

Naval Surface Warfare Center, Carderock Division

# AMERICA'S FLEET STARTS HERE



## Command Overview

*Naval Surface Warfare Center, Carderock Division*

**CAPT Mark Vandroff**  
*Commanding Officer, NSWCCD*

*February 2018*

**Dr. Paul Shang**  
*Technical Director (Acting), NSWCCD*

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# Carderock's History

**1896:**  
Experimental model basin established



**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..."*

**1967:**  
Consolidation with Marine Engineering Lab (Annapolis)



**2015:**  
Realignment-  
NAVSES becomes  
NSWC Philadelphia  
Division

1890s 1900s 1910s 1920s 1930s 1940s 1950s 1960s 1970s 1980s 1990s 2000s 2010s



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

**1937:**  
Carderock site approved



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

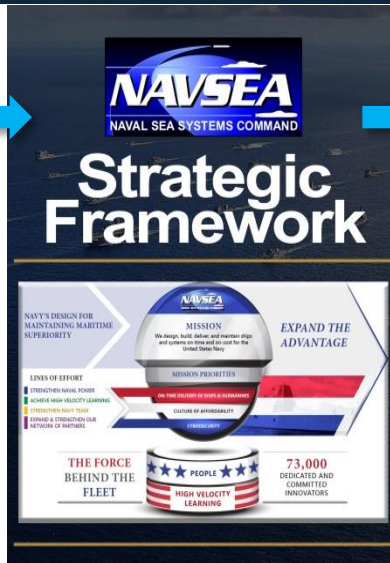
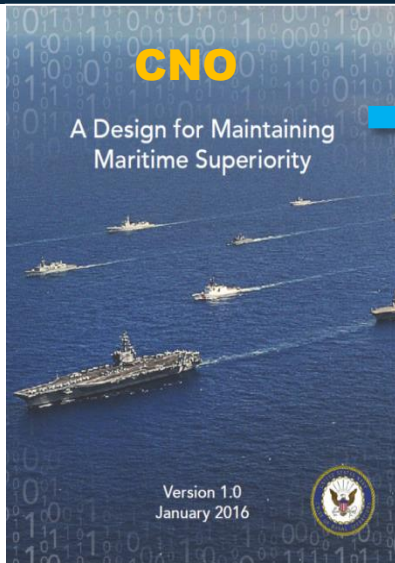


**2013:**  
Maneuvering & Seakeeping basin renovated

***Long history of supporting maritime RDT&E***



# Strategic Alignment



## 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



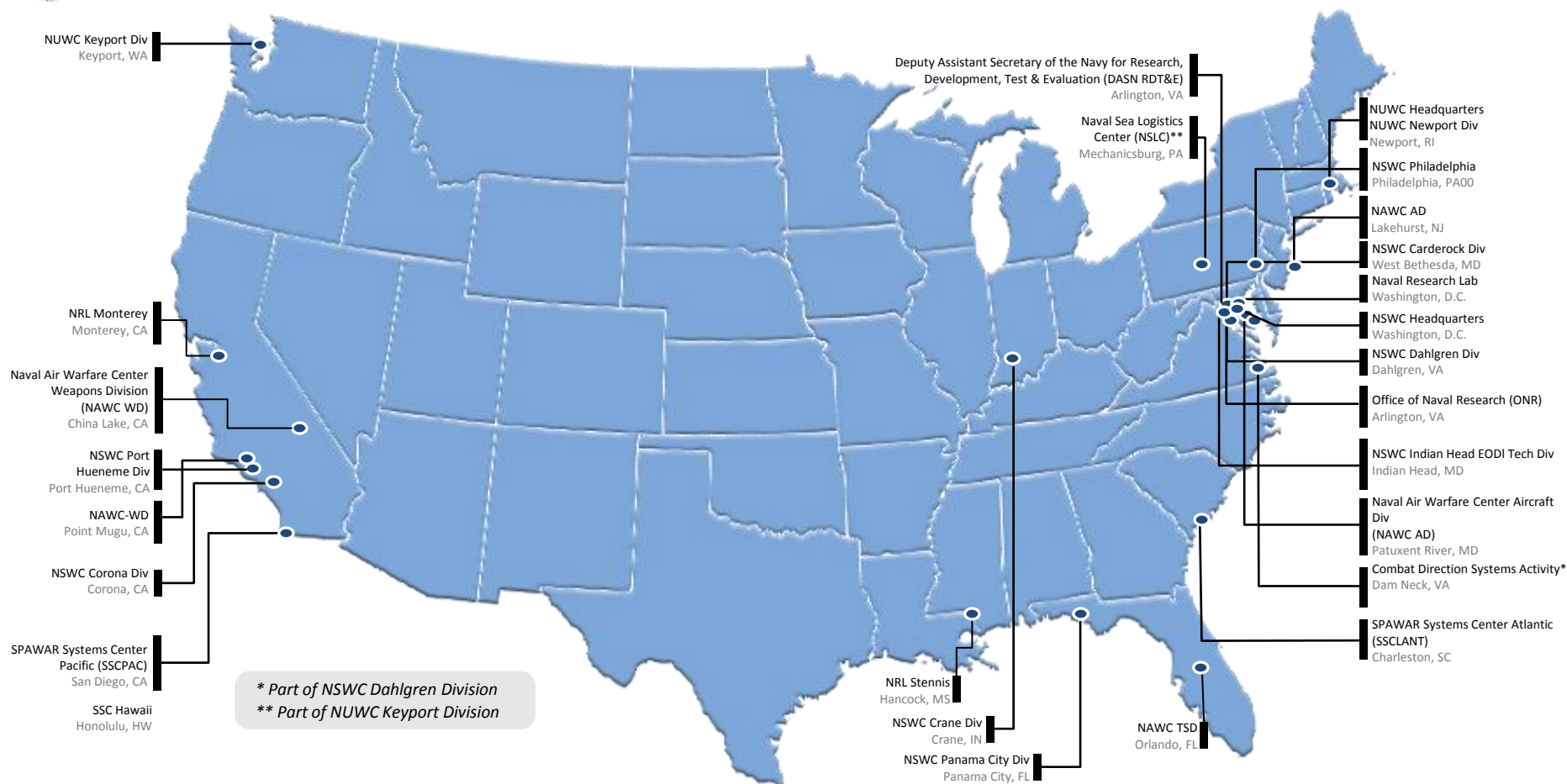
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**One Team – Expanding the Advantage  
through Collaboration**



# Naval Research & Development Establishment (NR&DE)



## Quick Facts

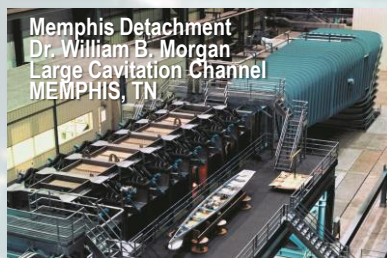
- ❑ Diverse and highly educated workforce with 25,000 scientists, engineers, and technicians (with more than 2,000 Ph.D.s)
- ❑ 20 commands across the NAVAIR/NAVSEA Warfare Centers, SPAWAR Systems Centers, ONR and NRL
- ❑ Conducts RDT&E for the DoN to discover, develop, transition and field technologically 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

UNCLASSIFIED

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



# Carderock: Where We Work





# Carderock: What We Do

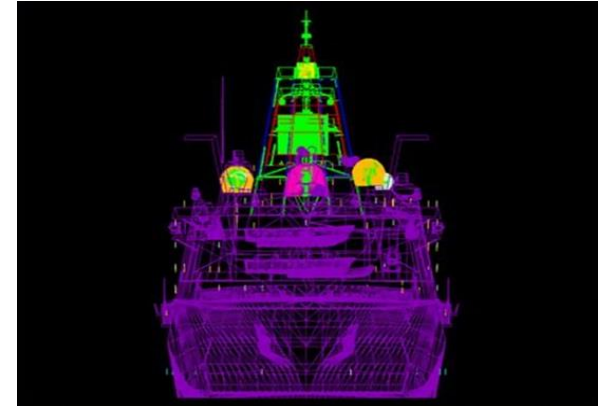
Science & Technology



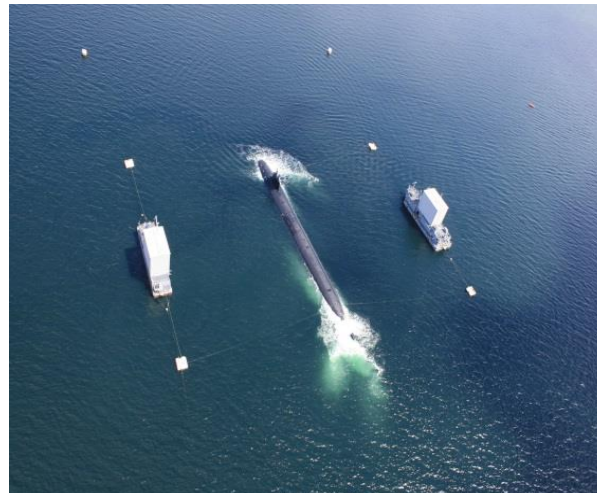
Research & Development



Advanced Concepts & Designs



Acquisition & Construction



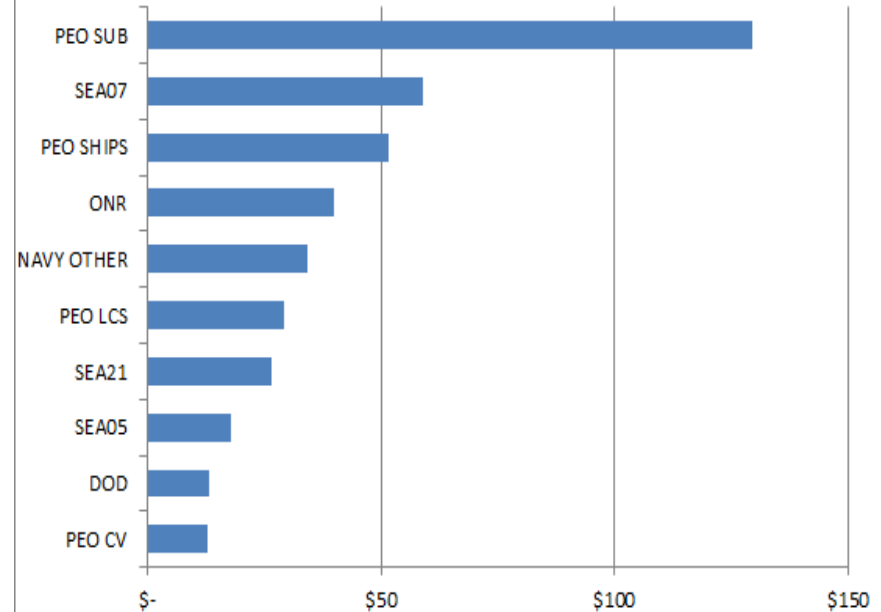
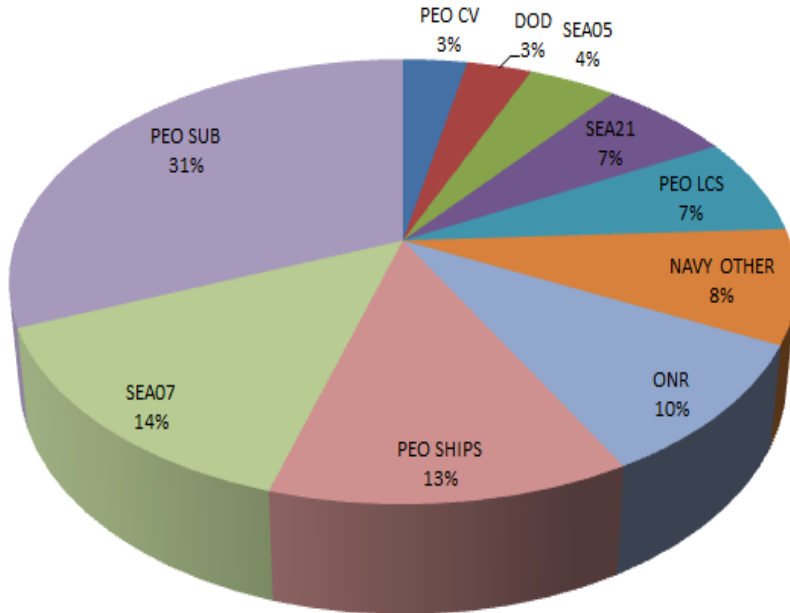
Test & Evaluation



Modernization & In-Service Engineering

# TASKING

## Major Customers and FY17 Budget



## Business

Cost reimbursable and direct cite:

# \$661 Million

	REIMURSABLE	DIRECT CITE
FY17 Actual	\$499 Million	\$162 Million

**FY16 \$620M Actual / FY17 \$661M Actual / FY18 \$686M Projection**

# Technical Departments



**Platform Integrity Department (Code 60)**



**Signatures Department (Code 70)**



**Naval Architecture and Engineering  
Department (Code 80)**



60

# 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 (MCRRS)
- ▶ 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

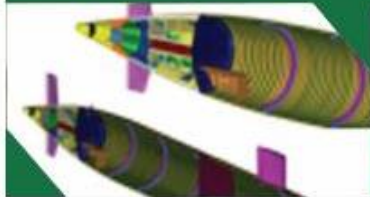
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# Ship Signatures Department: Signatures Product Lifecycle



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



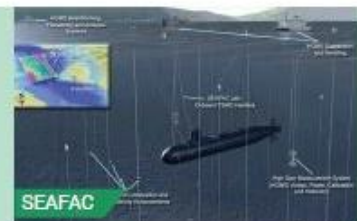
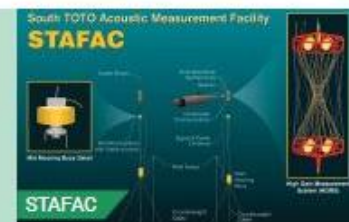
- ▶ Threat Analysis and Requirements Development
- ▶ Silencing System Design and Development
- ▶ Ship Acquisition & Construction Engineering
- ▶ Technical Warrant Holder Support

## FLEET SUPPORT



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

## FACILITIES





# 80

## 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



- ▶ Fleet support
- ▶ SHIPALTs
- ▶ Technology insertion
- ▶ In-service weighted stability assessment

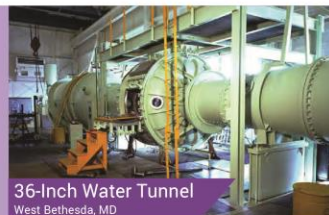
### FACILITIES



**MASK**  
West Bethesda, MD



**Tow Tank**  
West Bethesda, MD



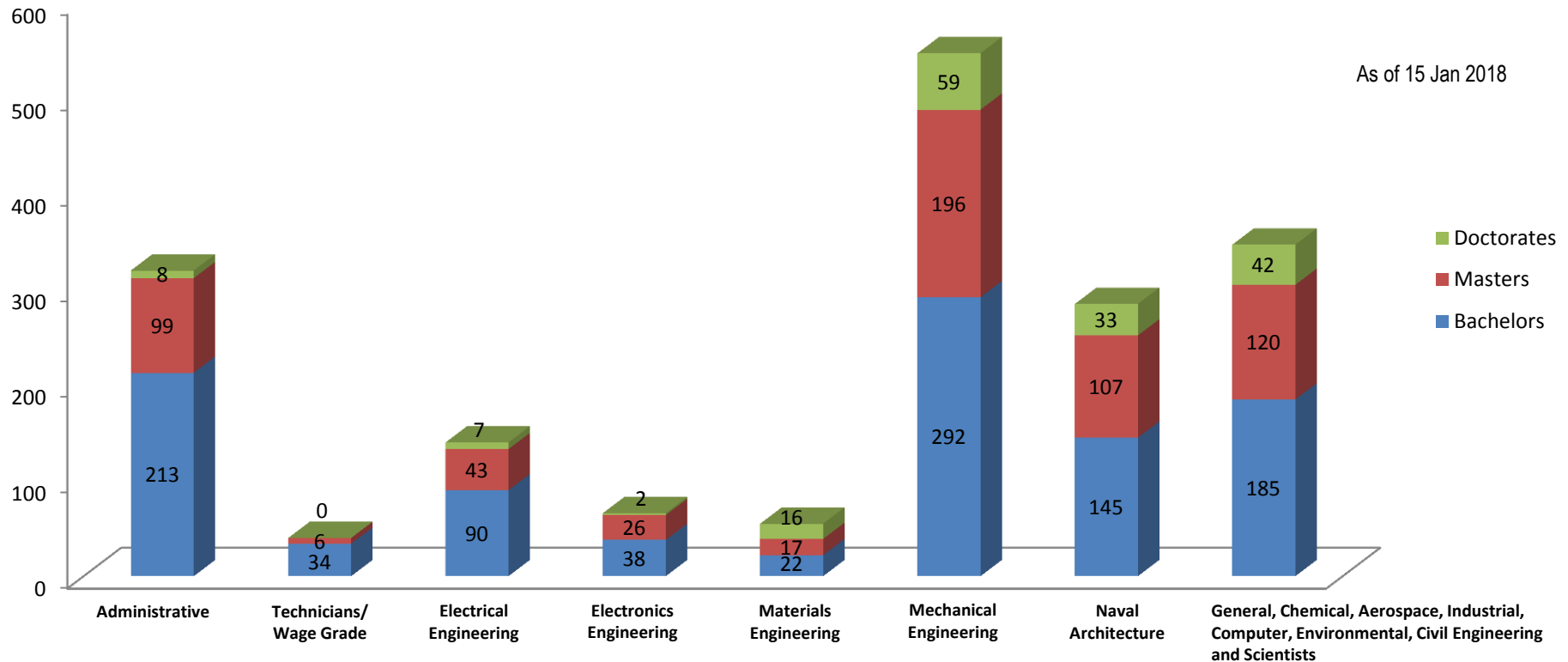
**36-Inch Water Tunnel**  
West Bethesda, MD



**Large Cavitation Channel (LCC)**  
Memphis, TN

# Carderock Workforce

As of 15 Jan 2018



TOTAL EMPLOYEES	SCIENTISTS & ENGINEERS	ADMINISTRATIVE	TECHNICIAN & WAGE-GRADE	EDUCATION		
2,206	1,448	535	223	Bachelors	Masters	Doctorate
				1,019	614	167
				Non-Degree		406



# 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)

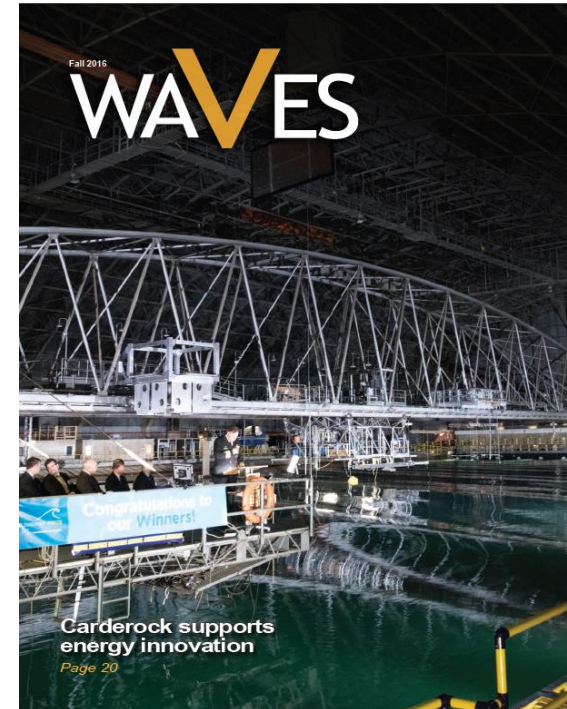
- 2011-2015: 126 issued; 116 applications filed; 120 disclosures submitted
- Carderock has earned 8 Rear Adm. Harold Bowen “Navy Patent of the Year” awards (most in Navy)

## 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



# Summary



Science &  
Technology

Research & Development  
Prototyping

In-Service  
Fleet Support

- **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*