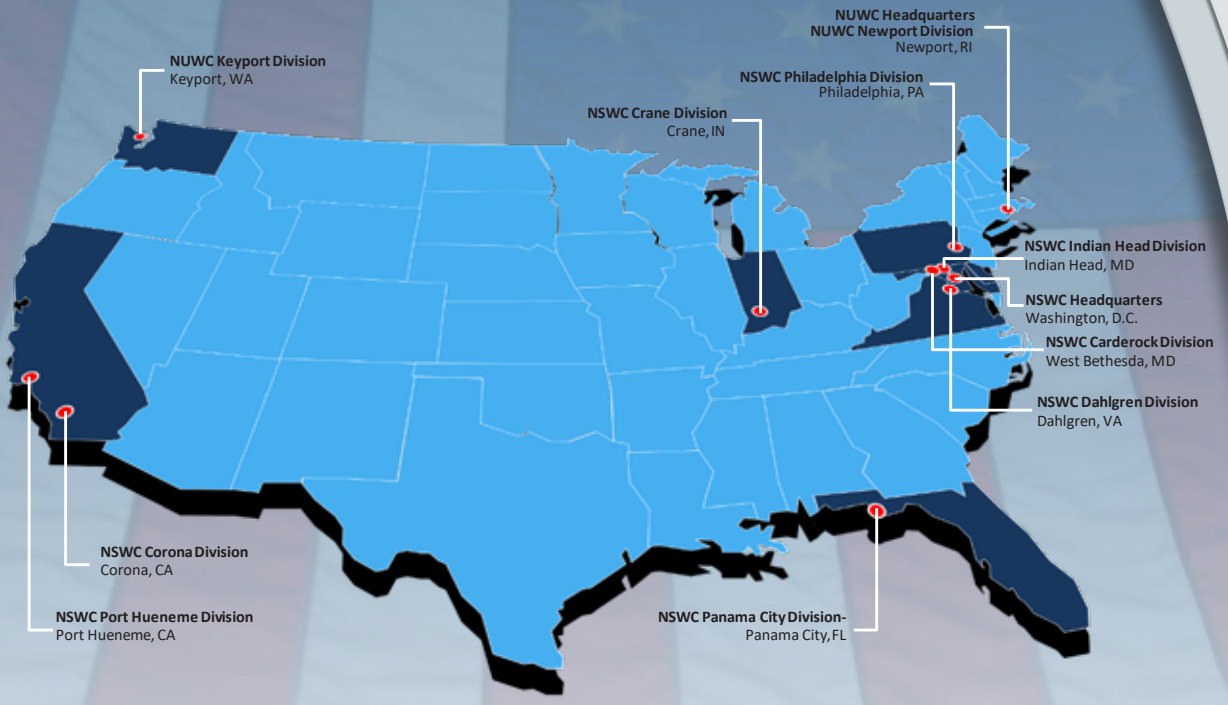
NAVAL SEA SYSTEMS COMMAND

WARFARE CENTERS

NAVAL SURFACE WARFARE CENTER | NAVAL UNDERSEA WARFARE CENTER

10 Divisions – One Team



Roles of the Warfare Centers

- Make naval technical programs successful
- Provide a bridge between the technical community and the warfighter
- Determine and develop capabilities for the fleet
- Verify the quality, safety, and effectiveness of platforms and systems
- Design, develop, and field solutions for urgent operational fleet needs

PROGRAMS

6,985
Ship/Submarine Modernizations/ Tech Insertions

145
Technical Capabilities

16,092
Depot Refurbs/ IMA Repairs

164+
Unique RDT&E Facilities

63,971
Technical/ Logistic Hotline Call Responses

3,235
Fleet Fly-Away Teams Dispatched

$6.6B
Contracted Annually

435
Customers

PERSONNEL

19,018
Scientists & Engineers *representing*

52% *of the* Navy's Scientific & Engineering Expertise

6,769
Masters Degrees

854
PhDs

147
Patents Filed

NAVAL SEA SYSTEMS COMMAND

WARFARE CENTERS

NAVAL SURFACE WARFARE CENTER | NAVAL UNDERSEA WARFARE CENTER

Innovate for the Fleet after Next | **Build an Affordable Fleet for Tomorrow** | **Sustain the Fleet of Today**

TRL 1-2 Concept to Application | TRL 3-4 Analysis, Testing, Prototyping | TRL 5 Operational Demo | TRL 6-7 Included in POR, industry transition | TRL 7-8 Acquisition and Fielding | TRL 9 Capability Delivered to Warfighter

Basic Research | Applied Research | Rapid Prototyping | Operational Testing | Technical Risk Assessments | Production Engineering and Support | Install: Modernization & Alterations | Technology/ Obsolescence Management

- Early ideation fueled by naval R&D priorities
- Project funding transitioned to sponsor
- Patents
- Technology transfer

- First tested in LOE or developmental / operational experiment
- New or enhanced capability demonstrated
- Leave behind capability following operational demo

- Industry incorporates innovation
- Sponsor invests in R&D for rapid prototyping and fleet demonstration
- Included in an acquisition program in the FYDP

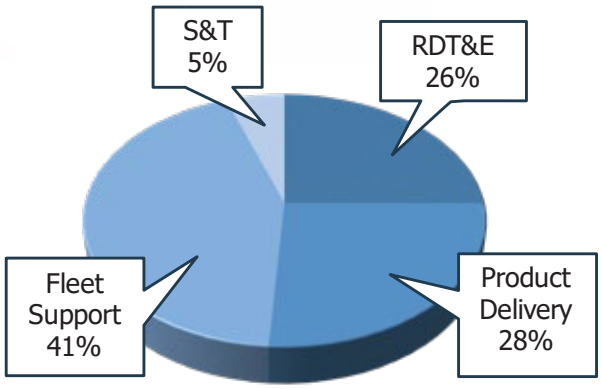
- Tests at major ranges/Land Based Testing facilities
- Live, Virtual, and Constructive training & experimentation
- System engineering
- Integrated logistics support

- ISEA fly-away teams sustain fleet operations
- Manage depots and facilities/IMA repairs
- Technology refresh
- Tech assists/ distance support

Delivering Readiness, Capability, and Capacity

- Warfare Centers play an important, value added role as a member of the acquisition team
- Warfare Centers' life cycle engineering capabilities help ensure safe, affordable and effective products are delivered to the warfighter
- Warfare Centers have a disciplined process for accepting and assigning the right work to the right site based on technical capabilities; and for sizing the workforce to the funded workload
- Warfare Centers continually shape the workforce size, workforce talents, and facilities to meet long-term strategic needs
- Warfare Centers are determined to standardize processes and procedures to become more efficient, structured, and transparent
- Warfare Centers advance cybersecurity, improve virtual infrastructure, and obtain the necessary tools to support the Navy's digital transformation
- Warfare Centers initiate and leverage partnerships with other government activities, industry, and academia to foster a collaborative culture

FY20 Reimbursable Funding



Warfare Centers Leadership

Dr. Brett A. Seidle, SES
Executive Director

Rear Adm. Kevin P. Byrne, USN
Commander

NSWC CARDEROCK DIVISION

NAVAL SEA SYSTEMS COMMAND

WARFARE CENTERS

2021 Highlights

Development of DDG 1000 Heavy Weather Guidance products: Culminated in 2021 when COMNAVSEA signed recommendation rescinding Sea State restriction on ZUMWALT-class destroyers (restricted from conducting intentional operations in Sea State 7 and above by CNO in 2011). Carderock's Hull Form Plan team conducted risk mitigation efforts improving dynamic stability performance and providing heavy weather guidance tools that became the basis of recommendation to remove restriction.

USS GERALD R. FORD (CVN 78) Full Ship Shock Trials: After years of finite element analysis, data collection planning and instrumentation installation, successfully led three separate explosive charge events validating ability of the new construction ship to carry out assigned missions in combat environment.

Acoustic Signature Trials for USS SOUTH DAKOTA (SSN 790): Conducted at South Tongue of the Ocean Acoustic Measurement Facility (STAFAC), Atlantic Undersea Test and Evaluation Center in Andros Island, Bahamas. The acoustic trials were a holistic, real-world assessment of submarine performance that allowed the ship to effectively address and/or monitor acoustic items of interest during deployments.

NSWC CARDEROCK DIVISION

NAVAL SEA SYSTEMS COMMAND

WARFARE CENTERS

Naval Surface Warfare Center (NSWC) Carderock Division is the Navy's center of excellence for ships and ship systems. For over 100 years, NSWC Carderock Division has helped preserve and enhance the nation's presence on and under the seas. NSWC Carderock Division is the full-spectrum research and development, test and evaluation, engineering, and fleet support organization for the Navy's ships, submarines, military watercraft, and unmanned vehicles with insight into new concepts and diverse technologies for the Navy fleet of the 21st Century. NSWC Carderock Division's expertise spans from naval architecture and marine engineering, to electrical and mechanical engineering, to computer engineering and physics.

NSWC Carderock Division specializes in ship design and integration; environmental quality systems; hull forms and propulsors; structures and materials; signatures, silencing systems, and susceptibility; and vulnerability and survivability systems.

NSWC Carderock Division's unique laboratories, modeling and simulation facilities, at-sea-assets, and large-scale, land-based engineering and test sites at our headquarters in West Bethesda, Maryland, and seven detachment locations across the country contribute to the full-spectrum nature of our mission.

Navy and maritime communities have come to depend on our expertise and innovative spirit in developing advanced platforms and systems, enhancing naval performance, integrating new technologies, and reducing operating costs.

NSWC Carderock Division will continue to solve challenging engineering problems to meet future fleet needs.

Mission

To provide full-spectrum research and development, test and evaluation, analyses, acquisition, and fleet support for the Navy's ships, ship systems, and associated Navy logistics systems. Specific emphasis is to provide the core technical capabilities required for the integration of surface and undersea vehicles and associated systems, to develop and apply science and technology associated with naval architecture and marine engineering, and to provide support to the maritime industry.

Vision

To be the Navy's trusted partner for identifying and providing world-class, innovative, and cost-effective solutions for advanced ship and ship systems, for providing technical solutions to the warfighter, and to keep our fleet at sea.

Thrust Areas

- Ship, Submarine, and Unmanned Vehicle Design and Integrity
- Advanced Manufacturing
- Digital Strategy
- Signature Management
- Unmanned Mobility Systems

Technical Capabilities

- Ship and Submarine Design and Integration
- Ship and Submarine Acquisition Engineering
- Ship and Submarine Systems Concepts, Technologies, and Processes
- Combatant Craft and Expeditionary Vehicles
- Unmanned Vehicles Naval Architecture and Marine Engineering
- Hull Forms and Fluid Dynamics
- Propulsors
- Surface, Undersea, and Weapon Vehicle Materials and Manufacturing Technology
- Surface and Undersea Vehicle Structures
- Alternative Energy and Power Sources R&D
- Liquid Waste Management, Science and Systems
- Solid Waste and Hazardous Material Management, Science and Systems, and Ships and Subs Systems Safety
- Surface, Undersea and Expeditionary Vehicle Vulnerability Reduction and Protection
- Surface and Undersea Vehicle Underwater Signatures, Silencing Systems, and Susceptibility
- Surface and Undersea Vehicle Non-Acoustic Topside Signatures, Silencing Systems, and Susceptibility
- Radiation Detection Technology Research and Management

Major Facilities

- David Taylor Model Basin — West Bethesda, MD
- Maneuvering and Seakeeping Facility (MASK) — West Bethesda, MD
- Deep Submergence Pressure Tank — West Bethesda, MD
- Anechoic Flow Facility — West Bethesda, MD
- Structure Evaluation Laboratory — West Bethesda, MD
- Explosives Test Pond — West Bethesda, MD
- Ship Materials Technology Center — West Bethesda, MD
- Magnetic Fields Laboratory — West Bethesda, MD
- Acoustic Research Detachment — Bayview, ID
- Large Cavitation Channel — Memphis, TN
- Southeast Alaska Acoustic Measurement Facility (SEAFAC) — Ketchikan, AK
- South Florida Ocean Measurement Facility (SFOMF) — Fort Lauderale, FL

Workforce Profile - 2021

- Total: 2,794
- Scientists & Engineers: 2,008

Advanced Degrees - 2021

- Ph.Ds – 189
- Masters - 786

Total Annual Funded Program - 2021

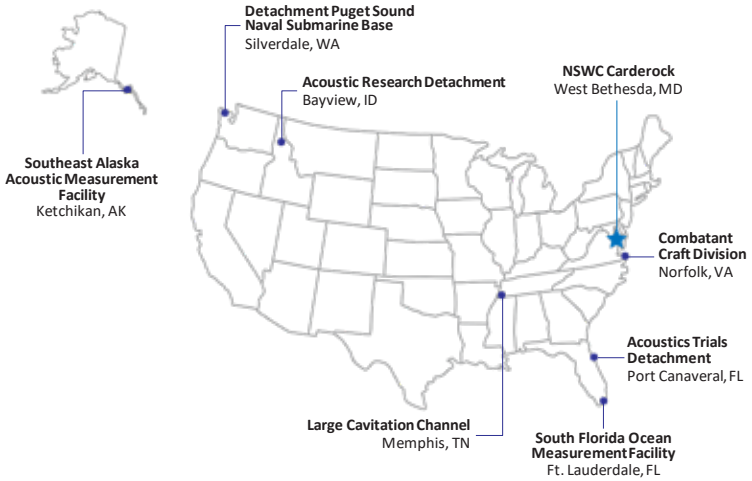
- $1.1 billion
- Contracts issued: $409 million

Carderock Division Leadership

Lawrence Tarasek, SES
Technical Director

Captain Todd Hutchison, USN
Commanding Officer

Carderock Division Sites



NSWC CORONA DIVISION

NAVAL SEA SYSTEMS COMMAND

WARFARE CENTERS

2021 Highlights

Live Virtual Constructive (LVC) Training: Large Scale Exercise 2021 (LSE 2021): Developed and managed the Navy Continuous Training Environment to produce a global LVC environment, which was heavily leveraged by LSE 2021, the largest, most complex naval exercise in four decades, designed to test naval force synchronization and Distributed Maritime Operations across a multi-echelon, cross component exercise audience. LSE 2021 validated current Navy LVC architecture, capability, and capacity, while identifying shortfalls in aviation (cockpit) LVC training, information warfare, cyber/space effects modeling, and open ocean instrumented range operations.

Combined Portfolio Assessment System (COMPASS): Fully deployed COMPASS for PEO Ships as a single source for authoritative ship acquisition data for automated execution metrics and data-driven decision making. Provides transparent and consistent metrics and management across the PEO Ships portfolio with broad integration of enterprise-wide data, including contract execution data and ship construction schedules and progress.

Engagement System Analysis Application – SHOTBOT: Developed the SHOTBOT analysis application system to perform automated missile flight reconstruction, designed to be applicable with any surface Navy engagement system to reduce development and sustainment costs. SHOTBOT has accelerated reconstruction times by 98% through adoption of a machine learning Gaussian mixture model to classify and remove noise and the application of dynamic time warping algorithms to identify key events during missile flight.

NSWC CORONA DIVISION

NAVAL SEA SYSTEMS COMMAND

WARFARE CENTERS

NSWC Corona Division has served as the Navy's independent assessment agent since1964. With experience in gauging the Navy's warfighting capability, NSWC Corona is a leader in NAVSEA data analytics. Utilizing networked data environments, data analytics and visualization, and measurement technology to bridge the Navy's data silos, Corona enables informed decision-making for the warfighter. With more than 3,800 engineers, scientists, and support personnel, Sailors, and contractors, NSWC Corona is located in Norco, California, with detachments in Fallbrook and Seal Beach and personnel in 14 additional locations.

Readiness Assessment

Corona Division manages programs to provide the Fleet and Shore community with transparency into the material readiness of critical weapon, combat, C41, and HM&E systems and the factors that are driving material readiness. Corona provides reliability, maintainability, and availability (RM&A) metrics for over 600 systems and 2800 variants (C5I and HM&E on surface ships and submarines) delivering automated & predictive analytics. Products and services have broad utilization across Navy Program offices, In Service Engineering Agents, Regional Maintenance Centers, OPNAV, and the Fleet. The Readiness Assessment capabilities and products are evolving to address the Navy's increasing expectations for improved transparency into readiness, cost, and Fleet maintenance/modernization processes.

Performance Assessment

Corona Division has its technical roots in conducting analytical data-driven performance assessments on offensive and defensive systems of the surface Navy supporting acquisition T&E and Fleet exercise feedback. Capabilities span across data, rigor, systems, and collaborations in order to facilitate comprehensive assessments in a timely manner. Corona executes best practices in data requirement documentation to assure the right data is available to answer the critical questions. Corona maintains collaboration spaces equipped to receive large volumes of data and the ability to store, process, analyze, and report out results in a classified environment. Corona has implemented automation and adopted visualization software to streamline the delivery of robust event reconstruction with embedded communication, video streams, and ground truth in a short amount of time (a handful of hours for Fleet Operational Training exercises, for example).

Range Systems Engineering

Corona Division provides Naval surface and air range systems engineering and technology solutions for Naval and Joint training and testing, engineering, integrating, and installing instrumentation on test and training ranges, including shipboard systems and remote range areas. Corona operates and maintains Fleet tactical training ranges and network environment and is the Fleet's technical engineering agent for the Fleet training live, virtual, and constructive (LVC) capability. Corona ensures that existing and future range systems meet the Fleet's demand for combat realism, live mission monitoring and replay, and information and data collection for analysis and assessment.

Measurement Science and Engineering

Corona Division is designated as the Navy's Test and Monitoring Systems technical advisor responsible for disseminating calibration guidance to over 2,750 personnel across the Navy enterprise, and ensuring accurate and traceable measurements to international standards to reduce the risk of wrong test decisions and improve Fleet lethality. Corona authors the detailed calibration procedures used to perform nearly 500,000 calibrations each year on the Navy's more than 1.6 million pieces of test equipment; and uses the results from these calibrations to establish and optimize calibration periodicities to ensure the proper risk vs. cost trade-off. Corona operates the Gage and Standards Laboratory, serving as the technical authority for NAVSEA combat systems special interface gage requirements. Corona also conducts strategic systems testing and analysis, and surveillance assessment for Trident Reentry Systems Mk4, Mk4A, and Mk5.

Quality and Mission Assurance Assessment

Corona Division provides quality and mission assurance for Strategic and Missile Defense systems that have a very low tolerance for failure or problem systems where the program manager requests focused support. Corona develops and tailors Quality and Mission Assurance (Q&MA) requirements which outline program office expectations for management and customer involvement in key technical processes during acquisition and sustainment such as system engineering, test, configuration control, reliability, manufacturing. In addition, Corona provides training to the contractor and government community on Q&MA requirements, conducts assessments, and provides on-site technical experts to determine and improve the effectiveness of the Q&MA activities and rigor.

Ground Combat Weapons and Ammunition Test, Evaluation, and Assessment

Corona provides ground ammunition and weapons engineering expertise to the USMC and ammunition community. Working directly with the acquisition community and warfighter, Corona supports fleet logistics, combat operations, and training by providing cradle to grave research and development, test and evaluation, lifecycle engineering, and acquisition expertise.

Mission

Provide transparency to warfighting readiness through data analytics and assessment, engineering the Fleet's Live-Virtual-Constructive training environment, and assuring the accuracy of measurements.

Vision

Optimize decision-making for warfighting and fleet readiness.

Technical Capabilities

- Warfare Systems Performance Assessment
- Quality and Mission Assurance Assessment
- Metrology, Test, and Monitoring Systems Assessment
- Naval Surface & Air Range Systems Engineering
- Weapons Systems Interface Assessment
- Naval Systems Material Readiness Assessment
- Strategic Systems Testing and Analysis, and Surveillance Assessment
- Ground Combat Weapons and Ammunition Test, Evaluation, and Assessment

Major Facilities

- Joint Warfare Assessment Lab
- Measurement Science and Technology Lab
- Daugherty Memorial Assessment Center
- Weapons Surveillance and Test Lab

Workforce Profile - 2021

- Total: 1,957
- Scientists & Engineers: 1,321

Advanced Degrees - 2021

- Ph.Ds – 24
- Masters - 460

Total Annual Funded Program - 2021

- $709 million
- Contracts issued: $362 million

Corona Division Leadership

Dianne Costlow, SES
Technical Director

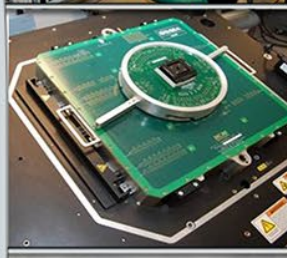
Captain Khary Hembree-Bey, USN
Commanding Officer

Corona Division Sites

NSWC CRANE DIVISION

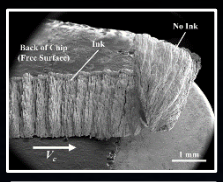
NAVAL SEA SYSTEMS COMMAND

WARFARE CENTERS



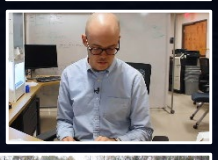
2021 Highlights

International Award: A Crane engineer received an international award for analyzing the cutting of tantalum, a rare metal that is highly corrosion-resistant. Dr. Jason Davis, a mechanical engineer, led the U.S.-Japanese research team from the Center for Materials Processing and Tribology at Purdue University. The award was announced in September from the Belgium-based Tantalum-Niobium International Study Center.



Transducer Milestone: Reached a milestone in the delivery of 50,000 TR-343 transducers to the Navy fleet over the past decade. As an offshoot of the technical lessons learned in this project, the command collaborated with NUWC Newport and PMS401 to initiate a modernization effort to meet the needs of rapidly evolving threats at sea.

Machine Learning in the Radio Frequency (RF) Spectrum: Electronic Warfare (EW) subject matter experts are applying Machine Learning (ML) to the RF spectrum. Machine Learning is a subcategory of artificial intelligence that has been applied to images, audio, and language processing to find patterns or identify objects and words. Helping develop and modify ML software that adjusts to RF signals automatically to improve EW capabilities.



Ground breaking for Radiation Modernization Facility: Leadership, industry, and state government stakeholders broke ground on a new Radiation Modernization facility on the installation on Monday, Oct. 4.

NSWC CRANE DIVISION

NAVAL SEA SYSTEMS COMMAND

WARFARE CENTERS

Located on the third largest naval installation in the world, NSWC Crane Division's total focus is to support the warfighter by leveraging its technical capabilities for the rapidly changing combat environment. Anchored by technical expertise, a strong work ethic and total lifecycle leadership, NSWC Crane Division's personnel and preeminent facilities set the standard for excellence in acquisition, engineering and sustainment.

NSWC Crane Division's electronic warfare (EW) mission area provides innovative, leading-edge, technical solutions for military actions that use electromagnetic energy to control the electromagnetic spectrum. This includes destroying an adversary's combat capability, gathering intelligence data and ensuring friendly use of the electromagnetic spectrum. NSWC Crane Division's technical solutions are employed across air, ground, maritime domains for the joint and coalition forces. With more than one-half million square feet of offices and labs, NSWC Crane Division has a critical mass of co-located personnel and secured facilities to provide responsive, affordable, total lifecycle leadership. Several outdoor test ranges with encroachment protection, the most comprehensive mobile radio frequency (RF) threat simulators and multiple anechoic chambers are only some of the best-in-class resources available at Crane.

NSWC Crane Division's expeditionary warfare mission area is dedicated to providing the elite warfighter with reliable and practical solutions, expertly delivered and deployed to ensure safe and effective missions. NSWC Crane Division delivers specialized training and support for the advanced warrior, providing a decisive advantage in sensors and communications, power systems and interconnect technology, mobility and maneuverability, special munitions and weapons. NSWC Crane Division is known for rapid technology transition, integrating threat assessment, proven solutions and risk management with product deployment and training. Co-located personnel and facilities demonstrate NSWC Crane Division's commitment to total lifecycle leadership, offering a unique ability to accelerate response for the warfighter.

NSWC Crane Division's strategic missions experts are focused on innovative technical solutions to deter and defend against aggression and defeat threats worldwide. NSWC Crane Division's strategic missions experts and preeminent facilities provide high reliability electronics and sensors for successful global deterrence and ballistic missile defense. In fact, every ballistic missile in U.S. arsenal carries key components developed or supported by Crane. NSWC Crane Division is dedicated to innovative science, processes and policies that advance technologies such as printed circuit boards and trusted microelectronics. Experts are committed to developing and deploying the technology that ensures that weapons systems are fully reliable and always available to the warfighter.

Mission

Provide acquisition engineering, in-service engineering and technical support for sensors, electronics, electronic warfare and special warfare weapons. Apply component and system level product and industrial engineering to surface sensors, strategic systems, special warfare devices and electronic warfare/information operations systems. Execute other responsibilities as assigned by the Commander, Naval Surface Warfare Center.

Vision

Combating our nation's greatest threats, NSWC Crane Division is the indispensable mission expert, leveraging our deep technical heritage to deliver solutions through innovation and strategic partnerships.

Technical Capabilities

- Electronic Warfare Systems RDT&E/Acquisition/Life Cycle Support
- Infrared Countermeasures and Pyrotechnic RDT&E and Life Cycle Support
- Strategic Systems Hardware
- Special Warfare and Expeditionary Systems Hardware and the Associated Software
- Advanced Electronics & Power and Energy Systems
- Sensors and Surveillance Systems

Major Facilities

- Rapid Innovation Prototyping Lab
- Special Weapons Assessment Facility
- Lake Glendora Underwater Test Facility
- Infrared Countermeasure Technology Complex
- Crane Artificial Intelligence Development Lab (CrAIDL)
- Spectrum Technology Advanced Research (STAR) Lab
- Anechoic chambers (3)
- Linear Accelerator Test Facility
- Strategic Weapons Systems Engineering and Evaluation Complex
- Electronic Warfare Systems Engineering Complex
- Electro-Optics Engineering and Test Facility
- Failure Analysis/Material Analysis Lab

Workforce Profile - 2021

- Total: 3,794
- Scientists & Engineers: 2,363

Advanced Degrees - 2021

- Ph.Ds – 124
- Masters - 731

Total Annual Funded Program - 2021

- $1.9 billion
- Contracts issued: $1.2 billion

Crane Division Leadership

Dr. Angela Lewis, SES
Technical Director

Captain Duncan McKay, USN
Commanding Officer

Crane Division

NSWC DAHLGREN DIVISION

NAVAL SEA SYSTEMS COMMAND

WARFARE CENTERS

2021 Highlights

Intelligent Automation: Conducted a live-fire demonstration of a prototype Unmanned Self Defense Payload, consisting of an automated remote weapon station on an unmanned ship, controlled remotely by a human operator on a separate, manned ship. The remote weapon station is equipped with a .50 caliber gun system controlled by government developed software providing it with the capability to autonomously detect and track targets, calculate a fire control solution, and fire when authorized by the human operator. Thirty six engagements were conducted where the target was detected, tracked, and engaged with live fire.

Software Engineering Revolution: Established the Software Factory, aligning itself with the PEO IWS Forge, Overmatch Armory, and overall naval strategy for Software Factories. The approach takes the unique data-driven approach of building software based on a five-pillar focus that accounts for workforce development, data governance, software policy, the DevSecOps platform, and software quality/agile metrics.

Information Superiority: Led development of the Integrated Combat System (ICS) Strategic Vision, which aligns with Commander, Naval Surface Forces' recently released, "Surface Warfare: The Competitive Edge." The ICS Strategic Vision is a living document, in concert with OPNAV and PEO IWS, establishing the strategy for ICS development to achieve the combat system capability described in the ICS top level requirements, which defines the end state of the ICS.

Hypersonic Weapons Advancement: Partnered with the Naval Research and Development Establishment, to pursue establishing an RDT&E infrastructure for the development and testing of hypersonic technologies. This includes prioritizing NISE 219 investments in this focus area, as well as growing the workforce to be experts in this next generation of weapons.

Digital Engineering: Pursuing digital transformation across work portfolio, leading the effort to produce a Model Based Systems Engineering (MBSE) Style Guide in less than 4 months by rapidly establishing and leading a multi-disciplinary team of subject matter experts across the Navy enterprise. In August 2021, the document was recommended by NAVSEA Technical Policy and Standards to be the primary reference to standardize MBSE across the Navy.

NSWC DAHLGREN DIVISION

NAVAL SEA SYSTEMS COMMAND

WARFARE CENTERS

NSWC Dahlgren Division is a shore command of the U.S. Navy under the Naval Sea Systems Command (NAVSEA), which engineers, builds and supports America's Fleet of ships and combat systems. NSWC Dahlgren Division has two primary sites – its headquarters at Dahlgren, Virginia and Dam Neck Activity in Virginia Beach, Virginia – as well as detachments and off-site locations across the United States.

NSWC Dahlgren Division provides science, technology, engineering and systems integration leadership and innovation that our nation's naval and joint forces rely upon for superior warfighting capability. NSWC Dahlgren Division works closely with the warfighter to fully understand operational challenges and requirements and provides the bridge to technology innovations and prototypes to develop capabilities with our private and industrial partners. This critical linkage results in delivery of effective, affordable and timely warfighting capabilities for our current fleet and the future fleet.

Mission

We deliver warfare systems to protect our nation and defeat our adversaries.

Vision

Design, develop, and integrate technologically superior, 21st century warfare systems.

Thrust Areas

Building on our core, target and prioritize technical opportunities in the following strategic thrusts:

- Lead electric weapons design, development and integration.
- Institutionalize mission engineering and analysis.
- Incorporate cyber warfare engineering in our naval systems.

Technical Capabilities

- Asymmetric Warfare Engineering and Embedded Systems
- Chemical, Biological, & Radiological Warfare Defense Systems RDT&E
- Conventional and Electromagnetic Gun Weapon Systems RDT&E
- Directed Energy Systems RDT&E
- Expeditionary and Other Weaponry Systems RDT&E
- Force & Surface Platform Level Warfare Systems Analysis & Modeling
- Force Level Warfare Systems Engineering and Integration
- Human Systems Integration Science and Engineering
- Integrated Surface Combat Control Systems Support
- Integrated Topside Design (ITD)
- Integrated Training Systems
- Physical & Non-Physical Vulnerability Analysis
- Radar and Distribution Systems
- Radar and Electro-Optic Systems RDT&E
- Re-Entry Systems
- Strategic Mission Planning, Targeting, and Fire Control Systems
- Surface and Expeditionary Conventional Weapon Control Systems RDT&E
- Surface and Expeditionary Missile Systems Integration
- Surface and Expeditionary Warfare Systems Safety
- Surface Combat Computing Systems S&T, RDT&E
- Surface Combat Control Systems S&T, RDT&E
- Surface Combat Systems Engineering & Integration RDT&E
- Surface Electronic Warfare Systems Architecture and Combat System Integration RDT&E
- Surface Warfare Electromagnetic Environmental Effects
- Surface Warfare System and Force Level Certification/IV&V
- Surface Warfare Systems Engineering & Integration RDT&E
- Weapon Systems Analysis, Effects, & Effectiveness
- Weapons Systems Integration for Surface, Air and Ground Unmanned Systems

Major Facilities

- Advanced Spatial Technology Research Analysis Lab
- Asymmetric Technology Innovation Lab
- Bateman Chemical, Biological and Radiological Warfare Lab
- Electromagnetic Environmental Effects Facilities
- Electromagnetic Railgun Launch Facility
- Explosive Experimental Area
- Force Integration and Interoperability Lab
- Human System Integration Lab
- Information and Special Warfare Systems Lab
- Integrated Combat Control Systems Lab
- Integrated Training Capabilities Lab
- Integrated Warfare Systems Lab
- Maginot Open Air Test Site
- Naval Directed Energy Warfare Lab
- Open Architecture Computing Facility
- Platform Integration Lab
- Potomac River Test Range
- Search and Track Sensor Test Site
- Submarine-Launched Ballistic Missile Lab
- Surface Sensor and Combat Systems Facility

Workforce Profile - 2021

- Total: 4,965
- Scientists & Engineers: 3,724

Advanced Degrees - 2021

- Ph.Ds – 132
- Masters - 1,364

Total Annual Funded Program - 2021

- $1.9 billion
- Contracts issued: $982 million

Dahlgren Division Leadership

Dale W. Sisson, Jr., SES
Technical Director

Captain Stephen C. Plew, USN
Commanding Officer

Dahlgren Division Sites

NSWC INDIAN HEAD DIVISION

NAVAL SEA SYSTEMS COMMAND

WARFARE CENTERS

2021 Highlights

New Underwater Explosive Validated: Developed and produced the first new underwater explosive in a decade. Through FY21 performance testing, it validated significant performance gains in undersea applications and for operational engagements, and is being applied to new U.S. capabilities.

Chemical Biological Radiological Defense Team Sustains Operations during COVID-19: The Chemical Biological Radiological Defense Division was tasked by the NAVSEA COVID-19 Rapid Response Team to develop engineering options for establishing shipboard quarantine and isolation compartments using existing or readily available shipboard equipment. These recommendations were developed across eight surface ship classes. The implementation of effective quarantine and isolation measures protected deployed crew members and maintained mission readiness for the fleet in a biologically compromised environment.

Battle Lab Unveiled to Support Warfighter Capability Gaps: Unveiled a new resource for the warfighter - the Battle Lab Division, a concept of operations executed within the Explosive Ordnance Disposal department in support of warfighter capability gaps. The Battle Lab conducts technical capabilities and limitations testing, assessments in operational environments, user feedback sessions, and market research to provide actionable data on equipment and technology. The mission is to provide a cycle of equipment review and evaluation to feed capability gap assessment, equipment buying decisions, requirements development, and technology implementation.

NSWC INDIAN HEAD DIVISION

NAVAL SEA SYSTEMS COMMAND

WARFARE CENTERS

Naval Surface Warfare Center Indian Head Division (NSWC IHD) brings together the largest full spectrum energetics facility in the Department of Defense (DoD) with the largest concentration of explosive ordnance disposal (EOD) technology resources and information in the world.

Energetics are explosives, propellants, pyrotechnics, reactive materials, related chemicals and fuels used in propulsion systems and in ordnance.

One of 10 Warfare Center divisions within the Naval Sea Systems Command (NAVSEA) enterprise, the main site for NSWC IHD is a 3,200-acre peninsula along the Potomac River on Naval Support Facility Indian Head, in Indian Head, Md.

NSWC IHD has a separate EOD campus, also in Indian Head, Md.; two official detachments in Picatinny, N.J. and McAlester, Okla.; six off-site locations; and employees stationed throughout the world.

NSWC IHD has the largest workforce in the DoD dedicated to energetics and EOD — over 2,300 strong and comprised of more than 900 scientists and engineers (more than 50 holding doctorates). The command also boasts EXU-1, an Echelon V command dedicated to collecting, processing, exploiting and analyzing improvised and conventional weapons, ordnance and components; and to providing near real-time targeting information and intelligence to EOD forces. The division's business base totals approximately $1.1 billion.

The Division's unique synergy and balanced capabilities address all aspects of the energetics technical discipline including basic research, applied technology, technology demonstration, prototyping, engineering development, manufacturing, acquisition, low-rate production, scale-up, in-service engineering/mishaps, failure investigations, surveillance, EOD technology/information and demilitarization.

Mission

Provide research, development, engineering, manufacturing, test, evaluation and in-service support of energetic systems and materials (chemicals, propellants and explosives) for ordnance; warheads; propulsion systems; pyrotechnic devices; fuzing, electronic devices; cartridge actuated devices and propellant actuated devices (CAD/PAD); packaging, handling, storage and transportation (PHST); gun systems; and special weapons for Navy, Joint Forces, and the Nation. Develop and deliver EOD technology, knowledge, tools and equipment and their life cycle support through an expeditionary work force which meets the needs of the Department of Defense, combatant commanders, and our foreign and interagency partners. Execute other responsibilities as assigned by Commander, Naval Surface Warfare Center. Support the Executive Manager for EOD Technology and Training.

Vision

As a field activity of the Naval Sea Systems Command and part of the Naval Research and Development Enterprise, NSWC IHD is the leader in ordnance, energetics and EOD solutions for the Department of Defense.

Technical Capabilities

- EOD/improvised explosive device (IED)/counter radio-controlled IED electronic warfare (CREW) threat and countermeasure information development and dissemination
- EOD/IED/CREW technology development and integration
- Energetics, ordnance components and systems for:
  - Science and Technology (S&T), Emergent and National Need Requirements
  - Air Warfare
  - Surface Warfare
  - Expeditionary and Undersea Warfare
- EOD unmanned systems
- Conventional and improvised weapons exploitation
- Chemical, Biological, and Radiological Defense (CBR-D) Systems

Major Facilities

- Aircrew Escape Ordnance Devices Development & Prototyping Complex
- Detonation Physics Research, Development, Test and Evaluation (RDT&E) and Acquisition
  - Bombproofs, blast chambers, self-contained gun ranges
- Solventless and Solvent-Based Energetics Processing Facilities
- Novel Materials R&D
  - Nano-energetic materials characterization
  - Complete suite of analytical capabilities
- Cast Composite Rocket Motor and PBX R&D & Scale-Up Complex
- Ordnance Test Facilities
- Chemical, Physical Property and Metallurgy Labs
- Quality Evaluation/Surveillance Facility
- Specialty Energetic Chemical Scale-up Facility
- High Pressure Explosives, Physics & Combustion Lab
  - Bomb testing, Strand burning; Combustion instability testing
- Microelectromechanical Systems (MEMS) Explosives-rated Clean Room
- Underwater Warheads RDT&E and Modeling & Simulation
- Foreign Ordnance Electronics Exploitation Laboratory
- Magnetic Signature Test Facility
- Ordnance Disassembly Complex
- Hypervelocity Test Facility
- Oxygen Cleaning Laboratory-EOD Diver Complex
- Gun Test Facility
- Packaging, Handling, Storage and Transportation Test Lab
- Gun Integration facility (Turret Facility)

Workforce Profile - 2021

- Total: 2,380
- Scientists & Engineers: 1,184

Advanced Degrees - 2021

- Ph.Ds – 93
- Masters - 393

Total Annual Funded Program - 2021

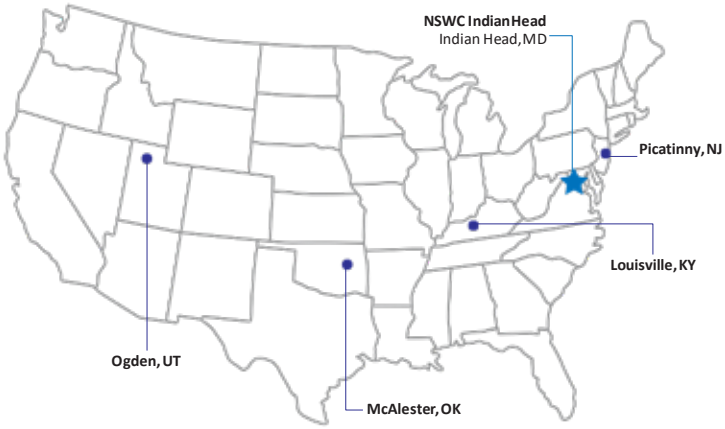
- $1 billion
- Contracts issued: $507 million

Indian Head Division Leadership

Ashley G. Johnson, SES
Technical Director

Captain Eric C. Correll, USN
Commanding Officer

Indian Head Division Sites



NUWC KEYPORT DIVISION

NAVAL SEA SYSTEMS COMMAND

WARFARE CENTERS

2021 Highlights

Delivered Torpedo Capacity, Capability, and Readiness to the Fleet: Delivered 989 heavyweight and lightweight weapons, exceeding expectations for heavyweight and greatly improving lightweight deliveries. The Test and Evaluation group ranged weapons and test vehicles in the Dabob and Nanoose ranges to verify current capability and test future capability, providing key data and analysis to support ongoing research and development programs. The weapons deployed in training exercises ensuring readiness of fleet forces to accurately and effectively prepare and fire weapons in near real life scenarios.

Unmanned Undersea Vehicles (UUVs): Received In-Service Engineering Agent designations for the Orca Extra Large Diameter UUV, the Snakehead Large Diameter UUV, and the Dry Deck Shelter variant of the Razorback Medium Diameter UUV. In fulfillment of these new assignments and in a co-location with UUVRON-1, accepted delivery of 8 Razorback vehicles, performed the first Depot-level Maintenance Period, and successfully supported vehicles' first missions. These experiences showcase the technical acumen and collaboration across a variety of stakeholders to provide agile and effective responses to fleet needs.

Technology Solutions for the Fleet and Naval Shipyards: Collaborating with shipyards and the fleet, developed automated tools to increase organic industrial base capacity and fleet readiness, including the successful OPDEMOed Motor Generator Set Commutator Refurbishment System. This modular, robotic system provides a field refurbishment capability for the 688, 726, and 21 Class submarine MG Set, giving back weeks of shipyard resource time for each application, automating a heavily manual process while improving safety, and allowing concurrent work processes to continue.

NUWC KEYPORT DIVISION

NAVAL SEA SYSTEMS COMMAND

WARFARE CENTERS

With a proud history spanning more than 100 years, NUWC Keyport Division is a global network of people, facilities, and capabilities, united in all we do by a culture of innovation and a common purpose: to expand America's dominance in the undersea domain. One of two divisions of the Naval Undersea Warfare Center, NUWC Keyport Division's advanced technical capabilities directly support the full spectrum of Navy undersea programs.

NUWC Keyport Division's primary location is in the community of Keyport, Washington, on the Kitsap Peninsula. Other Washington locations include an annex at Naval Base Kitsap-Bangor, and undersea ranges in Puget Sound and the Hood Canal, which combine state-of-the-art support infrastructure with unique natural conditions.

The command also maintains detachments in California and Hawaii, operating sites in Guam and Nevada, an office in Japan, the Naval Sea Logistics Center, in Pennsylvania, and the Nanoose Range in the waters of British Columbia, Canada. Our people frequently deploy around the world to support the U.S. fleet and allied militaries.

NUWC Keyport Division's current workforce consists of approximately 2,200 civilians and 30 Sailors.

Mission

Provide advanced technical capabilities for test and evaluation, in-service engineering, maintenance and industrial base support, fleet material readiness, obsolescence management and logistics support for undersea warfare.

Execute other responsibilities as assigned by the Commander, Naval Undersea Warfare Center.

Vision

Expanding America's Dominance in the Undersea Domain

Technical Capabilities

- Pacific USW T&E Range and Test Facility Operations
- Independent USW Systems Test and Evaluation and Experimentation
- USW Weapons and Vehicles Range and Environmental Test Systems
- Torpedo and Unmanned Undersea Vehicle Maintenance and Repair
- Obsolescence Management
- Undersea Warfare Systems Material Depot
- Torpedo and Unmanned Undersea Vehicles ISE and ILS
- Submarine USW Systems ISE and ILS
- Theater USW Systems
- Fleet Training and Training Management Systems
- Integrated Product Support for Surface and Undersea Systems
- Central Design Agent for Navy and NAVSEA Corporate Logistics Data Systems
- Ships Planned Maintenance System
- NAVSEA Operating Materials and Supplies (OM&S) Management

Major Facilities

- Additive Manufacturing and Rapid Prototyping Technologies Facilities (Keyport)
- Collaborative Test & Evaluation Capability Center (Keyport)
- Combat Systems Depot (Keyport)
- Custom Engineered Solutions/Obsolescence Resolution Facilities (Keyport)
- Fleet Integrated Simulation Technology Testing Facility (Pearl Harbor)
- Fleet Operational Readiness Accuracy Check Sites (Hawaii)
- Fleet Test and Evaluation Facilities (San Diego and Hawaii)
- In-Service Engineering Facility (Keyport)
- Magnetic Silencing Facilities (Pearl Harbor)
- Pacific Northwest Undersea Range Complex (Washington)
- Repair Technology Development Complex (Keyport)
- San Clemente Island Underwater Range (California)
- Shipboard Electronic Systems Evaluation Facilities (Hawaii)
- Torpedo, Anti-Torpedo and UUV Maintenance Depot/Intermediate Maintenance Activity (Keyport and Pearl Harbor)
- Torpedo Demilitarization Facilities (Hawthorne)
- Torpedo Exercise Support Facility (Guam)
- Undersea Warfare Mines Depot (Hawthorne)
- Unmanned Undersea Vehicle Homeport/Barb Hall (Keyport)

Workforce Profile - 2021

- Total: 2,723
- Scientists & Engineers: 970

Advanced Degrees - 2021

- Ph.Ds – 23
- Masters - 448

Total Annual Funded Program - 2021

- $576 million
- Contracts issued: $357 million

Keyport Division Leadership

Michael Slater
Technical Director (Acting)

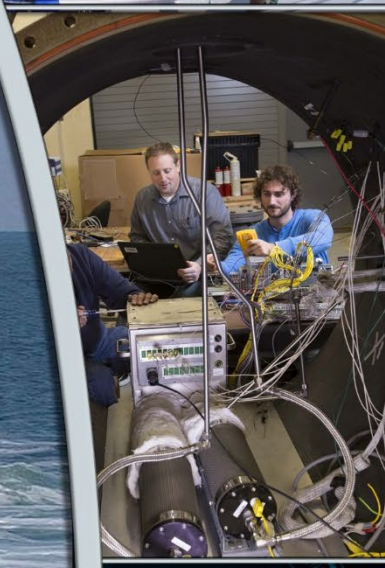
Captain Jon H. Moretty, USN
Commanding Officer

Keyport Division Sites

NUWC NEWPORT DIVISION

NAVAL SEA SYSTEMS COMMAND

WARFARE CENTERS



2021 Highlights

Advancing the Navy's State-of-the-Art: Leading technology initiatives to advance the Navy's state-of-the-art in the undersea domain through innovation, collaboration & demonstration in artificial intelligence (speed decision making/reduce operator workload), Live, Virtual, Constructive (more cost effective training/reduce demand on Navy platforms) & UUVs (technology development and demonstration).

Artificial Intelligence: Led Task Force Turing efforts to define an artificial intelligence adoption strategy for the Navy.

Live, Virtual, Constructive (LVC): Co-led Naval Integrated LVC Environment Exercise (NILEX) activities; successfully executed NILEX 20-2 incorporating many LVC "firsts" & 2 USW LVC M&S vignettes in NILEX 21-2.

UUVs: Leading efforts to integrate & deliver an operational Snakehead vehicle, the Navy's first large diameter unmanned undersea vehicle.

Transforming Submarine Systems: Transforming submarine combat system architecture (1st time in 30 years), leveraging industry best practices and incorporating cybersecurity & system resiliency for the warfighter. Completed installation of a submarine large vertical array, providing the Navy with unprecedented sonar detection capability.

Developing UUV Payload Roadmaps: Led a cross-org UUV Payloads Integration Group to develop UUV Payload Roadmaps for 4 classes of UUVs, providing Navy leadership a framework to influence technology insertion transition paths.

NUWC NEWPORT DIVISION

NAVAL SEA SYSTEMS COMMAND

WARFARE CENTERS

NUWC Newport Division, one of two divisions of the Naval Undersea Warfare Center, is the Navy's full-spectrum research, development, test and evaluation, engineering, and fleet support center for submarine warfare systems and many other systems associated with the undersea battlespace. NUWC Newport Division provides the technical foundation that enables the conceptualization, research, development, fielding, modernization, and maintenance of systems that ensure our Navy's undersea superiority.

NUWC Newport Division is responsible, cradle to grave, for all aspects of systems under its charter, and is engaged in efforts ranging from participation in fundamental research to the support of evolving operational capabilities in the U.S. Navy fleet. The major thrust of NUWC Newport Division's activities is in applied research and system development.

With headquarters in Rhode Island, NUWC Newport Division operates detachments at West Palm Beach, Florida and Andros Island in the Bahamas. Remote test facilities are located at Seneca Lake and Fisher's Island in New York; Dodge Pond in Connecticut; Fort Story, Virginia; Okahumpka, Florida; and Rota, Spain.

Mission

NUWC Newport Division provides research, development, test and evaluation, engineering, analysis, and assessment, and fleet support capabilities for submarines, autonomous underwater systems, and offensive and defensive undersea weapon systems, and stewards existing and emerging technologies in support of undersea warfare. Executes other responsibilities as assigned by the Commander, Naval Undersea Warfare Center.

Vision

Undersea Superiority: Today and Tomorrow

Technical Capabilities

- USW Communication Systems
- USW Communication Antenna Systems
- USW Combat Systems
- USW Trainer Systems
- USW Sensor and Sonar Systems
- Submarine Periscopes and USW Imaging Systems
- USW Electronic Warfare, SIGINT, IO Sensors and Systems Integration
- Undersea Surveillance Systems
- USW Launcher Systems and Payload Integration
- Submarine Tactical Missile Integration
- USW Autonomous Vehicles
- Torpedo and Sonar Defensive and Countermeasure Systems
- Torpedoes and Undersea Weapons
- Undersea Warfare (USW) Analysis
- USW Environmental Assessment Effects Analysis
- Undersea Range Technology and Application
- USW Systems Test and Evaluation
- USW Distributed Netted Systems
- Atlantic USW T&E Range and Training Operations
- Submarine Electromagnetic Environmental Effects (E3)

Major Facilities

- Acoustic Wind Tunnel
- Anechoic Chamber
- Chemistry Lab
- Combat Systems Evaluation & Analysis Laboratory
- Environment Centric Weapons Analysis Facility
- Launcher Laboratory
- Narragansett Bay Test Facility
- Over-water Arch Facility
- Propulsion Test Facility
- Quiet Water Tunnel
- Submarine Towed and Deployed Systems Research, Development, Test and Evaluation Complex
- Survivability Test Facility
- Undersea Warfare Analysis
- Virginia Payload Tube Facility

Workforce Profile - 2021

- Total: 3,612
- Scientists & Engineers: 2,807

Advanced Degrees - 2021

- Ph.Ds – 156
- Masters - 957

Total Annual Funded Program - 2021

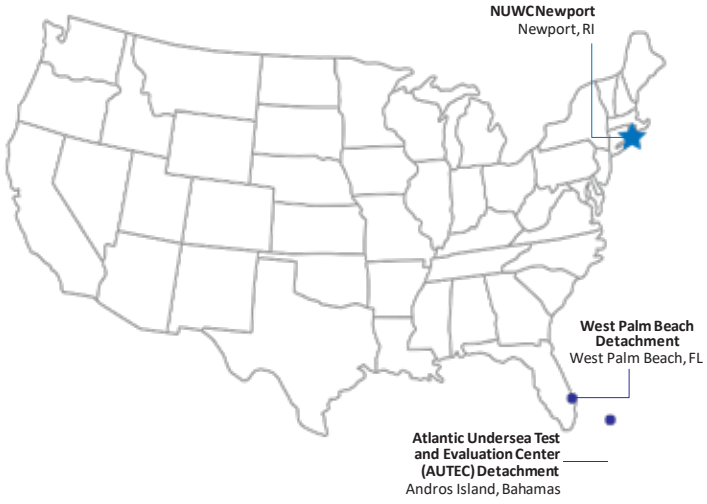
- $1.4 billion
- Contracts issued: $755 million

Newport Division Leadership

Ron Vien, SES
Technical Director

Captain Chad Hennings, USN
Commanding Officer

Newport Division Sites



NSWC PANAMA CITY DIVISION

NAVAL SEA SYSTEMS COMMAND

WARFARE CENTERS

2021 Highlights

Ship to Shore Connector (SSC): The latest episode of Discovery's Impossible Engineering went behind the scenes to showcase the Navy's SSC and the hovercraft history that led to this next generation landing craft. Filmed on location, the episode highlights how the government led design of SSC increases capability, performance, reliability and operational availability to the Navy and Marine Corps team. The craft are built with similar configurations, dimensions, and clearances to legacy Landing Craft Air Cushion (LCAC) hovercraft, ensuring the compatibility of this next-generation air cushion vehicle with existing well deck equipped amphibious ships, as well as the Expeditionary Transfer Dock.

CNO and MCPON Visit: Adm. Mike Gilday, CNO, and Master Chief Petty Officer of the Navy Russell Smith visited to learn more about progress on unmanned, artificial intelligence and machine learning technology. The visit provided a clearer understanding of efforts to support the warfighter.

HACKtheMACHINE: A team participated in the 2021 HACKtheMACHINE challenge to hone and sharpen their cyber skills to enable the Navy to defend the country against all enemies, both foreign and domestic. The annual competition, primarily virtual this year, is designed to foster engagement between the Navy and public and private sectors interested in tackling the Navy's toughest digital challenges.

STEM Outreach: Twelve Bay District School high school students took part in the Science and Engineering Apprentice Program, which was developed to encourage participating high school students to pursue science and engineering careers and further their education via mentoring from Navy laboratory personnel. The program allows students to participate in Navy relevant research and technology efforts, which can lead to employment.

NSWC PANAMA CITY DIVISION

NAVAL SEA SYSTEMS COMMAND

WARFARE CENTERS

Located on over 650 acres along St. Andrews Bay in Panama City, Florida, NSWC Panama City Division is the Navy's technical center of excellence for littoral warfare and coastal defense. NSWC Panama City Division employs over 1,400 civilian employees, of which the majority are scientists and engineers, who research, develop, test and evaluate capabilities in four core mission areas of mine warfare, diving and life support, naval special warfare and amphibious and expeditionary warfare. NSWC Panama City Division also patents innovative ideas and rapidly prototypes tomorrow's capabilities to fleet users by capitalizing on a talented workforce and a prime location on the Gulf of Mexico.

Mission

The mission of Naval Surface Warfare Center Panama City Division is to conduct research, development, test and evaluation, in-service support of mine warfare systems, mines, naval special warfare systems, diving and life support systems, amphibious/expeditionary maneuver warfare systems, other missions that occur primarily in coastal (littoral) regions and to execute other responsibilities as assigned by Commander, Naval Surface Warfare Center.

Vision

Ensuring Warfighting Dominance in the Littoral Battlespace

Technical Capabilities

- Personal Protective Systems for Extreme Environments
- Expeditionary Coastal and Maritime Security System Engineering and Integration
- Air Cushion Vehicle Systems
- Expeditionary Maneuver Warfare Systems Engineering and Integration
- Special Warfare Maritime Mobility Mission Systems and Mission Support Equipment
- MCM Detect and Engage Systems, Modular Mission Packaging, and Platform Integration and Handling
- Littoral Mission Systems Integration and Modular Mission Packages Certification
- Unmanned Systems Engineering & Integration, Autonomous Operations, Joint Interoperability and Common Control
- Mine Sensor and Target Detection Technology, Mine Delivery Platform Integration, and Minefield Architecture
- Diving and Life Support Systems
- Surface Life Support Systems for Extreme Environments

Major Facilities

- Mine Warfare Complex
- Littoral Warfare Research Facility
- Littoral Warfare Systems Facility
- Diving & Life Support Complex
- Special Warfare Research Engineering Complex
- Expeditionary Warfare Complex
- Landing Craft Air Cushion Facility
- Human Systems Integration Usability Lab
- USMC Amphibious Raids and Reconnaissance Integration Facility
- Coastal Test Range
- Prototype Fabrication Facility
- Fanselau Coil Facility
- Joint Gulf Test Range

Workforce Profile - 2021

- Total: 1,647
- Scientists & Engineers: 1,070

Advanced Degrees - 2021

- Ph.Ds – 72
- Masters - 427

Total Annual Funded Program - 2021

- $1.2 billion
- Contracts issued: $279 million

Panama City Division Leadership

Dr. Peter Adair, SES
Technical Director

Captain David Back, USN
Commanding Officer

Panama City Division

NSWC PHILADELPHIA DIVISION

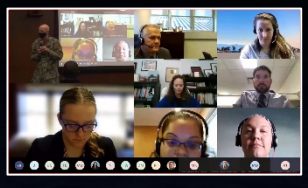
NAVAL SEA SYSTEMS COMMAND

WARFARE CENTERS

2021 Highlights

Advanced Weapons Elevator (AWE): The AWE team made strides progressing test and certification of weapons elevators as USS GERALD R. FORD (CVN 78) completed post-delivery test and trials and Full Ship Shock Trial milestones. Construction of the AWE Land Based Engineering Test Site (LBETS) elevator began in late summer and is on track to begin full operation in FY22. The LBETS will be the backbone for sustainment and modernization of the FORD Class AWE. The AWE team partnered with MITRE and Federally Funded Research and Development Centers to develop and integrate a new tool that automates the software verification test, resulting in cost and schedule savings.

Many Voices Pilot Program: The six-month program kicked off in April with five different groups of 12-15 employees meeting monthly, engaging in lively exchanges about difficult subjects. The initiative creates an inclusive environment that strengthens strategic relationships between leadership and the workforce by encouraging open dialogue among employees to exchange ideas and information. Upon conclusion in November 2021, CAPSTONE projects were presented to leadership and will be carried out in 2022.



Government/Defense Industrial Base Collaboration and Knowledge Sharing: Spanning Penn., Del., and N.J., the Liberty Tech Bridge is the 16th Tech Bridge within the continental U.S. The Liberty Tech Bridge serves as an innovation ecosystem between the Navy and industry, academia, and state and local governments to accelerate the development and transition of innovative increases in Navy shipboard warfighting capability. To accomplish this mission, innovative tools - such as the Other Transaction Agreement awarded for the establishment and management of the Maritime Sustainment Technology Innovation Consortium – will be used to develop and mature technologies that enhance the Navy's mission effectiveness.

LIBERTY TECH BRIDGE POWERED BY NAVAIR

MSTIC

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NSWC PHILADELPHIA DIVISION

NAVAL SEA SYSTEMS COMMAND

WARFARE CENTERS

The Naval Surface Warfare Center (NSWC) Philadelphia Division traces its founding to Nov. 18, 1910, when the Secretary of the Navy established the Fuel Oil Testing Plant (FOTP) to provide technical assistance to the Fleet as the U.S. Navy converted from coal to oil to fire its steam-powered ships.

In the century since, the organization's name has changed as its engineering responsibilities increased in scope: from FOTP; to Naval Boiler Laboratory; Naval Boiler and Turbine Laboratory; Naval Ship Engineering Center, Philadelphia Division; and Naval Ship Systems Engineering Station (NAVSSES).

When the Secretary of the Navy approved the establishment of the NAVSEA Warfare Centers in 1991, NAVSSES became part of the NSWC Carderock Division, but retained its status as a separate command. NAVSSES increased its capability in 1999 with the opening of the Machinery Research and Development Center. On Oct. 1, 2015, the Philadelphia command began the latest chapter in its history when it stood up as an Echelon four-level command, the Naval Surface Warfare Center (NSWC) Philadelphia Division.

NSWC Philadelphia Division is responsible for the machinery systems core equity of the ship and ship systems product area for the U.S. Navy, and serves as a central point for academia and industry to join forces with Navy technical experts to develop solutions to needs in naval machinery.

Consistent with its core equity responsibility, NSWC Philadelphia Division fulfills key functions including research, design, development, shipboard and land-based test and evaluation, acquisition support, in-service engineering, fleet engineering, integrated logistics support and concepts and overall lifecycle engineering.

NSWC Philadelphia Division provides the Navy's primary technical expertise and facilities for both naval machinery research and development and naval machinery lifecycle engineering.

Mission

NSWC Philadelphia Division provides research, development, test and evaluation, acquisition support, engineering, systems integration, in-service engineering and fleet support with cybersecurity, comprehensive logistics, and life-cycle savings through commonality for surface and undersea vehicle machinery, ship systems, equipment and material.

Vision

Shape the Navy's future by continuously expanding machinery systems advantages through technical dominance.

Technical Capabilities

- Surface and Undersea Vehicle Machinery Systems Integration
- Surface and Undersea Vehicle Mechanical Power and Propulsion Systems
- Surface and Undersea Vehicle Electrical Power and Propulsion Systems
- Surface and Undersea Vehicle Auxiliary Machinery Systems
- Surface and Undersea Vehicle Hull, Deck, and Habitability Machinery Systems
- Surface and Undersea Vehicle Machinery Automation, Controls, Sensors and Network Systems
- Advanced Logistics Concepts and Hull, Mechanical and Electrical (HM&E) Life Cycle Logistics Support
- Ship Recoverability and Damage Control
- HM&E for Undersea Vehicle Sail Systems and Deployed Systems
- Shipboard Waste and Hazardous Materials Management Systems
- Surface Ship and Undersea Vehicle Machinery Systems Integrity
- Shipboard Habitability Systems
- SUBSAFE Supervising Authority and Level-I Material Certification

Major Facilities

- Electric Drive Test Facility (EDTF)
- DDG-51 Land-Based Engineering Station (LBES)
- Shock & Vibration Laboratory (Deck Simulating Shock Machine)
- Submarine Life Support Test Site
- Gas Turbine Life Cycle Support Facility
- Advanced Data Acquisition, Prototyping Technologies, and Virtual Environments Lab (ADAPT.VE)
- Large Scale Machinery Anechoic Chamber
- Submarine Sail Test Site
- Submarine Towed Buoy Facility
- Weapons & Cargo Elevator Land Based Engineering Site
- Shipboard Hydraulics Lab
- Fluid Systems Machinery Silencing Lab
- Depth Control Valve Silencing Facility
- Volumetric Flow Calibration Laboratory

Workforce Profile - 2021

- Total: 2,813
- Scientists & Engineers: 1,875

Advanced Degrees - 2021

- Ph.Ds – 27
- Masters - 621

Total Annual Funded Program - 2021

- $770 million
- Contracts issued: $853 million

Philadelphia Division Leadership

Seth Burmaster
Technical Director (Acting)

Captain Dana F. Simon, USN
Commanding Officer

Philadelphia Division

NSWC PORT HUENEME DIVISION

NAVAL SEA SYSTEMS COMMAND

WARFARE CENTERS

2021 Highlights

Unmanned Test & Evaluation: Extra-Large UUV (XLUUV) capabilities continue to expand as Navy leaders celebrated the completed renovations of the Mission Package Support Facility on Dec. 8 to accommodate the Navy's new XLUUV during a ribbon-cutting ceremony.

Directed Energy Systems Integration Laboratory: After a 13-year journey that included incredible persistence, patience and partnerships, celebrated the completion of the Navy's only dedicated facility for complex testing, firing and evaluating of complete laser weapons in a maritime environment at the new Directed Energy Systems Integration Laboratory (DESIL). The outstanding team of directed energy in-service engineers will use DESIL to support and increase this game-changing combat technology for the fleet and the Navy now and into the future.

New Frigate Readiness Model: Took ship readiness a significant step further by helping develop a total ship Frigate Readiness Assessment Model (FRAM) for the first new Constellation-class frigate, USS CONSTELLATION (FFG 62), which will replace additional littoral combat ships and is in the final design and development phase. The FRAM will leverage digital tools to predict the ship's readiness prior to departure on its first mission.

Digital Tech Assists: To further advance the Navy's training capabilities and meet the command's North Star of discontinuing onboard technical assists to ships by 2030, the division is leveraging the Navy Continuous Training Environment (NCTE) that enables Live, Virtual, Constructive (LVC) Fleet Training, which enables the warfighter to train from anywhere in the world within a large number of virtual and realistic threat situations. The NCTE tool consists of networks, simulations, simulation routing equipment, data translation devices and live training range systems that operate in conjunction with the Navy Enterprise

NSWC PORT HUENEME DIVISION

NAVAL SEA SYSTEMS COMMAND

WARFARE CENTERS

Naval Surface Warfare Center Port Hueneme Division (NSWC PHD) maintains technical expertise at locations across the United States with engineering and logistics in Port Hueneme, Calif.; search radar engineering in Virginia Beach, Va.; and live-fire testing in White Sands, N.M. NSWC PHD is the Navy's center of excellence for in-service engineering, test and evaluation, and integrated product support for surface warfare combat and weapon systems. Since its inception in 1963, NSWC PHD has supported fleet combat and weapons systems by providing highly-skilled personnel and state-of-the-art facilities to lead the development and support of Navy surface ship warfare systems throughout their life cycle.

NSWC PHD focuses its technical capabilities on Next Generation In-Service Engineering, which involves direct connectivity to the fleet on a global basis and the immediate availability of around-the- clock access to products, services and fleet-support capabilities. Next Generation In-Service Engineering supports predictive system failure, remote diagnostics and corrective action via real-time networked communications.

Mission

Integrate, test, evaluate, and provide life-cycle engineering and product support for warfare systems

Vision

Keeping our Navy underway, combat ready and effective

Capabilities

"Cradle to Grave" lifecycle engineering and sustainment planning to ensure combat and weapon systems work together effectively to accomplish ship, strike group and theater warfare assigned missions. Naval enterprise area assignments include surface, aviation, expeditionary combat, NETWAR FORCEnet and undersea for over 50 major acquisition programs.

Onshore and at-sea live-fire testing of naval weapons in support of weapon system acquisition (missiles and laser systems), assembly of weapons for live-fire testing, launch of research rockets and assembly, including launch of low and medium fidelity theater ballistic targets.

Technical Capabilities

- Strike Force Interoperability and Theater Warfare Systems
- Surface and Expeditionary Combat Systems
- Surface and Expeditionary Weapon Systems
- Underway Replenishment Systems
- Surface and Expeditionary Missile Launcher Systems
- Radar Systems
- Directed Energy and Electronic Weapon Systems
- Littoral Mission Module
- Ballistic Missile Defense Test & Evaluation Target Vehicle Development, Integration and Deployment

Major Facilities

- Self Defense Test Ship
- Surface Warfare Engineering Facility
- Underway Replenishment Test Site
- Littoral Combat Ship Mission Package Support Facility
- Vertical Launch System Launcher Lab
- Engineering Development Lab
- Desert Ship – White Sands, N.M.
- Radar Lab – Virginia Beach, Va.

Workforce Profile - 2020

- Total: 2,934
- Scientists & Engineers: 1,696

Advanced Degrees - 2021

- Ph.Ds – 14
- Masters - 582

Total Annual Funded Program - 2021

- $1.4 billion
- Contracts issued: $571 million

Port Hueneme Division Leadership

Jeffrey Koe, SES
Technical Director

Captain Andrew Hoffman, USN
Commanding Officer

Port Hueneme Division Sites