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TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

U.S. Army Research, Development and Engineering Command

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ARMAMENT RESEARCH, DEVELOPMENT AND ENGINEERING CENTER
PICATINNY ARSENAL, NJ

TECHNOLOGY DRIVEN. ***WARFIGHTER FOCUSED.***

Army S&T Strategy

58th Annual Fuze Conference

Fuzing in a Challenging Environment

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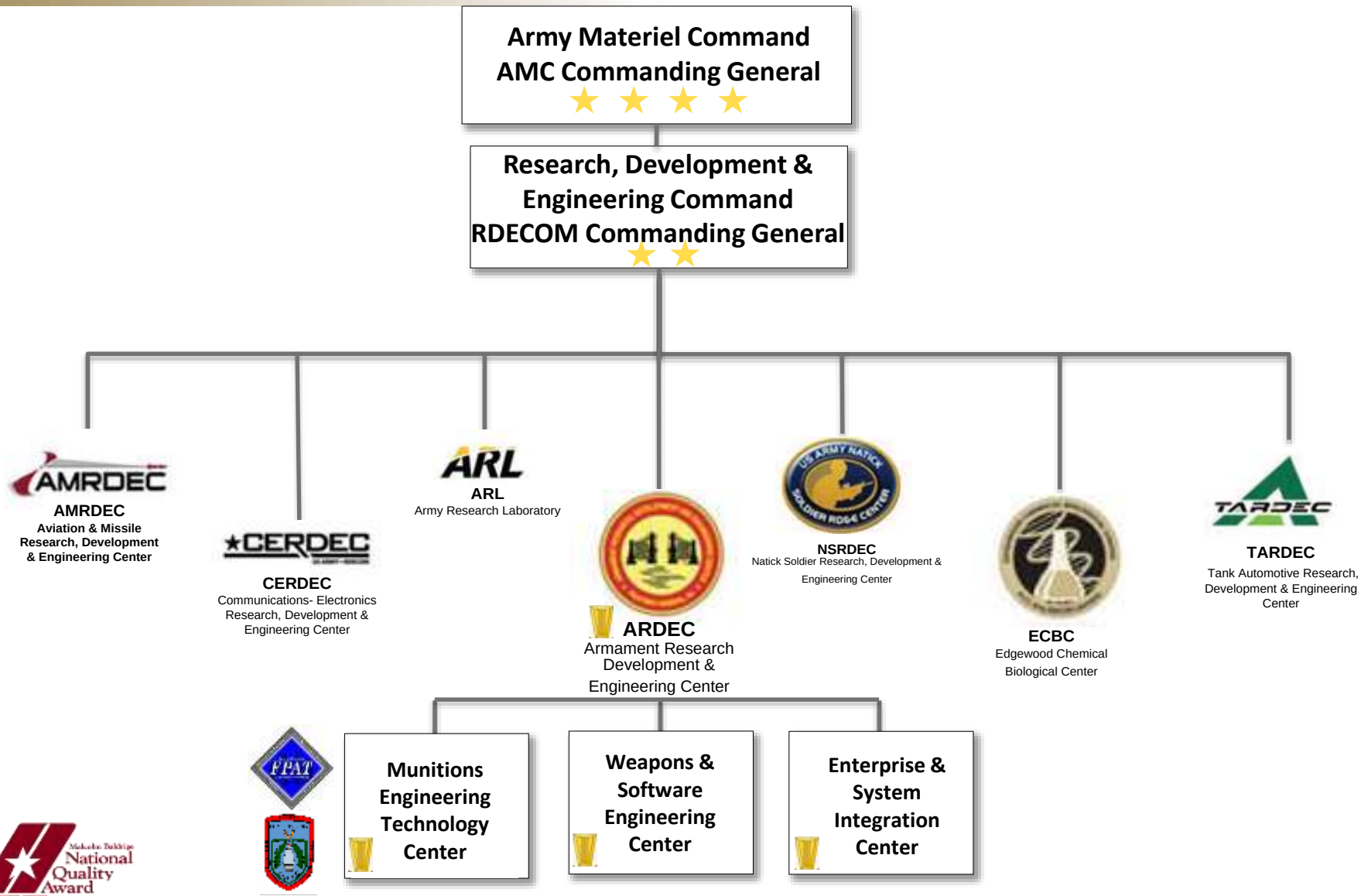
AGENDA

- ARDEC Organization
- Team Picatinny
- ARDEC Mission
- Fuze Division Commodity Areas
- ARDEC S&T Needs and Investment Analysis
- Fuze S&T Traceability to Stakeholder Needs
- Fuzing in a Challenging Environment
- Fuze S&T Efforts
- Challenges in Fuzing
- ARDEC Fuze Division Conference Briefings

ARDEC Organization
Chain of Command



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Team Picatinny

- Gov't Population 3,865
- 6,493 Acres
- 909 Structures
- 64 Laboratories

Highest Caliber

ARDEC

CG/PEO Ammunition

Joint Munition & Lethality LCMC

Garrison Commander

Office of the Executive Director for Conventional Ammunition

PEO Soldier
PM Soldier Weapons

PEO Ground Combat Systems
PM Ground Combat Vehicle

Defense Contracting Management Agency Springfield

Civilian Human Resources Agency

Naval Surface Warfare Center

Marine Corps G Company 2-25

Army Contracting Center - NJ

Army Recruiting Northern NJ HQ (Company)

7245th Installation Medical Support Unit

The Joint Center of Excellence for Armaments and Munitions

ARDEC Mission
Life Cycle Engineering & Support

PAX 3

PAX 41

Common Smart Submunition

Advanced KE

STAR

Excalibur

Plasma Arc Furnace

Research & Development

Lightweight Handheld Mortar Ballistic Computer

Cryofracture

Demilitarization

SUPPORT TOTAL LIFE CYCLE

Production

Lake City Army Ammunition Plant

Lightweight Dismounted Mortar

M900 Armor Piercing Cartridge

Field Support

Small/Cannon Caliber Ammunition

Dummy, Drilled, Inert

M240B 7.62MM Machine Gun

40mm Multi-Shot Launcher

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Commodity Areas

Artillery Fuzes

Mortar Fuzes

Medium Caliber Fuzes

Fuze Setters

Safe and Arm Devices

Hand Grenades

Rockets & Missiles

Tank Ammo

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ARDEC S&T
Needs & Investment Analysis Process

Needs/Source Documents

DoD/DA
- CSA 2025
- Army Operating Concept
- ASA(ALT) POM Guidance

PEOs
- PEO Priorities
- PEO Roadmaps
- PM Priorities

TRADOC
- MCoE
- FCoE
- MSCoE
- ACoE
- SCoE
- TCM-ABCT
- TCM-SBCT
- TCM-IBCT
- Capability
- Needs Analysis (CNAs)
- Warfighter Outcomes (WFOs)
- JCIDS Docs

- Identification, coordination, organization of individual "Source Documents" needs/gaps/priorities into one list.
- Collected from multiple lethality stakeholders

ARDEC S&T Portfolio

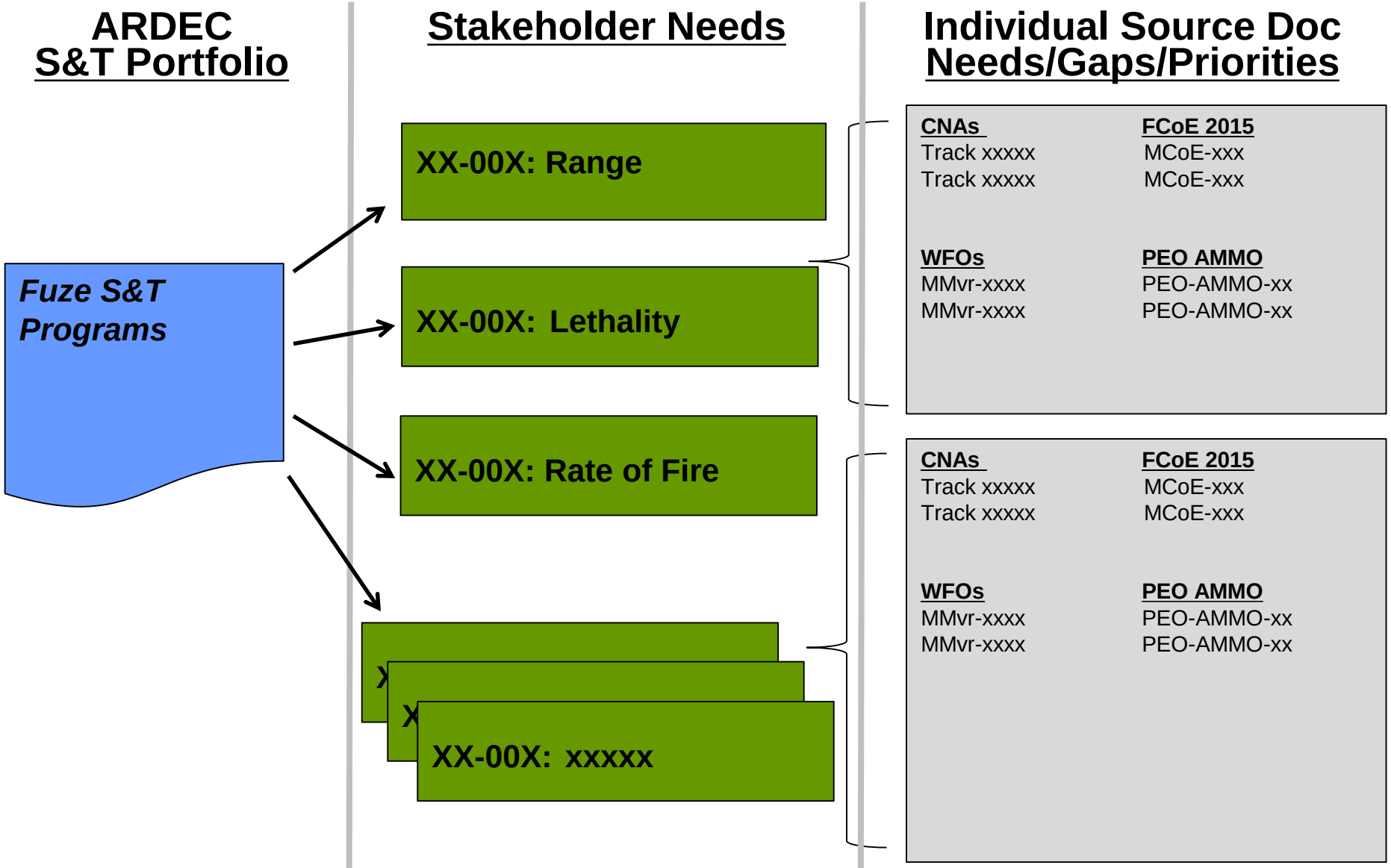
- Sets priorities for future investments (POM)
- Enables adjustments to on-going efforts
- Details/communicates opportunities to Service labs, industry, academia, international

S&T Opportunities

- Utilized by ARDEC Scientists and Engineers to marry innovation to needs
- Made available to industry partners to facilitate cooperative long term planning to include IR&D investment

Analysis…Exchange Information…Communication…Planning…Prioritization

Fuze S&T Traceability To "Stakeholder Needs"



Fuzing in a Challenging Environment

Tomorrow's Challenges with Yesterday's Budget

- S&T budgets are not as prominent as they were years ago
- Availability of budgeted funds for timely execution of programs
- Most projects leverage other funding to deliver capabilities

Emerging Threats

- Increased performance capabilities required in smaller packages
- Smaller, lighter, cheaper, more responsive systems to defeat new emerging threats
- Need for innovative & disruptive technologies to address some of these threat surges

Building on BBP 3.0 tenets:

Incentivizing Innovation in Industry and Government; Promote effective competition.

Next Generation of Precision Fuzing

Supporting the Industrial Base

- Government unique requirements drives the need for unique or custom components
- Diminishing IR&D in fuzing focus areas
- Need for Government – Industry partnerships for best use of core competencies
- Engaging academia & new industry partners

Requirements Definition

- Requirements not fully defined or fully understood
- Competing requirements with limited resources
- Requirements creep throughout program lifecycle
- Joint or common requirements for problem sets that may more Service-specific

Fuze S&T Efforts

Emerging & MaturingTechnologies

(6.2 OSD Joint Fuze Technology Program)

- Target Classification Prox for Tailorable Whds
- Micro Scale Materials and Energetic Effects Characterization

(6.3 OSD Joint Fuze Technology Program)

- PGK IMX-101 Compatibility
- Next Generation Proximity Sensor for Prox Fuzing
- Command Arm Actuation for Non-Spinning S&A Architectures

(RDECOM/ARDEC S&T Projects & Demonstrations)

- Future Initiation, Target Detection, Fuze Setting, Power
- Next Generation Prox Fuzing
- Distributed Multi-point Initiation
- Thin Film Power Sources
- MEMS Impact Switch Target Sensing
- Fuzing for Cluster Munition Replacement
- 120mm Guided Mortar
- Low Volume and Low Power Prox
- Direct Fire Prox Sensor - (Joint Non Lethal Dir)
- Autonomous Target Sensing for Shoulder Fired
- Airburst/PD and PD delay for Tank Ammo
- Command Arm MEMS S&A w/ Prox for 40mm
- Enhanced Multi-Purpose Grenade
- Low cost air dropped precision guided munition
- MEMS Safe & Arm Reliability & Manufacturing

On-going 6.6 Fuze Technology Integration

EMD/Production support for PM MAS, PM CAS, PM CCS, PD JP

Fuze and Power Technologies for Munitions

High-Rate Accurate Air-Burst Fuzing

Advanced Munitions Power

Next Generation Sensors and Safety

Next Generation Large Caliber Setting

Purpose:

- Develop and advance Fuze and Power Technologies to achieve leap ahead capabilities such as high accuracy air burst, advanced setting methodologies, innovative sensing (launch and target detection), as well as next generation safety and power systems .
- Demonstrate applications of these technologies in multiple munitions across commodities in order to handoff mature concepts to Program of Record EMD efforts.

Results/Products:

- Research advanced launch and high accuracy target sensing/classification components & methodologies, advanced fuze communication schemes, integration of printed materials for conformal antennas, power sources and energy harvesters. Develop advanced safe and arm devices to support advanced warhead and munition requirements.
- Demonstrate advanced technologies for high accuracy air bursting, target classification and high rate fuze setting in a relevant environment.
- Surrogate sub-system integration of technologies and components, for demonstration at TRL 6.
- Develop and validate Fuze-centric analysis techniques across multiple technology efforts. Validated modeling will decrease development cycle of future fuze systems .

Payoff(s):

- Enables increased and scalable lethality in broader applications across multiple munitions.
- Maximizes lethality while minimizing collateral damage and reducing logistical burden.
- Spiral technology solutions into numerous Program of Records and other S&T efforts.

Schedule

MILESTONES	FY15	FY16	FY17	FY18	FY19
High-Rate Accurate Air-Burst Fuzing		4		5	6
Next Generation Large Caliber Setting		4		5	6
Next Generation Sensors and Safety		4		5	6
Advanced Munitions Pow er		4		5	6

Milestone Indicators: TRL or SRL: ◆ Milestone Timeline: ▬

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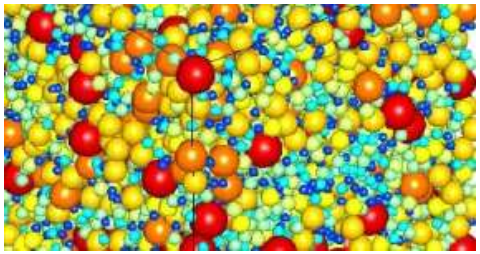
Affordable Fuzing and Power Systems for enhanced effects and operational overmatch

Challenges in Fuzing

Initiation of Insensitive Munition High Explosives



- Advanced initiation techniques for sustainment of detonation velocity in highly insensitive energetic materials
- Highly simultaneous multi-point solutions for initiation of IM fills

Networked Munitions

- MIL-STD-1911 compliant fuzing concepts
- Fireset hardware and firmware for main munition

Next Generation Target Detection & Sensing

- Advanced Next Generation low cost sensor technologies to provide enhanced battlefield performance & small form fit precision burst point control
- Higher-accuracy medium caliber air-bursting solutions
- Autonomous airburst for 30mm munition
- Target media classification MEMS-based impact characterization sensor capable of coarsely discerning target media types upon impact
- FMCW target classification proximity sensor

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Challenges in Fuzing

High Reliability Fuzing (<1% UXO)

- Compliance with DoD Cluster Munition Policy
- Fuze component technologies & functional architecture(s) for a system function reliability of >99%
- Non-networked, self-contained, & independent submunition fuzing solutions

Miniaturized Fuzing

- High volume, cost-effective manufacturing processes for MEMS scale components
- Mature the manufacturing readiness level with the elimination of touch labor and rework, establishing second sources of supply, optimizing tolerances and reducing process variation

Improved Fuze Setting

- Smaller and lighter large caliber fuze setter for use in auto-loading cannon systems and guided mortar applications
- High rate medium caliber fuze programming & communication for enhanced airburst response

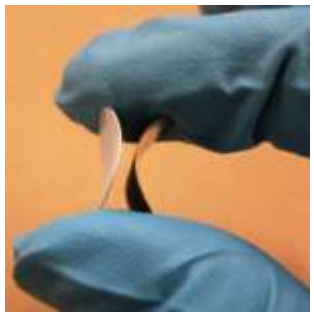
Challenges in Fuzing

Munitions Power Sources

- New power source technologies with a very high energy density and power density for use in extended range applications and the next generation of artillery fuzes
- Smaller in size and affordable

- Very small, reliable, & affordable power sources for use in medium caliber & hand emplaced applications
- Reliable performance throughout MIL-STD operational temperatures
- Higher energy densities

Thermal Reserve Batteries



Liquid Reserve Batteries

Super Capacitors

-Higher energy storage
-Cold temperature performance
-Sources of supply

Energy Harvesters

ARDEC Fuze Division Briefings

Command Arm Actuation for Non-Spinning Safe & Arm Architectures – Mr. John Geaney

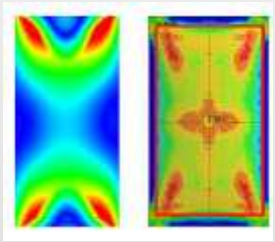
Rotor Safety and Arming Design and Development for Multi-Stage Arming of Submunition at Expulsion Event – Mr. Jintae Kim

Novel RF Fuze Setting– Mr. Joseph Breczinski

Decreasing the Sensitivity & Increasing the Delay Time in the M739A1 Impact Delay Module– Ms. Melissa Rhode

ARDEC Fuze Division Briefings

Micro Scale Materials & Energetic Effects Characterization– Mr. John Geaney



Multi-mode fuzing for XM1069 Tank Ammunition– Mr. Lloyd Khuc

Designing for Challenging Environments – Getting it Right the First Time- Mr. Stephen Redington

QUESTIONS?