

DTRA Counter WMD Technologies Fuzing & Instrumentation Technology Overview

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Outline

- Mission
- Requirement for Hard Target Fuzing
- Current Fuzing and Instrumentation
Technology Thrusts
- Summary



DTRA Mission

- Mission:
 - ...reduce the threat to the United States and its allies from Weapons of Mass Destruction (CBRNE) by providing capabilities to reduce, eliminate, and counter the threat, and mitigate its effects.
- Functions:
 - Conduct RDT&E programs...in areas related to WMD and designated advanced weapons to include...WMD-related targets and the entire class of hard and deeply buried facilities.
- Vision:
 - Develop, test, and demonstrate to the Warfighters reliable and effective solutions to defeat WMD and WMD-related functions protected in Hard and Deeply Buried Targets



Hard & Deeply Buried Target (HDBT) Defeat Critical to Counter WMD Mission

- Use of HDBTs is widespread among both hostile states and terrorists to protect WMD and WMD-related functions including:

- Production, storage, research
- Delivery systems
- Command and control
- National/terrorist leadership

**MOST
VALUABLE
ASSETS**



You can't defeat WMDs, if you can't defeat HDBTs!!

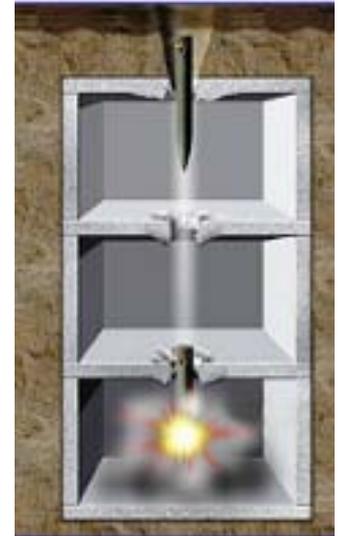
You can't defeat HDBTs, if the fuze does not survive!!





Fuzing and Instrumentation Technology Vision

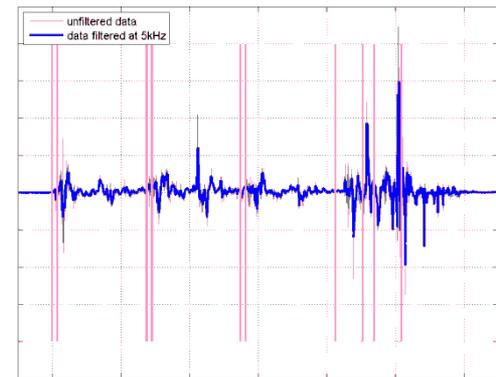
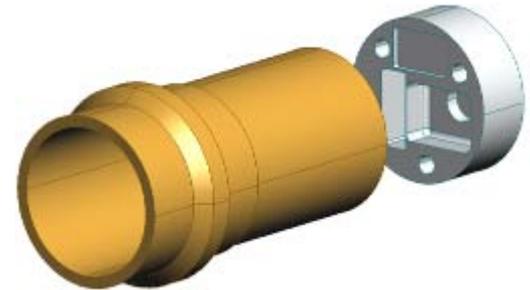
- Develop and demonstrate innovative **SURVIVABLE fuze technologies** to support the defeat of WMD related facilities
 - Fuze Harsh Environment Characterization
 - Sub-Scale Survivability Test Protocol
 - Micro-DEMON
 - Fuze Diagnostic Recording
- Develop **SURVIVABLE instrumentation packages** to support development of new fuze/fuze technologies
 - Robust Fuzewell Instrumentation System (RFIS)
 - 3-Axis DTRA Data Recorder (3DDR)





Fuze Harsh Environment Characterization

- Fundamental understanding of forcing functions on the fuze and fuze components
- System level aspects being pursued within the larger Community



Bottom Line: Need to be able to predict and test the multi-axis loads on fuzes & fuze components



Sub-Scale Survivability Test Protocol

- Collaborating with AFRL/RW to establish test methodologies for replicating desired shock spectrum
- Establish survivability test protocol utilizing various lab & field apparatus

Notional Shock Spectrum

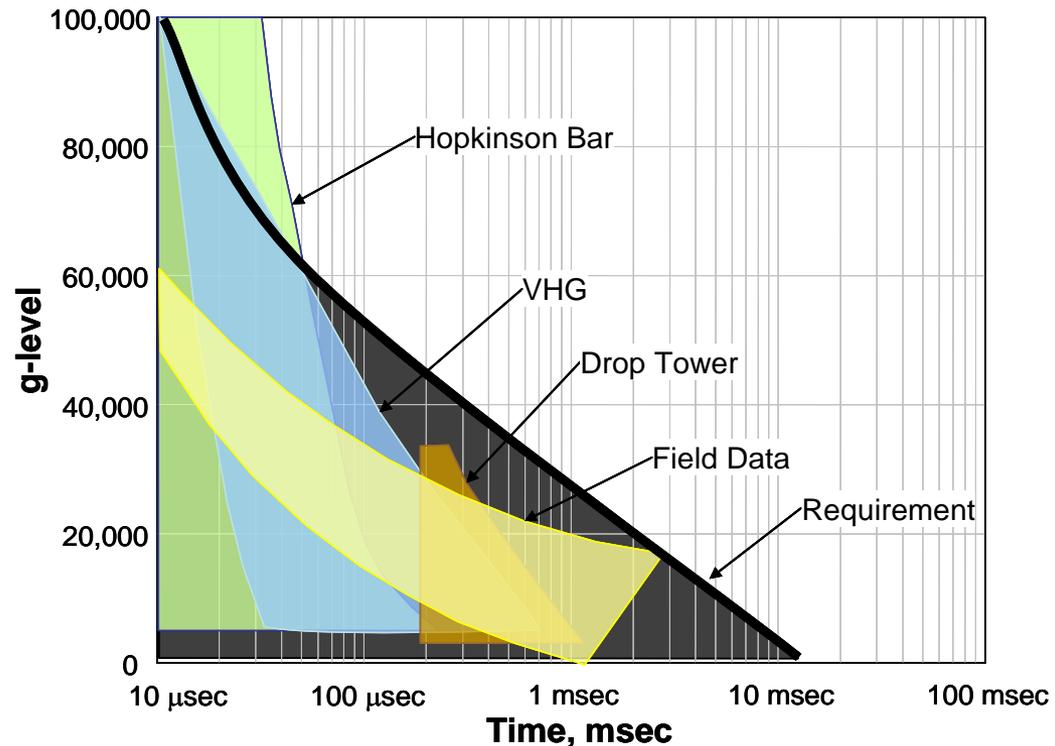
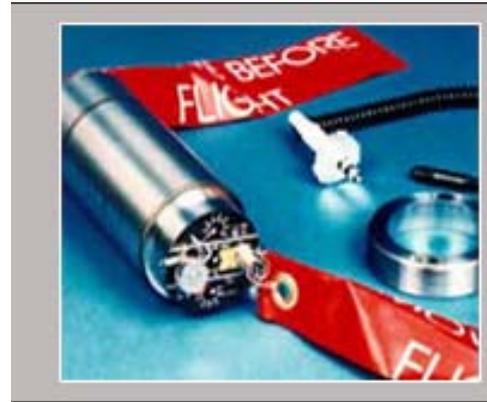


Photo Courtesy of AFRL/RWMF
Public Releasable: AAC/PA 03-496



FMU-152 Baseline Sub-Scale Test Survivability Assessment

- Collaborating with AFRL/RW and Kaman to establish an FMU-152 baseline survivability for sub-scale test protocol
- FMU-152 sub-scale test survivability limits will be utilized as qualitative baseline for future fuze/fuze components



Photos Courtesy of AFRL/RWMF (VHG Machine)
Public Releasable: AAC/PA 03-496 and
Kaman's Website: <http://www.kamanaero.com/fuzing.html>



DEMoN (Design for Efficient Miniaturization of Novel Fuzing)

- Collaborating with Sandia to explore level of miniaturization achievable for electronic in-line fuzing using COTS components, architectures and packaging technologies
- Miniature post-impact module benefits
 - Increased survivability
 - Increased reliability through redundancy
 - Common fuze components
 - Distributed architectures

Active Silicon as a Percentage of Package Area for Different IC Packaging Technologies

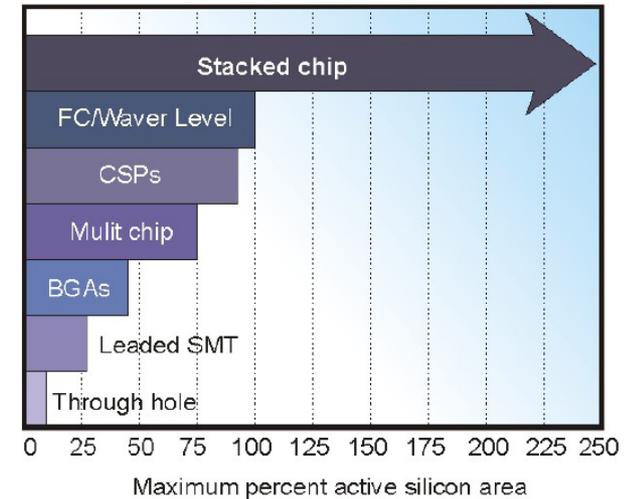
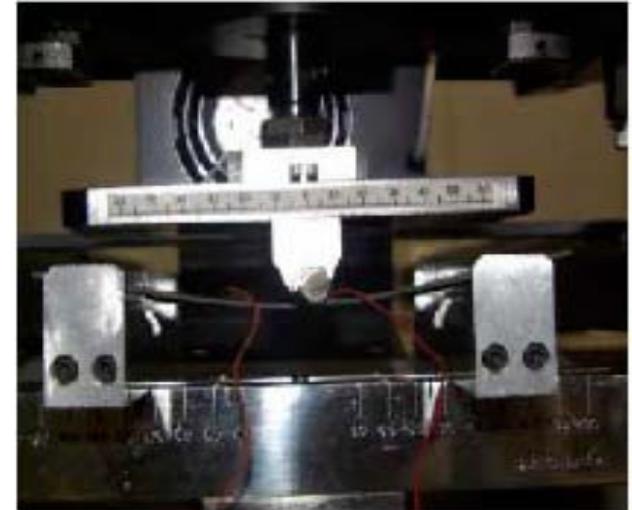


Photo courtesy of
http://www.smta.org/files/Pan_Pacific_2007_Fjelstad.pdf



Fuze Diagnostic Recording (FDR)

- Collaborating with Sandia to improve reliability and survivability of hard target fuzes by developing scientific understanding of mechanical & electro-mechanical behavior of critical components under high shock
 - Performance characterization for nominal environments and relevant functions
 - Repeat testing through gradually increasing stress (high-g) environments
 - Develop models of component performance to reflect high-g effects
- High voltage firing capacitors selected as initial component to assess/model

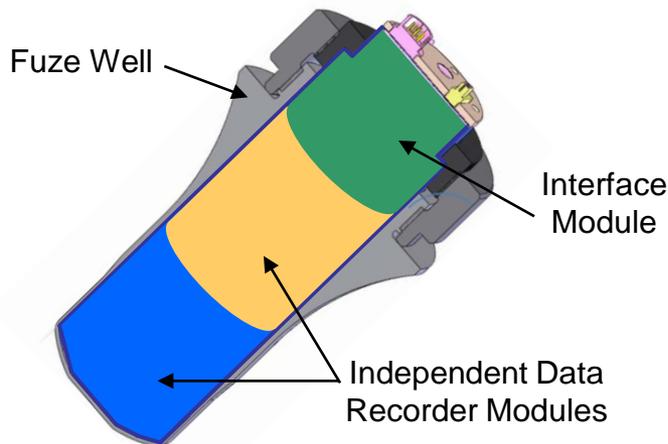


Photos Courtesy of
http://www.amd.com/us-en/assets/content_type/DownloadableAssets/Pb-free_Board-level_reliability_study.pdf



Robust Fuzewell Instrumentation System (RFIS)

- Collaborating with AFRL/RW to develop a robust data recorder instrumentation package with redundant internal data recorders to fit in standard 3" fuzewell
 - BAA Announcement Posted 10 Feb 2010
 - Solicitation Number: BAA-RWK-10-0004



Notional RFIS Concept

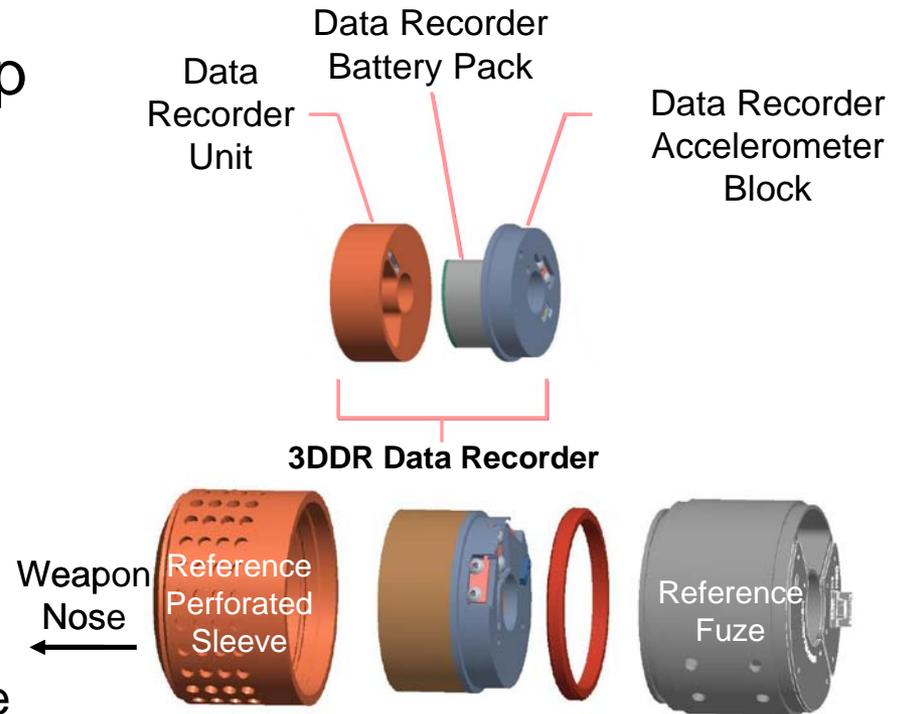
RFIS General Features

- 3" Data Recorder Instrumentation Package
- Size & weight of current legacy fuzes
- Standardized Robust/Reliable Interfaces
- Cantilever or Compression Mounted
- Independent Data Recorders
 - Threshold of 2
 - Goal of 3



3-Axis DTRA Data Recorder

- Collaborating with Sandia to develop survivable booster cup recorder
 - 1st Generation 3DDR Design
 - 3 Unit Design
 - Replaceable accelerometers
 - Successful laboratory and field testing
 - 3DDR-Advanced Miniaturization (3DDR-AM)
 - Utilize DEMoN philosophy to achieve miniaturization
 - Universal Booster Cup Compatible
 - Retain full 3DDR functionality
 - Smaller and lower power
 - Provides foundation for 3-AMP replacement



Photos Courtesy of Sandia National Laboratory
Public Releasable: SAND # 2009-0918 P



Summary

- Hardened or deeply buried facilities are becoming:
 - More important to potential adversarial nations and non-national organizations
 - Harder to defeat
- Capability to defeat HDBTs is critical to Counter-WMD mission
 - Fuze survivability is essential to defeating HDBTs
 - Smart post-impact burst point control required
- Fuze harsh environment characterization is essential
 - Predictive capability for fuze/fuze component survivability
 - Development of robust sub-scale multi-axis test protocol
 - Defining robust full-scale tests compatible with limited resources
- Focused on fuze & instrumentation survivability in harsh environments
 - Developing novel fuze diagnostic recording capability
 - Efficient miniaturization for novel fuzing

The Fuzing Evolution – Smaller, Smarter, Safer, and more Survivable”