NDIA 50th Annual Fuze Conference UNITED STATES NAVY OVERVIEW

Stephen Mitchell
Co-Chair, Naval Energetics Enterprise
OUTLINE

• Navy Energetics Enterprise – NEE
• Navy Safety Board Structure
• Air, Surface, Undersea Navy Programs
• Emerging Technology
• Summary
• Collaboration to provide best technical solutions for Warfighter needs

• Achieve long-term cost avoidance resulting from shared people and facilities
Navy Fuze Safety Review Process

Weapon System Explosives Safety Review Board – WSESRB

Fuze Initiator System Technical Review Panel - FISTRP

Joint Programs

Software System Safety Technical Review Panel - SSSTRP

Army Fuze Safety Review Board

AF Non Nuclear Weapons Safety Board
# Fuze Initiator System Technical Review Panel

**FISTRP**

Panel Chair – Jack Waller

<table>
<thead>
<tr>
<th>Panel Members</th>
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</thead>
<tbody>
<tr>
<td>Ralph Balestieri</td>
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<td>Brad Hanna</td>
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<td>John Hendershot</td>
<td>George Hennings</td>
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<td>Dave Libbon</td>
<td>Scott Pomeroy</td>
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<td>Dave Riggs</td>
<td>Gabe Soto</td>
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<td>Brian Will</td>
<td>John Kandell</td>
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<td>Ray Ash</td>
<td>Gene Marquis</td>
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## Current Topics of Interest/Challenge

- Evolving Requirements Definition (within FESWG)
- Move to STANAGS
- 1901A/23659B – In-Line Ignition Safety Device (ISD)
- Programmable Logic Devices (PLD) Implementation
- Built In Test (BIT)
FMU-139 Family
Electronic Bomb Fuze

- FMU-139C/B Currently Being Procured From KDI and ATK
  - Replenish Current Aging Inventory
  - Extended Operational Life With FFCS
FMU-139 PIP Efforts

- Currently Being Conducted at KDI and ATK
- Enhanced Capabilities Demonstration
  - Serial Data Interface
  - Increased Penetration
  - In-Line Explosive Train
  - Increased Reliability
FMU-139D/B

- Next Version of FMU-139
  - Enhanced Capability
  - Enhanced Reliability

Planned Full & Open Competition
RFP Release Late FY-06
HI-REL FUZE

• Next Generation Fuze For Precision Guided Munitions
  • Dual Mode LGB, JDAM
• Higher Reliability
  • Eliminate external devices such as Fuze Function Control Set (FFCS), Mk-122 Arming System Switch, M 70 Series Cable, and associated electrical and mechanical connections (i.e. lanyard)
  • Incorporate Pre-Release Checks
• Safety Architecture Integral With MIL-STD-1760 Interface and Weapon Guidance Control Unit
• NAWCWD Conducting Tests to Evaluate Compliance of Approach with MIL-STD-1316
Gunnery Programs

- Long Range Guided Projectiles in Development:
  - ERGM, BTERM, & LRLAP
  - 41nmi+
Gunnery Programs

- Short Range Self-Defense Projectiles:
  - 5” Guns Have 3 New Projectiles: KE-ET, HE-ET, HE-MFF
  - Minor/Medium Caliber Guns
    - 25mm
    - 30mm
    - 57mm
    - 76mm
Gunnery Fuze Production Programs

- Low Cost Fuzing
  - MOFN Instead of MFF for Most Threat Scenarios

- Producible Fuzing:
  - Need Battery for Next Production of MFF
  - Testing Diehl/Eagle Picher Batteries
Future Undersea Weapon S&A

MEMS S&A package
- Miniaturization of safety and arming and initiation components
- Enables common S&A for multiple platform deployment
- Ruggedness demonstrated in harsh environments

- Multi-Mission Capable
  - Single S&A configuration for multiple missions & platforms
  - Multi-point warhead initiation

- Safety Features
  - IMU based Safe Separation System
  - Safe-arm indication, safing switch

Packaged MEMS S&A Chip
**Redundancy**

- Two Recorders per Bomb
- Two Accelerometers per Recorder
- Non-Volatile Memory

**Data Recorder**

**Shock Hardened Recorder**

**Redundancy**

- Two Recorders per Bomb
- Two Accelerometers per Recorder
- Non-Volatile Memory

**FY06 JABS S&T**

- Flight tests with instrumented Fuzes
- Record water impact signature
- Monitor response of (FMU139) impact switches

**FY07 Evaluate JABS lethality in the Very Shallow Water (VSW)**

- Fuze (FMU139) with pre-selected delay times to increase bomb effectiveness against mines / obstacles in the surf zone
- Bomb detonates at optimum position in range of water depths
- Increase lethality against mines and obstacles

**MK-84**

**JDAM Tail Kit**

**JDAM Assault Breach System JABS**
ANTI-SWIMMER GRENADE (ASG)

Force Protection
- Designed to protect assets from attack by SCUBA swimmers

Safety
- ASG will detonate only underwater beneath a predefined safety depth
- Will harmlessly render itself safe if it is activated but fails to see the correct arming environments

Features
- Electronic In-Line Safe-Arm Device
- Hand-Emplaced Ordnance design meets MIL-STD-1911
- User-selectable function depth (10-ft to 100-ft in 10-ft increments)
Gunnery Technology Fuzing Thrusts

- Low Cost Guidance:
  - GIF & PGK
  - Developing Next Generation GPS Receiver
    - Small Size (<1.5 in²)
    - Low Cost (<$500)
    - Low Power (<1 Watt)
ONR Future Naval Capability (FNC) Program
IMU Based Safe Separation System

- Miniature (MEMS based) Inertial Measurement Unit (IMU) embedded in S&A to measure safe separation distance

- Flexible IMU-based safety algorithm that incorporates:
  - Weapon post-launch position determination independent of guidance system
  - Two independent parallel algorithms for fault tolerance

- COTS IMU sensor integrated into S&A

- FY06: in-water tests of IMU sensors
ONR Discovery & Invention (D&I) S&T Program
MEMS S&A Technology

- Capitalizes on commercially available IC large scale batch fabrication techniques
- Enables weapon system integrated fuzing for multi-mission and scaled effect capability
- Reduces fuze cost and size

Status:
Completed characterization of 1st prototype S&A components and devices in laboratory ... long throw actuators, G sense locks & impact sensors

Designed & fabricated hermetic cap chips

MEMS in-situ detonator based S&A device technology currently TRL 4

From tens of mechanical parts per fuze to 100’s of fuze chips per single wafer
ONR Discovery & Invention (D&I) Program
In-Situ Micro Detonator Technology

- Energetics formed in-situ after MEMS fabrication
- No energetic waste material
- No processing equipment exposed to energetics

Status:
Developed in-situ (dry) conversion process
Demonstrated explosive transfer to qualified booster materials; RSI-007, PBX-N5 & Comp A-5
Currently conducting detonation characterization experiments

MEMS in-situ micro detonator technology currently TRL 4
Summary

The Path Forward …

Joint Fuze Technology Program

• Navy PM/PEO community validated weapon requirements and needs that fed into the Joint Fuze Technology Program (DoD Fuze IPT)
  • Joint Fuze Technology Program will leverage on Navy S&T efforts and advancements

• Examples of Navy Future Capabilities Needed
  • Hard and Deeply Buried Target Fuzing
  • Increased reliability to reduce UXO
  • Multi-mission selectable fuzing
  • Advanced initiation for controlling lethal effects

Navy Energetic Enterprise