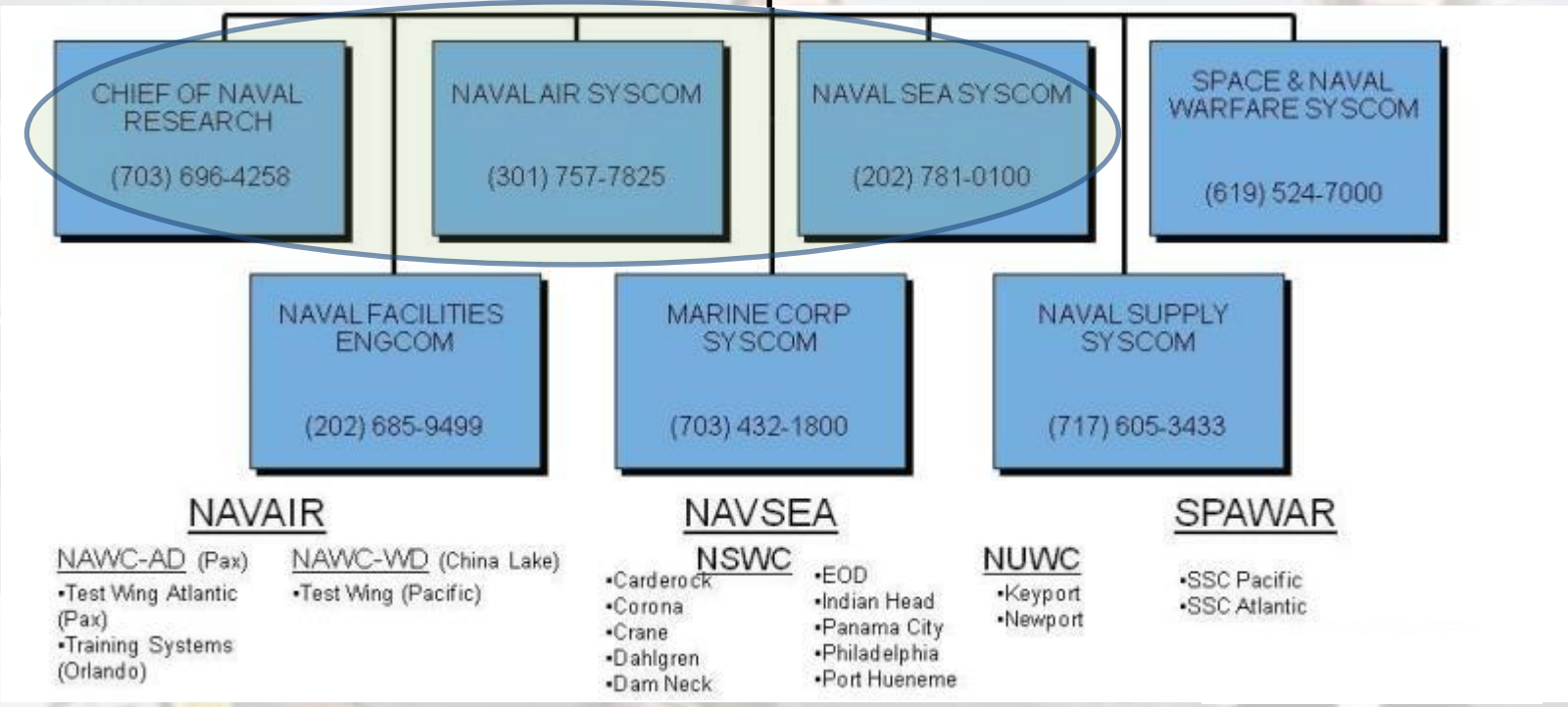
NDIA's 57th Annual Fuze Conference
NAVY OVERVIEW

Outline

- Navy Fuze S&T Strategy
- Navy Fuzing Future Directions
- Navy Fuze Work Highlights
- Summary

Navy Weapon Structure

Chief of Naval Operations
ADM Jonathan Greenert

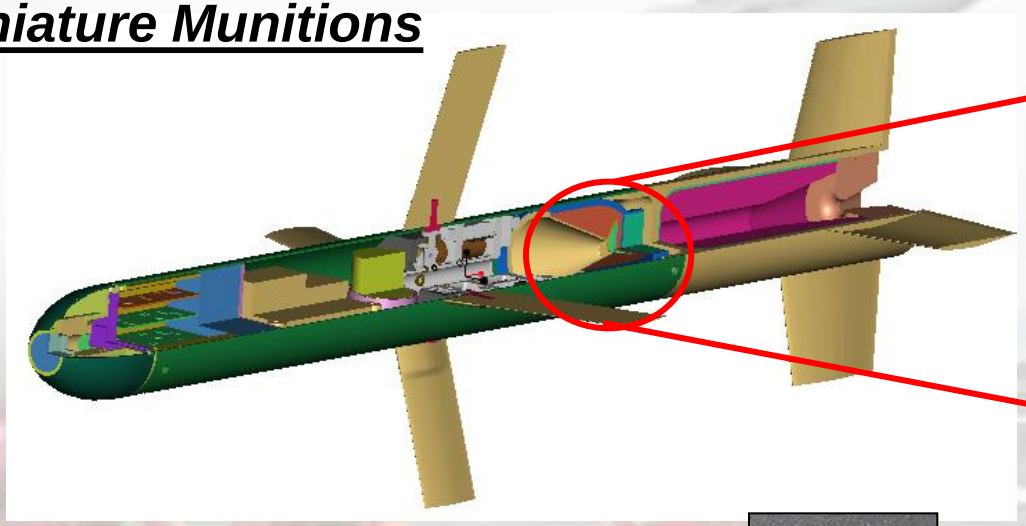


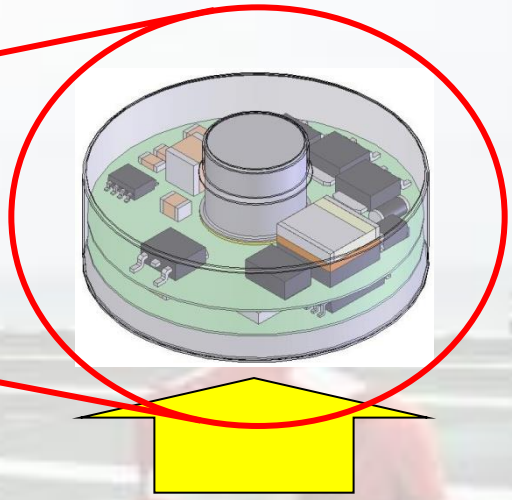
Navy S&T Strategy

- **Less of a formal Strategy, but more of a fuzing path into the future**
  - **Smaller - We really see that fuzing is heading in the direction of smaller is better.**
    - **Weapons are getting smaller and smaller sizes allow for redundancy to help reliability.**
  - **Reliability - Higher reliability is also a big player for Navy fuzing. Sub-munitions have very high reliability expectations and more traditional fuzing is also wanting higher reliability.**
  - **Lower Cost - With budgets falling, the pressure is on to make all weapons and weapons systems cost less.**

Navy Future Directions

Miniature Munitions

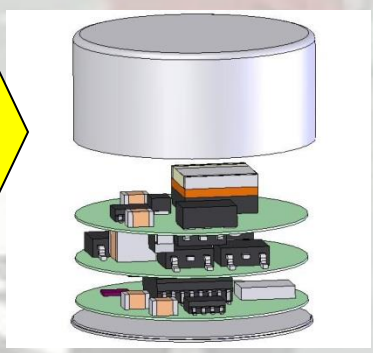




State-of-the-Art
In-Line & Out-of-Line
Safe-Arm Devices

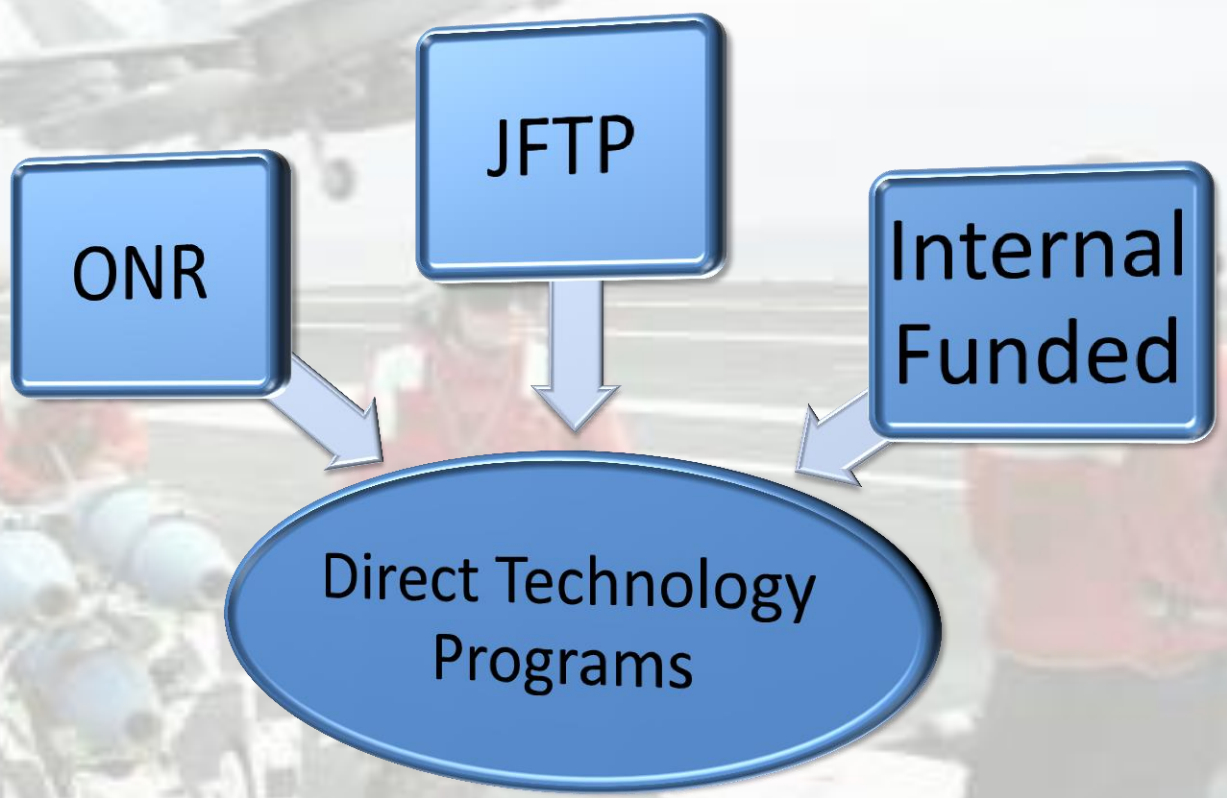
Large and bulky
Electro- Mechanical
Safe-Arm Devices

Complex Electro- Mechanical
Safe-Arm Devices



Advanced MEMS and
Electronic Technologies

Navy Tech Money Sources

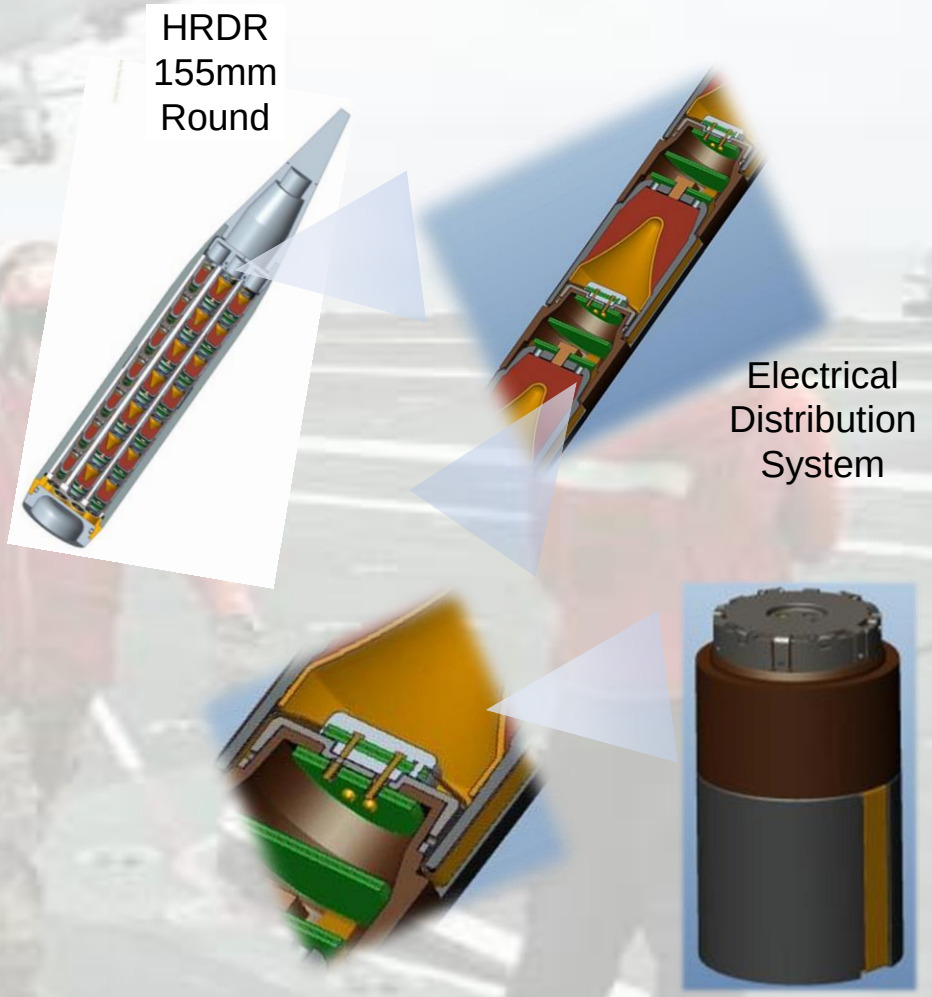


How Will We Get There?

- Smaller and more reliable and robust electronics and power conditioning technologies.
  - Improved reliability across all fuze applications.
- Improved detonator/initiator designs and components.
  - Improved IM and variable output weapons characteristics.
- Improved MEMS Technologies and producible MEMS designs.
  - Smaller and more robust fuzing application.
  - New families of contact sensors and fuzing devices
- Leverage spiral development of existing fuzes.
  - Improved reliability and capability.
  - Stop-gap to help support fuzing industry.
  - Demonstration beds for new technologies.
- Service life extension programs for existing fuze inventories.

High Reliability DPICM Replacement

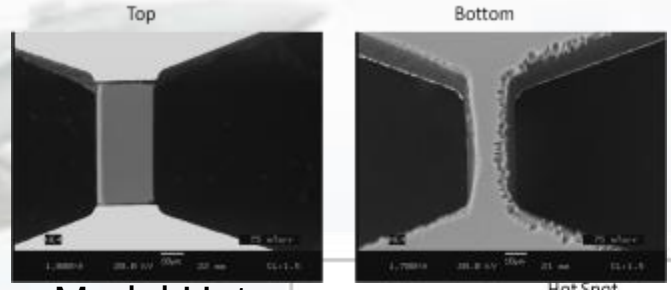
- Developing technologies to enable electrical signal distribution in a weapon system with large numbers of submunitions
  - Minimize disruption to the dispense event
  - Maintain robust mechanical and electrical interfaces



Closed Session VB briefing provided by Kevin Cochran

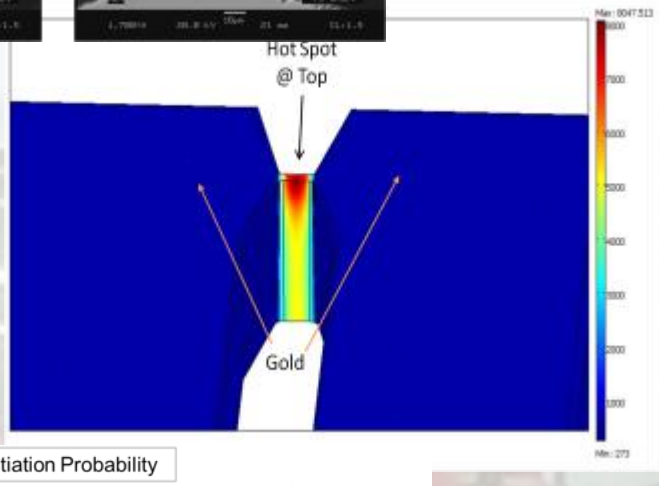
Reliability of MEMS Explosive Train Interfaces (13-G-021)

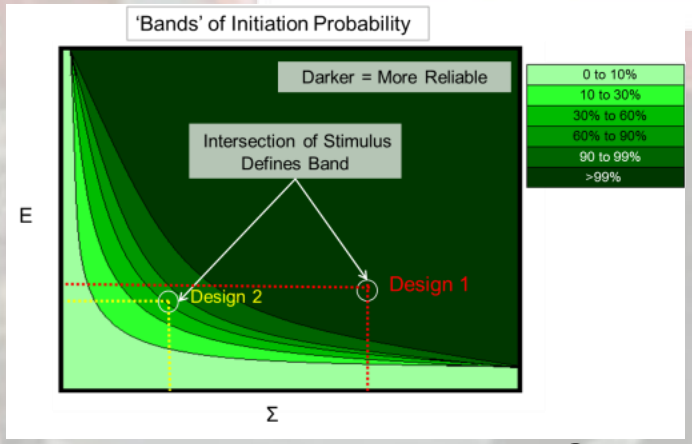
- Produce calculated reliability predictions for MEMS based explosive trains
- Characterize shock initiation and material properties of EDF-11
- Combined analysis of (100+) test data sets to determine a reliability of MEMS explosive interface



DRIE of Si Bridge

Model Hot Spots

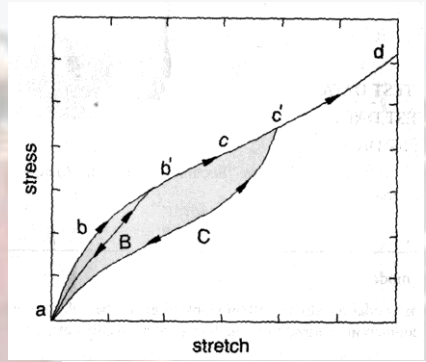


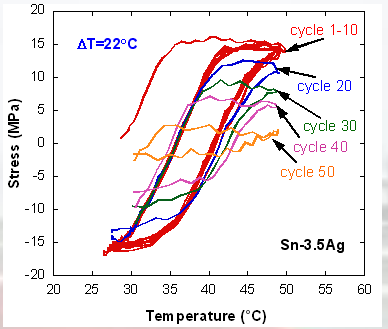


Closed Session IIIB briefing provided by Dan Pines

Characterization of Potting Materials for Electronics Assemblies Subjected to Dynamic Loads

- Increase fuze survivability by providing improved material models for potting materials and lead-free solder used in the design process
- Potting material characterization:
  - Variety of experiments to collect data
  - Populate existing material models with constants derived from the test data
  - Validate material models for use in HT penetration



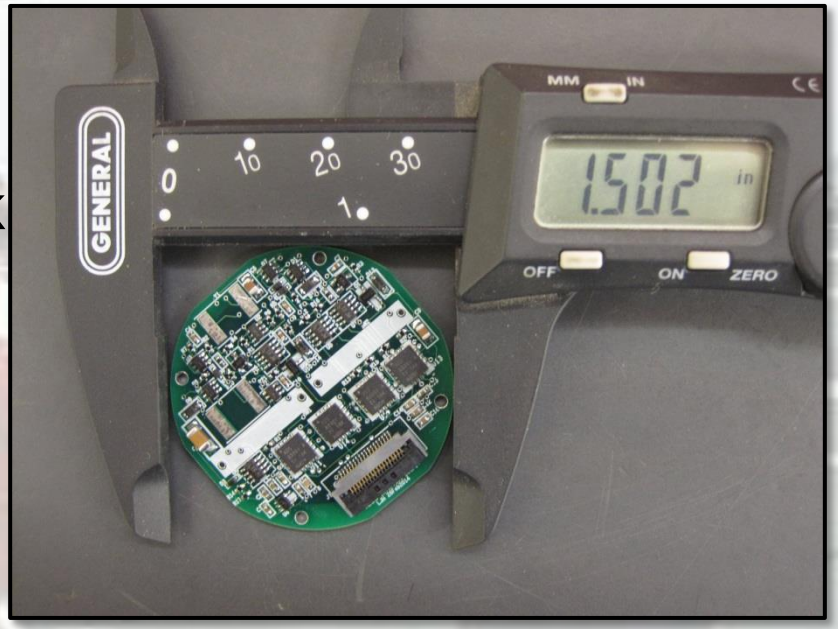


Closed Session IIIB briefing provided by Vasant Joshi

10

Unpowered Gun Setback Detection Test

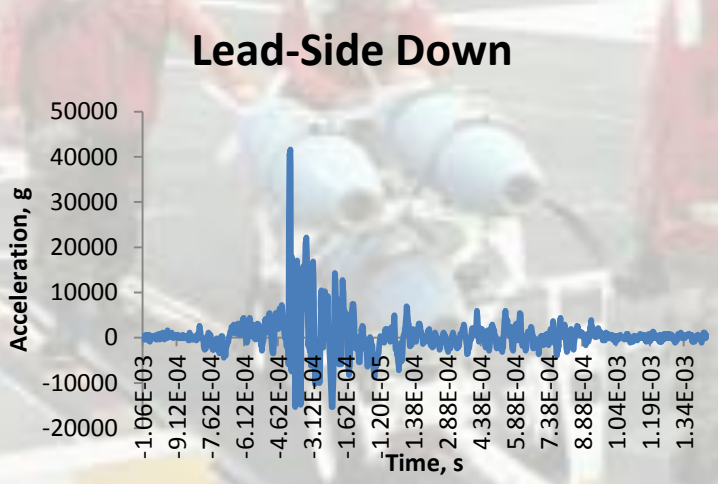
- Energy harvesting and analog signal processing
- Measures setback magnitude and the duration of the setback
- Board potted with production encapsulant for correct mechanical response
- Gun test will identify best configuration of component values and validate a setback detection method

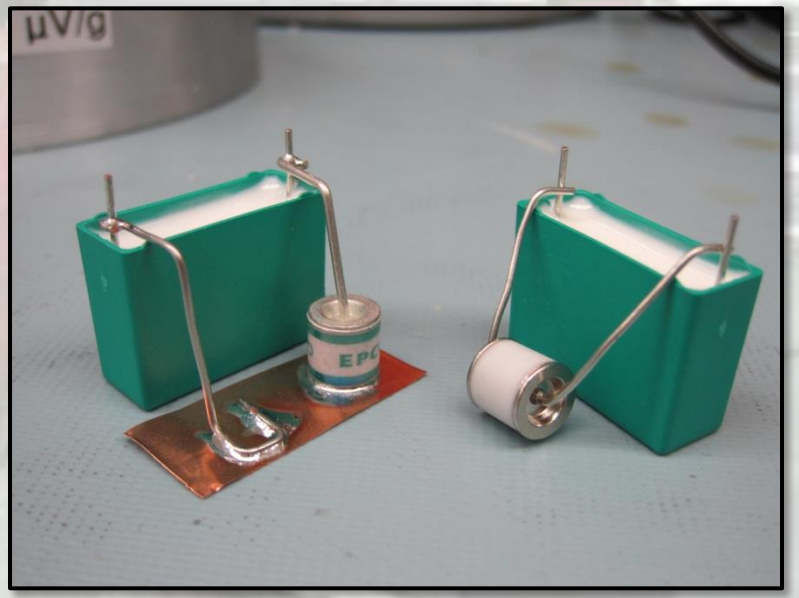


JFTP funded as 14-G-028 with internal leveraging

Gas Tube Shock Survivability

- Do Gas Discharge Tubes self fire from high g levels?
- 40 foot drop tower to generate short duration high shock levels
- Early testing indicates self firing may be a concern
- Additional experiments required





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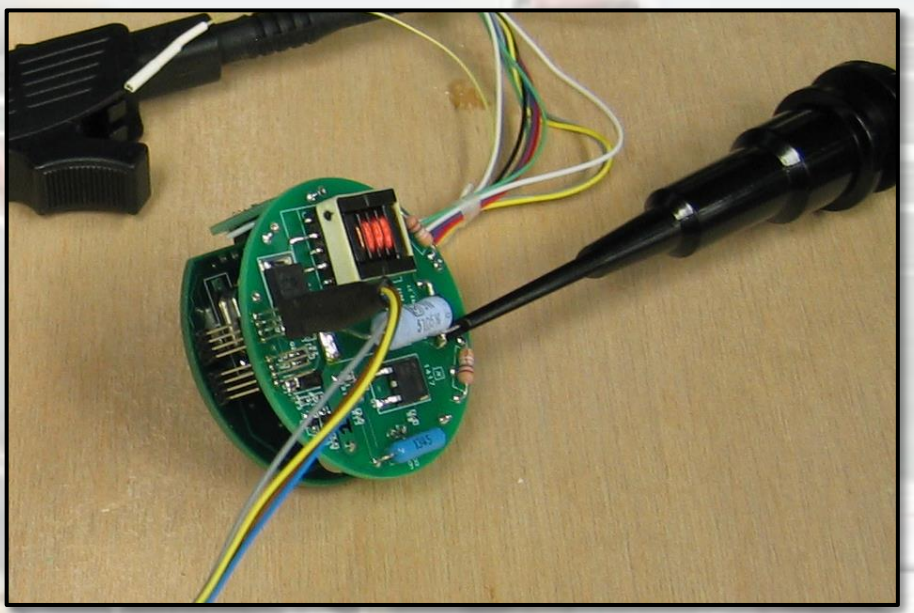
Low Cost ESAD

- Use true COTS components
- Simplify Circuitry Where Appropriate
- Component Selection is critical
- 1000 unit Quantities

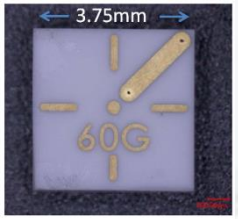


Closed Session VA Briefing provided by Mr. Michael Haddon

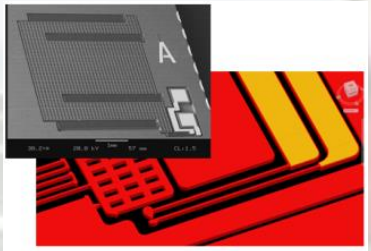
MEMS Retard and Impact Sensors

- Exploit existing MEMS micro-fabrication and packaging technologies to obtain higher-performance DoD retard and impact sensors
- Improved G-sensor performance for existing and future fuzes.
- Two efforts – Metal(LIGA) and Silicon(DRIE)
- Small lot of both metal and silicon retard sensors will be manufactured, tested and submitted to fuze vendor for evaluation via the DOTC.

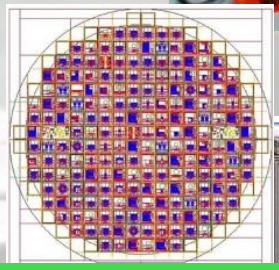
Conventional Impact Sensor

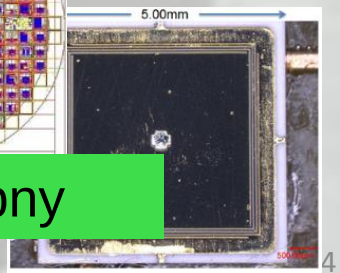


Metal (LIGA) Impact Switch



Silicon (DRIE) Retard Sensor





Metal (LIGA) Retard Sensor

Closed Session VA Briefing provided by Mr. Randy Drobny

Summary

Smaller, More Robust, Higher Reliability and Lower Cost fuze designs are future thrusts for future Navy Fuzing