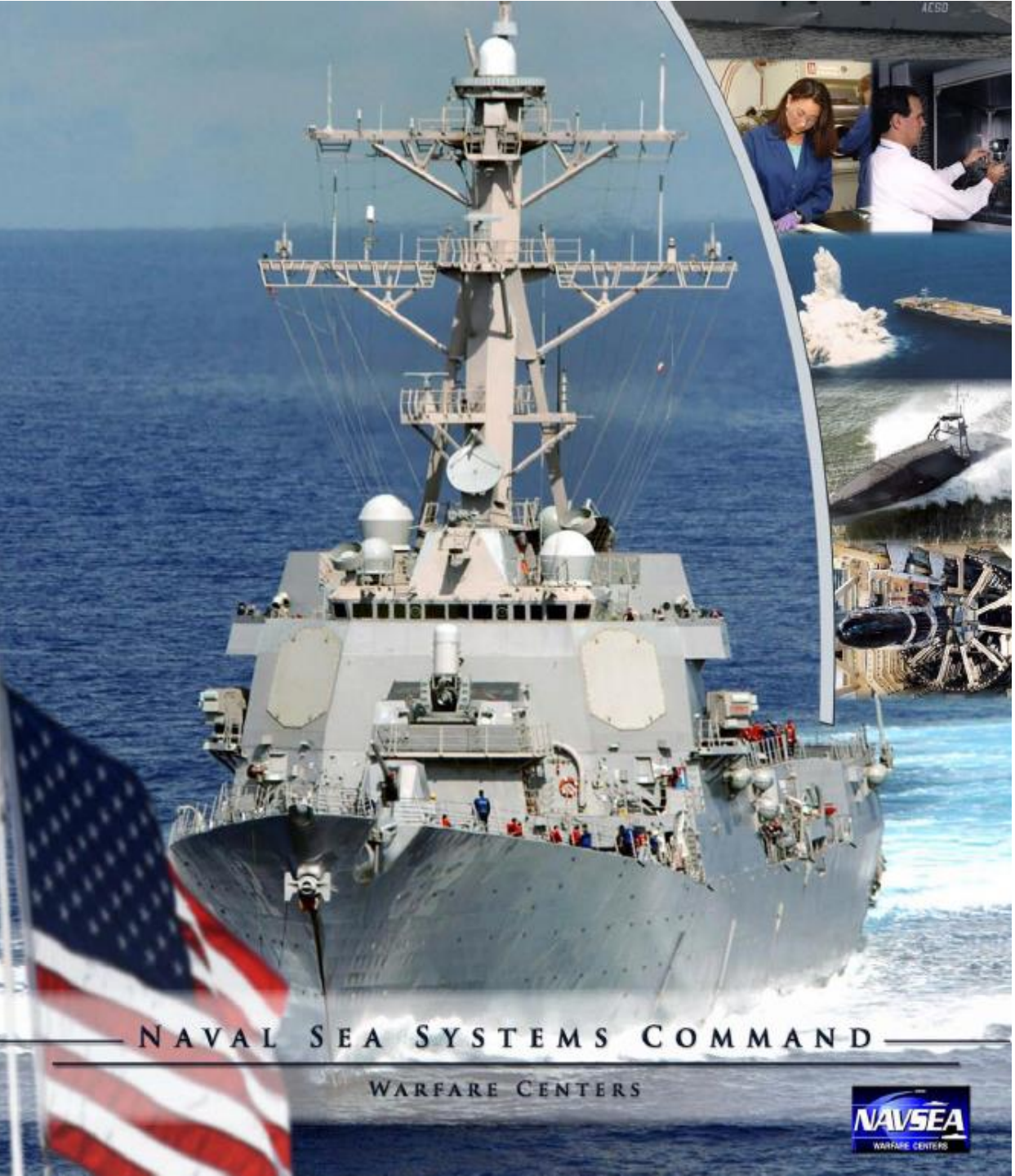


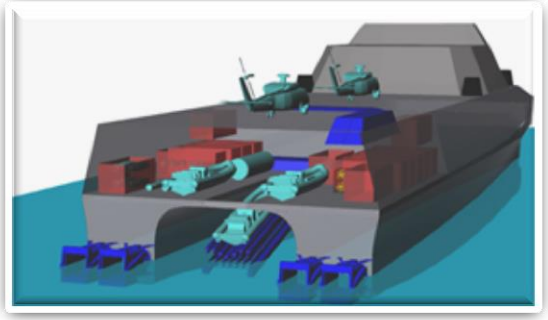
Human and Intellectual Capital Brief to Marine Board

Dr. Tim Arcano
Technical Director
NSWC Carderock Division

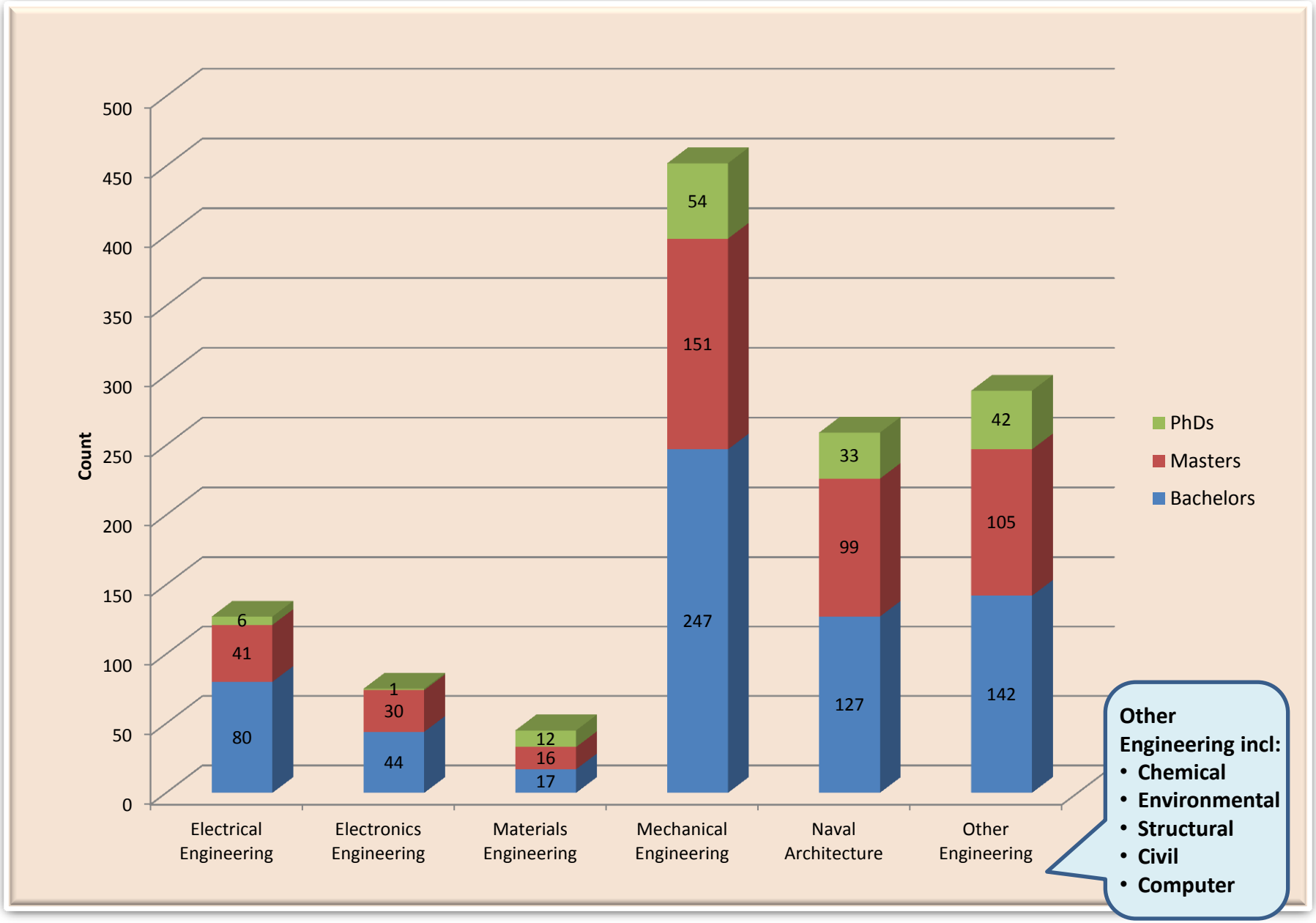
12 November 2015

Context

- Carderock & NAVSEA Warfare Centers
- Warfare Center Mission
  - Full-spectrum support across entire life-cycle
  - From S&T to In-Service
  - Technical Program Management
  - Pipeline to NAVSEA Hiring
- Includes all Ship Types: Surface, Combatant Craft, Submarines, Unmanned
- Naval Engineers
  - Not only about Naval Architects, but all Engineers working in Naval Enterprise
  - Technical knowledge must match complex, multidiscipline nature of Navy needs



Carderock's Naval Engineering Workforce



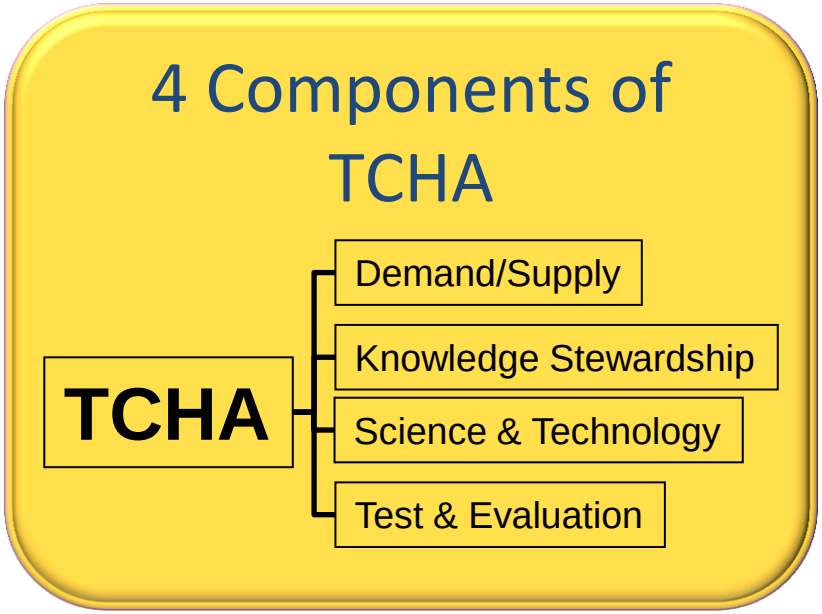
Framing Questions

1. Given your experience over the last five years, what are the critical gaps in knowledge, skills, and abilities (KSAs) that you see in your organization?

- Maintaining an enduring Culture of Innovation
- Conducting more Concept Designs
- Filling niche fields like Propulsor Design or Hydro- Acoustics
- Keeping up with emerging field of Cyber-security
- Developing systems-thinking decision makers

Warfare Center
Technical Capability Health Assessment (TCHA)

- Demand Signal
  - Solicit workload from customers
  - Looks out 3 years
- Knowledge Stewardship
  - Technical & Business Capabilities
  - Assess pipeline: Entry, Journey, SME
  - Identify health in people, pipeline, or SMEs (Rate: Red, Yellow, Green)
- Science and Technology (S&T)
  - Identify Knowledge Areas working S&T
  - Assess workload and health
- WFC Test and Evaluation (T&E)
  - Stewardship and health of the T&E workforce/facilities
  - Determine workforce who are part of the T&E Competency
  - Determine how to support T&E customers across the WC Enterprise



Carderock Division TCHA (FY15-FY17)

TC	TC Name	
CD01	Ship and Submarine Design and Integration	Y
CD02	Ship and Submarine Acquisition Engineering	Y
CD03	Ship and Submarine Systems Concepts, Technologies, and Processes	Y
CD04	Surface and Undersea Vehicle Machinery Systems Integration	Y
CD05	Combatant Craft and Expeditionary Vehicles	R
CD06	Unmanned Vehicles Naval Architecture and Marine Engineering	R
CD07	Hull Forms and Fluid Dynamics	Y
CD08	Propulsors	Y
CD09	Surface and Undersea Vehicle Mechanical Power and Propulsion Systems	Y
CD10	Surface and Undersea Vehicle Electrical Power and Propulsion Systems	Y
CD11	Surface and Undersea Vehicle Auxiliary Machinery Systems	Y
CD12	Surface and Undersea Vehicle Hull, Deck, and Habitability Machinery Systems	Y
CD13	Surface and Undersea Vehicle Machinery Automation, Controls, Sensors and Network Systems	Y
CD14	Surface, Undersea, and Weapon Vehicle Materials	Y
CD15	Surface and Undersea Vehicle Structures	Y
CD16	Alternative Energy and Power Sources R&D	R
CD17	Liquid Waste Management, Science and Systems	Y
CD18	Solid Waste and Hazardous Material Management, Radiation and Ships / Subs Systems Safety	Y
CD19	Advanced Logistics Concepts and HM&E Life Cycle Logistics Support	Y
CD20	Surface, Undersea and Expeditionary Vehicle Vulnerability Reduction and Protection	G
CD21	Ship Recoverability and Damage Control	G
CD22	Surface and Undersea Vehicle Underwater Signatures, Silencing Systems, and Susceptibility	Y
CD23	Surface and Undersea Vehicle Non-Acoustic Topside Signatures, Silencing Systems, and Susceptibility	G
CD24	HM&E for Undersea Vehicle Sail Systems and Deployed Systems	Y
CD25	Radiation Detection Technology Research and Management	Y

Framing Questions

2. What do you see as the key challenges your organization faces in the coming 5-10 years in terms of the acquisition and/or retention of talent with required KSAs?

- **What challenges do you see in training, education, career development, licensing, and certification of existing and future staff?**

- Continuing resources to support Internships, NEEC, SMART
- Developing specific Navy-related curricula at Colleges
- Maintaining sponsorship to develop Entry-level Workforce
- Changing DoD Hiring Policies (freezes, cuts, etc.)
- Providing Competitive Salaries

Retaining the Future Workforce

- Don’t overload, ensure adequate numbers of people
- Work-life balance
- Motivate
  - Mission/Purpose
  - Highlight specific technical areas that motivate:
    - Cyber warfare, robotics, state of the art
  - World class facilities
  - Leadership opportunities early
  - Variety and Diversity of technical challenges related to their career field
  - Ability to be involved, to make a difference, to be heard and be valued
  - Empower people to Innovate, especially through vibrant S&T programs
  - “Older folks” like to mentor; “Younger folks” like to be mentored; a natural process of “knowledge transfer”
- Awards; bonuses; supervisory pay differential; flex schedule and telework; rotations

“Really smart people working on very hard problems.”

- Young Engineer, Calvin Krishen, response when asked why he likes working here

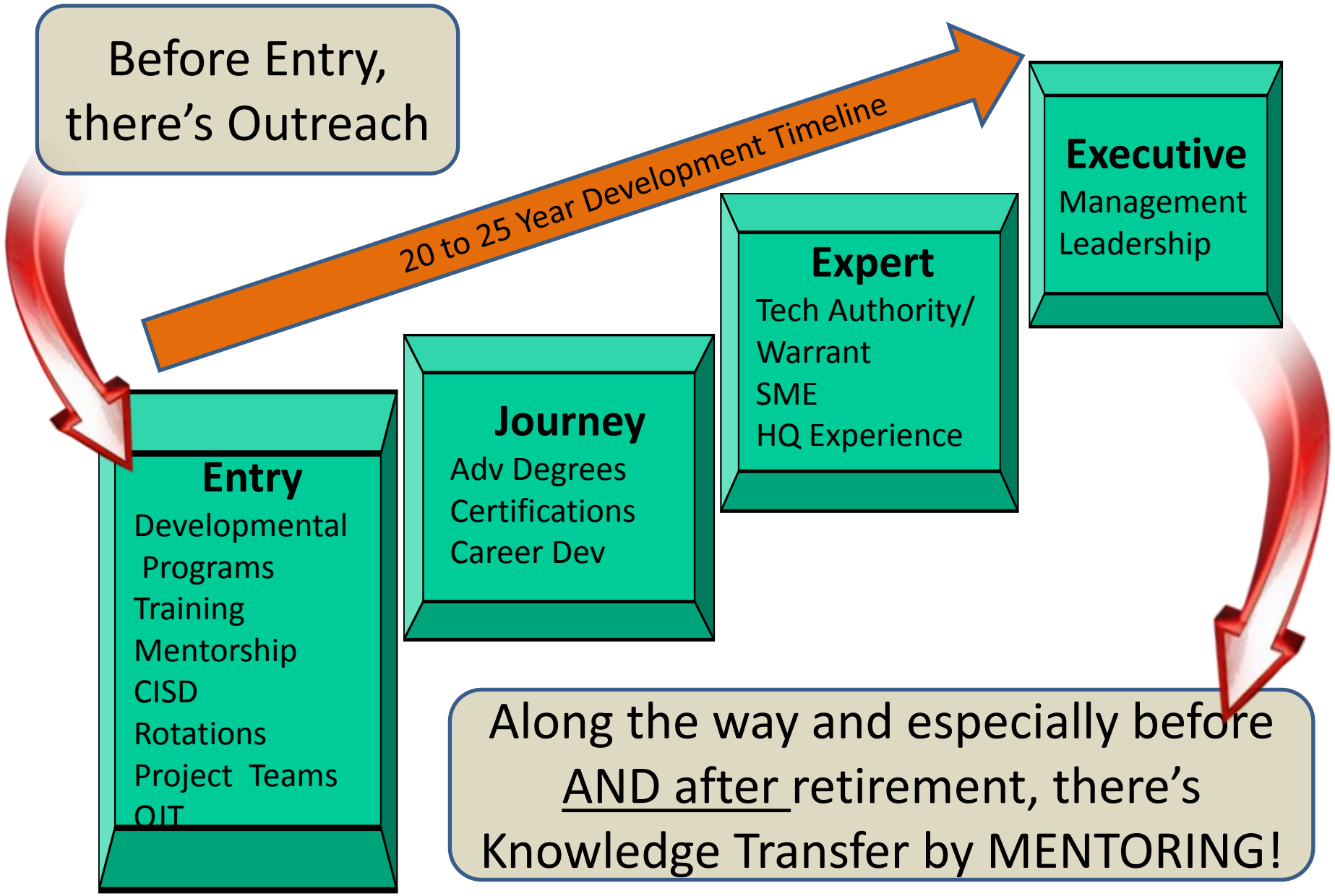
Framing Questions

3. Solutions you have implemented to address these KSA gaps (e.g., specific best practices) and what strategies have you found that have worked best for your organization?

- **What solutions/strategies have not worked?**
- **What are the various education/training programs currently available? Discuss their effectiveness and identify where there are gaps or needs for better or more effective training, education, licensing, or certification.**
- **Address opportunities as to how such needs can be achieved**

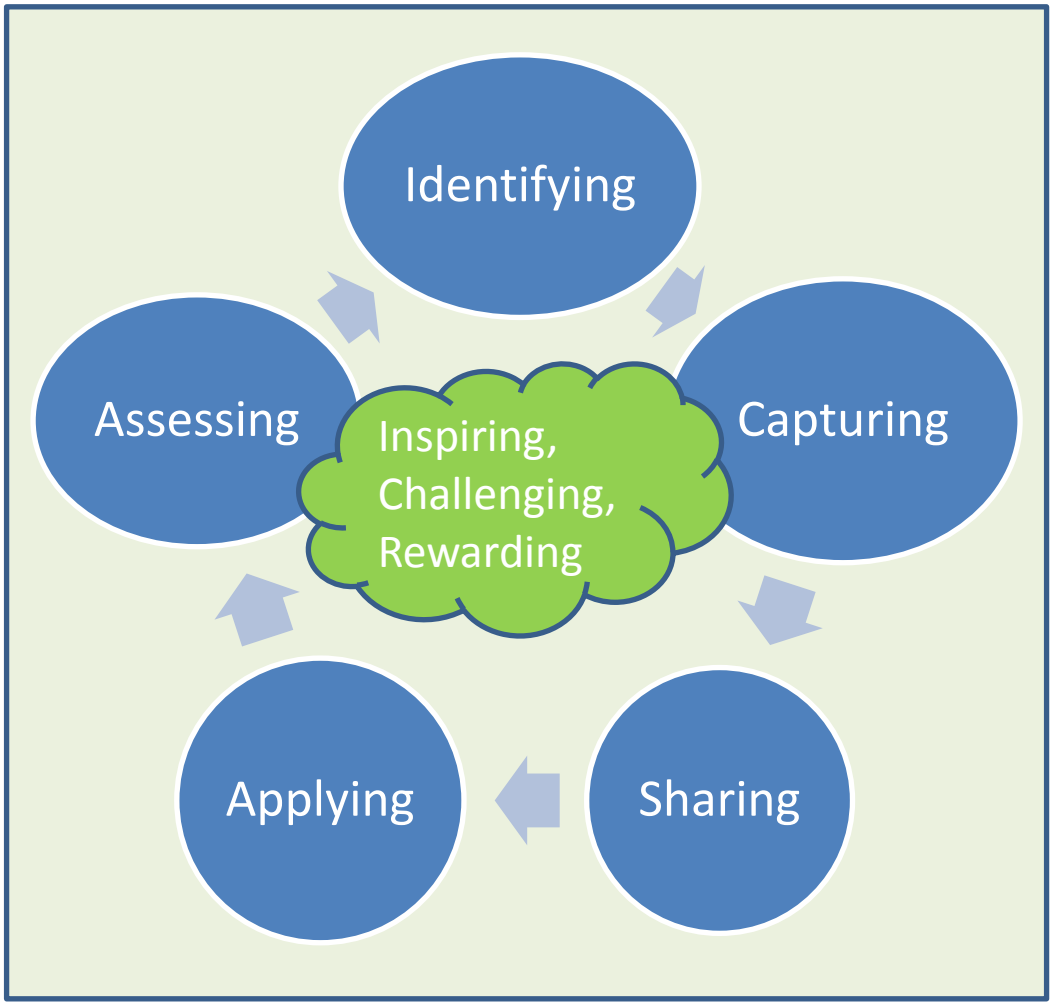
- Maintaining Pipeline – STEM, SEAP, NREIP, NEEC, Hiring Authorities
- Entry-Level Training/Experience
  - Science and Engineering Development Program (SEDP)
  - Naval Acquisition Development Program (NADP)
  - New Hire Bridge
- Knowledge Transfer
  - Meaningful rotations, developmental assignments, mentoring
- Continuing Education at Local or online Colleges and Universities
- Long term/Distance Training - Extended Term Training (ETT) Program
- SMART Scholars Program
- Leadership development in Journey-level – LEAD

Full Spectrum Life-Cycle of a Naval Engineer



Knowledge Transfer

5 Key Steps for Executing effective Knowledge Transfer



Culture Encourages Buy-in

- ✓ Our Organization Values KT
- ✓ The Culture Nurtures KT
- ✓ Our Policies Enact KT
- ✓ Technologies Enable KT

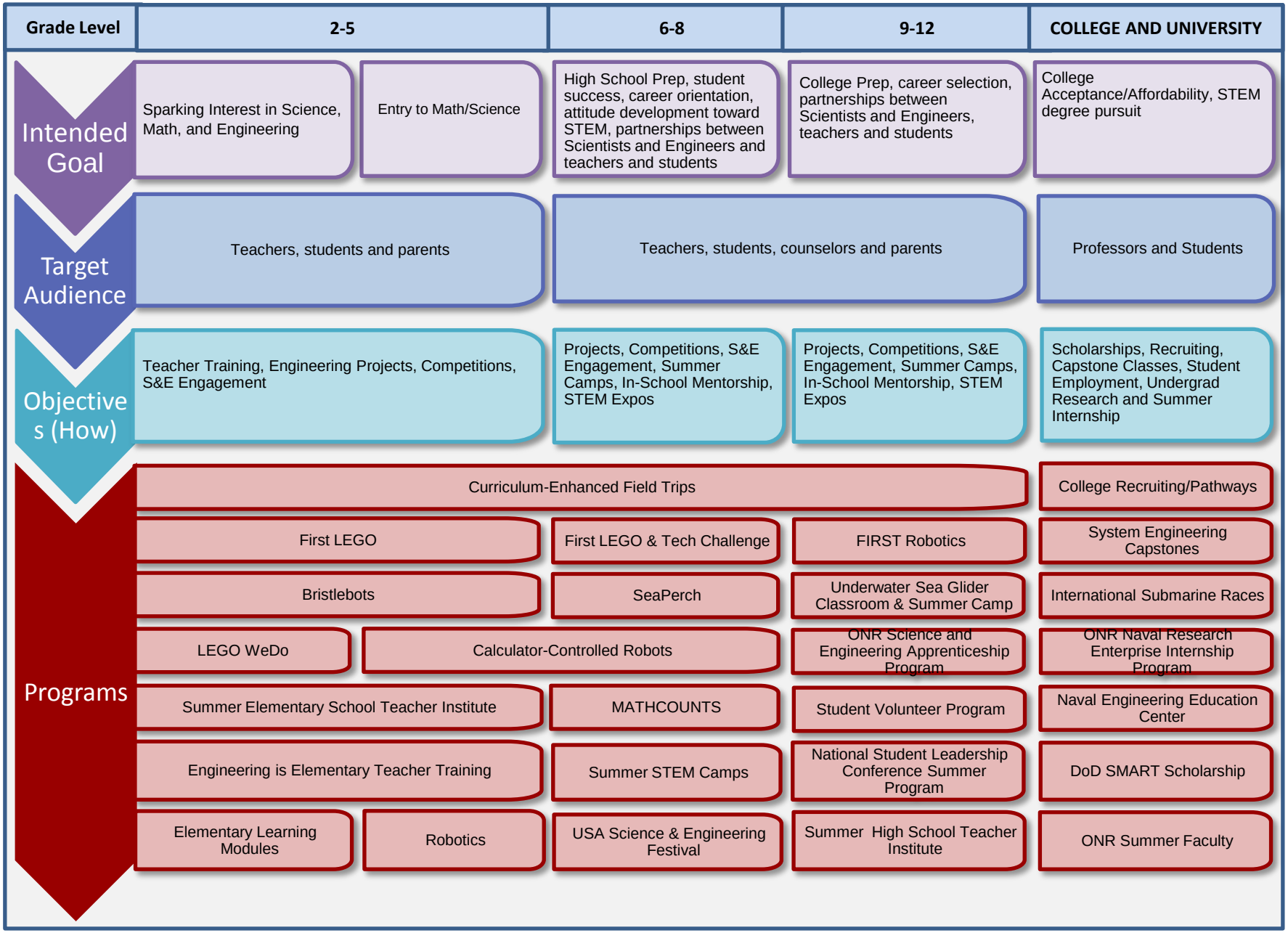
Leadership Sets the Tone

- ✓ Leaders are Responsible
- ✓ Champions lead efforts
- ✓ Promote Mentor/Mentee

People Make the Difference

- ✓ Ultimate recipients
- ✓ Useable & User Friendly
- ✓ Managers are the key enablers

NSWC Carderock Outreach Goals and Programs



Framing Questions

4. Have you found any specific techniques that work in attracting civilian talent given that the private sector can often pay more?

- **Also, what strategies/techniques have you implemented to retain experienced talent and keep staff from leaving for higher paying private sector jobs?**

- Good hands-on work
- Making a difference
- Developmental Programs – SEDP , NADP
- Developmental Assignments – Details, Rotations
- Educational opportunities & development for advanced degrees – learning culture
- Mobility – multiple career paths (SME, PM, Supervisor)
- Leadership programs – LEAD, NAVSEA
- Recognition – Awards, DEMO, Monetary, Time-off

Recruiting & Hiring

Enablers:

- Challenging and exciting mission and work - Show the excitement of what we do relevant to interests of technical, science and engineering millennials
- First class equipment and facilities
- Recruiting Events
- Variety of Hiring Authorities
- Recruitment bonuses
- Pay and benefits
- Entry-level Training
- Patriotic culture

View as continuum: STEM; SEAP; NREIP; NEEC and direct hiring authority – linkage to rewarding career paths

Developing the Future Workforce

- Cultures of Innovation and Learning
- Multiple training and education opportunities (e.g., certificates, advanced degrees)
- Leadership Development Programs
- Cross training, across skills, functional areas and organizations
- Rotations, especially early on
- Vibrant interaction with Colleges and Universities/ NAVSEA Federal and Design Agents/Shipbuilders and design agents
- Participation in professional societies

Our people learn naval engineering by doing naval engineering not by managing others doing the work

Framing Questions

5. What is the role for universities/other educational institutions or for professional societies/classification societies/licensing bodies in resolving the talent KSA gaps?

- Student engagement – initiating a sense of professionalism and passion for the trade
- Navy-related curricula & project-based education
- Engineers with solid math and science foundations
- Critical-thinking graduates
- Young Professional Society Programs
  - ✓ Especially networking with colleagues and senior people

NEEC

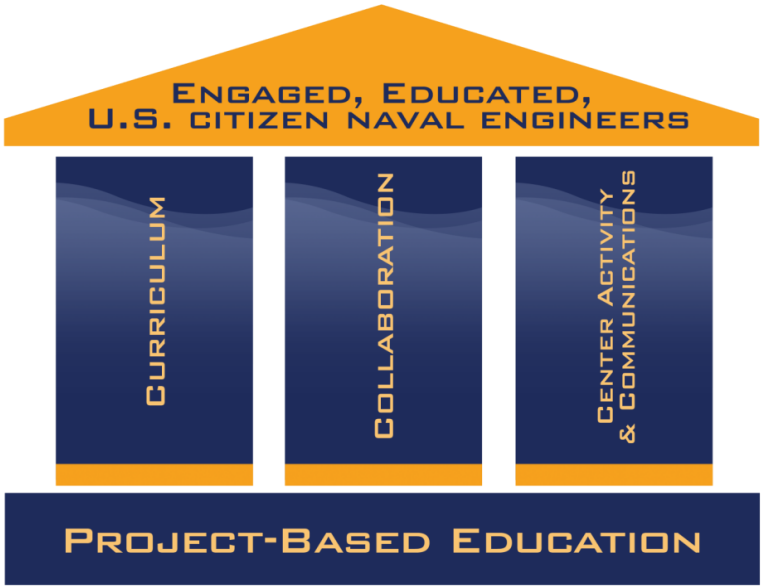
NAVAL ENGINEERING EDUCATION CONSORTIUM

Goal:

"Employ project-based research at colleges and universities that targets the Navy's technology needs and facilitate development of a world class Naval Engineering workforce via student's participation"

Project-Based Education:

- Engage students in ***multi-disciplinary projects***
- Investigate ***real Navy problems***
- Generate interest in ***Navy-related career opportunities***
- Focused on ***undergraduate students***



Framing Questions

6. Priorities in human and intellectual capital for your various areas of interest

- **How can the Marine Board serve as a liaison with U.S. institutions delivering relevant curricula and performing related research to help promote and implement these priorities?**

- Promote Diversity programs
- Promote increased sponsorship of student involved projects – “Learn-by-Doing”
- Encourage expansion of in-house government work in maritime research and design
- Promote federal government as “Lead Systems Integrator”

Framing Questions

7. Role for the Marine Board/NAS in addressing these KSA gaps and challenges through research, commissioned studies, forums, or workshops?

- Evaluate, Identify Best Practices and Encourage Mentoring as a Knowledge Management Critical Skill
  - Ample number of experienced people mentoring the inexperienced
  - Tools to facilitate learning in "safe-to-fail" environment
  - Inspiration as a necessity with Challenges and Intrinsic Rewards
- Monitor Trends in numbers of Naval Engineering graduates and where they are going
- Promote the Health of Naval Engineering – NNR-NE
- Encourage S&T investment in Ship Design – CONFORM, Tools, Processes

Summary

Key Challenges in the next 5-10 years:

- Availability of needed skillsets and experience requires link between curricula, internships, jobs and, ultimately, careers
- Inability to hire to meet our needs, especially for the long-term (Entry-level, as well as journey-level)
- Retaining talent within the Naval Enterprise thru Career Paths, Leadership, recognition/Awards, etc.
- Challenges in training, education, career development, licensing, certification of current and future staff to stay "up-to-date."

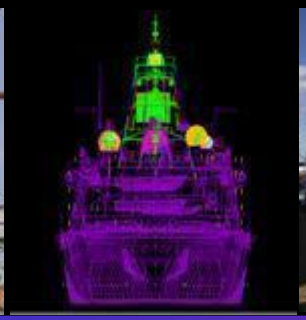
Requires:

- Early participation in intern programs and professional society student chapters
- Consistent year-to-year federal hiring will benefit both universities and students
- Robust rotational / developmental programs, provides challenging and meaningful work experiences
- Advanced education opportunities that deepen understanding and further cement passion for a career
- Mentoring and being mentored, the key to knowledge transfer

Questions


Science and Technology


Research and Development


Design and Requirements


Acquisition and Construction


Fleet Training and Simulation


Modernization and Lifecycle Support

Back-up

Mission and Vision

NAVSEA WARFARE CENTERS Carderock

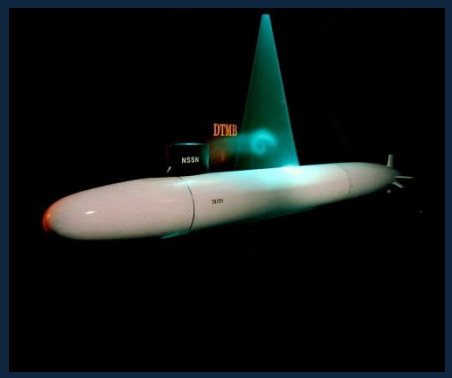
Mission:

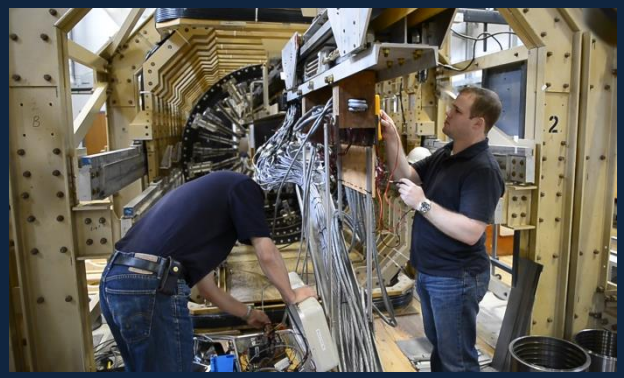
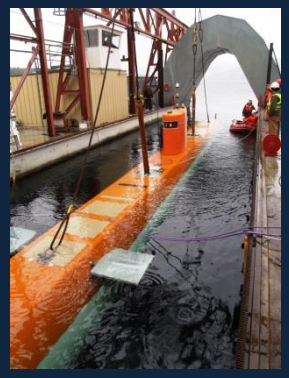
Provide full-spectrum research and development, test and evaluation, analyses, acquisition and fleet support for the Navy's ships, ship systems, and associated Navy logistics systems

- **Provide core technical capabilities required for the integration of surface and undersea vehicles and associated systems**
- **Develop and apply science and technology associated with naval architecture and marine engineering**
- **Support the maritime industry**

Vision:

Our vision is 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.



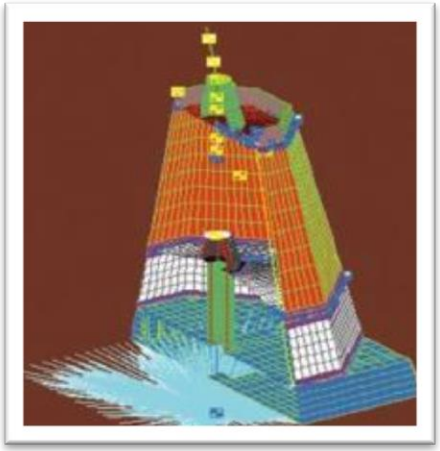




Science & Technology | Research & Development (including Prototyping) | In-Service/Support to Fleet

Structures, Survivability, Materials and Environmental Systems

- **Survivability and recoverability combat-ready platforms able to sustain damage and while fighting damaged**
- **Structural (including composites) design, analysis and physical scale modeling mission needs**
- **Metallic and non-metallic alloy selection, processing and repair techniques, corrosion mitigation, sensitized aluminum & biofouling**
- **Regulatory compliance and pollution prevention, solid and liquid waste management and treatment, hazardous waste management and disposal, and system safety**

Hull Pressure Testing



Finite Element Analysis

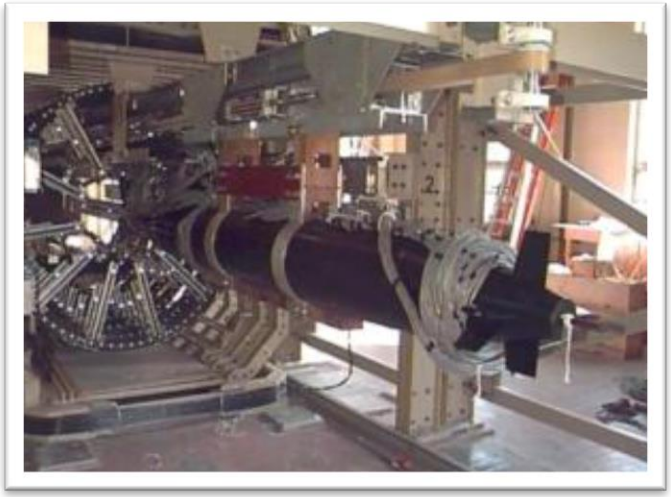
Explosives Test Pond

NAVSEA WARFARE CENTERS Carderock

Signatures

- **Provide an advantage for the Navy's ships, submarines, craft, and vehicles in acoustics, electro-magnetics, radar, infra-red, and emerging threat signatures**
  - **S&T, Design & Analysis, T&E, & coatings development**
- **Conduct modeling & simulation and scale model & full scale testing using unique world class facilities, ARD - Bayview**
- **Fleet support – STAFAC & SEAFAC Ranges, EM & other signature test ranges, fleet trainers**

Multi Band Radar



Magnetic Fields Lab

Buoyant Vehicle Acoustic Test

NAVSEA WARFARE CENTERS Carderock

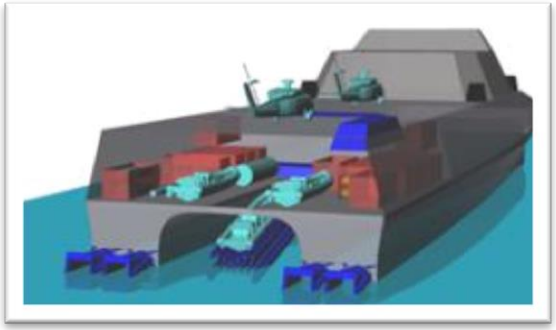
Naval Architecture and Engineering

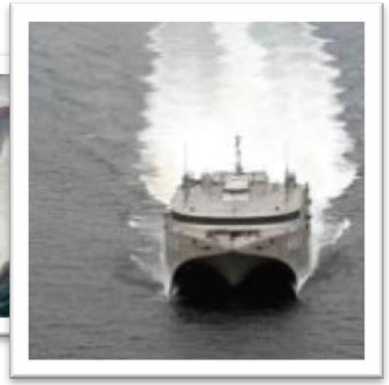
Naval Architecture of Ships, Submarines, Boats & Craft, and other Naval Systems

- **Early concept/design development includes**
  - **military/operational effectiveness analysis,**
  - **cost analysis,**
  - **detailed hydrodynamic & propulsor design,**
  - **maneuvering and ship control & model testing**
  - **internal arrangements & ship systems integration**

- **R&D – Model basin, MASK, Triadelphia Range & NOB Norfolk**

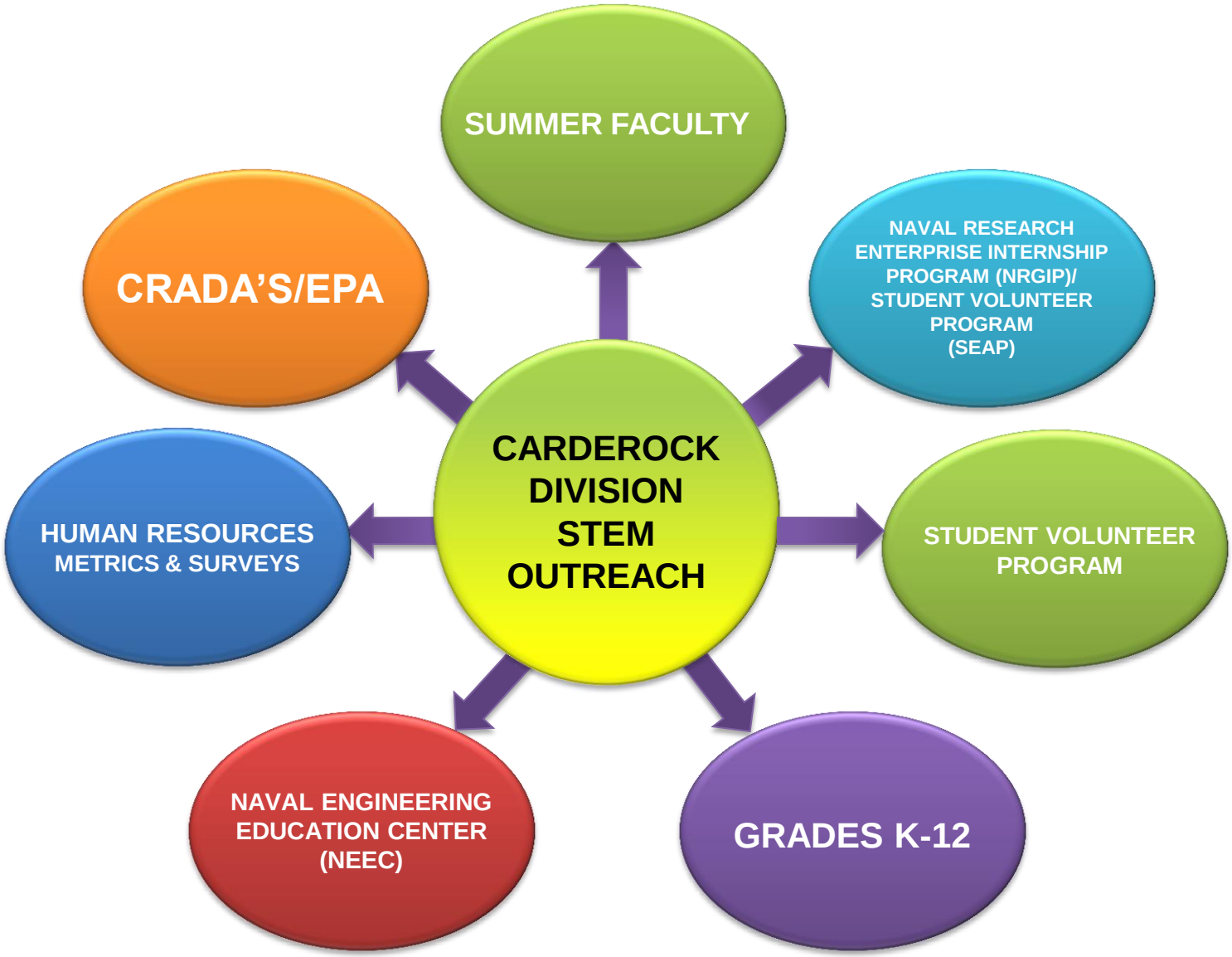
- **Fleet Support thru full-scale trials and operational support, heavy weather guidance**





Concept development and early design → **Small scale test and evaluation** → **Full scale tests, evaluation & trials**

Carderock Division Educational OUTREACH



NAVSEA Outreach Continuum

Strategic Business Alignment/Cascading Goals/NAVSEA Workforce Demand

Areas of Activity	Element 1 – PLANT K-12 Outreach	Element 2 – NURTURE Student Employment/Sponsorship	Element #3 – PRODUCE Partnerships for Capability Enhancement (EPAs, CRADAs, etc)
National	National Defense Education Program (NDEP) Science, Technology Education Program (STEP) …	SMART, STEP,SCEP,COOP, …	NEEC, UARCs …
Multi-Site	Patriots Program …	COOP Agreements with Polytechnic University of Puerto Rico University of MD …	Research Agreements with University of Puerto Rico, New Mexico State NCA&T VA Tech …
Local	State Programs (e.g. Going Places) Science Fairs Summer Camps	Local Colleges And Universities	College of Southern MD …

Warfare Center Special Hiring Authorities

- Special Hiring Authorities for Warfare Centers
  - **Direct Hire for S&E with Advanced Degrees**
    - MS and PhD candidates. Fill at any grade/band level.Direct Hire for S&E with Bachelors Degrees
  - **Direct Hire for S&E with Bachelor Degrees**
    - BS candidates. Fill at any grade/band level.
  - **Direct Hire for Veterans** – S&E and Technician positions
  - **Direct Hire for Information Technology Specialist (INFOSEC)** - Government Wide Direct Hire Authority for GS-9 and above.
  - **Expedited Hiring Authority for Acquisition positions (EHA)** – DAWIA designated positions.
  - **Distinguished Scholastic Achievement Appointment (DSAA):** This authority is tied to scholastic achievement. A cumulative GPA of 3.5 or better is required for appointment under this authority.
  - **DEMO Delegated Examining**: Competitive Examining for engineers and scientists.

SPECIAL HIRING PROGRAM – Carderock Employees

- **NAVSEA Scholars Program**: NAVSEA in partnership with ONR Program Office for Historically Black Colleges and Universities (HBCU) and Minority Institutions (MI) developed the NAVSEA scholarship to reach out to the next generation of scientists and engineers.
- **Tuskegee MS degree students**: The Masters of Science in Systems Engineering (MSSE) is a workforce acquisition and development program designed to increase the number of entry level employees
- **WRP: Workforce Recruitment Program for College Students with Disabilities**. NAVSEA conducts a nationwide recruitment effort at colleges and universities for students with disabilities.
- **Wounded Warrior**: Hiring initiative for any 30% disabled veteran. Can use any hiring authority that is available.
- **Pathways Program:** Three programs: Internship (replaces STEP/SCEP); Recent Graduate (replaces FCIP) and Presidential Management Fellows.

Specific Techniques to Attract Civilian Talent Given Private Sector can often pay more – **Leadership Opportunities**

- **Commander's Executive Fellows Program (CEFP**)
  - Develops capable leaders for NAVSEA now and in the future. The program seeks the top performers from the enterprise and provides them with a one of a kind opportunity to familiarize themselves with what it takes to lead at NAVSEA.
- **Leadership, Education and Development (LEAD)**
  - Carderock one year program for developmental activities and rotational assignments
- **Defense Senior Leader Development Program (DSLDP)**
  - A Department of Defense (DoD) program to develop senior civilian leaders to excel in the 21st Century joint, interagency, and multi-national environment.
- **Journey Level Leadership (JLL)**
  - NAVSEA one year program for developmental activities and rotational assignments
- **Next Generation (NEXGEN)**
  - Entry level two year program