NAVAL UNDERSEA WARFARE CENTER

DIVISION NEWPORT

150th Anniversary

20-NUWC/GRA0132

Undersea Superiority ★ Yesterday... Today and Tomorrow

Undersea Superiority

Welcome to NUWC Division Newport

The Naval Undersea Warfare Center Division Newport has celebrated our 150th Anniversary!

Men and women have been right here in Newport, Rhode Island for 150 years with the noble purpose of providing undersea superiority to the United States Navy. We began in 1869 when Adm. David Porter actively campaigned for the creation of an experimental station to conduct hands-on experiments with torpedoes, mines, explosives, and electrical devices to determine how these new technologies should be best employed.

"Undersea Superiority! Yesterday … Today and Tomorrow," was the theme for NUWC Division Newport's 150th anniversary celebration. In this yearbook, we are spotlighting the years of dedication and hard work that have been a cornerstone of our command since our formation as the Naval Torpedo Station on Goat Island on July 29, 1869, and the many ways in which we celebrated our anniversary with events throughout 2019.

Special recognition and many thanks to our 150th Anniversary Steering Committee! With a focus on the current workforce, the Steering Committee devised a plan that involved the entire command. With help from the Division Newport public affairs team, each department of NUWC Division Newport was empowered to plan its own event commemorating the occasion, leading to the simultaneous planning of more than 20 fun and informative command-wide events that fostered esprit de corps among the workforce and celebrated NUWC Division Newport's rich history. It was a comprehensive strategy to share NUWC's history and take pride in the fact that our workforce has been providing undersea superiority for the United States Navy for 150 years.

The main event was the 150th Anniversary Monument Dedication ceremony held July 29, 2019, with more than 500 employees, dignitaries and alumni in attendance. Sen. Jack Reed, the ranking member of the Senate Armed Services Committee, Sen. Sheldon Whitehouse and Rep. Jim Langevin, member of the House Armed Service Committee and House Committee on Homeland Security, Rear Adm. Eric Ver Hage, Commander, Naval Sea Systems (NAVSEA) Warfare Centers and Mr. Don McCormack, Executive Director, NAVSEA Warfare Centers gave speeches and helped reveal the new monument. Division Newport's commemoration of its Sesquicentennial was a tremendous success!

Since 1869, the women and men of Division Newport have provided undersea superiority to our Nation. We pay tribute to the long and historic tradition of innovation and strength through security, supporting the warfighter and the greatest Navy in the world!

Naval Undersea Warfare Center Division Newport • Undersea Superiority! Yesterday … Today and Tomorrow!

CAPT Michael R. Coughlin
Commanding Officer

Ronald A. Vien, SES
Technical Director

NUWC Division Newport honored for 150 years of service to the U.S. Navy

About 500 employees, dignitaries and alumni attended the Naval Undersea Warfare Center (NUWC) Division Newport's 150th anniversary celebration and monument commemoration on July 29, 2019. Supporting the command's historic accomplishments since its inception in 1869 as the Naval Torpedo Station, dignitaries extolled the virtues of the command's work. The diverse careers represented by the crowd — full of engineers, scientists, technology experts, divers, writers, administrative staff and accountants — exemplified Division Newport's importance in supporting a comprehensive naval fleet.

"What unites us all is the fact that what you do here gives our men and women at sea the tools, the weapons and equipment they need not only to contest our adversaries, but to prevail," Sen. Jack Reed (D-RI), the ranking member of the Senate Armed Services Committee, said. "For the people who have worked here in the past 150 years, it wasn't a job; it's a commitment to the country. I honor you for that and thank you for that."

Reed was part of the leadership group charged with unveiling the 150th anniversary monument, a dark granite submarine sail-shaped slab situated on an 18-foot, ground-level, three-tone, granite compass rose (see page 6 for more). Sen. Sheldon Whitehouse (D-RI); Rep. Jim Langevin (D-RI), member of the House Armed Services Committee and House Committee on Homeland Security; Rear Adm. Eric Ver Hage, Commander, Naval Surface and Naval Undersea Warfare Centers; Don McCormack, Senior Executive Service (SES), Executive Director, Naval Surface and Naval Undersea Warfare Centers; Division Newport Commanding Officer Capt. Michael Coughlin; and Division Newport Technical Director Ron Vien, SES, also took part in the unveiling.

NUWC Division Newport Commanding Officer Capt. Michael Coughlin welcomes dignitaries, employees, alumni and military members to the command's 150th anniversary commemoration on July 29, 2019.

NUWC Division Newport Commanding Officer Capt. Michael Coughlin (from left); Technical Director Ron Vien, Senior Executive Service (SES); Sen. Jack Reed; Don McCormack, SES, Executive Director, NAVSEA Warfare Centers; Rear Adm. Eric Ver Hage, Commander, NAVSEA Warfare Centers; Rep. Jim Langevin, and Sen. Sheldon Whitehouse revealed the monument commemorating Division Newport's 150th anniversary on July 29, 2019.

"Throughout our 150-year history, tens of thousands of employees have proudly served our nation by advancing the state-of-the-art in undersea warfare, making our Navy No. 1 in the world," Vien said. "This is the Naval Undersea Warfare Center, Division Newport: Undersea superiority — yesterday, today and tomorrow!"

Seats quickly filled up in a large tent and a sizable crowd formed behind it as the 88th Army Band from the R.I. National Guard — Brass Quintet played. Public Affairs Officer Jeff Prater served as the master of ceremonies and introduced Coughlin, who recognized those in attendance, as well as the workforce, past and present.

"We modified our standard vision of undersea superiority today and tomorrow to add in the yesterday piece," Coughlin said about planning for the 150th anniversary. "There really isn't too much yesterday about the folks who preceded us, but rather an enduring contribution to the common defense that they made through their accomplishments and to the today and tomorrow generations. They trained, they inspired, and they mentored to this day."

Whether it was producing guncotton in 1893, military equipment during World War I or the nearly 19,000 weapons during World War II, Division Newport has always been at the forefront at developing technologies to "give our servicemen and women the cutting edge, the decisive edge in battle," Reed said.

Turning his attention toward the present and future, Reed noted, "We're still ahead, but now we have to renew our efforts to lengthen our advantage to be absolutely dominant underwater," Reed said. "I'm committed to ensuring NUWC has whatever it needs to provide our men and women at sea with all they need to win the battle and deter the war."

Reed's cohort in the Senate, Whitehouse, shared

impactful words as he discussed the importance of ocean research with respect to climate change.

"We know less about the bottom of our oceans than we do about the backside of the moon, and we are changing our oceans dramatically right now," Whitehouse said. "We're pumping so much excess heat into the oceans that it amounts to four Hiroshima-sized nuclear devices going off every second.

"We are going to need to know as a species a lot more about the oceans. The types of technologies that are developed here not only have the national security uses that Jack talked about, but they will be very important for scientific research and exploration," he said.

Building off the words of Reed and Whitehouse, Langevin focused on innovation through collaboration between government, academia and industry. These partnerships have been a hallmark at Division Newport throughout its history, Langevin noted.

"In World War II, demand for torpedoes increased significantly and the Naval Torpedo Station was at capacity. As a response, industry stepped up," Langevin said. "Pontiac Motor Division at General Motors and the International Harvester Co. supplemented production and filled the gap. Collaboration with industry and academia is obviously not new at Division Newport, however, today we can all recognize that it's at a whole new level."

The development of a wide array of undersea weapons and sensors will be critical to combatting declining force structure and strike capabilities, Langevin said, as well as increased adversarial abilities.

"It's more important than ever that we press on by making investments in both research and development of advanced technologies, and transition them as quickly as possible to the warfighter," Langevin said.

Rep. Jim Langevin (from left), member of the House Armed Services Committee and House Committee on Homeland Security, Sen. Sheldon Whitehouse and Sen. Jack Reed, the ranking member of the Senate Armed Services Committee, wait for their turns to speak at the podium during NUWC Division Newport's 150th anniversary commemoration on July 29, 2019.

Members of the 88th Army Band from the R.I. National Guard — Brass Quintet listen as Donald McCormack (standing, from left), Executive Director, Naval Surface and Naval Undersea Warfare Centers, talks about NUWC Division Newport's rich history and what will be needed to meet the Navy's needs in the future.

"We have to pursue systems that are unmanned, that operate at an extended range and are all-observable. "These undersea warfare advancements and the complex systems engineering and integration required to develop them will help protect our allies, control our adversaries, combat instability, keep the homeland safe and, ultimately, give our warfighters every advantage."

Ver Hage gave some examples of the operational importance of Division Newport and how, like Langevin noted, this command has worked to give our warfighters every advantage. He discussed the April 14, 2018, coordinated strike on chemical weapons facilities in Syria in which Division Newport supported the USS John Warner.

"USS John Warner launched six Tomahawk land-attack missiles and struck all of its assigned targets," Ver Hage said. "Behind the scenes, the men and women of NUWC Newport helped make this operation a success.

"NUWC Newport not only provided critical support during the employment of the undersea strike capability, it also supported the broader task to develop, field and sustain the system as well."

Ver Hage also cited the Submarine Harpoon Demonstration Team's rapid updating of the legacy harpoon launching system as an example of its operational importance.

"The United States has — by any objective measure — the finest undersea force in the world," Ver Hage said. "And, while we face significant challenges to maintaining our undersea superiority, we clearly understand those challenges and are working to address them. "Nowhere is that more apparent than here in Newport. A place rooted in tradition but fueled by innovation. A place where people do the strategic and critical thinking necessary for innovation to flourish."

For McCormack, Ver Hage's counterpart at NAVSEA warfare centers headquarters, the day's events held particular importance.

Continued on page 4

NUWC Division Newport Commanding Officer Capt. Michael Coughlin (from left); Technical Director Ron Vien, Senior Executive Service (SES); Sen. Jack Reed, the ranking member of the Senate Armed Services Committee; Don McCormack, SES, Executive Director, NAVSEA Warfare Centers; Rear Adm. Eric Ver Hage, Commander, NAVSEA Warfare Centers; Rep. Jim Langevin, member of the House Armed Services Committee and House Committee on Homeland Security; and Sen. Sheldon Whitehouse were charged with revealing the monument commemorating Division Newport's 150th anniversary on July 29, 2019.

Continued from page 3

"I am especially happy to be here today because as many of you know, my roots are right here at Division Newport," McCormack said. "When I started my federal career back in 1985, we were still in the Cold War, so we had that sense of patriotism and urgency that we are feeling again today."

In looking toward the next 150 years, McCormack said, the Navy and Division Newport are going to need courage at different levels. The courage to:

- innovate;
- challenge the status quo;
- look outside ourselves to our partners for great ideas;
- collaborate and learn from others;
- fail, learn from that failure and try again;
- tell leadership when they may be wrong;
- conduct unbiased analysis, and then tell sponsors and program officers the technical truth, no matter how disruptive;
- do what is right for the fleet that we serve, even when it is unpopular.

"Throughout our rich history, we have sometimes been called technically arrogant, but I would argue that we need to be in order to do our jobs for the Navy," McCormack said. "We know that to accelerate innovation, we need diversity in our people and approach."

Vien concluded by providing perspective of just how long ago Division Newport began. In 1869, the first U.S. transcontinental railroad was built, the first professional baseball team debuted, the Cincinnati Red Stockings, and The Breakers mansion in Newport was still four years away from starting construction. He outlined some of Division Newport's technical achievements throughout its history, as well as some of its current areas of prowess.

"Throughout our 150 years we've become much more than just torpedoes," Vien said. "Today, Division Newport's undersea expertise includes sensors and sonar systems, combat systems, electromagnetic systems, platform and payload integration, mission engineering, ranges, and unmanned vehicles and defensive systems."

After the memorial was unveiled outside, the celebration continued with an exhibit of Division Newport's historic accomplishments. The history exhibit included panels of a timeline of technology to guide attendees through the decades since 1869. Departments contributed to a rack of World War I and World War II-era torpedoes and contributed the OV-1 Tow Body from the 1920s, originally towed by a dirigible. The

Contracts Department donated a 1930s-era Royal typewriter, once used to prepare contracts. The Submarine Force Library & Museum in Groton, Connecticut, contributed data collection devices from the 1950s and 1960s. A payroll ledger from the early days of the Naval Torpedo Station, when it was located on Goat Island, was also on display.

Tom Carroll, Other Transaction Authority (OTA) program manager, said the greatest contribution is being part of the Division Newport family's wealth of knowledge.

"I have seen [Division Newport] make a difference," Carroll said. "It is really a unique place, and it grows on you. Newport is considered the best and the brightest, out of all 11 warfare centers. So when you get to work for the No. 1 division, it's easy to come to work."

In his speech, Langevin praised the OTA as a significant milestone. The congressman was at Division Newport earlier this summer when the OTA was announced at the Undersea Technology Innovation Consortium (UTIC).

"DOD acquisition is often lampooned as the epitome of cumbersome bureaucracy. Both Congress and the department recognized that we have to make the process more efficient and agile to the services," Langevin said. "I can think of no better use of flexibility than an OTA contract to promote technology development and prototypes in undersea technology and innovative maritime systems, several things at which the Ocean State is obviously very, very good.

"It's so good at it, in fact, that the NUWC UTIC team has 50 contracts underway and has awarded $10 million to prototyping, with another $175 million in awards planned for the very near future," Langevin said.

Retired U.S. Navy Capt. Todd Cramer, who served as Division Newport's commanding officer from 2010-14, said that it was an amazing opportunity to be part of Division Newport. "This is a wonderful way to look back and remember what our mission was, and still is," he said. "We are always advancing to the future — for our systems and for the fleet."

Former NUWC Division Newport leaders also in attendance were Mary Wohlgemuth, SES, who served as the technical director from 2012-16; retired Capt. Geoffrey deBeauclair, SES, who served as commanding officer from 2016-17; Richard Bonin, former technical director and SES; Dr. John Sirmalis, former technical director from 1992-95 and SES; retired Rear Adm. Steven Johnson, former commander of NUWC; and Peter Herstein, a former NUWC Headquarters staff member and SES.

Division Newport cybersecurity specialist Anthony Porter, didn't fully understand how impactful his work — and that of the entire division — is until he heard about it from the congressional delegation and leadership in attendance.

"It's so good to see this, and see why our work matters," he said at the commemoration. "It reaffirms what we do, and puts emphasis on our work for the fleet and how [Division Newport] impacts it."

Financial analysts Tess Heidel and Ann Tetreault similarly felt inspired. "This keeps us motivated and gives purpose to what we do," Tetreault said. ❖

NUWC Division Newport Commanding Officer Capt. Michael Coughlin (right) gathers with the command's military detachment around the monument after a ceremony marking the 150th anniversary celebration on July 29, 2019.

The nearly 2,000-pound 150th anniversary monument is a testament to talent and teamwork.

150th anniversary monument celebrates history and achievements

Nearly 2,000 pounds of granite sit atop a concrete footing near the building where Naval Undersea Warfare Center Division Newport employees congregate for lunch. The monument, created to mark the Division's 150th anniversary, represents all the warfare center has accomplished since 1869, and what it is primed to complete in its future.

Carved into the shape of a submarine sail, the stone cenotaph rises 4 feet high, as if cutting through the waves at sea. It is an appropriate icon of Division Newport's work and features the 150th anniversary logo engraved on both sides. It sits atop a compass rose embedded into the stone pavers underfoot.

Almost two years in the making, and unlike other commemorative anniversary monuments that were placed in rock, the 150th monument was inspired by the 150th anniversary commemorative coin that command leadership hoped would become a permanent reminder of the Division's history and lasting legacy.

"One hundred fifty years is momentous! And it appeared to me that the way to properly memorialize our anniversary was with an emblematic monument," Public Affairs Officer Jeffrey Prater said. "I have been all over campus and there are several monuments, but they are in out-of-the-way places. So, for this 150th anniversary, we wanted something big, where people gather, and what better place than near our outdoor lunch area."

Placing the monument adjacent to the patio, by the building where the Division's corporate offices are located, was the perfect spot. Several ideas for the actual monument surfaced, including an exotic fountain, but the submarine sail was the most relevant and stoic representation. Placing it along an east/west line,

The entire team stands with the completed monument, on July 12, 2019.

A crane and the facilities team lower the monument into place on July 12, 2019.

facing seaward and outbound, where the Naval Torpedo Station was born, was the decided upon orientation.

"The Graphics Department had lots of ideas for the submarine sail, compass rose medallion placement and size," Project Architect and Manager John DiMaio said. "Once command leaders knew they wanted the medallion to be 36 inches in diameter, submarine sail 6 feet wide at the base and 4 feet high, we started with that medallion and worked backwards."

For the bird's eye view, DiMaio had a full-size replica made of foam core that helped determine proportions and placement, and he asked graphics to make a large sticker of the medallion to visualize how it would look on the stone.

"We started in March with nothing, and ended up designing a full site plan, including 18-foot circumference of the entire base," he said. "We worked on the lettering, proportion, width, height and thickness. After it was cut from the quarry, they milled it with a lathe and a special water-cutting machine to shape it to look like an actual submarine sail."

DiMaio viewed many shapes and color combinations of concrete pavers and bluestone to be set in the ground, and ensuring parts of the compass rose star in the center were contrasting each other. A special granite epoxy secured the granite to the pavers, so it can't be knocked over accidentally.

Contracts for the masonry, stone, engraving and general construction were prepared and released in less than three weeks, which is lightning speed, DiMaio said. Many jobs were completed in-house, like the structural engineering and design, site plan, rigging and landscaping. It definitely was a team effort to bring the monument to fruition.

"There was an evolution; everybody was on board," Prater said. "It started with an idea, and then the graphics and facilities teams got involved to figure out how it could be designed, engineered, fabricated and eventually installed into this amazing monument."

With so many different entities involved, plus command leadership overseeing progress, the monument was in place in July before the command's large commemoration ceremony on July 29.

"We just kept pushing. And everything went so well that we were able to get it done by July 1," DiMaio said. "One hundred fifty years is an accomplishment and now people come in and they can see it forever."

This legacy will remain for the next 150 years.

"It's something people here can be proud of," Prater added. "Employees can say, 'I was here when …' It's a big deal." ❖

Facilities team members admire their handiwork.

Happy anniversary to NUWC Division Newport! There were many people responsible for making this beautiful monument a reality. Special recognition for:

- Josh Robinson, the designer
- Mike Seaman for the 3D mock-ups
- John DiMaio for the project management
- Justin Cesino, the architect/draftsman
- Gary Ormiston for the structural engineering
- Leslie Brazil, the contract specialist
- Andrew Wells for the pavers
- Anthony Sciolto and Barer Vinbury for monument engraving
- John Furtado and Bob Darley for the landscaping
- With Naval Station Newport Transportation:
  - William Carvalho, the rigger work leader
  - Armand Levesque, crane operations
  - Harry Sambrano for the rigging

Employees cheer on someone taking a turn at the dunk tank during Sub Day held on July 31, 2019.

Sub Day features food, dunk tank, games with a 150th anniversary theme

Under a clear blue sky and with a warm breeze, Division Newport personnel enjoyed "submarine" sandwiches, a dunk tank and cornhole games on July 31, 2019, to celebrate the Division's 150th anniversary. Thousands of employees trekked to a lawn overlooking Narragansett Bay to participate in the event.

Jamelaa Jones, on a one-year rotational assignment, was very excited about the celebration, which she helped organize. Her first task was to solicit input from the workforce on how to enhance the 150th anniversary events and foster an environment for more cultural exchange. She took her assignment seriously, and for Sub Day she organized games such as a water balloon toss and dunk tank, recruiting department heads to take turns precariously perched above the water.

By far the biggest attraction, the dunk tank was manned by Dave Denny, Ranges, Engineering and Analysis Department, co-chairman of the New Professionals Network, who handed three softballs to any employee brave enough to take a shot at dunking some of Division Newport's leadership. Among the hearty souls who volunteered to be dunked were Dave Hart, branch head for Sensors and Sonar Systems Department; Steve Lamb, head of the Contracts Department; Joe Sheltry, department head for Sensors and Sonar

Mark Carlson, of CMWR's Food Service Board, assisted with the set up and distribution of approximately 2,300 subs, chips and drinks during Sub Day held on July 31, 2019.

Systems; and Mary Cordeiro, deputy head of Undersea Warfare Weapons, Vehicles and Defensive Systems Department.

"Joe's great, but I had to get him," said Keri Zambrano, a member of the Sensors and Sonar Systems Department who is Sheltry's administrative assistant.

Not to be deterred by missing the target with all three balls, Zambrano ran at the bull's-eye and pushed as hard as she could to finally dunk Sheltry.

"It felt awesome," she said.

"It's good for morale," Sheltry said about his turn in the dunk tank.

Hector Lopez, head, Undersea Warfare Weapons, Vehicles and Defensive Systems Department, took aim at Cordeiro, the only woman to volunteer to be in the tank. Cordeiro lasted for about 30 minutes before getting dunked in a tank that was filled with ice and water.

"If department personnel had known ahead of time, even more would have shown up to take a shot," Cordeiro said about her last-minute decision to sit in the tank.

John Boelter, business office lead in the Contracts Department, took great pleasure in dunking Lamb, who is his boss, on the first shot.

"It felt great," Boelter said. "It hit the spot."

CMWR handed out approximately 2,300 subs, bags of chips and drinks during the event. Joe Roberts, Sensors and Sonar Systems Department, served as disc jockey, and an Employee Organization booth was staffed by Vima Manfredo, Undersea Warfare Combat Systems Department, co-chairwoman of LGBT+A (Lesbian, Gay, Bisexual, Transgender plus Allies), and Lori Ailes, Undersea Warfare Engineering and Analysis Department, co-chairwoman of WiSE (Women in Science and Engineering).

The dunk tank was the popular attraction of the day, as employees lined up to take a shot at dunking some of Division Newport's department heads during Sub Day held on July 31, 2019. Dave Hart, branch head for the Sensors and Sonar Systems Department, was dunked several times.

Mike Paglierani, an engineer in the Sensors and Sonar Systems Department, who has worked at Division Newport for 21 years, said the 150th celebrations remind him to live up to the high standards of all employees who came before him.

"Every day at NUWC, I see the dedication of my colleagues," Paglierani said. "This dedication establishes tomorrow's legacy."

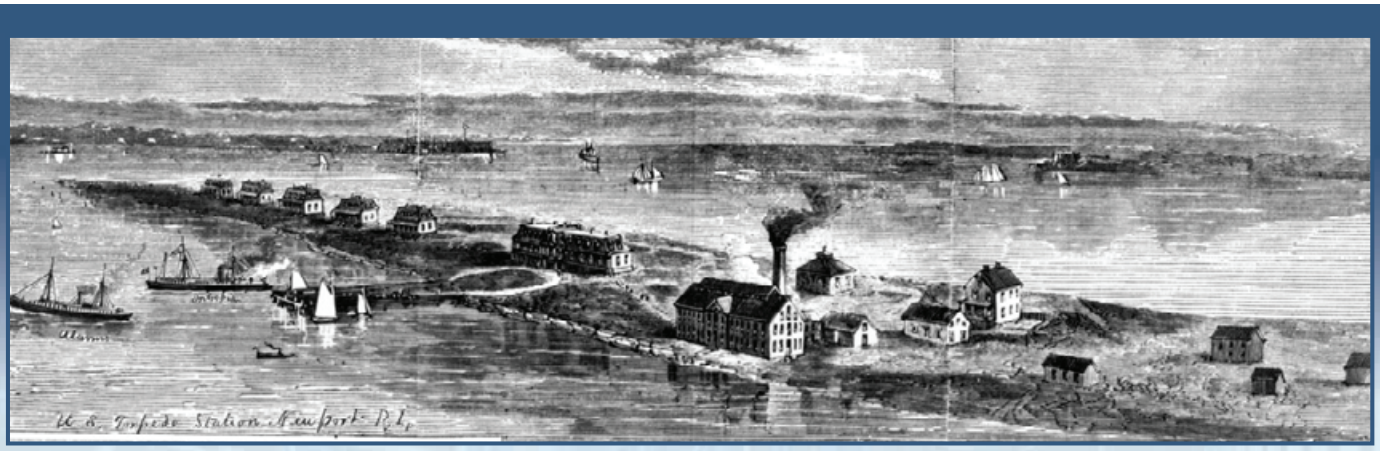
John Scholes, a logistician in the Platform and Payload Integration Department for four years, enjoyed being a part of an historic week.

"It's exciting to be part of something with such a long history, especially for a new employee," Scholes said. "It's an opportunity to reflect on everything that has been accomplished." ❖

Sheila Paglierani (from left), a McLaughlin Research Corp. contractor who supports the Corporate Operations Department, and Mike Paglierani, an engineer in the Sensors and Sonar Systems Department, who has worked at Division Newport for 21 years, play cornhole during Sub Day on July 31, 2019.

150 Years of Innovation

The Naval Undersea Warfare Center Division Newport is celebrating 150 years of excellence in undersea warfare! Men and women have worked in Newport, Rhode Island, for 150 years to provide undersea superiority to the U.S. Navy. Our vision of Undersea Superiority: Yesterday, Today and Tomorrow has not wavered, ensuring our Navy is the most advanced and lethal fighting force the world has ever known.



July 29, 1869

Naval Torpedo Station (NTS) is established on Goat Island in Newport as the U.S. Navy's first experimental ordnance facility. Cmdr. Edmund O. Matthews serves as commanding officer until 1873. During his tenure he leads the development of numerous experimental underwater weapons, including torpedoes and explosives.

Yesterday... Today and Tomorrow

1870

NTS staff consists of six officers, while 20 officers are being trained in mine warfare at any one time. By the end of the year, the number of civilian employees has grown from three to 24.

1871

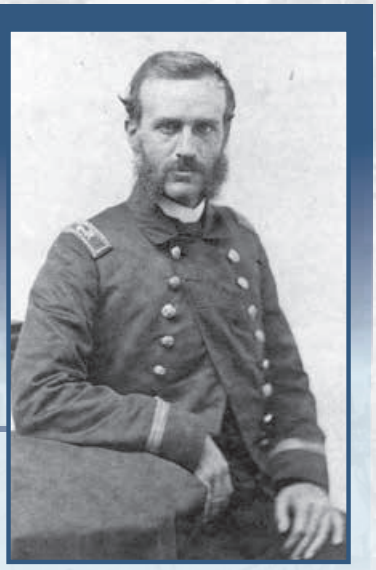
NTS builds and tests the U.S. Navy's first self-propelled torpedo, the Fish torpedo. Though it was never produced for combat, it is a significant achievement.

1873

NTS continues to conduct extensive testing on a variety of torpedo weaponry, including the Ericsson torpedo, the Spar torpedo and the first "Automobile torpedo" designs.

Officers' instruction is extended from an irregular schedule to 10 months of organized study. The modern Naval War College stems from this work.

Capt. Edward Simpson becomes NTS commanding officer for two years.



1875

Shortly after the three-year appointment of Capt. Kidder R. Breese as commanding officer, distinguished naval commanders and the Secretary of the Navy George M. Robeson, visit NTS to witness experiments and demonstrations of conventional stationary torpedoes (mines) and the new self-propelled torpedoes. Breese waives the customary 19-gun salute and welcomes these dignitaries with a 19-torpedo salute instead.

1877

The U.S. Telegraph Co. lays cable to connect NTS with Newport, so the station could communicate directly with police, city officials and businesses. This system is more convenient than the original, dispatching messages by boat across Newport Harbor. The fee for this access is $12.50 per month, until the widespread introduction of the telephone soon thereafter.

1881

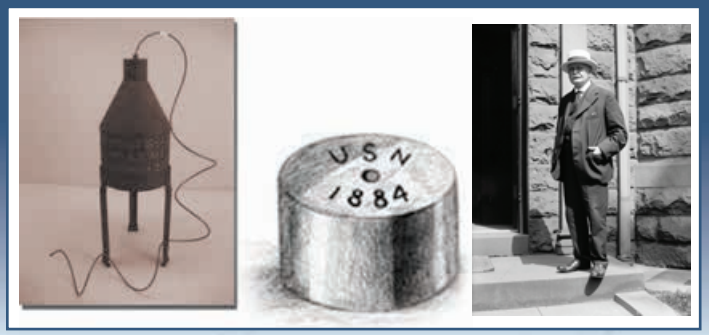
Extensive tests on the new Howell torpedo, the first pump jet-propelled torpedo, are conducted. The flywheel-powered torpedo was completely wakeless,

1883-84

NTS becomes the major producer of guncotton for the U.S. Navy, producing about 10,000 pounds of this explosive compound. It is stored on Rose Island, occupied by the War Department just northwest of NTS in Narragansett Bay. Though less energetic than dynamite, guncotton is more appropriate for volume production and fleet use, so it is universally used for torpedo warheads until 1912.

The steps to process guncotton included the nitration process (left photo), known as the nitrate bath. Prior to 1900, raw English cotton was picked apart by a machine (center photo) then washed in nitrate and taken to a separate building where the cotton was reduced to a pulp and solidified. To create the torpedo warheads, a saw (right photo) was used to cut the solidified pulp into the necessary dimensions.

Yesterday... Today and Tomorrow



1886

Charles Edward Munroe joins NTS as a chemist and discovers the basis of explosive-shaped charges, called "The Munroe Effect." He later discovers smokeless gunpowder.

1892

Developed and built in Austria in the 1870s by English engineer Robert Whitehead, the Whitehead torpedo is finally licensed for production in the U.S. and is authorized for use in combat. It is actively tested at NTS.

1907-08

Construction on the Navy's first torpedo factory begins. In 1908, the "hot running" Whitehead Mark V is the first torpedo built by NTS, after a civilian contractor produced Mark I-IV as "cold running" torpedoes. The Mark V traveled five times farther than its predecessors. The Station held regular classroom instruction (above) on the torpedo.

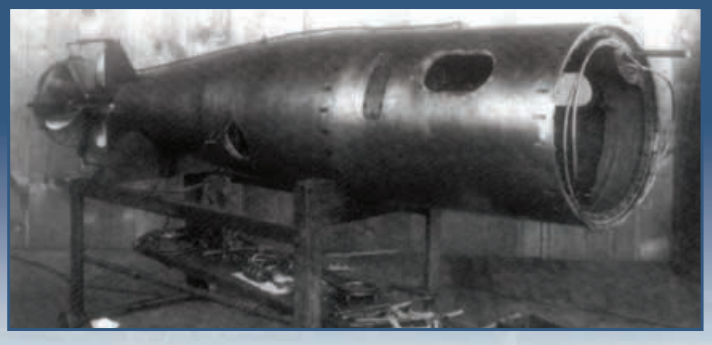
1909

The federal government purchases a portion of Gould Island, a 56-acre tract located in Narragansett Bay. The rest of the island was purchased in 1918, and by 1920 NTS had established an Air Station where torpedoes were dropped from sea planes and later fired from a facility built on a pier.

Undersea Superiority

1917

U.S. enters World War I. Torpedo research and development is superseded by the manufacture of depth charges and sea mines. NTS pivots its work toward these efforts, including the development of the famed "ash can" depth charge used to sink U-boats. The Station's workforce grew to about 3,200 employees, with about 300 women workers starting in July, assembling primers for mines and depth charges.



1920-30s

With the war over, torpedo production resumes with NTS's best year yet — in 1920 the Station supplied the Navy with 2,000 torpedoes. Later that year, however, with peacetime talks prevailing, torpedo production is halted and budget cuts force NTS to revert to its prior research and development (R&D) work. In 1923, the Station completes the first experimental electric torpedo. Over the next five years, numerous successful tests and tweaks are done, however the solitary specimen is lost during a test, and funding is unavailable to build another.

1941-44

U.S. enters World War II. NTS intensifies its torpedo production, manufacturing more than 18,700 weapons. Given the rapid increase in the fleet's demand, however, NTS is unable to properly test weapons before deployment. As a result, there are a high number of missed attacks that indicate the torpedoes don't work. NTS fixes the issues in 18 months. The Station hires more than 13,000 employees, including a large number of women to support round-the-clock operations. Above, an NTS worker uses a horizontal milling machine.

1945-51

In 1945, the Navy Underwater Sound Laboratory (later merged with NUWC) begins operations in New London, Connecticut, as the center of sonar development for both surface ships and submarines.

All ongoing R&D is consolidated at the nearby Coddington Cove annex, under the new Naval Underwater Ordnance Station (NUOS). NTS, shown above in 1951, is soon disestablished.

Yesterday... Today and Tomorrow

1954

With the launch of the USS Nautilus, the world's first nuclear-powered submarine, the Navy needs advanced systems to effectively operate the submarines and its systems.

NUOS engineers and scientists work to address the challenge of a submarine's unlimited endurance to stay submerged.

1961

The number of professional women hired in Newport increased, after the hiring of women at the Navy Underwater Sound Laboratory (NUSL) in New London, Connecticut. Women are hired as mathmeticians, mechanical and electrical engineers, physicists and scientists. This highly trained and diverse workforce, many with advanced degrees, began to explore the latest technologies and to develop new and highly sophisticated systems.

1963-66

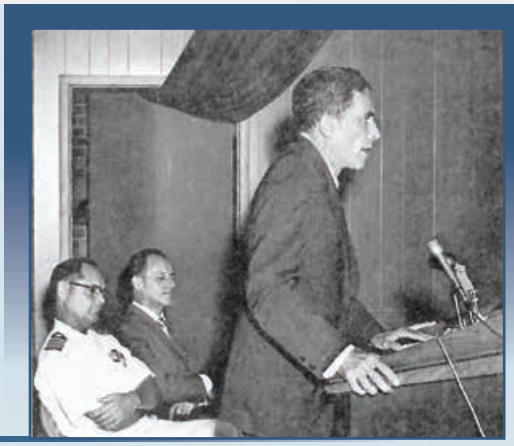
Housed under NTS from 1941-1945 to coordinate wartime torpedo production, the Central Torpedo Office (CTO) is renamed the Naval Underwater Systems Engineering Center in 1963, to accommodate its added mission of operational fire control systems and launchers. In 1966, the center merges with the Naval Underwater Ordnance Station (NUOS) to create the Naval Underwater Weapons Research and Engineering Station (NUWS).

Mid-1960s

NUOS becomes a major contributor to the development and testing of advanced heavyweight, electrically propelled torpedoes, including reduced radiated noise; improved operating depths; added speed control; enhanced exploders; drag reduction; and improvements to two-way wire communications. In the 1965 photo above, Robert White and Elmer Siebens work on a torpedo propulsion motor speed control system in the Electrical Propulsion Laboratory at NUOS.

1967

The Atlantic Undersea Test and Evaluation Center (AUTEC) on Andros Island in the Bahamas begins operations as a deep-water test and evaluation range.



1969

NUWS celebrates 100 years of naval weapons prowess with seminars, a ball, a family day and other festivities. R.I. Sen. Claiborne Pell gives the ceremonial address.

Yesterday... Today and Tomorrow

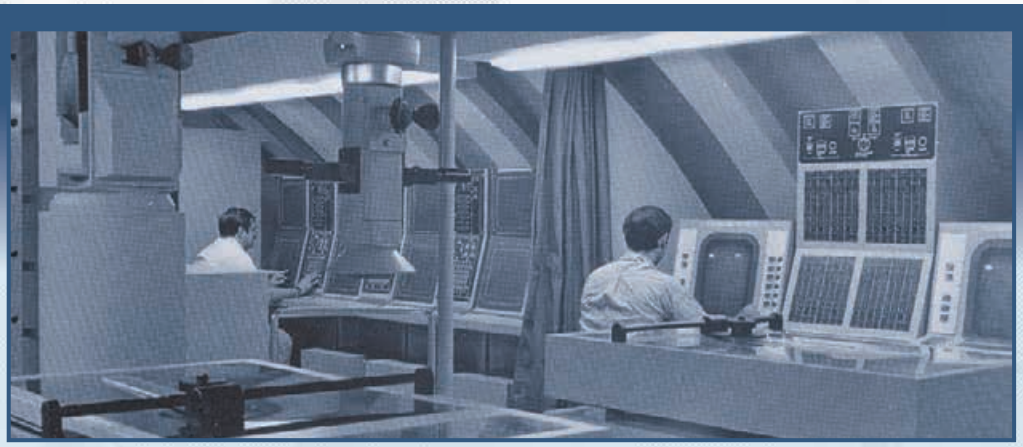
1970

NUWS and NUSL in New London, merge into the Naval Underwater Systems Center (NUSC) to support submarine warfare.

Congress approves $754,000 for construction of a three-level, 25,000-square-foot laboratory for research and testing of the Mark 48 torpedo.

1978

To counter the growing submarine threat worldwide, NUSC addresses the need for a larger, lightweight and software-controlled torpedo, applying mini-computers and digital technology to a 16-inch warhead. It initiates the Advanced Capability program to develop a high-performing digital homing system and becomes the technical direction agency for the Mark 117 torpedo all-digital fire control system.



1980s

The advent of the scientifically designed torpedoes, sonar systems, communications systems and other submarine-based systems — all with digital software — introduces a new era of technical and system-level challenges. In response, NUSC develops the Mark 1 Combat Control System, with the Mark 117 as the focus of an integrated weapons system for submarines. The Submarine Operational Test Bed (internal view above) is built as a full-scale submarine mockup for combat system operational evaluation.

1992

After a sweeping strategic naval repositioning and fleet reduction in the late 1980s and early 1990s, a Base Realignment and Closure (BRAC) process is implemented. As a result, NUSC and its Keyport, Washington, counterpart are restructured as the Naval Undersea Warfare Center (NUWC). NUWC Newport maintains its testing and R&D mission, including development of unmanned underwater vehicles; demonstration of an underwater projectile breaking the sound barrier; and technology development for periscope and electronic warfare components. Into the new millennium, NUWC continues to lead the charge of full-spectrum submarine weapons development, from new technology in existing weaponry designs to sonar processing, as well as the production of cutting-edge autonomous undersea and surface vehicles.

2000

NUWC Division Newport continues to lead the charge in full-spectrum submarine weapons development, from new technology in existing weaponry designs to sonar processing, as well as the production of cutting-edge autonomous undersea and surface vehicles. With its strong technical capabilities and its long history as a leading innovator, NUWC Division Newport is well positioned to fill its responsibility to provide advanced undersea combat systems for submarines by providing unbiased technical advice and innovative solutions to the U.S. Navy.

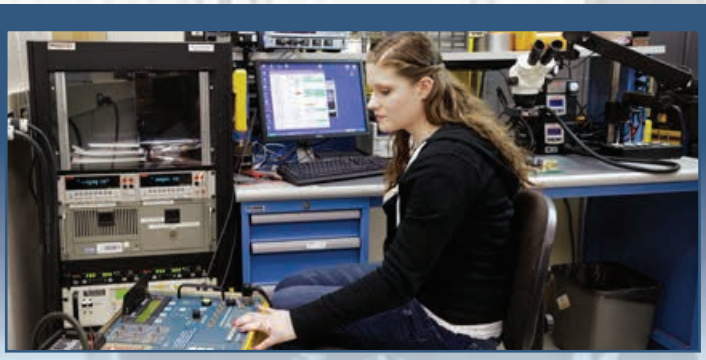
Early 2000s

The War on Terrorism and Operation Enduring Freedom require development of faster and smarter technological capabilities. Meanwhile, the Naval Surface Warfare Centers and the Naval Undersea Warfare Centers begin operating as an integrated entity in Newport. Donald F. McCormack is appointed NUWC technical director in 2005, and in 2014, becomes executive director of the Naval Surface and Undersea Warfare Centers. He champions the "Superiority from Seabed to Space" mantra of the 21st-century U.S. Navy.

Yesterday... Today and Tomorrow

2015

The first Annual Naval Technology Exercise (ANTX) is held at NUWC Division Newport. Later changed to the Advanced Naval Technology Exercise, ANTX was duplicated across NAVSEA and in the Marine Corps as a way to test new technologies and collaborate with industry partners. Meanwhile, high-velocity learning at every level becomes the focus at NUWC in order to develop the "Force of the Future" as it adapts to emerging worldwide threats.



2016

Testing and evaluation of Virginia-class systems, both dockside and at sea, gets underway. A comprehensive review of all test data was completed at NUWC Division Newport and preliminary assessment of torpedo placement indicated positive weapon system effectiveness. All platform torpedo tubes and vertical launch system tubes were fully tested with no material issues identified. Additionally, sensor accuracy testing showed that systems performed well.

2018

In direct support of the Chief of the Naval Operations, NUWC Division Newport quickly revitalizes a missile that had not been fired from a U.S. submarine in more than 20 years. Within one year, the legacy missile Harpoon is made ready for fleet engagement and is demonstrated as a significant capability for the U.S. Navy.

2019

NUWC celebrates its 150th anniversary with a year of special events, including a commemoration ceremony where a granite memorial is unveiled (see more on pages 6-8), Sub Day, 5K road race, movie nights, golf and bowling tournaments, and a special storytelling presentation, "The Knot."

To commemorate NUWC Division Newport's 150th anniversary, the command published a monthly article series about the Division's history. It is printed in full on the following pages. Sources include prior command publications and U.S. Navy press releases.

The Naval Torpedo Station on Goat Island is depicted above as it looked in the 1870s, not long after Cmdr. Edmund O. Matthews became its first commanding officer in 1869. (Courtesy Naval War College Museum)

The history of the Naval Torpedo Station

NAVAL TORPEDO STATION

The following account is from information compiled in 1920 for the booklet entitled, "The Naval Torpedo Station," under the direction of Capt. Martin E. Trench, inspector of ordnance in charge, J. P. Sullivan, the Station's chief clerk, and by W. J. Coggeshall and J. E. McCarthy, who were employees of the Ordnance Department of the Torpedo Station:

A strong work on Rose Island was armed with 40 pieces of heavy artillery. With such a powerful battery to defend the right of the line of seven heavily armed French guns and mortars of Brenton Point to protect its left, the whole presented a formidable army of land artillery and naval broadsides to guard the main entrance to the bay. Till the departure of [French Gen. Jean-Baptiste] Rochambeau, June 10, 1781, he with the assistance of many officers of engineers, continued to strengthen all the batteries, particularly those on Goat Island which had not been destroyed upon the British evacuation.

Among the new works thrown up by the French was a battery on Halidon Hill as this height commanded, at short artillery range, all the batteries at Brenton Point and on Goat Island.

Fort Liberty was dismantled after the Revolution and rapidly fell into decay. By an act of the Assembly of Oct. 4, 1784, the fortification was armed, the barracks repaired and given the name of Washington, after the Commander in Chief of the American Army.

On May 29, 1790, Fort Washington fired the first salute announcing that Rhode Island had finally joined the Union of the Thirteen United States, by adoption of the Federal Constitution.

In 1792, Fort Washington had armament of three 24 pounders, five 18 pounders and two six pounders, and the Assembly ordered powder for use on special occasions for saluting.

The Congress of the United States made appropriations for strengthening fortifications in 1794.

FORT WASHINGTON

The money appropriated for fortifications in Newport Harbor was used for strengthening Fort Washington on Goat Island. A fort, citadel and air furnace were erected.

On March 29, 1794, Étienne Nicolas Marie Béchet Sieur de Rochefontaine was appointed temporary engineer, promoted to lieutenant colonel and on Feb. 26, 1795, was made the commandant of the newly organized Corps of Artillerists and Engineers.* Rochefonatine's name, as constructing engineer of the works on Goat Island, is still to be found cut upon a stone which is being preserved at the Torpedo Station.

On Jan. 18, 1796, the Secretary of War reported to the U.S. Senate that on Goat Island there had been erected a fort, citadel and air furnace. He recommended a further expenditure to render the defense complete; to finish the fort, erect an artillery store and make a covered way around the fort as in regular fortifications. The expense was estimated at about $6,000.

Maj. Louis Tousard, who lost an arm in the Revolutionary War, succeeded Rochefontaine, May 7, 1798, the latter having been dismissed from the service.

**The original story listed two names as officers leading the station, but they are actually the same person.*

The works under Major Tousard was described as a "small, irregular, enclosed work of masonry and earth mounting 12 guns, beside flank batteries, mounting 18 guns with a brick magazine, officers' quarters and soldiers' barracks for one company."

From this description, it is evident that the recommendation of the Secretary of War to the Senate was not carried out.

At this time, the fortification was christened Fort Wolcott to commemorate the services of Rhode Island's war governor, Oliver Wolcott, and also as a compliment to his son who was then Secretary of the Treasury of the United States.

The former name of Fort Washington was transferred to a work on the Potomac River opposite Mount Vernon.

During 1798 a recruiting office was opened in the Vaughan House on Washington Square, for the purpose of garrisoning Fort Wolcott.

The 23rd anniversary of American Independence was celebrated by a salute of 13 guns from Fort Wolcott.

FEDERAL ACQUISITION AND MILITARY CONTROL

On April 16, 1799, Goat Island was legally turned over to the U.S. government by the town treasurer of Newport for a consideration of $1,500. Rights were reserved by the town to carry away sand, seaweed and gravel, and to serve civil and criminal processes (original deed cede). This was done in conformity with an act of Congress Empowering the United States to hold lands for fortifications and authority vested in the town treasurer by the Freemen of the Town of Newport, at a meeting held Nov. 30, 1790.

From meager details at hand, it appears that the first troops to garrison Fort Adams, dedicated on July 4, 1799, were a company of artillerists and engineers from Fort Wolcott under the command of Capt. John Henry.

Prior to war with England in 1811 there were, according to Secretary of War Eustis, 38 guns at Fort Wolcott and 17 guns at Fort Adams, 55 guns in all, large and small for the protection of Narragansett Bay against the most powerful fleet in the world.

After the War of 1812, a board of engineers was appointed to study the problem of national defense and devise fortification methods for the Atlantic and Gulf coasts. On April 7, 1820, the board submitted its proposal for the defense of Narragansett Bay. This project provided for the defense of the inner waters of Newport by Fort Wolcott and Fort Greene. This board decided work at North Point (what would become Fort Greene) and Goat Island would suffice for the interior defense of Newport Harbor when covered by new channel fortifications.

In 1827, Fort Wolcott finally was abandoned, the last garrison being removed at that time. It is evident from this that the recommendations of the board of engineers submitted in 1820, so far as Fort Wolcott was concerned, were never adopted.

Fort Adams was established as the strongest and most advantageous military point on Narragansett Bay, and Fort Wolcott became obsolete. The abandonment likely began in 1827, though the records of this period are blank on the history of Goat Island.

During the Civil War, Fort Adams again came to prominence when it was occupied by the Naval Academy. The frigates Constitution and Santee were moored near the shore for training purposes, and a number of the cadets were quartered at the old Atlantic House at the corner of Bellevue Avenue and Pelham Street in Newport.

On July 29, 1869, the Secretary of War authorized the occupation of Goat Island by the Navy Department. During the summer of that year, the Torpedo Station was established.

Continued on page 22

Cmdr. Edmund O. Matthews had the distinction of being selected as the first commanding officer of the Naval Torpedo Station (NTS), NUWC's original predecessor organization and the Navy's first torpedo station. Established in 1869 on Goat Island in Newport, NTS is credited with building and testing the Navy's first torpedo.

Matthews, with the assistance of Lt. F.M. Barber and civilian H.A. Hardy, designed the torpedo through many trials, tests and redesigns. They produced and demonstrated the U.S. Navy's first automobile torpedo in 1871. Although it was never volume produced, the successful design of a complex self-propelled weapon was a significant accomplishment at that time.

Continued from page 21

Soon after taking on the task of standing up the new activity, Matthews was promoted to commander. His staff comprised about six officers and three civilians, with approximately 20 officers being trained in mine warfare at any given time. By the end of 1870, the number of civilian employees had grown to 24.

Matthews led the development of numerous experimental underwater weapons including towed, stationary, spar and automobile torpedoes, in addition to explosives and electrical devices. He also initiated the design of a wedge-shaped rectangular torpedo made from two-inch planks that was 17 feet long, 13 1/2 inches wide, and 20 inches deep that was the first major piece of hardware built and tested at the new experimental station. Initial tests were conducted in January of 1870 to evaluate the drop magazine or "dirigible" feature that this new design incorporated.

In 1866, Robert Whitehead, an English engineer and manager of a factory in Fiume, Austria, designed an experimental underwater projectile powered by a compressed air engine and containing an 18-pound warhead. Matthews proposed that NTS design and build a torpedo similar to the Whitehead torpedo.

The following is his rather unspecific specification: "To go underwater to a considerable distance at a fair rate of speed, to deviate neither to the right or left, and to proceed to and keep at constant depth underwater no matter whether started on the surface or any point beneath it." (Source, "A Century of Progress — A History of Torpedo System Development," published by NUWC Division Newport)

The Torpedo Station was intended to be used for the development of torpedoes and torpedo equipment, explosives and electrical equipment for the Navy.

At that time on the island, there were buildings formerly used in connection with the fort by the War Department, consisting of a one-story building formerly used as a barracks and a number of small wooden structures erected for the use of the Naval Academy during the Civil War.

Early in 1870, the Torpedo Station was well underway. In January, Matthews suggested to the Bureau of Ordnance that a "pledge be exacted of officers and an oath from civilian employees" with a view to secrecy in connection with the work carried on at the Station. The bureau approved the exacting of a pledge from officers, but did not approve of the oath for civilians, who were to be immediately discharged and to forfeit all pay due to them for any breach of confidence.

On March 5, 1870, the Torpedo Station was directed to give a statement on its facilities for manufacturing torpedoes and to construct one torpedo for experimental purposes. This is the first record of an order for

19-Torpedo Salute

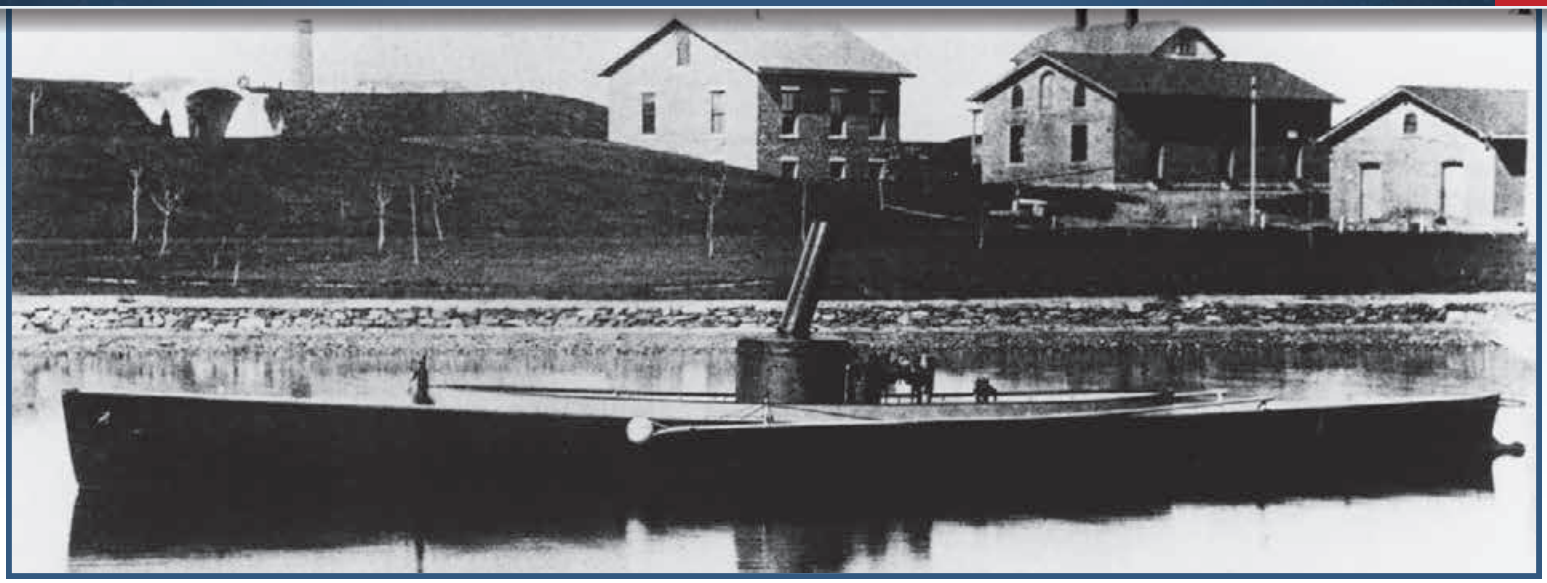
To honor Secretary of the Navy George M. Robeson's visit to the Naval Torpedo Station in the summer of 1875, professor Moses G. Farmer, the Station's electrical expert, set up 19 electrically activated, bottom-mounted torpedoes (mines) in the shallow water between Goat Island and Newport and wired them to a control station on Goat Island. Secretary Robeson's arrival was announced as "Farmer's dynamo-electric machine" sequentially fired the torpedoes from the shore station sending a 50-foot column of water into the air as each torpedo was fired. It was a spectacular start for the planned demonstrations and is the only recorded 19-torpedo salute.

During their two-day visit, the distinguished visitors were exposed to an extensive series of demonstrations and experiments to familiarize them with the work being done on moored torpedoes, spar torpedoes and the wore-guided self-propelled Lay torpedo.

Mock battles were conducted during which Adm. David Dixon Porter (at left), assistant to the Secretary of the Navy, personally took over the helm of the torpedo boat alarm, and bottom-moored, towed and spar torpedoes were exploded.

During the second day, the demonstrations were held in the open waters west of Goat Island and for the grand finale, chemist Walter Hill provided a spectacular demonstration of the new Swedish explosives dynamite and nitroglycerin that he was making at the Torpedo Station. A raft with 60 pounds of dynamite was exploded, blowing the raft into splinters and sending a water column 100 feet. Next a mine with 100 pounds of nitroglycerin moored in 30 feet of water was set off and the concussion was felt two miles away in downtown Newport. Finally, an old hulk loaded with almost 500 pounds of dynamite was blown to shreds. From the newspaper accounts, it appears that the residents of Newport not only witnessed the first 19-torpedo salute, but they also experienced a somewhat belated but spectacular Fourth of July-type display of pyrotechnics.

Admiral Porter was part of the celebration, as he had actively campaigned for the creation of Naval Torpedo Station to conduct hands-on experiments with torpedoes, mines, explosives and electrical devices.



The Herreshoff spar torpedo boat, Lightning, docked at the Naval Torpedo Station. Such boats were used during the 1870s to tow spar torpedoes, which were lashed to the ship's side and exploded by contact or at will.

any article of importance to be manufactured at the Station. The torpedo of this period was stationary and similar to a mine.

LIGHTING A SERIOUS CONCERN

On Oct. 21, 1870, authority was granted to run a gas pipe from Long Wharf, on the Newport side, to the Torpedo Station at a cost not to exceed $700.

At this time, the problem of lighting was a serious one. Construction on the pipe from Newport, however, likely never started, for on Nov. 30, a little more than one month later, a gas generator for lighting the island was purchased at a cost of $450.

A blacksmith shop, a coal shed and a coppersmith shop were constructed, and the location of a dispensary was being considered. There were 24 employees at the Station, including Professor Walter Hill, a chemist.

The conversion of the old Army barracks into quarters and offices for the inspector of ordnance in charge was completed and the quarters occupied on March 8, 1871. On June 28, 1871, foundations were started for the original cottages that are now known as Nos. 2, 3, 4, 5 and 6.

Extensive chemical and electrical experiments were conducted, and the efforts of the Station were bent to the development of torpedoes and explosives. A new storehouse, made necessary by increased activities, was constructed in 1871.

Lt. George Dewey, later Admiral Dewey, of Spanish-American War fame, was assigned to the Station, and during his tour of duty there is a record of him being addressed in official communications as "Commanding Torpedo Station." This was probably a temporary command, exercised in the absence of the regularly detailed commanding officer. On July 9, 1872, work commenced on the original machine shop.

PROGRAM, FACILITY DEVELOPMENT

In May 1873, the offices located in the inspector's quarters were moved, with the exception of administrative offices, to the second floor of the new machine shop. Progress in research made it necessary for an extension to the chemical laboratory and this was authorized in July 1873. Experiments with dynamite and gun cotton for use in guns of large and small caliber and for torpedo charges were extensively researched.

At this time, the spar torpedo was the preferred torpedo and was being extensively researched. It was named as such because it was fastened to the end of a spar, which was lashed to the ship's side and exploded by contact or at will. A Lay automobile torpedo later was purchased by the government, and experiments with this new type began at the Station.

Around this time, the Whitehead torpedo, which had been extensively experimented with and developed in Europe, was offered to the U.S. government for 8,800 pounds, but there was no money available for its purchase.

Early in 1873, the officers instruction class, which had been irregular, was extended to include a period of 10 months of organized studies from October to July.

In July 1873, Capt. Edward Simpson relieved Matthews, under whose efficient direction the Torpedo Station had been established and placed upon a sound working basis.

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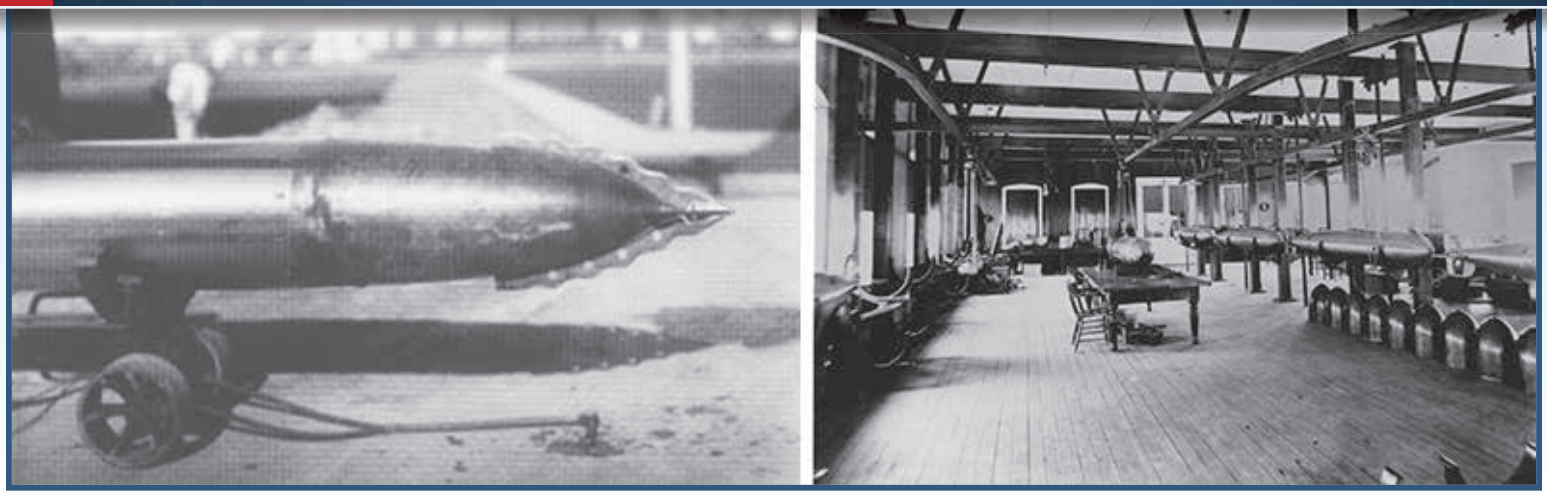

This Whitehead Mark 5 torpedo (left photo), the first torpedo to be purchased by the U.S. Navy, was fitted with a net cutter in this 1908 photo taken at the Naval Torpedo Station. (Source: Naval History and Heritage Command) Whitehead torpedoes are shown in the Torpedo Overhaul Shop (right photo) at the Naval Torpedo Station on Goat Island in 1908. Note the overhead track and simple crane mechanism (block and tackle) used to transport the torpedo to the work station in the center of the room consisting of a wood table and chair. (Photos courtesy Naval War College Museum)

Continued from page 23

Preparations were made in January 1874 to begin work on a jetty at the south end of the island. It was to be of stone, 150 feet long, two feet above the high water mark and to cost $2,000. This wall was completed in June and was the foundation of the seawall, which now entirely encircles the island. The money for the original wall was appropriated March 3, 1873, under "Rivers and Harbor Appropriations," and the work was performed under the direction of the Engineer Corps, U. S. Army.

There is a record of the Whitehead torpedo again being offered to the U.S. in 1874. This offer was made by an employee at Woolwich Arsenal and carried with it a condition of employment at the Torpedo Station.

During 1874, the inspector's quarters were entirely reconstructed, the chemical laboratory again was extended and the storehouse enlarged.

CHANGE OF COMMAND

Capt. Kidder Randolph Breese took command of the Station in June 1875, relieving Captain Simpson, who had materially promoted activities in the development of the important experimental work then underway.

Breese spent his entire career in the Navy, beginning with his appointment as a midshipman in November 1847 at the age of 16. His accomplishments include taking part in Commodore Matthew Perry's expedition to Japan from 1852-55 and serving during the Civil War, most notably distinguishing himself during the siege of Vicksburg.

Shortly after Breese's appointment at the Torpedo Station, Secretary of the Navy Robeson, accompanied by a distinguished entourage including Adm. David Dixon Porter; Admiral Rogers; Generals Burnside and Warren; Sen. Cragin; Commodores Jeffers and Davis; Captain Jones of the Royal Navy; and professors Rodgers and Cook, paid an official visit to the Station. The group witnessed experiments and demonstrations of conventional stationary torpedoes (later designated as mines) and the new self-propelled torpedoes under development. In honor of the occasion, in the summer of 1875, Breese decided to forego the traditional 19-gun salute and welcome Robeson with a 19-torpedo salute.

The only building improvement during 1875 was the addition of a boiler shop to the west side of the machine shop.

Until 1877, the Torpedo Station had communication with Newport only by boat. On April 3, 1877, the U.S. Telegraph Co. agreed to lay a cable to connect the Torpedo Station with Newport. This cable connection placed the Station in communication with the Western Union Telegraph Co., the police station, city officials and businesses on Thames Street. It also provided the time daily, except on Sundays. The cost to the government was $12.50 per month. This was prior to the introduction of the telephone in Newport.

In September 1878, Captain Breese's tour of duty concluded and he was relieved by Capt. F. M. Ramsay. Breese died three years later in Newport at the age of 50.

AUTOMOBILE TORPEDO

Under Breese, the Station had been active in the development of the automobile torpedo, which received much attention in America and abroad.

Around this time, the firm of Cozzens and Bull introduced telephonic communication, which was used with much success in Newport. This system was later developed and absorbed by the Providence Telephone Co.

The fast torpedo launch was being favorably considered by naval authorities and on May 2, 1879, the commanding officer at the Torpedo Station was directed to inspect a launch just constructed by the Herreshoff Works in Bristol.

On May 16, 1879, the Bureau of Ordnance directed the acceptance of a 42-foot boat, Spray, by the Torpedo Station. The launch of the boat was to be observed closely with an eye toward future adoption as a ferry launch.

On Dec. 2, 1879, the Hydrographic Office established the location of the flagpole at the Torpedo Station at "latitude 41 degrees 29' 7" N, longitude 71 degrees, 19', 40" with variation 10 degrees, 5' W." This location is at the southern end of Goat Island. It was directed that a copper plate be placed on the flagpole, giving this location.

On March 1, 1880, the tugboat Nina was assigned to the station for use in the development of torpedoes and explosives. The boat was attached to the Torpedo Station until it sank in 1910. While on its way to Boston, Massachusetts, from Norfolk, Virginia, the ship encountered a storm and heavy seas, and vanished with all on board.

The rapid development of the automobile torpedo led to the realization that the towing type of torpedo was becoming obsolete. On Oct. 12, 1880, the Bureau of Ordnance directed that no more towing torpedoes be issued to ships, however, some were to be kept on hand for harbor defense.

Experiments with Lay torpedoes were conducted with promising results, while the Whitehead torpedo was not believed to be of any value by American experts. This was because of its delicacy, difficulty of management and the secrecy of which prohibited a proper knowledge of its workings.

In 1880, the Seamen Gunners' Quarters and a powerhouse were built. The civilian employees at the station at this time were 34 men, an increase of 10 in a decade.

In a letter dated March 2, 1881, Jeffers outlined a plan for the future development of Goat Island, the last paragraph of which is of note: "As the Station is exposed to high and sometimes violent winds, it is desirable that no buildings hereafter erected should be more than one story in height — a consideration that must govern you in preparing the plan for future improvements."

LAY TORPEDO

On Jan. 15, 1881, Capt. T.O. Selfridge assumed command of the Torpedo Station, relieving Ramsay. On the same day, a Lay torpedo boat was contracted, to be delivered May 1.

On Feb. 8, 1881, the commanding officer of the station was directed to visit Herreshoff Works to examine an electrically lighted boat (utilizing a battery). From this investigation, the Torpedo Station fabricated a battery-powered shipboard lighting system.

Authority was granted around this time to build a machine to manufacture guncotton after its development had progressed to satisfactory margins for the Station. Chemists had experimented with nitroglycerin and dynamite with spectacular results, but the Navy was concerned about the shock sensitivity and stability of these compounds. Much of the effort also was dedicated to producing new primers and exploders, both contact and electrically activated, for use in the mines and torpedoes being developed.

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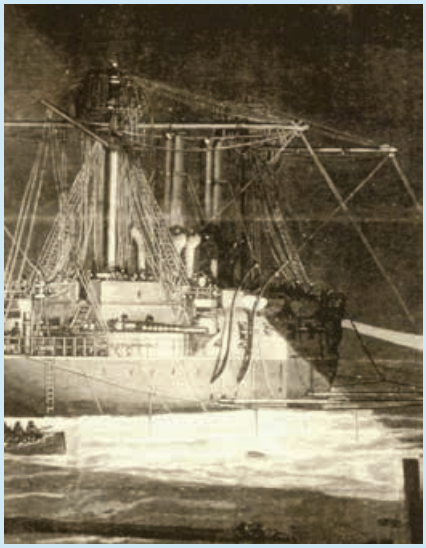

Let there be light: Navy puts electricity on ships

Electricity was the highlight of technology during the 19th century. Also, the Naval Torpedo Station was at the cutting edge of employing it not only for its weapons, but also for power equipment aboard ships. In 1881, Torpedo Station officers visited the Herreshoff Boat Yard in Bristol to examine an electrically lighted boat. The officers then developed a battery-powered shipboard lighting system for the Navy. A board of naval examiners convened to review the new system and judged it to be "highly satisfactory."

To support this expanding effort, a larger electrical facility was built in 1887 to house the new, specialized shipboard electrical equipment being developed. An experimental, 200-light dynamo for shipboard use was obtained and the machine shop was wired in accordance with plans for a shipboard lighting system. This facility, used for instruction and evaluation, also provided electrical power for the building and part of the island.

Experiments were conducted with other electrically powered equipment such as motors, batteries, searchlights and gun mounts on new steel warships that were being developed. A searchlight tower was built on top of the electrical laboratory and electrical firing devices were developed at the lab during its operation until 1909, when the lab was formally disestablished at the Torpedo Station.

(Source: "A Century of Progress," p. 37-38)

The steps to process guncotton included the nitration process (left photo), known as the nitrate bath. Prior to 1900, raw English cotton was picked apart by a machine (center photo) then washed in nitrate and taken to a separate building where the cotton was reduced to a pulp and solidified. To create the torpedo warheads, a saw (right photo) was used to cut the solidified pulp into the necessary dimensions. (Courtesy of "A Century of Progress")

Continued from page 25

The first record of a serious accident at the Torpedo Station occurred on Aug. 29, 1881, when Lt. Cmdr. Benjamin Long Edes and Lt. Lyman G. Spalding were killed by the explosion of a torpedo because of mismanagement of an electrical switch.

Chemical experiments had become so extensive that a further addition to the laboratory was necessary. In 1881, a chemist professor Hill tendered his resignation and was replaced by J. Fleming White the next year.

In July 1882, a diver was employed to instruct an officer's class for enlisted men. They were to be trained in the care, handling and operation of torpedoes and explosives. On Sept. 20 of the same year, the department purchased the McEvoy Finder, a device for locating lost torpedoes.

On Nov. 2, 1882, the Torpedo Station was ordered to begin manufacturing guncotton. Accordingly, on Jan. 11, 1883, the station's chemist and an assistant were sent to England to study how it was being manufactured there. On March 10, an appropriation was made for the construction of a guncotton plant at the station.

On Oct. 18, 1883, the Torpedo Station was authorized to store guncotton on Rose Island, which at the time was occupied by the War Department. Located just north of the Torpedo Station, an explosives storage area and a magazine were built for storing the guncotton, and the island was designated U.S. Naval Magazine, Rose Island.

During 1884, the guncotton manufacturing facility and its five-man workforce achieved full-scale production of approximately 10,000 pounds of guncotton issued for service use. Although a small facility, the Naval Torpedo Station became the major producer of guncotton for the U.S. Navy. Throughout the rest of the century, experiments were conducted to improve guncotton production methods and costs. Guncotton was the universally used explosive for torpedo warheads until about 1912.

In November 1884, Cmdr. William T. Sampson, later prominent in the Spanish-American War, relieved Selfridge. Sampson was considered an expert in ordnance, torpedoes and the like. Assisted by Joseph Strauss, Sampson devised and perfected superimposed turrets that later were introduced to Navy battleships.

Sampson was directed by the Bureau of Ordnance to conduct extensive tests on the new Howell torpedo, the first pump jet-propelled torpedo. Three Howell torpedoes were shipped to the Station, and the first that was tested promptly sank to the bottom of Newport Harbor. Five days later, the second was launched and, after a brief run, it too sank. Since the flywheel-powered torpedo was completely wakeless, it was next to impossible to determine its exact heading and thus extremely difficult to locate in the murky harbor waters. With two out of three units lost, the test program was put on hold and a massive search operation was conducted to find the missing torpedoes.

Upon locating the torpedoes, the bureau directed that a new testing site with clear water be used to visually observe the track of the torpedoes. A site on the shore of Lake Michigan was selected for the tests, and the design and preparation procedures underwent stringent reviews to determine why the torpedoes were sinking. By July 1886, the Howell prototypes consistently demonstrated successful in-water runs, which led to the selection of the Howell torpedo as the first automobile torpedo issued to the fleet.

In 1884, there also was much activity in the development of fast torpedo boats. A nautical mile was measured off in Narragansett Bay for testing of turning and maneuvering.

On Jan. 3, 1885, correspondence was opened with Herreshoff concerning a fast boat, constructed by the company, which was suitable for use as a torpedo boat. In April of that year, Sampson was directed to examine the boat for torpedo possibilities.

With the rapid development of the automobile torpedo, and the assurance of its effectiveness, the need for defensive precautions became apparent. In October 1885, the station was called upon to furnish a plan of torpedo nets for defense against an attack.

During 1885, the first Seaman Gunners Class began in accordance with a plan proposed in 1882. The class was composed of two seamen gunners and 20 continuous service men. Building operations during 1885 were confined to a magazine of brick, tin and stone.

Under Commander Sampson, the Torpedo Station was directed to further develop the auto torpedo, as well as investigate the application of explosives to the new weapon and the successful development of the fast torpedo boat. Sampson was relieved by Cmdr. C. F. Goodrich on Sep. 1, 1886.

Negotiations were entered into with Herreshoff in 1886, which led to the purchase of the Stiletto, the first American torpedo boat. In the same year, J. Fleming White resigned as chemist and professor Charles E. Monroe was hired.

Sampson left the Torpedo Station in 1886 and went back to the Naval Academy, this time as superintendent. He went on to earn fame in the Spanish-American War, which began when the U.S. declared war on Spain on April 21, 1898, after the sinking of the Battleship Maine in Havana Harbor. Sampson's command numbered 125 vessels, the strongest ever organized for hostile purposes. His fleet captured many Spanish merchant vessels and blockade runners, and finally defeated the Spanish fleet under Adm. Cevera.

Long after the other naval powers had adopted the new propulsion-driven torpedo, the U.S. Navy still clung to the antiquated spar torpedo. This photo illustrates a night maneuver in Narragansett Bay in which a spar torpedo boat from the torpedo station attacked ships of the North Atlantic squadron. It was not until early 1890s that a propulsion-driven torpedo, the Howell, became available to the fleet. (Source: "A Century of Progress," p. 38)

FACILITY CHANGES, TIME BALL REPLACED

Early in the history of the Torpedo Station, a time ball, designed to give the official time, was placed on the machine shop. It was raised at five minutes to noon and dropped electrically at noon. In June 1887, a plea was made to Washington for authority to remove the time ball, which was white, and plainly visible from Newport. Because of the failure of the Telegraph Co. to register correctly, it was feared that the time ball would become a standing reproach to the Torpedo Station. On Aug. 31, the dropping of the time ball was discontinued.

In November, a new ball and equipment were received from the Naval Observatory in Washington. During this year, electricity was installed at the station. A 200-light dynamo intended for instruction purposes was used for lighting part of the island and the buildings.

Extensive experiments were conducted to develop a lighting system for vessels during this time. In July 1887, the machine shop was electrically wired. This was done not only to light the factory, but also to test the feasibility of replicating this process on a ship.

Some difficulty was experienced with the shipment of explosives. Commercial companies refused to transport them despite the fact that they were claimed by the officers at the station to be absolutely safe. In a letter to the Bureau of Ordnance, it was stated by the commanding officer of the island that these explosives, especially wet guncotton, were "as safe to handle by the railroads as a barrel of salt mackerel."

By this time, the chemical and electrical laboratories at the station were considered of the utmost importance and a large amount of practical research work was being conducted.

During 1887, it was clearly demonstrated that the facilities were inadequate and it was necessary to build a new Electrical Laboratory and to extend the Chemical Laboratory. The course of instruction at this time included chemistry, electricity, diving and the manufacture, care and handling of torpedoes.

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The principal experiments in 1888 embraced guncotton, smokeless powder and their components; oils and metals, at the Chemical Laboratory; and electrical appliances of every nature that might be of possible use in the equipment of the Navy at the Electrical Laboratory.

During 1888, the water main from Newport was connected with the island. Prior to this time, the water supply was furnished by a windmill, which was erected in 1876, and what rain water could be trapped. This independent supply had been unsatisfactory in chemical work and had created a troublesome scale in the boilers and tanks.

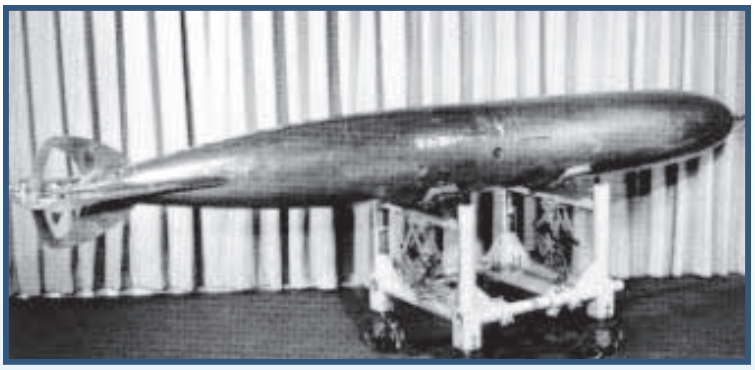
ELECTRIC LIGHTS IN 1888

Up to this time, there had been maintained on the south end of Goat Island, by the Old Colony Steamship Co., a buoy on which was hung a kerosene lamp as a guide for their steamers. In 1888, an electric light was installed by the Torpedo Station.

What is now known as cottage No. 7 was erected in 1888. In 1889, an electric fire alarm was installed. The Howell torpedo was accepted by the government and 70 were received at the station.

Goodrich's administration, which was marked by extensive electrical development and expansion of laboratory research work, ended on Dec. 6, 1889, when he was relieved by Cmdr. T. F. Jewell.

In 1890, a torpedo boat storehouse was built in connection with a marine railway at the Naval Torpedo Station on Goat Island. During the year, the south end of the main storehouse was set up as an emergency hospital ward and the north end was used for the instruction of Sailors. The emergency hospital likely was installed as a precautionary measure because of an epidemic of influenza that raged in Newport during the winter. It was recorded, however, that the health of the command was excellent during that period.



The brass Howell torpedo (Fish type) was the first automobile torpedo issued to the fleet. Its range was 400 yards at a speed of 25 knots (maximum range 700 yards) and the warhead charge was 100 pounds of guncotton. Just prior to launching, a 130-pound flywheel was spun to 10,000 rpm by a ship-mounted steam engine. (Photo courtesy Naval War College Museum)

A primer house also was erected at the Torpedo Station in 1890 and experiments with primers commenced thereafter. In addition, it was noted that the new time ball installed in 1887 was performing satisfactorily.

In 1891 the boat Triana, which had been attached to the Torpedo Station since its creation, was wrecked at Cuttyhunk Island, the outermost of the Elizabeth Islands in Massachusetts. Its loss was a severe one as it had provided comfortable quarters for the enlisted men and was valuable for experimental work. In December 1891, the tug Fortune was assigned to the Station to replace the Triana.

At this time, the Patrick torpedo was being tested. The Whitehead, however, was officially adopted and a contract was signed with the Bliss Co. for 100 torpedoes at $2,000 each. The first order for smokeless powder, 50 pounds, was received from the Bureau of Ordnance in 1891 and manufactured. The manufacture of primers began in 1891.

During 1892, the Stiletto was fitted with Howell tubes for experimental purposes. Experiments were conducted with the Hall automobile torpedo to study its construction and assembly. The Patrick and Howell torpedoes were both accepted by the government and two of the former and one of the latter were on-hand at the Station for experimental purposes. The old spar torpedo had changed its identity and experiments were conducted.

Rear Adm. George A. Converse took command of the Station in January 1893, relieving Jewell, under whose direction the facilities had been extended to include the manufacture of smokeless powder and primers.

Converse, who commanded the Station from 1893-97, was noted for his service as an officer of the U.S. Navy and for his contributions in the area of naval engineering. One of the first officers involved in the introduction of electricity aboard men-of-war, he was a pioneer in the experimentation of smokeless powder and its introduction to the Navy. In 1896, he was also instrumental in obtaining Lightning (Steam Launch No. 6), a spar torpedo boat designed by Nathaniel G. Herreshoff.

Naval Torpedo Station of the 20th century

At the turn of the 20th century, the Naval Torpedo Station was in transition and functioning as the Navy's "corporate headquarters" for automobile torpedoes. The Station, "by providing a full spectrum of technical support to both industry and the fleet, had become the focal point for Navy torpedo efforts." The Station "not only played a key role in introducing the new weapon to the fleet, it became increasingly involved in developing more new torpedoes, launchers and support equipment."

The photo at left, taken in 1910, is an aerial view of downtown Newport showing the Naval Torpedo Station on Goat Island, in the distance to the right of the steeple. There is little evidence of the Station on Goat Island today. The only remaining structure is a large white concrete building that houses a restaurant and offices for the Goat Island Marina and marine-related businesses.(Photo source: "A Century of Progress," p. 46)

Converse later went on to command the Montgomery and took an active part in operations off the coast of Cuba with Adm. William T. Sampson's squadron during the Spanish-American War in 1898. Converse was then commanding officer of the USS Illinois (BB-7) from its commissioning in 1901 to 1903.

Although Converse retired in 1906, he continued to serve as Chief of the Bureaus of Equipment, Ordnance and Navigation for another year. Converse died in Washington, D.C., on March 29, 1909.

Two destroyers have been named USS Converse in his honor. The Converse (DD-509) was launched and commissioned in 1942 in Bath, Maine. A Clemson-class (DD-291) was also named Converse.

MEN KILLED IN GUN COTTON FACTORY EXPLOSION

A number of significant events occurred during Converse's tenure at the Naval Torpedo Station. On July 3, 1893, the gun cotton factory was totally destroyed by an explosion caused by the presence of a foreign substance in the picker. Three men, Frank Laughlin, 1st class pipe fitter, and Jeremiah Harrington and Michael O'Reagan, laborers, were killed, and 10 men were seriously injured.

The explosion was found to be caused by a fire that originated in the "picked-cotton room" where a machine picked apart raw English cotton. A foreign object in the cotton struck the teeth of the picker resulting in a spark that ignited the cotton. This fire spread through the wire netting in the top half of the door to loose cotton in the hallway. A first-class laborer who was operating the picking machine was alerted to the fire in the hall by a noise that resembled a door flying open and striking something. After discovering the fire, he alerted the other staff to the situation by shouting "fire," and informed the factory foreman, Harrington. The fire spread to neighboring rooms and ignited a tank of dry guncotton. Thirteen individuals were working a hose attempting to fight the fire on the north end of the building when a resulting explosion injured 10 and killed three men.

TORPEDOES AT THE TURN OF THE CENTURY

In 1893, extensive experiments were being conducted on the Hall torpedo. Torpedo defense nets were exhaustively tested and proved successful. Experiments were conducted on war colors for boats, and an overhead trolley system was installed in the factory. Also in 1893, 145 Whitehead torpedoes, the first contracted, were received at the Station.

In 1894, the gun cotton factory, destroyed in 1893, was rebuilt and the manufacture of gun cotton resumed. Also in 1894, the water supply capacity was deemed inadequate and was doubled.

The explosion in the gun cotton factory in 1893 demonstrated that the Station's fire equipment was obsolete, and in 1895 a hose reel containing 1,000 feet of hose and new equipment was purchased for the proper fire protection of the Station.

In 1895, the fast torpedo boat Stiletto was fully equipped for use in experimenting with Howell torpedoes and for instruction purposes. The Cushing, of similar type to the Stiletto, was engaged in carrying on various experiments.

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Before and after pictures of the gun cotton factory at the Naval Torpedo Station reveal the effects of a disastrous explosion on July 3, 1893, that killed three men and injured 10 others. The explosion was found to be caused by a fire that originated in the "picked-cotton room" where a machine picked apart raw English cotton. A foreign object in the cotton struck the teeth of the picker resulting in a spark that ignited the cotton. (Photo source: "A Century of Progress," p. 33)

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The manufacture of spar torpedoes had long since been discontinued and they were now — besides undergoing conversion to mine use — being used for wrecking purposes.

In 1895, the Torpedo Station undertook tests and experiments with air compressors to be used in charging the new automobile torpedoes.

At this point, the Station had received 150 Whitehead torpedoes and 70 Howells. Of this number, 16 Whitehead and six Howells were kept on-hand to meet emergencies. Two Whiteheads and one Howell were being used for experiments.

In 1896, it was proposed to replace the inspector's quarters with a more substantial building, the present one being considered unsuitable. Reports from the time show there were safety concerns because of the high winds that prevailed.

In September 1896, the tug Leyden replaced the Fortune, the latter going to Norfolk, Virginia, for repairs. Under Converse, the Station activities were focused on the development of the extensive experimental projects then in progress, principal among them was the development of the air compressor. In June 1897, Lt. Cmdr. T. C. McLean took command, relieving Converse.

On July 15, 1897, an explosion of green cannon powder, caused by friction in sifting, occurred in the smokeless powder factory. The inside of the building was demolished, the roof blown off and two men seriously injured.

In 1897, a furnace was installed for the manufacture of calcium phosphide. In the following year, 125 pounds of calcium phosphide of a superior quality were manufactured.

At this time, in 1898, the Schwartzkopff torpedo was obtained as a result of the Spanish-American War. A tube was mounted for experimental purposes, and 12 torpedoes were purchased and sent to the Station.

On March 13, 1898, the tug Leyden was detached from the Station and sent to Cuba, fitted as a gunboat. It also carried an air compressor for charging torpedoes. McLean, whose administration had extended through the Spanish-American War, was relieved in October 1899 by Lt. Cmdr. N. E. Mason.

Electric lights were installed in the seamen gunners' quarters during 1899 and the torpedo boat Morris was assigned to the Station for duty.

The submarine boat Holland, the first submarine of the U.S. Navy, was purchased on April 11, 1900 for $120,000. The submarine visited the Naval Torpedo Station from June 15 to Oct. 1, 1901 for training and demonstrations.

On June 15, 1900, the Station fleet was further strengthened by the assignment of the torpedo boat Gwin. It is interesting to note that in July 1900 the Navy Pay Office was established in Newport.

On Dec. 14, 1900, the gun cotton dry house was badly damaged by an explosion, which was caused by the decomposition of gun cotton.

At this time, the civilian force employed numbered 157 men, an increase of 13 men from September 1898. In 1901, the grounds on Goat Island were graded, trees planted and the landscape generally improved and beautified.

An electric motor, which was formerly used to run a lathe in the carpenter shop, was successfully used to operate the printing press.

On May 10, 1901, a detachment of Marines consisting of five officers, 15 non-commissioned officers and 25

privates were attached to the Station for instruction in mining and countermining.

Lt. Cmdr. Frank Friday Fletcher, who later, as admiral, commanded Naval Forces at the landing of Vera Cruz, Mexico, relieved Mason of the Station, taking command in June 1902. Under Mason, the Station made favorable progress in the development of the submarine Holland and the general landscape plan of the island was greatly improved.

During 1902, the administration building was occupied, the lower floor for overhauling torpedoes, the upper floor as offices and a lecture room. Cottage No. 1 and a carpenter shop were built during the year. Late in 1902, a wireless mast, 180 feet high, was erected at a cost of $1,950. On Dec. 25, the top mast was blown down in a heavy storm. Early in 1903, the wireless top mast was replaced at a cost of $150.

On Jan. 21, 1902, the tugboat Leyden (which came to the station in 1896) was wrecked off the south end of Block Island and it was reported that the firm who purchased it for salvage could not reach it. In the spring of 1903, the submarines Adder and Moccasin were attached to the Station for trials.

In 1903, the paymaster was assigned to cottage No. 6, and the house on the west side of the island, formerly occupied by him, was fitted out as a dispensary and quarters for an apothecary. Two cottages were built at Rose Island in 1903 for a gunner and a watchman in connection with the storage of explosives at that place.

New slips were constructed at the north end of the island for the accommodation of torpedo boats. A new flag staff was erected to replace the old mast, which had been blown down. Two, 3-inch water mains were laid from Newport to the island, replacing the two former lines of lesser capacity, one of which was destroyed in 1901.

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Patrick Cunningham and 'The Flying Devil'

One little known but spectacular torpedo trial involved Patrick Cunningham and the rocket torpedo he invented in 1892 (at left). The torpedo was 17 feet long and had a maximum diameter of 15 1/4 inches across the forward end. The warhead was made of copper and could carry 125 pounds of explosive.

The torpedo itself was made of 1/4-inch iron and could travel one mile at the rate of 50 feet per second. Helical ribs on the outside surface gave the torpedo a spinning motion which improved stability. The propulsion system was composed of four powder chambers. These chambers were made of copper and contained another of Cunningham's inventions — 242 pounds of slow-burning powder which was forced into the chambers under a hydraulic pressure of 10 tons per square inch.

Cunningham was an ardent supporter of William Jennings Bryan for president and when William McKinley supporters held a giant pre-election parade for their candidate in New Bedford, Massachusetts, the inventor decided that his candidate would not be outdone. Filled with spirits and enthusiasm in October 1896, Cunningham rolled the torpedo out on a wagon and into the street. Straddling the weapon, he planned to ride it at the head of his own parade. While astride the weapon, he attempted to light it off with a burning newspaper that was rolled up to form a torch. Luckily, his son was present and pulled him off, but the torpedo "at once started down the street at a terrific pace."

Fire shot from the portholes in the sides and tail of the weapon. Hissing as it went, the torpedo scorched two horse-drawn carriages in its wild flight. People scattered and ran from its path. Finally, the torpedo hit a tree, veered across the road and smashed sideways into a shop, exploding violently. The blast was heard several miles away, and five houses and a store were severely damaged. Luckily, the only casualty was a bystander's handlebar mustache, which was partially shaved off by a piece of flying metal. Four persons who were in the marketplace at the time were "thrown violently upon a heap of debris, while others were injured by flying pieces of glass" as the building collapsed. Cunningham was arrested on a charge of maliciously destroying a building and held on $500 until the trial. From that day on, Cunningham was known to his friends as the "Wild Irishman," and his torpedo was called "The Flying Devil."

In 1898, Cunningham, having built more rocket torpedoes, was again ready to demonstrate his weapon. For these firings, he purchased the schooner Freeman and installed a torpedo tube in the forward part of her hold. The tube was his original design. It was primarily a drawn steel tube, 20 feet long and 16 inches in diameter, and weighed two tons. It projected about a foot through the hull of the Freeman, just beside the cutwater, and was parallel to and close to the keel on the starboard side. Steel straps 5 inches wide and 1 inch thick were bolted to the timber bed to hold the tube in position. The breech was closed and made watertight by pressure. Electrical current was supplied by a cable that ran from a battery on deck, through a hatch and to the tube in the hold. The first torpedo fired broached about 40 feet from the Freeman and buried itself deep in the mud on the bottom of Buzzard's Bay. The second torpedo exploded in the tube. It tore such a hole in the Freeman's bottom that it sank almost immediately. Fortunately, no one was hurt. This ill-fated venture marked the end of Cunningham's attempts to develop a rocket torpedo, but his idea was not abandoned. It was later resurrected to become one of our modern day weapons. (Source: "NUWSCOPE," April 2009 and Worcestershire Chronicle, cited by the BBC in a May 17, 2014 article)

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On June 20, 1903, the printing establishment was closed, and the printing force transferred to Washington, D.C. From the time of its installation in the early 1870s, the printing establishment at the Station was of great value to the service. Pamphlets were printed covering descriptions of torpedoes, mines, compressors, appliances and explosives manufactured and tested at the Station. These pamphlets served as an extension course to the service in the care, handling and operation of projectiles and explosives.

During 1903, the east boathouse and a calcium storehouse were built. Also in 1903, a telephone switchboard was installed in the tower of the administration building giving extended and more economic range to telephone communication with Newport.

Under Fletcher, the Station had been active in the development of the submarine and its application to modern warfare. He was relieved by Lt. Cmdr. Albert Gleaves, who took command of the Station in November 1904.

A ferry landing was constructed to replace a long pier built on piles, which had been used as a landing place until 1904.

The Government Landing at Newport was completed in 1905 under the direction of the inspector of ordnance in charge and was turned over to the commanding officer of the Second Naval District.

The capacity of the tug Chickasaw, which was being used as a ferry for transporting passengers and supplies to the island, was considered insufficient to meet the rapidly growing demand, so the purchase of a double-end ferry boat was recommended in 1905.

EXPERIMENTS AND EQUIPMENT

Under Gleaves, the Torpedo Station entered upon an era of progress in the development and manufacture of modern naval equipment.

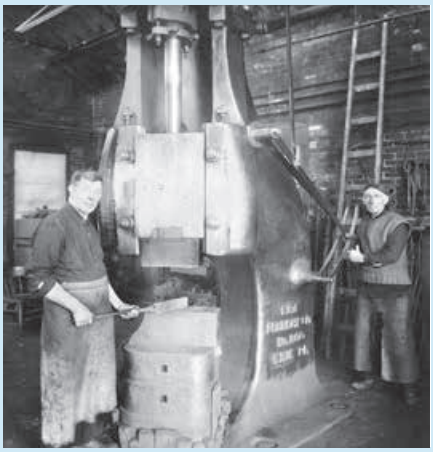
In 1906, the capacity of the Station was being taxed to the utmost in all branches. Extensive experiments were conducted in connection with the Whitehead torpedo and particular attention was given to torpedo air flask development. Bronze and steel flasks were charged and fired on with rifles and a 1-pound gun. Flasks resisted rifle fire. A bronze flask was perforated by 1-pound shot and a steel flask was exploded and entirely demolished.

First government-owned torpedo factory is built at Newport's Naval Torpedo Station

During the first decade of the 20th century, the Naval Torpedo Station's top priority was building a new torpedo factory and making it operational. The Station was still conducting basic research, developing new weapon concepts, providing technical support to the fleet and conducting formal classes to train Navy personnel in the use of torpedoes, guns, mines and technical ordinance matters, however, the U.S. Navy sought an increase in armament.

Under Lt. Cmdr. Albert Gleaves, who was Station commander from 1904-1908, the manufacturing systems were reorganized to meet the demands of a progressive plant engaged in the manufacture, repair, overhauling and development of naval ordnance.

In June 1907, Gleaves and Lt. Cmdr. G.C. Davidson were sent abroad to study torpedo manufacturing and $500,000 was allocated by the Bureau of Ordnance for the purchase of torpedoes. Some of that money — $155,000 — was used to build the first torpedo factory owned by the government. Construction began in July 1907.



A forge shop (pictured left) was among the numerous improvements made necessary to meet the increased demand for torpedo production.

Systems reorganizing the administration, for routing of work and accounting were put in place under the direction of J.P. Sullivan, chief clerk.

Lt. Cmdr. Mark L. Bristol assumed command of the plant in June 1908, and the new factory, designed for the manufacture of 50 torpedoes a year, commenced operations.

By 1910, the factory was producing 100 torpedoes a year and manufacturing spare parts.

(Sources: Article sources and "A Century of Progress")

TORPEDO GUN EFFECTIVE.

Davis Device Penetrates Protective Nets in Tests at Newport.

Special to The New York Times.

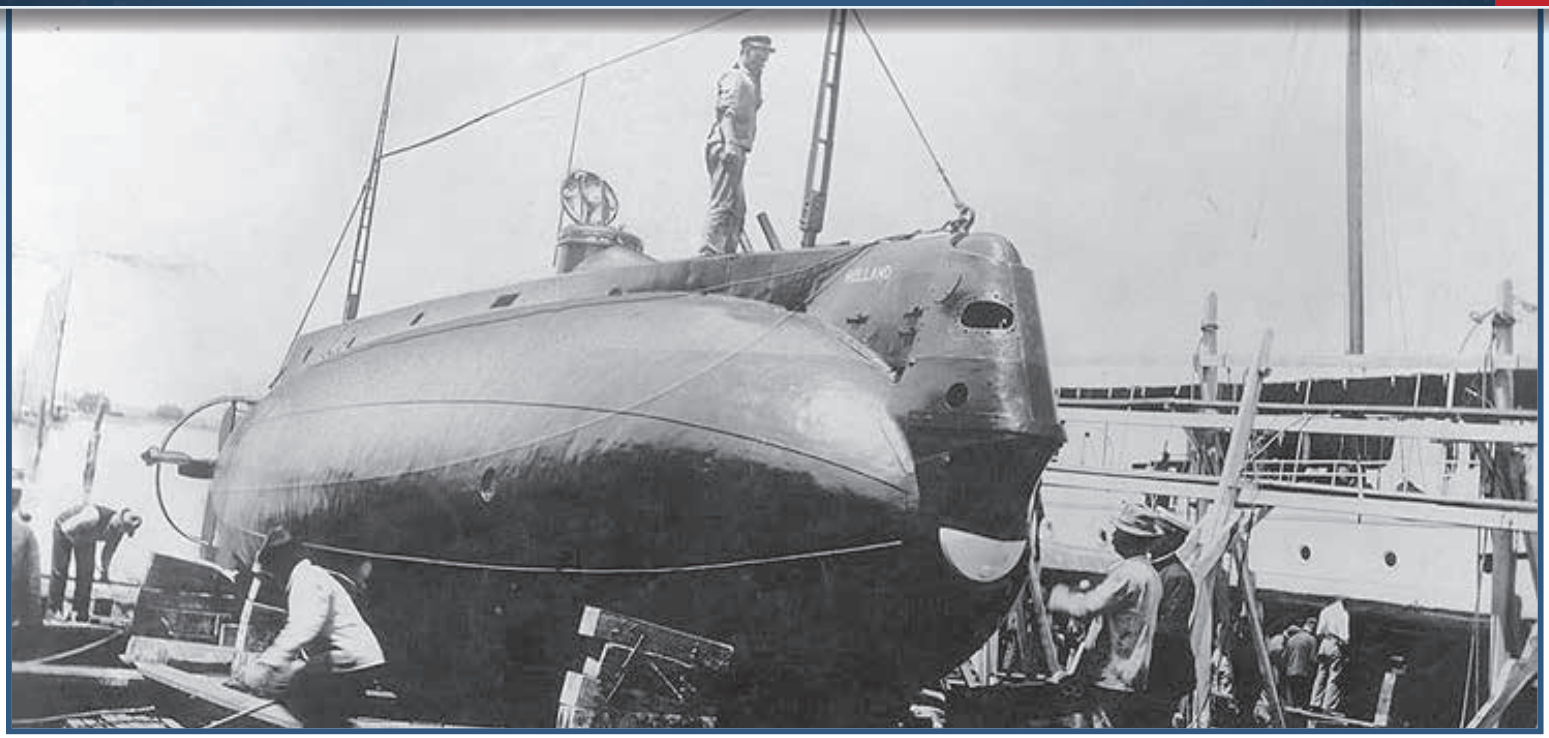
NEWPORT, R. I., Oct. 25.—The new Whitehead torpedo which was recently purchased by the United States Navy is being tried in Narragansett Bay. With a speed of forty knots it has been used in tests with the steel nets for warships and has proved most successful.

Lieut. Commander Cleland Davis, U. S. N., on duty at the Ordnance Bureau of the Navy Department in Washington, is the inventor. His device, which is known as a torpedo gun, is a sort of combination gun and projectile, effective at 5,000 feet, having its own motive power, similar to that of the Whitehead torpedo.

The projectile is 45 centimeters in diameter and 5 meters long. The outer tube is about two-thirds the length of the inner torpedo, and behind the torpedo proper are forty pounds of high explosive. When the nose of the projectile comes in contact with an obstacle, the concussion sets off the explosive, which drives the projectile through the object struck, and at the same time starts a time fuse, causing the torpedo proper to explode a few seconds later. It is this double action which gives the Davis projectile its great value.

The New York Times

Published: October 26, 1908



The USS Holland, the U.S. Navy's first submarine, was purchased on April 11, 1900, for $120,000. It is shown above while under construction in 1900. The submarine visited the Naval Torpedo Station from June 15 to Oct. 1, 1901, for training and demonstrations. (Source: U.S. Naval Archives and Records Administration)

War noses also were being experimented with and successfully developed. An anti-circular run device had been designed at the Station and was being constructed for experimental purposes. A curved fire device was under consideration. A dynamometer tank for shop tests of torpedoes was installed in the factory.

Installing machinery and reorganizing the workforce for manufacturing was entrusted to John Moore, quarterman machinist, who later became the general master mechanic. Moore designed the machinery used to manufacture smokeless powder and later contributed to other technological developments.

During 1907, a direct line of telephonic communication was established with Rose Island to replace the unsatisfactory method of communication via Newport and the Training Station. All telephone lines were placed in underground conduits to guard against wireless induction.

Brick tin and paint shops were built; a new heating system was installed in the cottages.

The water supply from Newport was deemed sufficient to meet all demands as to quantity, and the well at the south end of the island was condemned and filled. A distillery was recommended for the Station for purifying water for chemical uses.

In 1907, one-third of the total time of the chemical laboratory was devoted to experimental and research work. At this time, the principal product was primers, which were being made in the old machine shop.

Increased primer work and the demand for spare parts and repairs — in connection with the extensive experiments — called for expansion. Recommendations were made for a new factory, having in view the complete manufacture of torpedoes. Lt. Cmdr. Mark L. Bristol assumed command of the plant in June 1908. Early in that summer the new factory, designed for the manufacture of 50 torpedoes a year, began operations. An order was received in January for 20 Mark V, Whitehead torpedoes.

To meet the requirements of the new factory, the capacity of the power plant was doubled by the addition of a new boiler and smokestack.

In January 1907, the smokeless powder factory was closed and the equipment shipped to Indian Head, Maryland, where the manufacture was continued.

Also in January, the ferryboat Wave came to the Station. New slips for the accommodation of this first double ender were constructed at the Government Landing and the Station. The Wave was equipped with fire pumps and equipment, the value of which was demonstrated in June when the chemical laboratory was burned.

Three small boats were required to carry workmen back and forth and the Wave ran on a regular schedule for passenger traffic.

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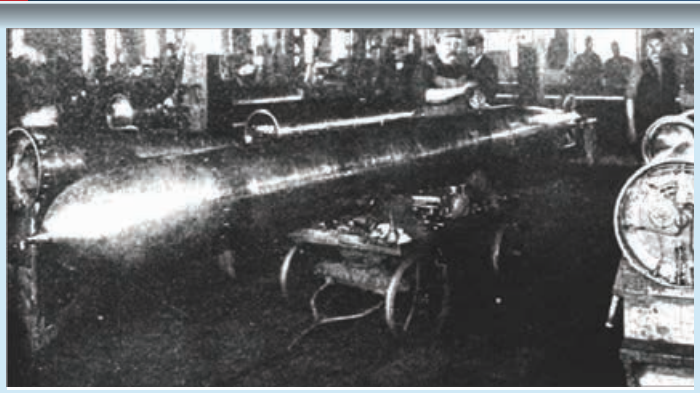

Gas-powered torpedoes

Development of a completely new torpedo in the early 1900s freed the U.S. Navy from paying royalties on the Whitehead torpedo design. Frank McDowell Leavitt, an employee of the E.W. Bliss Co., introduced a new turbine-powered torpedo, 21 inches in diameter (pictured), for use on battleships.

The Bliss-Leavitt torpedo, powered by a single-stage turbine, incorporated a revolutionary new "hot gas" propulsion system that dramatically increased torpedo performance. This new system burned alcohol inside the air flask to heat the air. In later developments, a combustion pot was introduced and placed between the air flask and the turbine where the burning alcohol could heat the air before it entered the turbine.

The torpedo also underwent a major transition to a gyro guidance system at this time, which transformed it into a guided missile. By revolving, the propeller released the firing pin as soon as it entered the water. Note the principal valve group in the picture. Within a decade, the firing range of torpedoes increased from approximately 1,000 yards to more than 10,000 yards. (Source: "A Century of Progress," pg. 47)

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LABOR BOARD CREATED

In the summer of 1908, a labor board was established to facilitate the proper handling of the labor questions, which involved the classification of trades, the establishment of eligible registers, and employment and discharge of workmen. It was recommended at this time that the name be changed to Naval Torpedo Factory and the ranking officer designated as Inspector of Ordnance in Command.

During 1909, numerous changes and developments were made because of increased activities. High and low pressure air systems were installed in the new factory and the old machine shop was remodeled. The drafting room and blueprint room, which were located on the second floor of the old machine shop, were moved to the lecture room on the second floor of the administration building. What had been the powder factory was converted into a chemical laboratory, replacing the laboratory burned in 1908.

The electrical laboratory was converted to a pay office and storehouse because extensive electrical experiments were discontinued. All wiring that remained above ground at this time was placed in underground conduits.

A fireproof brick building was built as a wireless station, and a new wireless steel mast was erected. A forge shop, brass foundry and stowage building for patterns and scrap metal were built.

To meet the increased demands, a 4-inch water main was laid from Newport, supplementing the two 3-inch mains then in use.

At this time there were 290 men on the payroll, an increase of 100 from the previous year.

Also in 1909, the federal government purchased a portion of Gould Island, a 56-acre tract of land located in Narragansett Bay. The rest of the island would be purchased in 1918 and the site developed in 1919.

In 1909, little more than a year after the arrival of the Wave, the need for a larger ferryboat became evident.

MACHINES GROUPED AND CLASSIFIED

In 1910, the machines in the factory were grouped and classified, and the work routed according to departments. This increased output while reducing the cost of operation. The working force was rapidly increasing in all branches and wages increased to ensure a skilled workforce. There were at this time 445 civilians on the payroll.

During 1910, much work was done about the grounds, and the north end of the island was surveyed for the location of additional buildings. The volume of business after the opening of manufacturing activities necessitated an increase in the storekeeping department.

In February, an order was received for 25 more Mark V, Mod 3 torpedoes, and in October an order for 30 more of the same type. At this time, it was planned to limit the capacity of the factory to 100 torpedoes per year, with further capacity devoted to the manufacture of spare parts.

An effort was made, without success, to transfer the manufacture and repair of torpedo tubes from the Washington Navy Yard to the Torpedo Station.

At this time, 32 boats, large and small, were attached to the Station.

Bristol, who had successfully launched the manufacture of torpedoes, was relieved by Lt. Cmdr. George W. Williams on May 12, 1911. In 1911, 95 more torpedoes were ordered: 20 Mark V, Mod 3, and 75 Mark V,

Mod 5. A building was erected for the storage of patterns, which were rapidly and extensively being manufactured. The forge shop was enlarged, a new foundry erected, and an incinerator was built to replace the old crematory for the burning of rubbish.

An automatic intercommunication telephone system was installed throughout the island.

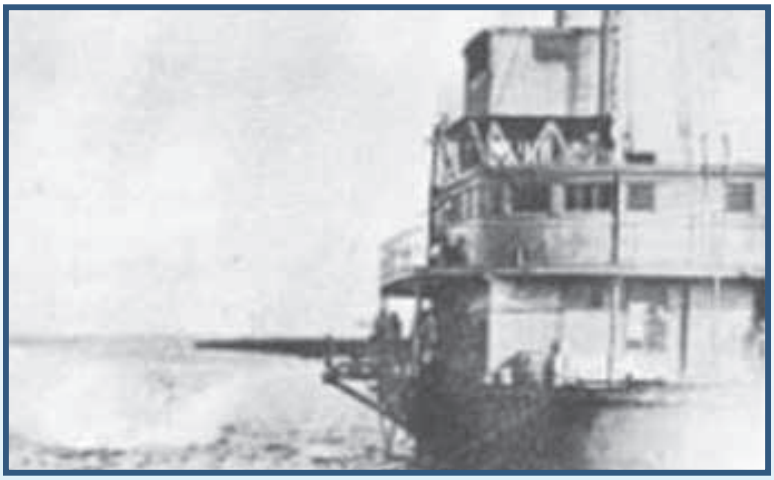
A second wireless tower of steel framework was built. This completed a wireless station on the island with a range of about 1,500 miles for sending messages and between 2,000 and 3,000 miles for receiving messages. In September 1911, the first order of 20 Mark V Torpedoes was completed. Their completion had been delayed by inexperience in the manufacture of an article with which the workforce was almost entirely unfamiliar. The delay, however, was justified by the performance of the torpedoes and it was demonstrated that they were in every way equal to those manufactured on outside contracts and lower in price.

In 1912, a new storehouse of reinforced concrete was completed. Also, a railroad track was constructed about the yard for the transportation on flat cars of torpedoes, mines and supplies.

In September 1912, an order was received for 90 Mark VII, Mod 2, Bliss-Leavitt torpedoes.

In the spring of 1913, a new brick power plant was built. It was equipped with diesel engines and generators to meet the increased demand for power.

At this time the storehouse, completed in 1912, was found to be insufficient. Thus, a spacious storage facility was planned for torpedoes only. This storehouse was included in a building program that called for an expenditure of $387,000. The program also embraced a combined factory and assembly shop, as well as a primer shop.



In 1913, test barge No. 1, was added to the floating equipment at the station and used for training and torpedo-proofing runs.

A test barge, No. 1, was added to the floating equipment at the station. This barge was fitted with above-water tubes for launching torpedoes on trial-proof runs, and was fitted with machinery to handle minor repairs necessary in ranging torpedoes. The barge was not self-propelling and was anchored on the range at Coddington Cove.

In September 1913, 85 Mark V, Mod 3 torpedoes were completed. During the year, a 3-ton-capacity steam railway crane was added to the Station's equipment.

In May 1914, 75 Mark V, Mod 5 torpedoes were completed, and in July, 200 Mark IX, Mod 1 torpedoes were ordered. The civilian force at the Station at this time numbered 625 men.

By 1915, America began to anticipate the effects of World War I and the Torpedo Station began preparations.

Under the direction of Cmdr. Samuel Robison, the manufacturing capacity was at least 300 torpedoes a year with an equal proportion of storage.

During the year, a school was formed for deep-sea diving. Instruction was given in a water tank into which pressure was introduced corresponding to that experienced at various ocean depths.

Up to this time, the Station manufactured and assembled naval defense mines, parts and fittings. In 1915, the Navy transferred this process to Philadelphia and Norfolk, Virginia.

In March 1915, 300 Mark IX, Mod 1 torpedoes were ordered, and in December 1915, 90 Mark VII, Mod 2, torpedoes were completed. The workforce had increased to 792. In September 1916, another order for 150 Mark IX, Mod 1 torpedoes was placed.

The civilian force increased to 1,086 men to keep pace with the installation of machinery and additional orders for torpedoes. In the early part of 1916, a system for maintaining a stock of torpedo and air compressor parts for quickly filling ships' requisitions was developed.

Early in 1917, an open break with Germany was obvious and the Station prepared to meet the emergency. A new, well-equipped factory opened at full capacity. The workforce, which numbered 2,160 men, worked overtime and in shifts to insure maximum output.

In March 1917, Robison was detached and Capt. Edward L. Beach Sr. assumed command.

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U.S. ENTERS WORLD WAR I, WOMEN WORK AT THE STATION

Upon declaration of war against Germany on April 2, 1917, the Station activities, under Beach's direction, increased and the workforce grew to about 3,200 employees. Of this number, about 300 were female primer workers and 115 civil service employees.

The Navy personnel during the war numbered about 1,300, of whom 20 were females in the position of yeoman.

When the first female workers came to the Station in July, the addition of four temporary, wooden buildings and the extensive manufacture of primers supplemented the Primer Department.

Under the direction of Chester Taylor Minkler, engineer of mines and explosives, the Torpedo Station was especially active in the development and production of depth and aero bombs and mines.

In July 1917, experiments began on a depth bomb for use in combating submarines, and tests conducted in July and August demonstrated the practicality of the bomb. In September, the first bombs were sent out to the service. These bombs, being safer and less difficult to handle, were later manufactured in large quantities by outside contractors and replaced the English bomb. In June 1917, experiments began with the Mark VI mine. It was completed and ready for service in February 1918, and extensively was used by the American Navy in the North Sea.

In March, 200 Mark IX, Mod 1 torpedoes were completed and 912 Mark X were ordered.

On Jan. 26, 1918, an explosion (the most disastrous in NUWC's history) occurred in one of the magazines, instantly killing 13 men and injuring five, including a Marine Corps private. One person injured in the blast later died of his injuries. The cause of the explosion could not be determined.

Those killed were: Horace A. Pelletier, George L. Giblin, Frank E. Wyatt, John H. Connolly, George H. Spooner, Joe C. Andre, David J. Sullivan, John F. Murphy, Timothy F. Fitzgerald, Joseph G. Moitozo, William G. Caswell and Joseph Frazier. James Mahoney later died from his injuries.

On May 24, 1918, a powder flare occurred in the Primer Room and several men were injured. Reginal S. King and Patrick F. Shea later died from their injuries. While receiving diving instruction on May 8, 1918, Frederick E. Reif, a U.S. Navy plumber and fitter, drowned in the diving tank. The cause could not be determined, but it is probable that a helmet failure caused the accident.

The Naval Torpedo Station on Goat Island is depicted above as it looked in the 1920s. The facility had expanded to accommodate training and torpedo production facilities. During World War I, the workforce grew to about 3,200 employees. (Courtesy Naval War College Museum)

In May 1918, experiments began with a new type of towing bomb. Three were built for experimental purposes, tested and perfected.

In July, an aero bomb was designed and experiments began immediately. During the year, the bomb was perfected and turned over to the service.

In the early days of the war, a complete torpedo repair plant was assembled at the Station and shipped to Ireland as a base for destroyers and submarines operating in the war zone. This plant was known as Base Six.

During 1918, there were extensive building operations made necessary by normal expansion without regard to the war. Beach's tour of duty terminated on Sept. 12, 1918, when he was relieved by Capt. Martin E. Trench.

TRANSITION FROM WAR SERVICE

Beach's administration principally was devoted to the conduct of war. Torpedo manufacture was maintained at the maximum, and aero and depth bombs and mines were experimented with, developed and manufactured for the service.

Two months after Trench took command, the armistice was signed and he was confronted with the difficulties of transitioning from war to peace. The Navy adopted a policy of retrenchment, which necessitated reduction of the force. The plant returned to pre-war "normal" in

three months by a reduction of 1,000 employees and was largely reorganized. All indications are that this transition went smoothly.

In the fall of 1918, the concrete storehouse, built in 1912, was extended to four times its original size. A combined laboratory and reclamation plant was completed and occupied late in the winter. This plant was engaged in chemical research work and testing; reclamation of oil, gasoline, waste and towels; the manufacture of three cleaning compounds for various metals; and, for scrubbing purposes, the separation of metal chips.

In the spring of 1919, the Torpedo Station engaged in usual pre-war activities on a larger scale because of added facilities. There were under construction 1,312 torpedoes: 160 Mark X, 912 Mark X, Mod 1, and 240 Mark X, Mod 2.

The power plant, which had been operating since 1913 with steam and oil engines, became obsolete and was replaced by a more modern steam-equipped plant. The electric current on the island was changed from direct to alternating when the new plant opened.

Late in the summer of 1919, a garage was built for the vehicles at the Station. To meet the diversified demands, six cars were added to the equipment list in 1919. This fleet consisted of one Marmon seven-passenger touring car; one White nine-passenger touring car; two Kelly-Springfield trucks, three-ton; one Pierce Arrow truck, three-ton; and one Ford one-ton truck. For light delivery and the transportation of heavy mail, an Overland 800-pound delivery car was purchased in September 1917.

During the summer of 1919, the net cutter and exploder were improved and perfected.

The manufacture of primers was discontinued early in 1920 and the facilities that had been devoted to primer work were directed to the manufacture and loading of bombs, detonators, fuses and torches. Manufacturing, experimental and development work were extended regardless of the fact that the force had been greatly reduced.

The obsolete powerhouse, abandoned in 1919, was remodeled and turned into a torpedo repair plant.

On June 30, 1920, there were 1,917 employees on the payroll.

To meet the demands of expansion, filling was used to steadily increase the area of Goat Island since its acquisition by the Navy. At that time, it was approximately 20 acres, more than double the original acreage at the Station's founding in 1869.

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Mark VI mines, depth bombs developed at Naval Torpedo Station

One of the U.S. Navy's leading experts in explosives, Chester Taylor Minkler (at right), dedicated 44 years of expertise to the Naval Torpedo Station and established a reputation as the "father of the depth charge."

Minkler experimented with the depth charge design by applying the principle of hydrostatic pressure to discharge the underwater explosive and developing a firing mechanism triggered by water pressure. As the depth bomb sunk, it was fired by a piston driven against the firing mechanism by the pressure of the water. The pressure mechanism was adjustable so the depth at which the explosion occurred could be predetermined.

Although the manufacture and assembly of naval defense mines were transferred from the Station to other naval activities prior to World War I, the Station was still responsible for the development of new mines. Minkler's inventions included the drifting mine, horn mine and hydrostatic mine. His research, papers and patents are on file at the Naval War College Museum.

Minkler's improvements were vital to allied victories in World War I, particularly in regard to the North Sea Mine Barrage, as it was called, which stretched roughly 250 miles across the North Sea from Aberdeen to the Norwegian coast and was 15 to 35 miles wide. American Mark VIs were mined in the deeper sections; the middle of the area, outskirts and shallow areas near the Orkney Islands and Norwegian coast were mined with the British chemical horn mines.

Operations in laying mines for the North Sea Barrage began on June 7, 1918, and ended Oct. 26. The mine-laying operation was a combined effort between the British and American squadrons.

More than 56,000 Mark VIs (shown at left being loaded onto a ship for use in the North Sea during World War I) were moored at depths ranging from 80 to 240 feet. The Mark VI cost approximately $400 each to manufacture and 125,000 were produced. The Barrage nearly was complete when the war ended.

One scholar noted: "… the effectiveness of the mine barrage really lies in its psychological effects as much as, if not more than, in the actual losses it inflicted."

(Sources: "A Century of Progress, p. 56 and The U.S in the First World War – An Encylopedia, edited by Anne Cipriano Venzon; mine photo "The Armies of Industry," by B. Crowell & R. F. Wilson)

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During fiscal year 1920, the largest number of torpedoes ever manufactured in any one year to that date were completed. Three hundred eighty-one torpedoes — 313 Mark X, Mod 1, and 68 Mark IX, Mod 1 — were built, an increase of 79 from the previous year.

Trench's regime was marked by great improvement in morale, beautifying the grounds, and the general cleanliness of shops and the Station. In December 1920, Capt. T. J. Senn assumed command of the Station.

In December, the Museum of Historical Exhibits opened in the old Radio Building. Models of old and new ordnance materials, patents and experimental exhibits of torpedoes, mines and bombs were displayed. A large library for Station personnel also opened in the same building.

On June 13, 1921, Chief Gunner's Mate Rudolph H. Wiggin was struck and killed by a wing nut from a torpedo that was being charged.

On July 16, 1921, to conform to retrenchment policy and to avoid a layoff, the Station went on a five-day working basis.

GOULD ISLAND UTILIZED

On Nov. 2, 1921, Lt. Thomas H. Murphy assumed command of the Station Air Detail with its hangar and kite balloon shed on Gould Island. Lieutenant Murphy was considered a pioneer in his field as the first pilot to drop a torpedo from a seaplane. The Air Detail successfully developed the method of dropping the Mark VII-2A torpedo and designing the drogues for all aircraft. During fiscal year 1921, 235 Mark X-l torpedoes were completed. Also in 1921, the method of lead-tin plating of air flasks was adopted.

On Dec. 31, 1922, the high power cable, furnishing light, and power to Fort Adams, was completed. During fiscal year 1922, 111 Mark X-l torpedoes were completed.

Capt. Ralph Earle assumed command on May 26, 1923, and because of a lack of funds was forced to reduce Station personnel from 1,564 to 927. This number appears exceedingly small when compared to the 3,130 civilian personnel at the Station in July 1919, a figure which illustrates the rapid growth of the Station from its 185 civilians in January 1908. Because of additional funds and work, the force was increased to 1,117 in September 1924.

Late in the summer of 1923, the USS Williamson came to the Station to test torpedoes designed for light cruisers, which required launching from a considerable height on a vessel steaming at highest speed. A range for this firing was established 15 miles to seaward.

Mark VIII-8 torpedoes were deemed rugged enough to withstand dropping at high speeds from highest tubes on light cruisers.

The air-sustained gyro, the new Uhlan depth mechanism, and the air blowing pressure exercise heads were fully developed and adopted. Extensive modernization or conversion of torpedoes took place, in addition to the manufacture of new Mark X-2 and VIII-8 torpedoes. The Mark VII-2 torpedoes were all converted for

Images from the explosion at Naval Torpedo Station on Jan. 26, 1918, the most disastrous in NUWC's history, which killed 13 men and injured five. (Source: U.S. Naval History and Heritage Command)

The Mark 9 weapon was a Bliss-Leavitt torpedo developed and produced by the E. W. Bliss Co. and Naval Torpedo Station in Newport. It was designed in 1915 for use on battleships. Later, the Mark 9 was modified for use on submarines.

aircraft use. An oil smoke tracer for exercise runs was adopted.

The multiple-speed torpedo was successfully tested, but the highest speed was not equal to that desired and further development ensued. Cold shots disappeared because of a new pre-mixer top and igniter.

On July 1, 1923, the torpedo stations at Alexandria, Virginia, and Washington, D. C., were placed in an inoperative status and unfinished materials were moved to Newport.

The abandonment of the Potomac River torpedo ranges brought to Newport testing barge No. 4 on July 28, 1923, and Scout Patrol No. 2840. Barge No. 1 was decommissioned at the end of the 1923 firing season, No. 4 taking its place the following year.

On June 30, 1923, the Station employed 1,279 civilians.

On Oct. 27, 1923, the Station observed the first Navy Day, with appropriate exhibits and instructive talks. The USS Morris, attached to the Station since September 1903, was condemned in January 1924, and sent to Philadelphia in April 1924 to be sold.

On Jan. 10, 1924, Chief Gunner's Mate G. F. Griswold was killed on board Lighter No. 49. His death was due to faulty seamanship in handling weights.

On May 22, 1924, the oil tanker Llewellyn Howland was stranded on Seal Ledge, off the south end of Newport. At the request of Army engineers, it was blown up by a working party from the Naval Torpedo Station.

On June 30, 1924, the Station had in its employment 1,007 civilians.

In July 1924, an extensive modernization of the torpedoes program was initiated by the Bureau of Ordnance. The Mark VIII3, 3-A and 3-B were to be made into Mark VIII-3C and 3D. Torpedoes of this type were in production by March 1925.

In fiscal year 1924, 145 torpedoes were completed, plus 65 completed but awaiting proof and 362 modernized.

On Jan. 23, 1925, Lt. C. A. Hawkins reported to Newport, and upon the detachment of Chief Gunner Murphy in June 1925, he assumed command of the Air Detail on Gould Island.

On April 27, 1925, Chief Gunner Norris L. Wilcomb died at his residence in Newport after an attack of acute indigestion. Replacing him was deemed exceedingly difficult. Just before his death, Wilcomb had completed a pamphlet on gyroscopes, a work including sketches entirely done by himself. Wilcomb was commended by the inspector of ordnance in charge and the chief of the bureau of ordnance for this work.

On May 25, 1925, Capt. E. B. Larimer assumed command of the Station.

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PRE-WORLD WAR II

The pre-World War II era at the Station is largely characterized by technologically advancing torpedoes. In some instances, that progress was tempered by the ineffectiveness of the weapons — either through operator error or design flaws.

Adm. Thomas C. Hart served as commander from 1927-29 and fought tirelessly to improve the submarine Navy. After World War I, he was responsible for the acquisition of a surrendered German U-boat and studied it for technical innovations. He chaired a post-war committee that called for building long-range cruiser submarines capable of operating in the Pacific Ocean. These ideas were the genesis of the World War II submarine fleet.

In 1930, the submarine torpedo inventory consisted of the Mark 7 (18-inch tubes), Mark 9 (converted from battleship torpedoes) and Mark 10 (developed in 1915). It was around this time that development began of the Mark 14, a 21-inch wet-heater, compressed air, steam turbine torpedo.

Approximately 13,000 torpedoes of this type were produced during World War II and the torpedo is credited with sinking approximately 1 million tons of Japanese shipping, although its effectiveness was questioned at the time.

Capt. Ralph Waldo Christie was heavily involved in the technical development of the Mark 14 and the Bureau of Ordinance's highly secret program to develop a magnetic influence detonator for torpedoes. When passing beneath an enemy ship, the target's magnetic field was supposed to trigger the exploder, which in turn would detonate the warhead and break the keel of the target ship. When the magnetic detonator was ready for its first test in 1926, Christie was directing torpedo development at the Station.

Christie oversaw the development of the Mark 14, which was created specifically for the Mark 6 magnetic detonator. Unfortunately, the Chief of Naval Operations placed restrictions on field testing and there were only a few live fire tests with the new torpedoes and exploders. Almost all tests were conducted with exercise heads, where the explosive was replaced by water ballast.

Operational depth settings were based on the practice torpedoes with warheads that weighed 200 pounds less than the production version. Once this problem was determined, depth settings were corrected; however, other problems were discovered over the years and corrected as soon as possible. These issues became paramount in the late 1930s and early 1940s.

Adm. Thomas "Tommy" C. Hart, who served as Naval Torpedo Station commander from 1927-29, was Time Magazine's cover story on Nov. 21, 1941, when he was serving as commander-in-chief of the U.S. Asiatic Fleet. Although he should have been retired from the Navy by this time, President Franklin Roosevelt said that Hart was "indispensable in the East."
(Source: time.com/time covers, August 2009 NUWSCOPE)

On Sept. 1, 1939, Germany invaded Poland, ushering in the start of World War II with the United Kingdom and France declaring war on Germany two days later.

In 1939, a Station civilian employee named Joseph Demurs was charged with sabotage. He was accused of mixing acid with lubricant oil used in the propeller mechanisms of torpedoes to "make them duds."

WORLD WAR II

After World War II broke out in Europe and Asia, the Station steadily expanded its Goat Island facilities

with new construction and a growing workforce — 4,800 employees by 1940.

On Aug. 12, 1940, President Franklin D. Roosevelt quickly toured the Naval Torpedo Station on Goat Island, peering into the torpedo factory windows and viewing a completed torpedo. Roosevelt arrived on the presidential yacht, USS Potomac, and left less than three hours later. The purpose of his visit was to make a comprehensive inspection and appraisal of the military and naval installations of the Narragansett Bay area.

In 1941, an effort began to increase employment to meet production needs. Students from Rogers High School in Newport participated in a vocational program that eventually led to many of them being hired by the Station.

Also in 1941, the British captured a German U-boat equipped with a wakeless electric torpedo, a major improvement for submarine-launched torpedoes. U.S. Navy torpedoes at that time were propelled by compressed air and the combustion of highly volatile fuel that drove the propellers through turbines. This system produced a white wake of bubbles that enemy observers could follow back to the launching submarine.

The captured German device was turned over to the Station, which within one year developed the Mark 18 utilizing this technology. This ultimately became the favored torpedo of the Navy, replacing the Mark 14. Electric torpedoes such as the Mark 18 required only about 70% of the labor required to manufacture a torpedo with thermal propulsion.

Also around this time, a top-secret device, the Mark 24 homing torpedo, was developed. While smaller and slower than conventional torpedoes, it proved more effective — especially launched from airplanes — as it followed underwater noise generated by the target vessel.

A submarine-launched version called the Cutie was developed in Newport and put into use later in the war. Rather than being launched from a torpedo tube, the Cutie "swam" out under its own power and sought its target.

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The Naval Torpedo Station on Goat Island (left photo) as it appeared in the 1940s. In October 1942, a new NTS annex opened at Coddington Cove (right photo, circa 1950) and shortly afterward became the headquarters of the Navy's Central Torpedo Office. Goat Island became the manufacturing center, with research and other support functions transferred to Coddington Cove. The Goat Island facility was disestablished in 1951. (Photos courtesy Naval War College Museum)

During World War II, the Naval Torpedo Station hired nearly 13,000 employees, including a large number of women to support round-the-clock operations. Women worked in the supply, machine, chemical, personnel, engineering, design and materials departments. New safety guidelines, as pictured in the 1940s picture at right, were put in place to address women's attire. (NUWC file photos)

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POST-WAR RESTRUCTURING

Almost immediately after the war, manufacturing began downsizing on Goat Island and by the end of 1945 the workforce had been reduced to 9,000 employees.

In 1945, the Navy Underwater Sound Laboratory (later merged with NUWC) began operations in New London, Connecticut, as the center of sonar development for both surface ships and submarines.

At the end of World War II, the U.S. Navy had seven types of torpedoes in service use. Three were pre-World War II developments: Mark 13, Mark 14 and Mark 15. Four were developed during the war: Mark 18, Mark 27, Mark 28, and Mine Mark 24. In addition, another 15 types were in development during World War II.

In the aftermath of the war, development of the Mark 35 and 37 torpedoes began with the intent of creating a universal torpedo that could be deployed from aircrafts, submarines or destroyers. They primarily would be used as an antisubmarine weapon with passive/active or combination homing.

The aircraft-launch requirement was dropped in 1948, and the development of the Mark 41, a compact version of the Mark 35, was initiated to fulfill the aircraft obligation. A limited number of the Mark 41s were produced, and it was later discontinued in favor of the Mark 43 type.

NAVAL UNDERWATER ORDNANCE STATION

In the aftermath of World War II, there was a conscious shift in the ideology of the Naval Torpedo Station to a greater focus on antisubmarine warfare (ASW) and its five phases — detection, classification, localization, tracking and weapon firing.

In 1951, the Naval Torpedo Station in Newport became the Naval Underwater Ordnance Station (NUOS). All ongoing research and development was consolidated at the Coddington Cove annex under the newly formed NUOS under the command of Capt. F. L. Robbins. Meanwhile, the Navy had set up a Central Torpedo Office in 1947, which, in 1953, led to the formation of the Naval Underwater Systems Engineering Center.

With the launch of the USS Nautilus in April 1954, the world's first nuclear-powered submarine, the Navy needed advanced systems to effectively operate the submarines and its systems. NUOS engineers and scientists worked to address the challenge of a submarine's unlimited endurance to stay submerged.

Nuclear propulsion provided the basis for quantum improvements in submarine performance, with dramatic increases in speed, endurance and maneuverability. This created a nightmare for a weapons community already straining to develop new acoustic-homing and wire-guided torpedoes, along with hydraulically operated (depth insensitive) torpedo tubes, to counter the postwar period's high-performance, conventional submarines with snorkels, large batteries and streamlined hulls.

Also in 1954, new in-service fire control responsibilities were assigned to NUOS thanks to the efforts of John F. Kelly, a division head, and John Formwalt, his department head. This Bureau of Ordnance assignment was to provide a Navy laboratory focus for ongoing modifications and alterations to existing fire control systems.

During the 1950s and 1960s, the first professional women were hired in Newport, mostly as mathematicians, after the hiring of women at the Navy Underwater Sound Laboratory (NUSL) in New London, Connecticut. Soon after, women were hired as mechanical and electrical engineers, physicists and scientists. This highly trained and diverse workforce, many with advanced degrees, began to explore the latest technologies and to develop new and highly sophisticated systems.

EMPLOYEES KILLED IN THE LINE OF DUTY

On Tuesday, April 26, 1955, an explosion occurred at approximately 11 a.m. in Building 115 in a dynamometer test room. It was initially reported that four were killed, five injured and one missing in the blast in the corner of the building at Coddington Cove, overlooking Ferry Landing. The death toll later increased to five in the afternoon. Those killed in the blast were Peter J. Lada, 37, of New Bedford, Massachusetts; John R. Lavender, 38, of Fall River, Massachusetts; Howard E. Staats Jr., 34, of Newport; Daniel J. Sullivan, 62, of Newport; and Anthony Zimon, 39, of New Bedford.

On Tuesday, April 26, 1955, an explosion occurred at approximately 11 a.m. in a dynamometer test room in Building 115. The blast is believed to have resulted from a high-pressure airline rupture while testing a high-energy monopropellant fuel, called normal propyl nitrate, in a modified Mark 16 Mod 3 torpedo.

The blast is believed to have resulted from a high-pressure airline rupture while testing a high-energy monopropellant fuel, called normal propyl nitrate, in a modified Mark 16 Mod 3 torpedo. Normal propyl nitrate was known to have unstable properties much like nitroglycerine. The dynamometer room, which was at one end of the one-story, 200-foot long concrete block structure, was torn apart and the cement roof was ripped off. About 15 windows were blown out and three wooden doors were ripped from their hinges.

A cloud of debris shot 100 feet into the air with a mushrooming effect, which reminded some of an atomic blast in appearance. The April 27, 1955, Providence Journal reported "an earth-shaking explosion … ripped like a matchbox the reinforced concrete building." At the time of the accident, NUOS employed about 800 people.

TECHNICAL DIRECTOR POSITION CREATED

In 1951, the technical director position was created and filled by Louis Michaelson until 1955 when Gerald G. Gould transferred from Bureau of Ordnance (BUORD) to the position, which he held until 1970. Under Gould's leadership, NUOS began to assume a systems-level approach with innovative training programs initiated to allow personnel to pursue advanced engineering degrees while continuing work.

Gould built a staff of scientists and engineers that gained an international reputation as leaders in underwater propulsion, underwater instrumentation and electronic signal processing. NUOS became one of the major research and development facilities of the Bureau of Naval Weapons. He also was instrumental in the development of the Atlantic Undersea Test and Evaluation Center (AUTEC) in the Bahamas, and the latest fire control and weapon launching systems for submarines.

In August 1956, the Submarine Sonar Division at the New London Laboratory proposed to Bureau of Ships (BUSHIPS) a sonar system concept called the Integrated Submarine Sonar Program. BUSHIPS, a predecessor of NAVSEA, later made a formal request for an integrated submarine sonar system specification. After several iterations, the final specification was written at the Underwater Sound Laboratory between March and October 1957.

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Later, in 1958, Raytheon Co. in Portsmouth, Rhode Island, won the contract for two sonar systems. One was installed in 1960 on the USS Tullibee (SSN 597), an experimental nuclear-powered submarine. The other system was designated for the USS Thresher (SSN 593), the first U.S. Navy production submarine to have a large spherical bow sonar array called for in the specification. All successive classes of U.S. Navy SSNs adopted this sonar sensor concept.

To examine the feasibility of a high-performance acoustic homing torpedo, BUORD initiated research torpedo configuration (RETORC) programs in the mid-1950s. The programs resulted from Project Nobska (named for its location near Woods Hole Oceanographic Institute in Cape Cod, Massachusetts) in December 1956.

The Nobska ASW study was performed by a high-level committee established by the Navy in 1955 and coordinated by the National Academy of Science. One conclusion was that fast homing torpedoes were both possible and needed. The development of a reliable wire-guidance capability for a submarine-launched torpedo also was given a high priority at the time. RETORC I, a program under the direction of the Naval Ordnance Test Station in California, concentrated on a lightweight, thermal-powered torpedo and resulted in the Mark 46 torpedo. A RETORC II program was established by Charles Sandler, the BUORD sponsor, and placed under the direction of the Ordnance Research Laboratory at Pennsylvania State University, with NUOS responsible for propulsion development and shipboard systems.

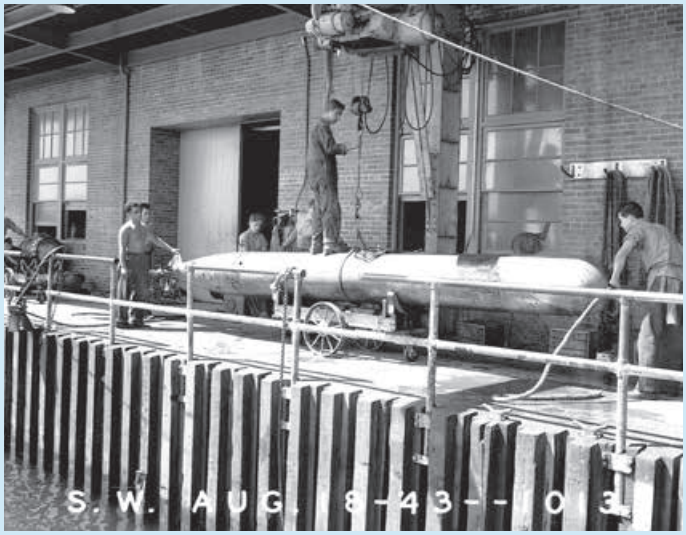
The RETORC II program combined a new homing system and mid-course guidance system from ORL-Penn State with new high-energy/density propulsion systems under development at NUOS. The goal of the program was to demonstrate that these new technologies could be combined to provide the increase in performance needed to support the development of a new generation of acoustic homing weapons.

The Mark 48 Torpedo, the principal armament of U.S. submarines, had its beginnings in the RETORC II program and under the aegis of BUORD's heavyweight torpedo feasibility studies, which began in September 1957. The primary target for the new high-performance torpedo, whose original designation (EX10) was changed to Mark 48, was the nuclear submarine.

Torpedo testing in Narragansett Bay

World War II test procedures at Newport (some 75,000 proof tests were run) typically went like this: The testing organization (housed in hilltop research building No. 138) on the mainland just north of Newport would give the torpedo to be tested to the staff to ferry out to the firing pier on 52-acre Gould Island, three miles up Narragansett Bay from Goat Island. There, the naval range officer would take over. (Airdrops, conducted by the Naval Aircraft Torpedo Unit on Gould Island, were plated into a deep trough dredged in the channel.)

Acoustic sensors on the channel bottom at thousand-foot intervals (with cables running back to the control room) would track the weapon as it sped in a 10,000-yard path north in Narragansett Bay, passing between Hope and Prudence islands. As the torpedo rushed by the hydrophones, its noise trilled through loudspeakers in the tracking room, indicating the torpedo's depth, speed and path. Later, the technicians could compare strip-chart recordings to similar charts recorded inside the torpedoes. War torpedoes are negatively buoyant; they sink when at rest to prevent recovery by an enemy.



In most tests, technicians replace the explosive with water that can be blown out by compressed air at the end of a run. The missile then floats. Torpedoes were almost never tested with live heads, as they were too expensive to sacrifice. Before the war, few Sailors had ever seen a live warhead fired. Narragansett Bay is relatively shallow, and one problem was that torpedoes would often run aground, sometimes jamming their water purging mechanisms. They were equipped with Sound Lab-developed pingers, however, and they were easily located by divers outfitted with backpack hydrophones.

For deeper runs, torpedoes would be moved to the "outside range," in the Atlantic Ocean, outside Narragansett Bay. Here, the torpedoes were usually fired from a destroyer's deck tubes. Acoustic sensors were impractical, so tracking was done by air. (Air tracking was also common in the inside range, mainly for photographic records.)

At the end of the run, compressed air would blow out a quantity of marker dye (usually green-colored calcium chloride) as it refilled the dye container with air to produce the positive buoyancy necessary. The vehicle would bob to the surface.

(Source: "Hellions of the Deep: The Development of American Torpedoes in World War II," page 37)

On May 4, 1959, the USS Skipjack, the Navy's fastest and most maneuverable submarine, arrived at NUOS for torpedo tube acceptance trials. The ship gave a deep-water maneuverability demonstration before its arrival.

In 1959, the annual budget of NUOS was $6.4 million, up from $5.6 million in the previous year. The company owned about $182,000 worth of land, $15 million in plant buildings and $5 million in equipment. No additional acreage was required for expansion, but approximately $75,000 worth of new or replacement items and facilities were added each year.

DEEP-WATER RANGE PLANS DEVELOPED

Also in 1959, the Secretary of the Navy tasked BUSHIPS and the Chief of Naval Operations (CNO) with designing and developing AUTEC, with NUOS designated as the lead activity assigned technical direction agency (TDA) responsible for establishing the deep-water range.

On Feb. 29, 1960, the ferry Aquidneck made its last run as the transportation service between Government Landing and Goat Island after 91 years of service. At the time, Goat Island was in the process of being declared surplus to government needs.

In November 1960, the Mark 48's enhanced range, speed and depth capabilities were specified in Operational Requirements. In-water tests demonstrated reduction in self-noise, a five-fold increase in acquisition range and a torpedo speed more than doubled. Variable-speed homing and mid-course correction also were demonstrated successfully.

By the early 1960s, sonar interests and requirements heavily influenced the basic design of attack submarines. According to Walter L. Clearwaters, an engineer at the Underwater Sound Lab, "The size, pressure hull geometry, and internal space arrangements were designed to allow sonar equipment and systems first choice of ship's space."

Beginning with the attack submarines of the USS Permit (SSN 594) class — authorized in 1957 and commissioned starting in 1961 — sonar became a most important design factor. The desire to reduce the submarine's self-noise and radiated noise was reflected in the hull form and propulsion design features, as well as auxiliary equipment specifications. The arrangement and location of tactical and fire control spaces allowed the preferred method of weapon delivery to USC sonar as the primary tactical sensor.

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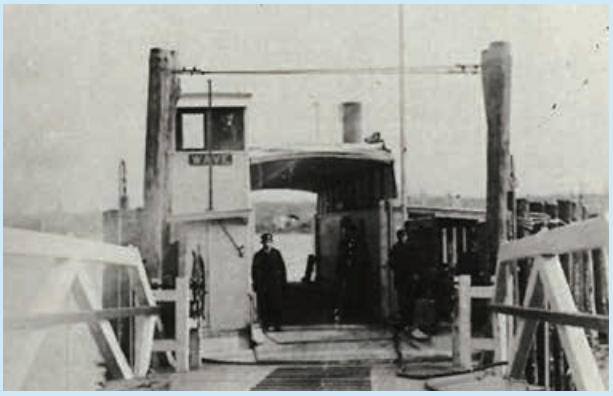

The Wave, one of three double-ender ferries that served the Naval Torpedo Station from 1907-37.

The Aquidneck transported workers to Naval Torpedo Station from 1937 until service shut down in 1960.

Challenges of transportation to Naval Torpedo Station

When the Naval Torpedo Station was established on Goat Island on July 29, 1869, workers on the island plied the waters of the bay in rowboats to get to and from work. In 1879, the back-breaking oars were replaced by modern (at that time) motor launches. Though the traveling accommodations were cramped, and the ride was rough, the passengers were not obliged to pull their weight.

In 1880, the motor launches gave way to the Navy tug. The first to inaugurate this "plush" service was the Nina. From 1880 until January 1907, the Nina and its fellow ships carried passengers and supplies to and from the Landing in Newport and the Station.

The Wave, first of three double-enders, made its initial run in January 1907; followed by the Narragansett, and then by the Aquidneck, which took up the regularly scheduled run on May 28, 1937.

On Feb. 27, 1960, the Aquidneck made the last of its daily runs, as Goat Island was in the process of being declared surplus to government needs, and the ferry service was discontinued as an economy measure. The entire day was set aside for trips from the Landing to the Station so that old timers, those who rode the ferry for many years while employed at the Station, and former crewmembers could ride the ferry for the last time.

The Aquidneck was decked out fore and aft in colorful bunting and signal flags. The Naval Station Band serenaded the passengers making the final runs. Loudspeakers carried the farewell message of Captain Gregor, Naval Station commanding officer. At 10:45 a.m., a special run, designated as a "ceremonial trip," left the Landing, with Gregor in the wheelhouse. Civil dignitaries, Navy officials, and senior ferry and Station workers joined forces to pay tribute to the Aquidneck's almost 23 years of service.

Officially, the Aquidneck made its last run on Feb. 29, 1960, at 11 a.m. It was berthed in the Goat Island slip until deactivation in the spring.

(Source: NUOS Narrator, March 18, 1960 edition)

The Atlantic Undersea Test and Evaluation Center (AUTEC) in the Bahamas, a deep-water range known as the Tongue of the Ocean, experienced considerable growth in the early 1960s. See more information about the range on page 78.

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CHANGING ROLE AT NUOS

Also in the early 1960s, two events took place that dramatically changed Newport's limited role in ASW fire control activities. The first was Kelly's successful initiative to secure for NUOS technical direction agency responsibilities to incorporate the heavy torpedo (the EX 10, later Mark 48) firing capabilities into the surface ship and submarine fire control systems, including the Mark 113.

The second event was the vision and actions of Caesar A. Spero Jr., head of the Development Department, to change the station's emphasis from analog in-service activities to research and development efforts oriented toward digital technology.

In 1962, with the Cold War at its peak and the Cuban missile crisis occurring in October, Newport recognized the Mark 113 fire control systems' potential to support an evolutionary development of capabilities needed for the anticipated growth in submarine fire control requirements because of new threats, weapons and submarine designs. That year, Joseph Ferranti, recently from industry, and Anthony Ruggiero, were sent by Kelly to the Naval Ordnance Laboratory to study the Mark 113. The success of this effort critically affected Newport's continuing in fire control.

Deep-water ranges, including AUTEC, known as the Tongue of the Ocean, also experienced considerable growth in the early 1960s.

During this timeframe, a team was put together in the ASW Division of the Development Department to perform research, development and full-scale testing of three underwater tracking configurations — vertical, fixed and bottom-mounted distributed arrays — to determine which configuration would satisfy the research and development (R&D) tracking requirements.

When Spero was promoted to assistant technical director for Systems Development, Charles Soliozy, head of the Advanced Underwater Weapons Division, became head of a newly established Weapons Development Department, with John J. Griechen as AUTEC program manager and Richard Austin heading the range development. NUOS also assigned a number of highly skilled engineers to the range development process.

SENECA LAKE FACILITIES BUILT

Around 1962, Division Newport's Seneca Lake Sonar Test Facility was built in Dresden, New York, on one of the Finger Lakes in the heart of Central New York's wine country. The lake is 38 miles long and 3.4 miles wide with its deepest point at 650 feet; the depth is about 480 feet where the test facility is located. The

facility is world-renowned for its testing and evaluation of projects requiring relatively deep water with fixed underwater geometry heavy load-handling capabilities. The main feature is its Systems Measurement Platform, a massive catamaran-type platform with a 220-ton crane built into its superstructure, which was put in place in the late 1960s.

Other changes occurred in Newport, which went through some facility name changes. Housed under the Naval Torpedo Station from 1941-1945 to coordinate wartime torpedo production, the Central Torpedo Office (CTO) was renamed the Naval Underwater Systems Engineering Center in 1963 to accommodate its added mission of operational fire control systems and launchers.

On April 10, 1963, the USS Thresher was lost at sea, along with the 129 Navy and civilian technicians aboard. The Thresher had been conducting deep diving tests in the Atlantic Ocean more than 200 miles east of Cape Cod, Massachusetts. It was the deadliest submarine disaster in the Navy's history, and led to the implementation of a rigorous submarine safety program, SUBSAFE.

In 1963, with the concurrence of the Bahamian government, an agreement was signed between the United States and the United Kingdom, whereby the U.S. Navy would have the control, for 20 years, of certain territory for three offshore test ranges. Under this agreement, the U.K. would have equal access to the test facilities on a payment basis. Construction of a main base and seven down-range tracking sites began in 1964 on the eastern shore of Andros Island. A formal dedication took place on April 14, 1965, in a ceremony at Andros Island with Capt. Harry Rice, NUOS commanding officer, representing Newport.

In August 1965, an initial cadre of naval officers and Seabees arrived in the Bahamas, with Cmdr. Glen Barney taking command of AUTEC as the first officer-in-charge. Also, the first contingent of personnel arrived in Florida to establish AUTEC headquarters at West Palm Beach, with Capt. Leroy Jackson as the commanding officer and Donald O'Meara as the technical director.

NAVAL UNDERWATER ORDNANCE STATION, NAVAL UNDERWATER WEAPONS RESEARCH AND ENGINEERING STATION AND NAVAL UNDERWATER SYSTEMS CENTER

In the mid-1960s, NUOS became a major contributor to the development and testing of advanced heavyweight, electrically propelled torpedoes, including reduced radiated noise; improved operating depths; added speed control; enhanced exploders; drag reduction; and improvements to two-way wire communications. NUOS was brought into the computer age, with new analog systems used for analysis and accuracy.

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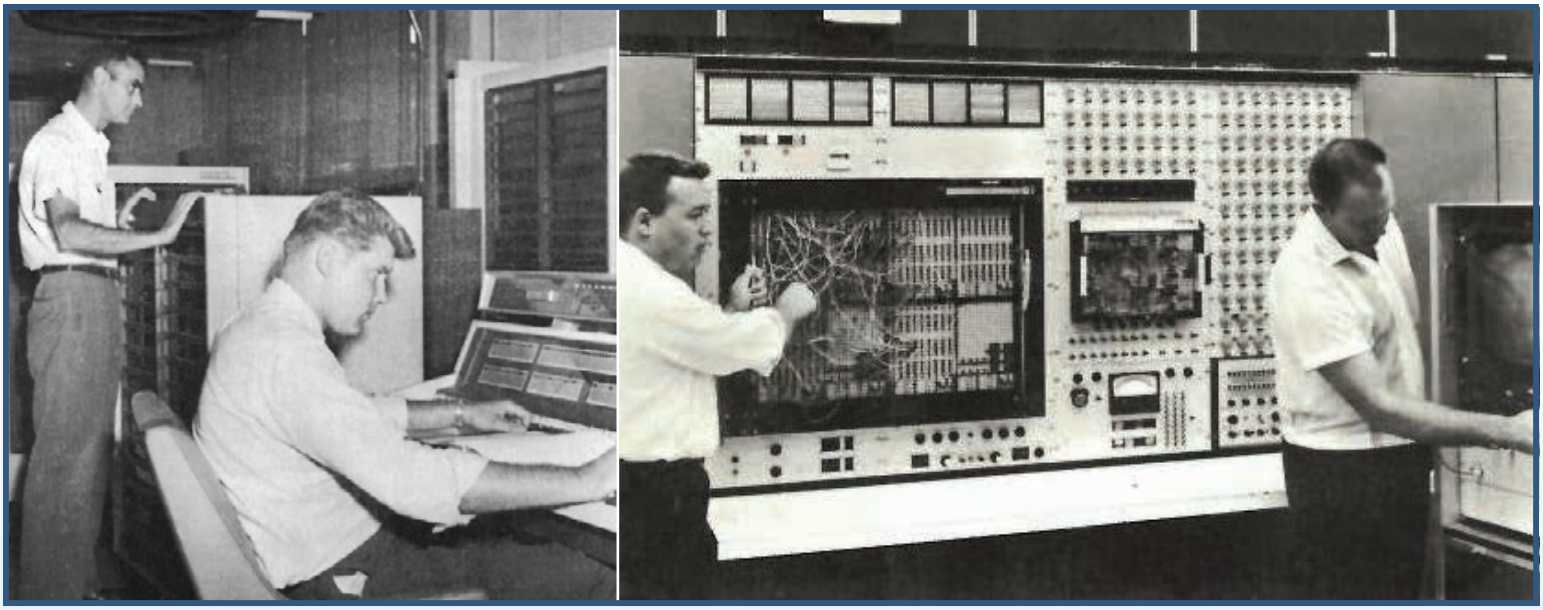

D.J. Cardin (left photo, from left), electronic engineer, and T.M. Floyd, electronic technician, check out the new GPS analog computer that was delivered to NUOS in 1965 to simulate and analyze fire control systems. Later that year, J.F. Neville (right photo, from left) and J.A. Sabulis, check program outputs of the Control Data Corp. 3200 Digital Computing system, which greatly increased digital computing capabilities in speed and storage capacity.
(NUOS Narrator, 1965 issues)

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On Feb. 21, 1966, a new activity was established in Newport with the combination of the Naval Underwater Ordnance Station (NUOS) and Naval Underwater Weapons Systems Engineering Center (NAVUWSEC). Named the Naval Underwater Weapons Research and Engineering Station (NUWS), the new activity was a result of a concerted effort to increase the effectiveness of the torpedo program through consolidation of related functions and elimination of overlap. The budget allocated for the program in 1966 was about $40 million with a workforce of 1,400 employees, including 102 military personnel.

On Feb. 26, 1967, Rear Adm. Edward J. Fahy, commander of the Naval Ship Systems Command, officially commissioned AUTEC as a deep-water test and evaluation range. The ceremonies were directed by Vice President Hubert H. Humphrey.

The maintenance and operations contractor, RCA Service Co., took responsibility for operations and maintenance of AUTEC on Oct. 1, 1966, replacing contractors who were involved in the design, development and installation phases, the major ones being ITT/Federal Laboratory and General Motors (DELCO). NUWS range experts provided technical leadership and expertise for the AUTEC range concept formulation, development and construction.

A sharp post-war rise in the number of college-educated women led to more opportunities for women at NUOS in the 1950s and 1960s. Pictured are some of the women who were hired in technical fields during that time, including Elizabeth Fox (from left), Zetelle M. Ridley, Cynthia P. Start, Frances C. Flynn, Mary K. Kiernan and Joyce H. Farrell. (Source: NUOS Narrator, September 1960)

In 1967, the need for a new periscope designed specifically for optical reconnaissance was identified. Thus, the Type 18 program, a radical departure from existing periscopes because it incorporated built-in low light level TV, a photo camera and low light level image intensification, was initiated. Above all, Type 18 was to provide the best possible optics for photography.

Also in 1967, as a result of new threat assessments, the need arose for the development of a new advanced submarine sonar system. In August of 1968, a Navy statement of requirements and a development concept paper provided the operational and system requirements for a new sonar system. The conception, development and implementation of the AN/BQQ-5 and its variants span the entire period of the Center's existence.

Another significant development during the 1968-69 timeframe was the portable Shallow Water Acoustic Tracking System (SWATS). This system could test torpedoes in various acoustic environments and had the capability to provide two-dimensional precision tracking of several objects in real time.

The SWATS portable range system provided up to 10 square miles of coverage in depths to 1,000 feet, used modified ASW sonobouys to receive acoustic pings emitted by torpedoes, and relayed the information to a computer system at the Range Tracking Center that processed the data and generated run plots.

In 1968, Randall J. Whitaker was nearing the end of a 33-year career at NUOS, his last years as a mechanical engineer in the Engineering Assurance Branch, Design Approval Department, when he died in a plane crash on his way home from an assignment in Washington, D.C.

"Never satisfied with the way things were, always probing, trying to improve himself and his Station, Randy was a most capable, likable, dedicated man whose very presence alone was sufficient to ensure success in many undertakings," a tribute to Whitaker states.

NUWS CELEBRATES CENTENNIAL

By 1969, as the Naval Underwater Weapons Research and Engineering Station celebrated its first century of existence, it was recognized for its full-spectrum lifecycle expertise in undersea weapons systems. To celebrate its centennial, seminars, a ball, a family day and other festivities were held. R.I. Sen. Claiborne Pell gave the ceremonial address.

In 1966, the Naval Underwater Weapons Research and Engineering Station (NUWS) was established (left photo, in 1967) with the combination of the Naval Underwater Ordnance Station (NUOS) and the Naval Underwater Weapons Systems Engineering Center (NAVUWSEC). The center eventually merged with the Navy Underwater Sound Laboratory (NUSL) in New London, Connecticut, (right photo, in the 1960s). For more information on NUSL, see page 77.

In April 1969, as the planning for the new sonar system was evolving, James Kyle, an electrical engineer from Raytheon Corp. in Portsmouth, Rhode Island, came to the New London, Connecticut, laboratory as head of the Submarine Sonar Division (later Department). During his 13-year tenure, he set the standard for system engineering within the department. He guided the development of the first computer-based integrated sonar systems, the AN/BQQ-5 and the later AN/BQQ-6.

During this period, many dramatic improvements in submarine towed array technology occurred. Kyle was a prime motivator in the development of the Submarine Active Detection Sonar (SADS) and later the Mine Detection and Avoidance Sonar (MIDAS) that formed the basis for the AN/BSY-1 active system capability during the 1980s. Kyle's appreciation for the fundamental importance of the sonar system's sensors was exemplified by a plaque on his office wall that stated, "As the array goes, so goes the sonar."

In November 1969, Naval Ship Systems Command (NAVSHIPS PMS 302) established a Near-Term Sonar Improvement Program (NTSIP) under the aegis of Chief of Naval Operations (CNO) and Naval Material (NAVMAT) to investigate techniques for quickly providing critical improvements in submarine sonar capability. The system sensor was to be a towed array. The purpose of the program was to provide sonar improvements for the 594-class and 637-class submarines, with rapid deployment to operational submarines as a program goal.

Lt. Cmdr. Curtis C. Roselle of NAVSHIPS, a submarine officer formerly with the Submarine Development Group at New London, was designated project manager. NUSC's New London Laboratory was assigned by NAVSHIPS to be the overall system technical director and installation facility.

NEWPORT, NEW LONDON MERGE TO FORM NAVAL UNDERWATER SYSTEMS CENTER

In 1970, 101 years after the Naval Torpedo Station was established in Newport, the Naval Underwater Systems Center (NUSC) was formed by the merger of the Navy Underwater Sound Laboratory in New London and the Naval Underwater Weapons Research and Engineering Station in Newport, a descendant of the Naval Torpedo Station. The mission of this new activity was to be the principal Navy research, development, test and evaluation center for submarine warfare systems, submarine weapons systems and surface ship sonar systems.

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R.I. Sen. Claiborne Pell and his wife, Nuala, celebrate the Naval Underwater Weapons Research and Engineering Station's first century of existence in 1969. Seminars, a ball and other festivities were held to celebrate the centennial and Pell gave the ceremonial address during a family day open house held Sept. 6, 1969. (Photo courtesy NUWS Narrator, September 1969)

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At the time, NUSC became the sixth research and development center established by the Secretary of the Navy under Adm. Ignatius J. Galatin, then chief of NAVMAT, to advance national competence in selected areas of defense technology.

By March 1970, an extensive technical investigation and a major submarine sea test of the new sonar system had been completed. At that time, the New London Laboratory, based on the sea-test results, recommended the configuration of the detection system hardware and the appropriate towed sonar array. At a ceremony held in Newport on July 1, 1970, the principal address marking the Center's establishment was delivered by Rear Adm. Leslie H. Sell, Vice Commander, Naval Ordnance Systems Command. Representing the Secretary of the Navy and the chief of NAVMAT was Joel S. Lawson Jr., who had been named director of Navy Laboratories. On June 30, a similar event in New London brought the Underwater Sound Laboratory officially into the new center.

The first commanding officer at the newly formed headquarters located in Newport was Capt. Bruce D. Inman. He served in that post until Sept. 21, 1970, when he was relieved by Capt. Robert T. Lundy, former commanding officer of NUWS.

The director of Navy Laboratories announced that Harold E. Nash, a civil service employee and technical director of the Underwater Sound Laboratory at New London, would serve as technical director of NUSC.

Early NUSC organization placed its emphasis on various segments of the lifecycle area. For example, the Science and Technology Directorate (designated Code T) focused on technology-based efforts; the Systems Development Directorate (Code S) conducted the development programs; and the Fleet Readiness Directorate (Code R) was responsible for operational systems and effectiveness assessments.

Though the organizational structure seemed efficient at first, it later was determined this arrangement led to a tendency to compartmentalize product activities within directorates, making it difficult to transition efforts from one directorate to another as programs progressed through the lifecycle.

Also in September 1970, the Submarine Tactical Array Sonar System (STASS) program was authorized and the first improved system was delivered six months later. By the end of 1971, part of the submarine fleet already had received both the new towed arrays and signal processing equipment.

Later in September 1970, the first command golf tournament was held with the team from Newport defeating New London by 36 strokes at Meadowbrook Golf

Club in Richmond, Rhode Island. In total, 104 golfers participated in the event.

In the early 1970s, a new SSBN program called Trident was initiated and aimed at a gradual replacement of the old Polaris/Poseidon platforms (SSBN 616, SSBN 627, and SSBN 640 classes).

At that time, Caesar Spero, associate director for Submarine Systems Development, and Earle Messere initiated a thrust that resulted in the Fire Control Department assuming a major role in the development, test integration, certification shipboard installation and lifecycle support of the Trident's command and control system. The success of this effort resulted in major changes to the Fire Control Department organization and considerably expanded the department's ongoing efforts for the next 20 years.

DEVELOPMENT OF THE MARK 48 TORPEDO

Much of NUSC's history concerning torpedoes in the 1970s involved the Mark 48, which used a turbine propulsion system and became the primary tactical weapon of the U.S. submarine fleet. Congress had earlier approved $754,000 for construction of a three-level, 25,000-square-foot laboratory for research and testing of the Mark 48 torpedo at NUSC.

At the time said to be the most sophisticated torpedo ever developed, the Mark 48 became the U.S. submarine's principal — and in many cases the only — ASW armament. NUOS provided direct technical, logistic and operational support throughout all phases of the Mark 48 combat system lifecycle, from R&D and system development to fleet introduction.

Early in 1972, the Mark 48 Mod 1, fitted with a conventional high-explosive warhead, was introduced into the U.S. fleet as a replacement for the Mark 37 conventional warhead torpedo and for the Mark 45 antisubmarine torpedo carrying a nuclear warhead. Two more mods of the Marks 48 would be produced in the 1970s.

NUSC played a lead role in the major upgrade of an operational torpedo, in providing the Mark 48 with an advanced, computer-based, digital guidance and control system.

The program to develop the Mark 48 ADCAP (advanced capability) weapon was initiated in response to a need to further enhance the Mark 48's effectiveness against emerging adversarial submarines entering service in the mid-1970s.

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The entrance (left photo) to the Naval Underwater Systems Center in Newport as it appeared in the 1970s. An aerial photo (right) of the Navy Underwater Sound Laboratory in New London, Connecticut, in 1972.

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In the early 1970s when the Harpoon anti-ship missile was developed with McDonnell Douglas as the prime contractor, the Navy directed the weapon to be incorporated into submarine weapon suites to provide an over-the-horizon (OTH) weapon for use against surface ship targets. NUSC was assigned responsibility for the submarine-launched encapsulated Harpoon program.

Initial efforts focused on the installation of the prototype encapsulated Harpoon command and launch subsystem (EHCLS) on the USS Permit (SSN 594) for the Harpoon technical evaluation/operational evaluation and the follow-on fleet introduction of the new missile system. Initial operational capability (IOC) was achieved in May 1977, when the USS L. Mendel Rivers (SSN 686) was certified for operational deployment of encapsulated Harpoons.

During the 1970s, NUSC's John R. Hinves led the development of a diver-less helicopter recovery system, a fast and safe system for recovering exercise torpedoes. This system enabled a helicopter to recover a torpedo from the water without the use of in-water personnel, even in high sea-states. The expended weapon could then quickly be returned for post-firing analysis and reuse.

In 1972, a Fiber Optics Group, under the direction of Frederick Allard, was established in the Submarine EM Systems Department. By 1974, Allard and his staff had developed and installed the first successful fiber optic system aboard a U.S. submarine. Using commercially available components, it replaced part of a conventionally wired sonar system aboard the USS Gato (SSN 615), and this fiber optic system was tested at sea over an extended period.

DIVERSITY, TECHNICAL ADVANCEMENT AND EXPERTISE

In 1971, 419 women were employed at NUSC — 235 in Newport and 184 in New London. A survey, conducted by the Federal Women's Program Committee, showed that the average age of the 170 women who responded was 34, with about seven years of employment at NUSC.

Results noted that only 14% of the women believed they had reached their highest level of employment, while 65% felt qualified for work at a higher level and and 97% had performed work other than what was defined in their job tasking.

FIRST MEETING OF NEW EEO COMMITTEE: Capt. Milton C. McFarland, (center, background) Commanding Officer, presented letters of appointment to members of the new NUSC Equal Employment Opportunity Committee. Directorate officials on hand for the discussion were Capt. Roy M. Springer (left), Chief Staff Officer, and Harold E. Nash (right), Technical Director. Committee members at the session (left, front to back), Kenneth H. McDaniel, EEO Coordinator, Kathryn L. Tonnes, John J. Kinateder, Arlyne H. Ashton and William L. Trezvant; (right side, front to back) Pat Proctor, Mary Rita Powers, Richard J. Medeiros and William Fitzpatrick, EEO committee chairman.

In 1972, a new Equal Employment Opportunity Committee was formed at NUSC to address inequalities among women and minorities. In the early 1970s, 419 women were employed at NUSC.

"Criticism centered about the lack of opportunity for advancement and especially a shortage of training opportunities, which may lead to advancement," the study states.

In 1972, a new Equal Employment Opportunity Committee was formed at NUSC to "stabilize our minorities and bring them in as equal partners, professionally and socially."

In 1973, the first female department head was appointed to the Manpower Resources Directorate. Louise Rickard — the highest-ranking female at NUSC, which had about 3,200 employees — had 29 years of federal service when promoted.

"At the Center, there should be no different procedures for evaluating women for employment or promotion than for men," Rickard said in an interview about her promotion.

In 1976, a major reorganization was initiated that restructured the Center into eight product lines, each under an associate technical director. This realignment changed the management structure to a product-oriented framework, where each of the product line department heads was responsible for lifecycle management in its product area.

Also in 1976, NUSC began a NAVSEA-sponsored upgrade to the SQS-35(V), a variable-depth sonar system independent of hull sonar systems. Its primary goal was to protect the hoist system on the ships from the effects of salt-water flooding and to increase operational availability.

New London was tasked to oversee the Type 18 periscope production and fleet introduction. The first Type 18 was installed onboard the USS Cuvalla (SSN 684) by a NUSC team in 1976. Over the next eight years, NUSC teams installed periscopes on 33 SSN 637-class and three SSN 688-class submarines (the first three 688s were constructed with Type 15s because Type 18s were not yet available).

By November 1978, a Navy contractor's graphic advertisement, complete with a drawing of a passing submarine, took two pages in the U.S. Naval Institute Proceedings to announce that "The AN/BQQ-5 Sonar System has joined the fleet." This is the advanced sonar system that existed as a sonar upgrade concept in 1968.

The Submarine Integrated Attached Center in Newport, as shown in 1975, supported the advanced combat systems research and development program.

Successful conversion of the attack center portion of existing analog fire control systems to digital technology presented new challenges to the engineers and scientists of the Fire Control Department. Advances in submarine sensor capabilities, improvements in existing torpedoes, the introduction of new weapons, the changing threat, the need for coordinated information flow in the attack center, and the demand for coordinated approach and attack procedures utilizing multiple weapons against multiple targets, were all challenges to be met.

The demonstrated flexibility of the operational Fire Control System Mark 117 instilled confidence in Fire Control Department personnel that these challenges could be met with this new, flexible system. The subsequent development of Mark 117 changes evolved into the first combat control system — Combat Control System Mark 1.

The Mark 1 Combat Control System Development Program, initiated in 1979, was targeted for the new SSN 688 class (SSNs 700-715), as well as back fit on 637 class SSNs.

As a result of these developments, in March 1979, NUSC proposed the formal establishment of a Combat Systems Analysis and Modeling Staff answering directly to the Technical Director.

The request was approved by the chief of Naval Material and signed by James H. Probus, director of Navy Laboratories, on April 3, 1979. The proposed staff would meet the growing Navy needs in the area of total combat system effectiveness and system requirements.

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In the 1980s, the Naval Underwater Systems Center (NUSC) in Newport (left) and the Navy Underwater Sound Laboratory in New London, Connecticut (right) were working as one entity, NUSC. But a Base Realignment and Closure in the 1990s ushered in many changes at the command. (Photos courtesy command newsletters)

Continued from page 53

By the late 1970s, the threat from deep and fast submarines of Soviet naval forces, began to press the limits of the existing Mark 48 performance. The Center immediately responded with a development plan for a Mark 48 expanded operation envelope that would provide the weapon with, among other things, a greater depth capability.

Two months into the program, in June 1979, modified Mark 48 torpedoes were tested at AUTEC to target depths 30% beyond current specified operating depths without any changes to the torpedo hull structure. Concurrently, design changes to the comb filter in the homing control logic were made to expand the outer limits of target Doppler by about 25%. By December, the feasibility of what would be a Mod 4 design was demonstrated through intensive effort, prototype fabrication and certification conducted with an early production model.

NAVAL UNDERWATER SYSTEMS CENTER

In the early 1980s, several important, submarine-related technological developments were emerging at NUSC. These included new submarine-based weapons, enhanced performance for sonar systems, sophisticated microprocessors and the practicality of all-digital central processing for sonar systems.

The weapon developments included the cruise missile, with both submarine torpedo tube and submarine vertical launch potential. In addition, this weapon afforded the submarine the capability of both land and sea target missions, as well as the traditional submarine assignments.

On Nov. 7, 1980, Capt. Vernon C. Honsigner relieved Capt. Alfred S. McLaren as NUSC commanding officer.

By 1980, it was recognized that commercial desktop computers could, in some applications, augment and enhance basic surface ship ASW information handling needs. A NUSC program began implementing off-the-shelf, high-tech computers to improve ASW data handling.

As the analysis staff assignments internal to the Center and those coming from external sponsors increased, staff organizational changes and additions were made. These additions primarily involved existing groups at the Center whose work was closely related to the analysis staff. In September 1981, the staff expanded to include personnel trained in intelligence.

On May 29, 1981, Capt. John W. Ailes IV relieved Honsigner as NUSC commanding officer.

Also in 1981, in addition to the NAVSEA Tomahawk tasking, the Missiles Division began providing direct technical support to the Joint Cruise Missile Project (JCMP) Office. Under JCMP tasking, NUSC supported the submarine Tomahawk technical evaluation by providing analysis of all flight tests, developing launch procedures and providing necessary support during the follow-on operational evaluation. NAVSEA was established as the activity for lifecycle maintenance of the Trident command and control system (TRICCSMA), after NUSC had developed the

Trident Land Based Evaluation Facility and its operating procedures.

Some shipboard applications of commercial desktop computers included collating ASW sensor data, tactical information and mission planning aids into one system for the ASW ships. In 1982, a desktop computer-based tactical operators' performance prediction system (TOPPS) was developed and implemented under the leadership of Michael Pastore. This system provided a real-time assessment of the ship's capability against the threat.

Two years later, sea tests were made of a tactical information command and control system. The purpose of the computer application was to more easily perform the target motion analysis for all threat contacts.

In the early 1980s, NUSC's Surface Ship Sonar Department, then headed by Larry Freeman, developed a program to improve to the SQQ-89 Sonar/Fire Control Integrated Combat System.

The program was called the Surface Ship ASW Advanced Development Program; Bernard Cole and David Ashworth developed many of the concepts. These advanced development efforts included active sonar lower frequency capabilities, reconfigurable multiline towed arrays, longer towed arrays, more system automation, and advanced detection and tracking techniques.

The ADCAP program took off with a goal to achieve initial operating capability in the late 1980s. With a team comprised of 15 to 20 people, the Newport laboratory's Torpedo Propulsion Test Facility — the Navy's principal resource for experimental testing and development of torpedo propulsion systems — was used in the development stages for designing and configuring an advanced model of the proposed torpedo.

Initiated in 1982, the Center's role in a Navy/industry team developing the new system was to provide coordination and technical direction to the entire Navy team and to interface with the industry team.

A major milestone for the electromagnetic capability (EMC) group and the culmination of many years of effort was the publication of the NAVSEA "Handbook of Shipboard Electromagnetic Shielding Practices" in 1982, with a revised version in 1989. This handbook — largely accomplished under the direction of Percival J. Johnson — at the time was the definitive resource for the determination of cable shielding and spacing on Navy platforms.

During the 1970s and early 1980s, many organizational changes took place. The Fire Control Department became the Combat Systems Department, and it in turn merged with the Sonar Department to form a directorate.

Caesar Spero, then deputy technical director, retired in January 1980, and Messere was promoted to the deputy technical director position. These two men left a legacy of excellence that continued over succeeding years. In June 1982, Messere took over as technical director, relieving C. Nicholas Pryor, who had served in the position since July 1975.

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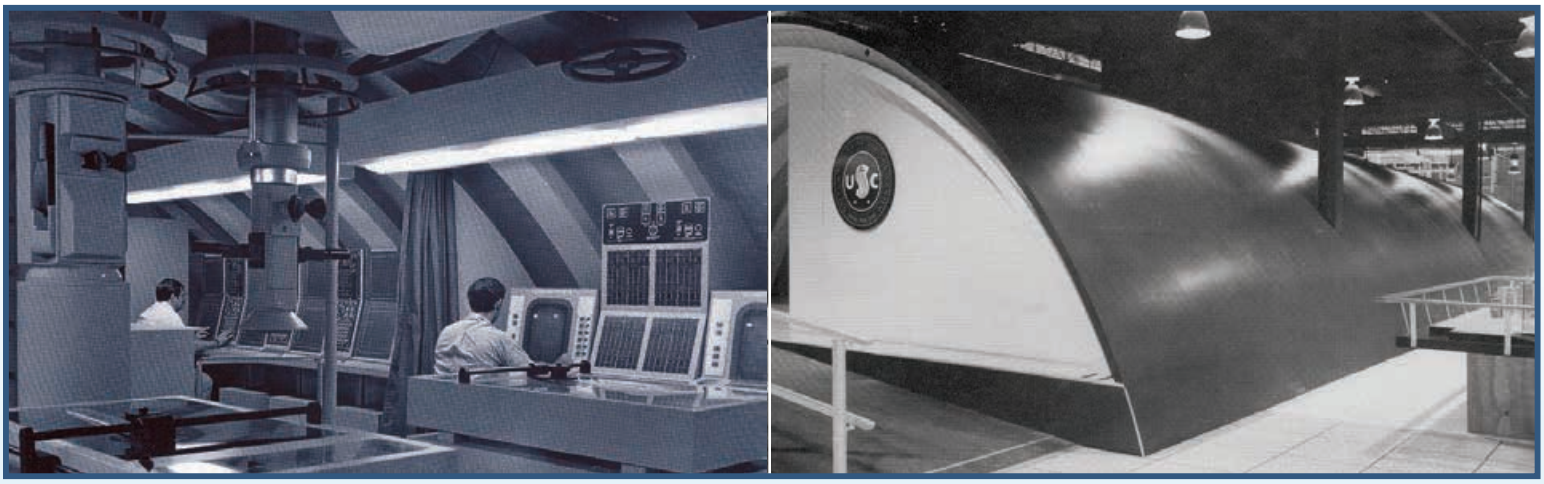

Developed in the 1980s, this test bed was a full-scale submarine mockup for combat system operational evaluation. It was used for both near-term and advanced concepts. Views of the internal (left) and external (right) test setup are shown.

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EMERGENCE OF THE SEAWOLF CLASS

A further opportunity for the Center to participate in the design process for new fast-attack submarine deliberations occurred in 1982. NUSC, along with other Navy research centers, participated broadly in all aspects of the new submarine design cycle sponsored by OPNAV and NAVSEA. NUSC's involvement included combat control and acoustics, electronic support measures, exterior communications (RF systems), periscopes and infrared systems.

These particular design efforts culminated in 1988, when Seawolf (SSN 21) fast-attack submarine procurement began. The procurement plan placed Seawolf in the fiscal year 1989 shipbuilding budget with an industry contract in early 1989. The first submarine itself was scheduled to enter service in the first half of the 1990s.

In 1983, the Central Test and Evaluation Activity (CTEA) in Florida, was renamed the Towed Array Test and Evaluation Facility. It was put under the direction of the Range Management Division of the Test and Evaluation Department of NUSC in Newport.

In 1983, NUSC broke ground on a $4 million, 54,000-square-foot Launcher Systems Laboratory, which opened in 1984.

In 1984, NUSC formally was identified as NAVSEA's technical direction, in-service engineering, design and acquisition agent for all submarine periscopes — roles the Center had been performing de facto for many years.

In the mid-1980s, the placement of NUSC personnel in the field broadened. A Fleet Assistant Program began in which junior professional personnel with three to five years of experience at the Center were provided with development opportunities to serve at fleet commands, both within and outside of the United States.

In 1985, AUTEC hosted Queen Elizabeth II of Great Britain for a tour. In the same year, $28 million was funded for the construction of the Submarine Weapons Systems Integration Laboratory and a new Land-Based Evaluation Facility in Newport to support TRICCSMA.

Also in 1985, a new division, called the Advanced Systems Concepts Division, was created, bringing together several individuals scattered throughout a number of staff positions. The focus of this group was to pull together the various assessment activities in a structured methodology to address investment strategies for force modernization and technology.

The overall advanced combat system development effort was organized in May 1985, into two separate programs. One combat system program, the AN/BSY-1, was adapted for the remaining SSN 688s scheduled for construction. A second combat system, AN/BSY-2, was designed for the Seawolf-class submarines still on the drawing boards.

In 1985, Queen Elizabeth II visited Andros Island to dedicate a rose garden and to tour the Atlantic Undersea Test and Evaluation Center (AUTEC).

Dedicated in April 1988, this supercomputer was at the time the most powerful computer in New England. It supported NUSC's scientific computing needs and its engineering efforts through the Defense Advanced Research Projects Agency (DARPA) worldwide computer network, which was the predecessor of the internet.

When the Submarine Warfare Directorate, headed by Dr. John Sirmalis, was formed in 1986 to further consolidate all weapons system-related programs (torpedoes, mobile targets, tactical missiles, launcher systems and related technology base programs) under a single director, a systems-level focus was instituted for managing the increasingly sophisticated weapons suite of submarines.

As in the case of the 1976 restructuring of the Weapons Department, the Submarine Warfare Directorate more effectively utilized resident technical expertise and specialized facilities. At the same time, it examined emerging technologies such as superconductivity, new propulsion and launcher systems, and unmanned undersea vehicles (UUV).

On April 8, 1988, the NUSC Advanced Scientific and Engineering Computational Center (ASECC) was dedicated. The backbone of the computer system was a CRAY X-MP/28 supercomputer with numerous digital VAX systems in the network. The ASECC could compute up to 200 times faster than any computer at NUSC at that time. While the majority of the computer's workload was unclassified, one of the most important aspects was its ability to process classified data. At its installation, this computer center was the most powerful computer facility operating in New England. Rhode Island's congressional delegates attended the ribbon-cutting ceremony.

In 1988, NUSC completed an intensive, 12-month technical demonstration program for the ADCAP. The program defined specific problem areas, evaluated overall weapon performance, defined technical performance limits and ensured readiness for operational evaluation testing.

USS San Juan (SSN 751), commissioned in August 1988, was the first Los Angeles-class submarine to go to sea with the AN/BSY-1 onboard. The Center's system responsibilities also included the at-sea technical evaluation scheduled for 1990.

A large system with 117 units, the AN/BSY-1 weighed about 32 tons and used five integrated sonar subsystems. Various submarine design iterations for the new class of attack submarine to follow the SSN-688 class were studied and examined.

The NUSC combat system performance and sonar system design team, established in 1984, contributed to the platform design features. The team included, among others, Cort Devoe, Patricia Dean, Robert Garber, Bruce Spear, Howard Schloemer and Robert Manke.

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In 1984, the National Aeronautics and Space Administration (NASA) chose Dr. Paul D. Scully-Power, a senior oceanographer at NUSC, as a payload specialist for the 13th Space Shuttle Challenger mission. He traveled 3.4 million miles in 133 orbits of the earth during the mission.

On June 28, 1985, Capt. Douglas Volgenau assumed command of NUSC, relieving Ailes.

CONTINUED EXPANSION OF COMBAT SYSTEMS

In July 1985, the preliminary design report of the new Seawolf-class submarine was released. This provided the opportunity to implement several maturing combat system technologies and concepts.

Extensive at-sea tests were conducted onboard the USS Augusta, and the first performance data on the wide aperture array (WAA) were available in March 1986. The test results showed that the WAA system could achieve outstanding detection and localization performance.

Subsequently, based on this long-term effort, the acoustics array suite for the Seawolf class included the Center's WAA system. The Martin Marietta Co. in Baltimore, Maryland, as a subcontractor to the prime contractor General Electric, was engaged to build the array portion of the WAA system, in accordance with NUSC's specifications.

Dr. Paul D. Scully-Power, a senior oceanographer at NUSC New London, was chosen by the National Aeronautics and Space Administration (NASA) in 1984, as a payload specialist for the 13th Space Shuttle Challenger mission. He traveled 3.4 million miles in 133 orbits of the earth. Scully-Power (right) is shown with his wife Frances, (holding daughter Tara) and their other children Lincoln (from left), William, Adam, Victoria and Holly. (Photo courtesy New London Day)

On April 29, 1987, Capt. Mario P. Fiori relieved Volgenau as NUSC commander.

Also in 1987, the Surface ASW Directorate was established to advance the Center's surface ship efforts. Larry Freeman was the first head of the directorate, which was staffed with about 350 people. Within the new directorate, an ASW Systems Department and the Environmental and Tactical Support Systems Department provided two principal areas of concentration.

Perhaps the most remarkable example of the power of rapid prototyping to meet Navy needs during this era was project Kingfisher. Initiated in 1988, the project developed a field change to hull-mounted sonar that made them capable of detecting and avoiding mine-sized objects. This was done in response to the sea mine threat in the Persian Gulf.

Led by Kyril Korolenko, a NUSC team assisted by Raytheon engineers developed, tested and fielded this change kit within months of project authorization. The technique proved so successful during operations Desert Shield and Desert Storm that it was incorporated into all ASW sonars and was adapted for commercial use.

In October 1989, the first deployment of a supercomputer aboard a submarine, the USS Augusta, occurred.

During fiscal year 1989, Fiori and Messere issued a letter transferring the Fort Lauderdale Detachment operations to new NUSC facilities in West Palm Beach, Florida.

John Short, who became the Combat Systems Department head after succeeding Messere, initiated efforts related to combat control systems Mark 1 and Mark 2 programs. In 1990, Short was promoted to head the Submarine Combat Systems directorate, and Philip A. LaBrecque Jr. was appointed to head the Combat Systems Department. By that time, the department had grown to approximately 400 people with a wide range of interests and expertise supported by state-of-the-art facilities. In this vein, the Mark 2 program was initiated in 1988.

On Oct. 1, 1991, Capt. Robert L. Mushen became NUWC commander, relieving Fiori.

The New London Laboratory was closed by BRAC action, and the personnel and most functions were moved to Newport. Several major new construction projects provided office, laboratory and test facilities at the Newport site to support the move.

From 1988-92, the Navy program included the construction of 20 Los Angeles-class submarines.

BASE REALIGNMENT AND CLOSURE (BRAC)

In the aftermath of the fall of the Berlin Wall and the dissolution of the Soviet Union, the Navy analyzed the changes in the threats and its resources with an eye to the future to help formulate a new direction.

To help meet the challenges of the strategic shift within an austere budget environment, there was a significant decrease in the number of ships and a Base Realignment and Closure (BRAC) process was implemented. The BRAC directly affected naval research and development laboratories like NUSC.

Over several rounds of realignment and consolidation, the BRAC process resulted in the formation of four major Navy warfare centers — for air, surface, undersea, and command and control. More BRAC rounds, based on the Adolph Commission recommendations of 1991, marked the next several years.

On Jan. 2, 1992, as part of the BRAC process, NUSC in Newport and the Naval Undersea Warfare Engineering Center in Keyport, Washington, were disestablished and restructured as separate divisions of the new Naval Undersea Warfare Center (NUWC), with Center headquarters co-located with NUWC Division Newport in Rhode Island.

NUSC New London became a detachment of Division Newport, but that would not last. It was disestablished in 1995, and its functions and personnel were moved to Division Newport over the course of the next two years. In this consolidation, lightweight torpedo development projects moved to Division Newport, and lightweight torpedo maintenance and fleet support moved to Division Keyport.

Rear Adm. William C. Carlson served as commander and Messere as technical director of NUWC, with Messere's title changed later to executive director. Sirmalis, who had headed the Weapons Directorate at NUSC, was named to the lead civilian vacancy at Newport. He was formally appointed technical director on Aug. 6, 1995, after Messere's title was changed.

Mushen continued as commander of NUWC Division Newport until Aug. 12, 1994, when, at a change of command ceremony, he retired and Capt. Stephen J. Logue became Division Newport's commander.

In 1995, as missions were further realigned, the NAVSEA Naval Combat Systems Engineering Station in Norfolk, Virginia, and the Naval Research Laboratory (NRL) Underwater Sound Reference Division, Detachment Orlando, in Florida, also were incorporated into the Division Newport organization.

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On May 20, 1996, a ribbon-cutting ceremony was held to commemorate the formal opening of the Submarine Electromagnetic Systems Laboratory. The 93,000-square-foot building was designed to be the Navy's principal research facility for submarine communications systems, electronic warfare systems, electro-optic systems and periscope systems. The project cost an estimated $13.8 million.

When the facility opened, it marked the first major move of personnel from New London as a result of BRAC. The building housed close to 200 technical and support personnel, whose assignments ranged from developing technology for electromagnetic system techniques and components to evaluation of prototype systems aboard operational submarines.

The testing of OTTO-fueled torpedo propulsion systems resumed at the end of June 1996, with the test of a Mark 46 torpedo. This was the first land-based test conducted by the Division of this system since an explosion in February 1995, during the testing of a Mark 48 ADCAP torpedo (see below).

On Oct. 4, 1996, a decommissioning ceremony was held at the New London, detachment to recognize the laboratory's "51 years of excellence." The detachment was to be closed by Dec. 31 with an operational closure date set for March 31, 1997.

"This occasion, though sad, is not an ending, but the beginning of memories of achievements and milestones," Navy chaplain Cmdr. Ernest W. Holland said at the ceremony.

Also in October 1996, Juergen Keil was selected as the executive director of NUWC Division Newport. He had been acting executive director for the past 18 months.

The effects of BRAC continued to be felt in 1997, with the decommissioning of the Orlando, detachment on Jan. 22. About 20 people relocated from Orlando to Newport between the decommissioning and the operational closure on Sept. 20.

On July 19, 1997, the first Seawolf class submarine was commissioned — a major milestone for both Division Newport and the Navy.

BIRTH OF ARTIFICIAL INTELLIGENCE

Despite the reductions, NUWC engineers and scientists continued to push the boundaries of what is possible. An August 1997 article in a command newsletter described the efforts of the Cognitive Neuroscience (CNS) group to design an intelligent sonar system as the first steps toward a larger Fully Automated Systems Technology With Adaptive Reasoning (FASTWAR).

A section of the roof on the Deep Depth Test Facility in Building 179 blew out after an explosion on Feb. 24, 1995. (Photo published in April 1995 'NUWSCOPE')

Explosion in Deep Depth Test Facility

On Feb. 24, 1995, a mishap occurred in the Deep Depth Test Facility in Building 179 during a high-energy research and development test run of a Mark 48 Advanced Capability (ADCAP) torpedo propulsion system.

To evaluate the performance of a longer burning startup grain, a torpedo had been running normally for about 12 minutes, consuming about 75% of its total fuel load, when it exploded. The energy release and pieces of a pressure vessel knocked holes in the reinforced concrete roof and two side walls of one test cell. The fourth fiberglass wall blew out as designed, allowing for the directional release of pressure from the test cell across a safety area.

No one was killed in the mishap, but a perimeter guard suffered partial loss of hearing in one ear because of the sound of the blast. The environmental impact of the accident was minimal, but the cost estimate of damage to government assets was $3.3 million.

— Source: 'NUWSCOPE,' April 1995

On May 20, 1996, a ribbon-cutting ceremony was held to commemorate the formal opening of the Submarine Electromagnetic Systems Laboratory (left photo). In the late 1990s and 2000s, a number of new buildings opened at the Naval Undersea Warfare Center Division Newport as the center continued to expand both in size and capabilities. (Photo courtesy of command newsletters)

The groups described CNS as the study of human brains with the ultimate goal of modeling its functions and capabilities — what we refer to today as artificial intelligence.

On Aug. 11, 1997, a new evolution in heavyweight torpedo capability was introduced with the Mark 48 Mod 6 advanced capability (ADCAP) torpedo. The new warshot was loaded onto the USS Alexandria and debuted at Naval Submarine Base, New London.

The Mark 48 Mod 6 provided significant operational improvements in the area of radiated noise, shallow water performance and hardware capability compared to the Mod 5.

In September 1997, NUWC set a new national submerged speed record with special bullets designed for high performance underwater. In a test held in the Supercavitating High-Speed Bodies Test Range, the bullets' launch velocity exceeded the speed of sound in water, approximately 1,500 meters per second.

On Oct. 1, 1997, the new Engineering, Test and Evaluation Department was stood up with Dick Bonin leading the department.

By the end of 1997, the last of the transfers from New London were completed with the expansion of the Electromagnetic Sensor Test Facility and construction of Submarine Antenna Over-Watch Arch Facility on Pier 2. This completed the requirements set forth by BRAC.

A ribbon-cutting ceremony was held Jan. 21, 1998, for the opening of the Acoustic Pressure Tank Facility. The 400-ton pressure tank was shipped by barge in the previous year from the Underwater Sound Reference Division in Orlando.

On March 30, 1998, Rear Adm. John Shipway stepped down as NUWC commander to assume responsibilities as director, Strategic Systems Program. In his stead, Technical Director Dr. John Sirmalis assumed command. Sirmalis would cede that position to Rear Adm. Charles B. Young on Oct. 15 of that year.

On May 26, 1998, a groundbreaking ceremony was held for MILCON P-070, the Undersea Weapons Systems Laboratory.

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THE INTERNET ERA

In May 1998, the Technical Library achieved a significant milestone in establishing desktop access to the library via the installation's intranet.

During this time, the internet was revolutionizing what could be done at Division Newport as far as information sharing. Another example was the Electronic Document Management System (EDMS), which among other things, contained selected documents on heavyweight torpedoes. These documents included the most frequently used by intermediary maintenance activities (IMAs) for preparation, turnaround and test equipment maintenance for the Mark 48, Mod 4, 5 and 6 torpedoes.

Benefits also were realized in the way in which people learned with the advent of online training and education.

On. Aug. 18, 1998, Capt. Walter Elliott relieved Capt. Stephen Logue as commander, NUWC Division Newport. Logue had commanded the division since Aug. 12, 1994, and served in the Navy for 26 years.

On Oct. 15, 1998, a joint team consisting of the Program Management Office for Unmanned Undersea Vehicles (PMS403), Division Newport, and Raytheon Naval and Maritime Systems (NAMS) successfully completed the system critical design review of the Mark 30 Mod 2 antisubmarine warfare training target system. This system was designed to replace the Mark 30 Mod 1 and serve as the fleet's heavyweight training target of choice in the next century.

On Friday, April 16, 1999, the Navy concluded Phase 2 of Fleet Battle Experiment Echo (FBE-E), the fifth in a series of major at-sea exercises designed to help U.S. forces achieve "network-centric" warfare capability within the next decade.

This exercise was significant because it demonstrated the power of advancements in information warfare through the ability to monitor a major fleet exercise using internet technology. During the exercise, personnel at Division Newport observed from a remote, simulated command center set up in the Warfare System Presentation Facility.

Online, real-time connectivity through U.S. Pacific Fleet and Commander Task Force 12 facilities provided an instantaneous view of the naval operations planning and execution during the experiment.

A July 1999 NUWSCOPE article outlined what Division Newport was doing to prepare for Y2K. The article, "Y2K: What we're doing about it — a Navy lab and range perspective," outlined that the Department of Defense's initiative to prepare for this began in 1995, and largely consisted of cataloguing inventory. The fear at the time was that after Dec. 31, 1999,

The Technical Library, shown above in 1999, offered a suite of research tools via an intranet and became a model electronic library for the U.S. Navy.

Within hours of the Sept. 11, 2001, terrorist attacks, Newport and New London bases were placed on Force Protection Threat Condition Delta. A National Day of Prayer and Remembrance Ceremony was held on Sept. 14 in Newport.

all computers would stop working worldwide and all information on them would be lost. In reality, very few computer failures were reported worldwide and none at Division Newport when the clocks rolled over into the year 2000.

On Oct. 31, 1999, Division Newport's Building 80 gymnasium was used as a media center after EgyptAir Flight 990 crashed into the Atlantic Ocean about 60 miles south of Nantucket. More than 170 media representatives from around the world were stationed at Building 80.

Debris and remains from the flight were taken to the former Naval Air Station at Quonset Point, while media and families of victims went to Newport. All 217 passengers and crewmembers were killed in the crash. On Sept. 15, 2000, a change of command and retirement ceremony was held for Capt. Walt Elliott, who was relieved by Capt. Patrick Bloomfield. The ceremony was held in the auditorium of the new John H. Chafee Undersea Weapons Systems Laboratory. The building was dedicated just four days earlier to Senator Chafee, who died in late 1999.

Secretary of the Navy Richard Danzig announced on Oct. 6, 2000, that a $6.9 billion contract had been awarded to build and maintain a department-wide Navy-Marine Corps Intranet (NMCI). Division Newport began the transition process the next year and it was completed Oct. 1, 2001. The system is still in operation today.

A significant milestone was achieved in the development of the Manta Test Vehicle (MTV) with a successful endurance test in the Propulsion Test Facility on March 15, 2001. Division Newport and the UUV Branch had been developing the Manta since the 1990s.

"This bold new concept involves new sensing methods as well as seamless connectivity between surface, subsurface and aerial platforming," engineer Scott Osterman wrote at the time. "The MTV is capable of operating in shallow-water environments, providing a cost-effective means to evaluate and test various payloads and advanced technologies."

Rear Adm. (select) John D. Butler relieved Rear Adm. Charles B. Young as NUWC Headquarters commander at a change of command ceremony held at Division Newport on July 27, 2001.

TERRORIST ATTACKS ON SEPT. 11, 2001

Within hours of the terrorist attacks on Sept. 11, 2001, Division Newport was placed on Force Protection Threat Condition Delta, which sent all but essential personnel home. Two days later on Sept. 13, employees returned to work under THREATCON Charlie at staggered reporting times to aid in traffic flow with increased security at the gates.

On Sept. 14, A National Day of Prayer and Remembrance Ceremony was held in Newport.

"The horror of war and what our military forces have faced throughout their history and will continue to face has, for the first time, been driven home to the civilian sector," Juergen G. Keil, NUWC Division Newport executive director, told the crowd of more than 200 in attendance. "As we grieve it is important to stay focused on our job — providing the fleet with the capability they need as they stand by to execute whatever orders the President puts forward in response to this act of war taken against our beloved country."

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Pat Dean receives civilian service award posthumously

At a memorial tribute to Pat Dean, held on February 13 in the Chafee Auditorium, the late head of the Surface Undersea Warfare Department was presented with one of the Navy's highest honors—the Superior Civilian Service Award. Don McCormack, Acting Executive Director, presented the award on behalf of NAVSEA Commander Vice Adm. Phillip Balisle.

The citation stated, in part, that the award was presented to Dean "in recognition of her significant technical and managerial achievements and her exemplary service to the Navy and to the Command. Her 26-year career has been characterized by her dedication, resourcefulness, and an unrelenting drive to keep the U.S. at the forefront of technological development. She has contributed significantly to the development of undersea warfare system engineering and is a pioneer in acquisition reform. Programs such as the AN/BSY-2 and VIRGINIA Submarine Combat Systems, which are of major significance to the Command, to the Navy, and to the Nation's defense, have benefited from her outstanding skill and personal dedication as systems engineer. She has also led efforts in programs including the DD(X) and SPARTAN Unmanned Surface Vehicle, which promise to deliver unparalleled capabilities to the Navy of the future. Establishing open communications with a network that includes co-workers, defense contractors, and Navy leaders, she has repeatedly built and led highly effective teams that develop capable, affordable systems and meet ship schedules under the challenge of acquisition reform. Under her superb leadership, these teams have been focused on innovation, continuous product improvement, and awareness of customer needs. Ms. Dean's technological contributions and her innate ability to effectively manage and mentor a very diverse workforce are invaluable assets to the organization and to the U.S. Navy.

Pat Dean

Because of her extraordinary technical insight and demonstrated managerial abilities, Ms. Dean has served as a role model for the entire organization."

Dean passed away on January 25, 2003, at age 53. ❑

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On Nov. 19, 2001, a ribbon-cutting ceremony was held to open the $9.3 million, 47,500-square-foot Undersea Battlespace Laboratory.

On Oct. 9, 2002, Dick Bonin was selected as Division Newport technical director after more than three decades at NUWC.

By the end of 2002, the effects of Sea Power 21 were beginning to take hold. Sea Power 21, first introduced in a June 2002 speech by Chief of Naval Operations Adm. Vern Clark at the Naval War College, was a strategic vision to align efforts, accelerate progress and realize the potential of the Navy's people.

It was described as having three major components: Sea Strike (projecting decisive combat power when needed and by whatever means necessary), Sea Shield (projecting defense power from the sea) and Sea Basing (operating the fleet as bases around the world with the capabilities to respond at a moment's notice). In turn, this presented realignment challenges at Division Newport in the years to come.

On Dec. 4, 2002, Rear Adm. William G. Timme was assigned by CNO as NUWC commander, relieving Rear Adm. John D. Butler. A change of command ceremony took place in Building 80 on Jan. 9, 2003.

That mood of celebration soon shifted to mourning after the death of Patricia Dean on Jan. 25, 2003, at age 53. Dean, who had retired earlier that month after a 27-year career at NUWC, was described as a trailblazer for women engineers. Dean began her career as an electrical engineer in the New London detachment and became the first woman in Division Newport to rise to the rank of GS-15. She also was Newport's first female member of the Senior Executive Service (SES) and served as acting technical director from June 2002 until her retirement. During this time, she was dual-hatted as the head of the Surface Undersea Warfare Department as well. In February 2003, Dean posthumously received the Superior Civilian Service Award.

On May 4, 2003, Don McCormack, SES, was selected as NUWC Division Newport executive director after serving in the same role on an acting basis for the previous year. A reorganization of NAVSEA leadership in October 2003 eliminated the position and McCormack was selected to lead the USW Command and Control product area. He later returned as technical director of NUWC after Bonin's retirement in November 2004.

McCormack's position was not the only one affected, as the realignment had reaching effects throughout the warfare center — such as the creation of the Sensors and Sonar Systems Department. These changes, attributed to Sea Power 21, also led to Don Aker being

named Division Newport technical operations manager on March 26, 2004.

ADVANCEMENTS IN CAPABILITIES AND LETHALITY

A cross-departmental team developed a method to fabricate a magnesium-titanium template for a magnesium-hydrogen peroxide fuel cell in October 2003. Also during this time, NUWC developed a prototype countermeasure transducer using single crystals.

In December 2003, the Spartan Scout, a modular, reconfigurable, multi-mission, high-speed, semi-autonomous unmanned surface vehicle, received high praise in its first deployment with the fleet aboard the USS Gettysburg (CG-64). The technology was developed under the direction of Division Newport.

In March 2004, a major milestone was achieved in the Tomahawk program when the first of this type of missile was launched from a submarine torpedo tube. Previously, launch had only been possible from the vertical launcher system. Advancements continued with this weapon, as the following month a new capability was demonstrated when there was successful communication between the submarine and missile after launch.

On April 13, 2004, the latest version of the Mark 48 torpedo, the Mod 6, was successfully tested during the Ship Sinking Exercise (SINKEX) when a single torpedo sent the ex-John Young to the bottom of the Pacific Ocean.

On June 4, 2004, a change of command ceremony was held as Rear Adm. Stephen E. Johnson relieved Timme.

In October 2004, full production of the Mark 54 lightweight torpedo was approved. Described as the "lightweight torpedo of the 21st century" at the time, the Mark 48 was a highly capable, shallow-water, lightweight torpedo with minimized development, procurement and ownerships costs.

On Aug. 5, 2005, Capt. Michael W. Byman relieved Capt. John Mickey as Division Newport commander in a change of command ceremony. Mickey had served in that role since Aug. 28, 2002.

The Common Broadband Advanced Sonar System (CBASS) for the Mark 48, Mod 7 torpedo successfully completed the first of two tests off the coast of Australia in December 2005.

On Aug. 25, 2006, Rear Adm. John Elnitsky assumed command of NUWC in a change of command ceremony. McCormack had served at the operational commander since May 8 of that year after Rear Adm. Stephen E. Johnson accepted a new assignment as director of Strategic Programs. Elnitsky only stayed in the position until Dec. 21, 2007, when he left to become director of the Deep Submergence Branch of the CNO's staff. Rear Adm. Thomas J. Eccles assumed command on March 2, 2007.

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In December 2003, the Spartan Scout, a modular, reconfigurable, multi-mission, high-speed, semi-autonomous unmanned surface vehicle, received high praise in its first deployment with the fleet aboard the USS Gettysburg (CG-64).

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Also in August 2006, a significant breakthrough came with the developments of the Tomahawk All-Up Round Simulator (AURS) and Mark 112 All-Up-Round Electronic Simulator (AURES) for the Ohio-class SSGN Submarine Program Office.

In January 2007, it was reported that members of the Engineering and Diving Support Unit conducted a series of successful tests of new swimmer detection systems.

On Feb. 23, 2007, a ribbon-cutting ceremony was held for the opening of the Missiles and Autonomous Systems Laboratory. The project to build the 100,000 square-foot facility took nearly five years to complete at a cost of $20.5 million.

In March 2007, NewPortal debuted as Division Newport's primary knowledge-sharing platform. It was seen at the time as a significant advancement from the previous platform, Knowledgenet.

On April 5, 2007, Division Newport contracted with the University of Rhode Island (URI) to establish the first Center of Excellence in Undersea Technology in the country. The center's mission was to establish cooperative research, product development, technology transfer, science and technology training, and educational alliances between NUWC and other center partners. Its initial project was focused on designing and building an undersea distributed network system. In May 2007, Dr. Paul Lefebvre was selected to be the technical director of Division Newport as a part of organizational realignment. In turn, Aker was named deputy technical director.

Also in May 2007, the Ohio-class Guided Missile Submarines (SSGN) program completed a major milestone with the successful demonstration of two new capabilities: Launching conventional Tomahawk Land Attack Missiles (TLAMs) and deploying Special Operations Forces (SOFs) from a submarine.

On July 31, 2007, a change of command ceremony was held as Rear Adm. Patrick H. Brady relieved Rear Adm. Eccles as NUWC commander. Brady served in that role until Sept. 19, 2008, when Rear Adm. David Johnson relieved him.

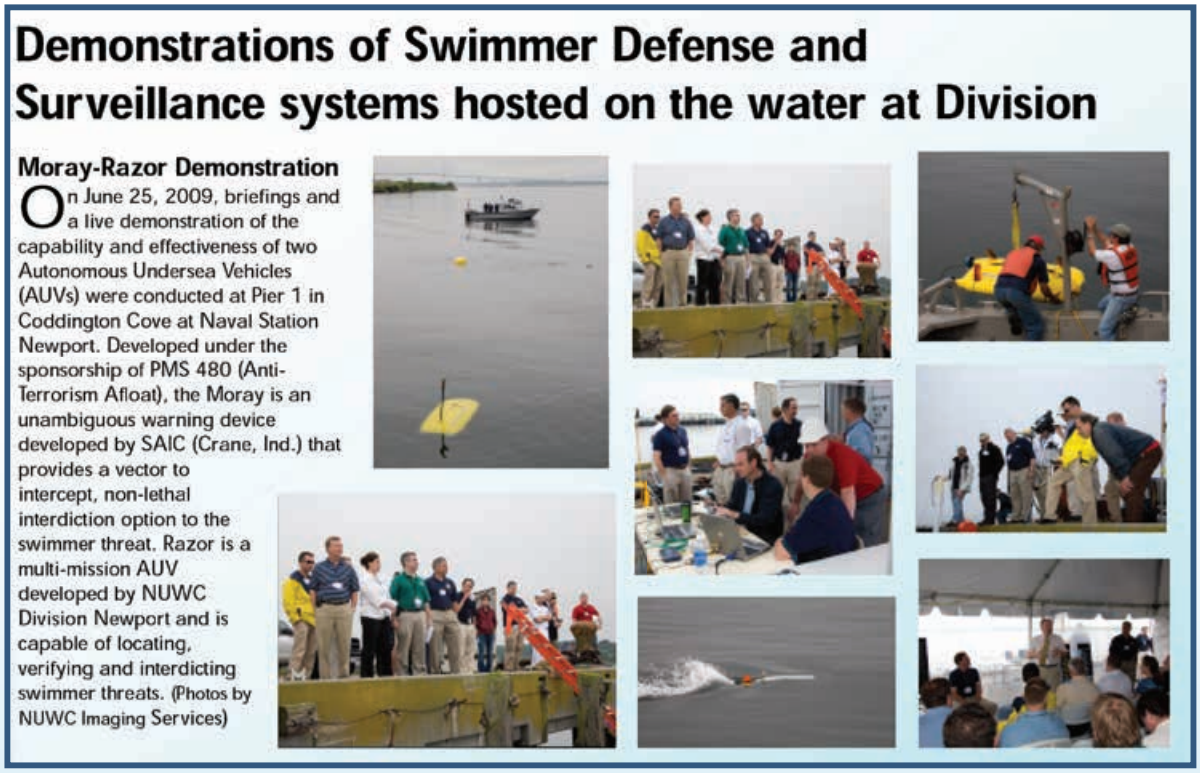
In September 2007, NUWC supported the first-ever tactical weapons onload for the SSGN platform. The two all-up rounds were loaded onto a submarine in Port Hadlock, Washington.

As of Oct. 1, 2007, Division Newport employed 2,329 people with an economic impact of $466 million.

Also in October 2007, the AN/BLQ-11 Mine Reconnaissance System successfully conducted at-sea launch and recovery of a UUV. The system, which uses a robotic arm to retrieve the UUV, had been in development for a decade.

In 2008, Division Newport's economic impact topped the half-billion mark with more than $531 million spent in payroll, construction, facility support and local contracts. At this time, there were approximately 2,572 civilian personnel and 30 military staff members.

In 2009, Division Newport celebrated its 140th anniversary with a series of special events throughout the year. Some of the



Live demonstrations of the Razor held in June 2009 display some of the cutting-edge technology developed at NUWC Division Newport.

A ribbon-cutting ceremony for the Undersea Collaboration & Technology Outreach Center was one of the many events held in July 2009 to commemorate the Division's 140th anniversary. Pictured are Don Aker (from left), deputy technical director; Commanding Officer Capt. Michael Byman; Technical Director Dr. Paul Lefebvre; Kelly Ross, corporate operations officer; and Mary Sylvia, outreach center project coordinator.

events included a coastline/base cleanup; golf tournament; 5K walk/run; reception at Newport County Chamber of Commerce; and the dedication of a new collaboration and outreach facility in Building 80 on July 31.

In March 2009, the Combat Systems Department held a Lean event through the Linden Labs program Second Life. This meeting in the virtual NUWC Conference Room was an early step toward the development of the NUWC Virtual Worlds program.

On April 9, 2009, Division Newport secured $9.9 million in funding toward construction of an unmanned antisubmarine warfare support facility on the pier at Stillwater Basin.

On June 23, 2009, the first five submarines of the Navy's newest class of submarines, the Virginia class (SSN 774), were named "operationally effective" and "operationally suitable" by Commander, Operational Test and Evaluation Force (COTF). Division Newport played a critical role in the development of this class of submarine over the course of the previous decade.

A change of command ceremony was held Nov. 4, 2009, as Rear Adm. Thomas G. Wears relieved Rear Adm. Johnson as NUWC Commander.

In early 2010, Division Newport's economic impact numbers for 2009 were released. The total funded programs reached an all-time high of $1.03 billion, with more than $639 million spent on payroll, construction, facility support and local contracts. Division Newport added approximately 200 new employees in 2009, increasing its total to 2,683 government civilian employees and 30 military members. In addition to the government workforce, NUWC Division Newport contracted for approximately 3,000 work years during 2009 from companies located in Rhode Island, Massachusetts and Connecticut, its combined government and contractor workforce to more than 6,000 positions.

Another focus around this time was becoming more environmentally friendly as an organization and Navy. Some methods were as simple as cutting electricity costs, raising awareness and increasing recycling habits, while others were more in-depth. One such instance was in May 2010, when the USS Nevada became the first submarine to be painted with heavy-metal-free antifouling paint, thanks to a collaboration between Division Newport researchers Dr. Wayne Tucker and Dr. Thomas Ramotowski and Sherwin Williams Paint Co.

On July 16, 2010, a change of command was held as Capt. Todd W. Cramer relieved Byman as Division Newport commanding officer.

On Oct. 28, 2010, a groundbreaking ceremony was held for the start of $6 million in renovations on an Unmanned Antisubmarine Warfare Support Facility. Once again, Division Newport funding reached an all-time high in 2010 with a budget of $1.1 billion. Employment also increased at this time to 2,758 government civilian employees and 30 military members. In addition to the government workforce, NUWC Division Newport contracted for approximately 3,000 work years during 2010 from companies located in Rhode Island, Massachusetts and Connecticut, bringing its combined government and contractor workforce to more than 5,700 positions.

On Aug. 16, 2011, a ribbon-cutting ceremony was held for the Maritime Subsurface Sensor Operations Laboratory. Under construction since July 31, 2009, the 40,000-square-foot facility cost $11 million to build. In December 2011, the command followed Navy guidance to enter the world of social media and created a Facebook page that was linked to a Twitter account. The command's newsletter launched its first digital issue in January 2012, which soon replaced the printed monthly newsletter.

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The total funded programs of Division Newport exceeded $1.1 billion in 2011 for the second consecutive year. NUWC Division Newport's employee base included 2,752 government civilian employees and 34 military members with a total gross payroll of more than $280 million. Of the full-time government civilian staff, 74% were classified as scientists or engineers and approximately 37% had graduate degrees. In addition to the government workforce, NUWC Division Newport contracted for approximately 2,650 work years during 2011 from companies located in Rhode Island, Massachusetts and Connecticut, bringing its combined government and contractor workforce to more than 5,400 positions.

In 2012, Division Newport committed to the Environmental Protection Agency's (EPA) Federal Green Challenge to reduce its environmental impact. A goal to reduce Division Newport's waste generation and energy usage by more than 5% was set.

NUWC Division Newport dedicated a $24.9 million Virginia Payload Tube Facility (VPTF), aimed at defining payloads for future missions, with a ribbon-cutting ceremony on Oct. 15, 2014. The ceremony was attended by Sen. Jack Reed, Rep. Jim Langevin, R.I. Gov. Lincoln Chafee and other dignitaries.

On Jan. 15, 2012, Mary Wohlgemuth was selected as Division Newport's new technical director, the first woman to be named to that position. She replaced Dr. Paul Lefebvre, who retired after more than 31 years at Division Newport — the last five as technical director.

NEW FACILITIES

In February 2012, installation of the Navy's first fully capable Virginia Block III Weapon Launch System (WLS) in the Launcher Laboratory was completed. Included in the extensive preparation required for delivery of the system was arranging transport of a large, nearly 10,000-pound component to NUWC from the vendor, Electric Boat, in Groton, Connecticut, as well as the shipment of the 95,000-pound prototype of the VPT by barge across Narragansett Bay from Quonset Point.

The tube ultimately was installed by crane on Nov. 20 and a ribbon-cutting ceremony marking the opening of the $24.9 million facility was held on Oct. 15, 2014. During three days of testing at NAVAIR's Patuxent River Test Range in Maryland, from Oct. 22-24, 2012, a NAVSEA Warfare Center team remotely fired missiles from an unmanned surface vehicle (USV) — a U.S. Navy first. Division Newport played a critical role in the development of the project along with Naval Surface Warfare Centers Crane and Dahlgren.

In 2012, the total funded program of Division Newport exceeded $935 million, with more than $581 million spent in payroll, construction, facility support and local contracts. The command was the largest federal activity in the state in terms of personnel and payroll. NUWC Newport's employee base included 2,748 government civilian employees and 31 military members with a total gross payroll of more than $296 million. Of the full-time government civilian staff, 74% were classified as scientists or engineers and approximately 36% had graduate degrees. In addition to the government workforce, Division Newport contracted for approximately 1,950 work years during 2012 from companies located in Rhode Island, Massachusetts and Connecticut, bringing its combined government and contractor workforce to nearly 4,700 positions.

In August 2013, Division Newport, in conjunction with Harvard Medical School, announced that it had designed and developed an imaging system for biomedical analysis that provides accurate bacterial cell counts using a shadow-imaging technique for detection

Naval Undersea Warfare Center Division Newport has grown substantially since its formation as the Naval Torpedo Station on July 29, 1869. Shown above in an aerial photo in 2015, the warfare center is equipped with cutting-edge technology and facilities, and the best and brightest employees in various fields. As has been the case for more than 150 years, NUWC Division Newport is committed to ensuring undersea superiority yesterday, today and tomorrow!

and diagnosis of diseases, including AIDS, malaria, cholera, lymphoma and typhoid.

In this new technology, a software-based feature characterization algorithm was utilized to capture and count microscopic cells for application as a biomedical device for screening samples for pathogens, infected cells, abnormal lymphocytes and other purposes.

On the morning of Sept. 16, 2013, Aaron Alexis fatally shot 12 people and injured three others in a mass shooting at NAVSEA headquarters inside the Washington Navy Yard in Washington, D.C.

Alexis, who in the month prior had been stationed at Naval Station Newport and working on the NUWC campus, was killed by police around 9:25 a.m., but not before committing the second-deadliest mass murder on a U.S. military base in history.

The events at the Washington Navy Yard had a ripple effect throughout NAVSEA, leading to an increase in safety precautions and training across the command, including Division Newport. The day after the shootings, then-Secretary of the Navy Ray Mabus directed a rapid review of Navy and Marine Corps' security procedures at military bases in the U.S.

On April 7, 2014, a ribbon-cutting ceremony was held for the opening of the $24.3 million, 54,000-square-foot Electromagnetic Sensor Facility.

On Monday, July 28, 2014, NewPortal V3 replaced NUWC Division Newport's main intranet site, NewPortal V2. The updated portal was built with SharePoint 2010 to provide a more feature-rich, user-friendly environment.

In 2014, Division Newport maintained its position as one of the state's largest employers, with a total operating budget of more than $933.6 million and more than 4,800 government civilian employees, contractors and military personnel. In addition to the government workforce, Division Newport contracted for approximately 2,384 work years during 2014 from companies located in Rhode Island, Massachusetts and Connecticut, bringing its combined government and contractor workforce to more than 5,100 positions.

Section 219 of the Duncan Hunter National Defense Authorization Act continued to provide a viable avenue of funding to keep the science and technology workforce strong. In 2014, Division Newport used Section 219 to fund approximately 88 initiatives. Of the $8-million allocation, 32% supported innovative basic and applied research, 35% funded projects that had the potential to transition technologies into operational use, and 33% supported workforce development initiatives to maintain technical stewardship areas and to improve the capacity to recruit and retain science and technology personnel.

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Funding through the In-House Independent Research (ILIR) and Independent Applied Research (IAR) programs also provided support for a variety of projects. Among the highlights were determining the effects of acoustic transmission to beaked whales, improving the damage tolerance of laminated, woven composite materials and development of improved and more accurate methods for determining drag on towed arrays.

On Sept. 19, 2014, a change of command was held as Rear Adm. Michael Jabaley relieved Rear Adm. David M. Duryea as commander of NUWC headquarters.

In October 2014, Division Newport's workforce participated in the center's first Rapid Innovation Center Event (RICE) dubbed "Hacking for Undersea Technical Excellence." Division Newport used the event — considered the division's first Hackathon — to inaugurate the new Rapid Innovation Center (RIC), a workspace designed to encourage innovation and creative thinking. In 2015, Division Newport's first Cyber Challenge was hosted in the RIC.

STATE-OF-THE-ART FACILITIES

State-of-the-art software and equipment such as tablets, high-performance computers, wireless systems, cameras and imaging equipment, Oculus Rift (virtual reality headset), a 3D printer and scanner, Raspberry Pi (a credit card-sized microcontroller), iPads, iPods, iMacs, Android tablets, large touch screens, displays with multi-touch capabilities, wireless intrusion detection system and various gaming systems became available for employees to utilize.

In November 2014, Capt. Howard S. Goldman became commanding officer of Division Newport, relieving Cramer.

In 2015, the total funded program of Division Newport was approximately $961 million. Of its total operating budget, more than $650.4 million was spent in payroll, construction, facility support and local contracts. Division Newport's employee base included 2,960 government civilian employees and 29 military members with a total gross payroll of more than $284 million.

On Jan. 27, 2015, Division Newport was closed for the day because of a blizzard that dumped 15-28 inches of snow across the state from Jan. 26-27. The storm ranked No. 4 on the top 10 list of snowstorms for Providence all-time, and marked the first time the base had closed since 2005, also for a blizzard.

A change of command ceremony was held on Friday, July 31, 2015, when Rear Adm. Moises DelToro III relieved Jabaley as commander at NUWC Headquarters.

Division Newport employees Deborah O'Connor (from left), Matthew Puterio, Ray Rowland and Tim Nolan participate in demonstrations of capabilities of Rapid Innovation Center on April 29, 2015. (Photo by Rich Allen, McLaughlin Research Corp.)

NUWC Headquarters Commander Rear Adm. Moises DelToro III (from left) presided over a change of command ceremony on March 17, 2017, when Capt. Geoffrey deBeauclair was relieved by Capt. Michael Coughlin. Coughlin served as NUWC Division Newport commanding officer until May 15, 2020.

THE BIRTH OF ANTX

From Aug. 10-14, 2015, Division Newport hosted the first Advanced Naval Technology Exercise (ANTX). The weeklong showcase of Undersea Constellation technology from Division Newport, Naval Surface Warfare Center Carderock Division (NSWCCD) and SPAWAR Systems Center Pacific (SSC PAC) was held at the Stillwater Basin Test Facility on Narragansett Bay. From this first year, ANTX has grown exponentially into an annual event with hundreds of attendees gathering to witness dozens of technologies.

In December 2015, work on the Virginia Payload Tube Facility was completed, allowing for true end-to-end testing for the Tomahawk weapons system. The project's initial design and development effort began in 2010.

In early 2016, Division Newport began working with a new social media tool, Fusion. Developed by Space and Naval Warfare Command (SPAWAR) Systems Center Pacific, Fusion shares similarities with Facebook and Twitter in that each user sets up a profile with interests, skills, projects — possibly a photo — but it is geared specifically toward increasing communication between warfare center personnel.

On March 1, 2016, the Corporate Research and Information Center (CRIC) launched Research Commons, a dynamic, comprehensive and user-friendly information portal that also serves as a digital space for collaboration and networking.

On May 26, 2016, Division Newport entered into a partnership intermediary agreement (PIA) with the city of Newport to promote cooperative activities between Division Newport and small business firms and educational institutions served by Newport. This was the first agreement of its kind to be signed by an entity in Rhode Island and helped lead to the construction of Innovate Newport, which opened at the former Sheffield School three years later on June 3, 2019.

Overall in 2016, Division Newport's funding and workforce increased from the previous year. The total funded programs of Division Newport reached $1.07 billion in 2016 with an employee base of 3,135 government civilian employees and 34 military members. From 2014-16, Division Newport hired more than 800 new employees.

In addition to the government workforce, NUWC Division Newport contracted for approximately 2,289 work years during 2016 from companies located in Rhode Island, Massachusetts and Connecticut, bringing its combined government and contractor workforce to more than 5,400 positions.

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On March 17, 2017, a change of command was held as Capt. Michael Coughlin relieved Capt. Geoffrey G. deBeauclair as commanding officer of Division Newport. DeBeauclair, who had served as commanding officer since June 2016, after relieving Goldman, retired after 30 years of U.S. Navy service.

After the transfer of technical director Wohlgemuth on May 27, 2017, to the Department of Commerce, a rotating schedule of acting technical directors was established. Each of the technical department heads at that time, David Grande, Ron Vien, Dr. Brian McKeon, Marie Bussiere, Eric Spigel and Dr. Gerard Exley rotated at two-month intervals as technical director.

COMMUNITY PARTNERSHIPS

On April 13, 2017, Division Newport and URI's Business Engagement Center (BEC) signed a partnership agreement to promote collaboration between the institutions focused on a shared mission to assist small business development and technology commercialization in Rhode Island and the region. A signing ceremony to mark the agreement was held at the URI Alumni Center.

The first of its kind for the university, the agreement formalized the relationship between the university and NUWC to promote cooperative activities related to the Department of Defense, undersea technology and marine industries. This included initiatives and educational events, as well as workforce and economic development in the state.

On June 27, 2017, URI President David Dooley and Coughlin signed an education partnership agreement (EPA) for undersea research during a brief ceremony at Division Newport.

In 2017, the total funded programs of NUWC Division Newport reached $1.17 billion and its employee base included 3,212 government civilian employees and 41 military members. Also in 2017, NUWC Division Newport hired 263 new professionals and 58 interns. In addition to the government workforce, NUWC Division Newport contracted for approximately 2,543 work years during 2017 from companies located in Rhode Island, Massachusetts and Connecticut, bringing its combined government and contractor workforce to more than 5,755 positions.

University of Rhode Island President David M. Dooley (from left) and Capt. Michael Coughlin signed an educational partnership on April 13, 2017, to promote collaboration between URI and NUWC Division Newport focused on assisting small business development and technology commercialization in Rhode Island and the region. (URI photo by Jessica Vescera)

On April 9, 2018, Ron Vien was selected as the next technical director of Division Newport with an official start date of April 29. An electrical engineer with more than 30 years of experience at NUWC, Vien is the 15th technical director since the position was established in 1951 at NUOS.

On June 18, 2018, Division Newport announced a three-year landmark agreement with the Undersea Technology Innovation Consortium (UTIC) to prototype cutting-edge undersea and maritime technology. The agreement allows for an estimated $20 million to be distributed annually to technology companies through the management firm Advanced Technology International.

In July 2018, the Virtual Worlds (VW) program of the Undersea Warfare Combat Systems Department celebrated its 10-year anniversary. Since Division Newport's initial $2 million strategic investment, VW exploration and application research generated a significant number of prototypes and capabilities across many different domains. The success of VW can be attributed to its ability to enable innovation while fostering cross-community collaboration — key

mission-focus areas for Division Newport — through the creation of a powerful yet intuitive simulation environment that meets both social and technical objectives.

A change of command was held Friday, Dec. 14, 2018, as Rear Adm. Scott Pappano assumed command of NUWC Headquarters from Rear Adm. Moises DelToro III, who retired after serving as the commander since July 2015.

Overall in 2018, the total funded programs of NUWC Division Newport were $1.12 billion. Division Newport's employee base included 3,332 government civilian employees and 41 military members with a total gross payroll of $352.1 million. In addition to the government workforce, NUWC Division Newport contracted for approximately 2,602 work years during 2018 from companies located in Rhode Island, Massachusetts and Connecticut, bringing its combined government and contractor workforce to 5,934 positions.

COMMEMORATING 150 YEARS

In 2019, Division Newport celebrated its 150th anniversary with a number of events held throughout the year, which are documented in this yearbook.

On March 18, 2019, engineer Gary Huntress debuted Division Newport's new supercomputer, the fastest at the installation. To put it in perspective, Huntress said the speed of the computer is about 40 billion times faster than a PDP-7 produced by Digital Equipment Corp. some 50 years earlier.

In early April 2019, a realignment of flag officers occurred at NAVSEA. As a result, Pappano was appointed to lead the Program Executive Office (PEO) for the Columbia submarine program. Pappano's counterpart at the surface warfare centers, Rear Adm. Tom Anderson, assumed command of NAVSEA 21.

On April 5, 2019, Rear Adm. Eric H. Ver Hage was installed as the commander of both the Naval Surface and Undersea Warfare Centers. He is the first single flag officer of all 10 warfare centers.

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U.S. Sen. Sheldon Whitehouse (left photo, right) gets a demo on the latest swarming technology from Aquabotix during ANTX 2019 on Aug. 29, 2019. ANTX celebrated its fifth anniversary with more than 800 attendees witnessing more than 70 different technologies.

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On Aug. 28 and 29, 2019, ANTX celebrated its fifth anniversary with more than 800 attendees witnessing more than 70 different technologies. The event — themed "Prepare for Battle: Undersea Security" — was attended by Navy leadership, politicians, industry and academic partners, subject matter experts and the Division Newport workforce.

On Sept. 3, 2019, Division Newport was selected to host one of five national Tech Bridges charged with creating a nexus of high-impact knowledge and skills for the Department of the Navy (DON). Over the next few months, Tech Bridges continued to be defined and culminated on Dec. 16, 2019, with a launch event of the 401 Tech Bridge at Innovate Newport.

At the Dec. 16 event, a partnership intermediary agreement (PIA) was signed between Division Newport and Polaris Manufacturing Extension Partnership. Through Polaris MEP, Division Newport teams with URI, the Composites Alliance of Rhode Island and the R.I. Textile Innovation Network to reach out to businesses and educational institutions. This allows the installation to conduct cooperative research and development to solve Navy problems with small business innovation and commercial problems with warfare center inventions.

These partnerships and lessons learned from more than 150 years of undersea excellence will play a critical role as an eye is turned toward the future.

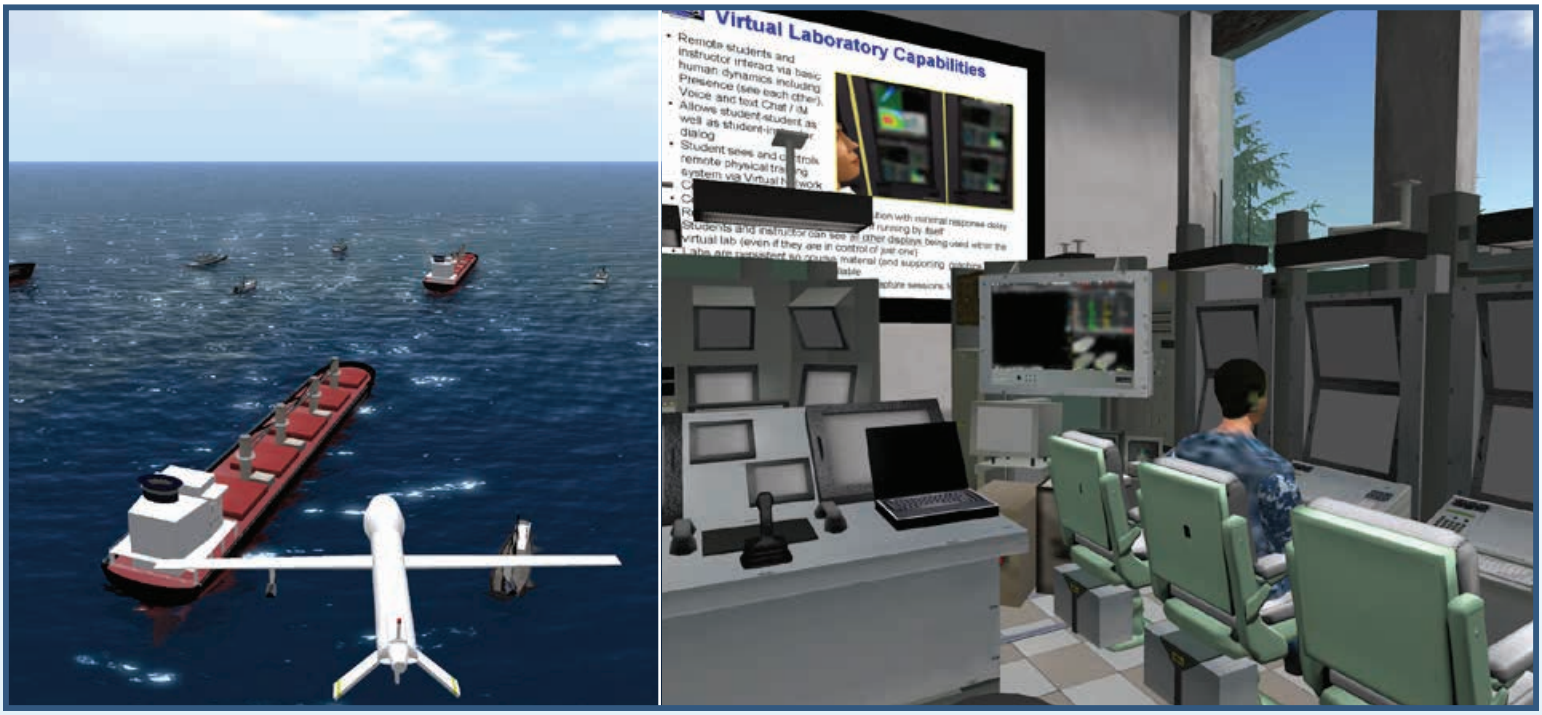
NUWC DIVISION NEWPORT'S FUTURE

More advanced submarines are coming. The largest shipbuilding contract in U.S. Navy history was signed in December 2019 with General Dynamics Electric Boat and Huntington Ingalls Industries in Virginia.

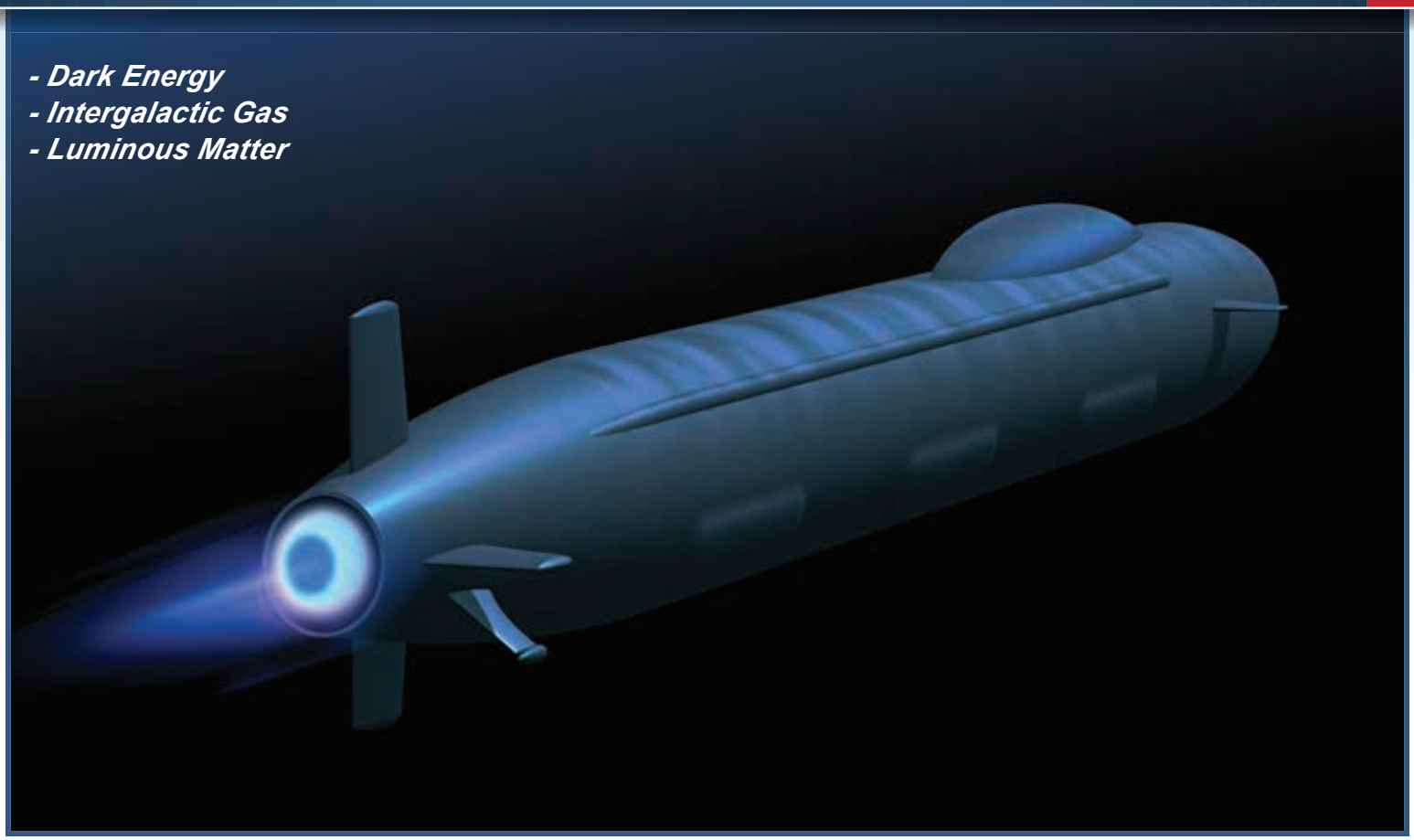
The contract, worth $22.2 billion, calls for nine new Virginia-class submarines as part of the new Block V generation with an additional option for a 10th vessel to bring the value of the contract to $24 billion. Construction began in December 2019 and runs through 2029.

Construction of the Columbia-class submarines is scheduled to begin in late 2020. The Navy expects the Columbia-class boats to enter into service starting in 2031, with a total of 12 submarines planned. All 12 vessels should be completed and in service by 2042.

Even beyond that, the fleet is expanding. Acting Secretary of the Navy Thomas Modly expects a 355-ship Navy — including both manned and unmanned vehicles — by 2030. Division Newport will undoubtedly play a major role in that, as the Navy fiscal year 2020



Over the last decade, Division Newport's Undersea Warfare Combat Systems Department set out to research the ability of a virtual environment to train and educate Sailors as well as its potential for modeling and simulation, integration and interoperability, and rapid prototyping.



More advanced submarines are being built for the U.S. Navy. The largest shipbuilding contract in U.S. Navy history was signed in December 2019, with General Dynamics Electric Boat and Huntington Ingalls Industries.

budget request calls for production of dozens of UUVs of varying sizes.

Each of these new platforms will face threats unlike any other ever documented in history. Quantum computing, directed-energy weapons, artificial intelligence and advanced robotics are just some of the emerging technologies that will shape the future battlespace.

The importance of cybersecurity is ever increasing as quantum computing and faster data processing become a reality. While cyber adversaries use more sophisticated technologies and methodologies to find their way into networks, data breaches, phishing and social engineering have become everyday occurrences. Complacency can be the adversary's best asset, and thus the evolving nature of cybersecurity will require a shift from a compliance and reactive mindset to a more proactive cyber defense approach.

No place is better equipped to succeed in this great power competition than Division Newport, as some of the brightest minds in the world reside here. Each day the men and women at Division Newport live at the forefront of innovation to ensure our warfighters never enter a fair fight.

As has been the case for more than 150 years, NUWC Division Newport is committed to ensuring undersea superiority yesterday, today and tomorrow! ❖

Gould Island: 1909 to present day

In 1909, the federal government purchased a portion of Gould Island, a 56-acre tract located in Narragansett Bay. The rest of the island was purchased in 1918, and by 1919, the Naval Torpedo Station had constructed hangars for seaplanes and kite balloons, a water tower and underground lines, a wooden pier for personnel at the north end of the island, and a concrete pier for torpedoes at the southeast end. Later, additional buildings were erected to provide torpedo and warhead storage as well as housing for a Marine detachment. The former Haughton family residence was converted to a barracks for the Marines who guarded the magazines.

ON APRIL 25, 2019, the Army Corps of Engineers reported to the Gould Island Restoration Advisory Board about ongoing efforts to make the island safe for recreation at a meeting held at Jamestown City Hall. The island, which is off limits to visitors between April 1 and Aug. 15 to protect a bird nesting site, might see future use as a campground. It is estimated that it "will be the mid-2020s before it can be used by the public," said Gary Morin, area director of FUDS (Formerly Used Defense Sites), a Department of Defense agency involved in the restoration project. (Source: Andy Long, Newport This Week, May 2, 2019.

In 1909, the federal government purchased a portion of Gould Island, a 56-acre tract located in the middle of Narragansett Bay. In this 1951 aerial view (from the R.I. Geological Information Services at the University of Rhode Island), the torpedo test station is visible at the north end of the island. The seaplane facility at the south end appears to have been closed, as there are no aircraft visible on the island.

SOME NOTABLE OCCURRENCES ON THE ISLAND INCLUDE:

- In 1920, a Naval Air Detail was established.
- On Aug. 20, 1921, two naval torpedo planes — modified by the addition of pontoons — arrived at Gould Island to test-drop aerial torpedoes. They were subsequently used to track and locate torpedoes that were test-fired from a large barge or, later, from the Firing Pier at the north end of the island.
- On Nov, 2, 1921, the first successful U.S. air drop of a torpedo in the waters off Gould Island was made.
- The Sept. 21, 1938 hurricane brought an estimated $17,900 of damage to the Navy installation on Gould Island — one seaplane broke loose from outside a hangar and sank about 1 mile north of the island; debris from buildings and other planes was later recovered 7 miles south near Beavertail Lighthouse in Jamestown.
- In 1939, test drops began from aircraft of a turbine-powered torpedo.

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This 1925 photo shows a torpedo drop in Narragansett Bay from a plane assigned to the Station Air Detail on Gould Island. Note the drogue attached to the exercise head of a Mark VII torpedo. (Photo courtesy Naval War College Museum)

The birth of underwater sound laboratories

During World War II, the U.S. Navy needed an effective means of combating German U-boats in the Atlantic and funded the creation of underwater sound laboratories. In July 1941, a small building was erected at Fort Trumbull in New London, Connecticut, for Columbia University's Division of War Research under the leadership of the National Defense Research Committee. This temporary building housed a laboratory and staff of scientists and engineers that could operate around the clock. At the same time, a group known as the Harvard Underwater Sound Laboratory was established in Cambridge, Massachusetts.

The mission of New London's sound lab included developing aircraft listening equipment, ordnance, surface craft listening equipment and surface craft echo-ranging equipment. These four areas of antisubmarine work comprised the major mission of the sound labs from April 1941 to August 1943. In mid-1944, submarine-directed research gradually increased to 85% of the labs' mission, providing important assistance to the war effort in the Pacific.

The highly successful radio sonobuoy and submarine-installed listening sonars were developed in New London. Harvard University research, on the other hand, directed its attention primarily to active antisubmarine warfare "sonar" (for sound navigation and ranging), particularly in the development of the scanning type of sonar. These university efforts also resulted in the development of numerous devices and equipment, radically new in design and function, which aided the operating naval forces. The new technology

Sign outside the Navy Underwater Sound Laboratory in New London, Connecticut, which later merged with the Naval Undersea Warfare Center in Newport. (U.S. Navy photo)

Fort Trumbull in New London, Connecticut, in 1944. (U.S. Navy photo)

reduced the threat to U.S. shipping in the Atlantic Ocean and changed the nature of naval warfare in the Pacific Ocean.

On March 1, 1945, the Navy Research Laboratory (NRL) took over the direction of the New London laboratory for the Bureau of Ships, as it was decided that work at the university laboratories should continue after the war under direct Navy guidance. Shortly thereafter, in July 1945, the sonar portion of Harvard University's work was transferred to New London and the Navy Underwater Sound Laboratory (NUSL) began operations.

NRL continued direction of the laboratory in New London until March 6, 1946, when it relinquished this responsibility to the Bureau of Ships. In 1950, facilities previously used by the Maritime School closed and became a part of NUSL. For the next decade, and during the Cold War, New London's research and development focused on new scientific problems posed by the development of nuclear submarines and guided missiles. NUSL had a definitive role in submarine sonar and radio communication systems and antisubmarine sonar systems for surface craft. Efforts also included ocean surveillance systems for continental defense against missile-launching submersibles, underwater acoustic research and Polaris command communications.

"The Russians were building 16 subs a year," said Thaddeus Bell, who worked at the New London sound lab from 1947 until 1991. "At the time the U.S. built four a year. We were lagging behind in technology and this was a driving force in getting sonar systems going."

Expanded research activities at the site necessitated alterations to many of the old buildings and construction of new buildings.

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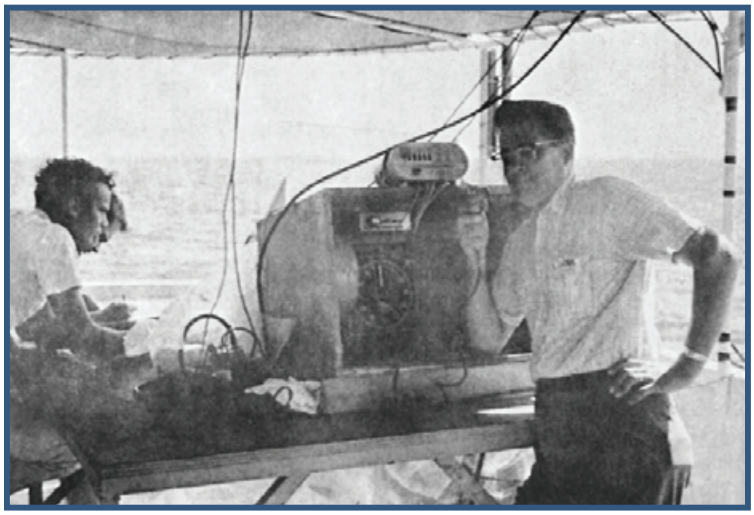
Deep-water range, detachments developed

In 1959, the Secretary of the Navy requested the BUSHIPS and the Chief of Naval Operations (CNO) to implement designing and developing the Atlantic Undersea Test And Evaluation Center (AUTEC), with NUOS designated as the lead activity assigned technical direction agency (TDA) responsibility for establishing the deep-water range.

AUTEC: THE LABORATORY IN THE SEA

The Atlantic Undersea Test and Evaluation Center (AUTEC) is unique in that it is situated on an undeveloped island belonging to a foreign government. As a result, all services necessary to run and maintain the facility, as well as to care for the assigned personnel, must be provided by AUTEC and primarily supplied from the continental U.S.

The main base on Andros Island is a self-sufficient community occupying an area of some 420 acres. AUTEC's mission was defined as providing a deep-water test and evaluation facility for making underwater acoustic measurements, testing and calibrating sonars and providing accurate underwater, surface and air tracking data on submarines, surface ships, aircraft and weapons. This work was in support of Navy undersea research and development programs and for fleet assessments and operational readiness.



NUWS employee Dick Austin (right), launch director, gives a countdown for torpedo firings while onboard the M/V Tsunami at AUTEC in 1968. (Photo from NUWS Narrator, July 1968)

Atlantic Undersea Test and Evaluation Center (AUTEC) circa 1970.

In 1974, control of the fixed acoustic range, located in the Tongue of the Ocean, was transferred from the Naval Ship Research and Development Center to NUSC. This led to a 12-year period of close involvement with SUBLANT (the Atlantic submarine fleet) in the measurement of submarine signatures. During this period, an innovative program called FAST (fleet acoustic silence trial) was implemented. The FAST program allowed submarines to run the acoustic range tests between other evaluation exercises, thus obtaining signature updates at frequent intervals for validation of machinery bills prior to patrol. The NUSC Test and Evaluation Department's acoustic arrays led to a program that provided a fixed array for the U.S. Pacific Fleet in Guam for submarine noise signature evaluation after refit.

Because the AUTEC environment provides deep-water, operational security and very quiet ambient noise conditions, it is ideal for future test and evaluation requirements, such as stealth weapons and the products of unmanned underwater vehicle technology. The present AUTEC site in the Bahamas will continue to play a central test and evaluation role because of its combination of size, water depth, acoustic quietness, and security, all of which are vital and fully adequate for the majority of planned new programs.

— *Source: 'Meeting the Submarine Challenge,' pages 254-260, published 1997.*

The Systems Measurement Platform at NUWC Division Newport's Seneca Lake Sonar Test Facility, located in Dresden, New York, is a massive catamaran-type platform with a 220-ton crane built into its superstructure. The Navy's primary underwater test facility, it was established for evaluating active and passive acoustic devices from a single element to a full sonar system. (U.S. Navy photo)

SENECA LAKE FACILITIES BUILT

Around 1962, Division Newport's Seneca Lake Sonar Test Facility was built in Dresden, New York, on one of the Finger Lakes in the heart of Central New York's wine country. The lake is 38 miles long and 3.4 miles wide with its deepest point at 650 feet — the depth is about 480 feet where the test facility is located. The facility is world-renowned for its testing and evaluation of projects requiring relatively deep water with fixed underwater geometry heavy load-handling capabilities. The main feature is its Systems Measurement Platform, a massive catamaran-type platform with a 220-ton crane built into its superstructure, which was put in place in the late 1960s.

DODGE POND ACOUSTIC MEASUREMENT FACILITY

Commissioned in 1955 and considerably upgraded in 1993, the Dodge Pond Acoustic Measurement Facility, in East Lyme, Connecticut, is the Navy's most modern open-water acoustic test and evaluation site. The facility is centrally located and fully staffed. The Dodge Pond Acoustic Measurement Facility combines an ease of access to all parts of central New England with quiet conditions (ambient noise less than sea state zero), platform image for testing of all types of transducers, arrays, domes, baffles, towed line arrays, and other underwater electro-acoustic devices. The facility supports all types of research and development programs as well as the advancement and application of new underwater acoustic test equipment and methodology. The facility supports all types of research and development programs as well as the advancement and application of new underwater acoustic test equipment and methodology. ❖

The Dodge Pond Acoustic Measurement Facility in Connecticut consists of a 133.5-square-kilometer (33-acre) pond, a 4-square-kilometer (1-acre) shore site, and a fully instrumented, environmentally controlled test platform.

Undersea Superiority

$751 Million to Local Economy

for payroll, contracts, construction, and services purchased

5,997 Total Work Years

(Government and Contractor Employees)

$1,207 Billion

Total Funding

99% of Employees

Are Compliant with DAWIA Field Certifications

38% of Engineers and Scientists have Advanced Degrees

6% PhDs (140)

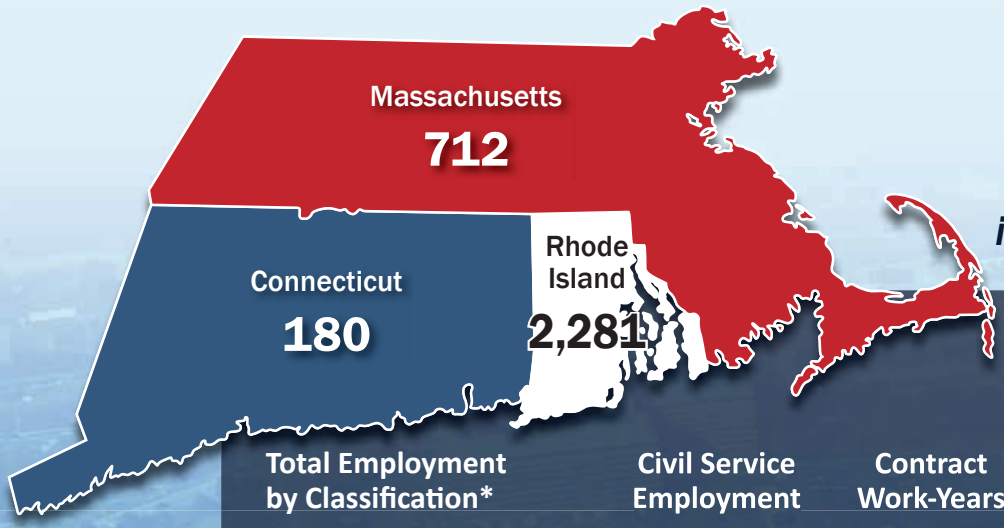
32% Masters (780)

151

New Partnership Agreements Established

372

External Hires



3,173

Total Workforce in Southeastern New England

Total Employment by Classification*	Civil Service Employment	Contract Work-Years	Est Overall Employment
Engineering/Science	2,454	833	3,287
Technician	236	605	841
Information Technology	151	118	269
Professional Administrative	490	761	1,251
Administrative Support	33	134	167
Clerical	27	40	67
Wage Grade/Other	1	33	34
Students	81	0	81
Total	3,473	2,524	5,997

Data as of 9/30/19

**Includes all detachments*

Yesterday... Today and Tomorrow

Financial Perspective		Target	Results
Sustain Business Excellence in Working Capital Fund Management	Actual $ Direct (New Orders) ($M)	$816	$798
	Total Direct Workyears	2488	2597

Employee Perspective		Target	Results
Recruit and Retain High Caliber Workforce	End Strength	3504	3477
	External Hires	346	372
	Retention Rate: 5+ Years	90%	86%
	External Awards Participation	7%	7%
Train and Mentor Workforce in Mission-Critical Competencies	Employees with Advanced Degrees (Total Workforce)	30% Masters; 6% PhDs	27%/5%
	Scientists and Engineers with Advanced Degrees	37% Masters; 7% PhDs	32%/6%
	% of Employees that are Compliant with DAWIA Field Certifications	100%	99%
	% of Employees that are Compliant with DAWIA Continuous Learning Points	100%	99%
	% of Employees on Track for Financial Management Certification	80%	91%

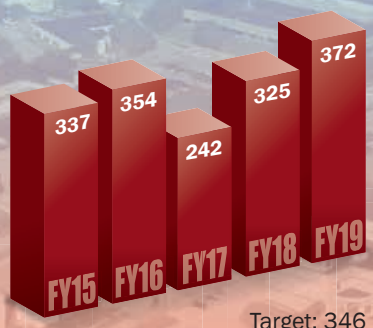
Total Direct Workyears

Target: 2488
Results within performance parameters

Actual $ Direct (New Orders) ($K)

Target: $816K
Results within performance parameters

External Hires



Target: 346
Results met performance parameters

Retention Rate: 5+ Years

Target: 90%
Results within performance parameters

% External Awards Participation

Target: 7%
Results met the target

NUWC's legacy of weapons and defense

With the Cold War raging, Division Newport was on heightened alert in the 1980s. The Russian force was escalating, and pressure was high to put weapon research and development into action to counter a mounting submarine threat overseas. Newport engineers needed to deliver, quickly.

This on-the-ground effort was assigned to a former college intern turned Division Newport principal investigator who originally thought he might design automobiles in Detroit, Michigan. Working on weapon propulsion for the U.S. Navy was much more appealing for Robert Tompkins, however, and his timing for career advancement was right on target. Focusing on research and development, and later torpedo service in the fleet, Tompkins witnessed the direct impact of Cold War pressures on Division Newport's day-to-day operations.

"The threat arrived before ADCAP (advanced capability) was ready, and it was an extremely intense effort. We needed to develop a brand new torpedo, or what could have been a brand new torpedo," Tompkins, a recently retired senior technical warrant holder for torpedoes, said. "We reworked the Mark 48 torpedo, introducing new software, which was a first. An entire division worked just on that torpedo. It was unusual, but it showed the dedication to get that product into service."

Dedication defined this entire command, spreading across individual departments and staff, driving job interest and productivity. This teamwork environment attracts the best and the brightest to this work and has established a legacy of unprecedented innovation in undersea warfare weaponry and defense, from autonomous vehicles to submarine technology, cybersecurity to electromagnetics, sonar to payload integration and torpedoes.

Despite this commitment to the cause, and Tompkins's division-wide effort, funding was eliminated once the Cold War ended in 1991. The new Mark 48 and the ensuing Mark 50, developed for a similar submarine threat, were never delivered, leaving Tompkins and his team unfulfilled, he said.

Sailors load a Harpoon anti-ship cruise missile onto the Los Angeles-class fast-attack submarine USS Olympia (SSN-717) as part of the biannual Rim of the Pacific Exercise, July 3, 2018. (U.S. Navy photo/released)

This prototype unmanned undersea vehicle (UUV) is being prepared for testing during the 1990s. The image accompanied a story about the selection of the Naval Underwater Systems Center as the lead laboratory for the Navy's first major UUV development project. Since that time, UUVs have matured beyond the vehicle stage into an independent undersea platform. (Source: NUWSCOPE, Feb. 28, 1991)

"We only delivered one of three torpedoes needed. It was very frustrating," he said. "But there was a sense of accomplishment because the Cold War ended in part because of what we had done, and we brought that capability to bear. It was a major reduction in threat at the time."

Though the trial and error nature of research and development can leave ideas on the drafting room floor, the volume of work has skyrocketed as the need intensifies to modernize the fleet. This domino effect has influenced the pace since long before Tompkins started at Division Newport in 1974, as each department responds to demand in real time.

John Babb, deputy technical director for technical excellence, has experienced an equally impressive series of changes to weapons and the fleet in his 37 years at Division Newport. Most notably, the sweeping transition from analog to digital warfare allowed for upgrading weapons more rapidly. The Navy is continually working combat system and weapon modernization, and fleet systems are always better than they were years ago, Babb said.

"Our threats continue to modernize, so we must stay on the ball," Babb said. "We really have to understand the science and technology, assess its value, advance it over time, outpace the adversary and make it real."

Making their challenging work a reality is a benchmark across campus, because a longstanding competition between the U.S. and our country's adversaries means real advancement in warfighting capability is a priority. With emerging threats arising seemingly every day, cooperation across government, non-governmental organizations, academics and industry professionals is crucial, he said.

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In 2002, the Advanced Half Length Torpedo was part of the Swampworks portfolio of rapid-response technology insertions sponsored by the Office of Naval Research (ONR) and developed by NUWC Division Newport. The torpedo included a high-frequency, littoral sonar added to the ADCAP sonar for improved target discrimination in noisy littoral environments. Swampworks efforts focused on a set of high-risk, high-payoff programs to respond to both emerging and enduring fleet operational challenges. The half-length requirement allowed twice as many torpedoes to be carried and improved flexibility in loading-out for other missions. (Source: NUWSCOPE , October 2002)

In 2005, the Midsize Autonomous Research Vehicle (MARV), the size of a lightweight torpedo, was tested aboard the University of Rhode Island's R/V Endeavor. From torpedoes to autonomous vehicles, NUWC Division Newport is focused on advancing the state of art of undersea warfare and meeting the needs of the U.S. Navy fleet.

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"We have a large portfolio of cooperative research partnerships to advance the state-of-the-art, maybe share some of our technology with them and package it into a capability, or leverage their technology," Babb said. "That's important and we work really hard on it. If we were a gated community, just working on this ourselves, we wouldn't advance this far."

Chris DelMastro, head of the Undersea Warfare Platform and Payload Integration Department, agrees. He said that Division Newport is a more open community than it was in the past, in terms of what technology is discussed and what is shared with outside ventures.

"We are breaking the barriers, either real or imaginary, and really capitalizing on the entire naval enterprise, rather than working myopically," DelMastro said. "As a collective we are more united and focused on the bigger problems. We had our niche, but we've moved on from looking introspectively to looking across the enterprise to serve the fleet's needs."

DelMastro, a former Division Newport college intern in the 1990s, has witnessed his current department nearly double in size since then. He also has seen systems that once were constrained by computer processing speed and memory now function much quicker as the latest technologies have been applied, he said. With this year's administrative merger of the Unmanned Undersea Vehicle (UUV) Division under DelMastro's oversight, staff count, and execution

Sailors and Military Sealift Command civilian mariners working from Polaris Point in Guam transfer torpedoes to the Los Angeles-class fast-attack submarine USS Topeka (SSN 754) from the pier on May 31, 2018. (U.S. Navy photo by Mass Communication Specialist 3rd Class Alana M. Langdon)

responsibilities will continue to expand in 2020 and beyond.

"We are going from torpedo-like systems to larger unmanned platforms that are more submarine-like than historic" DelMastro said. "We are really establishing the culture in the department and the processes and tools for our team to succeed. UUVs are a growth area. In addition, we are in the early stages of research and development for the next generation of submarine platform beyond the Virginia-class, which will start in fiscal year 2021. So this department, with its weapon launch and handling work, will be a big part of shaping the design trades for that platform."

Because unmanned systems support submarine tasks, to complement missions with a lower cost and lesser risk to Sailors, the Navy has said unmanned systems could be a force multiplier, said Mike Grant, technical warrant holder and head of the UUV and Propulsion Systems Division. They are at an inflection point where the technology and other drivers of unmanned systems are peaking, so they are transitioning from research and development to delivering capabilities to fleet operators.

"The technology is useful and the Navy has embraced it, so now we're operationalizing unmanned systems. Snakehead, Medusa, Kingfish upgrades, Swordfish, ORCA, these are all products in development with the intent to deliver to the operating fleet," Grant said. "That is driving everything, and Division Newport is well positioned to support this."

The Midsize Autonomous Research Vehicle (MARV) was designed and built by Division Newport engineers more than a decade ago, and is still being used for research and to test new vehicle payloads. These are about the size of a torpedo. Newport is designing and building an operational prototype of the Snakehead vehicle, which will weigh several tons and fit onboard a submarine. The ORCA vehicle, being designed and built by industry, will be several times this size. Meanwhile, Grant once carried the lightweight IVER vehicle down Thames Street in Newport to a conference.

"UUVs come in all shapes and sizes, like the Razor vehicle, which is relatively flat and swims with both flapping wings and propulsors. We have many prototypes here. Some we build ourselves, like MARV, Razor and Snakehead, but others we buy commercially and militarize, write new software and enable new payloads, and make it into a mine-hunting vehicle, for example," Grant said. "Everywhere we are testing something. Just recently we were down at the water with a new prototype. If you were driving over the Newport Bridge that morning, and could have seen under the surface of the water, you would have seen one of our UUVs in the bay."

His growing team also uses 3D printers increasingly, Grant said, which has streamlined and hastened their creation processes.

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"If I needed a part made years ago it was a lengthy process. We had to have it designed, and priced out, then shipped and had to wait for it to arrive, and what happened if it didn't fit?" Grant said. "Now I can ask an intern to print it, and it's ready overnight. The cost is a few dollars. Many UUVs have plastic components, not only metal, so we're saving money."

While these 3D-printable, unmanned vehicles are considered "the future" of 21st century naval warfare, and explosive torpedoes have remained largely the same since developed in the 1870s, only adding homing in the second half of the twentieth century - and countermeasures have been effectively defending the fleet since then. Since beginning as steel pipe-filled 55-gallon barrels that made noise when towed behind a ship, countermeasures have modernized, said Thomas Frank, a chief scientist who works on torpedo defense. These models include various decoys and barriers used to distract enemy ships' sonar.

Thinking outside the box in this way is Frank's specialty. His decades of experience as "inventor-in-chief" and background in military history mean that his innovations are "different and weird," he said.

"After World War II, homing capability was the future, so we developed better towed countermeasures. We developed a tow body with transducers in it that sent signals down a cable to an amplifier on

Cryptologic Technician 1st Class Keith Wood lifts the Nixie system, the Navy's torpedo countermeasure system, aboard the amphibious assault ship USS Peleliu (LHA5) as Electronics Technician 2nd Class John Keefer looks on during U.S. 5th Fleet operations on the Arabian Sea on Sept. 4, 2010. (U.S. Navy photo by Mass Communication Specialist 3rd Class Ian Campbell)

3D printing technology is in use across Division Newport.

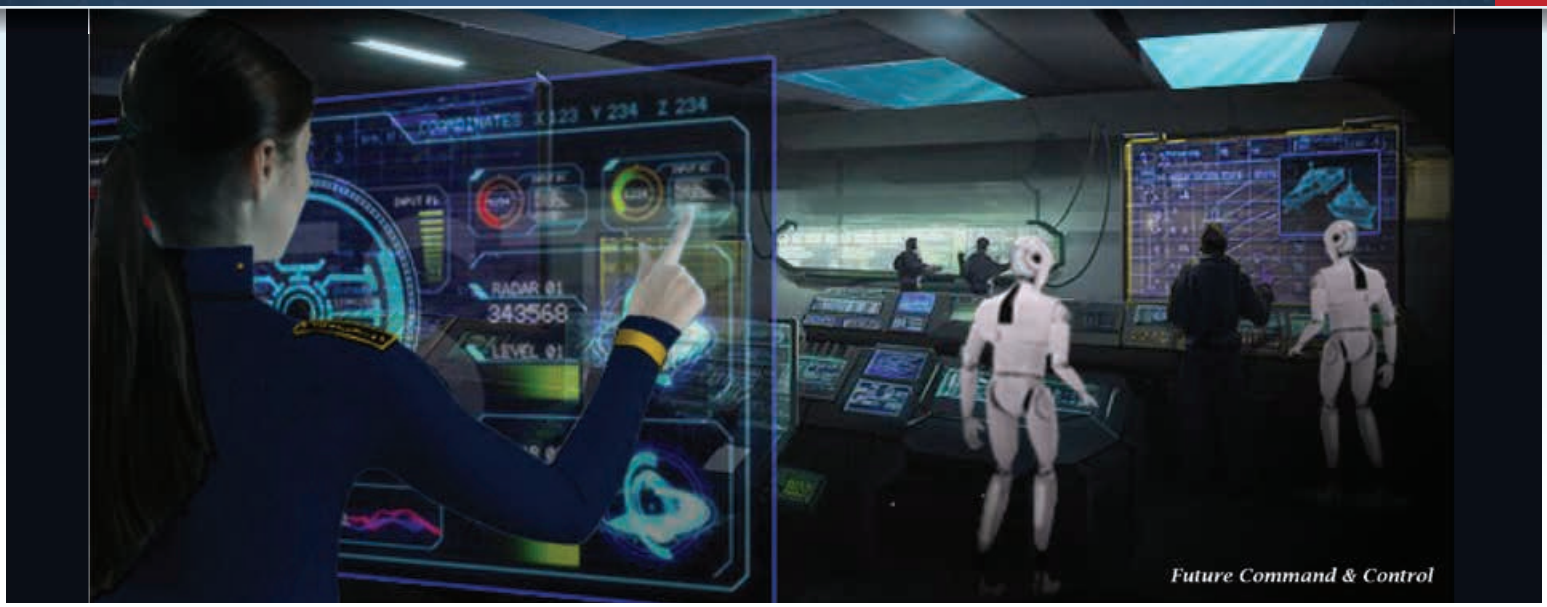
the ship," Frank said. "We added broader frequency ranges, greater electronics and computers from discreet components. It's been a progression, but at the end of the day it's the same fundamental thing: it makes noise to distract the enemy. We're upgrading to modern technology what will be sufficiently generic, so that when the parts inside become obsolete you can interchange with parts off the shelf and it does the same thing. We are separating the software from the hardware."

Just like autonomous vehicles, the torpedo defense team also has personified its products with names like Siren and Nixie, mythological creatures that lured Sailors to their death, Frank explained. While they are considering the cultivation of alternate forms of for acoustic sound generation, Frank's team is still working on Nixie, he said, with varying versions in stages of production, fleet use or obsolescence.

"But we proved we could make a really spiffy piece of torpedo countermeasure hardware," Frank said. "The Navy needs Nixies, and it's already in more than 20 other countries because we sold it everywhere. But they can't buy the parts anymore. So we need the next one."

Division Newport is focused on advancing the state-of-the-art of undersea warfare. So whatever the future has in store for naval warfare, from torpedoes to autonomous vehicles to defense, Division Newport will be at the front line.

"The future is difficult to predict," Tompkins said. "We are working on the next ADCAP technology, a variant of the Mark 54. The fleet outfitting model we have today is to maintain the systems we have today,

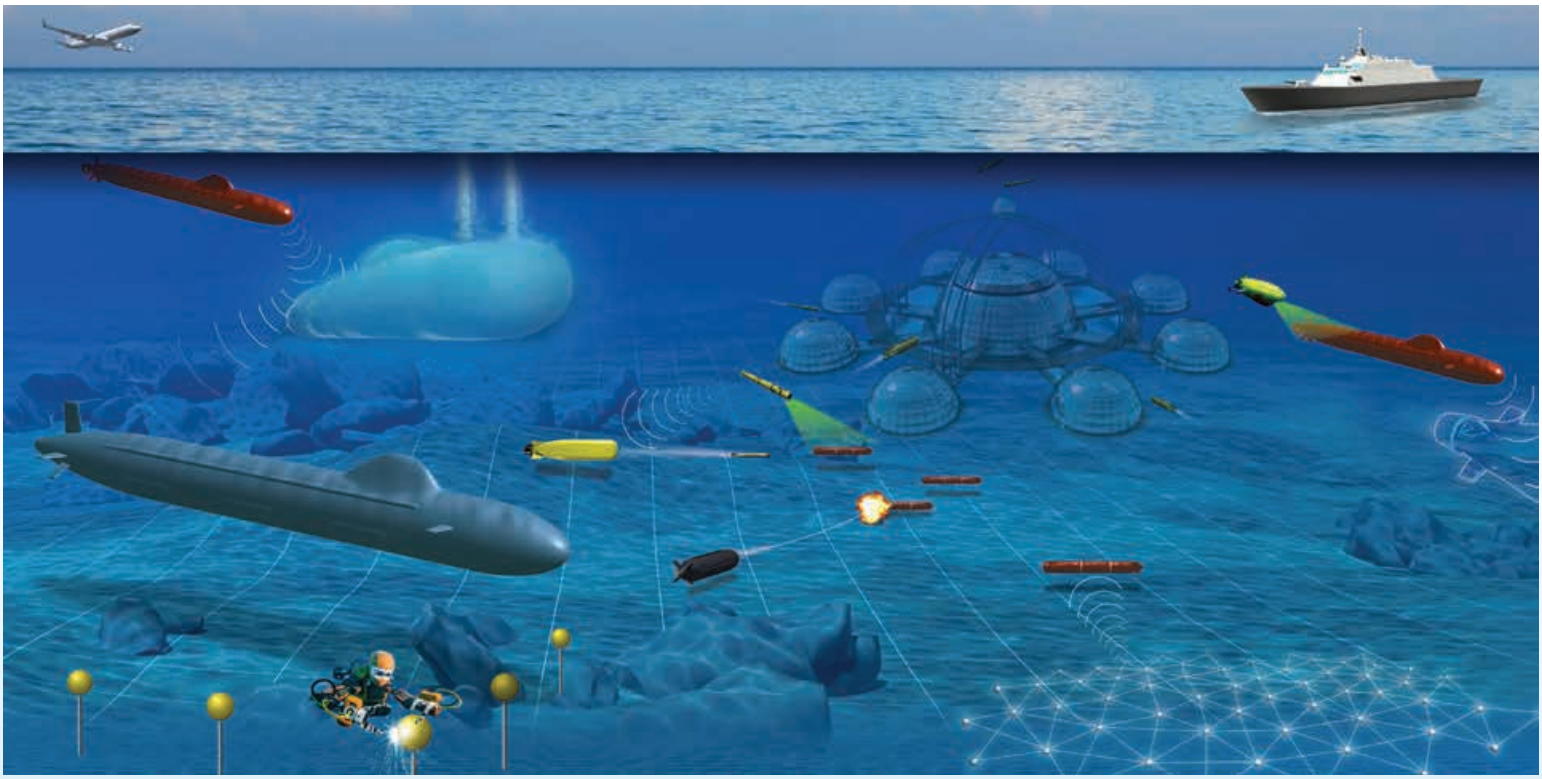


Experimenting with 3D holograms, faster electronics and digital capabilities, Division Newport is pushing limits for undersea warfare.

and improve the capability in an evolutionary fashion, without replacing what we have. The previous employment model we had before ADCAP and Mark 54 was to develop a new weapon and take the old one out of service. Today, we take the old one out of service, upgrade it or maintain it, and with current production we increase the numbers. It's affordable and maintains capabilities."

Grant echoes the belief that the future is in unmanned systems.

"I think there is no doubt that the future will include autonomous vehicles," Grant said. "If we don't have to send a Sailor into harm's way, can eliminate the dangerous work and replace it with autonomous vehicles, then that's a good thing." ❖



Dominating the undersea warfare realm takes myriad layers of capabilities, from submarines to torpedoes, manned and autonomous vehicles, stationary mines and countermeasures, all of which work together to form a fleet of superiority.

The Workforce: NUWC Division Newport's Heartbeat

When Jose Feliu was recruited to Division Newport from the University of Puerto Rico nearly 25 years ago, he was unsure what his future would bring. Leaving home for a new job in mainland America, with $1,700 borrowed from friends, Feliu had three days to find a place to live and reliable transport to and from work. With no family or friends nearby who could help with his transition to American life, he had one chance to make it work.

It was a difficult first step for the young engineer, but he persisted. Inspired by his own experience, he decided to create his own family by making relocation smoother for the handful of Puerto Rican recruits who are hired by NUWC every year. They now have their own community, celebrate holidays together and rely on each other for the comforts of home.

"I wanted them to experience a warm welcome," Feliu said to a crowd of 200 employees at a speaker's series event in June, 2019. "When I left Puerto Rico I was not sure what would happen. And now I am home."

His story of perseverance and triumph, with a shared sense of purpose to support the U.S. Navy fleet, is one that Division Newport fosters throughout its more than 3,300 federal civilian employees. Since the Naval Torpedo Station was established in 1869, this diverse workforce has been the heartbeat of that mission.

Jose Feliu was hired by NUWC Division Newport from the University of Puerto Rico nearly 25 years ago, and at the time was unsure what his future would bring. With Feliu's assistance, Division Newport has hired more than 80 employees from Puerto Rico in the past 20 years.

At the forefront of innovation, it is leading the conversations about diversity and inclusion, recruitment and mentoring.

"At the end of the day, NUWC is a family of diverse people with the same purpose in support of the fleet," said Norma Lopez, head of the Combat Systems Trainers in the Undersea Warfare (USW) Combat Systems Department. The workforce and contractual support in her branch nearly doubled in the past five years.

"All of them come together, to share their talents and characters and they have a great appreciation for their role in our team, for the purpose of supporting the fleet," she said. "The team dynamic puts me in awe, because I see it working every day across the whole base."

A display celebrating Puerto Rican culture, one of 12 cultures celebrated during NUWC Division Newport's 32nd annual International Day, offers non-alcoholic piña coladas and lots of comradery. The annual event was held Nov. 6, 2018.

New approaches to recruiting

Bringing new approaches to processes for engineering and undersea weapons development means the command must have a broad reach to attract the brightest stars in the nation.

Hector Lopez, head of Weapons, Vehicles and Defensive Systems Department, currently leads some recruiting efforts across the country and in Puerto Rico. Hired by Division Newport in 1991, also from the University of Puerto Rico, he knows there is tremendous value in thinking bigger.

"Having a diverse workforce at Division Newport would be harder to accomplish if we didn't do recruiting outside our local area," he said. "If you want to have diversity at all levels of the organization, it starts by having diversity at the base of the workforce pyramid."

Mary Cordeiro (right) speaks with potential hires during a NUWC Division Newport job fair held on May 20, 2015.

Recruiting efforts in Puerto Rico started showing clear improvement with Feliu's involvement, and have expanded to multiple universities on the island. There are currently more than 80 employees from Puerto Rico in our organization. Division Newport is pushing this conversation, seeking out candidates who will be champions for engineering and the command.

"These are non-traditional solutions we're looking for. We have to have diversity of thinking, ideas and experience, not homogeneity," Hector Lopez said. "We want a diverse pool of candidates, so we actively recruit more than 300 people across the country, including universities in Florida, Georgia, Alabama, North Carolina, New York, New Jersey and Puerto Rico. Most importantly, we want to bring people on board who will be able to integrate into our organization and have successful careers as civil servants."

Continued on page 90

Henry Banas (left) and Hector Lopez man the grills during the Employee Appreciation Picnic held on Oct. 11, 2018.

Hector Lopez speaks to industry representatives on Sept. 1, 2016.

The future is in diversity

Continued from page 89

Diversity has become more than just a buzzword across Division Newport — diversity has become part of NUWC's mission. Attracting and retaining an inclusive workforce is a key component to serving the needs of the fleet, and that diversity ranges from gender to race to sexual orientation and cultural differences.

"Affirmative action was a good thing in theory, but we have to afford everyone an opportunity," said Kendra Spencer, Head of Business Operations for the Ranges, Engineering and Analysis department.

"I am committed to providing equal employment opportunities for all employees," Commanding Officer Capt. Michael R. Coughlin said. "To accomplish our mission, we must work together to ensure an inclusive workplace environment where every individual is treated with dignity and respect."

The real look of equality in the workforce is more than hiring and talking about it. "It's about what leadership does to support us once we walk through the door," Spencer said. "NUWC does a lot, and that is refreshing."

Norma Lopez cited earning her master's degree in computer science with the financial assistance of Division Newport as an example.

Norma Lopez, head of Combat Systems Trainers in the USW Combat Systems Department, has seen the workforce in her branch nearly double in the past five years. "At the end of the day, NUWC is a family with a diverse purpose," Lopez said.

Sravanthi "Sree" Bodana, head of NUWC Division Newport's Software Engineering Branch in the Platform and Payload Integration Department, serves as the special emphasis program manager for American Indian and Alaskan natives. Selected in October 2018 for a two-year assignment by Naval Sea Systems Command, Bodana serves on NAVSEA's 25-member panel for the Inclusion and Engagement Council.

Spencer, who served as a special emphasis program manager and change agent at Division Newport, also earned her master's degree in accounting in 2005 with Division Newport's help. She was later one of 12 employees selected to participate in the first Leadership in a Diverse Environment training in 2017.

An advocate for Division Newport's African-American workforce, Spencer now plans events to discuss diversity and equal employment opportunities. To honor Black History Month in February, Spencer coordinated a display and lecture series with two keynote speakers, including retired four-star Adm. Cecil Haney, who addressed disturbing trends in the global security environment, and G. Lee Floyd who discussed cross-cultural communication and coaching.

"I received so many phone calls from people saying how refreshing that was and how grateful they were to have that display at Headquarters," she said. "It was a really good thing. It shows that our top leadership is focusing on diversity, and that diversity is important to Division Newport."

It has taken some time to get there, however. Before the World War years, women were scarce in the workplace, but they filled a need when men were sent to battle. They quickly proved more valuable than a temporary replacement, and were added to the roster of permanent employees. Now women are here in force.

"When I first came here, there weren't many women. The percentage of female scientists or engineers was in the single digits," said Candida Desjardins, head

of the Educational Outreach Program, who has been at Division Newport for 38 years. "There are more now, but we still have room to grow."

Dawn Vaillancourt, head, Strategic Planning Office, is one of the women in leadership who has been vocal about the need for diversity and inclusion at the command. A former administrative assistant, she pursued all available opportunities at Division Newport, which resulted in obtaining two mechanical engineering degrees from the University of Rhode Island. Now, 34 years into her career, she is a champion for diversity, planning events such as a speaker series that brings more exposure to unconscious biases that may exist in the workplace.

Dawn Vaillancourt (left), head, Strategic Planning Office, is one of the women in leadership who has been vocal about the need for diversity and inclusion at the command. Above, Vaillancourt discusses a project during a new professional poster session.

Having attended the Warfare Center-sponsored Leadership in a Diverse Environment (LDE) event, Vaillancourt, along with Esther Thatcher and Equal Employment Opportunity Office Deputy Matt Souza, led Newport's LDE follow-on activity with the help of change agents from across the command. Change agents, like Spencer, engage in all demographics to set up events that target their professional growth.

"It's about education and awareness of some of the issues that people face," Vaillancourt said. "We strive for inclusion and engaging the workforce at all levels so they feel like they're part of the team."

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Retired four-star Adm. Cecil Haney (seated center) had lunch with new professionals during his visit to Division Newport to celebrate Black History Month on Feb. 14, 2019. Seated with the admiral are Kendra Spencer (left), Division Newport's former African American special emphasis program manager, and NUWC Division Newport's Technical Director Ron Vien (right).

Mentors assist workforce development

Continued from page 91

Mentoring has become a crucial element for workforce development and training. This informal initiative gives new hires and long-standing employees an opportunity to connect, learn from each other and provide guidance when needed.

"It was important to me to have mentors to encourage me to apply for new opportunities," said Ann Turley, head, Surface Ship and Aviation Systems Division of the Sensors and Sonar Systems Department.

Hired at Division Newport in 1995 as a combat systems engineer, Turley said she wanted to share some of that support she received.

"I felt I had a responsibility to do more for the organization, and to help others become leaders," she said. "I appreciate that opportunity."

Spencer and Desjardins also benefited from mentor relationships, and pursued job-growth opportunities where they would not have otherwise applied. From career planning to finances and how to prepare for an interview, Spencer said, "mentors were crucial for me."

"I didn't realize how important it was to have mentors, but it is essential. I applied for promotions many times thanks to their encouragement. Now younger staff call me for advice, and I love strategizing with them," Spencer added.

Ann Turley, head, Surface Ship and Aviation System Division, believes that mentoring is a crucial element for workforce development and training. Turley has developed a presentation on women and their various roles at NUWC throughout the years, which she presents yearly to the workforce.

Recruiting and inclusion continued to be critical to secure success for all employees at Division Newport. It has resulted in a command that excels at meeting the Navy's needs in undersea warfare.

"We want to increase inclusion, not create unfair advantages for one group of people over another," Turley said. "That would further isolate them. We try to make things better for everyone, not just women or minorities or any other group."

Division Newport recently was honored with an award recognizing its recruitment efforts on social media, specifically Facebook and LinkedIn. In 2018 alone, more than 325 people were hired for federal government service at the command. These employees represent a diverse generation who are building the Navy of the future.

"It's proven that diverse teams provide better results and solutions, because they have different ideas and opinions. So we'll keep striving to achieve diversity," Hector Lopez said. "My utopia will come when we don't have to discuss the importance of diversity anymore. It's just the norm." ❖

In 2019, Division Newport was honored with an award recognizing its recruitment efforts on social media. In 2018 alone, more than 325 people were hired for federal government service at the command. These employees, such as those hired in April 2019 (above), represent a diverse generation who are building the Navy of the future.

Our Workforce

Spotlight on Expertise: Go-to Guy

Facilities man Ray Perry has kept NUWC Division Newport shipshape for 50 years

For more than 50 years, administrative technician Raymond Perry has taken care of everything at NUWC Division Newport that needs fixing, plowing, mowing, cleaning or set up.

Busted windows and leaking sinks? Call Ray Perry. Gardens need mulching, lawn needs mowing? Call Ray Perry. Need a tent and chairs, podium and microphones for a special event? You got it. Call Ray Perry.

For more than 50 years, administrative technician Raymond Perry has taken care of everything at NUWC Division Newport that needs fixing, plowing, mowing, cleaning or setting up. The extent of his work spans the entire 190-acre campus, from the smallest broken doorknob to the biggest event with VIPs.

He's the man in the background, directing hundreds of employees coming in and out day after day to ensure NUWC puts on its best face. So when people don't know Perry is there, that means he's doing a good job.

When a blizzard in 2005 dropped a foot of snow, Perry remembers working three days straight through the weekend to ensure roads and pathways were cleared.

"It was up to the windows, all you could see was the building sign," he said, pointing out a window and shaking his head. "We had to pile it on the lawns, in the drainage basins and wherever we could. I didn't get home all weekend to shovel my wife out of our house, and we still had to close campus the following Monday. It was bad."

From the worst of times to the best of times, one of his favorite days was setting up the event that is now known as ANTX. He was, and still is, the logistical go-to guy, from the tents and shuttle buses to the portable bathrooms and exhaust fans for those hot August days where hundreds of people exhibited the newest projects in naval undersea warfare technology.

"It was so great because it just came together," Perry said. "There were a lot of people involved, it wasn't just me. It was fun, but it was a lot of work. I even cooked the battery on my cell phone."

This jack-of-all-trades just likes working with his hands, so he started his career as an electrician and then worked as a tradesman at Division Newport's Facilities Department for 30 years. Perry learned of the opening in the Facilities Department at NUWC, was hired and found he loved the work.

"I used to do all my own service calls, and just worked my way up," he said.

The challenging environment at Division Newport appealed to his on-the-go nature and kept him coming back for five decades. Hands on is just the beginning for Perry, who admits he's slowed down a bit in recent years, and now leaves the heavy lifting to the younger men and women.

With no retirement plans yet, this 74-year-old is dedicated to keeping NUWC shipshape.

"One minute you're doing surveillance of the grounds crew, next minute you're on the roof trying to chase down a leak," he said. "That's one of the best things of this job, it's always something different." ❖

Perry sets up safety barriers for the NUWC Division Newport Employee Picnic held on June 25, 2008.

Perry (right) waters a tree after an Arbor Day planting held on April 26, 2012.

Spotlight on Expertise: Problem-Solving Machine

Tony Bruno looks for high-risk ideas in anti-submarine warfare

Tony Bruno at the beginning of his career when assigned to the Naval Underwater Sound Laboratory in New London, Connecticut.

Engineering new solutions for anti-submarine warfare is a daily task for Tony Bruno. This engineer, mathematician and physicist plays with models, sensors and hardware, to solve weapons and technology problems in the fleet. After more than 50 years, he doesn't appear to be slowing down.

Passionate and dedicated, Bruno has been commuting to Division Newport from his Connecticut home since the NUWC Detachment Lab in New London, Connecticut, was merged with Division Newport in the late 1990s.

"I really enjoy this hands-on technical work," he said. "I have advocated for non-traditional, non-acoustic sensors for a good part of my career. Traditionalists look at acoustics. I firmly believe there are other things in the environment that we need to take a look at and take advantage of."

Bruno spent 25 years working on novel underwater sensor methods in New London, doing numerical and analytical modeling, as well as developing prototype hardware for experimentation. He would spend weeks at a time at sea, sometimes bringing with him 4,000 feet of underwater cable to test different types of extremely low-frequency-receiving antennas.

"It was fun out in the fleet – I'd get to interact with the officers and crew, and make the warfighter's job easier while staying out of their way," he recalled.

Once in Newport, Bruno experimented in management for six years as deputy competency head of the test requirements and conduct competency division, where he was in charge of sensor calibration and survivability, data recording in the days of analog software, plus reliability, maintainability and accessibility of thousands of the fleet's sensors.

Myriad technological challenges will perpetually exist for the fleet, so Bruno has no shortage of work. He experimented with finite elements solving complex wave equations, and built models to explain fluid mechanical and electromagnetic issues. He has researched how to get non-traditional sensors into all sorts of mechanisms, from gliders to warheads.

"We can't always put cables out there to a fixed sensor field, so it's a lot easier to throw a wave glider over the side of a ship and let it do its thing," he explained. "But we have to figure out their power source, how they'll propel themselves, and have consistent communication of data back to the fleet."

Bruno is a one-man problem-solving machine with seven electromagnetic communications and sensor systems patents to his name. Now his interest in modern wave gliders, and their potential over fixed sensors, is part of a joint wave glider test and evaluation program with the Pentagon's Warfighting Lab Incentive Fund.

"We provide technical solutions that are put together by engineers who are constantly working to make it better," he said. "The solution isn't always more information. Sailors on deck are overloaded and can only process so much to figure out what's going on. So we take all this data and process it internally, then get it to the people who can use it."

Looking ahead, Bruno has lots of high-risk ideas that he'd like to develop, because he knows America's adversaries are forging ahead. We can't get complacent, he said.

"So that's what I'm trying to do — re-establish off-the-wall research, development and testing to help solve the surface and undersea warfare problem." ❖

Looking ahead, Bruno has lots of high-risk ideas that he'd like to develop, because he knows America's adversaries are forging ahead. Bruno (center) shared his years of experience during a lecture held on Nov. 11, 2015.

Bruno shares his expertise, as an engineer, mathematician and physicist, with a co-worker during the new professional poster session held on Sept. 7, 2017.

Spotlight on Expertise: STEM Advocate

Candida Desjardins teaches future engineers and scientists

Candida Desjardins, head of Division Newport's Educational Outreach Program, brings science, technology, engineering and mathematics to middle and high school students.

Growing up in the 1970s at the tail end of the women's liberation movement, Candida Desjardins was told by her family and peers, by society and by her internal motivation that she could pursue any profession she wanted. So she asked herself: "OK, so how do I make the biggest difference?"

Teaching came naturally to the effervescent and independent young lady, but it didn't pay much. She always loved math, so Desjardins decided to pursue that field by studying at UMass Dartmouth.

"Back then, math majors went into teaching or computer science, because there was no such thing as a computer science major at the time," she said.

Since her dad worked at the U.S. Navy base in New London, Connecticut, Desjardins admired the naval facilities in New England. So the day after she graduated in 1981, she naturally stepped into a job at NUWC Division Newport programming range software in the Test and Evaluation Department.

Exactly 38 years later, she is still at Division Newport, having combined her love of math and teaching to create and sustain NUWC Division Newport's Educational Outreach Program. Working with students ages 9-18 in largely underprivileged communities, Desjardins is helping to develop the science, technology, engineering and mathematics (STEM) fields. Advising the award-winning underwater robotics team at Rogers High School in Newport, she also trains math teams to compete at state and regional competitions, and teaches fourth and fifth grade students in New Bedford, Massachusetts, about marine science and many other topics.

"The need for STEM has been documented, and we're being a good community steward," she said. "It's good for the community and us."

Starting with a few hundred students in 2006, her program has expanded to more than 5,000 students annually across Rhode Island and Southern Massachusetts.

"I'm in schools every day of the week and nine weeks of the summer," she said. "We're trying to light a spark and give them an opportunity to keep going."

Engaging more than 250 NUWC Division Newport staff volunteers in these fields, including Spanish-speaking female engineers and minority volunteers, Desjardins said the students are encouraged to pursue STEM careers because they see that their dreams are possible.

"There are a lot of students in the robotics programs who would love the opportunity to pursue this line of work professionally, and having the staff at NUWC Division Newport encouraging them is the push they need," she said.

This program encourages professional engagement with these students, some of whom go on to apply for jobs at NUWC Division Newport or government work at large.

"NUWC has always supported this effort," Desjardins said. "The Department of Defense is one of the biggest sources of scientists and engineers, so they see the value." ❖

Starting with a few hundred students in 2006, the Educational Outreach Program has expanded to more than 5,000 students annually across Rhode Island and Southern Massachusetts. Above, Desjardins helps a youngster build a mini robot during Division Newport's Family Holiday Party in 2010.

Part of the outreach program includes training math teams to compete at state and regional competitions. Above, Desjardins and volunteers gather at the 2016 Mathcathalon held at Normandin Middle School in New Bedford, Massachusetts on March 22, 2016.

The legacy: Two generations reflect on NUWC careers

Tammi McCarraher, NUWC Division Newport's deputy comptroller, and her aunt, Amelia "Amy" Medeiros, who was employed as a secretary at the command from 1954-97, attend NUWC Division Newport's 150th anniversary celebration on July 29, 2019.

When Amelia "Amy" Medeiros started working at Naval Underwater Ordnance Station (NUOS) as the secretary for the Launchers Department, it was 1954. While the country endured an era of civil disobedience, gender and racial disparity, NUOS was experiencing its own tidal change.

During the 1950s and 1960s, the first professional women were hired in Newport, mostly as mathematicians. Women began to be hired as mechanical and electrical engineers, physicists and scientists. This highly trained and diverse workforce, many with advanced degrees, began to explore the latest technologies and to develop new and highly sophisticated systems.

In those days, there were few secretaries to do the vast typing, communications and office management work for which Medeiros was responsible, she said, but that resulted in close relationships among the support staff. Medeiros said co-workers helped each other through the transition to computers, shared ideas about growth and attended Women's Equality Day lectures.

"I worked with wonderful people. Everyone was like family because we were so small," she said. "I loved going to work, and I looked forward to it. We had the best department in the whole Division."

Medeiros, a resident of Middletown, Rhode Island, often talked with pride about her dedication to work, and the outstanding research and development at the center, which was undergoing many technological advances.

Those comments left an impression on Medeiros's niece, Tammi McCarraher, of Dartmouth, Massachusetts, who now continues the family legacy at Division Newport as deputy comptroller.

McCarraher said she owes everything to her aunt, who explained the values of civil service, inspired her to push for an education and professional success, and encouraged her to take advantage of the former Stay in School program, which provided hands-on professional training to students.

"My aunt was always very proud of the work the Division did and told me that people were dedicated and hard working," McCarraher said. "She was very proud that she was part of this organization. I don't know that I would have considered this line of work if it weren't for her. I have been fortunate to have been able to take advantage of many of the opportunities the Division has offered. I have had wonderful mentors and work with an amazing group of people."

As the Division maintains its vigorous hiring goals to adapt to the modernizing fleet's needs, it will continue to expand. Even Medeiros didn't recognize her former building when she returned last July for Division Newport's 150th anniversary monument commemoration ceremony, which she attended with McCarraher.

"When it was time to retire, it was hard. It was like cutting off my umbilical cord, my lifeline," Medeiros said about her departure in 1997. "I was sad to leave yet happy to have been part of something so terrific for so long. The alumni luncheons are a wonderful way to stay connected. We have stuck together like glue."

McCarraher is taking her aunt's lessons to heart. "Every position I've held, I hope that I have left something positive behind that will help shape the future organization," she said. "When I started, I said 'who stays in a job 30 years? I don't think I can do that.' But, 34 years later, here I am!" ❖

NUWC Division Newport employees Julie Henry (from left), Elaine Trainor, Bill Thorp, Jerry McCauley, Trevor Kelly-Bissonnette and Jeff Prater gather after "The Knot," a 150th anniversary-themed storytelling event on Nov. 13, 2019. Podcasts from the event can be found at https://soundcloud.com/navseawarfarecenters.

'The Knot' honors Division Newport's 150th anniversary with personal anecdotes of history

The Department of Defense is in her genes. As the fifth person across three generations of two separate families to work in the defense industry, Elaine Trainor is part of a network that has made it their family business to serve the country. From engineering and design to combat and torpedo assembly, it's not just genetic predisposition that determined her fate. Dedicated to her current work as administrative officer on detail to Corporate Operations Department head Vicki Comeau, Trainor is proud to continue the tradition that began with her maternal aunt.

Sharing these memories and her family history during "The Knot" presentation on Nov. 13, 2019, in Chafee Auditorium, Trainor was the first of four speakers honoring Division Newport's 150th anniversary with stories of history, service and commitment. Other presenters were Jerry McCauley, mechanical engineer in the Propulsion Test Facility; Bill Thorp, project manager for Program Management Office; and Trevor Kelly-Bissonnette, International Programs Office.

"These are stories from the workforce that tie us together," Public Affairs Officer Jeffrey Prater said, after he introduced the lineup. "And these four stories will complete that (150th anniversary) theme."

'The Family Business'

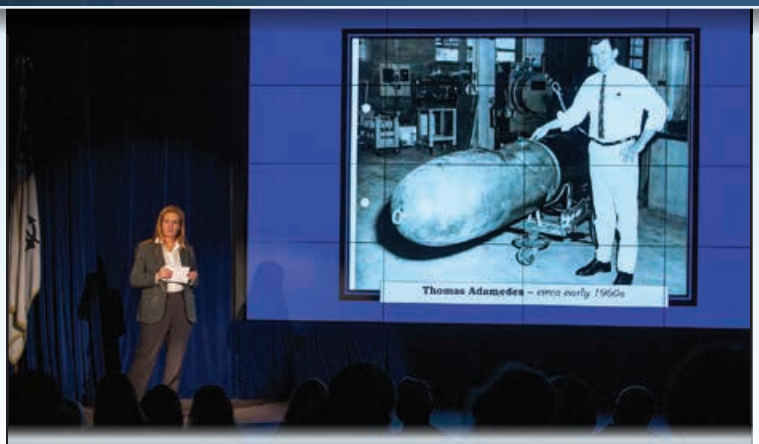
Graduating with a degree in business from the University of Rhode Island in 1988, Trainor told the crowd, "I was 21 and ready to rule the world."

She had grown up in Newport where her mother's family owned a candy store on Spring Street, and couldn't wait to get out of the small town. As she grew older and learned of her family's sacrifices, though, she gained a greater appreciation of her upbringing.

During the World War II-era, while the country rationed sugar and chocolate, the store struggled financially, so her Aunt Mary dropped out of Rogers High School to support her family of seven. She worked at the Naval Torpedo Station on Goat Island, bought war bonds, and on her salary fed everyone and saved enough money for the down payment for her parents' first home.

"When she was working at the Torpedo Station, my father was in the first grade in Greece," Trainor said. He was a shepherd in Damaskinia, a region heavily bombed during World War II. The Germans invaded his village many times, and the family fled to caves in the mountains, which he knew well.

"He was so scared one time that he ran off into the woods and his mother couldn't find him for three days," Trainor



Elaine Trainor discusses her family's history in Newport and working at the Torpedo Station and later NUWC.

said. "He shielded a lot of the worst of his stories from me and my sister."

After World War II ended, civil war began in Greece, and Trainor's family had enough. They immigrated to America, settling in Newport, where Trainor's father, Thomas Adamedes, enrolled in Rogers. His family ran the Atlantic Diner on Thames Street, where Busker's Restaurant is now, she said. He graduated in 1950, and enlisted in the Army infantry because that's all he knew. He fought in the Korean War, and when he returned he attended Middlebury College in Vermont. "He hadn't seen the inside of a classroom since he was a boy," Trainor said. "He struggled with English, so he started taking math and physics classes, because apparently that was easier."

He graduated with a degree in mechanical and industrial engineering from University of Rhode Island, and later earned his master's degree in industrial and ocean engineering. He also earned an MBA in 1965, the first graduating class in that field at URI. He landed a job at the Torpedo Station "doing the work he loved and serving the country," she said, bought the family home and put Trainor and her sister Zoe through college. Zoe started her career at Division Newport but has worked as a chemical engineer designing zinc batteries for a DoD contractor in Connecticut for 25 years.

"My dad has always pushed education. When my sister asked him about a dowry, and what we would give to our husbands, he said, 'The gift you give your husband is the gift of an educated wife,'" she said. "I was always very grateful that he supported education of women and ensured we both earned our degrees."

Trainor met her future husband in high school, and became a military wife after he graduated West Point. Stationed in Schofield Barracks, Hawaii, Trainor worked in Pearl Harbor as a purchasing agent. They relocated to Houston, where she was a contracting officer on space shuttles for NASA's Johnson Space Center and where her son was born. "I took a 19 year break in service of federal employment to be a mom," she said. "That was the best job ever." Returning to Newport five years ago, she was hired by Division Newport to run the drug testing program for the Human Resources Department.

"Growing up, it's easy to have something right in front of you and not appreciate it," she continued. "But during this month of remembrance and thanksgiving, I want to thank the DOD, NUWC, the Navy and especially my dad, because my education and success would not have been possible without them."

'The Best Thing Since Sliced Bread'

Mechanical Engineer Jerry McCauley, of the Propulsion Test Facility, has been testing weapons and machinery his entire career. From submarines to make sure they go, to torpedo propulsion to ensure they stop, McCauley knows about torpedo development and its history here at Division Newport.

One thing he knows particularly well were the issues that plagued torpedoes developed in Newport during World War II. "They wanted to develop a newer torpedo that was faster and better. As part of that program you'd expect lots of testing of the new technology. That was not the case," he said. "We ended up with a black eye and a really bad reputation."

McCauley explained that the torpedo engineering team at the time only did one series of live fire tests, with a 50% success rate. It concluded the weapon was ready and it was issued to the fleet. During the first month of the war, "The fleet fired 98 torpedoes and sank only three ships. The torpedoes ran too deep and didn't explode," McCauley explained. "The Torpedo Station didn't believe the fleet, said their tactics were bad. It cost some submarine commanders their careers. So the fleet took matters into their own hands, strung up a net and shot torpedoes through it. They concluded that the torpedoes were running 18 feet too deep.

With the depth control fixed, it started to "explode too soon, 15 seconds into the run or just before the target," McCauley said. "They disabled the magnetic influence exploder and used the contact exploder." They expected this to solve the problem since it had worked on earlier versions of the torpedo. Unfortunately, they now were experiencing a large number of duds.

Continued on page 100

Jerry McCauley talks about the Torpedo Station and the devastating lessons learned in its early days.

Continued from page 99

By 1943, after they fired 12 torpedoes at a disabled Japanese tank and all of them were duds, the fleet had enough, McCauley said. "So they shot three torpedoes at an underwater cliff. The third one was a dud. They retrieved it and did diagnostics to determine what was wrong. They found out that if (the torpedo) hit at an angle it would explode. So they issued an order to the fleet not to make good shots, only bad shots until they could fix the problem. It actually worked!"

So 23 months after the United States entered the war, the U.S. Navy finally had torpedoes that worked, McCauley said. "We started out pretty poor with performance, but improved greatly. It took 100 torpedoes to sink three ships during the first month of the war. At the end of the war, we shot 14,748 torpedoes and sank 1,314 ships, which equals 11.2 torpedoes to sink a ship. This resulted in 55% of ships sunk during the war were sunk by torpedoes," he said. "Just think about how much shorter the war could have been and how many lives would have been saved had we put out a good product. So we always try to do the best we can to issue a quality weapon to the fleet."

McCauley went on to explain that the modern day Naval Undersea Warfare Center has learned from its mistakes. Structural safety is a primary concern as well, and after an explosion in 1955 that caused a fatality, they moved the testing facility to a more remote location where fewer injuries could occur. Then in 1995, they were running a torpedo propulsion test at depth. It developed a fuel leak and detonated, destroying the building. But with the new construction, it functioned as it was supposed to, directing the energy up and away from people so no one was hurt.

"These are things we can't forget. We have to remember these events, do our due diligence. It takes a while to put together documentation. To test the full capability of the weapon, and document how it goes wrong," he concluded. "At the end of the day I want to be able to say we gave the fleet a weapon that works, and that we can go home to our families every night."

'Underwater Legacy'

Imagine starting out your professional career with your grandfather and parents, as well as their reputations, around every office corner? Such was the environment for third-generation Underwater Sound Lab employee Bill Thorp, a project manager in the Undersea Warfare Weapons, Vehicles and Defensive Systems Department, who began working in 1995 in the New London Sound Laboratory's surface sonar department. His parents were wrapping up their storied careers there, and his grandfather's legacy lingered.

"When I started, there were still lots of people who worked there who were colleagues of my parents and even contemporaries of my grandfather. They shared some of their stories with me, what it was like working with my grandfather," Thorp said. "They left me with a lot of technical data that couldn't be transferred to Newport. I didn't know what to do with it all, but I took it with a smile."

Bill Thorp talks about the Naval Underwater Sound Laboratory in New London, Connecticut, before it merged with NUWC in the 1990s.

Since the New London lab was scheduled to be closed under the Base Realignment and Closure (BRAC) program in 1992, NUWC was transferring all the work to Division Newport. "With the anticipated attrition associated with the BRAC, I was one of many hired to continue the surface sonar work in Newport. It worked out well for me," he said. "It was interesting work, and a good start."

The New London lab went as far back as World War I, with a significant history in acoustics and sonar development, Thorp said, and was re-established in World War II in conjunction with Columbia and Harvard Universities prior to becoming a Navy lab. His grandfather took a job there in 1947, starting off his research characterizing sound propagation loss, and more specifically volume attenuation. He identified a deviation in the attenuation coefficient curve below five kilohertz, and spent a good portion of his career characterizing it and ultimately developing a mathematical expression for it (as a function of frequency).

"He traveled the world, from the Tanzania lakes of Africa to the Bermuda Triangle, collecting analog data. It was painstaking work," Thorp said. "He published his findings in the Journal of Acoustical Society of America in 1965 and 1967. He was fortunate to have lots of his work published." He retired in 1975, and by the time Thorp arrived 20 years later, "so many people still remembered my grandfather," he said. "It was pretty interesting to start my career there, with people who had dedicated their lives to this work. They were very passionate, and wanted the tradition of underwater acoustics development to continue in Newport. And it has. It was a significant accomplishment, and I think they're very proud of that."

'The Feminine Mystique'

Trevor Kelly-Bissonnette, customer advocate for International Programs, was more comfortable with science and math than English and the arts in school. So it was no surprise that she took advantage of Title IX, which gave girls access to male-dominated courses such as woodworking, electronics and shop. That education and experience led her to Division Newport, where she started her career as an engineer in 1982.

"At that time, the rest of the nation was dealing with getting women in the workforce, so there was a lot of focus on that. I was on the beginning wave to increase the engineering population here 20%, including female engineers," she said. "It was a male culture for sure. I worked with other engineers, platform integration of the torpedo (loading and handling) with four different classes of subs. It was not uncommon to see a calendar with women's bosoms. It was risqué. There was one very raunchy poster of a naked lady. It was uncomfortable."

When Kelly-Bissonnette shared with her supervisor that these posters made it uncomfortable for her, her complaint went up the chain of command, and her Division head went around asking male staff to take the posters down, saying "'Trevor doesn't like it,'" she said. "There were less than 10 female engineers at NUSC then, and I was impacting the culture within 90 days of starting here."

As an engineer, the work she was doing was interesting. Russia had a new submarine, she remembered, and ADCAP (advanced capability) Mark 48 was going to be the answer. There was a sense of urgency that encouraged good teaming across departments. "I had an exciting opportunity to ride the sub. I had conducted the analysis, developed the test plan, secured fleet services — everything was ready. I met with the CO, and he said no, he can't take a risk to have a woman on board. Women are bad luck."

Integrating women into the workforce in the 1980s was a national issue, she said. At that time, there was a full-time EEO officer, and a full-time Women's Equality Day manager at NUSC. There also was an annual Women's Equality Day forum led by Federal Women's Program (FWP). Many women were added to the roster from 1982 to 1986. But despite this growth, the shifting dynamic and attention on women resulted in disgruntled male co-workers and judgment. They said, "That's where the girls go to bitch and complain," Kelly-Bissonnette said, remembering her colleagues' comments.

She joined the FWP, a program that prohibited gender as a form of discrimination, identified barriers to the hiring and advancement of women and enhanced employment opportunities for women in every area of federal service. She was encouraged by Dot Bing, the FWP manager at the time, who said: "If there is a vacuum fill it, don't wait to be asked and take control of your career," she remembered.

In the 1980s and 1990s, the BRAC program forced the closure of facilities across the country, including New London. "The workforce was stressed. We were worried about our jobs. Working parents had to deal with childcare, which was scarce. Women were dropping out of the workforce because day care was so expensive. If people are stressed about their lives and don't feel secure, work is impacted and innovation slows down," said Kelly-Bissonnette. "The volunteers in the FWP got engaged and pulled the data and metrics to plant the seed to get a CDC (child development center). The CDC outside the gate grew from that seed. It is great that people in this audience are using it."

The command also was aware of the stress of that period and implemented "the Employee Opinion Survey," conducting a big introspection on its workforce and workplace. The data was collected and focus groups created to identify methods of making the work-life balance better. Teleworking and part-time made it easier for the workforce to balance home needs with work commitments, and lateral transfers also were instituted, she said.

"We all benefit from these policies today," Kelly-Bissonnette said. "The 80s and 90s saw a lot of changes. Today, gender is not even noticed anymore. These work policies have allowed us to stay motivated. And NUWC needs a highly motivated workforce to support the innovation that has enabled the 150-year history. There is strength through diversity, inclusion and engagement." ❖

Trevor Kelly-Bissonnette talks about NUWC in the 1980s and 1990s and her experience as a female engineer at the center.

During a contracts workshop, Elizabeth Mostowy (second from left), Jamelaa Jones (center) and Daynamar Delgado Nieves (right) determine how best to procure a piece of equipment given the different options available, as part of 'Bring a Co-worker to Work Day,' on Aug. 8, 2019.

'Bring a Co-worker to Work Day' educates, inspires Division Newport employees

Avatars and fish vertebrae are taking over Division Newport. Testing boundaries and challenging our perceptions of Sailor training and weapons experimentation, these miniscule digital humans and underwater creatures are the foundation of the command's developing technologies.

These were just one element of the Combat Systems Technology Lab and Acoustic Materials Lab on display during the annual 'Bring a Co-worker to Work Day' held on Aug. 8, 2019. One hundred thirty eight employees across the command took advantage of the opportunity to explore 15 different tours to better comprehend and appreciate the scope of Division Newport's groundbreaking work.

The most popular? The Acoustic Pressure Tank Facility, Single Crystal Transducer Materials, and Chemistry Lab attracted more than 50 division Newport employees.

"We use bio-inspired modeling and 3D printing to see if there are some useful tools in underwater biology," said Al Armstrong, head of Surface and Aviation Systems Engineering Branch. "Fish swim in a certain way and get to a place very fast. So if we can design our underwater vehicles and towed arrays to be more flexible to get through the ocean, we're going to try to take advantage of that in an underwater environment. Last year we modeled seal whiskers for a similar application."

Designer Kenneth Figuerado was part of the team to build the avatar and the virtual art gallery where it lived. Much like the futuristic feature film, this avatar did whatever its human handler instructed, acting as a digital puppet. With a few simple strikes of the keyboard, Figuerado maneuvered his avatar across NUWC's digital campus and launched virtual torpedoes from a virtual Narragansett Bay Test Facility.

"We can really push creativity here," Figuerado explained, referencing Van Gogh's "Starry Night" painting that his team virtually recreated in the Combat Systems Technology Lab. "I'm a hands-on learner, and so are Sailors who need to train the way they fight. I'm trying to find what's wrong in a scenario or a point of failure in a system, so I can see where we might get better."

Additional simulation at the Submarine Bridge Trainer echoed this intention for improvement as participants climbed aboard a platform. Winds howled and projectors displayed a virtual nautical snowstorm on the screen, highlighting the training Sailors undergo.

"Fans even blow your hair back as if you're going fast," technician Samantha Roberts said. "This exercise tests Sailors' communication skills during the submarine docking sequence."

Yesterday... Today and Tomorrow

From docking to launching, the group stared down the head of a Tomahawk missile to visualize how it would be transported, stored and dispatched from a surface ship or submarine.

"We design, manufacture, maintain and test the equipment and systems for loading, handling and ejection of most anything that leaves the submarine," said Payload Integration and Launcher Laboratory Manager Joe Carreiro. "Noise generation is a big issue in submarine work. We're dealing with a very high horsepower weapon launch system that moves water at an extreme flow rate, and it has to be quiet."

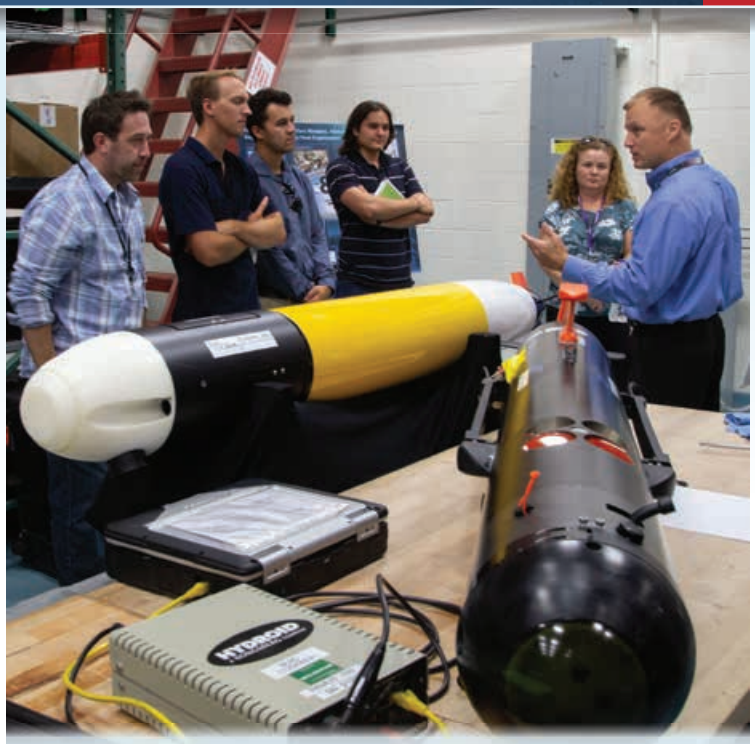
From unmanned aerial vehicles (UAV) to the Autonomous Undersea Vehicles (AUV) Lab, employees were exposed to the vast heights and depths of Division Newport's research and development.

Mike Ansay, head of Autonomous Undersea Vehicles, discussed the variety of his team's underwater vehicle development and testing, and said that torpedoes and UUVs actually look similar. From their long, cylindrical shape and aerodynamic style, they mimic each other at first glimpse, but the two couldn't be more different on the inside.

Unlike torpedoes, UUVs have no warhead, he said, are neutrally buoyant, travel slowly and have a long life.

"They're also autonomous, so when we put them underwater, they're on their own," Ansay said. "Until we get that vehicle back, we don't get its data.

"In the littoral space, there is lots of surface traffic on the water, which places AUVs at risk. Narragansett Bay is busy with pleasure boats, and we don't want the AUVs to surface and get hit by one. As a result, the AUVs are designed to stay underwater to avoid any collisions."



A visit to Division Newport's Autonomous Undersea Vehicle Lab was at the top of employees' lists during 'Bring a Co-worker to Work Day' held on Aug. 8, 2019.

Gliders are another unmanned undersea watercraft, with long endurance and a languid pace to soak up as much data as it can.

"We've been losing ground to our technology peers in the air and space domains," Ansay reminded the curious group, "but undersea we still hold an edge." ❖

Beata Jones and Zach Augustine from the Contracts Department; Joshua Jasper, Corporate Operations Department; Bryan Ash, Contracts Department; and Stanley Poon, Undersea Warfare, Weapons, Vehicles and Defensive Systems Department, collaborate during the 'Bring A Co-worker to Work Day' festivities.

NUWC Division Newport pays tribute to those who made the ultimate sacrifice

Gray skies above served as a solemn backdrop on May 23, 2019, as the Naval Undersea Warfare Center Division Newport paid tribute to employees who have died in the line of duty while in service to our country.

"As we build the Navy we need for our nation, the agility in our forces and our workforce, it's very important to reflect on the civilians who lost their lives for our nation," said Rear Adm. David Goggins, Program Executive Officer for Submarines, who was the principal speaker at the Memorial Day Remembrance ceremony. "They're also warfighters, in my opinion, and have done a great service for our country."

Goggins, Division Newport Commanding Officer Capt. Michael Coughlin and Technical Director Ron Vien were the featured guests, accompanied by about 75 employees.

"I think back to President Abraham Lincoln delivering the now-famous Gettysburg Address in 1863, and a portion of that short but immortal speech reads: 'We have come to dedicate a portion of that field as a final resting place for those who here gave their lives so this nation might live. It is altogether fitting and proper that we should do this,'" Coughlin said. "It continues to be fitting and proper that we celebrate, once per year, the Americans that have given their lives in defense of our country and our way of life."

Public Affairs Officer Jeffrey Prater explained that NUWC is celebrating its 150th anniversary this year, shared NUWC's history and then talked about 34 individuals who have lost their lives in service. The remembrance concluded with a wreath-laying ceremony while R.I. Army National Guard member Sgt. William Chilton played taps.

Prater opened the remembrance by talking about the history of the monument, which was erected in 1930 at Government Landing in downtown Newport under the auspices of the Newport Metal Trades Council, but was later relocated to its current location at Division Newport.

"On May 27, 1966, a ceremony, with Frank Smith, president of the Local 119, International Association of Machinists presiding, marked the relocation of the station's memorial," Prater said.

After Petty Officer Adam Upleger tolled the bell in honor of those men lost in service here, Prater noted that two new names recently were added to the monument: Lt. Cmdr. Benjamin L. Edes and Lt. Lyman G. Spalding, who were killed by an accidental torpedo explosion in 1881. ❖

NUWC Division Newport alumni reunite for 150th anniversary

The sense of comradery at Division Newport remains long after retirees depart their long-standing professional post. So when they are reconnected, it's like a family reunion. Such was the sentiment at a special alumni luncheon held on June 5, 2019, at McGovern's Restaurant in Fall River, Massachusetts, in honor of Division Newport's 150th anniversary.

"We wanted to do a lunch for the retired folks and those who still work here so we could see them and they could see each other," Terry Cunha, who co-organized the event, said. "There were 79 people there, and it was great."

Welcoming about 50 retired employees from across all departments and decades, with 29 current NUWC Division Newport employees, Cunha said she even saw one gentleman there who had retired in the 1970s.

"The different departments were definitely well represented," she said.

The event opened with a few remarks from co-organizer Bev Ferris, who welcomed everyone and asked for a moment of silence to mark the passing of retirees during the past year. She introduced Public Affairs Officer Jeffrey Prater ,who shared details about Division Newport's 150th anniversary celebration this year.

"So many people told me they were so glad we did this," Cunha said. "Afterward people hung out to talk. It was a great opportunity to catch up. It was a great success."

Retiree reunions are held three times a year – the first Wednesday of June, September and December. To be added to an email list for the events, contact Ferris at (401) 855-4292. ❖

Nearly 200 people participate in 150th Anniversary Golf Tournament

Jim Broadmeadow, Platform and Payload Integration department, scooped his golf ball from the bottom of the cup, turned and raised it in the air as if to acknowledge a gallery full of fans. There was no audience to cheer when Broadmeadow pivoted, though. Instead, he was met — predictably — with a few friendly digs from co-workers Anthony Travelyn and Travis Tucker, both of the Platform and Payload Integration department, as each took their turn at a 13-foot putt for a chance to win a raffle prize.

"You're welcome for the read," joked Travelyn, who went first, missed his putt and watched his two co-workers sink theirs.

The lighthearted atmosphere of the NUWC Division Newport 150th Anniversary Golf Tournament held Sept. 13, 2019, at Green Valley Country Club in Portsmouth mirrored the day's perfect golf weather with temperatures in the high-60s.

A light breeze gently swept intermittent clouds about the sky as 180 golfers scurried about the course between the two sessions, one which began at 7:45 a.m. and the other at 1 p.m.

Marc Francis, Frank Machado, Anthony Soscia and Brian Manton of the Combat Systems Department were the golf tournament winners.

While Broadmeadow, Travelyn and Travis found time to make a few jokes, their play on the course was hardly something at which to laugh. They teamed with Rob Arnold to shoot an 11-under-par 60, good enough for second place.

Marc Francis, Frank Machado, Anthony Soscia and Brian Manton of the Combat Systems Department also finished 11-under, but notched first place by virtue of the tiebreaker, a card-by-card comparison to determine who had the better scores on the course's most difficult holes. The Combat Systems Department also was the department winner of the event.

Third place overall and the lowest round in the afternoon session went to the Electromagnetic Systems Department's Birse Timmons, Anthony Susi, Daniel DaRos and Joseph Villucci, who shot a 10-under-par 61.

"This is a special event and Green Valley has been absolutely tremendous," Tom Carroll, an analyst in the Strategic Planning Office, and principal organizer of the tournament, said. "They were willing to roll out the red carpet for us because I think they recognize the significance of this event. For them to close down the course to the public and their members for the day to accommodate us is awesome. We're all so grateful." ❖

Two bowling tournaments held at Naval Station Newport

The 150th anniversary bowling competition held at Naval Station Newport's Seaview Bowling Lanes was so popular in August (above photo) that organizers held a second competition in November (below photo).

Enthusiasm to participate in the 150th anniversary bowling competition at Naval Station Newport's Seaview Bowling Lanes was so high that organizers knew a second competition had to happen.

The first competition on Aug. 2, 2019, was at full capacity with 44 bowlers representing all departments across Division Newport. On Nov. 22, 40 bowlers, and only a few repeats, had the chance to participate, according to organizer Teresa Cunha of the Undersea Warfare Weapons, Vehicles and Defensive Systems Department.

"No lanes were quiet, everyone was having a great time," Cunha said. "All the lanes were Division Newport and people knew each other across the lanes, so everyone was having a good time."

In August, Towing the Line (team No. 11), from the Sensors and Sonar Systems Department, won first place and had the highest one-game score of 796. Team members were: Keith Koepke, who served as captain, Michael Williams, Scott Greenberg and Kenneth Webman. Along with bragging rights and a bowling pin, each member received a NUWC Division Newport 150th anniversary commemorative coin.

Fleet Support 855, (team No. 10), from the Undersea Warfare Weapons, Vehicles and Defensive Systems,

won second place, with a score of 691. Team members were: Kevin Lowther, who served as captain, Nathan Abdow, Ken Oehmen and George Andes. This team also won first place in November, with the highest one game score of 766, and Kevin Lowther as the only returning bowler on this team. Additional team members were Gary Paquin (captain), Mike Alice, and Phil Campo Sr., all of whom earned bragging rights and a pin.

In November, the second place winner, with the second highest one game score of 618, was Team No. 6 "Spare and Reasonable" from the contracts and command departments. Team members included Dameon Harrington (captain), Carolyn Gillman, Shane Murray and Justin Rianna. They also won bragging rights and small prizes. This was the only team who returned with the same four bowlers who bowled in the first competition.

Last place went to Team No. 8 "The Strike Zone," from the Operations and Contracts Departments. Team members were Jenny Roach (captain), Caryn Morehead, Kevin Murphy, and Mary Navarro. "Their team score went up by 51 points in the second game and they had a lot of fun!" Cunha said.

"With 10-pin bowling, 100 is considered a pretty good score for someone. A few were going over 200, and that's really good. Division Newport people bowl pretty well!" Cunha said. "It brought people together who aren't usually together, so it was a great event to recognize the 150th anniversary."

Division Newport's Civilian Morale, Welfare and Recreation supplied the 150th anniversary coins to all the winners and commemorative wooden coins were given to each bowler. ❖

150th anniversary movie screenings are a big hit

As part of events to celebrate the 150th anniversary, employees were invited to several movie screenings held throughout 2019. A viewing of "Hidden Figures" held in April, 2019, also coincided with Black History and Women's History months. The story of NASA employees Katherine G. Johnson, Dorothy Vaughan and Mary Jackson, brilliant African American women who served as the brains behind one of the great operations in history — the launch of astronaut John Glenn into orbit — demonstrated how the visionary trio crossed all gender and race lines to inspire generations to dream big.

"That is just the kind of example NUWC Division Newport employees strive for each and every day — diversity, inclusivity and engagement," said Public Affairs Officer Jeff Prater, who organized the movie series.

Screenings of submarine-themed movies also were held as part of the series. "The Hunt for Red October" was shown twice in August and "U-571" was shown in December. The movies also featured a discussion from a panel of submarine officers, who talked about real-world submarine operations and how they compared to those events portrayed.

The team of former submarine Sailors who answered questions at "The Hunt for Red October," included Division Newport's Executive Officer Cmdr. Marc Picard, Richard Medley, Michael Cockey and Jim Pillsbury. ❖

As part of the screening of "The Hunt for Red October" in August (left photo), a team of former submarine Sailors presented a discussion about real-world submarine operations. The panel included Executive Officer Cmdr. Marc Picard (left photo, from left), Richard Medley, Michael Cockey and Jim Pillsbury.
A viewing of "Hidden Figures" in April (right photo), also coincided with NUWC Division Newport's celebration of Black History and Women's History months.

Threats from yesterday, today and tomorrow are part of 150th anniversary wargaming event

Armed with two surface ships, two submarines and two planes, NUWC Division Newport employees Nicole Evangelista and Cassandra Tompkins strategically placed their pieces around the game board during a 150th anniversary wargaming event held on Sept. 18, 2019.

"I'm going to put one here and one here, so that when we move, we can patrol," Tompkins, of the Sensor and Sonars Department, said.

"What if we use our ships in these bigger spaces over here?" Evangelista, an employee in the Undersea Warfare Engineering and Analysis Department chimed in, drawing approval from Tompkins.

The goal for Tompkins and Evangelista was to identify two Soviet Union Foxtrot-class diesel submarines armed with nuclear-warhead torpedoes to hold the boats at risk, thus preventing them from breaking the United States' blockade of Cuba during the Cold War.

"You have correctly classified two of two submarines," Tucker Sylvia, who controlled the Soviet subs in his role as umpire for the game, said — much to the joy of Tompkins.

Evangelista, Tompkins and Sylvia were three of 18 NUWC Division Newport employees who took part in the first of the two, three-hour wargaming sessions. "This gives you a chance to see just how complicated wargaming can be," Tompkins said.

"It was very informative," Sylvia added.

Alejandro Rodriguez and Nicholas Caswell practice their wargaming strategies during an event on Sept. 18, 2019.

Ann Turley, Peter Rodgers and Allison Redington strategically place their game pieces around the board during a wargaming event held Sept. 18, 2019.

The idea for the wargaming event arose during the initial stages of planning events for Division Newport's 150th anniversary according to Julie Henry, a branch head for Division Newport's Submarine and Surveillance Training. Henry organized this event with Paul Vebber, Bill Jankowski and Ann Turley, head, Surface Ship and Aviation Systems Division in a collaboration between departments.

"We were brainstorming ideas and somebody wanted to do something a bit competitive and look at NUWC's history through some kind of game," Henry said. "This gives people a little bit of awareness as to when you're developing technology why it helps or hurts the fleet.

"These war games also help employees to understand the different platforms we have in the fleet, and why Navy leadership decides to fund what they do."

Participants were split into teams of three with one player serving as umpire, controlling the enemy pieces, and the other two in charge of moving U.S. game pieces to locate the enemy ships. The game board was comprised of 64 squares and 49 circles, with the circles located at the points where the corners of four squares touch.

Game play was a combination of chess meets Battleship and any board game involving dice. Each piece could only move and surveil a certain amount of spaces. For example, submarines move only one square space at a time but in any direction — like a king in chess — but surveil only the spot on which they occupy. Surface ships move only on the circle spaces and up to three spaces at a time, but surveil all the square spaces in which they touch. Planes remain on the outside edges and surveil entire rows of the board, however, the more area a game piece covered, the less accurate it was at identifying and classifying a contact.

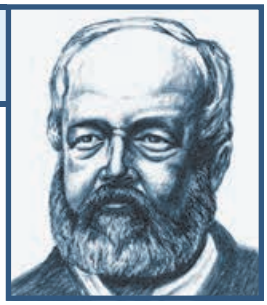
Continued on page 121

Test your NUWC Knowledge

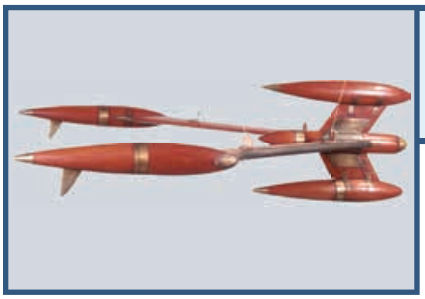
1. What was the name of the U.S. Navy's first Experimental Ordnance Facility and where was it located?

2. Built by the Herreshoff Co. of Bristol, Rhode Island, in 1886, what was the name of the Navy's first wooden torpedo boat stationed at the Naval Torpedo Station?

3. An English engineer and inventor revolutionized naval warfare in the 1860s with the invention of the first "Automobile Torpedo." What was his name?



4. In 1871, Adm. David Porter directed NTS Newport to "examine closely into the subject and ascertain if torpedoes of this plan [similar to the early Whitehead designs] cannot be gotten up." This torpedo was the Navy's first self-propelled torpedo. What was its name?



5. The OV1 tow body, a World War I underwater listening device, was able to obtain good readings on surface craft at distances of up to 2 miles. How was this device towed?

6. The Mark 6 depth charge was developed at Naval Torpedo Station Newport and used in World War I to sink German U-boats. What was the nickname for this depth charge?

7. The first women employees at the NTS Newport came to work when extensive manufacture of torpedo and depth charge primers commenced. What year was that?

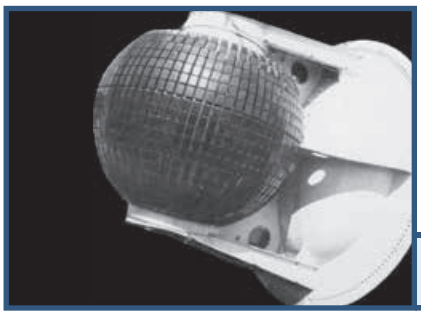
8. The new firing pier at NTS Newport played a pivotal role in early torpedo testing. Note the two elevators with tubes for firing torpedoes. Where is this?

9. The Mark 9 Torpedo was a Bliss-Leavitt torpedo developed and produced by the E. W. Bliss Co. and NTS Newport. What kind of vessel was it produced for?

10. Leading up to and during World War II, NTS Newport operated 24 hours a day, 7 days a week, and many of the newly hired were women. About how large was the workforce?

A. 3,000 B 10,000 C. 13,000 D. 8,000

Yesterday... Today and Tomorrow



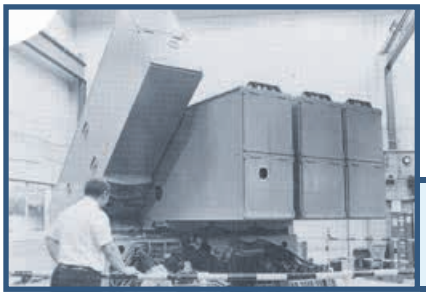
11. The Mark 13 was the first torpedo designed specifically for aircraft launch in the mid-1930s. What was the name of the torpedo plane used to launch it?

12. At the NTS during the war years, what island was used extensively?

13. The first submarine bow sphere sonar was mounted on what submarine?

14. MATT acted as a submarine during tests of early acoustic homing torpedoes. What does MATT stand for?

15. This submarine was the world's first nuclear submarine. At 11 a.m. on Jan. 17, 1955, it went to sea for the first time and signaled its historic message: "Underway on nuclear power." Name this submarine!



16. This laboratory at the Naval Underwater Ordnance Station played a key role in missile development and in resolving in-service issues for solid-fuel, rocket-propelled, ballistic, standoff missiles fired from surface ships against submarine targets. What were the rocket payloads?

17. What is the name of this submarine-launched weapon capable of attacking both undersea and surface targets?

18. July 1, 1970, marked the establishment of the Naval Underwater Systems Center. The new center was formed by the merger of what two organizations?

19. This unique test facility for evaluating antenna performance in a typical submarine operating environment was initially installed at the New London Laboratory in 1981. When New London was closed, this facility was disassembled, moved to Newport, and reconstructed near Pier 2. What is the name of this facility?

20. Dedicated at NUSC Newport in April 1988, this supercomputer was the most powerful computer in New England at the time. It supported NUSC's scientific computing needs and its engineering efforts through the Defense Advanced Research Projects Agency (DARPA) worldwide computer network, which was the predecessor of the internet. What was the name of this computer?

21. Developed to meet the need for an unmanned undersea vehicle (UUV) with a larger payload and energy capacity, NUWC Division Newport designed this vehicle as a test platform for innovative UUV concepts of the future. What is its name and where is it today?

Answers on page 112

Trivia Answers

1. Established in 1869, the Naval Torpedo Station (NTS) on Goat Island off Newport was established as the U.S. Navy's first Experimental Ordnance Facility.

2 NTS Torpedo Boat Stiletto was built by the Herreshoff Co. of Bristol, Rhode Island, in 1886, as the Navy's first wooden torpedo boat.

3. Englishman Robert Whitehead was working in Austria when he invented the first "Automobile Torpedo."

4. The NTS Fish torpedo, the Navy's first self-propelled torpedo, was built by NTS Newport later that year.

5. The OV1 was towed by a "lighter than air craft."

6. Commonly referred to as "ash cans," the depth charge is shown here being readied for over-the-side deployment.

7. The first women employees at Naval Torpedo Station Newport came to work in July 1917.

8. The Gould Island firing pier.

9. The Mark 9 Torpedo was designed in 1915 for use on battleships, and later modified for use on submarines.

10. There were more than 13,000 NTS Newport employees.

11. The TBD-1 "Devastator" torpedo plane.

12. Goat Island.

13. Spherical sonar arrays were first mounted on USS Tullibee, which was constructed in the late 1950s.

14. Mobile Acoustic Torpedo Target (MATT).

15. USS Nautilus (SSN 571) (1954-1980). Nautilus was the world's first nuclear submarine.

16. ASROC Launcher Laboratory at Naval Underwater Ordnance Station had two basic configurations — a torpedo version and a nuclear depth charge version. NUOS's ASROC Laboratory played a key role in missile development and in resolving in-service ASROC issues.

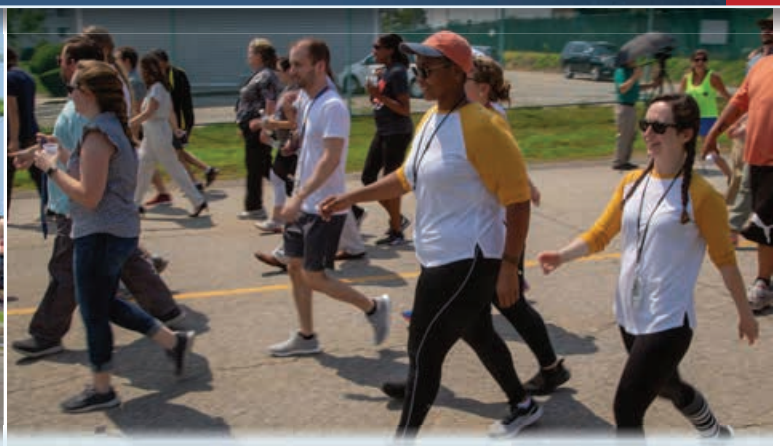
17. The Mark 48 Mod 1 torpedo. It entered service in February, 1972, after a "shoot-out" against the Mark 48 Mod 0 version. The Mod 1 was heavily supported by teams from Newport and Keyport, Washington.

18. The new center was formed by the merger of the Navy Underwater Sound Laboratory in New London, Connecticut, and the Naval Underwater Weapons Research and Engineering Station in Newport. This organization served the Navy throughout the Cold War era.

19. The Submarine Antenna Overwater Arch Measurement Facility.

20. CRAY X-MP/28 Supercomputer.

21. Manta Test Vehicle (MTV). The MTV was based on the technology developed for the NUWC 21-inch UUV that grouped heavyweight torpedo hull sections to provide larger sections for payload, energy and propulsion. Its futuristic design incorporates a custom fiber-reinforced plastic outer hull.



More than 350 employees participated in a 5K Fun Run/3K Fun Walk, held on July 30, 2019 as part of NUWC Division Newport's 150th anniversary celebration. (Photos by Dave Stoehr, McLaughlin Research Corp.)

Anniversary run/walk attracts many employees

More than 350 employees participated in an inaugural 5K Fun Run/3K Fun Walk, held July 30, 2019, as part of the weeklong celebration of NUWC Division Newport's 150th anniversary. The 182 runners and 169 walkers logged 866.6 miles on the 5K and 3K routes that took them around the campus perimeter.

"Wow! I've never seen so many NUWC Division Newport staff members in any event," Chuck Albrecht, of the Corporate Operations Department, said. "Impressive! We should do this once a quarter. I'd call this a classic teamwork event. Although an individual sport, we're all out there cheering one another on, meeting new people, doing something different."

The run/walk featured employees of all ages, and some departments participated in color-coded shirts. A red, white and blue balloon arch marked the start/finish line near the new main gate. Water stations were set up along the course, and a team of volunteers assisted with registration, timing and officiating the event.

The Contracts Department won an award for the highest participation by logging in the most aggregate miles for the run and walk combined. The Commander and Technical Director and Corporate Operations departments had the second and third highest participation, respectively.

"The run/walk to promote a healthy lifestyle was truly a terrific event with tremendous participation," Public Affairs Officer Jeff Prater said. "Each of the line organizations was represented."

The top three male runners were, Rylan King, of the Sensors and Sonar Systems Department, with a time of 17 minutes 36 seconds; in second place, Maruti Kolluru, Platform and Payload Integration Department, in 17:49; and Eric Kirchoff, Sensors and Sonar Systems Department, in 18:11. The top three female runners were, Katherine Stankus, NUWC Keyport onsite representative, in 21:56; Rachel Meyen, Ranges, Engineering and Analysis Department, in 22:02; and, Victoria Boatwright, a contractor with the American Society of Engineering Education in support of Sensors and Sonar Systems Department, in 22:08.

Planning for the run/walk event began in the spring. The organizers worked closely with the Safety Office and Naval Station Newport to ensure paramedics and police were stationed along the course. Meg Duckett, Undersea Warfare Combat Systems Department, led the planning and designed the awards, and Stephen O'Grady, Undersea Warfare Combat Systems Department, designed the course and organized registration.

A team of volunteers also contributed to the event's success. They included: Jakki Conway and Pat Carrellas, both from the Fitness Center; Anna Kane, Undersea Warfare Combat Systems Department; Shelly Walter, Corporate Operations Department; Kathryn Berube, Undersea Warfare Weapons, Vehicles and Defensive Systems Department; Jamelaa Jones, Sensors and Sonar Systems Department; Sandie Grage, Undersea Warfare Combat Systems Department; Phil Duckett; Tim Powell, Undersea Warfare Combat Systems Department; Matt Silva, Undersea Warfare Combat Systems Department; Petty Officer Nathanael Herrold, Undersea Warfare Electromagnetic Systems Department; Petty Officer Michael Mize, Sensors and Sonar Systems Department; and Petty Officer Adam Upleger, Undersea Warfare Electromagnetic Systems Department. ❖

Cutting-edge capabilities on display during ANTX 2019

For nearly 250 years, Rhode Island has driven naval innovation in the United States.

On Aug. 26, 1775, Rhode Island helped engineer the foundation for the U.S. Navy when the then-colony passed a resolution stating that there would be a single continental fleet fronted by the Continental Congress.

Ninety-five years later, the Naval Torpedo Station was born in Newport to provide research and technology to the Navy. Fast forward to the present day and Division Newport's Advanced Naval Technology Exercise (ANTX) 2019, held Aug. 29, 2019, demonstrates that Rhode Island remains on the cutting edge.

"Two-hundred, forty-four years ago, Rhode Island set the path for the Navy that we have today and Rhode Island, quite frankly, continues to do so," R.I. Secretary of Commerce Stefan Pryor said. "NUWC Division Newport is at the forefront of that, and our undersea work is par excellence."

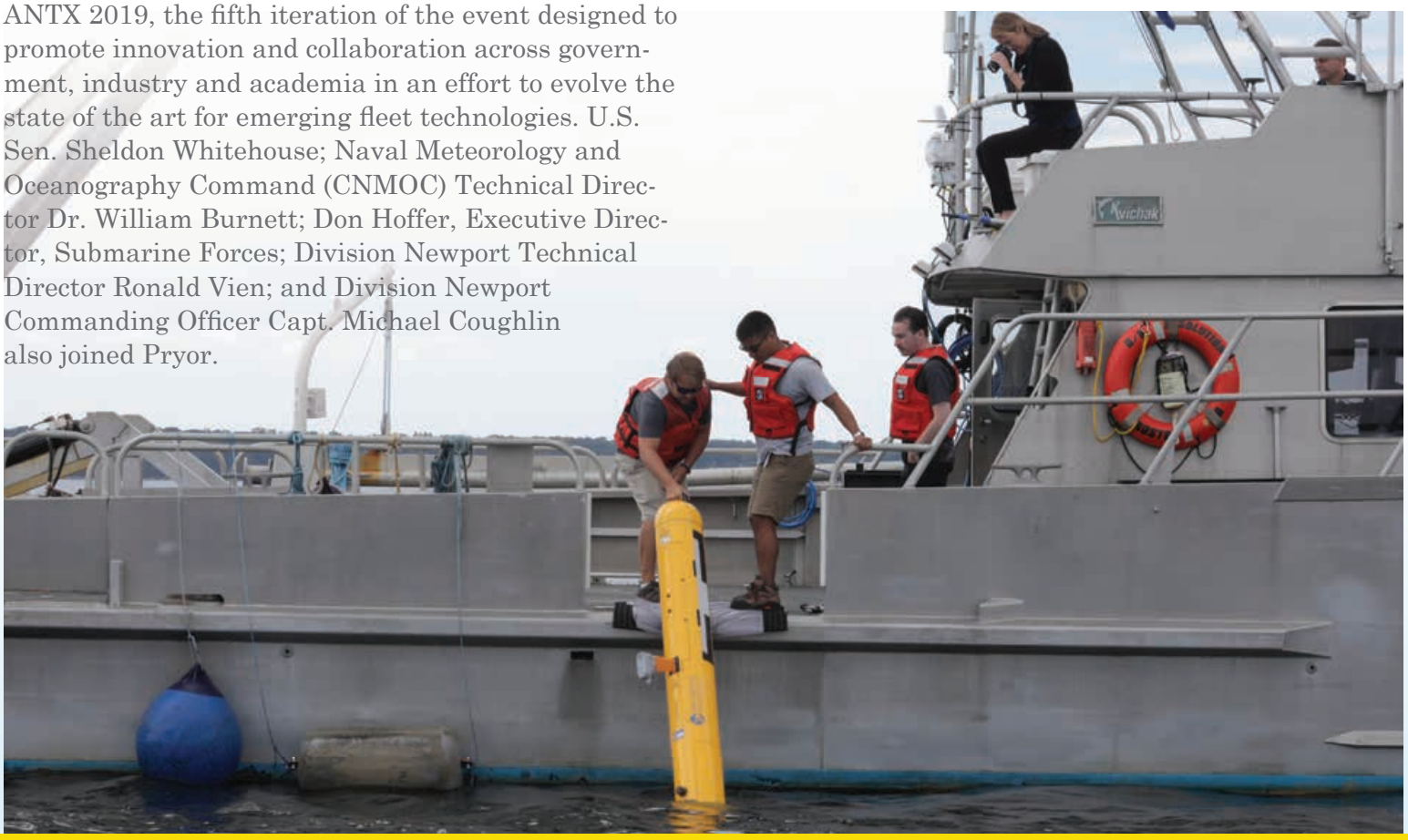
Pryor was one of the dignitaries who spoke during ANTX 2019, the fifth iteration of the event designed to promote innovation and collaboration across government, industry and academia in an effort to evolve the state of the art for emerging fleet technologies. U.S. Sen. Sheldon Whitehouse; Naval Meteorology and Oceanography Command (CNMOC) Technical Director Dr. William Burnett; Don Hoffer, Executive Director, Submarine Forces; Division Newport Technical Director Ronald Vien; and Division Newport Commanding Officer Capt. Michael Coughlin also joined Pryor.

"I am super proud of ANTX. I love this show, and I can't wait for it to get bigger and bigger," Whitehouse said. "We've been growing pretty steadily, but we have nowhere to go but up."

Whitehouse also noted that the state's representatives are committed to building ANTX. "This is amazing technology and I think this particular ANTX event can be a seriously big deal. I love the trajectory we're on and I will do everything to be helpful," he said.

A Partnership Intermediary Agreement (PIA) signing between NUWC Division Newport and the Mississippi Enterprise for Technology (MSET) later that day exemplified some of the growth ANTX has enjoyed since its inception, particularly in strengthening the relationship between government, industry and academia. Division Newport already has a PIA in place with the University of Rhode Island, the Southeastern New England Defense Industry Alliance (SENEDIA) and the City of Newport.

"There are already several links between the state of Mississippi and Rhode Island, and this is now another one," MSET CEO Robert Ingram said. "This will help to rapidly bring innovations we have to the warfighter."



R.I. Secretary of Commerce Stefan Pryor (center from left) and U.S. Sen. Sheldon Whitehouse get a demo on the latest swarming technology from Aquabotix during ANTX 2019 on Aug. 29.

Pryor, Burnett and Hoffer also addressed the topic of strengthening bonds between government, industry and academia in their speeches. Burnett thanked Whitehouse in particular for helping pass the Commercial Engagement through Ocean Technology Act, which directs the National Oceanic and Atmospheric Administration (NOAA) to coordinate with the private and academic sectors and the Navy on evaluating the at-sea data collection capabilities of unmanned maritime system technology and to integrate such technology into NOAA's observation suite.

"How better to secure commercial technology to understand, explore, navigate and — for the Navy — militarily exploit the ocean environment?" Burnett said. "The Navy and NOAA are already following the legislation that was signed by sharing ocean buoyancy gliders that are able to measure the real-time ocean temperature and salinity at the location that they're at so we can get those into our models.

"Right now, we're sharing these ocean buoyancy gliders to place them in front of Hurricane Dorian to get a real-time heat context of the ocean to understand how strong this hurricane will be."

In his address, Hoffer expanded on the importance of innovating with speed — particularly in this current era of a great power competition.

"The collaboration between the providers and users is critical to rapidly understanding the latest technology and how to implement it in the fleet. The discussions and demonstrations from this event help shape our fleet," Hoffer said. "Our efforts are paying off."

One did not need to look far on the waterfront to see just how much ANTX will pay off in the future, too. Representatives from businesses that could design, develop and present inimitable technology set up displays that ranged from high-resolution drone bathymetry to multi-domain remote monitoring, theater management, synthetic aperture sonar and artificial intelligence.

"We're the only ones in the world who can do this kind of bathymetry to this level of precision with such a small vehicle," Colorado-based AstraLite President Gerald Thompson said. "We look for objects and detail in the water that are important to measure, like a bridge piling, pipeline, jetty or unexploded ordnance. First responders after a flood or the U.S. Navy would want to know those objects are there."

Division Newport employees also took full advantage of a preview day held Aug. 27, 2019, exploring the bayside tents with savvy curiosity. ❖

A crowd gathers to hear speeches and presentations during the Advanced Naval Technology Exercise (ANTX) 2019 held on Aug. 29 at the NUWC Division Newport's Narragansett Bay Test Facility. ANTX 2019 demonstrates the future of Navy technologies in a low-risk environment before they become integrated in the fleet. This year's theme was Prepare For Battle: Undersea Superiority.

Navy, state, academic and industry leaders converge to launch 401 Tech Bridge

As Rear Adm. Eric Ver Hage, Commander, Naval Surface and Undersea Warfare Centers, astutely pointed out at the 401 Tech Bridge launch event held at Innovate Newport on Dec. 16, 2019, there are few things more iconic in Rhode Island than the Pell Bridge.

"Over the years, it has become much more than a concrete and steel connection between Aquidneck and Conanicut islands," Ver Hage said. "The Newport Bridge — and the earlier Mount Hope and Sakonnet bridges — became gateways to and symbols of economic opportunity.

"With the freer flow of people, goods and ideas, as well as the new connections and relationships fostered, our bridges became indispensable enablers of commercial, cultural, educational and recreational success. The impact of our bridges has been profound."

Now, 50 years after the opening of the Pell Bridge, a new bridge made not of concrete and steel, but of innovation and collaboration is opening in the Ocean State. Ver Hage and those in attendance are hoping this 401 Tech Bridge will become just as iconic.

"The Navy is going to play a very exciting role in this new organization," U.S. Congressman David Cicilline, (D-R.I.), said. "We've tried in a number of different ways to create avenues for this collaboration. It really is intended to bring everyone together to work to create these manufacturing ecosystems."

In addition to Ver Hage and Cicilline, Division Newport Commanding Officer Capt. Michael Coughlin, Sens. Jack Reed and Shelden Whitehouse (both D-R.I.), Polaris Manufacturing Extension Partnership center director Christian Cowan, Secretary of Commerce Stefan Pryor and University of Rhode Island President David Dooley also spoke to the importance of the 401 Tech Bridge.

"The warfare centers recognize that to be successful, whether it is on a submarine, on a ship or solving a technical challenge, you need a good team," Division Newport Commanding Officer Capt. Michael Coughlin said. "We realize that expanding the advantage means reaching out beyond our Navy partners, warfare centers and traditional defense contractors. We need our team to include small businesses and educational institutions that don't traditionally work with the Navy."

The 401 Tech Bridge, which is one of six tech bridges nationally under the auspices of NavalX, is designed to do just that — particularly in the field of composites. As the Department of the Navy identified its need to manufacture at scale, the R.I. Manufacturing Extension Partnership (MEP) was simultaneously gathering a group of stakeholders from industry and academia to increase the capabilities of the Rhode Island maritime manufacturing community. These initiatives, coupled with the State of Rhode Island's multi-million-dollar investment in local innovation

Among those in attendance for the 401 Tech Bridge launch event were Division Newport Commanding Officer Capt. Michael Coughlin (from left); Division Newport Technical Director Ron Vien; NAVSEA Warfare Centers Commander Rear Adm. Eric Ver Hage; R.I. Secretary of Commerce Stefan Pryor; Sen. Sheldon Whitehouse (D-R.I.); Rep. David Cicilline (D-R.I.); Strategy Composites Alliance of Rhode Island Vice President Susan Daly; R.I. Marine Trades Association Executive Director Wendy Mackie; Polaris Manufacturing Extension Partnership Center Director Christian Cowan; University of Rhode Island Vice President of Research Dr. Peter Snyder; University of Rhode Island President Dr. David Dooley; and Sen. Jack Reed (D-R.I.). (Photo by NUWC Division Newport Public Affairs Officer Jeff Prater)

centers, culminated in very fertile ground for collaboration on Navy challenges.

"We all know we're in a global competition in many aspects, and we know we have to leverage our resources," Senator Reed said. "This is the future and we have to seize the future today or be in danger of losing out dramatically. The 401 Tech Bridge is one of those areas where all the roads converge."

To test the viability of the 401 Tech Bridge, the Office of Naval Research (ONR) and Division Newport collaborated to source Navy problems out to industry to solve NAVSEA's first-ever Prize Challenge. Three problems were posted to Challenge.gov and at Innovate Newport on Dec. 16. Goetz Composites of Bristol, Response Technologies of West Warwick and Spencer Composites of Sacramento, California, were announced as the selected winners.

"We received more than 30 submissions, and with the help of Innovate Newport we were able to have the companies come in to pitch them and ask them questions directly," said Maria Medeiros, ONR program manager for Advanced Power and Energy Undersea Applications, Naval Enterprise Partnership Teaming with Universities for National Excellence, and Navy Undersea Research. "These three companies will receive $250,000 for six months to come up with a feasible product."

The Prize Challenge was not the only new collaborative road paved at the launch event. At its conclusion, Coughlin and Cowan signed a Partnership Intermediary Agreement (PIA) between Division Newport and the Polaris MEP.

NUWC Division Newport Commanding Officer Capt. Mike Coughlin discusses the Partnership Intermediary Agreement between Division Newport and the Polaris Manufacturing Extension Partnership on Dec. 16, 2019.

NUWC Division Newport Commanding Officer Capt. Mike Coughlin (seated from left) and Polaris MEP Center Director Christian Cowan sign a Partnership Intermediary Agreement between Division Newport and the Polaris Manufacturing Extension Partnership on Dec. 16, 2019.

Through Polaris MEP, NUWC Division Newport is now teaming with the University of Rhode Island, the Composites Alliance of Rhode Island and the R.I. Textile Innovation Network to reach out to businesses and educational institutions. This will allow them to conduct cooperative research and development to solve Navy problems with small business innovation and enable us to solve commercial problems with warfare center inventions.

The Tech Bridge construct also will provide creative spaces for the Navy, industry, non-profits and academia to collaborate that are located off-base and easily accessible. This may include innovation spaces at URI's Fascitelli Center for Engineering and a proposed Portsmouth facility. The partnership also may take advantage of collaboration facilities like Innovate Newport.

"It's part of our intrinsic mission to assist in the economic mission of the state we call home. That means we need to teach, and we need to research," URI President Dooley said. "It also is my strong conviction that it is another responsibility to assist in providing for the common defense of our nation. The talents that we turn out have in important role to play in national security."

While all those in attendance were proud of what the 401 Tech Bridge has accomplished thus far, Whitehouse was quick to note that there is still plenty more to be done.

"This is a really exciting model, but this is the beginning. This is not the end," Whitehouse said. "From here going forward, we need to work really hard, all together and make sure that this is the success that it is. I'm all in." ❖

Underwater Sound Reference Division named Designated Institute by National Institute of Standards and Technology

For nearly 80 years, NUWC Division Newport and its predecessor organizations have been known for their expertise in the area of underwater sound. Now, that degree of knowledge has been made official.

On Nov. 12, 2019, Division Newport's Underwater Sound Reference Division (USRD) was named an official Designated Institute (DI) for "Acoustics: Sound in Water" by the National Institute of Standards and Technology (NIST).

"This will formally designate NUWC Division Newport's Underwater Sound Reference Division as the NIST measurement facility for underwater metrology," Technical Director Ron Vien said. "The team has been working on this for years, overcoming a number of technical hurdles in order to complete this initiative. This is a huge accomplishment. When we participate at international metrology standards meetings we represent the United States. This is great news!"

USRD Branch Head Dr. Victor Évora echoed many of the same sentiments and was effusive in his praise of all those who over the years helped to realize this goal.

"I'm just so proud of the USRD team for all its efforts. It's quite an accomplishment and, for sure, it was a team effort," Évora said. "This recognition is very significant. USRD has been a national asset in the area of underwater sound for many decades."

According to Évora, USRD has supported NIST at International Bureau of Weights and Measures (BIPM) meetings since the early 1990s, but never had the "proverbial stamp of approval" by NIST.

The process of becoming officially accredited ramped up in January 2017 when USRD formally launched its quality management system. In

NUWC Division Newport's Underwater Sound Reference Division recently was named an official Designated Institute for "Acoustics: Sound in Water" by the National Institute of Standards and Technology. Staff who helped achieve the designation include Anthony Paolero (front row, from left) head, Sensors and Arrays Division; Michael Bergeron, Joseph Sheltry (back row, from left), head, Sensors and Sonar Systems Department; Dr. Steven Crocker, chief metrologist; Dr. Victor Évora, branch head; William Slater; Jason Burghouwt; and Benjamin Lee.

July 2018, it received ISO/IEC 17025 accreditation through the NIST National Voluntary Laboratory Accreditation Program (NVLAP). One of the requirements for becoming a DI, ISO/IEC 17025 accreditation governs the general requirements for competence of testing and calibration laboratories.

Division Newport's USRD is the first DI to be recognized by NIST and the effects of such accreditation are wide reaching.

"The end result of this effort is that for the first time the United States has national measurement standards for sound in water. We haven't had that before," Dr. Steven Crocker, USRD chief metrologist, said. "We've made these kinds of measurements in water at USRD for 40 or 50 years, but the metrological foundation and the traceability that goes along with that for every other measurement in the country — voltage, mass, length — has never existed for sound in water. Now, it does."

This designation brings a host of benefits, according to Crocker. Among them is having a single understanding of what the acoustic Pascal, a fundamental measurement of sound pressure, is in water.

"This has raised the bar for us," Crocker said. "We can now say with well-understood uncertainties how good the transducer standards that we send out to other Navy laboratories, universities and

contractors are, and how well and accurately they perform."

In turn, the NIST designation will provide more opportunities for collaboration between Division Newport, academia and industry. One of the responsibilities as a DI is that Division Newport provide opportunities for other U.S. entities to demonstrate proficiency against the standard.

"Every single measurement in water is traceable to [Division Newport], and to the lab and the equipment," Crocker said. "There's one other place where you can say that, and that's at NIST. It's this room or NIST for the whole country."

This new designation also will help Division Newport achieve its goal of equipping our warfighters with the tools they need to succeed.

"This directly has a positive impact on fleet sensors and sonar systems, next generation capabilities and everything that we do here for the Navy," Tony Paolero, head of Division Newport's Undersea Sensors and Arrays Division, said. "Submarines and surface ship sensors and arrays that we acoustically characterize rely on testing that needs to be both accurate and precise to keep us competitive. This outstanding effort by this team has gotten us to a level at which we need to be to expand the advantage."

The NIST accreditation is the latest example of Division Newport's commitment to excellence in the field of underwater acoustics, one that dates back to World War II.

In the early 1940s, the United States recognized the need for establishing systematic methods for calibrating and evaluating sonar transducers. Subsequently, the Underwater Sound Reference Laboratory (USRL) — what would later become the USRD — was established with headquarters in New York and field stations in Mountain Lakes, New Jersey, and Orlando, Florida.

Among the early achievements of the lab was a generalized theory of electroacoustic transducers, which led to the development of the first standard hydrophones, wide-band underwater sound sources and practical calibration procedures for underwater sound transducers.

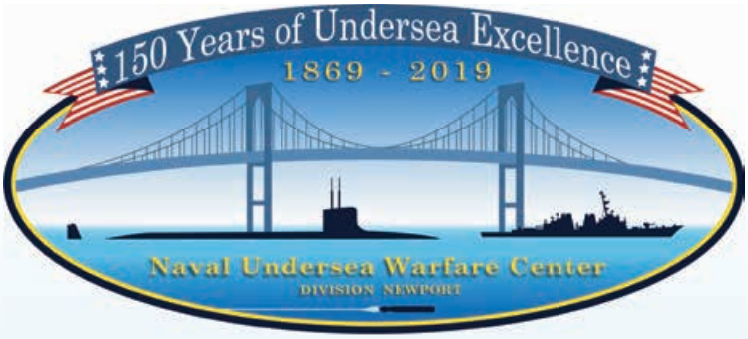
After World War II, all activities were consolidated in Orlando under the direction of Owen Owsley and the auspices of the Office of Naval Research (ONR).

In the decades that followed, the USRL — renamed the Underwater Sound Reference Detachment in 1966 — helped shape the field of underwater acoustics. Some of those achievements were detailed in the book "Underwater Electroacoustic Measurements." Written by Robert J. Bobber, the USRD's second superintendent, the comprehensive book was the first to be published on the subject of underwater acoustic calibration.

The USRD remained in Orlando until 1997, when it closed because of Base Realignment and Closure (BRAC) and its operations moved to Division Newport. The Bugg Spring deep-water facility in Leesburg, Florida, which was established in 1965, stayed open.

After moving to Newport, the USRD remained the supplier of primary and secondary transducer standards for the Navy and U.S., maintaining more than 800 standards. Some of its services include the leasing of hydrophones, as well as maintaining and operating facilities used to design, analyze, fabricate and maintain transducer standards.

For more information on USRD facilities, visit NUWC Division Newport's public website. ❖



Gould Island: 1909 to present day

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Some notable occurrences on the island include:

- In 1939, the first production Douglas TBD-1 Devastator was fitted with a pair of floats, and then sent to Gould Island for drop tests of the Mark 13 torpedo.
- In 1941, the newly constructed Naval Air Station at Quonset became the operational base for four squadrons of seaplanes and the Gould Island air facility was designated an auxiliary landing area.
- From 1941-45, a total of 4,300 test drops of the Mark 13 torpedo were conducted in the waters east of Gould Island.
- In 1942, construction began for a new hangar and a larger, south-facing ramp for the air facility at the south end of Gould Island.
- In October 1943, construction of the Firing Pier and the adjacent overhaul shop at the northern tip of Gould Island was completed. The Firing Pier had four torpedo tubes for firing torpedoes, two for test-firing surface-ship torpedoes, and two, on elevators that lowered into the water, for test-firing submarine-launched torpedoes. By the end of World War II, more than 65,000 torpedo test-firings had been made from its launchers.
- At the peak of aviation activity in 1944, the Air Detail included 11 officers, 119 men and 26 planes

The Firing Pier on the north end of Gould Island (left photo, undated) and in 2006 (right photo). In 2000 and 2001, the upper two floors of the Firing Pier were torn down. (Source, left photo Naval War College; right photo, George DiGregorio in 2006)

- In 1951, the Torpedo Test Facility on Gould Island became part of the Naval Ordnance Station at Coddington Cove, which had succeeded the former Naval Torpedo Station on Goat Island.
- Seaplane operations on Gould Island were discontinued before 1954, as the seaplane facility was no longer depicted on the November 1954 Boston Sectional Chart (courtesy of Chris Kennedy).
- The seaplane facility appeared abandoned in a 1963 aerial photo.
- In 1975 the Navy began transferring the southern 70% of Gould Island (about 39 acres) to the State of Rhode Island.
- In 2000 and 2001, the four Navy structures within the area that was still Navy property were torn down, including the upper two floors of the firing pier. The rest of the firing pier was retained. ❖

The birth of underwater sound laboratories

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In 1970, the New London facilities were combined with undersea research and development activities at the Naval Underwater Weapons Research and Engineering Station in Newport. The resulting Naval Underwater Systems Center (NUSC) became a single center that provided technological expertise for underwater systems, combat control and communication systems.

NUSC was the sixth research and development center established by the Navy. Personnel from the New London laboratory have won international recognition for their pioneering work in acoustics and for introducing advanced high-performance sonar suites for both submarines and surface vessels. Staff in New London was also involved in the development of periscopes and non-acoustic sensors used on submarines, thereby providing at one location expertise in all aspects of underwater detection. A broad mix of talent covered a spectrum of topics, ranging from theoretical acoustic research through fleet introduction and testing of new sonar suites and provided resident expertise that has been a leader in the evolution of modern antisubmarine warfare sensor systems.

In January 1992, following recommendations of the Base Closure and Realignment Committee, NUSC was absorbed by the newly created Naval Undersea Warfare Center (NUWC), with divisions in Newport and in Keyport, Washington. At that time, the New London laboratory was closed and personnel were moved to Newport.

(Sources: "History of the New London Laboratory," by John Merrill and Lionel Wyld; Thaddeus Bell quote from Portal News story, September 2014) ❖

Threats from yesterday, today and tomorrow are part of 150th anniversary wargaming event

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Once players identified contacts (located only on square spaces), they either could use a ship's sonar or deploy a sonabuoy to determine through a roll of the dice if this was a false contact, like a whale, or the enemy submarine. Depending on the roll of the dice, the umpire either correctly or incorrectly classified the contact according to a corresponding set of rules.

The complicated nature of determining whether or not players identified a false contact or enemy submarine represents the difficulties Sailors face in real settings, Vebber explained.

Employees practice wargaming strategies during an event held on Sept. 18, 2019.

The event very much embodied Division Newport's motto for the 150th anniversary — "Undersea Superiority: Yesterday ... Today and Tomorrow!" — as each game examined a different era. After starting out in a current-era training scenario with a reduced set of pieces to learn the game rules, participants then played that scenario again — this time with more assets of their own, but more enemy subs that moved randomly.

For the third game, the players picked two from a set of 18 "future technologies" that gave them capabilities that addressed various problems they may have experienced during the game. The Cuban missile crisis game, which gave players some perspective on how far we've come since those events nearly 60 years ago, concluded the event.

Much like how the world of antisubmarine warfare has evolved, the games increased in difficulty as the event progressed, adding in different aspects like unmanned underwater vehicles, submarines with more advanced capabilities and decoys. Games lasted for about 30-45 minutes, and the first team that successfully found all the enemy's submarines and tracked them all simultaneously was declared the winner. ❖

150th Anniversary Commemorative Yearbook

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150 Years of Undersea Excellence

1869 - 2019

Naval Undersea Warfare Center

DIVISION NEWPORT

Undersea Superiority ★ Yesterday...Today and Tomorrow