NDIA 45th Annual Fuze Conference
Ordnance Fuzing/Safety & Arming
Programs Overview

Anh N. Duong
Explosives & Undersea Weapons Program Manager
NSWC - Indian Head
## Report Documentation Page

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OUTLINE

♦ Current Development Programs
♦ Product Improvement Programs
♦ Applied MEMS Technology Programs
Current Development Programs
Navy Assault Breaching Systems

**Navy Assault Breaching Systems**

- **LCAC**
  - SABRE
  - Launches

- **140’ to Cabin**
- **407’ SABRE**
- **10’ Deep**
- **3’ Deep**

- **10’ Deep**
- **3’ Deep**

- **50’ Overlap**

- **171’ to Cabin**
- **150’ DET**
DET Fuze/S&A

♦ Distributed Explosive Technology (DET)
  • 180’x180’ Explosive Net Used in Surf Zone Mine Clearance
♦ All Mechanical Fuze/Safety and Arming Device
♦ DET Technical Evaluation Completed
♦ DET Operational Evaluation Currently on Hold
  • May be Combined with SABRE OPEVAL Scheduled FY03
NEW START -- New Fuze/S&A for Shallow-water Assault Breaching (SABRE) System

♦ Contractor Development - Contract Award in Process
♦ Fire-and-Forget Fuze/Safety and Arming System
♦ Requires Extremely High Reliability
♦ Support SABRE System MS III Production Decision of March 2003
P3I Programs

- NSFS ERGM EX171 M80 Submunition PIP Proximity Fuze Insertion

- Next Generation Small Active Electromagnetic Torpedo Fuze

M80 Submunitions

EM Fuzed Torpedo Shell Section
Program Goals:

- Develop an Add-on Proximity Fuze System
  - Inserted within the M234 SD Fuze Envelope
  - Minimal Impact to M234 SD Fuze High Rate Production Equipment
  - Meet ERGM Safety, Performance, Environmental, & Life Cycle Requirements
TECHNICAL APPROACH:

♦ One-for-One Replacement of the M234 Self-Destruct (SD) Fuze Slide Assembly

• Utilize Gun Launch Environment for Battery Activation

• Miniaturize the FM/CW RF Proximity Sensor of the M734A1 Mortar Fuze

• Assemble Expertise from Army / Navy Labs and Industry to Achieve Technical Goals and Reduce Critical Risk Areas
Proof-of-Principle Demonstrated
- **7:1** Reduction Input Power
- Multiple Transmitter Designs
- Suitability of EM Fuzing for Small Diameter torpedoes

Successful Torpedo Sea Run Tests
- Dynamic Environments
- Target Detection
- Model Validation
Applied MEMS Technology

♦ Surface Ship ATT F/S&A Device

♦ Standard Missile Embedded Sensors

♦ Ordnance Inventory & Surveillance
NAVY MEMS-BASED F/S&A PROGRAM

OBJECTIVE:

♦ Apply & Transition MEMS Technology to Undersea Weapon F/S&A Systems

APPROACH:

♦ Capitalize on the MEMS Industrial Base
  • Commercial (COTS) Sensors & Devices

♦ Leverage DARPA Funded Infrastructure
  • Design, Modeling & Analyses Capability

♦ Demonstrate MEMS F/S&A Reliability
  • Assure Weapon Safety with Miniaturized Modular Architecture
MEMS F/S&A TECHNOLOGY
COTS / Modular Components

Typical Building Block Components
for MEMS-Based Exploder

Impact Sensor
Flow Sensor: Pressure Differential
Inertial Measurement Rate Sensor

Initiation System Slapper, Fire-set & Optical Charging Circuit
DRIE MEMS CHIP
LIGA S&A Chip
Main Objective: Transition MEMS F/S&A Technology for FY 02 CCAT E&MD Start

Technology Focus:
♦ MEMS Fabrication
♦ Packaging Reliability and Robustness
♦ Inertial Sensor (IMU) Technology
♦ Remote Initiation Systems
♦ Optical Interruption

Prototype Development:
♦ Develop/Build 15 S&A Prototypes
♦ Conduct Environmental and Field T&E
♦ Utilize IHD MEMS Clean Room for MEMS S&A Prototypes Packaging, Assembly, & Test
◆ Installing Temperature Data Loggers to Canisters
◆ Funded to Develop Embedded Stress Gauges
◆ Funded to Develop Embedded Ultrasonic Sensors
Advanced Technology Ordnance Surveillance (ATOS)

- Selected by OSD as an FY 01 Advanced Concept Technology Demonstration
- Demonstrate operational utility of miniature radio frequency identification (RFID) tags coupled with micro-electromechanical sensor (MEMs) technology for use in tracking/monitoring critical items:
  - Joint “high dollar/low density” munitions
  - Category I munitions (high potential of theft/terrorist use)
  - Future Potential: Medical and biological supplies, perishable substance and other environmentally sensitive commodities, DU munitions, etc.
MEMS Sensors

- Temperature
- Humidity
- Stress/Strain
- Acceleration
  - Shock/Vibration History
- Chemistry Lab on a Chip
  - Presence of Degradation Products
  - Stabilizer Depletion
FUZE / SAFE & ARMING
FOR THE 21ST Century

- **Approach**
  - Focus on electronics & emerging MEMS technology in industry
  - Increase joint service collaborative efforts
  - Develop “building Block” approach for universal application

- **Challenges / Opportunities**
  - Shrinking DOD budgets / downsizing
  - Affordable weapon systems / reduced LCC
  - Smarter, multipurpose weapon systems
  - Acquisition reform
  - Maintain critical smart F/S&A core within DOD
  - Miniaturization