies for small vessels. (U.S. Navy photo by Devin Pisner/Released)

to set up a rapidly reconfigurable operations center on a large surface craft capable of relaying information from other surface and air platforms and demonstrate the ability to communicate and transfer data with a land-based tactical operations center via line of sight radio and satellite networks.

"The C4ISR systems the Navy currently fields onboard ships are expensive, slow to upgrade and install, and nearly impossible to reconfigure for a change in mission," CRIC Project Lead Lt. Jason Knudson said. "As a result, we only field full C4ISR systems on our carriers, destroyers, amphibious ships and cruisers. We asked the question, 'How might we make C4ISR mission packages rapidly reconfigurable?' We are determined to break out of the old model and take advantage of new technologies and platforms of opportunity."

The program also provided the 25 participating industry partners an opportunity to receive immediate end-user feedback toward increasing technology readiness levels and access to direct operator input.

The Capability Demonstration was unique in that each vendor signed a Cooperative Research and Development Agreement (CRADA) with Carderock Division specifically developed for

the Stiletto Maritime Demonstration Program. The Capability Demonstration's requirements led Dr. Joseph Teter, NSWCCD director of technology transfer and Deputy Director Alyssa Littlestone, to develop and execute a new type of limited-purpose CRADA allowing private industry to bring their technology and expertise onto the at-sea demonstration platform. Each agreement facilitates the exchange of the data collected between the Navy and the company. Since this is not a traditional acquisition process, these official agreements were necessary to allow the government and private companies to work together on research and design.

"The vendors were encouraged to work with other vendors to rapidly integrate their individual technologies into a system of systems to overcome capability gaps," said Tutton.

"At this time, we are forced to take our assets with capability and push them to where we need access. Often, this involves taking a multi-billion dollar investment off station when other platforms are available, but may not have the capability," Knudson said. "We are saying push out the capability, not the platform. Make it man-portable. Make your platforms plug-and-play ready. By doing this, we can make the CNO's concept of 'Payloads Over Platforms' a reality."

With Navy Expeditionary Combatant Command and Navy Expeditionary Intelligence Command's expertise in expeditionary operations, Knudson said he hopes to see NECC and NEIC, among others, operating AFP LOC missions in theater by the end of the year.

Two scenarios were conducted daily to demonstrate how the AFP LOC will help optimize command and control capabilities: a high-value target interdiction scenario and a humanitarian assistance disaster relief scenario. To test rapid reconfigurability, the AFP LOC shifted between these drastically different mission sets within an hour.

In addition to the Stiletto vessel, there was an 11-meter rigid-hulled inflatable boat and other Carderock-owned assets, such as jet skis, that were used as needed depending on the requirements of the demonstration.

"For this demonstration, the CRIC was assessing adaptive force packages while our smaller craft simulated small boat threats, CRIC and Stiletto personnel along with systems developers tracked items of interest from the Stiletto's Command Information Center," Tutton said.

The next Stiletto Maritime Demonstration will be in fall 2015.

Prototype fire detection and actuation system installed on USS Wasp (LHD 1)

By Joseph Battista, NAVSSES Public Affairs



A F-35B Lightning II takes off from the flight deck of the amphibious assault ship USS Wasp (LHD 1) in the Atlantic Ocean, May 25, 2015. Wasp, with Marine Fighter Attack Squadron (VMFA) 121 and VMFAT-501 embarked, is underway conducting the first phase of operational testing which will evaluate the full spectrum of F-35B measures of suitability and effectiveness in an at-sea environment. (U.S. Navy photo by Mass Communication Specialist 3rd Class Rawad Madanat/Released)

Engineers at Naval Ship Systems Engineering Station (NAVSSES) completed installation of a new fire detection and fire suppression actuation system in the Lithium-ion Battery Shop on USS Wasp (LHD 1) March 31. The shop holds three different lithium-ion batteries used to support testing of the Joint Strike Fighter (JSF) (F-35B) Marine Corps variant on LHD 1.

According to Joseph Westenberger, mechanical fire protection systems engineer with Damage Control, Recoverability, Chemical and Biological Defense Branch at Naval Surface Warfare Center Carderock Division in Philadelphia, LHD 1 has been outfitted with state-of-the-art fire-detection and suppression systems to accommodate the potentially flammable materials contained in lithium-ion batteries.

“We need to make sure we can immediately suppress the fire within the enclosed area to protect Sailors and the ship,” said Westenberger. “The system we installed is designed to quickly detect fire-related anomalies and take appropriate actions.”

Those actions include cutting electrical power to the area (the area serves as a charging station for the batteries), opening ventilation dampers, and / or deluging the area with seawater. The detection of smoke or heat in the storage area, which contains individual lockers for each battery, triggers the above actions. Each battery is stored individually to prevent a hazardous event with one battery from triggering reactions to nearby batteries.

“Under certain circumstances, Lithium-ion batteries can have a violent reaction called a thermal runaway where a flammable gas is released,” said Westenberger. “We have to make sure if this happens we can suppress it immediately and fire doesn’t spread.”

Westenberger said they also fitted the space with a sprinkling system that cools the temperature of the gases, cools the exterior of the lockers, and cools the acidic concentrations.

Westenberger said the installation began in January, and it went “fairly smooth.”

“We encountered a few issues we had to resolve,”

said Westenberger. “But, we tested the system to ensure it was fully operational before we left the ship. We had to ensure it was operating properly before the JSF testing period.”

According to Westenberger, this is a prototype installation. His team will evaluate the system’s performance during the JSF operational tests. They will continue to monitor the system and make necessary improvements that will be incorporated into future installations on amphibious class ships.

In addition, Westenberger said they are getting ready to do a prototype installation on USS Abraham Lincoln (CVN 72). He said the lithium-ion battery storage spaces on aircraft carriers are different – requiring a modified fire detection and suppression actuation system. They will evaluate the performance on CVN 72 and make any necessary improvements before installation on the remaining fleet of carriers.

NAVSES electrical engineers receive NAVSEA Excellence Award

By Kate Hogarth, NAVSES Public Affairs

Naval Ship Systems Engineering Stations (NAVSES) electrical engineers Ewane Etinge, Michael Michejda and Dr. Michael Knauff with the Machinery Research and Silencing Division received a NAVSEA Excellence Award at the Washington Navy Yard on May 1, for the work they accomplished as part of the DDG 51 Flight III Dynamic Modeling Analysis Modeling and Simulation Team.

The team, sponsored by the Naval Sea Systems Command DDG 51 Program Office (PMS 400), is performing a series of four analysis tasks, using modeling and simulation, to assess the impacts of upgrading to a higher voltage power system to enable integration of a higher powered radar into DDG 51 Flight III ships. In order to support the design and construction schedule for DDG 51 Flight III upgrades, the tasks need to be accomplished and the results provided to the design engineers in a limited time frame.

"Responding to the schedule is difficult," said Knauff, the team lead who earned his bachelor's degree from the University of Hartford and his master's degree and doctorate in electrical engineering from Drexel University. "With modeling and simulation there is a lot of uncertainty and things can change unexpectedly. We have to keep up with the schedule while adjusting to the changes. When something doesn't go as planned we all pull together to come up with alternate solutions."

Michejda, who received his bachelor's and master's degree in electrical engineering from Fairleigh Dickinson University and graduated from the Naval Acquisitions Development Program, said "Simulations can take about 24 hours to run each scenario. To optimize the time, we utilize multiple computers to run the simulations."

The team completed two out of the four tasks on schedule and is moving on to the third. The first two tasks, power transient and power quality analysis, investigated the effects changes in power and quality of power would have on the system. The third task, power continuity analysis, will analyze how the electrical system emergency devices operate in an emergency situation. During the fourth task – the team will be analyzing how the electrical system responds to damage if the ship is attacked.

"I nominated the DDG 51 Flight III Dynamic Modeling Analysis Modeling and Simulation



Vice Admiral William Hilarides Commander, Naval Sea Systems Command (NAVSEA), presents Naval Ship Systems Engineering Stations (NAVSES) electrical engineers Ewane Etinge, Dr. Michael Knauff and Michael Michejda with a NAVSEA Excellence Award at the Washington Navy Yard on May 1, 2015, for the work they accomplished as part of the DDG 51 Flight III Dynamic Modeling Analysis Modeling and Simulation Team. (U.S. Navy photo/Released)

Team because they were able to undertake a difficult modeling task with an aggressive schedule and develop a product that far exceeded the sponsor's expectations," said Daniel Evans, Machinery Technology Research and Development Branch head. "Other NAVSEA sponsors have taken notice to what the team has accomplished and have inquired about similar tasking for other Navy ships."

According to the award citation, using modeling and simulation instead of full scale testing saves the Navy millions of dollars and allows the electric plant to be exercised in numerous ways that could dangerously stress an actual electric plant.

"I'm confident the work we are doing is going to prevent situations where the ship could go dark and other detrimental things that could happen, won't happen because we have done this work," Knauff said. "Our modeling work is one of the more preliminary de-risking steps. From the modeling we know the problems that might crop up."

The team has learned a great deal from this project. "I think modeling and simulation is expanding and I think through this project we are building up that capability to be stronger in the future," Knauff said.

"Being with this project helps me understand more of what's actually going on with the systems on the ships and I've always enjoyed coding. Working with the team has been great," said Etinge, who earned his bachelor's and master's degrees in engineering from Tuskegee University.

The team received a lot of help, support and advice from fellow NAVSES engineers including, Jimmy Hom, Tom Coughlin, Toni Checchio, Tracy Hannon, Christian Schegan, Shaun Cruz, Dan Santosusso, Daniel Evans and Lyle Plesnick.

Investigation of passive heating in diving wet suit materials using carbon nanotubes as insulators

By Nicholas Malay,
NSWCCD Public Affairs

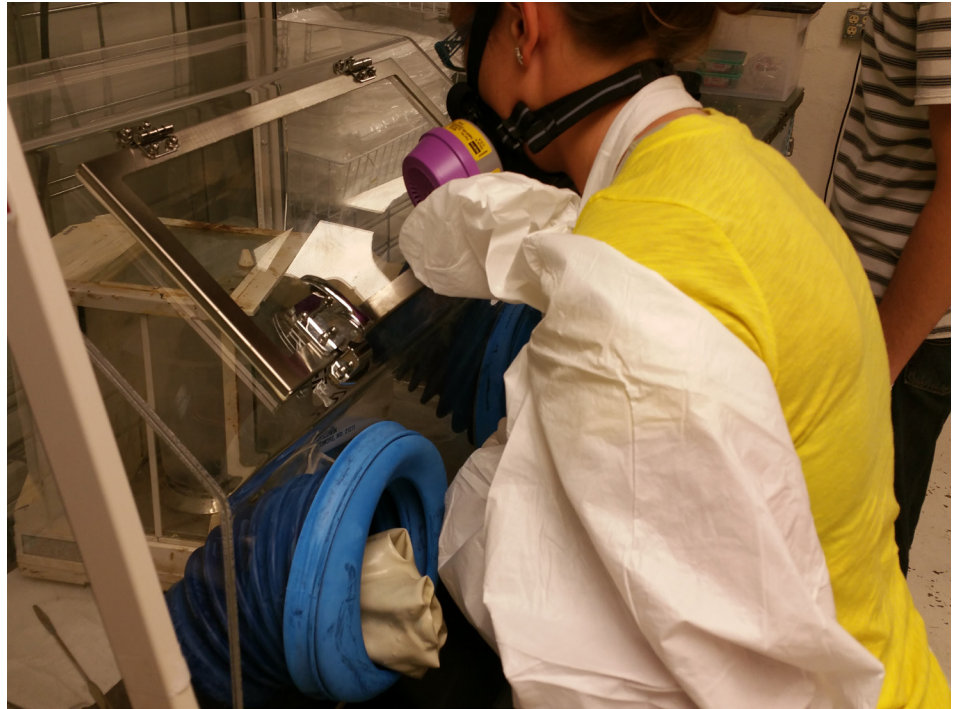
Engineering students from Florida Atlantic University (FAU) converged at Naval Surface Warfare Center, Carderock Division (NSWCCD) Apr. 7-8 to present their Naval Engineering Education Consortium (NEEC) research project entitled, Investigation of Passive Heating in Diving Wet Suit Materials Using Carbon Nanotubes as Insulators, to optimize current U.S. Navy wet suit materials.

"The NEEC provides hands-on experience on Navy projects and internship opportunities at NSWC Panama City Division," FAU College of Engineering and Computer Science professor Dr. Hassan Mahfuz said. "Their ocean engineering background at FAU paired with the NEEC prepares them to fine-tune their career development within the Navy."

The purpose of the NEEC is to accelerate the development of the next generation of naval scientists and engineers through project-based education and hands-on experience. Project teams include students, university faculty and a NAVSEA warfare center mentors.

"NEEC is the connection mechanism between ocean engineering students and warfare centers, facilitating students to pursue Naval Research Enterprise Internship Program (NREIP) and Science Mathematics and Research for Transformation (SMART) fellowships," continued Mahfuz. The FAU team collaborated with NSWC Panama City Division mentor Dr. Tye Langston, who provided guidance to Mahfuz and FAU students for the U.S. Navy's need of research in the area of wet suit materials.

"This consortium jumpstarts networking



Florida Atlantic University (FAU) senior Jen Frame conducts a mixing process and places carbon nanotubes into the neoprene liquid dispersion in a closed container at FAU's College of Engineering and Computer Science Lab April 1, 2015. (Photo courtesy provided)

opportunities and exposure to research process, hands-on application and the transfer of theoretical knowledge," FAU Ocean Engineering senior Jen Frame said. "This consortium also strengthens student-professor relationships and fosters career applicable work opportunities while still in school."

Their objective is to develop diving suit materials made of neoprene foam infused with a 3-D network of carbon nanotubes (CNTs). "Carbon nanotubes impregnated into the rubber will help with the strength of the foamed rubber," FAU Ocean Engineering senior, John Walsh said. "The nanotubes will allow for the heat to transfer throughout the wet suit and not let heat directly escape. This will be accomplished through a 3-D structure of nanotubes in the neoprene rubber, which are aligned by coating the nanotubes in iron oxide and by the magnetic field of a directed magnet."

Wet suits work by having closed celled air pockets throughout neoprene rubber, transforming it into foam. The air pockets keep a boundary layer between the thin water layer in the suit and the outside water. As a diver goes deeper into the water, the outside pressure compresses the air pockets and the insulative boundary layer reduces and becomes less efficient.

"3-D carbon nanotubes will reduce the thermal conductivity of neoprene foam by several orders of magnitudes," Mahfuz said. "For example, the thermal conductivity of aligned carbon nanotubes is 250 W/m K (watts per meter per kelvin), while the thermal conductivity of bulk carbon nanotubes is approximately 30-75 W/m K. That is one order lower than that of individual CNTs. If the 3-D network can be established, it will reduce thermal activity dramatically." Heat then becomes dissipated at the nodes of this 3-D network of nanotubes.

The fusion of nanotubes into the cellular structure of diving wet suit foam will increase the stiffness and compressive strength. "This will allow the foam to withstand hydro-static pressure at higher depths, which will allow divers to dive deeper and for longer periods of time," Mahfuz said.

In addition, this technology can mitigate the chance of hypothermia amongst Navy Sailors by enhancing thermal mechanical properties of the diving suit material, he said.

"At FAU, we are striving to keep our maritime workers safe, such as Navy divers and underwater welders," Frame said.

Frame will join the NREIP at NSWC Panama



Two samples of Neoprene after curing. The sample on the left has been infused with carbon nanotubes and the one on the right has not. (Courtesy photo provided)



A sample of neoprene with no carbon nanotubes, this is showing the foaming process of the neoprene with the visible bubbles in the material. (Courtesy photo provided)



Florida Atlantic University (FAU) Senior John Walsh mixes a solution in a conventional blende-type mixer at speeds of around 1200 revolutions per minute in FAU's College of Engineering and Computer Science Lab April 1, 2015. (Courtesy photo provided)

City Division this summer. The NREIP is a 10-week intern program that provides opportunities for undergraduate and graduate students to participate in research, under the guidance of an appropriate research mentor, at a participating Navy laboratory.

Other NEEC projects that were presented during the 2015 NEEC Annual Meeting included maritime acoustics, additive manufacturing, communications, quantification of extreme events in ocean waves, noise and thermal management of systems, remote magnetometry, testing and operation of a reduced-scale railgun, shock response of composite materials and the use of unmanned vehicles.

In addition to presenting their research projects, the students toured several NSWCCD labs and facilities, including the Maneuvering and Seakeeping (MASK) Basin, David Taylor Model Basin, Test Pond, and Liquid Waste Lab.

They also received briefings from subject-matter experts and senior Navy leaders including Rear Adm. Lorin Selby, commander of Naval Surface Warfare Center; Dr. Tim Arcano, the technical director of NSWCCD; and Kelly Cooper, program officer with the Office of Naval Research.



Primary mixing process at a lower speed of less than 600 revolutions per minute. (Courtesy photo provided)

NAVSSSES Department Head Q&A

By Kate Hogarth and Joseph Battista, NAVSSSES Public Affairs



From left to right: Tom Perry, Machinery Programs and Platforms Development Department head; Chris Savage, Cybersecure Machinery Control Systems and Networks Department head; Tom Perotti, Machinery Research, Logistics and Ship Integrity Department head; and Ana Gulian, Propulsion, Power and Auxiliary Machinery Department head. (U.S. Navy photo/Released)

The Public Affairs Office sat down with the new department heads of Naval Ship Systems Engineering Station, Naval Surface Warfare Center Carderock Division (NAVSSSES) to learn more about their careers and get a sense of their leadership style and vision for their departments as NAVSSSES moves forward to become an echelon four command.

Ana Gulian,

Propulsion, Power and Auxiliary Machinery Systems Department head (Code 40)

- Bachelor's degree in electrical engineering from the State University of New York Maritime College.
- Master's degree in engineering managing from Drexel University.
- NAVSSSES employee for 29 years.

Q: Did you think when you first started here, that you would be where you are now? Why or why not?

A: Since starting at NAVSSSES, I had aspirations to pursue leadership positions but I did not speculate on where I would be now. Early on in my career, my focus was gaining experience as an in-service engineer and developing an understanding of the organization, NAVSEA, other SYSCOMs and the Navy at large. Simultaneously, I enrolled in graduate school one month after having started and chose to study Engineering Management. In graduate school, I remember one of my professors clearly stated that if you choose a managerial/leadership career path be prepared to work very long hours. Aside from professionally developing myself, from

a personal standpoint, I also wanted to make sure I could make that commitment. I did not pursue managerial positions until I felt my family situation was at the point where I could make the time commitment. Over the years, my family has been very supportive but work-life balance always has its challenges.

Q: How would you describe your leadership style?

A: My leadership style is based on open communication, being inclusive and working together to get the job done—one that is always seeking continuous improvement in everything we do. My leadership style is to lead by example and is also based on accountability—making sure we are accountable for the decisions we make and the support we provide the Navy.

Q: What are some of your short-term and long-term goals for your department?

A. My short term goal is to ensure an effective transition of the three divisions and several former code 96 branches into the Propulsion, Power and Auxiliary Systems Department. As a result of the reorganization, span of control has changed allowing for more leadership involvement which will factor into the department's short and long term goals. These goals will include increased communication and collaborative efforts and initiatives across technical departments and with other warfare center divisions. Amongst future collaborative efforts will surely be the integration of high power directive weapons, such as railgun and laser weapon systems, onto naval platforms. Supporting these systems' demanding power requirements and thermal management aspects due to operational heat loads will come with their technical challenges - both areas of responsibility for Department 40. Ensuring innovation is being fostered within the department will be another long term goal. To that end, Dr. Arcano introduced the Technical Director's Innovation Challenge two years ago and it has been beneficial in placing an emphasis on innovation. I think we should continue to build upon innovation challenges, possibly introducing a competitive challenge amongst teams working on defined technology gaps.

Q: How do you plan to keep morale high within your department through the reorganization and realignment?

A. Constant communication is one way I would like to keep morale high. I have weekly meetings with the division heads and I have been meeting with each branch head for branch overviews. Branch heads discuss various topics including technical/system areas of responsibility, branch construct, issues and concerns. Periodically, I plan on having focus group meetings with department employees to get their perspective on various topics. The communication piece is very important to ensure employees know they have a voice. As leaders, it is imperative that we understand their issues and concerns and that they are being articulated up the chain of command.

Employee recognition is also very important to me. I ensure customer feedback from the fleet and program offices regarding our employee's accomplishments and efforts is acknowledged and shared with our commanding officer and

technical director. In addition, I make sure our workforce is being submitted for awards. As a division head, I took an active role by meeting with the branch heads to discuss employee nominations for some of the major award data calls and ensured nomination packages were prepared and submitted. I will use the same approach in Department 40 and continue to take an active role in employee recognition.

Christopher Savage, Cybersecure Machinery Control Systems and Networks Department head (Code 50)

- Bachelor's in electrical engineering from Pennsylvania State University.
- Master's in engineering management from George Washington University.
- Started at NAVSSES right out of college, in 1987.

Q: Did you think when you first started here, that you would be where you are now?

A. No, I would not have thought that 27 years later I'd be here in this position. Right out of school I started in the vibration monitoring section, the old 95 division, which is now part of Code 32. It provided me a good background of various shipboard systems as vibration monitoring touched all rotating machinery. From there, I ended up moving to Code 91/95 and getting involved with condition based maintenance and the original "Smart Ship" development/installations. These installations included machinery controls, networks, CBM, damage control, and Integrated Bridge Systems.

I was presented the opportunity to lead the Integrated Logistics and Maintenance Division which was a different business area than what I had traditionally worked in. It provided me further insight into the full spectrum of Life Cycle Management of HM&E systems. This included areas from new acquisition logistics like the CVN-78 program to end of life type buys in support of obsolete systems.

When the decision was made to stand up NAVSSES as an Echelon 4 command and its own warfare center the decision to split

Department 90 into four smaller departments provided an opportunity for four new department heads. I was selected to lead the Cybersecure Machinery Control Systems and Networks Department. I felt this was a good opportunity to make a difference within the organization as we stand up to be NSWC Philadelphia.

Q: What has been the biggest challenge you've faced in your career and what did you do to overcome it?

A. I think the toughest technical challenge I was involved with was when we started the SmartShip program. The team ripped all the old consoles off of the ship and installed Windows based control and monitoring systems. The technical and schedule risks involved with this program were enormous. We were able to succeed by successfully teaming with other Navy organizations and contractors to overcome these challenges/risks for a successful installation. I also feel that our organization's commitment to standardized software processes such as the Integrated Capability Maturity Model (CMMi) for software based systems enabled us to successfully develop and install the system while identifying and managing risk.

Q: What are the best and worst decisions you've made?

A. I feel the best decision I made was to embrace change and take advantage of new opportunities. A lot of people are averse to change, but each time I have had the opportunity to change, moving over to a different position or being promoted to a new position, it seemed like it worked out well.

I can't really cite the worst decision that I made, but one of the worst things I think you can do as a manager is to make a decision prematurely before you have all of the information. Whether it's reacting emotionally or perhaps taking the first bit of information you receive and running with it, a manager needs to try and avoid these type of knee jerk reactions. I feel you have to get all of the background and the details prior to making a decision.

Q: What do you like most about being a naval engineer?

A. Working with the ship and the navy personnel... I don't get too much direct interaction these days but it is a very rewarding feeling when you do. I think sometimes we take

it for granted that our systems and products are on the ships and in the hands of the warfighter on a 24/7/365 basis. The importance of what we do here as naval engineers cannot be underestimated.

Q: How would you describe your leadership style?

A: I would describe my leadership style as empowering, delegating, and ensuring accountability. I also believe in a culture of developing and rewarding our people.

Tom Perry,

Machinery Programs and Platforms
Department head (Code 20)

- Bachelor's degree in mechanical engineering from Drexel University.
- NAVSSES employee for more than 36 years.

Q: What has been the biggest challenge you have faced in your career?

A: The biggest challenge of my career is helping to reorganize Department 90 (Machinery Research and Engineering Department) into four technical departments at the same time we are realigning NAVSSES into an echelon IV command. The challenge is to accomplish both at the same time with minimal impact to our workforce. It is important that we continue to execute our mission while maintaining business and technical excellence. The key to success is hard work, cooperation, teamwork and using your career experience to make good decisions for the greater good of the organization.

Q: Did you think when you first started here that you would be where you are now?

A: When I started as a co-op in 1979, and then as a junior engineer, I never dreamed of being a department head. I had so much to learn, and I worked with such intelligent and talented people that it was hard to imagine ever being their equal – let alone one of their leaders.

Q: Why did you apply to become a department head?

A: I wanted to become the Code 20 department head so I could use my experiences and understanding of NAVSSES capabilities and business processes to help guide the organization into the next chapter of our history as an echelon IV command.

Q: How would you describe your leadership style?

A: I try to lead by example – work hard and build trust with my coworkers and leadership. I believe in collaborative and inclusive leadership with a team first approach. I value diverse opinions and points-of-view with open and honest communication.

Q: Do you remember the first project you worked on at NAVSSES?

A: I remember my first two projects, but I cannot remember which was first. The project I had the most fun on was the Cold Start Turbine Main Feed Pump Steam Turbine Test in Bldg. 633 This was an energy conservation program funded effort. We were asked to evaluate a nuclear power plant turbine for use on Navy steam powered ships. This program included test plan development, detailed test site design, piping flexibility analysis, test site construction, integration of the test site into the steam plant, control system design and test operation. The purpose was to determine if the unique auxiliary turbine wheel design was rugged enough to start from a cold (stand-by) condition in 10 seconds without damage. The unit worked perfectly and was approved for Navy application.

Q: What are some of your goals for your department?

A: I want to maintain current business practices as we transition into an echelon IV command. I would also like for us to continue planning, building and operating world class test facilities. In addition, I want to establish efficient and effective business processes designed to improve workload management throughout the organization and continue to build a more diverse and highly-motivated workforce.

Q: What do you like most about being a naval engineer?

A: I like the interesting and challenging work, the great people, the diverse environment and all the responsibility I could handle.

Tom Perotti,

Machinery Research, Logistics and
Ship Integrity Department head
(Code 30)

- Bachelor's degree in mechanical engineering from Drexel University.
- Quality Systems Certificate from George Washington University.
- NAVSSES employee since 1987.

Q: Do you remember the first project you worked on?

A: After assisting senior engineers as a co-op student in the then Heat Power Systems Department and graduating from Drexel, I led two projects in Division 96; the SSN 688 class BPS-15 radar mast automatic locking mechanism design and the BPS-15 radar mast SUBSAFE waveguide window design, test and installation. Working submarine communication systems gave me the hands-on design and shipboard installation experience I was looking for and I later received a patent for a BPS-15 submarine radar mast upper bearing design improvement.

Q: Why did you apply to become a department head?

A: I wanted to leverage my accomplishments and experience to strengthen our mission and broaden our vision – shape and maintain our capabilities and drive our culture of engineering excellence with a focus on developing our employees.

Q: How would you describe your leadership style?

A: I am an outward looking visionary who is open and engaging, direct and upfront with everyone.

Q: What do you like most about being a naval engineer?

A. The challenges it brings and the ultimate reward. It is about the pride we all share in supporting our Sailors, our fleet and our country.

Q. What was the biggest challenge you have faced in your career and what did you do to overcome it?

A. It was my last position as Major Programs Branch manager. The position provided significant technical, programmatic, and facility design and construction related challenges. There was never a dull moment. To meet the challenge, I remained focused on what was important – building a strong team of experts to lead our programs and developed a very talented workforce who always got the job done. Working as a team, our people constantly amaze me with their capabilities and what they can accomplish.

Q. Did you think when you first started here that you would be where you are now?

A. This was always a far reaching goal of mine and to achieve it I needed to meet other career goals as well. Each of those positions along the way were enormously rewarding and I recognized how difficult a challenge it would be as my career progressed – having seen and been mentored by great leadership all along the way.

Q. Who was your inspiration professionally?

A. My Dad. Entering as an immigrant into this country at 30 years old with no support system and little command of the language and culture, he did so much with so little. His work ethic was fierce and dedicated, and his work demeanor was always professional and engaging. My Dad never let anything stew unattended for very long – he was the first to roll up his sleeves and get the job done. He always made it a point to personally know those he worked with and showed me the importance of work-life balance, achieving goals, and maintaining close professional and personal relationships.

Q. What are some of your short-term goals for your department?

A. This department's uniqueness is that it spans across and must integrate with other technical departments due to the diversity of work products. Our divisions, with the inclusion of Department 33 later this year, each stands unique in the expertise they provide. My primary short-term goal is to assess our capabilities and integrate our processes, culture and people as we transition to an echelon four organization.

Q. What was the best decision you have made professionally?

A. It was taking a job as a co-op here. Before coming here I couldn't even tell you the color of a Navy ship. What an incredible opportunity it turned out to be. It got me hooked on naval engineering. I knew almost immediately this is where I wanted to work my entire career.

Commonality variance reduction increases competition and lowers Navy costs

By Joseph Battista, NAVSSES Public Affairs

Naval Sea Systems Command's (NAVSEA) Enterprise Commonality Office (SEA 06C) strives to reduce the number of unique systems, subsystems, and components introduced into the fleet inventory through new ship acquisition programs and major modernization programs. One of the tools used by the Commonality Office to achieve their goal is the Commonality Virtual Shelf – a repository of standard architectures, design guidelines, specifications, and technical warrant holder (TWH) approved parts for use by programs under the cognizance of NAVSEA and NAVSEA affiliate Program Executive Offices (PEOs), as well as government contractors. The Commonality Virtual Shelf is currently hosted on Defense Acquisition University (DAU) site: <https://acc.dau.mil/virtualshelf>.

According to Bill Moss, the Commonality Team lead with Naval Ship Systems Engineering Station, Naval Surface Warfare Center Carderock Division (NAVSSES), the perception is widely held that variance reduction through commonality suppresses competition by reducing the inventory required to support future ship configurations.

“Open competition is important to

commonality,” said Moss. “It helps reduce costs. If there is more than one company with a CAGE (Commercial and Government Entity) code who can supply a qualified part listed on the Shelf, it may drive down the cost of the part through competition during active solicitations.”

Although a part listed on the Virtual Shelf may be provided initially by one company, there is a process for other companies to compete for the opportunity to supply the part by making an alternate offer during an active solicitation. The alternate offer states that the company believes they can provide an item that is form, fit and function (FFF) identical to the product that is being solicited.

According to Chuck Simmons, the NAVSEA re-procurement execution coordinator with NAVSSES' Provisioning and Supply Support Branch, if an NSN goes out for competitive procurement, and a new/different manufacturer submits a proposal to provide an alternate item (part number new to the NSN being procured), then the Navy's in-service engineering agent (ISEA) will perform a review to determine if the item is FFF identical. If the item is approved as FFF, then the following steps will occur:

1. If the item is a repairable component (can be repaired by the replacement of one or more repair parts), the item will be assigned a new NSN. The supply system catalogers will then establish an NSN family showing that the original NSN is interchangeable with the new NSN.
2. If the item is a consumable FFF, a new source will be simply added as another CAGE and reference number to the existing NSN.

As a result of these actions, more sources are identified to improve competition and support the items on the Commonality Virtual Shelf even though the number of variations have been reduced in the fleet. Therefore, commonality does not suppress competition but improves it.



Navy and industry leaders discuss the future of additive manufacturing

Timothy E. Hunt, NSWCCD Public Affairs



Last row center: Vice Adm. Phillip Cullom, deputy chief of naval operations for fleet readiness and logistics, poses with almost 200 Navy engineers and scientists after designating them Navy Additive Manufacturing Plank Owners April 28, 2015, to kick off the 2015 Naval Additive Manufacturing Technical Interchange (NAMTI) at Naval Surface Warfare Center, Carderock Division in West Bethesda, Md. This three-day event focuses on collaboration, discussions and workshops to advance and accelerate the introduction of additive manufacturing, also known as 3-D printing, into Naval weapons systems. The first NAMTI was conducted last year. (U.S. Navy photo by Devin Pisner/Released)

Naval Surface Warfare Center, Carderock Division (NSWCCD) hosted the second Naval Additive Manufacturing Technology Interchange (NAMTI) meeting April 27-30 in West Bethesda, Maryland. The interchange explored the changes that will occur throughout the Navy and Marine Corps as they move forward with adopting additive manufacturing (AM) technology. The Office of Naval Research Naval Air Warfare and Weapons Department (ONR 35) sponsored the meeting, which drew nearly 200 participants from industry, academia, the U.S. Navy and other government agencies.

Additive manufacturing describes the process of building 3-D objects layer by layer using a variety of materials, including structural metals. It is currently in use in several areas of the Navy: aviation, medical prosthesis, on-demand parts

production and test modeling. It is expected to have a revolutionary impact on how the Navy approaches everything from logistics to the manufacture of parts at sea and manufacturing by industry partners.

Vice Adm. Phillip Cullom, Office of the Chief of Naval Operations, gave the keynote address, "Additive Manufacturing: Transforming the Navy." His remarks focused on the overall vision of AM implementation in the Navy. His address was followed by presentations and a question-and-answer period moderated by Dr. Tim Arcano, NSWCCD technical director, with members of the Executive Panel on the Naval Vision for AM.

The panel, consisting of Vice Adm. David Dunaway, Naval Air Systems Command; Rear Adm. Bryant Fuller, Naval Sea Systems

Command; and Dr. Thomas Killion, Office of Naval Research, discussed what they have identified as the foundational issues that need to be addressed to support AM in the Navy. The panel identified what they termed the "digital thread" as the key to successful AM implementation. They then discussed several aspects of implementation held together by this "thread."

The key to effectively establishing the thread, according to Killion, is the ability to leverage data models. "With the rise of better tools, we now have the ability to create models that can be used through the entire lifecycle of a system. This use of a consistent data model allows designers to explore alternatives during development in a more controlled way. It also increases collaboration between designers, allowing them to see, share and produce



From Left: Dr. Thomas Killion, acting director of technology, Office of Naval Research; Rear Adm. Bryant Fuller, deputy commander, Ship Design, Integration and Naval Engineering, Naval Sea Systems Command; and Vice Adm. David Dunaway, commander, Naval Air Systems Command, discuss the Navy's vision for additive manufacturing on the Executive Panel at the 2015 Additive Manufacturing Technical Interchange (NAMTI) at Naval Surface Warfare Center, Carderock Division in West Bethesda, Md., April 28, 2015. (U.S. Navy photo by Devin Pisner/Released)

systems and parts that are consistent in fit, form and function," Killion said.

Killion also pointed out the benefits of the digital thread with addressing manufacturing and sustainment issues. "Having a digital library of system models that can be shared with all manufacturers gives us the ability to spread out manufacturing needs across a wider variety of vendors without losing the consistency in quality. It also ensures better availability of parts that might otherwise be unavailable, or require long lead times to produce. There is also the added benefit reducing the logistical needs of buying, warehousing and shipping parts to the fleet," he said.

Beyond the sustainment issues Killion discussed, the panel pointed to the establishment of a set of data standards that would be used universally by contractors, suppliers, business partners and the Navy as the first step toward effectively deploying AM effectively. They then talked about the requirement for a central data repository that is both accessible across the Navy and business partners, as well as secure from cyberattack.

The presentations and breakout sessions that followed delved deeper into the ideas presented in the keynote address. The sessions discussed the current state of AM infrastructure and available resources across the Navy and sought to identify specific needs in each subject area. The sessions also worked to outline standards related to AM practices, define specifications for AM materials, identify data standards and networking requirements, cybersecurity issues and required training needed by Navy personnel to support AM.

This is the second year NAMTI has been held. It is just one of many efforts underway across the NAVY and other armed services. The senior leadership in attendance was unanimous in their position that as the idea of AM grows in acceptance and capability, interchanges such as NAMTI will become more important in ensuring the AM potential is fully realized in a cost-effective and operationally safe manner. Additional NAMTI events are being planned.



Vice Adm. Phillip Cullom, deputy chief of naval operations for fleet readiness and logistics, kicks off the 2015 Naval Additive Manufacturing Technical Interchange (NAMTI) April, 28, 2015, at Naval Surface Warfare Center, Carderock Division in West Bethesda, Md. (U.S. Navy photo by Devin Pisner/Released)



Glenn Gardner, director, Commonality, Additive Manufacturing and Industrial Engineering, Naval Sea Systems Command, brought some 3-D printed show and tell in the form of a prototype undersea wireless charging unit during a panel discussion on implementation at the 2015 Additive Manufacturing Technical Interchange (NAMTI) at Naval Surface Warfare Center, Carderock Division in West Bethesda, Md., April 28, 2015. (U.S. Navy photo by Devin Pisner/Released)

NAVSES engineer mentors teams at FIRST Robotics Competition

By Kate Hogarth, NAVSES Public Affairs

Naval Ship Systems Engineering Station (NAVSES) electrical engineer Kim Yee and the Rancocas Valley High School (RVR87) robotics team took home the Gracious Professionalism Award at the Mid-Atlantic FIRST (For Inspiration and Recognition of Science and Technology) Robotics Competition (FRC) in Tabernacle, New Jersey, March 20-22.

FIRST is a non-profit organization that motivates young individuals to pursue education and career opportunities in science, technology, engineering and mathematics (STEM).

Yee, program manager of the DDG51 Restart Program for government furnished equipment, serves as mentor for the RVR87 team through sponsorships by the NAVSES STEM Outreach Program coordinated by Peter Mark and the Naval Defense Education Program (NDEP). The NDEP emphasizes hands-on learning experience and encourages learning by doing.

At the Seneca FIRST Robotics Competition, Yee stepped up to help the George Washington Carver team because their mentors Pinkesh Bharatia and Patrick Violante (also NAVSES employees) could not be there. "A first year team needs a lot of help as compared to the senior teams who have a lot of mentors and teachers," Yee said. "So I took over as mentor for their team and it turned out to be a good thing."



Kim Yee (right), with the George Washington Carver High School robotics team at the Mid-Atlantic FIRST (For Inspiration and Recognition of Science and Technology) Robotics Competition (FRC) in Tabernacle, New Jersey, March 22, 2015. (Photo provided by Kim Yee)



Kim Yee (center right), program manager with Combatants Acquisition Branch, and the Rancocas Valley High School (RVR87) robotics team earn the Gracious Professionalism Award at the Mid-Atlantic FIRST (For Inspiration and Recognition of Science and Technology) Robotics Competition (FRC) in Tabernacle, New Jersey, March 22, 2015. (Photo provided by Kim Yee)

Yee and the RVR87 team had the whole place rooting for the George Washington Carver team, earning RVR87 the Gracious Professionalism award. George Washington Carver received the Rookie Inspiration Award, a win-win for both teams.

Gracious professionalism is defined by FIRST as a mutual respect for other teams. This means respecting the integrity of other teams, as well as the spirit of competition. RVR87 embraced this concept by helping the George Washington Carver team. These are values FIRST encourages its participants to display in their lives outside of FIRST and beyond.

"The founder of FIRST wanted to see teams helping each other out and learning from each other. If you have something you want to share with them, if someone needs something, you can go over and help them out. He wanted to emphasize that," Yee said. "It's not just about winning, it's about learning and it's about helping each other out."

At the FRC kickoff in January, teams found out this year's challenge. Every year the robots are different, one year robots had to throw Frisbees, the next they

had to shoot basketballs. This year's theme was Recycle Rush. To score points, robots were required to stack totes on scoring platforms, cap the stacks with recycling containers and properly dispose of pool noodles (representing trash).

After the kickoff, the team had six weeks to come up with a concept, build a prototype, build a robot and test it for the competition. "It is an intense evolution," Yee said. "I'm not sure how we pulled it off in six weeks."

The robotics club is part of the Rancocas Valley STEM initiative called "Project Lead the Way," established to get students interested in the field of engineering.

"It is about cooperation, the ultimate goal is to encourage kids into technology STEM initiatives, so that they will pursue careers in the science and engineering areas," Yee said. "This hands on experience helps solidify the desire to go into the STEM field."

Yee is an active contributor to the Equal Employment Opportunity (EEO)/Diversity Initiatives at NAVSES and has provided leadership as the EEO Advisory Committee (EEOAC) chairperson. Yee's passion is reflected in his work with Employee Resource Groups, mentoring, community outreach, SeaPerch and the FIRST Robotics Competitions.

Digital voltage regulator helps Sailors better control generator voltage output

By Joseph Battista, NAVSSES Public Affairs



The Avenger-class mine countermeasures ships USS Scout (MCM 8) transits off the coast of Southern California as part of Rim of the Pacific (RIMPAC) Exercise July 17, 2014. (U.S. Navy photo by Chief Mass Communication Specialist Mark C. Schultz/Released)

Engineers at Naval Ship Systems Engineering Station (NAVSSES) completed installation and testing of a Digital Voltage Regulator (DVR) on mine countermeasure (MCM) class ship USS Scout (MCM 8) May 30. The new regulator provides Sailors a better control of the Ship Service Diesel Generator's (SSDG) output voltage than the antiquated analog regulators currently on MCMs, regardless of load fluctuations.

"The DVRs are better than the Analog Voltage Regulator (AVR) because the parameters of the regulator can be preset to optimize control of a specific generator without changing components," said Andy Guo, systems electrical engineer with Steam, Diesel and Electrical Power Systems Branch at NAVSSES. "In addition, the DVR has more built-in functions such as generator protection features, programmable output relays, soft-start buildup, and generator paralleling with either reactive droop compensation or cross current compensation."

USS Scout is the eighth MCM ship to receive the DVR, which regulates the SSDG output voltage to the switchboard that powers the entire ship. Guo said the first installation was in 2009 and the remaining ships in the class will be upgraded by the end of 2018. Guo said the system has proven to be very reliable and a great benefit to Sailors.

"The DVRs are located outside the switchboard, whereas the old AVRs are located inside – making troubleshooting the DVR much easier since the Sailor no longer has to secure power to the entire ship to troubleshoot or replace the DVR if an issue arises," said Guo. "All the parameters such as voltage, current, power, and frequency can be viewed from the human-machine interface (HMI) screen in front of the DVR enclosure. It certainly saves the Navy time and money."

Guo said replacing a nonfunctioning analog system costs approximately \$80,000 with a six-month wait time to receive the replacement unit. The DVR costs \$12,000 and is readily available.

NAVSSES engineers developed the DVR design for the MCM class, and they oversee the installation, validation, training and in-service support.

"We have had minimal issues and / or failures of the DVR system over the past five years," said Guo, who has been involved with the project since its inception in 2005.

Guo said it took three years to go from design to the first installation. Installations take about five weeks and testing another two weeks.

Guo said one of their goals was to meet the Navy's desire for commonality. Other ship classes such as LSD 41, LSD 49 and LCC 19 have received similar upgrades from analog regulators to DVRs – further reducing the Navy's cost. The DVR is scheduled for installation on Wasp (LHD 1) class ships during their mid-life upgrade availability.

NSWCCD tests field deployable wastewater treatment systems for U.S. Army

Timothy E. Hunt, NSWCCD Public Affairs

In collaboration with the U.S. Army, the Office of Naval Research (ONR) and the Naval Sea Systems Command (NAVSEA), the Naval Surface Warfare Center, Carderock Division's (NSWCCD) Survivability, Structures and Materials Department has been testing several types of self-contained portable wastewater processing modules to determine their viability on Forward Operating Bases (FOBs) and on naval vessels.

The NSWCCD Non-Oily Wastewater Team, consisting of Tina Lerke, Sheila Riggs, Sarah Holman, Tom O'Connell, Dennis Buckley of the Environmental Quality Division, has been testing not only the effectiveness of the scientific processes, but the durability and maintainability of the equipment in the modules themselves. The treatment systems are also being studied to determine the potential reduction in the need for waste hauling and other support requirements at FOBs.

Four sponsors are involved in the collaboration are primary sponsors U.S. Army Tank Automotive Research, Development and Engineering Center (TARDEC) and the U.S. Army Research, Development and Engineering Command (RDECOM), which are working in cooperation with NAVSEA and ONR. TARDEC, NSWCCD and ONR all recognized an opportunity for significant leveraging of projects. The Liquid Wastewater Laboratory was chosen as the best test facility for the evaluations due to the unique liquid waste feed system waste feed capability, as well as the experience and expertise of the Non-Oily Wastewater Team for creating simulated wastewater. From previous studies, the Non-Oily Wastewater Team has characterized Navy shipboard-generated non-oily wastewater and used that knowledge to simulate test influent for marine sanitation device laboratory testing. For this project, the team worked with TARDEC to characterize and create a simulated FOB wastewater.

The wastewater processing modules being tested process graywater and blackwater from food service and hygiene-related activities into clean water capable of being discharged into the environment. However, there are differences between the sources of waste for both graywater and blackwater depending on whether the sources are in a Navy or Army environment. This is a significant consideration when choosing a wastewater processing method.

For the Army simulation, the wastewater



Shown above, the biological treatment technology module (bottom of picture) uses a more traditional bacterial digestion approach to break down wastewater. Also shown is the Electrochemical Advanced Oxidation Technology module (upper left) which uses separators and electrocoagulation to remove suspended solids. The remaining wastewater is processed using the electrochemical oxidation subsystem which oxidizes and disinfects the water. (U.S. Navy photo by Timothy E. Hunt/Released)

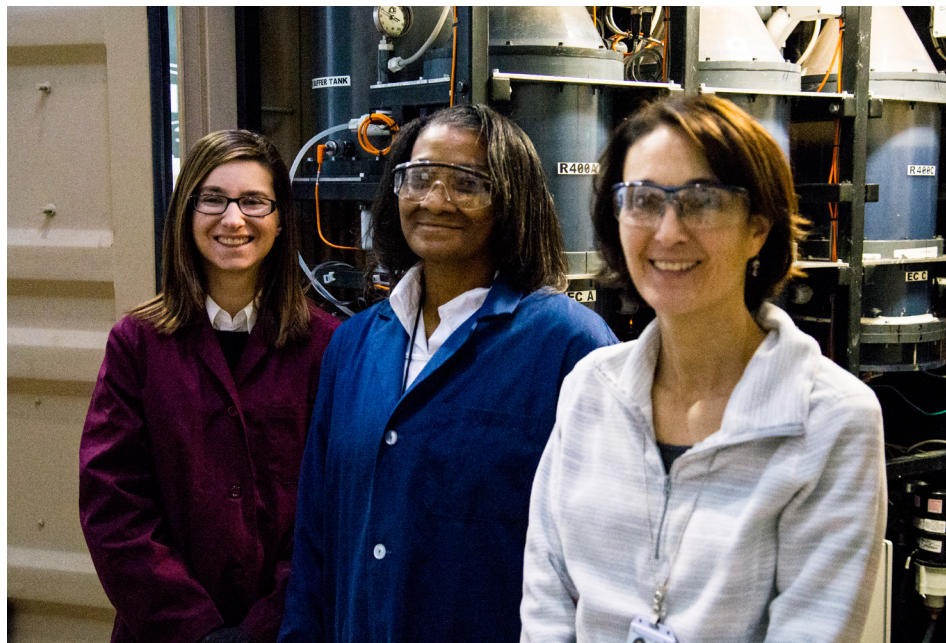
consisted of food service, latrine low-flush, hygiene complex (showers, laundry) and the reject stream from the Army's Shower Water Reuse System (SWRS). Navy wastewater is comprised of laundry, shower, some scullery and vacuum-collected sewage. This situation is reversed in blackwater processing. While blackwater from both Army and Navy sources contain human waste, the Army's sources of blackwater can also contain food service waste.

Currently, the Army disposes of waste at their FOBs using traditional methods, burial or burning being the most typical in primitive combat situations. Larger and more complicated arrangements consisting of several 60-foot long shipping containers are used in rear area bases. However, the larger setups are not entirely self-contained and have significant power requirements. In addition, the need to haul away and dispose of the sludge and other contaminated byproducts of the processing remains.

Per OPNAV 5090.1C, the Navy handles this need on ships by using holding tanks inside of restricted waters. Holding capacity is also an issue since the systems can only hold a limited amount of waste before tanks must be dumped.

There are three technologies under test:

Biological treatment technology – This method involves the more traditional bacterial digestion approach to break down wastewater. The process involves traditional settling of solids and moves through a series of tanks where bacteria break waste down to produce clean effluent and sludge. Ultraviolet disinfection is



From left: Sarah Holman, Sheila Riggs and Tina Lerke of the Non-Oily Wastewater Team of the Environmental Quality Division of Naval Surface Warfare Center, Carderock Division shown in front of the Electrochemical Advanced Oxidation Technology module. The testing they are conducting is part of a collaborative effort between the U.S. Army Tank Automotive Research, Development and Engineering Center and the U.S. Army Research, Development and Engineering Command working in cooperation with NAVSEA and ONR. (U.S. Navy photo by Timothy E. Hunt/Released)

used at the end of the process.

Electrochemical advanced oxidation technology – In this process, wastewater is first treated in a lamella plate separator (LPS) to remove large and/or higher density suspended solids. The wastewater is then treated by electro-coagulation (EC) which clumps suspended solids together. The solids then rise to the top of the EC portion of the module. Floatation is facilitated by generated gas bubbles and allows waste to be skimmed off. The remaining wastewater is processed in the electrochemical oxidation subsystem where reactors oxidize organics in the waste stream, reducing the chemical and biochemical oxygen demand loadings in the wastewater, and also disinfects the stream.

Microbial fuel cell technology – This process is designed to produce enough of its own energy to perform processing. In this process, black wastewater is first filtered to remove suspended solids and flows to an equalization tank for holding and pH adjustment; the solids are collected for disposal. From the tank, the wastewater is pumped through a microbial fuel cell reactor that removes approximately 85 percent of the waste stream biochemical oxygen demand (BOD). BOD is one of the regulated contaminants and has defined standards for the

limits on BOD content of the treated effluent. It is during this phase where power is generated and harvested via a power management system. This system then transforms the electricity gathered into usable power for equipment such as pumps and air blowers. The final step in the process removes any residual BOD, as well as clarifies and disinfects the water.

At the onset of the project and throughout the execution, TARDEC and NAVSEA recognized the significant value of collaboration between armed services branches with the same goals. Results from both Army and Navy evaluations will be used to assess the applicability of the systems for Army FOBs, as well as military ships.

From the perspective of the Non-Oily Wastewater Team leader, engineer Tina Lerke is pleased with how smoothly the collaboration is progressing. She also expressed her pride in the team's efforts so far.

“Throughout the evaluations, the Non-Oily Wastewater Team members have demonstrated superb technical support and teamwork. The testing required long hours in the laboratory, which included weekend hours. Collaboration with several U.S. Army organizations and with the individual manufacturers' engineers for

Army requirements:

- Rapid system start-up of biological systems
- Ability to adapt to widely varying load conditions
- Reduced system footprint and pack out volume
- Reduced system energy demand



The three samples shown were collected from the different processing stages of the Biological Treatment Technology module. From left to right, Sample 1: wastewater before entering the module for processing. Sample 2: wastewater undergoing bacterial digestion. Sample 3: water as it exits the module. Sample 4: Empty. (U.S. Navy photo by Timothy E. Hunt/Released)

each system was required to understand each sponsor's needs, understand the technologies, troubleshoot the systems and perform the testing effectively," Lerke said.

The need for systems such as these has become a priority for both the Army and Navy as environmental regulations and deployment demands evolve. The movement to highly

mobile Army FOBs and ships that can be more self-sufficient while balancing cost and resource limitations also has become more important from a warfighting capability standpoint. Once deployed, systems such as these will allow the Army to reduce sustainment demands and fuel needs, and eliminate undesirable practices which pose security risks, are unsafe, generate quality-of-life issues for Soldiers or create pollution.

Navy requirements:

- Fast system start-up in meeting effluent quality standards quickly
- Variable high-strength shipboard wastewater contamination levels
- Size and weight restrictions
- Reduced need for highly trained operators dedicated to a treatment system

Energy Storage Summit fosters collaboration, innovation

By Rebecca Grapsy, NSWCCD Public Affairs

A green and forward-leaning fleet remains a priority for the Navy and was the central theme for the Naval Surface Warfare Center, Carderock Division (NSWCCD) second Energy Storage Summit held in West Bethesda, Maryland, June 2-3 to bring together some of the best minds in the energy storage and battery communities

This summit enabled engineers and scientists from NSWCCD to come together with their counterparts at Naval Surface Warfare Center, Crane Division, and from across the Navy, Marine Corps and Department of Energy, for a second time to review progress in their energy storage programs, track progress and collaborate with their peers to brainstorm the path ahead.

“The CNO has stated that he wants a comprehensive, system-agnostic, lithium battery certification process to be developed for surface ship, submarine and other undersea warfare applications now,” said Dr. Tim Arcano, technical director for NSWCCD. “It is a priority of his and has become a funded speed-to-fleet program. Success of this program depends on advanced capabilities and safety to maintain military dominance. We need both of these, but we also need to be able to afford them.”

Falling in line with top leadership priorities, the summit focused on three key subject areas



Eric Shields, a mechanical engineer with the Materials and Power Systems Branch and leader of the Advanced Power and Energy Group, which helped organize the Energy Storage Summit held at Naval Surface Warfare Center, Carderock Division (NSWCCD) in West Bethesda, Md., introduces Mateo Jaramillo, Tesla Motors' director of powertrain business development, during the summit's keynote address held on June 2, 2015. (U.S. Navy photo by Devin Pisner/Released)



Naval Surface Warfare Center, Carderock Division (NSWCCD) Commanding Officer Capt. Rich Blank presents a copy of the NSWCCD David Taylor history book to Tesla Motors Director Mateo Jaramillo after Jaramillo's keynote address at the Energy Storage Summit held in West Bethesda, Md., June 2, 2015. (U.S. Navy photo by Devin Pisner/Released)

within energy storage: improving energy storage acquisitions and programmatic tools, improving and standardizing energy storage technologies and initiating U.S. Navy and the Office of the Secretary of Defense policies. It allowed the benefits of Carderock's culture of innovation to come through, as lithium-ion batteries in the fleet become more prevalent and the Navy faces the challenges and pressures of getting the best, safest product possible to the warfighter as quickly as possible.

“The technical community felt we needed to provide better tools to inform and enable the acquisition community,” said Eric Shields, group leader for the Advanced Power and Energy Group, Materials and Power Systems Branch, NSWCCD, which hosted the summit. One idea that came out of the two days of meetings was the creation of a database of batteries fielded and tested, paired with a cost versus time estimation-reporting tool. “Program offices could pull concise reports from the database to identify options and gain a better understanding of scheduling and costs implications of technology selections. Additionally, technical labs could use the data to eliminate redundant testing and share knowledge, and finally any battery modeling efforts would need a centralized database for validation and verification purposes.”

As a meeting of innovators, the Energy Summit

turned to the private sector to keynote the two days of meetings.

Tesla Motors Director Mateo Jaramillo addressed a full house of Carderock employees, as well as summit attendees from the Navy, Marine Corps and Department of Energy, in the Maritime Technology Information Center (MTIC) on June 2.

Jaramillo's presentation focused on Tesla's growth as a company that has only been in the market for 12 years, and how Tesla is working to change the commercial energy storage industry. As a young company, Tesla is driven by innovation and the desire to advance humanity's role in a sustainable energy future, and they have invested in the lithium ion battery as their energy storage solution of choice.

Commercial energy storage has implications for the Navy as well, with the potential to integrate products that are already being made. And as lithium-ion batteries become mainstream and a completely electric car heading down the road no longer turns heads, more hands-on efforts in private industry provide the opportunity for continued collaboration, innovation and improvement of lithium ion battery products.

The summit group plans to meet again in spring 2016.



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