



Naval Undersea Warfare Center
Division Newport

Platform & Payload Integration Department Code 40

Department Overview April 2016



Agenda



- **Mission & Vision**
- **Code 40: Today's Navy, Next Navy, & Navy After Next**
- **Our Product Line**
- **Roles & Responsibilities**
- **End-to-End Payload Integration**
- **Code 40 in the Virtual Submarine**
- **Code 40 Science & Technology**
- **The Virginia Payload Tube Facility**
- **Code 40 Organizational Structure**
- **Our People**
- **Funding Profile**
- **Code 40's Strategic Thrusts**
- **Contracts Overview**



Code 40



Platform & Payload Integration Department

Our Mission:

*Provide Full Spectrum Life Cycle Technical Leadership and **Knowledge Base** for Submarine Missile/Payload Integration, and USW Launcher Systems*

Our Vision:

*Remain **relevant** by sustaining our Technical Capabilities and upholding our reputation as the Navy's subject matter experts in the definition, development, and life cycle support of undersea warfare launcher systems, submarine tactical missiles, and submarine payload integration to ensure current and future US Navy technical superiority*

Our Cornerstones:

- **Teamwork**
- **Communication**
- **Integrity**



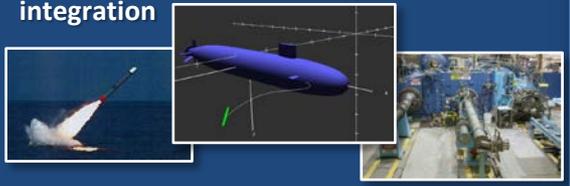
Our skilled workforce and unique facilities keep us relevant!

NPT Core Mission Area: Platform & Payload Integration

Today's Navy

Effective Ready Forces

- Developing, Integrating, Providing Life Cycle Support for Launcher & Payload Systems
- Maintaining World Class Test Facilities and Analysis Tools
- Providing Middleware Expertise
- Cooperative Foreign Military Sales Support
- Maintaining technical authority, responsibility and accountability in USW launchers, payload and tactical missile integration

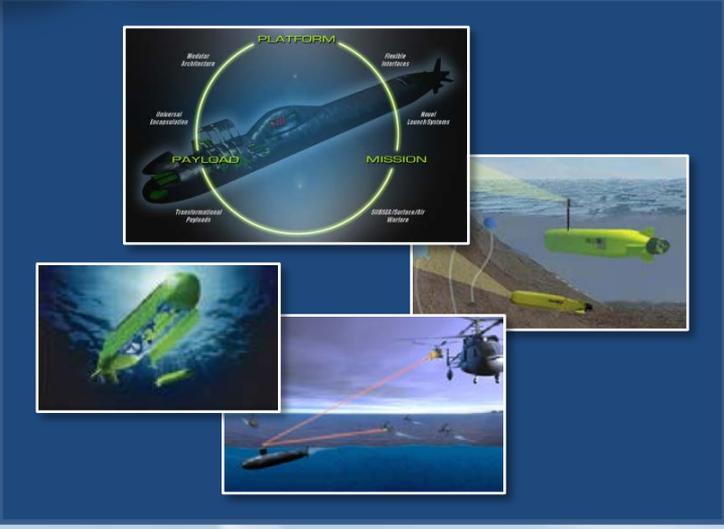


Potential Game Changers/ Disruptive Technologies

- Directed Energy
- Wireless Communications and Power Interfaces
- Underwater Cloaking
- External Weapon Clips
- Weapon Cache Autonomy
- Distributed C2
- Long Range Undersea Comms
- Immersive Imagery
- Advanced Material Coatings for Shock and Biofouling Mitigation



Ref: A Cooperative Strategy for 21 Century SeaPower



Next Navy (+5-10 yrs)

Current Focus

Expanding current launcher and payload system capabilities with a focus on providing critical Anti-Access capabilities while leading the transformation of advanced undersea payload integration and deployment

Evolutionary Enhancements

- Expand vital land-based facilities and technical capabilities
- Evolutionary Weapon Integration
- Decoy and Deception Payloads
- Unmanned Vehicle Launch and Recovery
- Expand Cooperative Foreign and Domestic Collaborations

Navy After Next (+20 yrs)

Vision of the Future

Modular, cascaded undersea launcher and payload systems enabling greatly expanded undersea domain effects which are scalable and deliverable from manned and unmanned platforms and environments

Revolutionary Capabilities

- Novel Launch and Recovery Systems with Wireless Interfaces
- Sustain Integration & Interoperability with Distributed and Autonomous Systems
- Scalable Universal Encapsulation
- Cascaded Payload Development
- Transformational Weapons Integration to Expand Mission Portfolio and Use Available Volume Most Efficiently



The Code 40 Product Line

- **Submarine Launcher Systems**
 - Torpedo Tubes
 - Launchway/Shutter Doors
 - Ejection Systems (Ram Pump, Turbine Pumps)
 - Vertical Launch System (VLS)
 - Weapon Handling / Stowage Systems – Torpedo Room
 - Control Panels
 - Internal/External Countermeasure Launchers
 - Trash Disposal Unit
 - Torpedo Mounted Dispenser (TMD)
 - VA Payload Tube (VPT), VA Payload Module (VPM)
- **Submarine Launched Tomahawk Missile**
 - All-Up-Round & Capsule
 - Test Missiles (TOTEM) / Support Equipment
 - TOMIS – Tomahawk Management Information System
- **Encapsulated Harpoon Weapon System (FMS)**
 - All-Up-Round & Capsule
 - Test Missiles / Support Equipment
 - Encapsulated Harpoon Command & Launch Subsystem
- **Electronic Missile Simulators – MK 101 and MK 112**
- **Surface Ship Tubes (SVTT MK 32, TWS/CAT)**
- **Hatches, Trunks and Closures**
- **Hydrodynamic, Shock, and System Safety Analysis**
- **TEMPALT Development**

In-Service Engineering Agent (ISEA)
Technical Direction Agent (TDA)

Design Agent (DA)
System Integration Agent (SIA)

Acquisition Engineering Agent (AEA)

Missiles/Precision Strike Division

(Code 401)

- ISEA for Submarine Launched Tomahawk All-Up-Round (AUR)
- ISEA/DA/AEA for Tomahawk Capsules and Peculiar Support Equipment
- ISEA for Submarine Launched Tomahawk All-Up-Round (AUR)
- TDA/ISEA/SIA/AEA/DA for Encapsulated Harpoon Weapon System
- TDA/ISEA/AEA/DA for Tomahawk Missile AUR Electronic Simulators

**WFC Technical Capability-NP10:
Submarine Tactical Missile Integration**

Launcher Systems & Payload Integration

(Code 402)

- TDA & ISEA for Tactical Weapon Launch & Handling Systems Including:
 - Horizontal Torpedo Tubes
 - Torpedo Tube Control Panels
 - Internal Countermeasure Launcher
 - Vertical Launch System
 - Surface Vessel Torpedo Tubes
 - Trash Disposal Unit
 - VIRGINIA Payload Tube
 - VIRGINIA Payload Module including AEA
- TDA & DA for Payload (non-missile) launch and recovery performance for VPM
- TDA for Submarine Structural Closures & Trunks
- TDA for External Countermeasure Launcher
- TDA, ISEA, SIA & AEA for FMS Submarine Launcher Systems

**WFC Technical Capability-NP09: USW
Launcher Systems and Payload Integration**

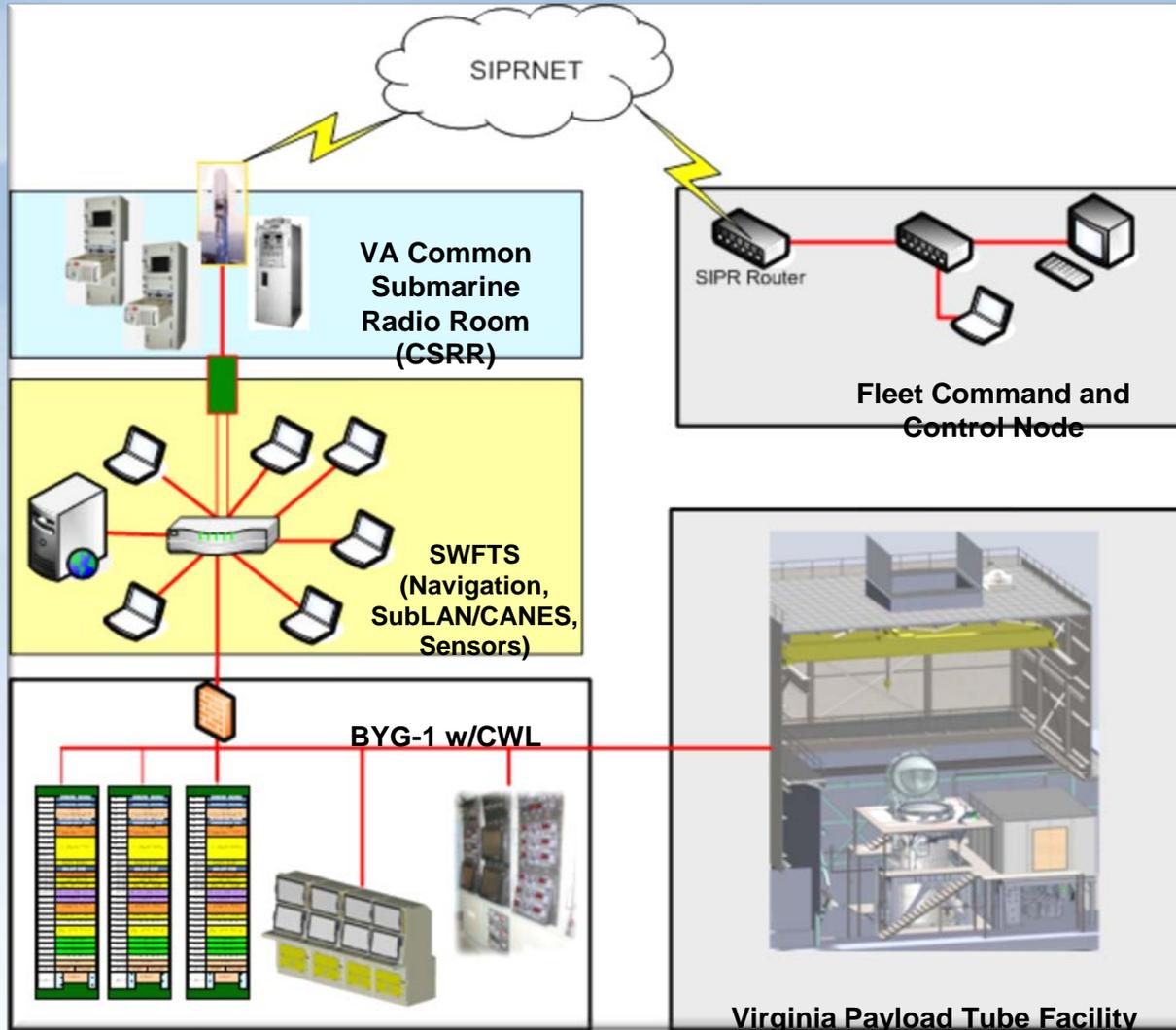
End-to-End Payload Integration

- Payload System Design Development
- Payload Handling Studies & Stowage Design
- Shock Analyses
- Platform/Launcher System Interface Studies
- Hydrodynamic Analysis
- Ship's Operating Procedure Development
- System Safety Program Establishment
- TEMPALT/ORDALT/SHIPALT/OPALT Development
- Hardware Installation / Removal support
- TECHEVAL & OPEVAL
- CONOPS & Tactics Development
- Integrated Logistics Support
- Maintenance Planning
- Fleet/Operator Training
- Acquisition Support
- Cradle to Grave Life Cycle Support
- Electronic and Digital Interface Definition/Specification, Design and Control
- Hotel Services including Power Requirements and Distribution, Cooling, Environmental
- Platform/Shipboard Data Requirements (including Navigation, Time, Sensor Data)
- Manning (Attack Center, Torpedo Room, Module)
- Human Factors Integration
- Command and Control
- Land-Based Segment and System Level Testing (prior to TECHEVAL/OPEVAL)
- Safety (includes WSESRB and SSTRP)
- Information Assurance
- Operator and Fleet Documentation

What is Payload Integration?

“The successful integration of new and legacy payloads and their associated launcher, recovery and handling systems onto a platform considering all aspects of shipboard HM&E, electronic and digital requirements, mission need, operations, tactics, logistics, readiness, reliability, maintainability and cost.”

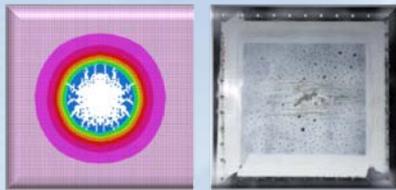
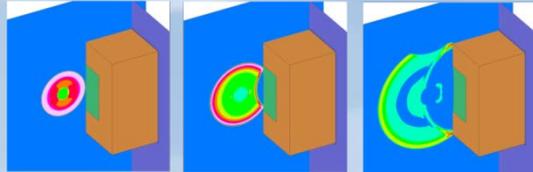
Code 40 in the Virtual Submarine System of Systems for Payload Integration



Leveraging the NUWC Virtual Submarine with Tactical Equipment and Links, the addition of the Virginia Payload Tube Facility provides a complete capability for End-to-End Payload Integration

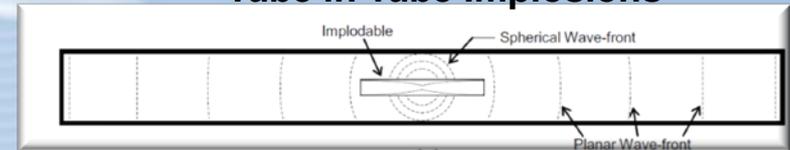
Shock Loading of Composites

Computational Modeling

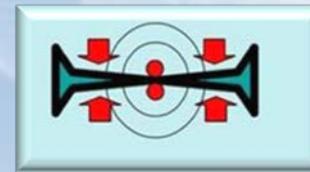


Implosion

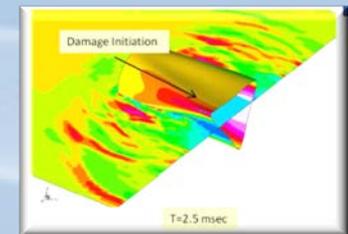
Tube in Tube Implosions



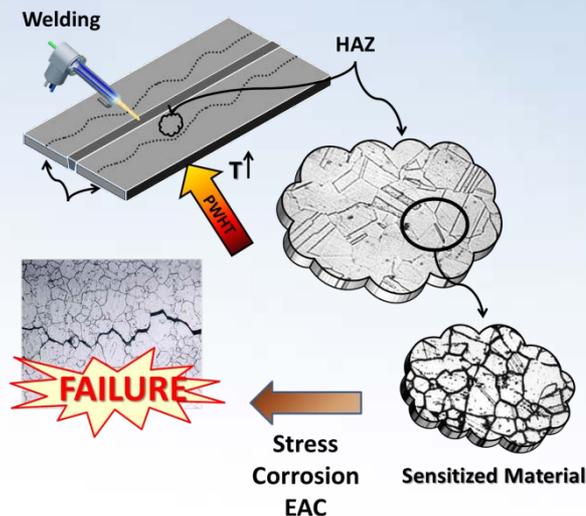
Implosion Mechanics



Composite Implosion



Weld Sensitization Detection



Additional Research

- Implosion mitigation methodologies
- Hydrodynamic interactions of three dimensional geometries emerging from a body
- Polyurea coatings for blast mitigation
- Immersive Imagery

VIRGINIA PAYLOAD TUBE FACILITY (VPTF)

FACILITY FOR FLEET SUPPORT, TEST AND EVALUATION, TROUBLESHOOTING, AND TRAINING ON VIRGINIA PAYLOAD TUBES

Capabilities

Virginia Payload Tube Shipboard Equipment and Arrangement:

- Support systems (hatch, mechanical, hydraulic, flood/drain, and air systems)
- Electrical and fiber optic cabling.
- Payload tube control panel with payload manager space

Capability to flood/drain/pressurize underhatch volume.

Extensive data acquisition, simulation, and fault insertion capabilities.

NUWC Virtual Submarine Network Interface.

Supports Fitment and Operational Testing of Future Payloads.

Supports Future Submarine Designs

- Control panel upgrades.
- Block V Virginia payload module tube.

In-Service Engineering

Replication of Ship Functionality

- 87" clear bore tactical tube
- Hatch-and-mechanicals
- Electrical cabling
- Valves and system piping

Distance Support

- Rapid problem resolution
- Troubleshooting casualties
- Initiating corrective action
- Modernization/upgrade/alteration

Support Operational Activities

- Simulated launch analysis (TTF prep)
- End-to-End compatibility testing
- VPT alignment (missile) confidence test

Procedural Proof of Concept

- Ship Alterations (SHIPALT)
- Temporary Alterations (TEMPALT)
- MRC's/IMA Procedures
- OD Procedural Validation

Payload Integration

Interfaces

- Weapon/payload control
- Configured for VPT, adaptable to VPM
- End-to-End connectivity with NUWC's virtual submarine network
- VIRGINIA Class Payload System Interface
- Control Document (PS-ICD)
- Adaptable for SSGN
- Middleware Design Development

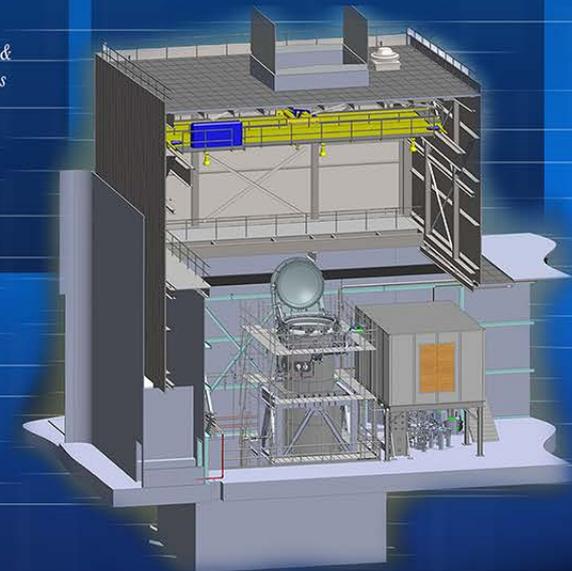
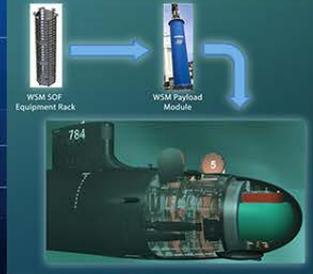
Support Payload Development

- Cost-effectively supports advanced payload integration
- Procedural verification/qualification
- Mission experimentation via virtual submarine network
- Large Unmanned Undersea Vehicles & Novel Launch and Recovery Concepts

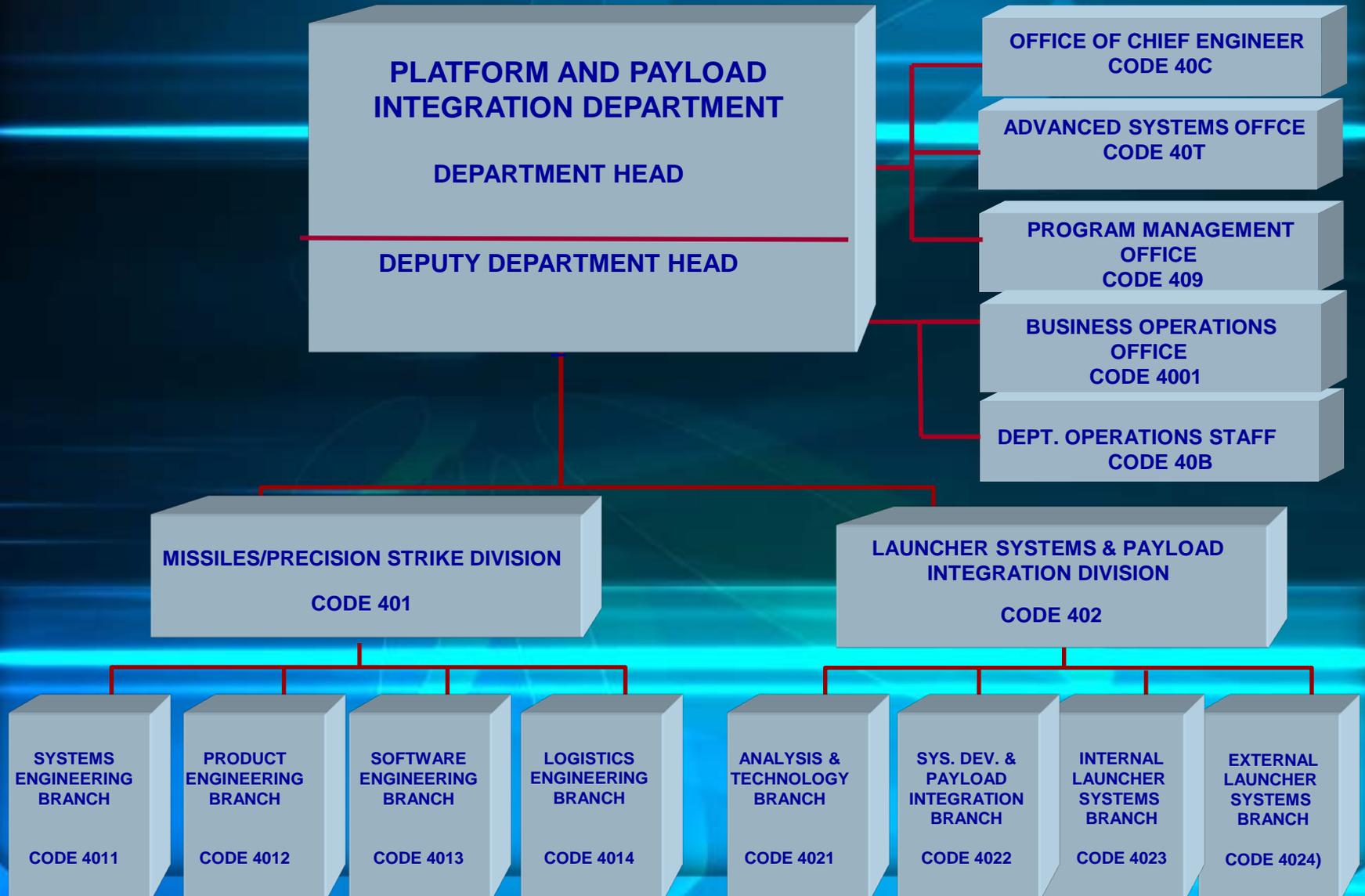
Training

Provide a Tactical Alternative for

- Fleet operational training
- CONOP development
- I and O-Level maintenance training

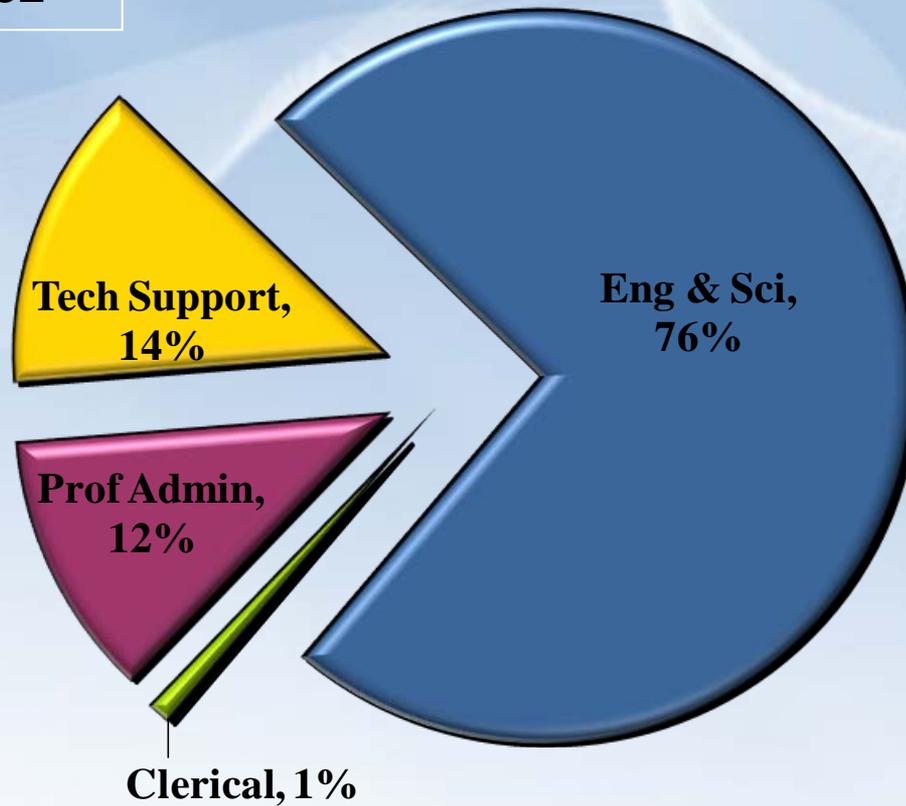


Code 40 Organizational Structure



“Our People”

Civilian Total: 232*

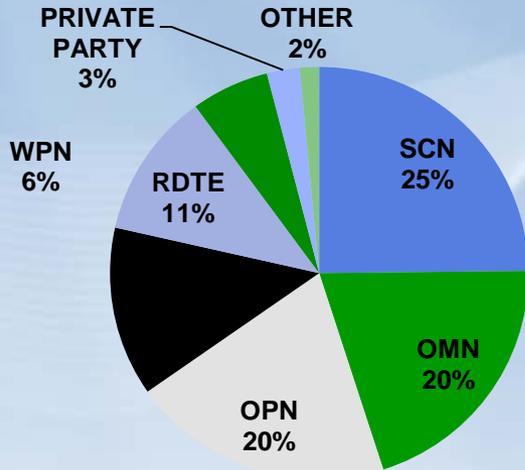


* As of 8 April 2016

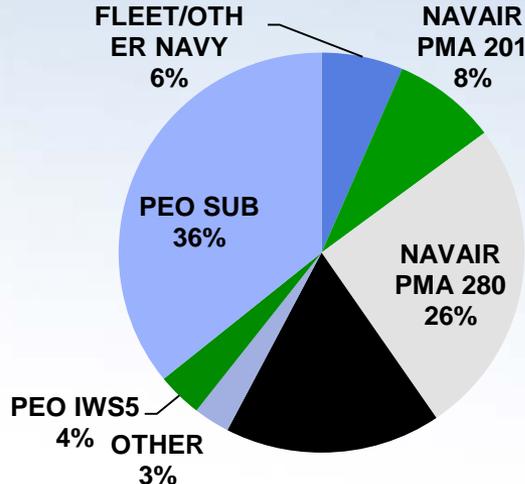
*32% of our Engineers and Scientists have Advanced Degrees
& 3% have PhDs*

Platform & Payload Integration Department FY15 Funding Profile

FUNDING BY APPROPRIATION (FY15)



FUNDING BY SPONSOR (FY15)



FUNDING BY PROGRAM (FY15)



FY15 BUDGET \$103M



Code 40 Strategic Thrust Areas



Technical and Business Readiness

- Align our organization to maximize effectiveness and efficiency
- Apply rigorous SE tools and processes
- Sustain a culture of Lean Thinking

Next Generation USW

- Develop and implement a Payload Integration Vision
- Mature enabling technologies for submarine payload integration
- Maintain and expand our Land-Based Facilities
- Expand business base in VIRGINIA Block Upgrades and OR
- Pursue targeted expansion of S&T

People

- Build and sustain a diverse and adaptable workforce
- Develop and Mature successful collaborative relationships



Code 40
Contracts Overview
April 2016



Agenda



- **Current Code 40 Major Service Contractors**
- **Current Outsourced Work-Years by Skill**
- **Projected Contract Dollars FY16 – FY18**
- **FY17 Projected Outsourced Services by Program**
- **FY17 Projected Outsourced Services by Skill**
- **Future of Code 40**



Current Code 40 Major Service Contractors

BAE Systems

- Development and Analysis of New Systems and Payload Integration
- Engineering Services and Problem Resolution for Existing Systems
- Programmatic, Design and Documentation Support
- Fabrication, Assembly, Installation and Evaluation Services

Boeing Corporation

- Harpoon Missile Systems Support

Epsilon Systems Solutions

- Manufacturing, Fabrication, Repair and Installation Services
- Logistics, Alteration Data Package and Documentation Support
- Engineering, Design, Prototyping and Testing for Payload Integration

General Dynamics Electric Boat

- SUBSAFE/Level I Requirements
- Systems Engineering and Technical Analysis
- Mechanical and Electrical Engineering and Design
- Manufacturing, Installation, Test and Evaluation, and Repair Services
- Software Engineering & Programming Support
- Field Services, Fabrication and Logistics Support



Current Code 40 Major Service Contractors

Hydroid

- Remote Environmental Measuring Units (REMUS) Unmanned Undersea Vehicles (UUV) systems
- Engineering Services for:
 - Vehicle System Design Modifications
 - Software Development, Assessment and Update
 - Troubleshooting and Repair

McLaughlin Research Corporation

- Missile and Launchers Program and Financial Management Support
- Production Engineering Support
- Configuration Management Support
- Documentation, Training and Inventory Management Support
- Cruise Missiles Lab, Field Services and Logistics Support
- Launcher Facility Complex Support
- Acceptance Testing, Repair and Refurbishment Support
- Surface Vessel Torpedo Tube (SVTT) Support

Oceaneering International Inc - Marine Services Division

- SUBSAFE/Level I Requirements
- Systems Engineering and Technical Analysis
- Mechanical and Electrical Engineering and Design
- Manufacturing, Installation, Test and Evaluation, and Repair Services



Current Code 40 Major Service Contractors

Systems Application International Corporation

- Missile Program Management Support
- Software Development and Systems Analysis Support
- Missiles Engineering Support Services
- Cruise Missiles Lab, Field Services and Logistics Support

Systems Engineering Applications Corporation

- Missile and Launchers Program Support
- Engineering, System Design and Development Support
- Missile Flight Test Program Support

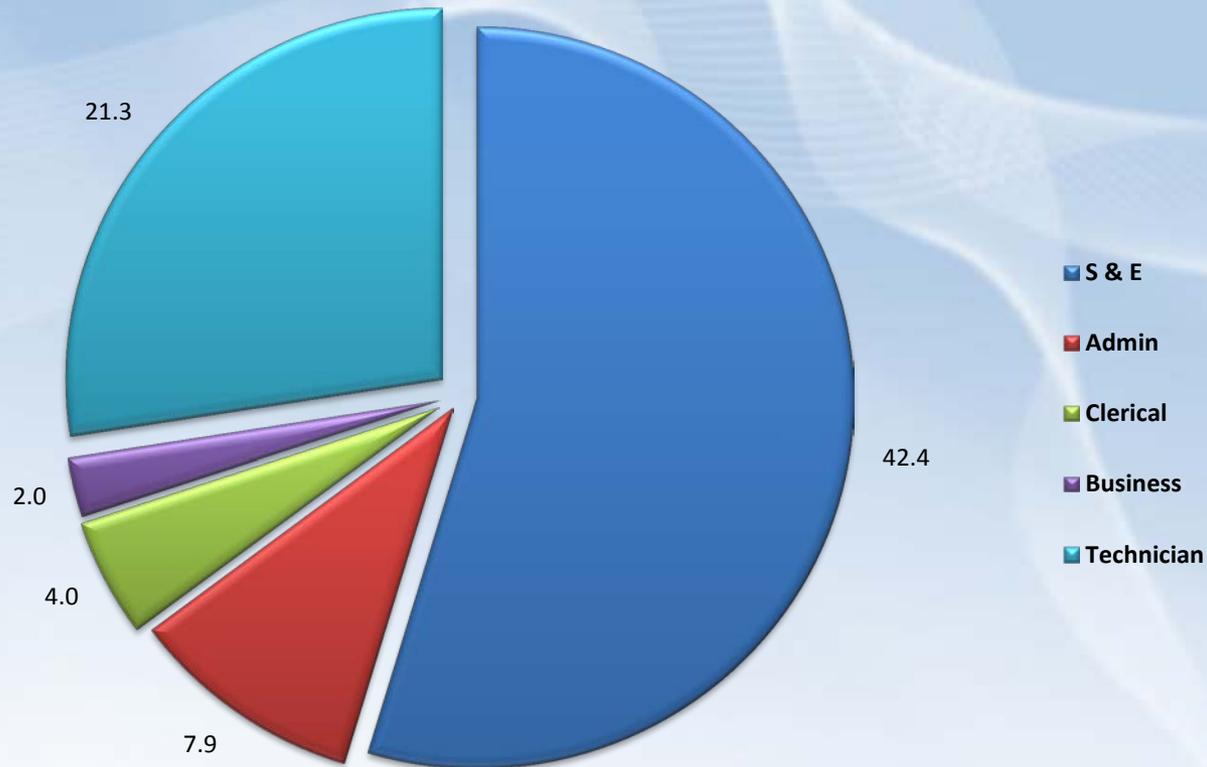
Woods Hole Oceanographic Institute

- Remote Environmental Measuring Units (REMUS) Unmanned Undersea Vehicles (UUV) systems
- Develop and Demonstrate Techniques for Payload Launch and Recovery (Surface & Submarine)
- Tow Body Engineering and Design Support

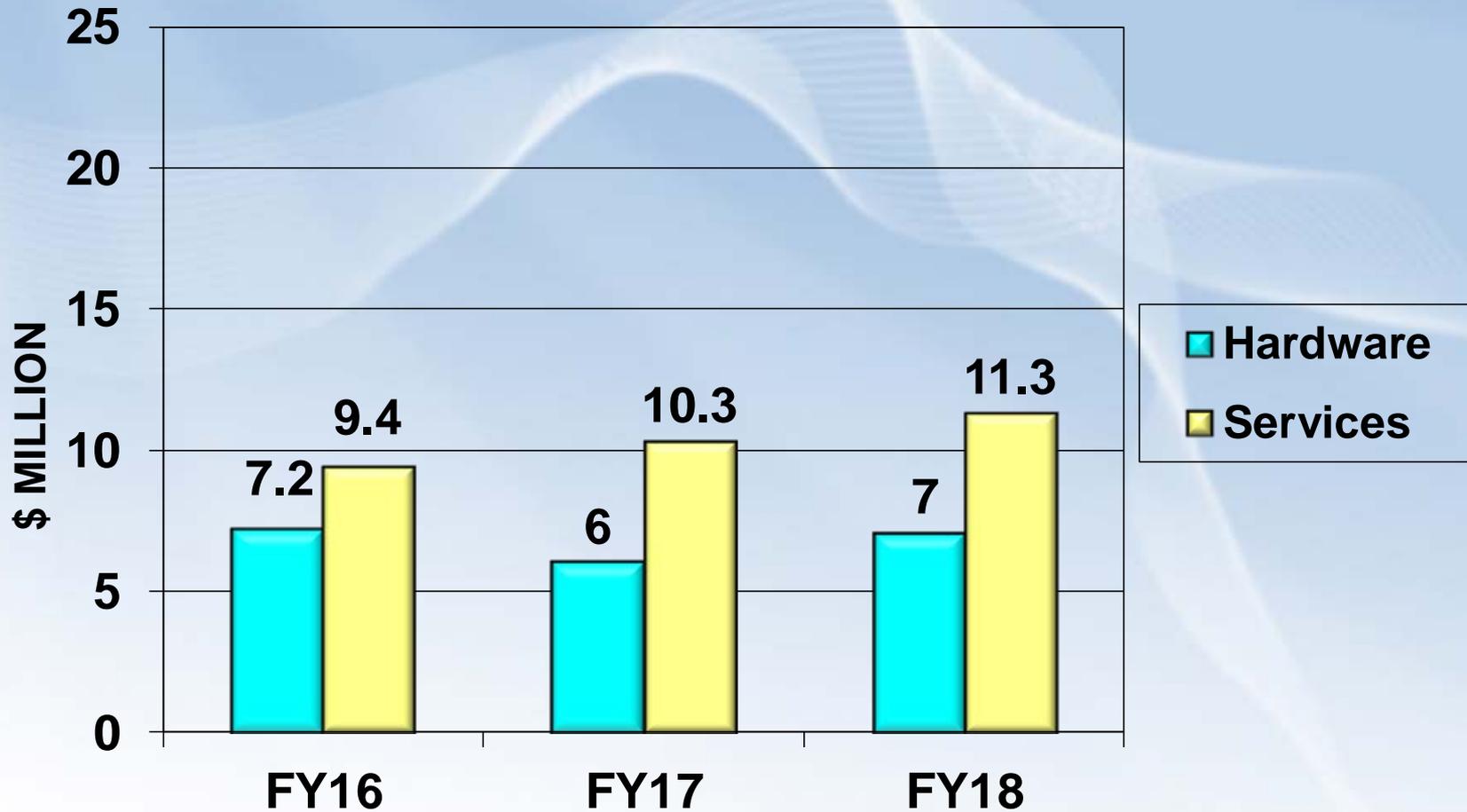
Code 40

Outsourced WYs By Skill – FY16

Total WYs – 77.6



Projected Contract Dollars FY16 – FY18





FY17 Projected Outsourced Services Requirements - by Program



Code 40 is presently forecasting an increased resource demand in several of our technical efforts

- **New Submarine Payload Integration Efforts**
 - Next Generation Strike / ASuW Weapon
 - Next Generation Countermeasure System
 - Fleet Modular Autonomous Undersea Vehicle (FMAUV)
 - Large Unmanned Undersea Vehicles
 - Novel Launch and Recovery Concepts
- **Advanced Launcher / Missile System Concepts**
 - SSN (X) Payload Solutions & Analysis of Alternatives
 - SOF Ordnance Handling
 - Innovative Middleware Solutions
- **Technical Design Agent (TDA) and In Service Engineering Agent (ISEA) Technical Support**
 - VIRGINIA Class Blocks III, IV and V (VPT & VPM)
 - OHIO Replacement



FY17 Projected Outsourced Services Requirements - by Skill



Code 40 is interested personnel with the following skills to help meet its forecasted resource demand:

- **Science & Engineering Services:**
 - **Systems/Test/Safety Engineers**
 - **Land-based and at-sea test support**
 - **Electrical/Mechanical Engineers**
 - **Design and drawing support, technical procedures and/or technical manual development / updates**
 - **Computer Engineers**
- **Technical Services:**
 - **Configuration Management Specialists**
 - **Waterfront Support; Weapon and Submarine Launch Systems**
 - **ILS Planning/Technical Documentation/ Supply Support**
- **Administrative Services**
 - **Program Management Specialists**
- **Business Services**
 - **Financial Analysts**



Projected Contracts



Contract #	Title	Current Contract Value (w options)	Incumbent	Seaport	Follow-On	Current Contract Type	Expected RFP Release	Strategy
4083 N460	ILS Support	\$9.5M	MRC	Y	Y	CPFF	Feb 2017	TBD (Sources Sought)
4083 N459	MK 32 Surface Vessel Torpedo Tube (SVTT)	\$12.7M	MRC	Y	Y	CPFF	Feb 2017	TBD (Sources Sought)
4018 N413	Development and Analysis of New Systems	\$13.8M	BAE	Y	Y	CPFF	Dec 2016	TBD (Sources Sought)
4122 N430	Tomahawk Missile Flight Tests	\$3.3M	Seacorp	Y	Y	CPFF	Mar 2017	TBD
4018 N412	Harpoon FMS	\$6.1M	BAE	Y	Y	CPFF	Sept 2017	TBD (Sources Sought)



Projected Contracts (Con't)



Contract #	Title	Current Contract Value (w options)	Incumbent	Seaport	Follow-On	Current Contract Type	Expected RFP Release	Strategy
New	VACL Launch Control and Display Panel (LCDP) Fabrication	N/A	N/A	N	N	Will be FFP	Oct 2016	TBD
New	MK21 Muffler End Caps	N/A	N/A	N	N	TBD	Jan 2017	TBD

The Future of Code 40

- ***Maintain our relevance and value in the field and on the waterfront as ISEAs***
- ***Expand our role in Payload Integration***
- ***Support VA Block Upgrades and OR***

KEY ENABLERS

- An agile, adaptive, highly trained, diverse and proficient workforce
- Unique world-class land-based RDT&E facilities
- Rigorous and disciplined systems engineering process
- A collaborative work environment
- Our Cornerstones – Teamwork, Communication and Integrity