Carderock’s History

1896: Experimental model basin established

1967: Consolidation with Marine Engineering Lab (Annapolis)

1937: Carderock site approved

1995: Consolidation with Naval Ship Systems Engineering Station (NAVSEES/Philadelphia)

2013: Maneuvering & Seakeeping basin renovated

2015: Realignment-NAVSEES becomes NSWC Philadelphia Division

HR 7542 June 10, 1896
“Established a model tank... for investigating and determining the most suitable and desirable shapes and forms... for U.S. naval vessels... (And)... for private ship builders... provided that the cost be defrayed...”

HR 10135 Feb. 24, 1937
“...For U.S. vessels, including aircraft and the investigation of other problems of ship design...”

Long history of supporting maritime RDT&E

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Strategic Alignment

One Team – Expanding the Advantage through Collaboration

4 LINES OF EFFORT
- Strengthen Naval Power
- Achieve High Velocity Learning
- Strengthen our Navy Team
- Expand, Strengthen our Network of Partners

FORCE BEHIND THE FLEET
- On-time delivery of ships & submarines
- Culture of affordability
- Cybersecurity
- People
- High Velocity Learning

NSWC Carderock
STRATEGIC FOCUS AREAS
- Modern Knowledge Transfer
- Procurement Planning & Execution
- Workforce Development
- Unmanned Vehicles / Autonomous Systems
- Ship / Platform Design and Integration
- Additive Manufacturing
- Culture of Innovation
- Cybersecurity

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Quick Facts

- Diverse and highly educated workforce with 25,000 scientists, engineers, and technicians (with more than 2,000 Ph.D.s)
- 20 commands across the NAVAIR/NAVSEA Warfare Centers, SPAWAR Systems Centers, ONR and NRL
- Conducts RDT&E for the DoN to discover, develop, transition and field technologically superior naval warfighting capabilities.
  - Examples: prototype development, demonstrations and experimentation to accelerate the fielding of new operational concepts, technology and systems innovations.
- Unique RDT&E facilities and test ranges

Aggressive Research, Development, Test & Evaluation for reliable real world solutions

UNCLASSIFIED

V. 13 July 2016
Carderock: Where We Work

Carderock Division HEADQUARTERS
WEST BETHESDA, MD

Southeast Alaska Acoustic Measurement Facility
KETCHIKAN, AK

Puget Sound Detachment
at Naval Submarine Base Bangor
BANGOR, WA

Acoustic Research Detachment
BAYVIEW, ID

Norfolk Detachment
Combatant Craft Division
NORFOLK, VA

South Florida Ocean Measurement Facility
DANIA, FL

Acoustic Trials Detachment
CAPE CANAVERAL, FL

Memphis Detachment
Dr. William B. Morgan
Large Cavitation Channel
MEMPHIS, TN

Carderock: Where We Work

AMERICA'S FLEET STARTS HERE

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Carderock: What We Do

Science & Technology

Research & Development

Advanced Concepts & Designs

Acquisition & Construction

Test & Evaluation

Modernization & In-Service Engineering

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**TASKING**
Major Customers and FY17 Budget

**Business**
Cost reimbursable and direct cite:

<table>
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<th>REIMURSABLE</th>
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<tr>
<td>FY17 Actual</td>
<td>$499 Million</td>
<td>$162 Million</td>
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FY16 $620M Actual / FY17 $661M Actual / FY18 $686M Projection

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Technical Departments

Platform Integrity Department (Code 60)

Signatures Department (Code 70)

Naval Architecture and Engineering Department (Code 80)
Platform Integrity Department

Envision, Design & Realize the Future Fleet | Sustain the Current Fleet

**SCIENCE & TECHNOLOGY**
- Cutting edge materials and metallurgy characterization (ceramics, magnetostrictive, metamaterials)
- Investigation of novel electrochemical energy sources for DoD
- Material Characterization of Additive Manufactured parts for shipboard use
- Modeling and simulation (M&S) for material sciences

**RESEARCH & DEVELOPMENT**
- Advancement of shipboard waste systems
- Innovative materials for signatures, ballistic protections, corrosion resistance, and biofouling
- Development of analytical tools for M&S of structural and shock assessments
- Fracture and fatigue analyses on novel welds and materials

**TEST & EVALUATION**
- Advanced numerical simulations for ship and submarine vulnerability assessments
- Live Fire Test and Evaluation (LFT&E) for Surface, Submarine, and USMC vehicles
- Qualification and testing of submarine pressure hulls
- Testing and certification of electrochemical energy sources and novel materials for Naval systems
- Full Scale rough water trials of Navy ships for sea loads

**ACQUISITION SUPPORT**
- Program Office support in the areas of Survivability, Structures, Materials, and Environmental
- Development and acquisition of Mobile Cleaning, Recovery and Recycling System (MCRSS)
- Specification development and procurement of Navy dosimetry equipment
- Principle for Safety services for Navy acquisition programs

**FLEET SUPPORT**
- On-site Corrosion Control Assist Team (CCAT) to train and provide tools to Ship's Force
- Composite patch repair of aluminum Navy ships
- Forensic and failure analyses on parts, structures, and energy sources
- In-situ material evaluations of aluminum structures
- Production of signature materials for Navy submarines

**FACILITIES**
- Explosive Test Pond
- Deep Submergence Tanks
- Structural Evaluation Facility
- Ship Materials Technology
Ship Signatures Department: Signatures Product Lifecycle

Envision, Design & Realize the Future Fleet | Sustain the Current Fleet

SCIENCE & TECHNOLOGY
- Basic & Applied Research
- Detailed understanding of Physics
- Modeling & Simulation
- Numerical & Analytical Model Development

RESEARCH & DEVELOPMENT
- Concept Studies
- Technology Development
- Small and Large Scale Model Experiments

TEST & EVALUATION
- Signature Measurement
- Systems Development
- Advanced Signal Processing
- Source Localization
- Full-Scale Trials

ACQUISITION SUPPORT
- Threat Analysis and Requirements Development
- Silencing System Design and Development
- Ship Acquisition & Construction Engineering
- Technical Warrant Holder Support

FLEET SUPPORT
- Direct Fleet Support
- SHIPALTS/TEMPALTS
- On-Board Acoustic Measurement Systems
- Fleet Training Systems

FACILITIES
- ARD, Bayview
- STAFAC
- SEAFAC
- SFOMF
Naval Architecture & Engineering Department

Envision, Design & Realize the Future Fleet | Sustain the Current Fleet

**SCIENCE & TECHNOLOGY**
- Technology development
- Modeling and simulation
- Tool development

**RESEARCH & DEVELOPMENT**
- Center for Innovation in Ship Design (CISD)
- Concept exploration and design studies
- Ship systems integration
- Cost analysis
- Seakeeping assessments
- Manufacturing and affordability

**ACQUISITION SUPPORT**
- Embedded support in PEOs for ship and submarine design
- Engineering managers for Tech Warrant support
- Collaboration with shipyards
- Acquisition engineering support
- Ship preliminary and contract design

**TEST & EVALUATION**
- Full-scale trials
- Performance validation
- Model scale testing

**FLEET SUPPORT**
- SHIPALTs
- Technology insertion
- In-service weighted stability assessment

**FACILITIES**
- MASK
  - West Bethesda, MD
- Tow Tank
  - West Bethesda, MD
- 36-Inch Water Tunnel
  - West Bethesda, MD
- Large Cavitation Channel (LCC)
  - Memphis, TN
Carderock Workforce

As of 15 Jan 2018

<table>
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<tr>
<th>TOTAL EMPLOYEES</th>
<th>SCIENTISTS &amp; ENGINEERS</th>
<th>ADMINISTRATIVE</th>
<th>TECHNICIAN &amp; WAGE-GRADE</th>
<th>EDUCATION</th>
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<td></td>
<td>Non-Degree</td>
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</tbody>
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Innovation Catalysts

NISE – Section 219 Funds
• Major innovation catalyst

12 active Educational Partnership Agreements (EPAs)
• Most recent – EPA with University of Maryland Baltimore County (UMBC) on July 27 for collaborations in the areas of:
  • cybersecurity; additive / advanced manufacturing

Patents (past 5 years)
• 2011-2015: 126 issued; 116 applications filed; 120 disclosures submitted
• Carderock has earned 8 Rear Adm. Harold Bowen “Navy Patent of the Year” awards (most in Navy)

Cooperative Research and Development Agreements (CRADAs)
• 136 active; 44 new in FY16
• CRADAs with Maryland companies: Lockheed Martin, Northrop Grumman, Johns Hopkins Applied Research Laboratory, DRS Power & Control Technologies, Chesapeake Technology International Corp., and Herrick Technology Laboratories

Collaborations (undersea)
• SCO
• Shipyards
• NUWC Newport, NUWC Keyport
• NSWC Philadelphia
• UARCS (Penn State, Texas, Washington)
• OSD CREATE
• Industry

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Summary

• NSWC Carderock Division provides critical support to today’s Navy and tomorrow’s fleet

• Dedicated, talented workforce and world-class facilities

• Active collaboration with industry, academia

• Integrated with local communities

We do things for the warfighter that industry can’t, won’t or shouldn’t do