



Research and Development at NSWC Indian Head Division

Presented to:

**St. Mary's College of Maryland
The Patuxent Partnership**

Presented by:

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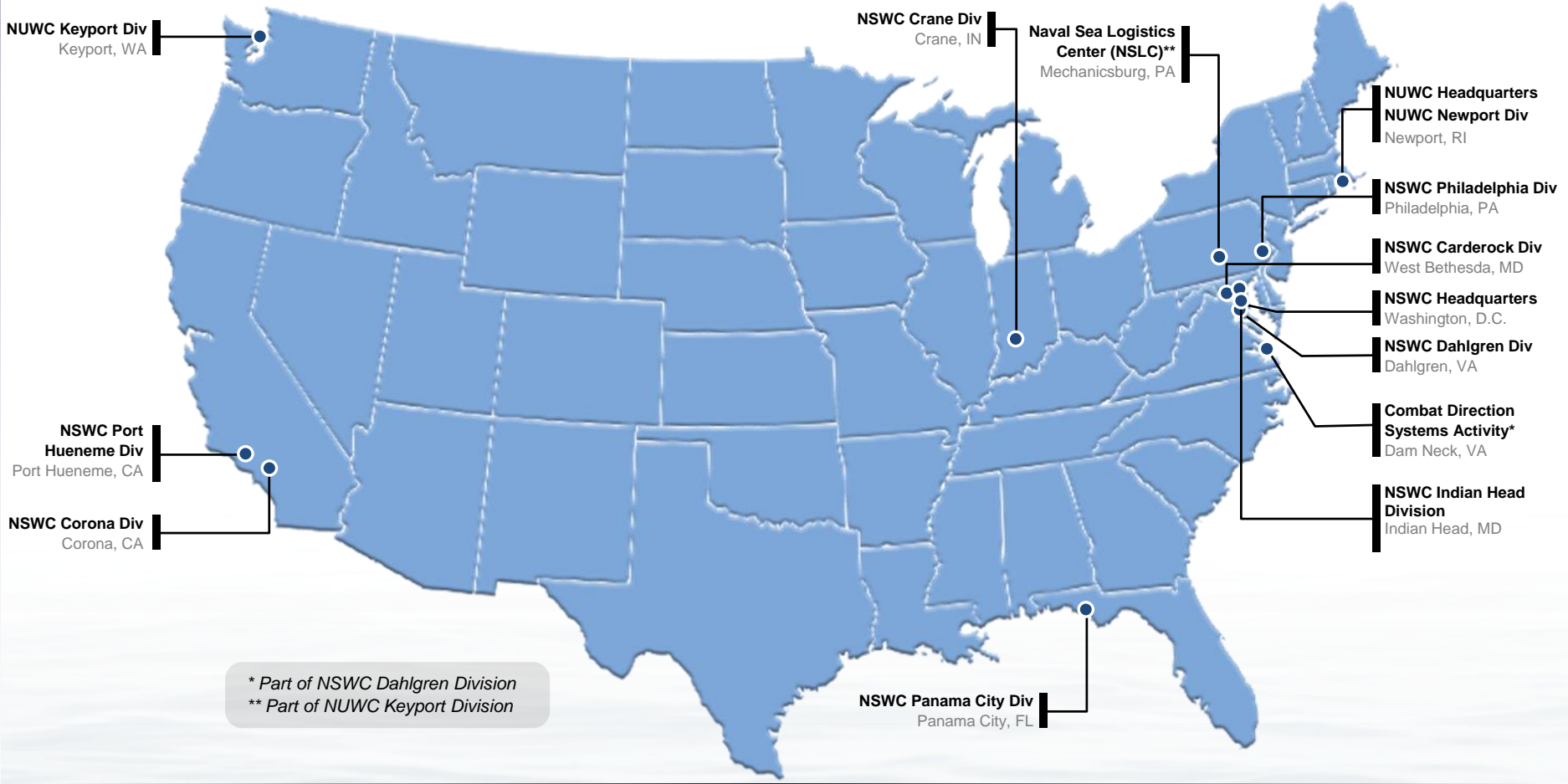
**Capt. Eric C. Correll, USN
Commanding Officer**

**Mr. Ashley G. Johnson, SES
Technical Director**

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NAVSEA Warfare Centers at a Glance



* Part of NSWC Dahlgren Division
 ** Part of NUWC Keyport Division

Warfare Center Quick Facts

- ❖ ~24,479 diverse and highly educated employees focused on innovation (~16,400 scientists, engineers, and technicians with ~750 Ph.D.s)
- ❖ 129 unique Technical Capabilities (TCs) across 10 Divisions
- ❖ Operates under the Navy Working Capital Fund (NWCF) business model
- ❖ Disciplined process for accepting and assigning the right work to the right WC Division based on TCs
- ❖ Part of the Naval Research & Development Establishment (NR&DE)
- ❖ Size of the workforce is based on the funded workload
- ❖ Performs work our industry partners can't, won't or shouldn't do.
- ❖ Maintains more than 164 unique RDT&E facilities



Roles of the Warfare Centers



- Make naval technical programs successful
- Provide a bridge between the technical community and the warfighter
- Determine and develop capabilities for the fleet
- Verify the quality, safety, and effectiveness of platforms and systems
- Design, develop, and field solutions for urgent operational fleet needs

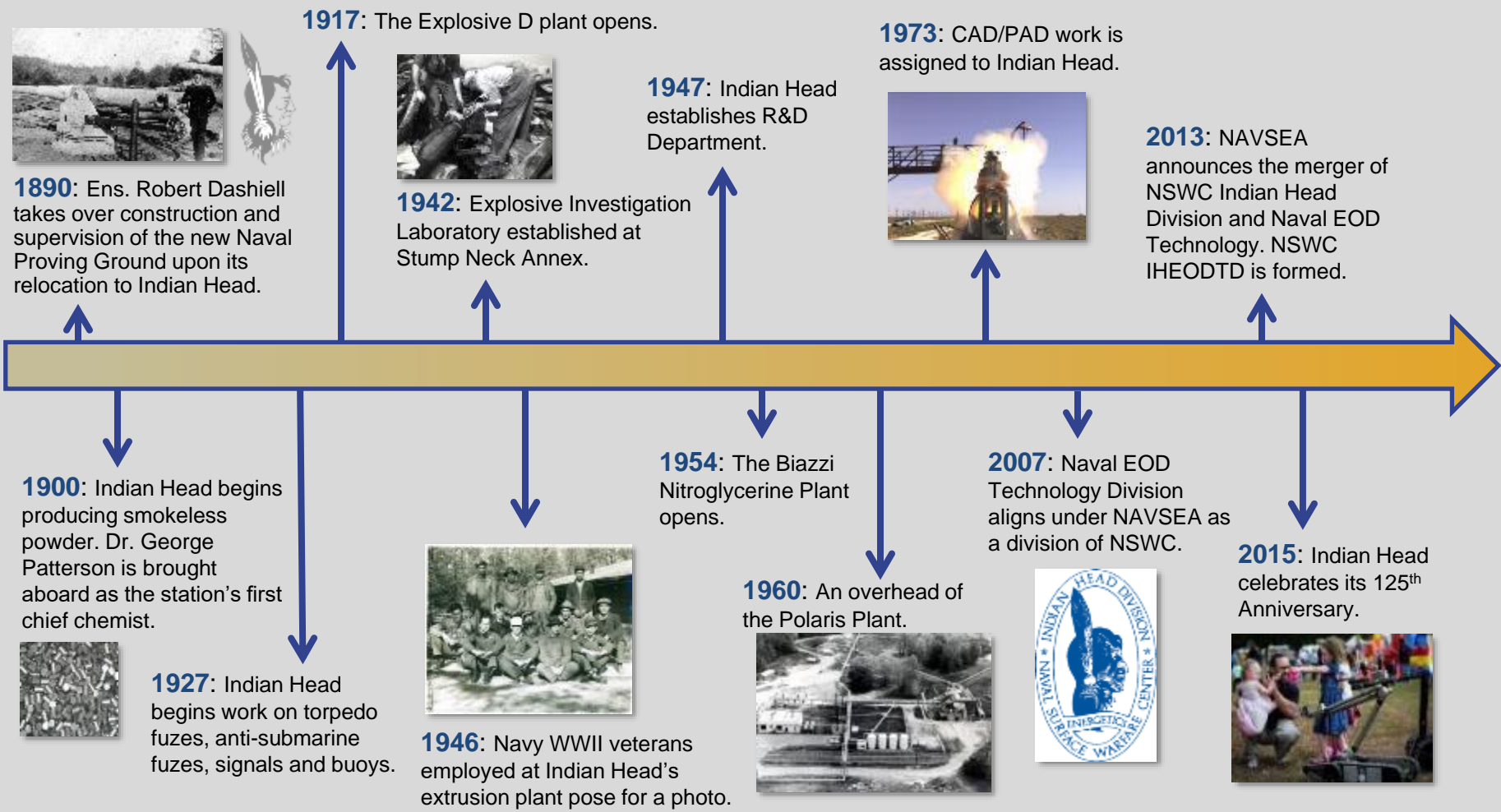
Operating Principles

- Part of the Naval Research & Development Establishment (NR&DE)
- Technical Capabilities - disciplined process for accepting and assigning the right work to the right Division
- Operate under the Navy Working Capital Fund business model
- Workforce size based on funded workload
- Perform work our industry partners can't, won't or shouldn't do

One Team: Expanding the Advantage



Command Timeline



FLY FARTHER

HIT HARDER

SAVE LIVES



Mission



Research, develop, test, evaluate (RDT&E), manufacture and provide in-service support of energetics and energetic systems. Provide Soldiers, Marines, Sailors and Airmen with information and technology to detect, locate, access, identify, render safe, recover, exploit and dispose of explosive threats.



Range and Speed

- Propellants
- Explosives
- Fuels
- Reactive materials
- Rocket motors
- Conventional ammunition

Effects

- Novel explosives
- Reactive materials
- Warheads
- Casing
- Modeling and simulation (M&S)
- Conventional ammunition

Signatures

- Propellants
- Fuels
- Rocket motor design
- M&S
- Safe and arm (S&A) devices

Safety

- EOD
- S&A / Fuzing
- Aircrew escape
- Packaging Handling, Storage, and Transportation of Energetics
- Insensitive munitions
- Chem bio defeat

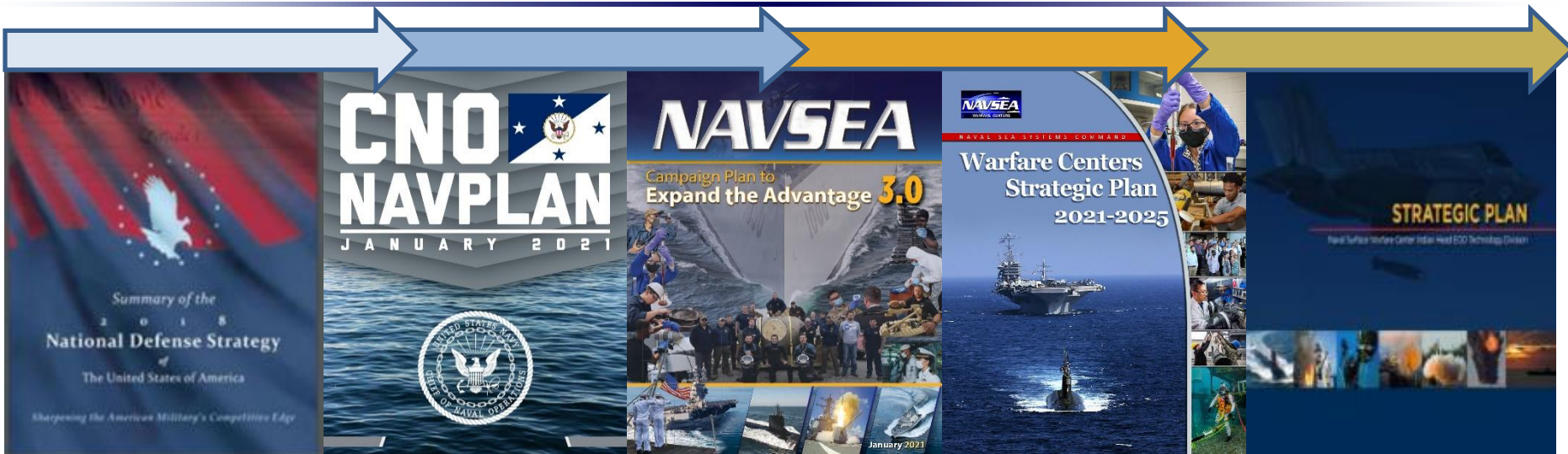
FLY FARTHER

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SAVE LIVES



Strategic Thrusts



- Build a More Lethal Force
- Strengthen alliances and attract new partners
- Reform the department for greater performance and affordability

- Readiness
- Capabilities
- Capacity
- Sailors

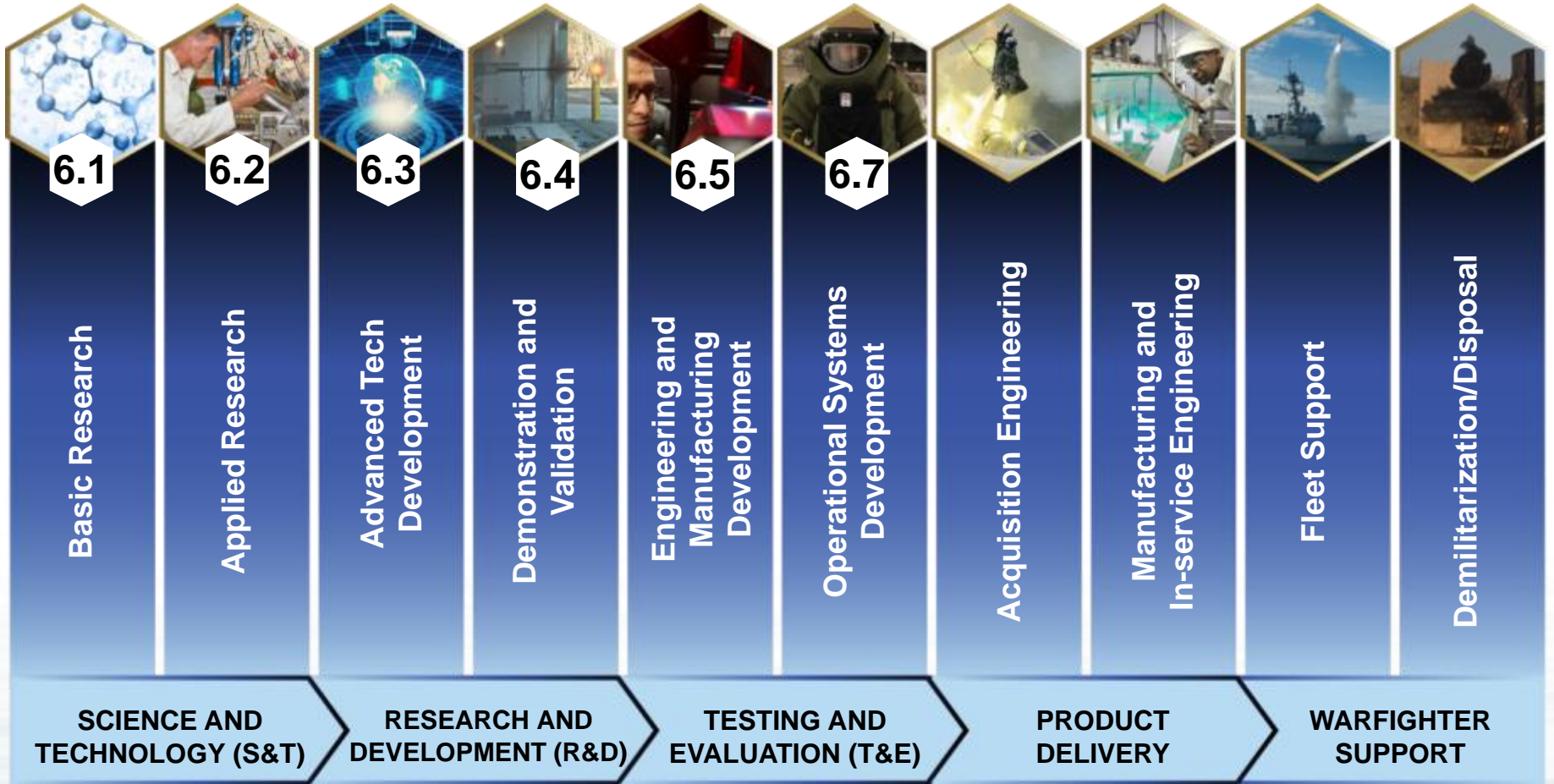
- Ships, submarines, systems - cost, schedule, performance
- Deliver combat power
- Transform Digital Capability
- Build a Team to Compete and Win

- Workforce and Leadership Development
- Mission-Aligned Strategies at the Division Level
- Technical Innovation and Excellence
- Business Excellence and Improvement
- Right Culture/Values

- Reshape facilities and utilities
- Establish public-private partnerships
- Develop new products and services
- Sustain and expand core product lines
- Reinvigorate naval energetics



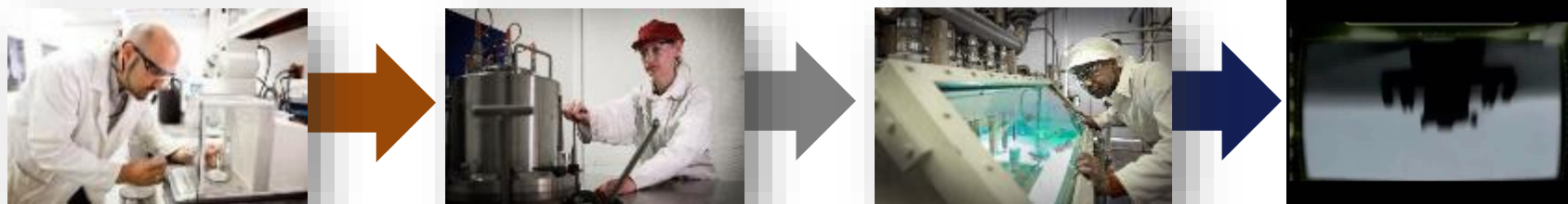
Molecule-to-Mission



Only DoN activity delivering both energetics and EOD technology solutions from basic research through disposal

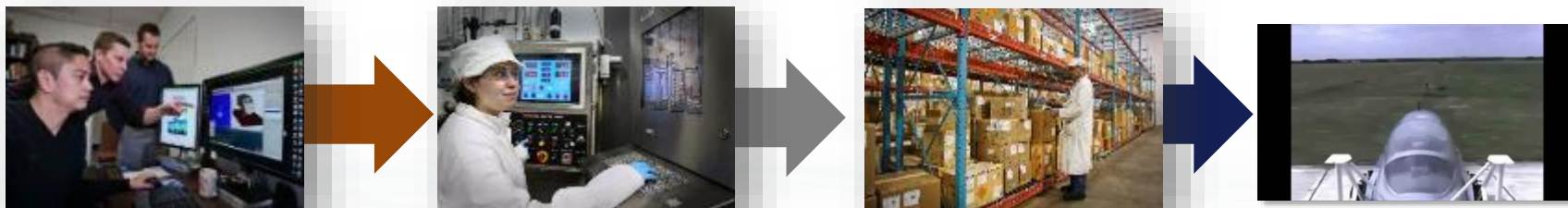
Molecule-to-Mission Across the DoD

Air Launched 2.75 inch Rockets



The command is the Warfighter's source for production of the 2.75 inch rocket: from propellant manufacturing to production of the warhead. We make and deliver the tools to give our Warfighter the winning edge.

Cartridge Actuated Devices / Propellant Actuated Devices (CAD/PAD)



NSWC Indian Head Division manufactures CADs/PADs for aircrew escape ejection systems. Our Virtual Fleet Support facility allows the Warfighter to obtain any component within one week from order request.



Numbers at a Glance

FY21 Execution

\$600.2M direct / \$89.3M indirect

Total Contracting Effort

\$442.5M

Buildings Occupied

879

Total Square Feet

1,968,161

Civilian Staffing

Employees *

2,362

Top S&E Disciplines

**Scientists and Engineers:
907**

Average Years of Service

13

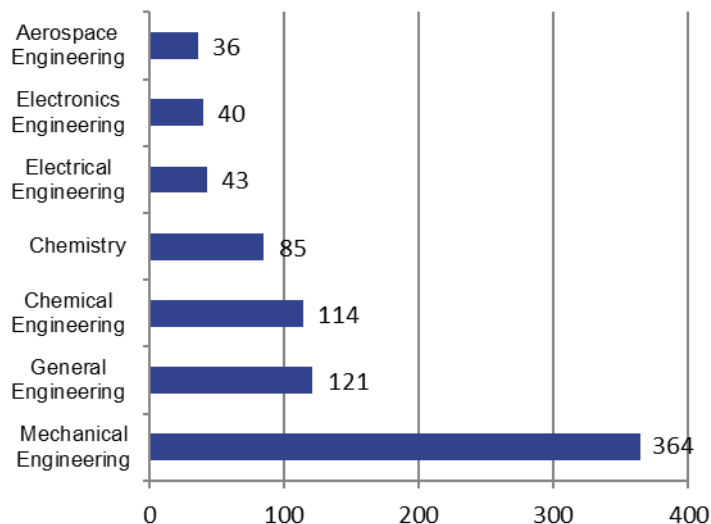
Top S&E Disciplines

Average Age of Workforce

45

Workforce Education (Technical)

**Bachelors: 567
Masters: 246
Ph. D.: 79**



* Does not include contractors

Technology Transfer



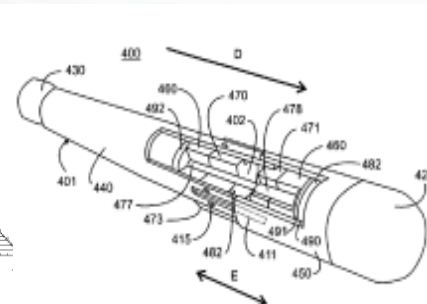
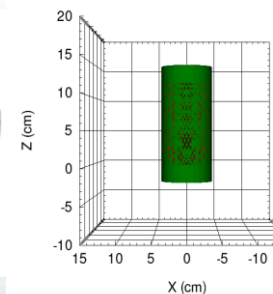
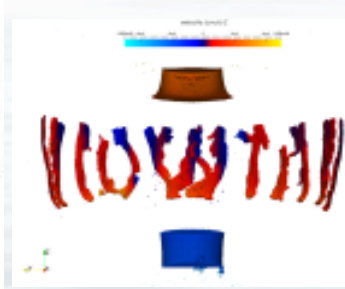
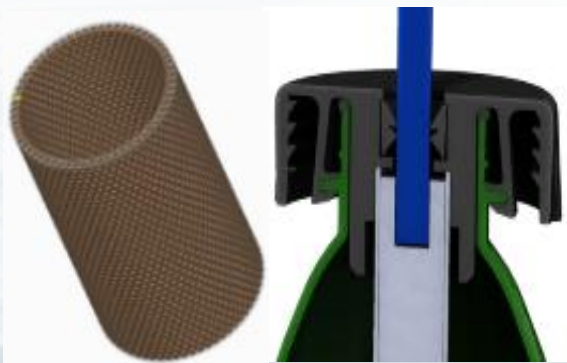
NSWC IHD Technology Transfer initiatives look to jointly develop dual-use technologies with academic and private industry partners, develop collaborations with partners interested in access to our unique expertise and facilities, and assist in the commercialization and marketing of our intellectual property.

Partnering Agreements

- 73 Active CRADAs
- 4 Patent License Agreements
- 9 Educational Partnership Agreements
- 8 Partnership Intermediary Agreements

10 Year Metrics

- CRADAs
 - 144 collaborations
 - \$18 million
- Patents
 - 172 patents awarded
 - \$71,000 in revenue







Full Spectrum Capabilities

**Research
Development
Test & Evaluation**




Engineering

Manufacturing




**Operational
Footing**

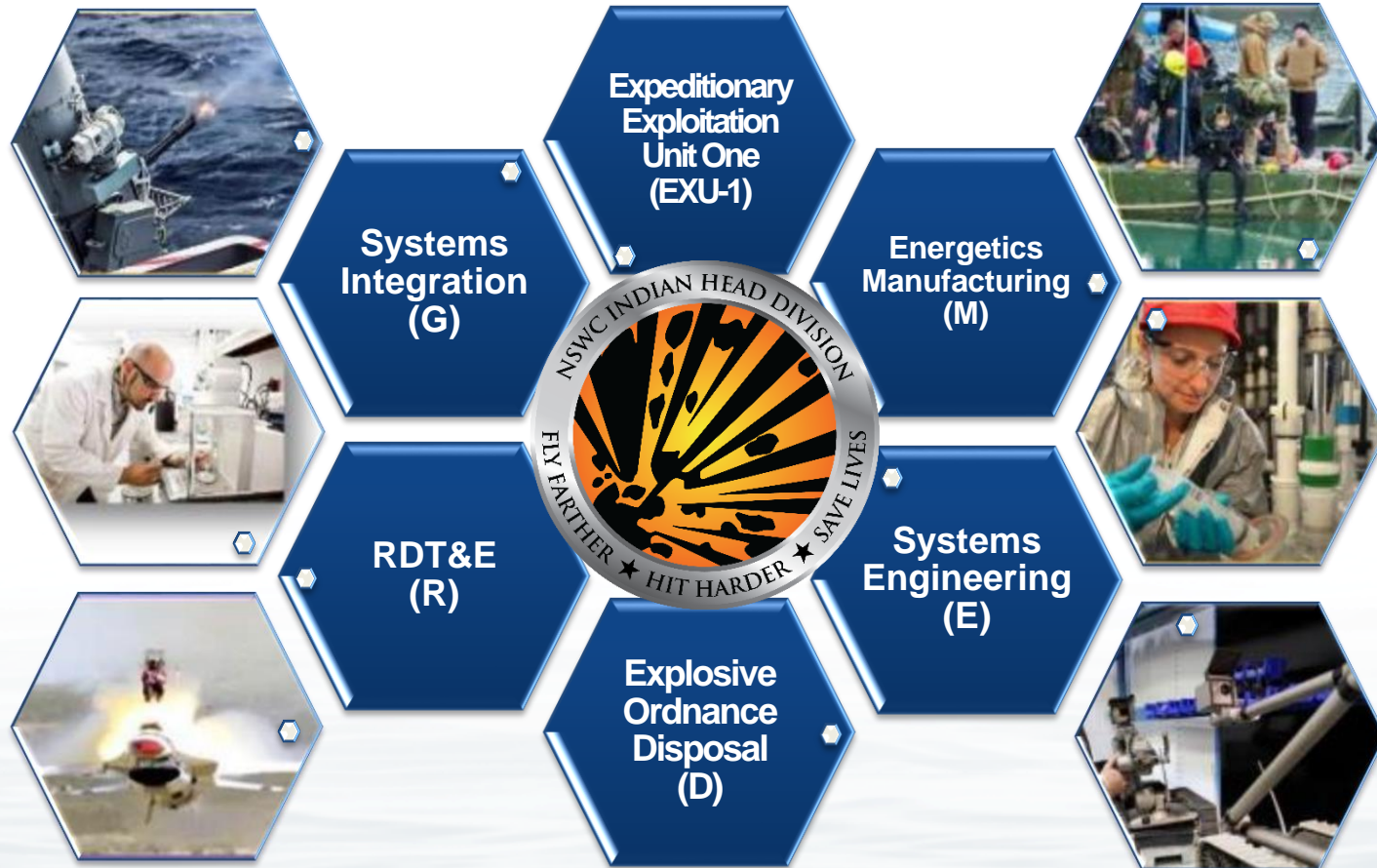




Indian Head's operations range full spectrum from basic research to warfighter support



Technical Departments





RDT&E (R) Department



Capabilities and Facilities

- Detonation science facility for controlled, dynamic research of energetic materials
- Material properties laboratory and ordnance dissection for health analysis and aging
- Non-destructive evaluation and analytical chemistry laboratories for in-house lot acceptance and quality assurance of products
- Condition-controlled laboratories for high-fidelity R&D
- Chemistry and biology labs (up to BSL-3), collective protection prototypes and over-water range testing for CBRD

Warfighting Impact

- Integrated signatures program helps Warfighter diagnose threat to the “left of boom”
- Advanced propulsion R&D will lead to future advances in weapon range and flexibility
- Chemical, Biological, and Radiological Defense (CBRD) protects ships and facilities from attack and contamination

Lines of Operation

Research and Development (Code R1)

- Energetic materials science and technology to develop new chemicals, explosives, propellants and performance measurement concepts

CBRD (Code R2)

- Full lifecycle support for CBRD in a maritime environment

Test and Evaluation (Code R3)

- Detonation and combustion test and evaluation for performance, lifecycle analysis and lot acceptance



RDT&E (R) Department



Qualification of PBXIH-136 UW Explosive Formulation

Chemical Biological & Radiological Fleet Integration & Support

Warfighter Impact

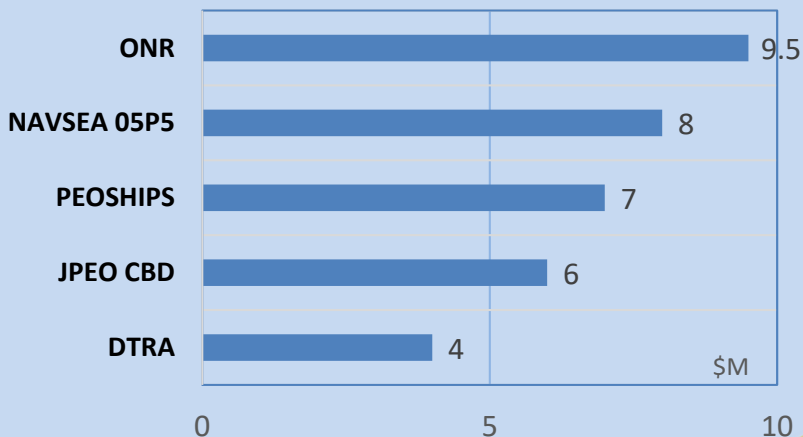
Shipboard Collective Protection

Blast Assisted Munition Advanced Low Cost Munitions Ordnance Replacement

Reactive Material for Enhanced Lethality



Top Customers



WFC Collaborations

- NSWC DD: CBR Defense – RDT&E
- NAWC WD China Lake and NSWC DD: advanced gun propellants and primers and a gun launched solid fuel ramjet projectile to improve range of 5” guns; novel processing methods for enhanced performance formulations
- NSWC DD: Accelerated development of Reactive Materials technology and advanced gun propellants and primers for large caliber guns.
- NSWC Philadelphia: Share ColPro engineering agent roles for ship integration.
- NSWC PCD: CBR Defense in the area of individual protective equipment.



Systems Engineering (E) Department



Lines of Operation

- Energetics technology
- Micro-electrical mechanical systems, lethality, blast effects, insensitive munitions and savings-through-simulation
- Energetic systems
- Engineering for all warfighter domains
- CAD/PAD support of more than 3,000 ejection system components

Warfighting Impact

- STANDARD and Evolved Sea Sparrow Missile propulsion engineering
- Clandestine Delivered Mine
- Improvised Explosive Device Exploitation
- Countermeasure anti-torpedo warhead and fuzing
- Aircrew escape systems
- Ordnance assessments leading to service life extensions

Capabilities and Facilities

- MEMS explosive-certified cleanroom, characterization and test
- Polymer and metal additive manufacturing capability (3D printing)
- CAD/PAD virtual fleet support
- Airguns test rounds from 3" - 21"



Systems Integration (G) Department



Lines of Operation

- In-service engineering agent and acquisition engineering agent for guns and ammo
- Conventional ammunition commodity management
- Weapons and armament PHST design agent and ISEA



Warfighting Impact

- Gun weapon systems standardized pier-side maintenance and repair
- Mobile Ammunition Evaluation and Repair Unit
- Gun weapon system casualty report support
- Fleet liaison for guns and ammo (LANTFLT / PACFLEET)
- PHST member of Board of Inspections and Survey, and Weapons System Explosive Safety Evaluation Board member

Capabilities and Facilities

- 16,000 sq. ft. Packaging, Handling, Storage and Transportation test facility
- Gun stand complex
- 12,000 sq. ft. minor caliber lab
- Medium/minor caliber live fire range facility
- Quad City Cartridge Case Facility



Energetics Manufacturing (M) Department



Lines of Operation

- Energetic development, scale-up and qualification
- Design, development and low-rate initial production/full-scale production of energetic materials and ordnance end-items
- Flexibility to make products from mortars to rockets through the same processing line: from 5 grams to more than 1 million pounds
- Maintains in-house energetics processing capabilities and engineering expertise to:
 - Act as sole source, second source and emergency supplier
 - Provide expertise allowing program offices to act as “smart buyers” for the DoD, foreign military sales and other customers



Warfighting Impact

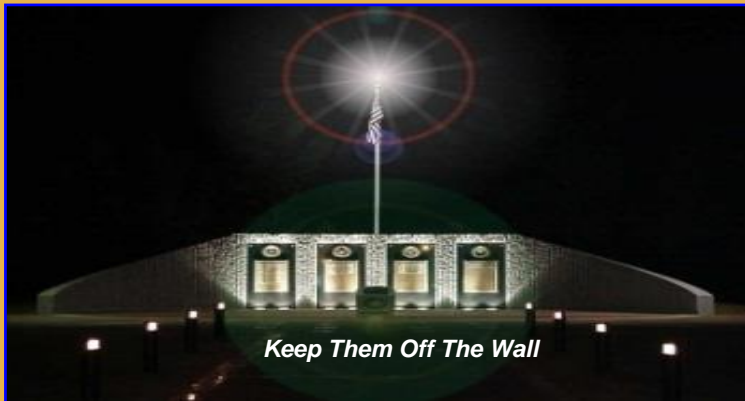
- Provider of Otto Fuel II torpedo fuel
- CAD/PAD manufacturing and centralized stock point
 - Sole stock point of all Navy CAD/PADs
 - Able to ship parts anywhere around the globe

Capabilities and Facilities

- Cast-composite propellant and polymer-bonded explosive mixing/casting
- Chemical manufacturing and scale up
- Pressed explosives and warheads
- Cartridge igniter and CAD/PAD assembly
- Solventless extrusion
- Decon and disposal



Explosive Ordnance Disposal (D) Department



Lines of Operation

- **EOD Information Management**
 - Collection, analysis, development and dissemination of procedures and countermeasures information to the Joint Service EOD community
- **EOD Systems**
 - Provides EOD support across the Development and Acquisition Spectrum: S&T, prototyping, POR development, T&E, engineering agent/ISEA, support/sustainment, disposal
- **Battle Lab**
 - Provides a cycle of equipment review and evaluation to feed capability gap assessment, COTS/MCOTS buying decisions, requirements development, and technology implementation at the speed of relevance

Warfighting Impact

- Technical Data and Procedures
- Foreign Materiel Acquisition and Exploitation
- Explosives Detection Equipment Program
- Demonstration and Assessment Team and EOD Technology Assessment Team
- Underwater EOD
- EOD Unmanned Systems
- Ordnance Disrupt/Modeling & Simulation
- Anti-Terrorism/Force Protection

Capabilities and Facilities

- Co-located with EOD service detachments and Joint EOD Executive Agency Support office
- 24-7 / 365 warfighter call-back ability to Technical Support Center
- Explosive test and robotics test ranges
- Magnetic Signature Test Facility
- Prototyping facilities to accelerate ideas/rapid support for 3D printing
- Explosive Chemistry Laboratory
- Electronics Laboratory
- EOD Library
- Disassembly complex



Expeditionary Exploitation Unit One (EXU-1)

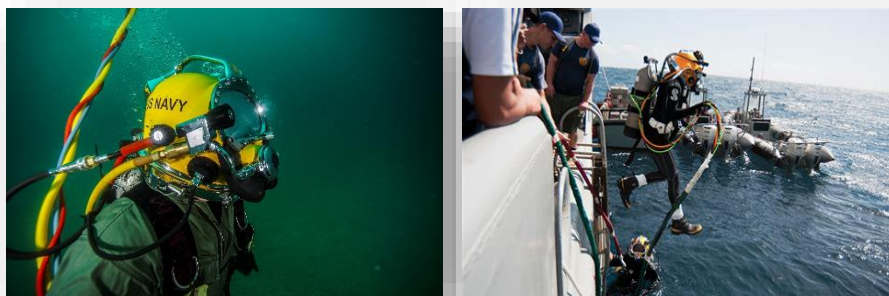


Mission

Technical Exploitation Platoons (TXP) and Foreign Materiel Program (FMP) Platoons collect, process, exploit, and analyze improvised, conventional, and advanced weapons systems and other collected exploitable materiel (CEM), on land and at sea, for the purpose of providing near real-time technical intelligence to tactical commanders, EOD community, service components, Department of Defense (DoD), national level intelligence agencies, and Allied and Partner Nations.

Organization and Manning

- Type II Sea Duty Operational Command (Ech V)
- ISIC: NSWC Indian Head Division



Capabilities

- ✓ Globally deployable tailored to Fleet requirements
- ✓ Expeditionary Mine Countermeasures Exploitation
- ✓ Level-1 Exploitation (field)
- ✓ Level-2 Exploitation (lab)
- ✓ Foreign Materiel Acquisition
- ✓ Intelligence Community & SOF Interoperability
- ✓ Surface and Underwater Post-Blast Analysis
- ✓ Advanced Electronic Exploitation Division



Questions?

