Naval Surface Warfare Center, Carderock Division

# AMERICA'S FLEET STARTS HERE

**Michael S. Brown, Department Head for**
**Naval Architecture and Engineering**

NAVSEA WARFARE CENTERS Carderock

*Naval Surface Warfare Center, Carderock Division*

## *Marine Board*

**CAPT Todd Hutchison**
*Commanding Officer, NSWCCD*

*18 April 2023*

**Lawrence Tarasek, SES**
*Technical Director, NSWCCD*

# About Carderock

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## MISSION

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.

## Strategic Pillars

- **Ship and Submarine Design**
- **Platform Integrity and Performance**
- **Signature Management**
- **Unmanned Systems**

# Carderock: Performing a Critical Role in Determining and Realizing the Current and Future Fleet

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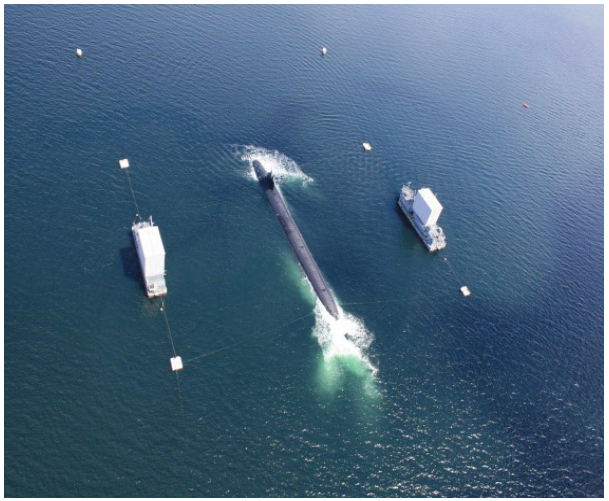
Science & Technology

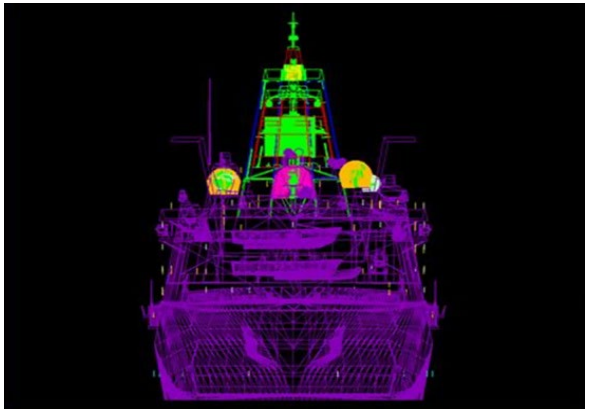
Acquisition & Construction

Research & Development



Test & Evaluation

Advanced Concepts & Designs



Modernization & In-Service Engineering

# Major Programs Supported

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## Submarines






## Surface Ships






## Emerging Programs

# Carderock: Where We Work

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Southeast Alaska Acoustic Measurement Facility
KETCHIKAN, AK


Carderock Division HEADQUARTERS
WEST BETHESDA, MD


Puget Sound Detachment
at Naval Submarine Base Bangor
BANGOR, WA


Norfolk Detachment
Combatant Craft Division
NORFOLK, VA


Acoustic Research Detachment
BAYVIEW, ID


Acoustic Trials Detachment
CAPE CANAVERAL, FL


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


South Florida Ocean
Measurement Facility
DANIA, FL

# Unique Facilities (West Bethesda site)

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# Unique Workforce – Dedicated and Diverse

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## Platform Integrity Department

- *Materials & Manufacturing*
- *Environmental & Energy*
- *Structures & Composites*
- *Survivability & Weapons Effects*

## Signatures Department

- *Full Scale Signatures Measurement & Analysis*
- *Acoustic Signatures Technology*
- *Signatures Measurement & Management Systems*
- *Electromagnetic Signatures Technology*

## Naval Architecture & Engineering Department

- *Future Concepts & Design Integration*
- *Combatant Craft*
- *Naval Architecture & Engineering*
- *Surface Ship Hydromechanics*
- *Submarine Maneuvering & Control*

# 21st Century Navy Challenges

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1. ***Additive Manufacturing***
   - ***Shrink the Supply Chain***
   - ***In-situ Manufacturing***

2. ***Unmanned Systems***
   - ***How do we design***
   - ***How do we use***

3. ***Naval Engineering Workforce***
   - ***Competition for skills***
   - ***Recruiting, Training and Retention***

# Naval Additive Manufacturing (AM) Implementation

## NSWCCD faces the challenges ahead

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### AM material performance is hard to predict

- NSWCCD engineers investigate the many unknowns associated with AM material response through applied R&D projects across naval platforms and length-scales.

### AM components are hard to inspect

- NSWCCD engineers support development of NDT techniques and requirements for AM components
- NSWCCD engineers investigate use of in-situ inspection and monitoring techniques to offset this challenge

### AM technologies are hard to qualify

- Developing the pathway for AM component qualification and certification

### AM technologies are hard to sustain

- NSWCCD engineers help solve logistical challenges associated with applying AM technologies including operator support, training, and data management

# Workforce Development in AM

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## Pathway to Supporting Navy AM

- NSWCCD personnel are heavily engaged with industry & academia partners throughout AM
- Very willing to answer questions with greater detail regarding specific areas of interest.

## Training/Education

- Industrial AM system manufacturers and AM organizations provide frequent trainings as a “crash-course” on concepts unique to AM technologies.




# Navy Unmanned Systems

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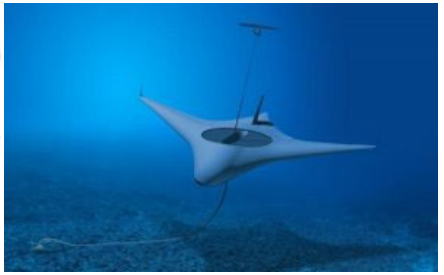
PMS-406: XLUUV ORCA

PMS-406: LDUUV Snakehead



DARPA: Manta Ray

MC: LRUSV

SCO: SeaHunter

ONR: OUSV Mariner

PMS 406/420: MCMUSV

ONR: OUSV Ranger

SCO: SeaMob

SCO: SeaHawk

# Unmanned Systems Challenges

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- **Design uniqueness (unmanned or optionally manned)**
- **Endurance**
- **Autonomy**
- **Reliability**
- **Sustainment**
- **Integration with the Fleet**
- **Payload and Sensor Integration**

# Workforce Recruitment, Development, and Attrition Challenges

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## *Recruitment*

- Not enough schools develop individuals with Naval Architecture, Hydromechanics or Signatures background
- STEM, Outreach
- Summer Internships for High School and College participants
  - We hire from the NREIP participant pool
- Target specific schools (Michigan, Webb, Stevens Institute, Viriginia Tech, others)

## *DEVELOPMENT*

- Center for Innovation in Ship Design
  - Ship and Submarine Cohorts annually
  - Graduate from CISD to doing early stage Ship and Submarine Concept Designs
- Offer training from Naval Post Graduate School in Systems Engineering and Robotics, George Mason for Naval Architecture
- Ship and Submarine Curriculum Developed at NSWCCD and broadcast and recorded via TEAMS Channel

# Workforce Development Path

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*STEM, Outreach, Internships, and Recruiting*

20 to 25 Year Development Timeline

**ENTRY**

- Ctr for Innovation in Ship Design
- Training
- Mentorship
- Rotations
- Project Teams
- On-the-job Training

**JOURNEY**

- Advanced Degrees
- Certifications
- Career Development

**EXPERT**

- Tech Authority / Warrant Holder
- Subject Matter Expert (SME)
- HQ Experience

**EXECUTIVE**

- Management
- Leadership

Transition, Knowledge Transfer, Mentoring, and Volunteer Corp

# Workforce Recruitment, Development, and Attrition Challenges

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## *Attrition and Retention*

- **Attrition 6%-9% Annually (of those ~50% move to other jobs to support the Navy**

**(On the low side for a technical business)**

- **Most people come to Carderock become engaged with supporting the Navy Mission**
- **Although Carderock is competitive on salaries, most people do not take the job for salary alone**
- **Diverse opportunities to explore or refine your technical skills**
- **Independent Research is encourage and funded**
- **Career Flexibility**
- **Culture**

# Summary

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Science & Technology | Research & Development Prototyping | In-Service Fleet Support

- **Carderock Divison Supports all aspects of Naval Ship, Submarine and Unmanned Systems**
- **NSWC Dedicated, talented workforce**
- **World-class facilities**
- **Providing critical support to today's Navy and tomorrow's fleet**
- **New Challenges will be met with proper training, OJT, industry and academia partnerships**

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