



DIGITAL PROVING GROUNDS
An Integrated Laboratory Environment for Surface Warfare

VACAPES
Virginia Capes Operating Area

Dam Neck Activity

Naval Surface Warfare Center Dahlgren Division

Navy Fuze Science and Technology Overview

65th Annual NDIA Fuze Conference

Presented by

Michael Deeds, Ph.D.
NSWC IHD

on behalf of Jason Koonts
NSWC DD

May 10, 2022

The Leader in Warfare Systems Development and Integration



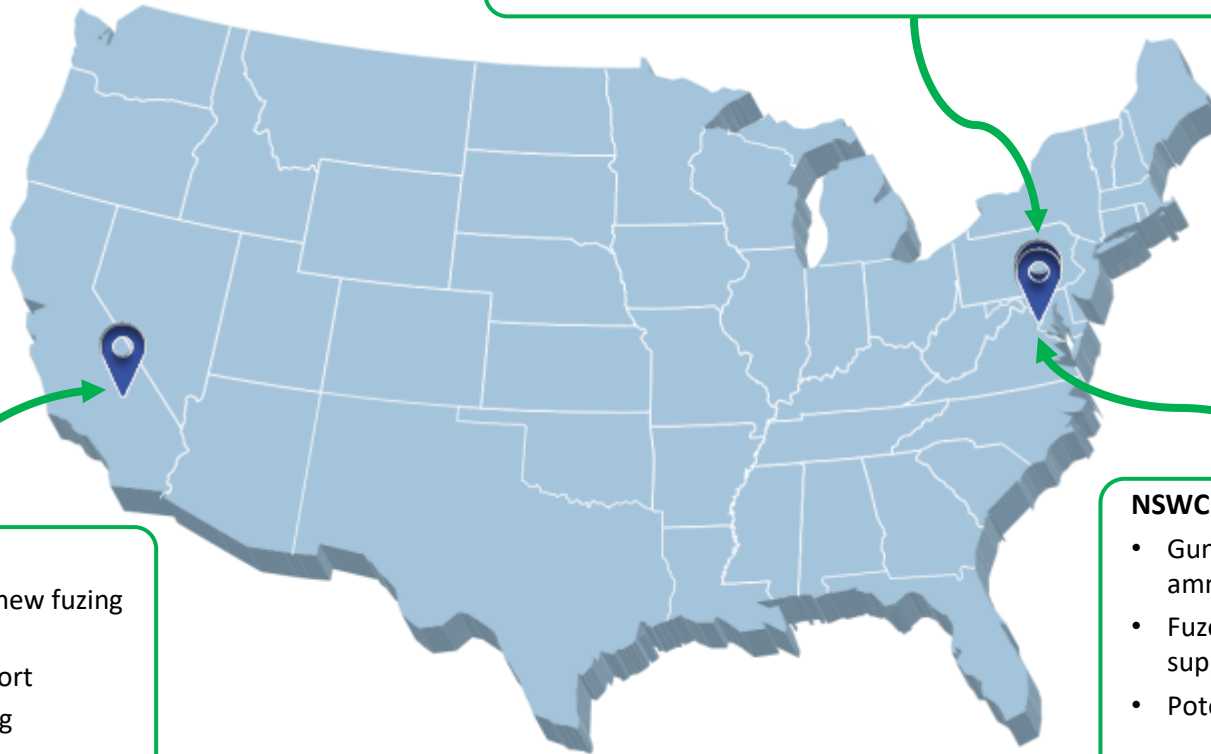
NAVAL SURFACE WARFARE CENTER
DAHLGREN DIVISION
DAHLGREN | DAM NECK



- Navy Fuze Organizations Overview
 - Naval Air Warfare Center Weapons Division China Lake (NAWCWD CL)
 - Naval Surface Warfare Center Dahlgren Division (NSWC DD)
 - Naval Surface Warfare Center Indian Head Division (NSWC IHD)
- Fuze Science and Technology (S&T) Thrust Areas
- Navy Safety Overview
- Conference Papers

NSWCIHD

- 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

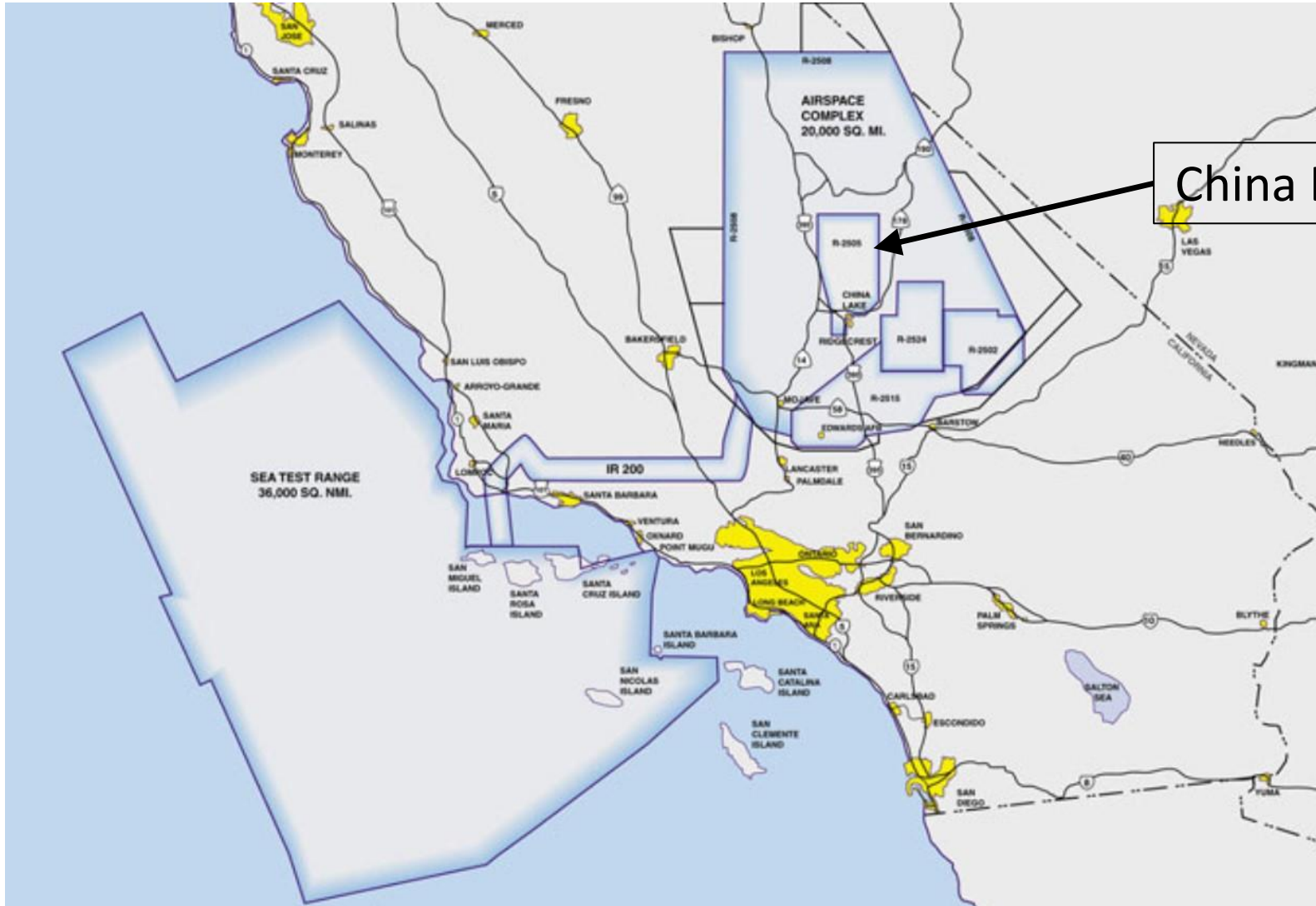


NAWCWDCL

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

NSWCDD

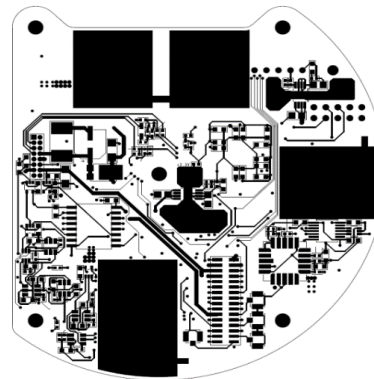
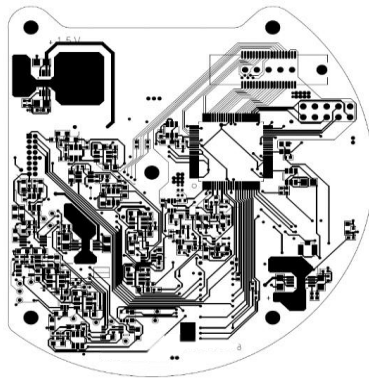
- Gun-launched, conventional ammo fuzing
- Fuze qualification and fleet support
- Potomac River test range



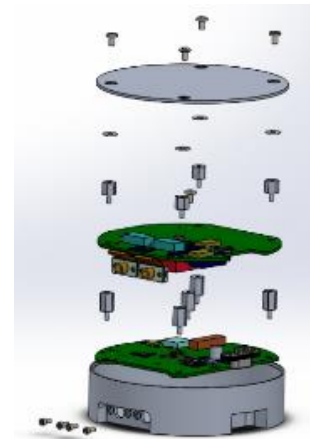


- **Rapid Prototype**
 - Verify sub circuitry components
 - Research and test new components for advancements in technology, cost and/or space
- **Fully equipped and calibrated laboratory**
- **In-house development**
 - Schematic design and simulation
 - Printed Circuit Board (PCB) layouts
 - Geometric dimensioning and tolerancing certified
 - Full scale modeling
 - J-STD-001 soldering certified
 - IPC-A-610 inspection certified
 - Explosives handling certified
- **Demonstrated capabilities**
 - Multi-point initiation, configurable initiation
 - Various distributed fuzing applications
 - Fuzing test hardware: miniature hardened data recorder, fuze light telemetry system, fuze system support module

Design and Validation Testing

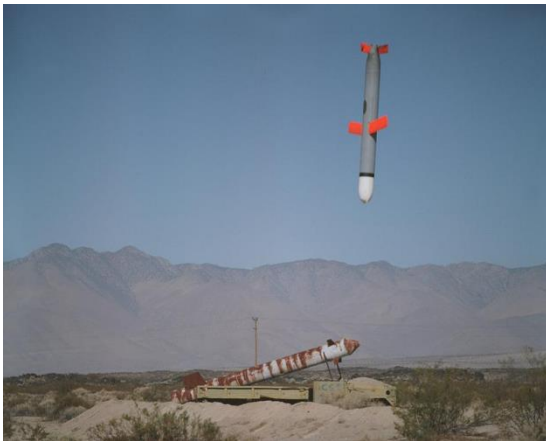


PCB Layout Capability



Modeling Capability

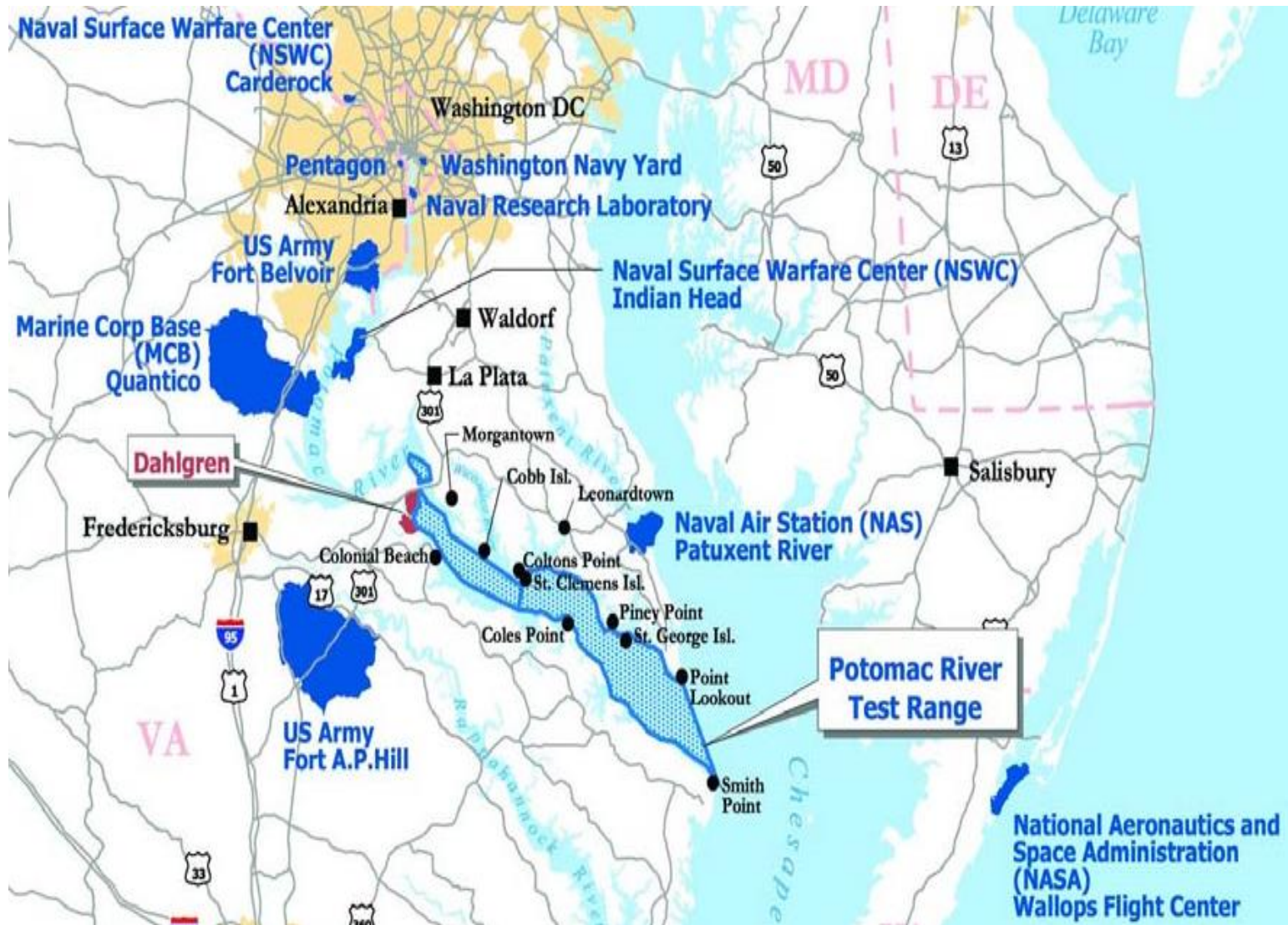
- Program support from production through sustainment and ordnance assessment
- Respond to Conventional Ordnance Deficiency Reports (CODR) from the fleet



- Environmental/functional test sites to support qualification, lot acceptance testing (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 (IM) test facilities.
- Sled test capability



Naval Surface Warfare Centers Overview



Development

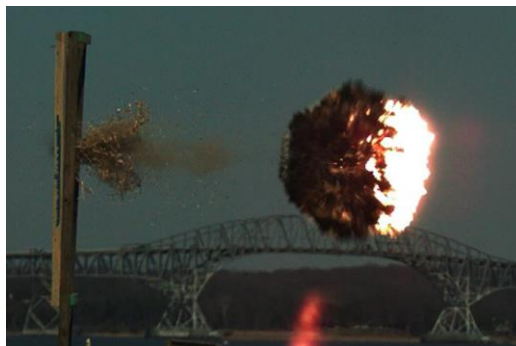
- Gun-launched, conventional ammo fuzing
- S&A design
- Preparing specs and requirements
- Benchtop electronics testing
- CAD modeling and finite element analysis
- Rapid prototyping

Qualification

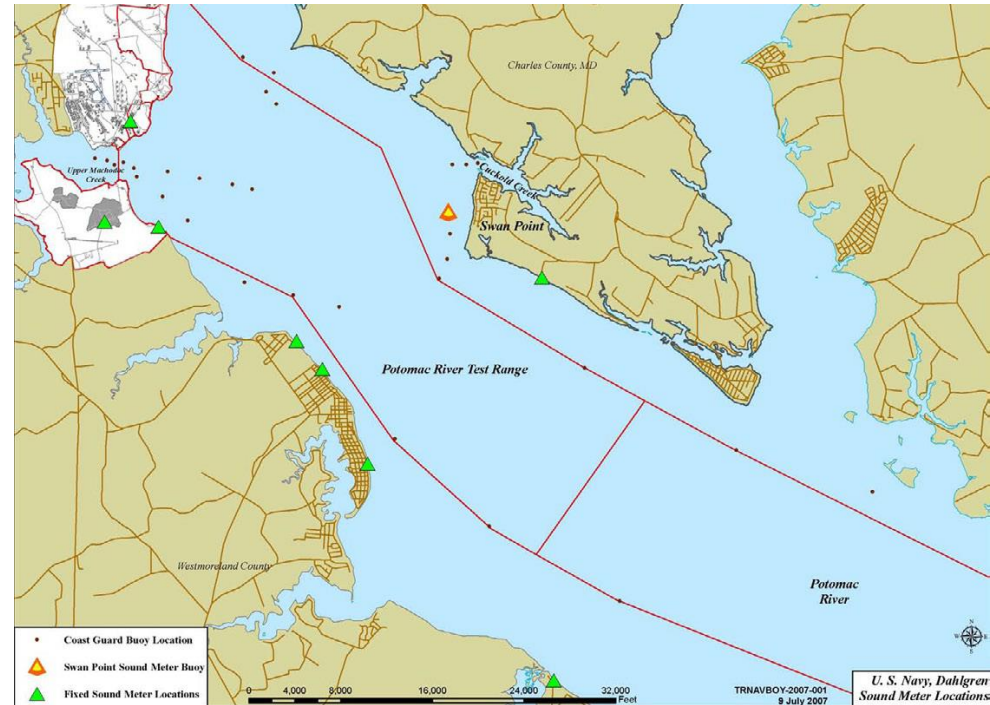
- Closed and open loop HWIL testing
- Execute and approve qualification testing
- Energetics and ballistic testing
- Extensive safety support with FISTRP representation

Fleet Support

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

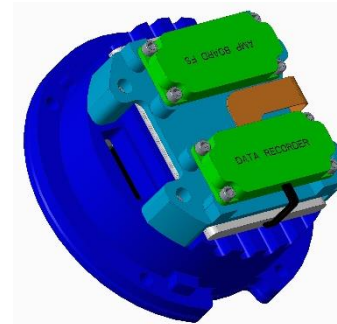
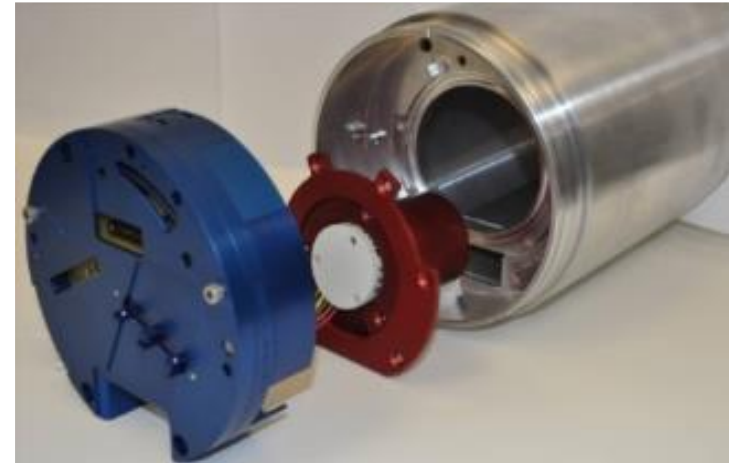


- 169 square miles of controlled water
 - Ballistic range of up to 20 nautical miles
 - Airspace clearance to 60,000 feet
- Fully instrumented network of range stations along Virginia shore of the Potomac River
- Over 2,300 acres of explosive ranges provide full spectrum of capabilities for live fire 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

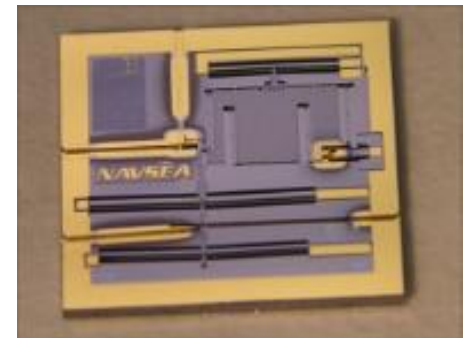


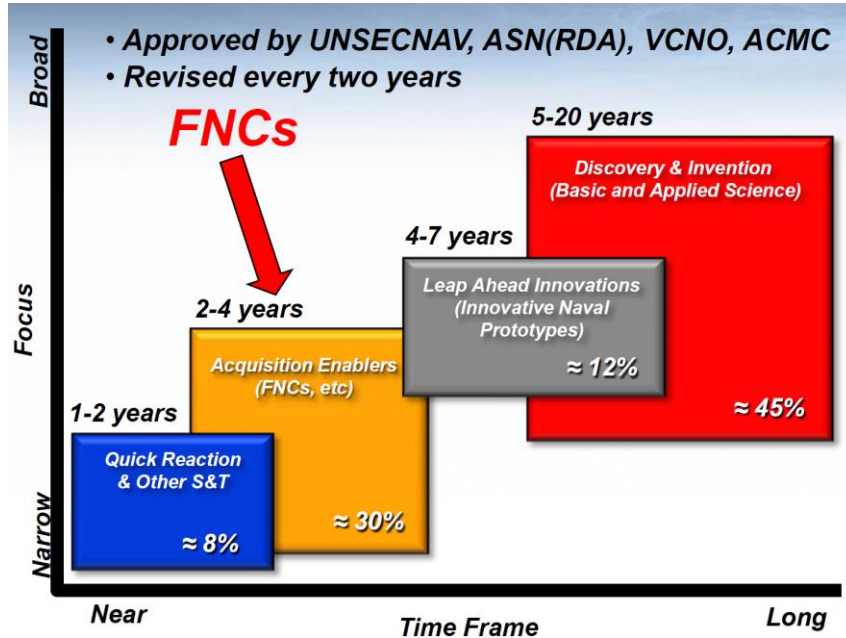
NSWC Indian Head Division provides R & D, assessment, qualification, and production of safety and arming (S&A) devices and fuzes for both government and commercial organizations

- Interdisciplinary team of engineers and scientists spanning a 170 staff division
- Research and development of technology pushing the state-of-the-art in S&A and fuzing technology
- Supporting all warfare domains
- Assessment of legacy systems
- Expertise in safety requirements and review process
- Full end to end lifecycle support from basic research to demilitarization

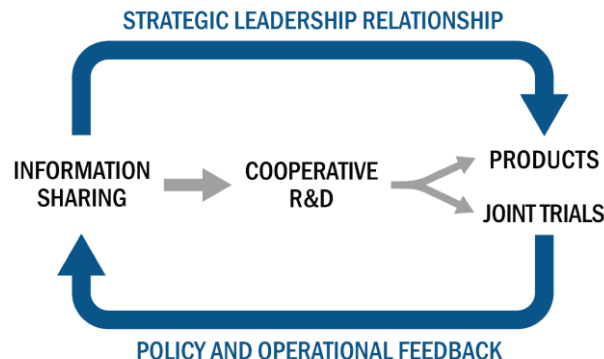


- Design and testing
 - Electronic Safe Arm Devices (ESADs) and MEMS SADs
 - Sensing technologies, imbedded systems, RF design
 - Power sources & energy harvesting
 - Cleanroom facilities
- Initiation systems
 - Micro-energetics, micro-firesets
 - Characterization (e.g., Photonic Doppler Velocimetry)
- Survivability
 - Fuze packaging
 - Full scale launch and impact testing
 - Guns up to 21" diameter; speeds >2000 ft/s
 - Inert and live ranges
 - High G shock testing and survivability
- Sensors
 - Environmental and target detection sensors
 - Algorithms

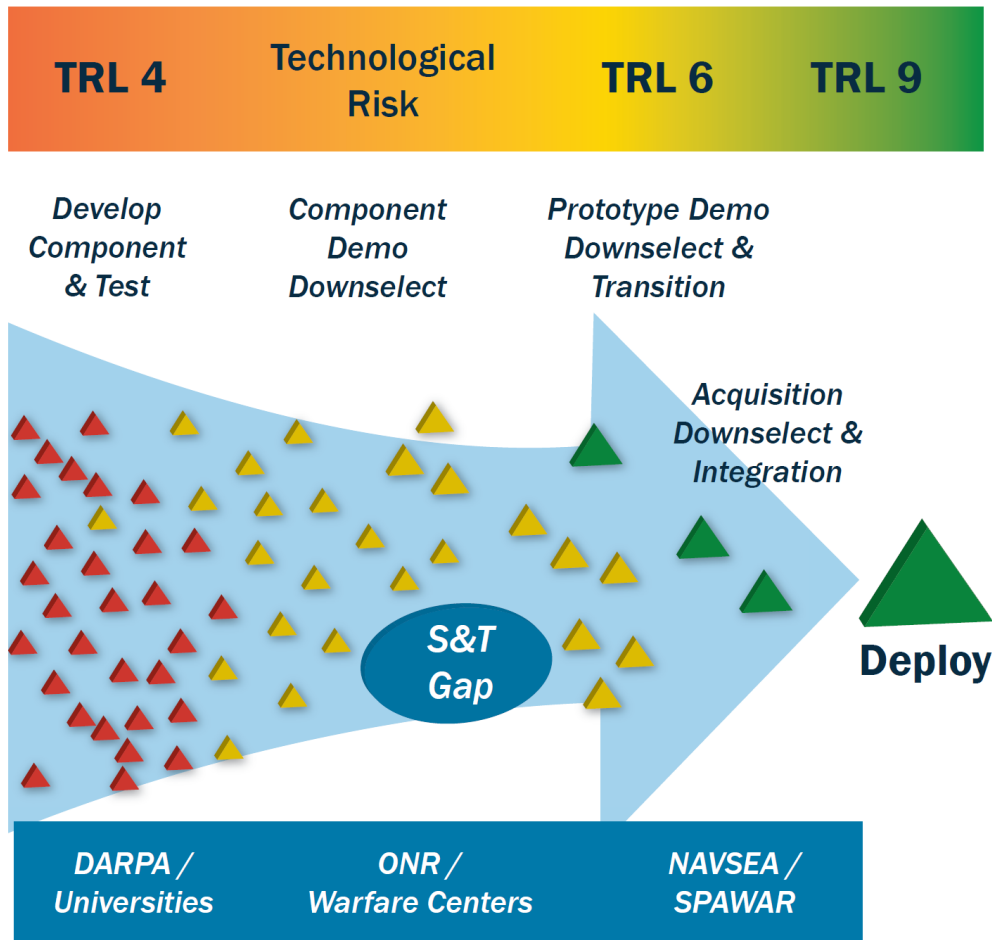




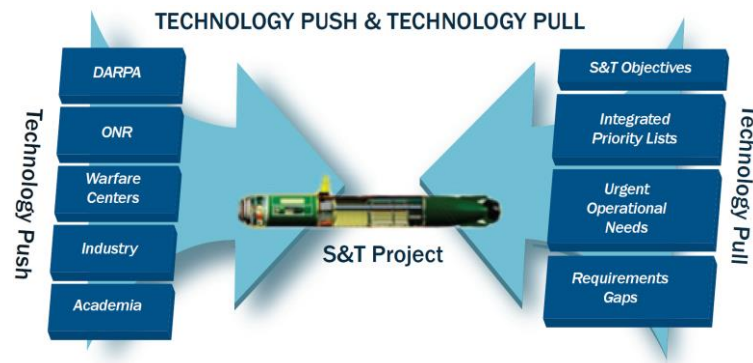
- Autonomy and unmanned systems
- Expeditionary and irregular warfare
- Power and energy
- Precision direct and indirect fires
- Deeper and more cost-effective conventional magazines
- Electric weapons and directed energy
- Hypervelocity and long range
- Total ownership cost



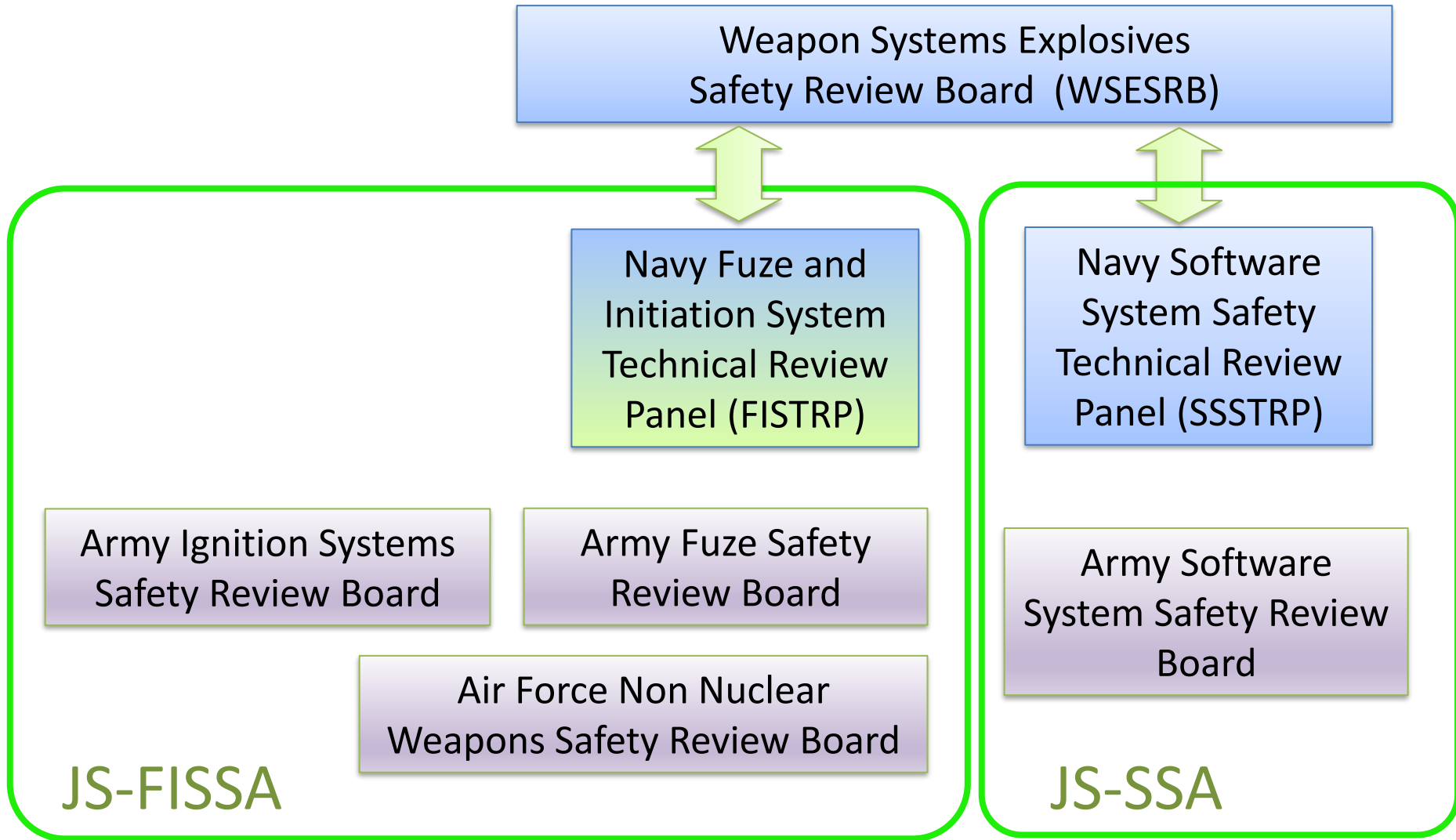
S&T TO MEET CAPABILITY NEEDS



Warfare Centers and private industry involved throughout design lifecycle



	FY22	FY23	FY24	FY25	FY26	FY27
Thrusts Areas						= TRL
Extreme environment survivability						
Component modeling for advanced M&S						
Signal generation and processing techniques						
Novel Safety and Arming environments						
Safety analysis techniques to expand design options						
Alternative critical component technologies						



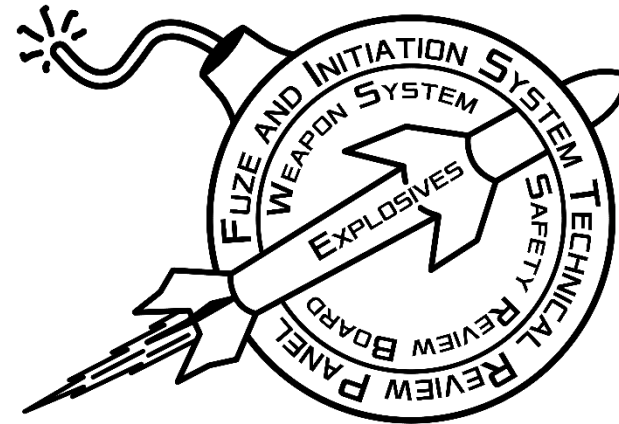
- WSESRB formed after 1967 fire aboard USS Forrestal (CV-59)
 - Investigation recommended independent review process be established
- NAVSEAINST 8020.6E
 - “...the WSESRB is the Navy’s independent oversight for safety compliance of all DON military munitions...”
 - “The FISTRP reviews specific safety aspects requiring expertise in the area of design, analyses, and testing of fuzes, initiators, safe/arm devices and ignition systems contained in weapon systems.”

- Panel Chair:

- Gabriel Soto - NAWCWD CL

- Panel Members:

- Ralph Balestrieri – NSWC IHD
 - Tinya Coles-Cieply - NOSSA
 - Michael Demmick - NOSSA
 - Michael Haddon - NAWCWD CL
 - Bradley Hanna - NSWC DD
 - John Hughes - NAWCWD CL



- John Kandell - NAWCWD CL
 - Jason Koonts - NSWC DD
 - Melissa Kennedy – NSWC IHD
 - Adedayo Oyelowo – NSWC IHD
 - Ciarra Villa - NAWCWD CL

- Survivable Fuzing for High-Speed Engagements of maritime Targets (24237)
 - *Kevin Cochran*
- High Shock Modeling of Fuze Components (24240)
 - *Chris Cao*
- Superfast Signals in Arena Tests (24225)
 - *Dr. Nicholas Nechitailo*
- High Reliability Dual Purpose Improved Conventional Munition Replacement Project (24232)
 - *Evan Young*
- Safe and Arm Sensing for Small UAS (24236)
 - *Caitlyn May*
- High Voltage Fireset Component Behavior at Elevated Temperatures (24239)
 - *Chris Cao*