SEA 05E Explosive Ordnance Engineering Overview

"Who We Are & What We Do"

Jason Steffin, Deputy Director

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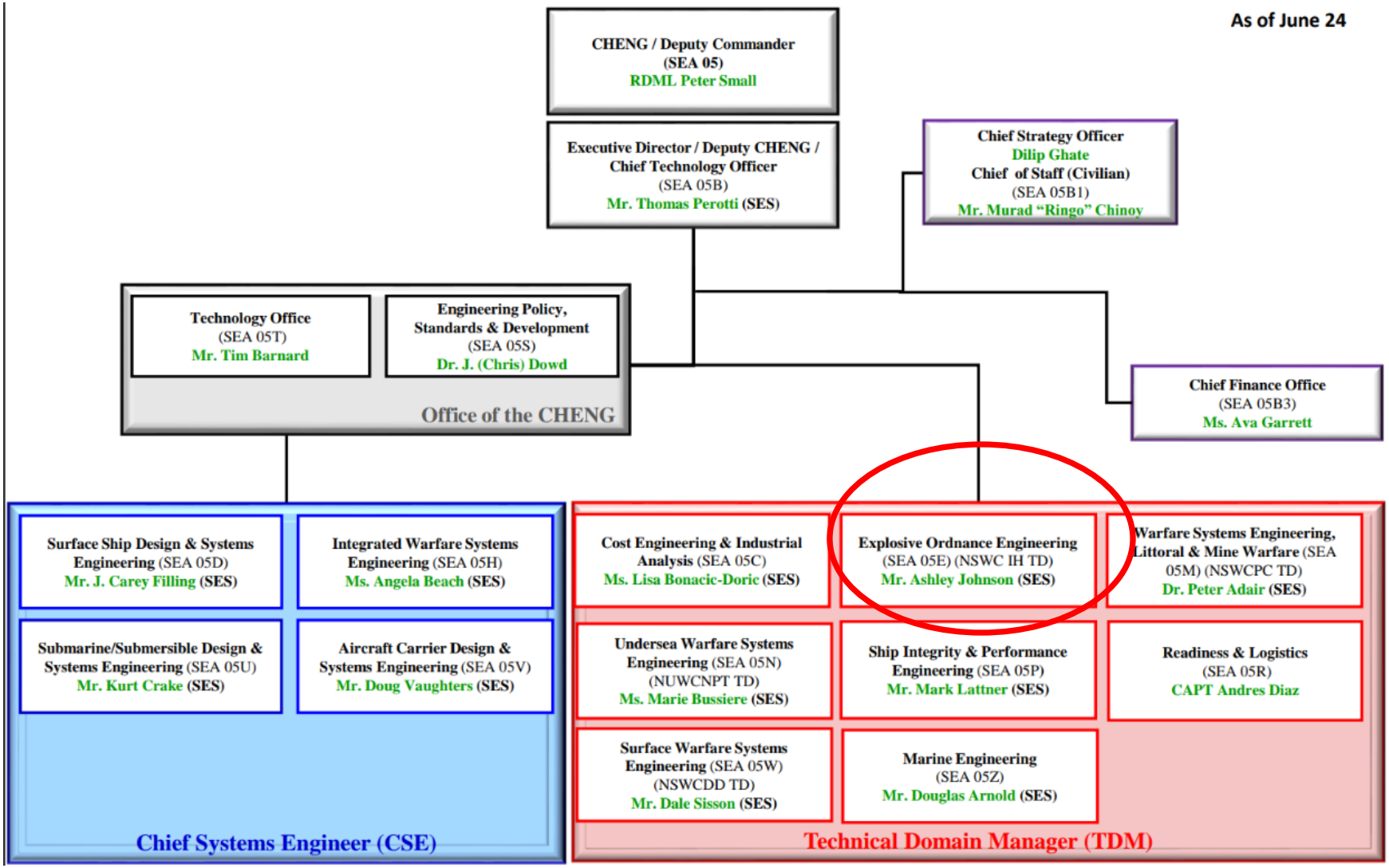
NAVAL SYSTEMS ENGINEERING AND LOGISTICS DIRECTORATE (SEA 05)



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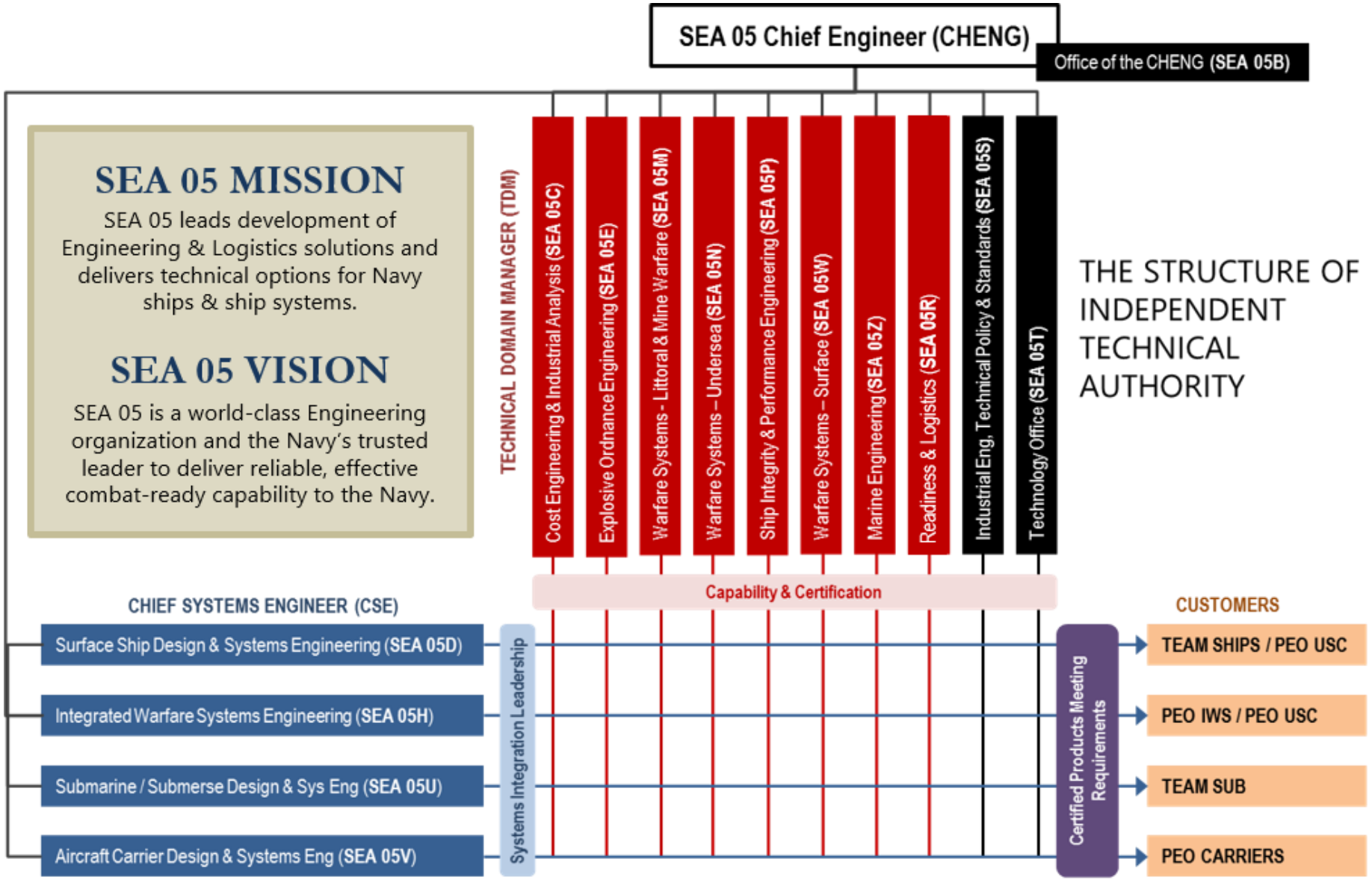
SEA 05

SEA 05 MISSION

SEA 05 leads development of Engineering & Logistics solutions and delivers technical options for Navy ships & ship systems.

SEA 05 VISION

SEA 05 is a world-class Engineering organization and the Navy's trusted leader to deliver reliable, effective combat-ready capability to the Navy.



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SEA 05E Explosive Ordnance Engineering

Mission

Provide independent, unbiased technical authority and rigor to ensure safe, suitable, reliable and supportable explosive ordnance solutions from inception to disposal

05E Director (SES)
Mr. Ashley Johnson

05EB Deputy Director
Jason Steffin*

05E1	05E2	05E3	05E4	05E5	05E6	05E7
Explosives	Ordnance Packaging, Handling, Storage & Transportation (PHS&T)	Propellants and Energetics Propulsion	Cartridge Actuated Devices / Propellant Actuated Devices (CAD/PAD)	Explosive Ordnance Disposal (EOD)	Small Arms & Weapons	Anti-Terrorism / Force Protection (AT/FP)
TBD (TWH)	David Hoegler (TWH)	Dr. Jamie Brewer (TWH)	John Burchett (TWH)	Michael Hollander (TWH)	David Long* (TWH)	Dr. Mark Thoreson (Deputy TWH)
	Ryan Broderick (Deputy TWH)		Anthony Quebral (Deputy TWH)			

*Warfare center billet

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SEA 05E Explosive Ordnance Engineering

- **Who We Are:**
  - Navy Engineers recognized as Technical Area Experts across the DoN Technical Domain

- **What We Do:**
  - Provides Technical Authority and independent technical rigor to ensure technically sound, safe & reliable munition systems are delivered and maintained for the Navy; coordinates with platform and SYSCOM Technical Authority to integrate munition systems for the Fleet; determines the courses of action to reduce technical, performance and safety risk across munition systems
    - Located at the Naval Surface Warfare Center Indian Head, Indian Head Picatinny Detachment, and Naval Surface Warfare Center Crane, we leverage the core technical experts within the Surface Warfare Center technical domain and Technical Authority pyramids to provide research and system engineering competency
    - We determine the courses of action to reduce technical, performance, and safety risk across Navy munition systems

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- What is Technical Authority?
  - Set Technical Standards
  - Maintain Technical Area Expertise
  - Ensure Safe and Reliable Operations
  - Ensure Effective and Efficient Systems Engineering
  - Provide Judgment in Making Unbiased Technical Decisions
  - Steward of Engineering and Technical Capabilities
  - Maintain Accountability and Technical Integrity

"The exercise of Technical Authority is a process that establishes and assures adherence to technical standards and policy… a range of technically acceptable alternatives with risk and value assessments…"

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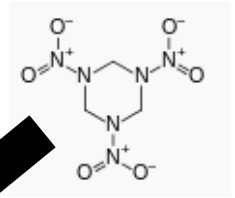
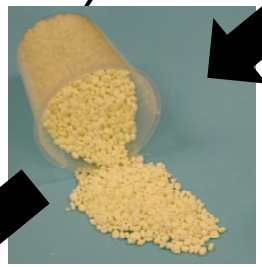
Explosives

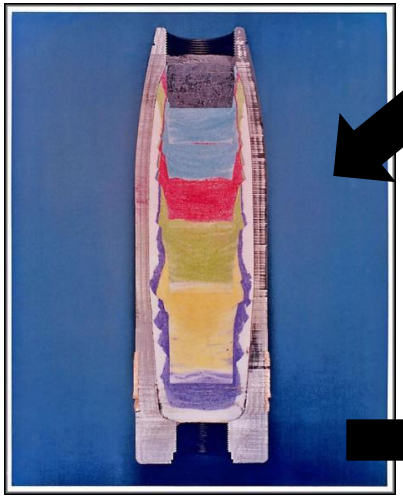
- Explosive = energetic material that can sustain a supersonic detonation wave through the rapid release of energy and gaseous decomposition products
- Scope includes:
  - Explosive raw ingredients and formulations (used in)
  - Warheads
  - Fuzes
  - Safe and arming devices
  - Detonators
  - Igniters
  - Squibs
  - CAD/PAD



RDX
High Explosive



High Explosive
Formulation



Payload

Standard Missile

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Explosives

- Involved in the design, manufacture, repair, performance, and analysis of explosives in weapons systems
  - Oversight or cognizance in safety and reliability of operations, ensuring efficiency and effectiveness of performance, and understanding life-cycle impacts

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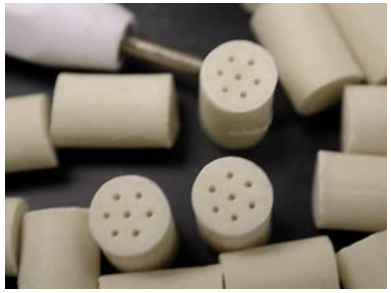
Propellants & Energetics Propulsion

- Propellant = energetic material that burns smoothly, generating gaseous products at a uniform rate, without atmospheric oxygen
- Scope includes:
  - Propellants and combustion systems as they apply to weapons and propulsion, such as for:
    - Guns
    - Missiles
    - Rockets
    - Rocket Motors
    - Torpedoes
    - Gas Generators
    - Hypersonics

  - Propellant raw ingredients and formulations



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Propellants & Energetics Propulsion

- Heavily involved in the design, production, functional performance, and analysis of propellants and propellant systems
  - Can include solid, liquid, gelled, cases, nozzles, liners, and much more

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Ordnance Packaging, Handling, Storage and Transportation

- PHST = Packaging, Handling, Storage, and Transportation
- Scope includes:
  - Packaging: container certification and packing methodology for ordnance
  - Handling: Ordnance Handling Equipment (OHE) certification
  - Storage: shipboard and ashore instruction, stowage density
  - Transportation: truckloads, unit loads, intermodal loads, transportation authorization/certification per Title 49 Code of Federal Regulations
- Ordnance items spend a majority of their time in the logistical packaged state, being handled, stored, or transported

Packaging

Storage/ Stowage

Handling

Transportation

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Ordnance Packaging, Handling, Storage and Transportation

- Packaging – It's not just a box…
  - Our containers must protect weapons from
    - Shipping
      - Vibration/repetitive shock
    - Handling drops and impacts
    - Near-miss shock events
    - Insensitive Munitions events
      - Bullet & fragment impact
      - Slow and fast cook-off scenarios
      - Sympathetic detonations
    - Harsh Environments
      - Temperature extremes
      - Salt/Fog/Sand/Dust/Snow/Ice
      - Rapid pressure differentials

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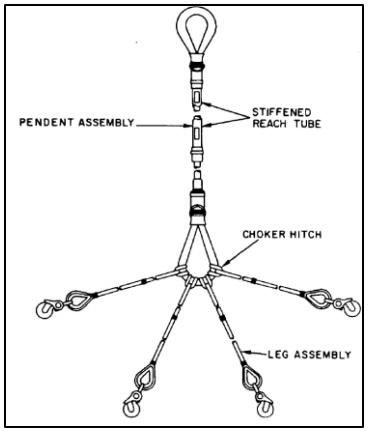
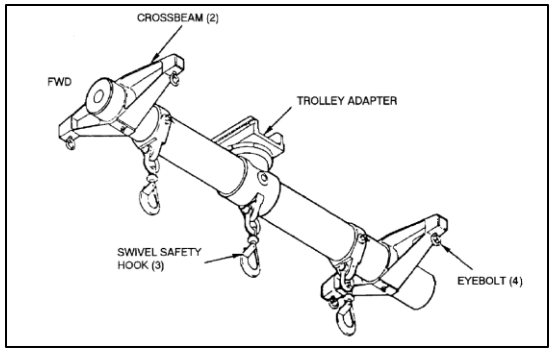
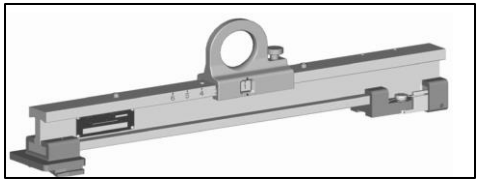
Ordnance Packaging, Handling, Storage and Transportation

- Handling considerations
  - Multi-use functionality
    - Utilizing OHE for multiple applications







- Storage and stowage optimization
  - Maximizing shipboard stowage density while considering:
    - Shipboard magazine clearances and spaces
    - Weapon size/design features

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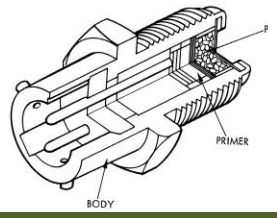
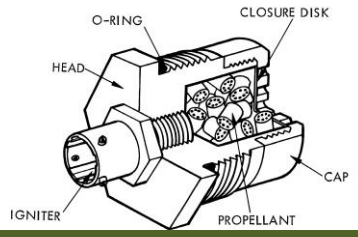
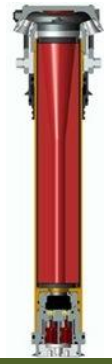
Cartridge Actuated Devices/ Propellant Actuated Devices

- Cartridge Actuated Device (CAD) = energetic device that performs work or transmits a signal
- Propellant Actuated Device (PAD) = rocket powered, propulsive device using controlled energy release to perform a work function
- Scope includes:
  - Electric initiators, detonators, cartridges, squibs, and many other “pyro” components
    - Explosive bolts, pyro valves (fuel, water, coolant), thrusters, ejectors
    - Gas generators, (emergency flotation, fire suppression), small rocket motors
    - Detonating and ballistic cord







Examples: Initiator/detonator | Cartridge | Explosive bolt | Cutter | Rocket motor

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Cartridge Actuated Devices/ Propellant Actuated Devices

– Applications/Uses
  - Missile, torpedo, and mine restraining/release systems, staging components, ignition safety devices (ISDs), launchers
  - Shipboard and mine cable cutters and releases, emergency buoy release system components
  - Aircraft emergency systems (egress, fire suppression, weapons release), countermeasures

Over 8000 unique CAD/PAD items installed across all services.

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Explosive Ordnance Disposal

- Explosive Ordnance Disposal (EOD) = safely disposing of live ordnance / explosive hazards
- Scope includes:
  - Tools, equipment, systems, information, and procedures to:
    - Detect/locate
    - Access
    - Diagnose
    - Render safe/neutralize
    - Recover
    - Exploit
    - Dispose of:
      - Conventional munitions
      - Improvised explosive devices (IEDs) and devices containing chemical, biological, radiological, nuclear and/or explosive payloads

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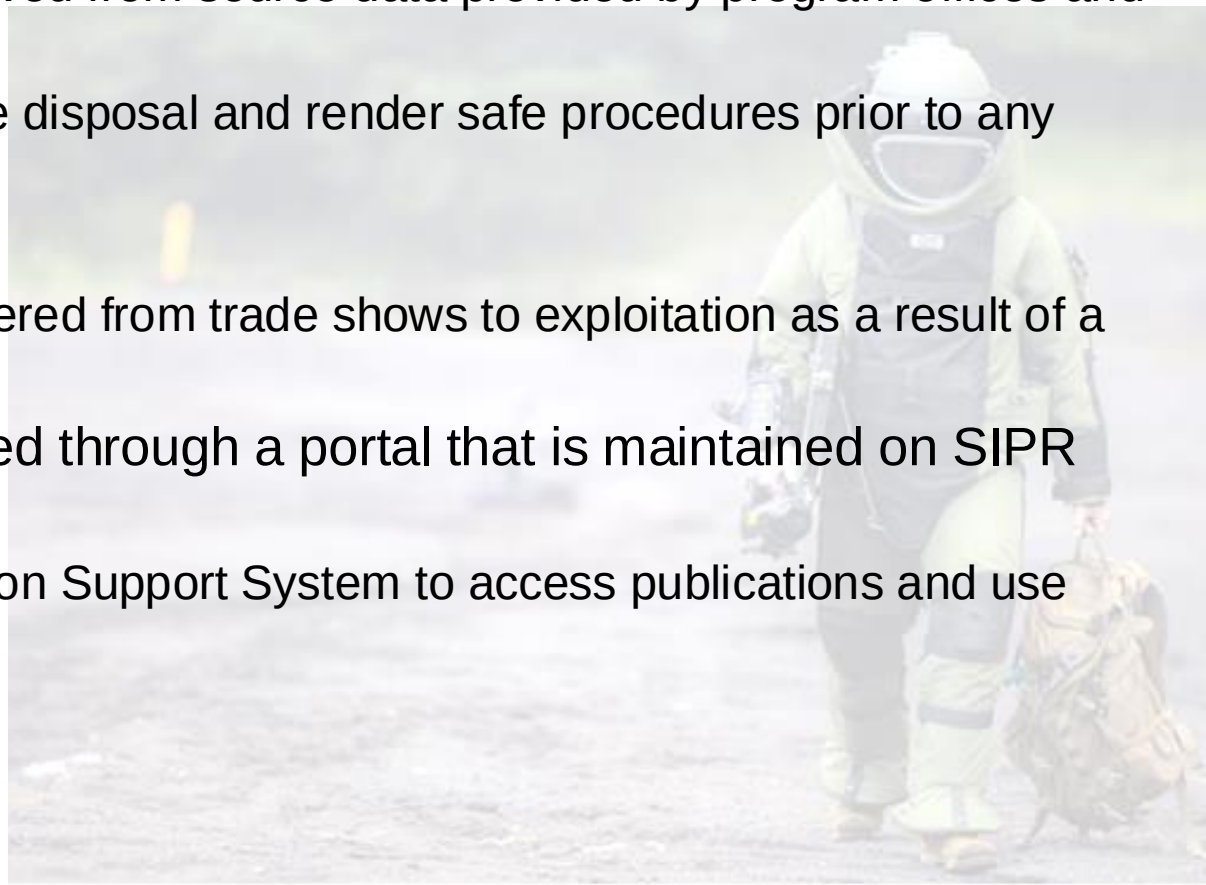
EOD - Publications

- Technical Publications
  - The EOD community operates on ordnance technical publications.
  - Publications are generated for US and foreign weapons systems.
    - US publications are derived from source data provided by program offices and weapons developers.
    - Data is used to generate disposal and render safe procedures prior to any fielding or testing.
  - Foreign Ordnance
    - Information can be gathered from trade shows to exploitation as a result of a recovery
  - Publications are accessed through a portal that is maintained on SIPR and NIPR.
    - EOD maintains a Decision Support System to access publications and use blast effect calculators



EOD – Areas of Technology

- Underwater
  - Use UUVs with sidescan sonar to map, identify and reacquire objects
    - Deployment systems – Remotely Operated Vehicle development and Unmanned Underwater Systems
  - Use UW tools to recover or dispose of explosive hazards
    - Energetic tools – Acoustic firing device, limpet mine neutralization, and general disruption tools to disrupt the firing train
- Ground – Joint Service
  - Currently developing unmanned solutions to map and identify ordnance for rapid clearance operations.
  - Developing technology solutions to access deeply buried ordnance
  - Unmanned ground vehicles are used for remote access, move ordnance, and disrupt threats –commonly used in IED response

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Small Arms and Weapons

- Small Arms = handheld, shoulder fired, and crew-served weapons
- Scope includes:
  - Crew served weapons (M2A1, M240B, MK19, MK48, MK44)
  - Shoulder fired weapons (M4, M320A1, M500, M14)
  - Pistols and handguns (M9, M11, M18)
  - Ammunition
  - Mounts
  - Stabilized small arms mounts (MK50)
    - Not Currently Fielded
  - Weapon mounted enablers


M18


M4A1


M320A1


M2A1


MK19 MOD 3

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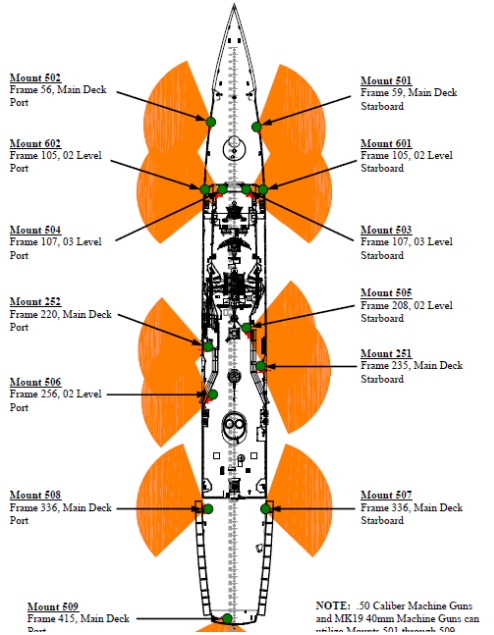
Anti-Terrorism/Force Protection

- Anti-Terrorism/Force Protection (AT/FP) = preventing, deterring, and mitigating the effects of asymmetrical actions against Naval personnel and assets
- Scope includes:
  - AT/FP arrangements
  - Ballistic shields
  - Non-lethal weapons
  - Biometrics
  - Visual augmentation systems
  - AT/FP equipment



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SEA 05E Lines of Operation

- SEA 05E technical authority is executed from inception to disposal
- TWHs provide expertise with:
  - Research & development / Science & technology
  - Design
  - Analysis
  - Qualification
  - Manufacturing and Lot Acceptance
  - Shipboard/System Integration and Systems Engineering
  - Disposal/Demilitarization efforts
  - Warfighter training and procedures
  - Risk assessments, hazard analyses, and failure investigations
- SEA 05E certification authority:
  - Ordnance Handling Equipment (OHE) *(Ordnance PHST TWH)*
  - Ordnance containers *(Ordnance PHST TWH)*
  - Small arms foundations *(Small Arms and Weapons TWH)*
  - Safe to Ship (*Propellants TWH)*

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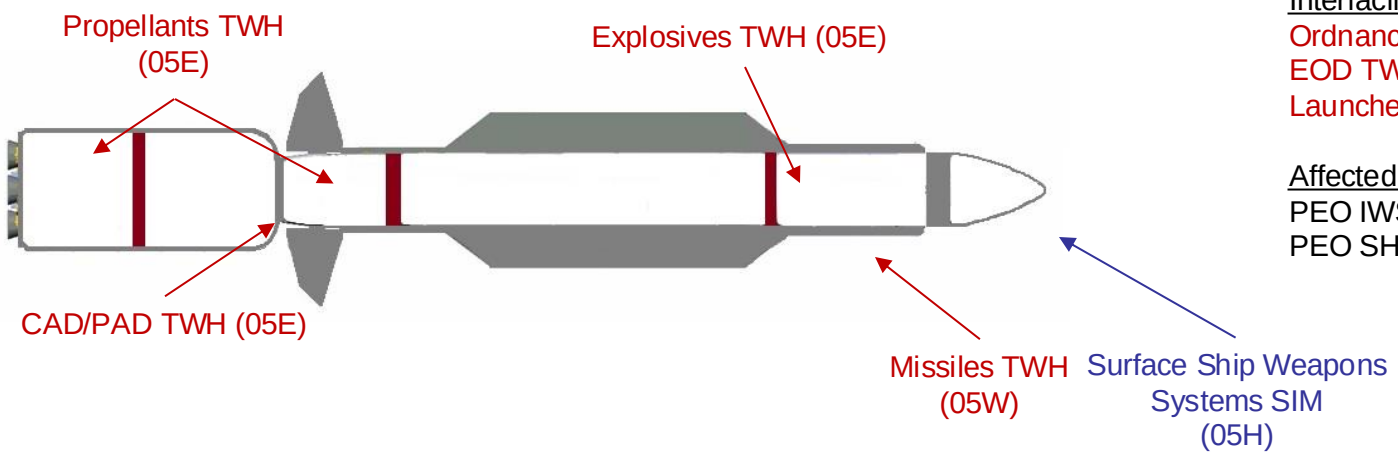
Who is Affected?

- Across NAVSEA, there is a general lack of awareness of where SEA 05E has technical authority and how that applies to Ships and NAVSEA writ large
- In many cases, SEA 05E is the technical authority for components and ingredients, not end items or systems
- Interfacing TWHs, SIMs, and PMs need to be aware that SEA 05E issues are also *their* issues

- *A simple missile example:*



Interfacing TWHs:
Ordnance PHST TWH (05E)
EOD TWH (05E)
Launchers TWH (05W)

Affected PEOs:
PEO IWS
PEO SHIPS/USC/SUBS

TWH = Technical Warrant Holder
SIM = Systems Integration Manager

Key Partners

- Energetic material systems require specialized facilities and expertise to develop and manufacture
- SEA 05E TWHs are heavily involved with Government and Industry partners to ensure safety and reliability
- Primary partners:
  - Naval Surface Warfare Center Indian Head Division (the only GO-GO Arsenal)
  - Naval Surface Warfare Center Crane Division
  - Naval Surface Warfare Center Corona Division
  - Naval Surface Warfare Center Dahlgren Division
  - Naval Surface Warfare Center Philadelphia Division
  - Naval Undersea Warfare Center, Division Newport
  - Naval Air Warfare Center Weapons Division, China Lake
  - McAlester Army Ammunition Plant
  - BAE, Holston Army Ammunition Plant (GOCO)
  - BAE, Radford Army Ammunition Plant (GOCO)
  - Lake City (GOCO)
  - Prime Contractors – Raytheon, Lockheed Martin, Northrup Grumman, Boeing
  - Johns Hopkins University/Applied Physics Laboratory

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Focus Areas

- Facilitating expedient transition of new and modified explosive ordnance solutions from concept to fleet introduction
- Enabling safe and supportable explosive ordnance solutions, with a focus on combating material obsolescence and reducing vulnerabilities in the manufacturing base
- Driving innovative solutions to outpace the scope and scale of emerging threats
  - Energetics are a pervasive enabler of range, speed, terminal effects, signature management and safety
    - Energetics are critical to our National Defense Strategy
- Support a renewed demand for munitions in the explosives industrial base, including surge capacity

SEA 05E and NSWC IHD

- SEA 05E and NSWC IHD are Key Partners
  - Six of nine 05E TWH's and Deputies are seated at IHD
  - IHD provides primary support for many of the technical pyramids
- As the only GO-GO Arsenal, IHD leverages all aspects of SEA 05E operational expertise:
  - Research & development / Science & technology
  - Design
  - Analysis
  - Qualification and Certification
  - Manufacturing and Lot Acceptance
  - Shipboard/System Integration and Systems Engineering
  - Disposal/Demilitarization efforts
  - Warfighter training and procedures
  - Risk assessments, hazard analyses, and failure investigations

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SEA 05E and NSWC IHD

- Necessary to leverage this relationship in order to:
  - Strengthen Technical Pyramids
  - Align Technical Expertise with Policy Expertise
    - Work together to support and build relationships with SEA 09 and NOSSA
  - Ensure Transition and Mission Support Success
    - Help to liaise with IWS and PO entities
    - Work together to ensure all “players on the field” are armed and ready

Questions

- Questions?

- Thank You!