NAVSEA
WARFARE CENTERS
Indian Head EOD Technology Division

Navy Fuze Science & Technology

Presented to:

National Defense Industrial Association

Virtual Fuze Conference (vFuze)

Presented by:

Naval Surface Warfare Center

Indian Head EOD Technology Division

August 4, 2020

Outline

- Navy Fuze Organizations Overview
  - Naval Surface Warfare Center (NSWC) Indian Head EOD Technology Division (IHEODTD)
  - NSWC Dahlgren Division (DD)
  - Naval Air Warfare Center Weapons Division (NAWCWD) China Lake (CL)
- Fuze Science and Technology (S&T) Projects and Thrust Areas
- Fuze S&T Roadmap
- Navy vFuze Presentations

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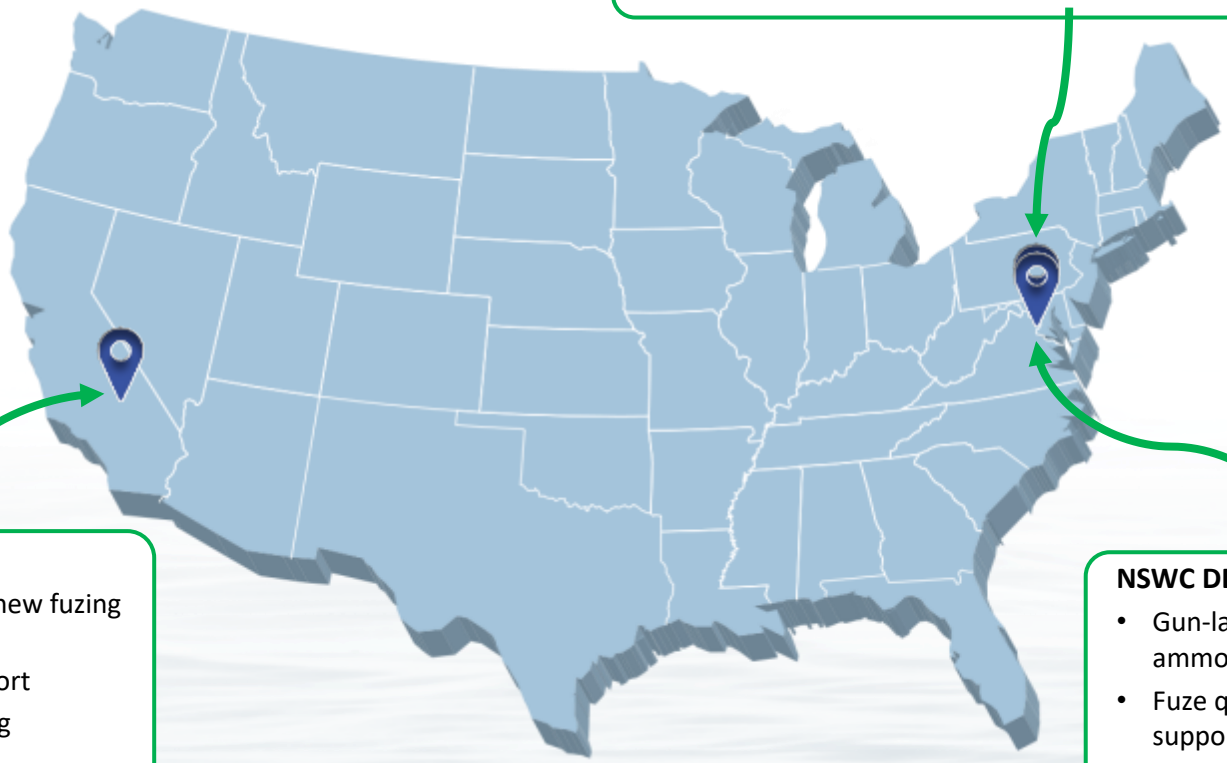
Navy Fuze S&T Strategic Locations

NSWC IHEODTD

- Naval Sea Systems Command Center of Excellence for Energetics
- DoD EOD program lead
- Expeditionary Exploitation Unit ONE (EXU-1)
- Co-located with Naval Ordnance Safety and Security Activity



NAWCWD CL

- Design and develop new fuzing concepts
- In-Service fleet support
- Extensive fuze testing capabilities

NSWC DD

- Gun-launched, conventional ammo fuzing
- Fuze qualification and fleet support
- Potomac River test range

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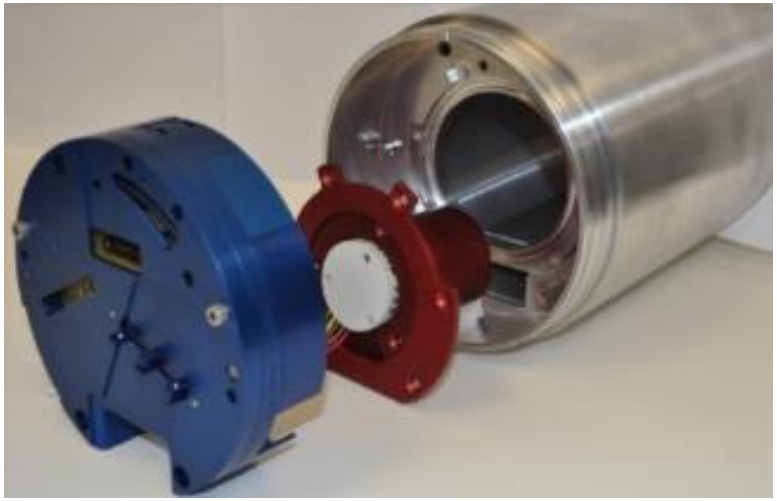
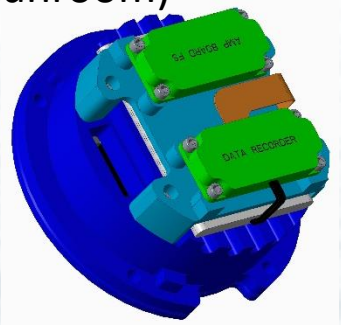
NSWC IHEODTD Fuzing Overview

- Fuze safety architectures, safety analysis, system safety
- Distributed fuzing, multipoint and embedded
- Firing systems and firesets
- Fuzes
  - Torpedoes
  - Mine / mine neutralization
  - 40mm grenade
  - 155mm
  - Hand emplaced
- Target detection
- Microelectromechanical Systems (MEMS) and energetics integration (explosively certified cleanroom)
- Energy harvesting
- Powerless environment sensors
- Rapid and continuous prototyping
- In-house production





NSWC IHEODTD Core Capabilities

- Electrical design and test
  - Electronic Safe Arm Devices (ESADs) and MEMS SADs
  - Sensing technologies, imbedded systems, RF design

- Initiation systems design and test
  - Micro-energetics, micro-firesets
  - Characterization (e.g., Photonic Doppler Velocimetry)

- Mechanical design and test
  - Fuze packaging
  - Full scale launch and impact testing (reverse impact available and explosive certified)
    - Guns up to 21” diameter
    - Speeds >2000 ft/s
  - MEMS
  - High G shock testing and survivability

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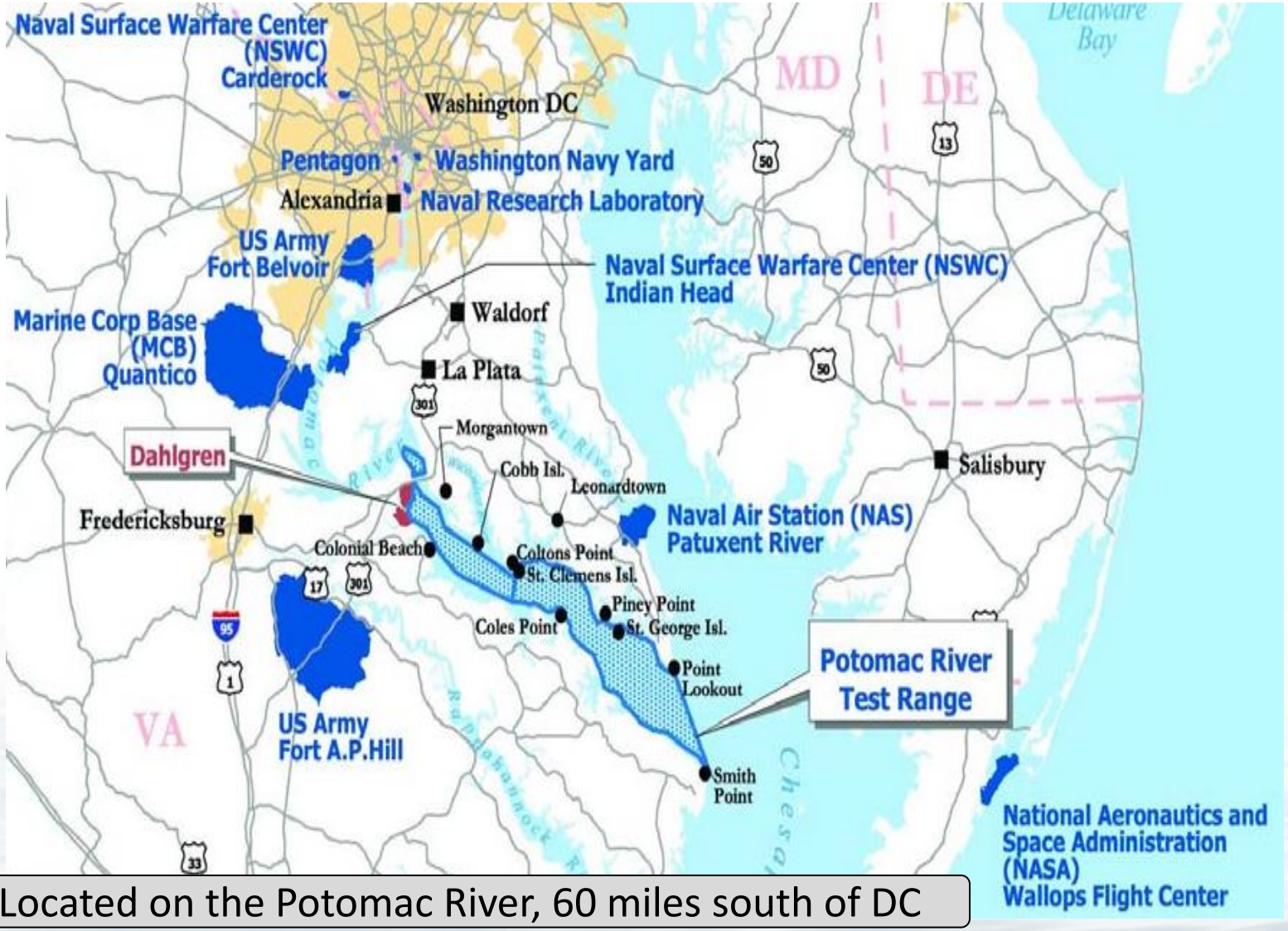
NSWC DD Overview



Located on the Potomac River, 60 miles south of DC

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NSWC DD Core Fuzing Capabilities

Development

- Gun-launched, conventional ammo fuzing
- S&A design
- Preparing specs and requirements
- Benchtop electronics testing
- CAD modeling and finite element analysis
- Rapid prototyping

Qualification

- Closed and open loop HWIL testing
- Execute and approve qualification testing
- Energetics and ballistic testing
- Extensive safety support with FISTRP representation

Fleet Support

- Direct communication with fleet
- Support various at-sea test events
- Respond to Conventional Ordnance Deficiency Reports (CODRs)
- Provide SME support/training

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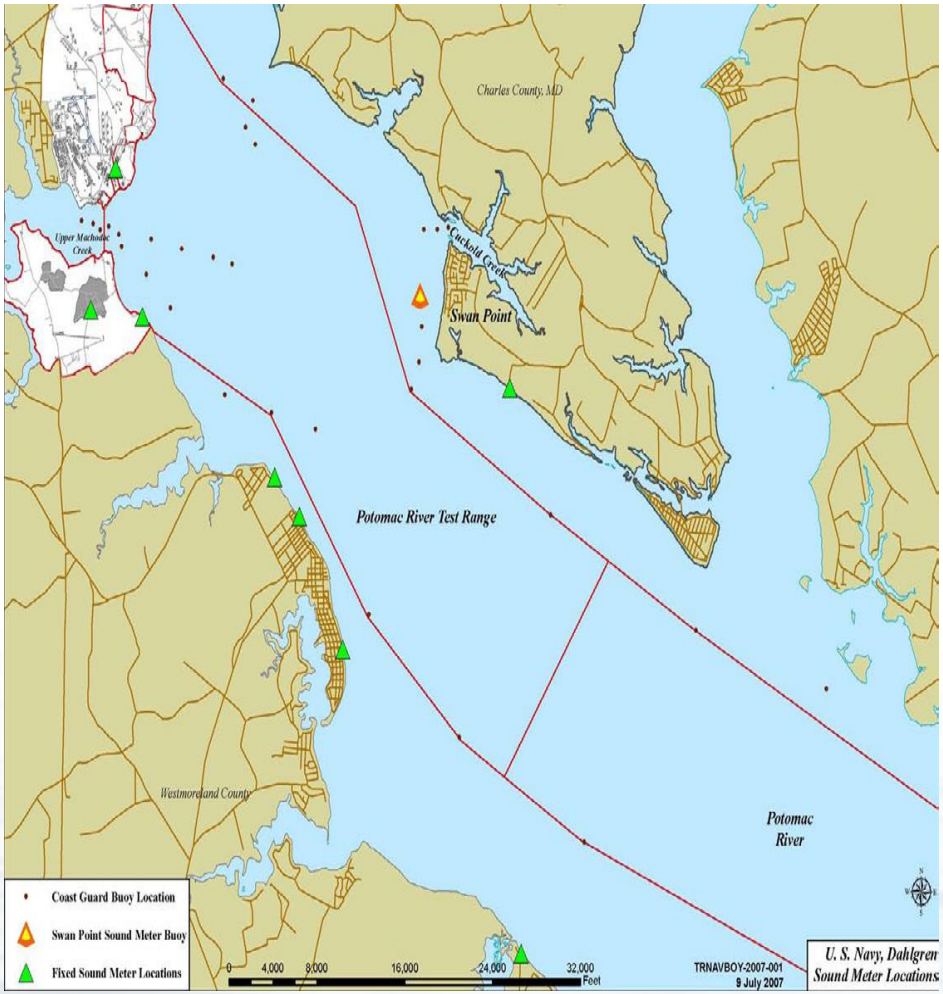
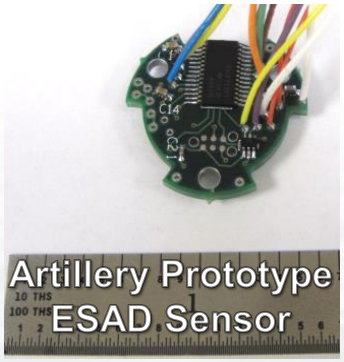
NSWC DD Potomac River Test Range

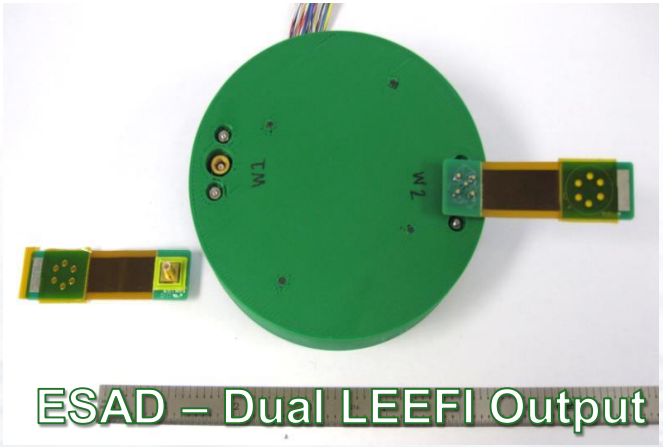
- 169 square miles of controlled water
  - Ballistic range of up to 20 nautical miles
  - Airspace clearance to 60,000 feet
- Fully instrumented network of range stations along Virginia shore of the Potomac River
- Over 2,300 acres of explosive ranges provide full spectrum of capabilities for live fire testing of energetics and directed energy systems
- Test range supports legacy, emergent, and “Navy after Next” programs
- Fuze test facility capable of:
  - S&A spin testing
  - Battery activation testing
  - Detonator time and explosive output testing
  - Fuze electronics testing
  - RF target simulation
  - Environmental testing



NAWCWD CL Engineering Overview

- Design and develop new fuzing concepts
  - Rapid prototyping (3D print or machined)
  - FPGA development and logic analysis (up to 208 channel)
  - ESADs, ISDs, FTSAs, test range fire-sets





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NAWCWD CL In-Service Fuze Support

- Over 50 years of combined experience
- Program support from production through sustainment and ordnance assessment
- Respond to CODR from the fleet

NAWCWD CL Fuze Testing Capabilities

- Environmental/functional test sites to support qualification, LAT, ordnance assessment (OA), recertification and experimental testing
- Capability on-site to test AUR configurations with both multi-shaker underwing and 6DOF capabilities
- Full suite of Insensitive Munitions test facilities
- Sled test capability

Navy Fuze S&T Thrust Areas

- Microelectronics and micro explosive trains
- 3D printed electronics and explosive components
- High-fidelity fuze testing >2000 ft/s
- Increased modeling and simulation capability
- Power sources
- Low power passive sensors
- Target detection sensors and algorithms
- Electronics packaging for extreme environment survivability

Navy Fuze S&T Road Map

JFTP - Fuze Components and Energetics

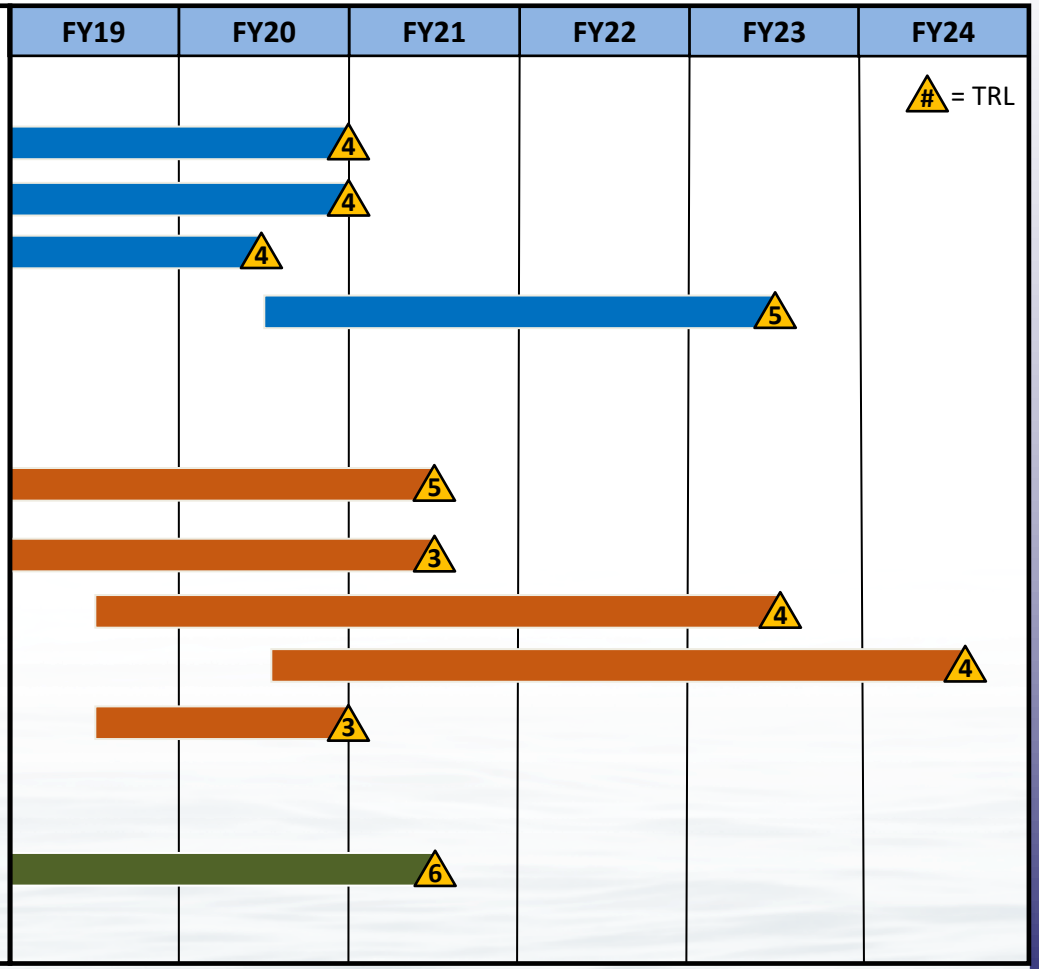
- Primary Explosives Electromechanical Fuzes
- Booster Explosive Improvement
- Memory Configuration Check
- Novel Safety and Arming Environments

JFTP - Modeling, Experimentation and Design Tools

- Electronics Encapsulation Dynamics Model Improvement
- Small Scale Test Improvement
- Improved Shock Modeling
- Encapsulation Aging Study
- Target Sensor Algorithm

6.2-6.4 Navy Funded Fuze Technology Efforts

- Cluster Munition Replacement



Navy vFuze Briefings

- Wednesday, August 5
  - 1305 to 1325: Fully Resettable MEMS Safe/Arm with Lock and Slider Position Feedback
    - Presenter: Daniel Jean, PhD