Naval Surface Warfare Center Dahlgren Division

Navy S&T Strategy

62nd NDIA Fuze Conference

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Presented by

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The Leader in Warfare Systems Development and Integration

NAVSEA WARFARE CENTERS DAHLGREN

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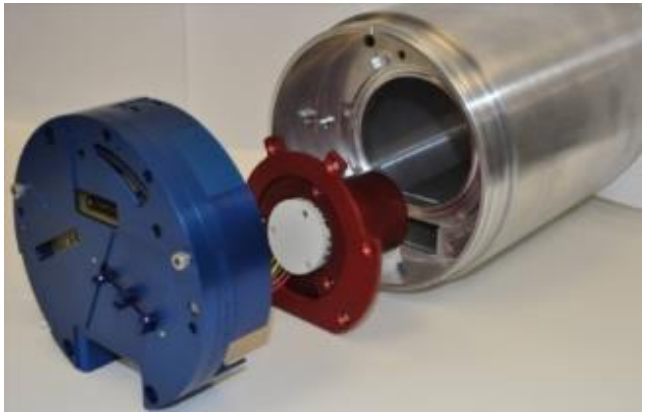
Outline

- Navy Organizations
  - NSWC IHEODTD
  - NSWC DD
  - NAWCWD CL
- Navy Safety Overview
  - FISTRP
  - FESWG
- Navy Fuze R&D Highlights
- Conference Papers

Strategic Locations

NSWC IHEODTD Fuzing Overview

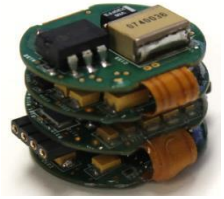


- Fuze safety architecture
- Distributed fuzing
- Firesets
- Underwater fuzes
  - Torpedoes (e.g., Anti-Torpedo Torpedo)
  - Mine/mine neutralization
- MEMS and energetics integration (explosively certified cleanroom)
- Energy harvesting
- Powerless environmental sensors
- Rapid prototyping/circuit board layout

NSWC IHEODTD Core Capabilities

Electrical Design and Test

- Electronic Safe Arm Devices (ESADs)
- Sensing technologies, imbedded systems, RF design

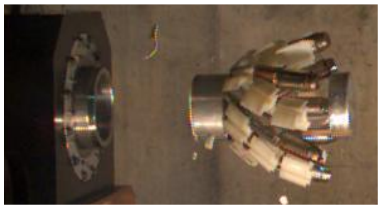


Initiation Systems Design and Test

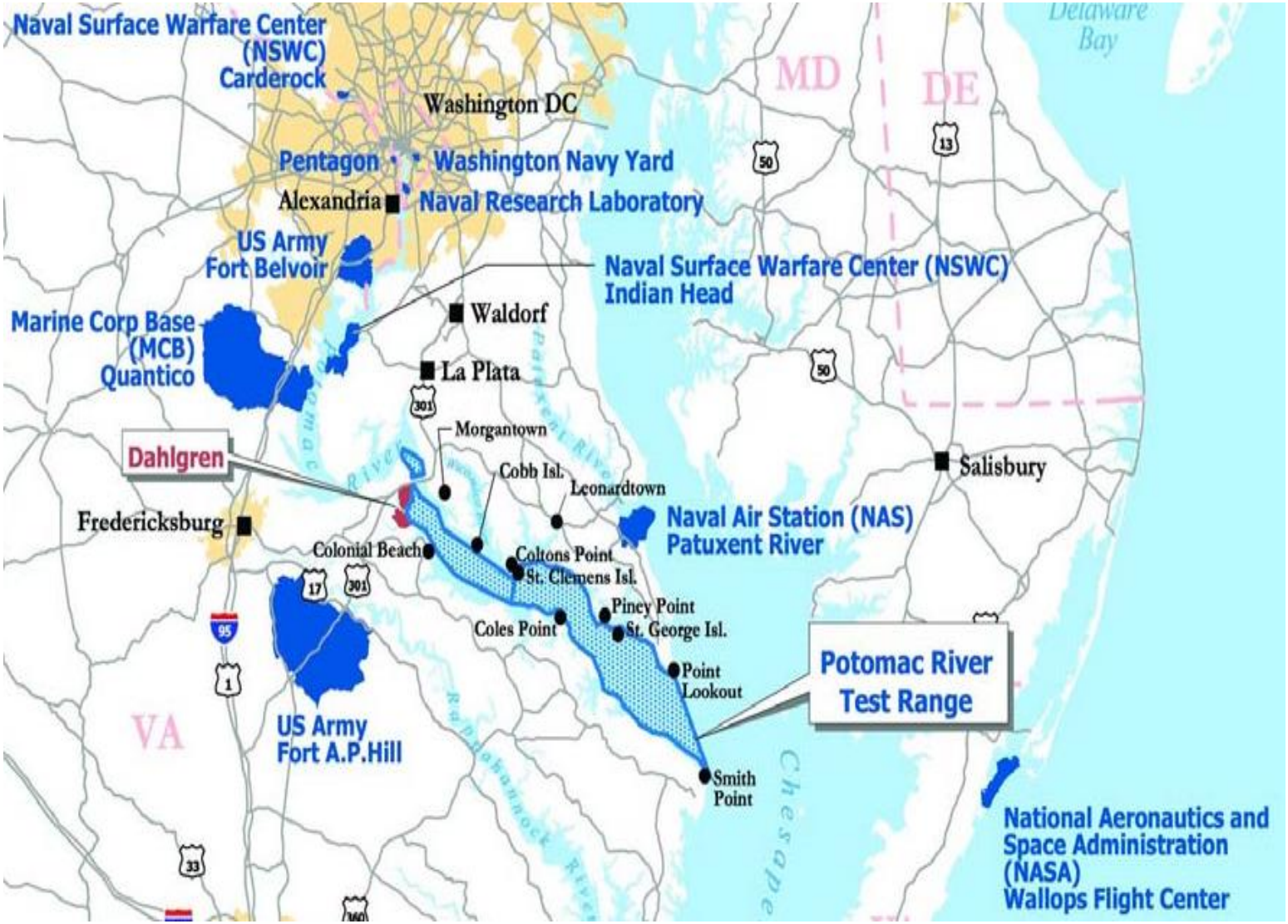
- Micro-energetics
- Characterization (e.g., Photonic Doppler Velocimetry)

Mech. Design and Test

- Fuze packaging
- Full scale launch and impact testing
- Microelectromechanical Systems (MEMS)
- High G shock testing and survivability



NSWC Dahlgren



Located on the Potomac River, 60 miles south of DC

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

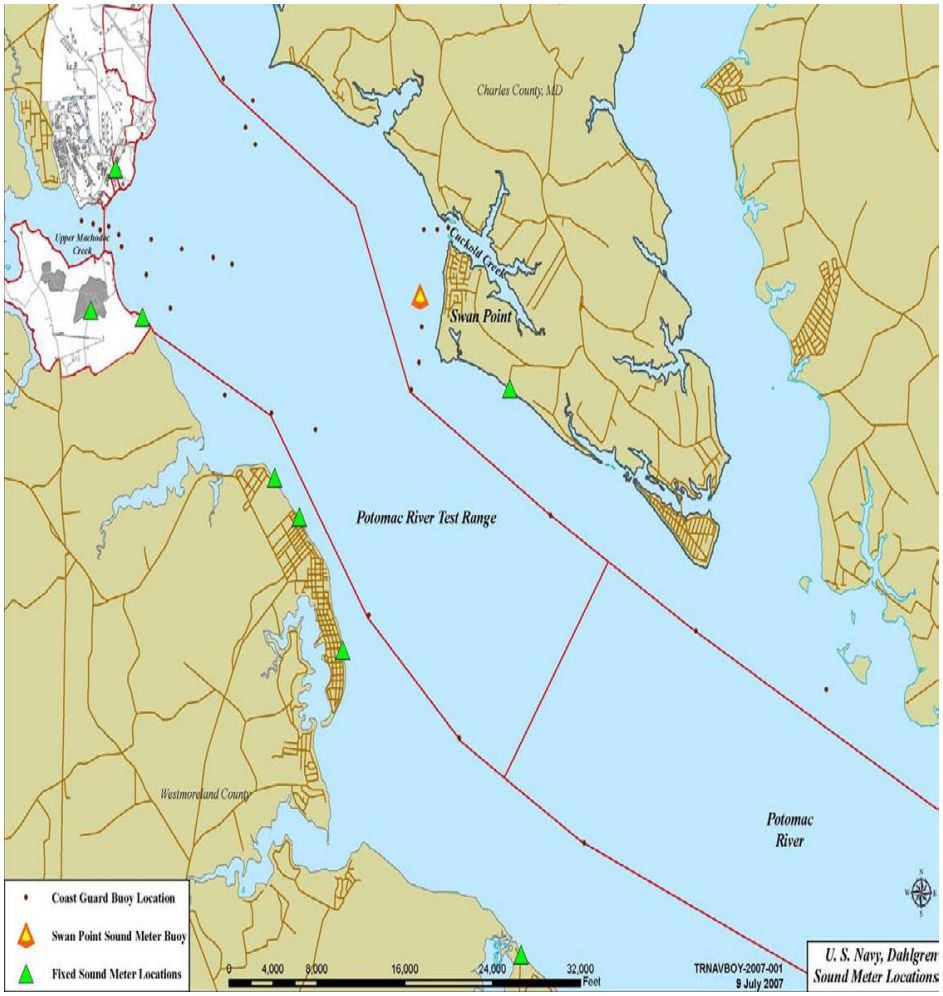
- Closed and open loop HWIL testing
- Execute and approve qualification testing
- Energetics and ballistic testing
- Extensive safety support with FISTRP representation

FLEET SUPPORT

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

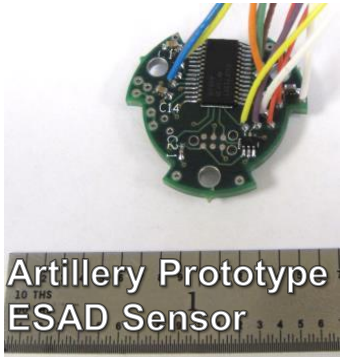
Potomac River Test Range

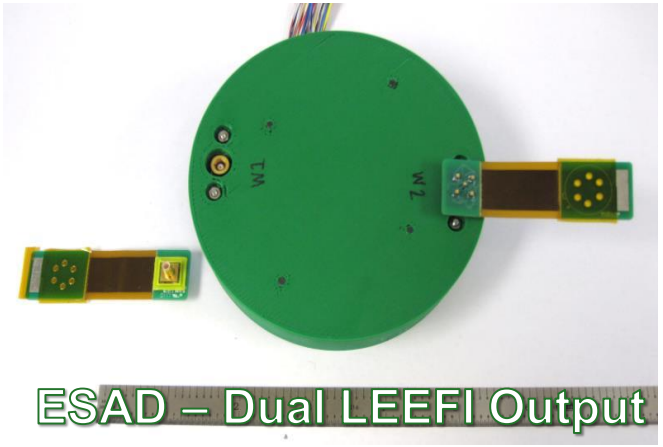
- 169 square miles of controlled water
  - Ballistic range of up to 20 nautical miles
  - Airspace clearance to 60,000 feet
- Fully instrumented network of range stations along VA shore of the Potomac River
- Over 2,300 acres of explosive ranges provide full spectrum of capabilities for live fire testing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

- Design & 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





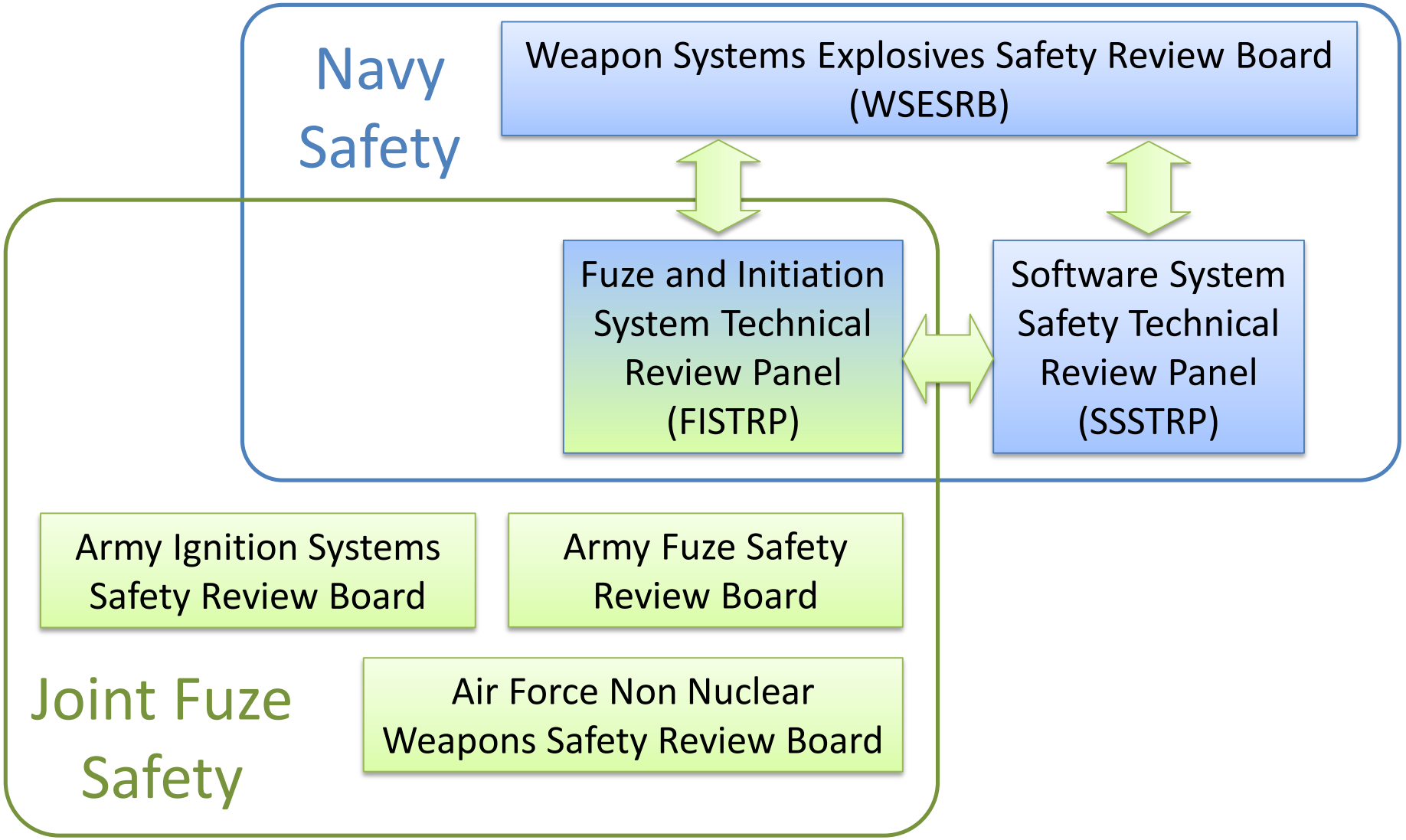
In-Service Fuze Support

- Over 50 years of combined experience
- Program support from Production through Sustainment and Ordnance Assessment
- Respond to Conventional Ordnance Deficiency Reports (CODR) from the fleet

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 (IM) test facilities.
- Sled test capability

Navy and Joint Services Safety



Navy Ammunition Safety

- WSESRB formed after 1968 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."

FISTRP Process

- Formal Reviews
  - FISTRP will draft meeting notes and record action items
  - FISTRP chair briefs WSESRB, who formally release FISTRP findings to Program
  - SSSTRP has similar process for software reviews
- Technical Assists
  - Informal meetings
  - Treated as SME opinion from available FISTRP members
  - Program can record meeting minutes, which FISTRP will review

JOTPs

MIL-STD-1316 STANAG 4187
MIL-STD-1901 STANAG 4368
MIL-STD-1911 STANAG 4497

FISTRP Membership

- Panel Chair:
  - Gabriel Soto - NAWCWD CL

- Panel Members:
  - Ralph Balestrieri - IHEODTD
  - 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
  - Daniel Lanterman- IHEODTD
  - Melissa Milani - IHEODTD
  - Adedayo Oyelowo - IHEODTD
  - Ciarra Villa - NAWCWD CL

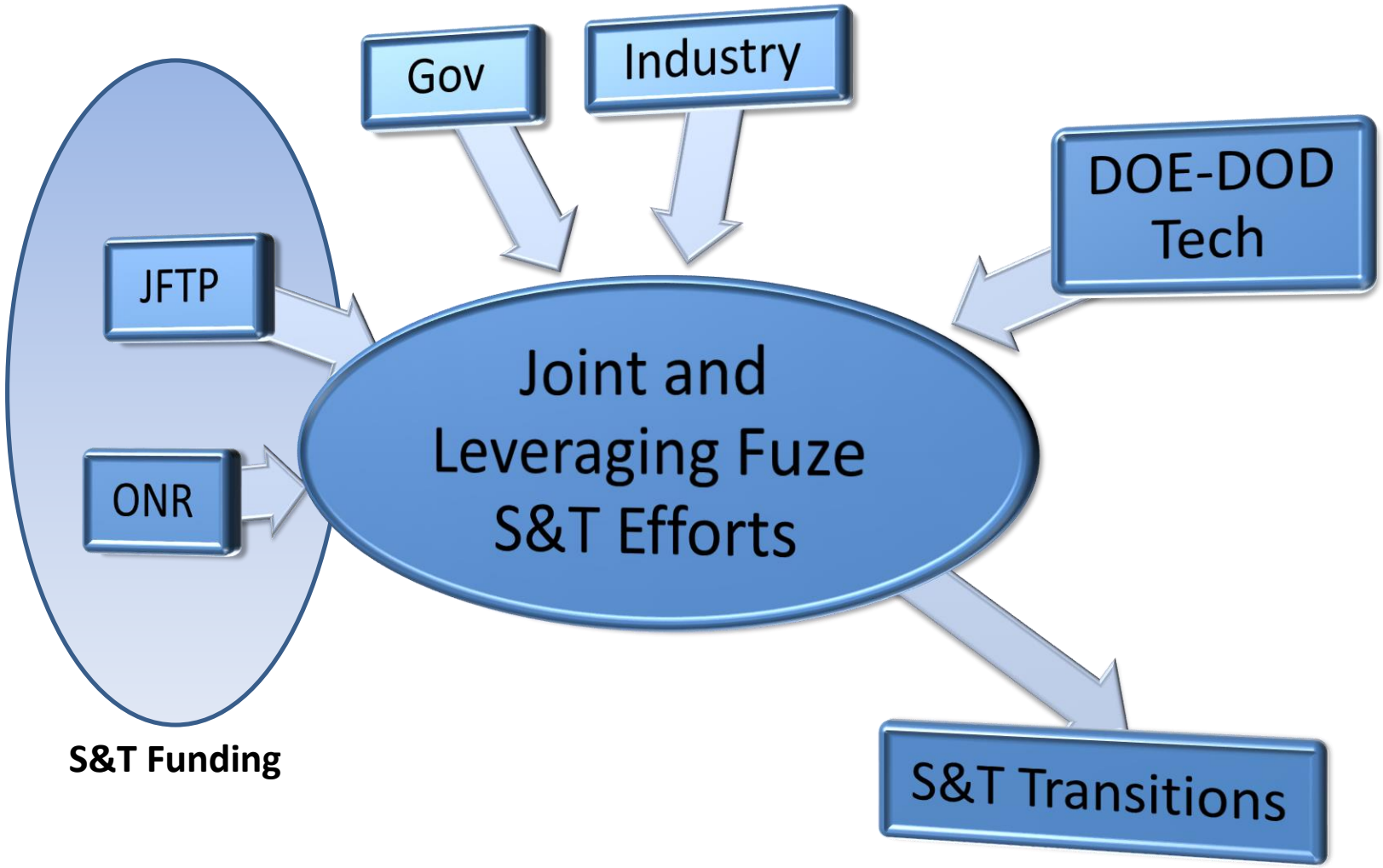
FESWG

- Fuze Engineering Standardization Working Group
  - Chartered as a Joint Standardization Board (JSB) by the Defense Standardization Program (DSP)
    - Approaching the 100th meeting, originated in the 1970's
  - Objective is to achieve common, mutually satisfactory solutions to shared requirements and problems
- Chairperson
  - Homesh Lalbahadur, US Army, Picatinny Arsenal, NJ

Current FESWG Efforts

- Guidelines for evaluation of electronic safety and arming systems
- MIL-STD-1911B for hand-emplaced munitions
- MIL-STD-1901B for ignition safety devices
- Design requirements for remotely controlled safety, arming, and functioning (SAF) systems
- Safety design criteria for command and control of directed energy weapons
- Interface with NATO groups for international fuzing safety requirements

Fuzing Technology



Navy Fuze S&T Efforts

- ONR: High Reliability Dual-Purpose Improved Conventional Munition (DPICM) Replacement
- JFTP (Joint Fuze Technology Program)
  - Advance proximity sensing
  - Hard Target Survivability – Modeling & Simulation, Testing, Encapsulation, Materials
  - MEMS and micro-explosive train reliability

Summary of Navy Conference Briefs

- Session 4A (Open)
  - DoD MEMS Fuze Explosive Train Evaluation and Enhancement (8:00am-8:20am)
    - David Muzzey, NSWC IHEODTD
- Session 4B (Closed)
  - Electrical Transmission Line Replacement for Det-Cords in Flight Termination Systems (8:20am-8:40am)
    - Dustin Atwood, NAWCWD CL)
  - EFI Fire Pulse Delay Circuit (10:40am-11:00am)
    - Michael Haddon, NAWCWD CL)

Summary of Navy Conference Briefs

- Session 5A (Open)
  - Survivability and Reliability of Silicon MEMS Components (2:20pm-2:40pm)
    - Caitlyn May, NSWC IHEODTD
- Session 5B (Closed)
  - Small-Scale Testing of Electronic Components in Shock Loading (2:00pm-2:20pm)
    - Vasant Joshi, NSWC IHEODTD