GENERAL DYNAMICS
Ordnance and Tactical Systems

56th Annual Fuze Conference
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'Next Generation Fuzing for Next Generation Weapons"

Medium Caliber Ammunition Scalable Airburst Fuze

Presented by: David A. Andersen

Agenda

- GD-OTS Introduction
- GD-OTS Marion
- Marion Product Portfolio & Airburst Family
- Airburst Target Spectrum
- 25x 137 mm Airburst Cartridge Design
- Scalable Airburst Fuze
- Airburst Electronic Module (EM)
- Airburst Safe & Arm (S&A)
- Airburst Operation
- Fuze Communication
- Airburst Fuze Summary
- Points of Contact

General Dynamics-Ordnance & Tactical Systems (GD-OTS)

- 6 Strategic Business Units
  - Large Caliber Ammunition
  - Medium Caliber Ammunition (MCA)
  - Small Caliber Ammunition
  - Precision Systems
  - St. Marks Powder
  - GD-OTS Canada

- 3,927 Employees
- 17 Operating Facilities

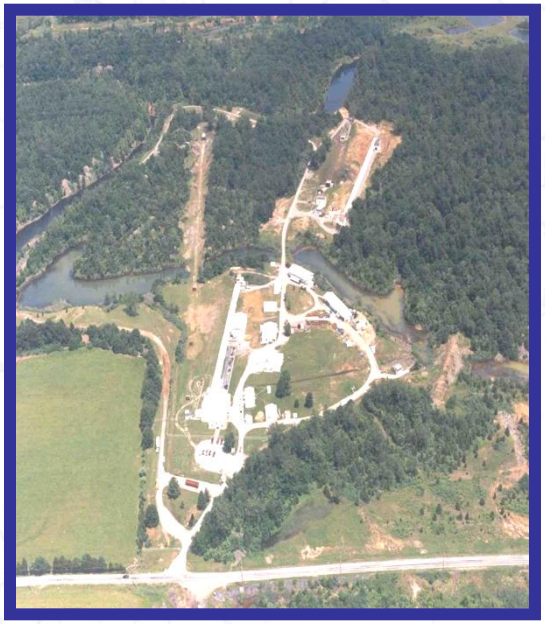
GD-OTS Marion Operations Facility

631 acres leased for Manufacturing

Propelling charge, solid propellant products, Advanced Development

Ammunition Manufacturing

290 acres owned



Test Range

Roadway:	10 miles
Buildings:	224
	76 Magazines
Operating Buildings: (Area, Square Feet)	159,290

GD-OTS Medium Caliber Ammunition - Product Portfolio

20mm Ammunition

20mm C-RAM

30mm Lightweight

25mm Ammunition

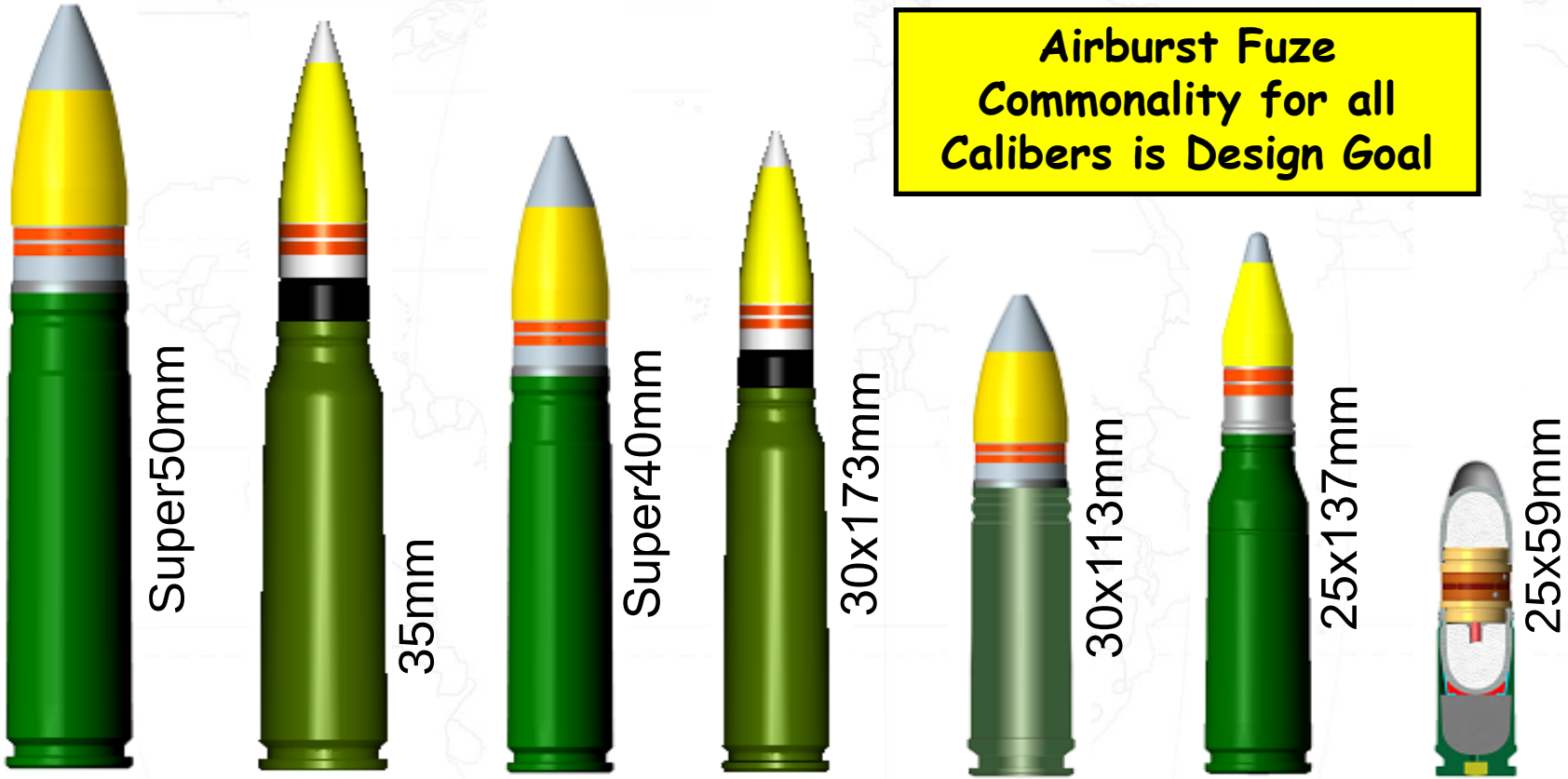
30mm x 173

25mm - 57mm Airburst

40mm Grenades

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited

Scalable Airburst Family



Airburst Fuze Commonality for all Calibers is Design Goal

Current Capability Gap: Modern Target Spectrum

Gap to fill with MPAB-T/SD

M792 HEI-T/SD

M791 APDS-T

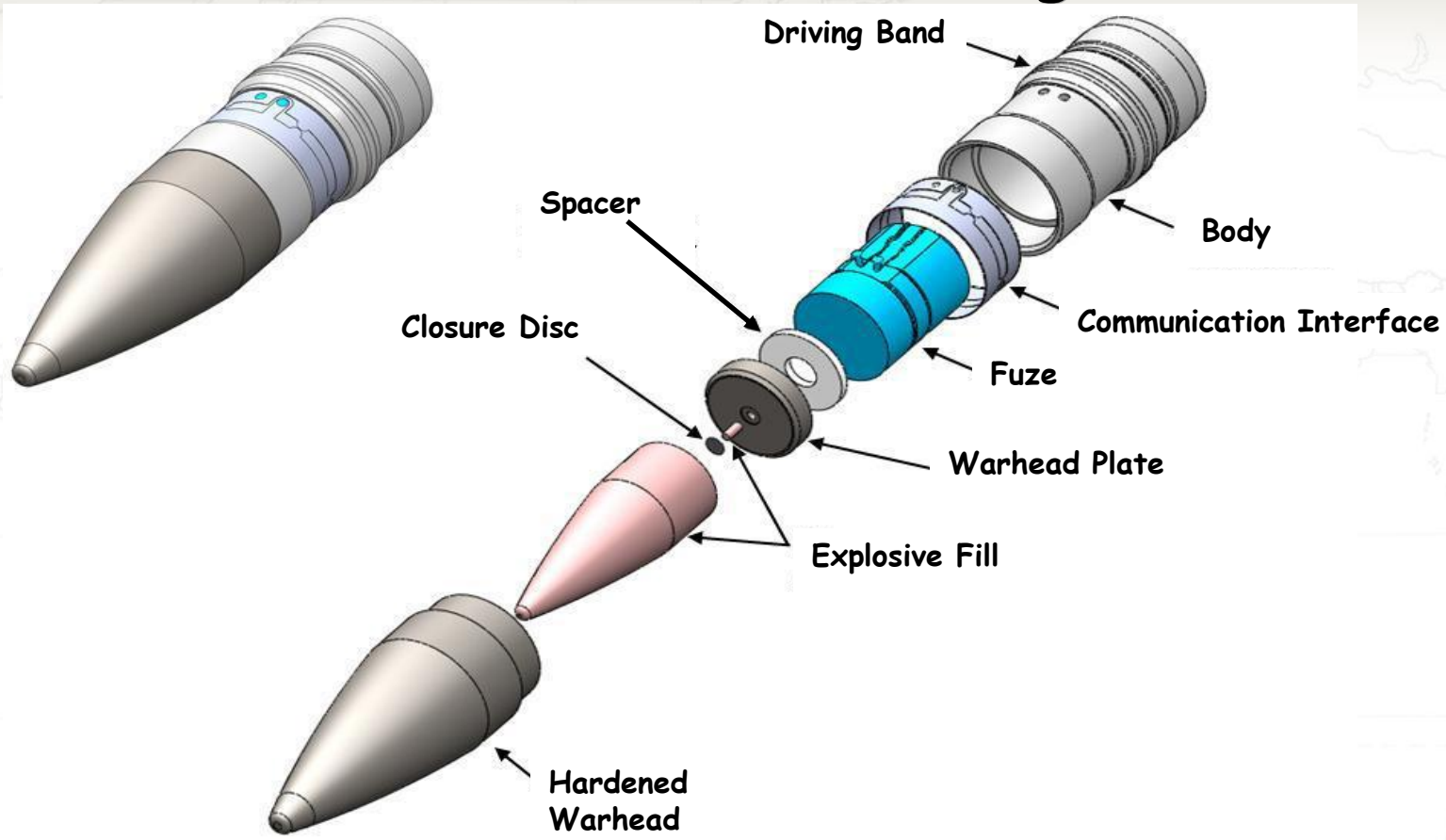
AP gap filled with M919

Airburst

M919 APFSDS-T

Airburst fills capability gap against troops in trenches, barricades, & buildings

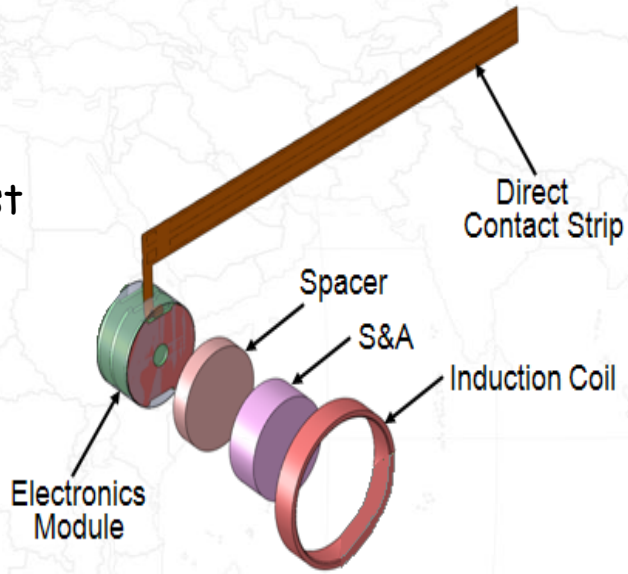
25x137mm Airburst Cartridge



25mm useful caliber for MCA fuze & projectile development ; resulting design easily adaptable to other calibers

Scalable Airburst Fuze – Design Characteristics

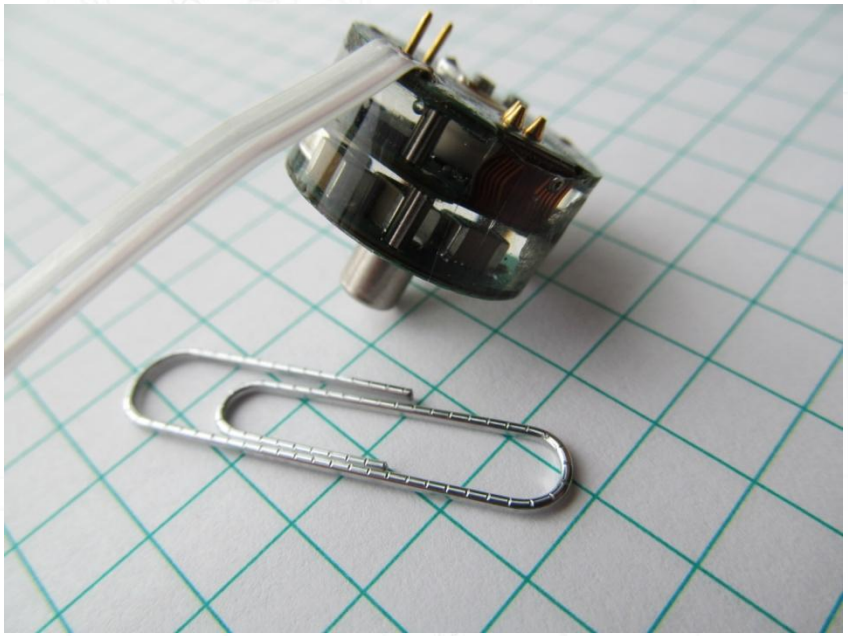
- Inductive or Contact set, time-based, programmable electronic fuze
- PD-Immediate/PD-Delay feature to:
  - Increases capability of the ammunition by providing additional operating modes
  - Defeat light material targets
  - Provide PD function in the unlikely event that an air burst communication signal fails, or impact occurs after safe separation but before airburst time out.
- Selectable arming: allows user to select arming distance based on engagement
- Self destruct operating mode
- Command to Arm Safe & Arm
- Design meets basic Mil-Std-331 Safety Tests including;
  - Jolt, Jumble, 1.5 Meter Drop, Transportation & Tactical Vibration, Primary Explosive Component Safety, HERO, and Helicopter -ESD



Induction/Contact Airburst Fuze

Electronic Module (EM)

EM provides airburst capability timing precisely from launch to intended burst time



- Integrated flex approach
  - No additional interconnects
  - All electronic components on one side enhances manufacturability
- Advanced micro-controller for Muzzle Velocity Correction (MVC) accuracy
- Hardened for 8" Double Reinforced Concrete wall, and 34"Adobe wall impacts
- Stand-alone *complete* assembly
  - Adaptable to MCA calibers from 25mm to 50mm

Simple topology = successful high volume manufacture

Safe & Arm Design

- Setback and centrifugal spin locks, with Command-to-Arm rotor 'block' release
- Arming Energy: Projectile spin
- Miniature Size - .300" thick
- Operational capabilities
  - 109,000 RPM, 110,000 G setback
  - No change in arm distance with temperature
  - No lubrication required
- Meets Mil-Std-1316 requirement of two independent launch environments- setback & spin
- Suitable for 25mm – 50 mm MCA applications

Crew safety emphasized through simple, rugged design

Airburst Cartridge Operation

Step 1, Gunner Selects:

1. Airburst Mission:
   Vehicle fire control determines range, computes time to burst, and programs fuze with PD-immediate as back up
2. Point Detonation Delay Mission:
   Normal engagement, programmable detonation delays 4-5ms after impact
3. Arming:
   Default is safe separation range 50-100m with gunner option for "short" 10-25m arming if needed

Step 2, Arming

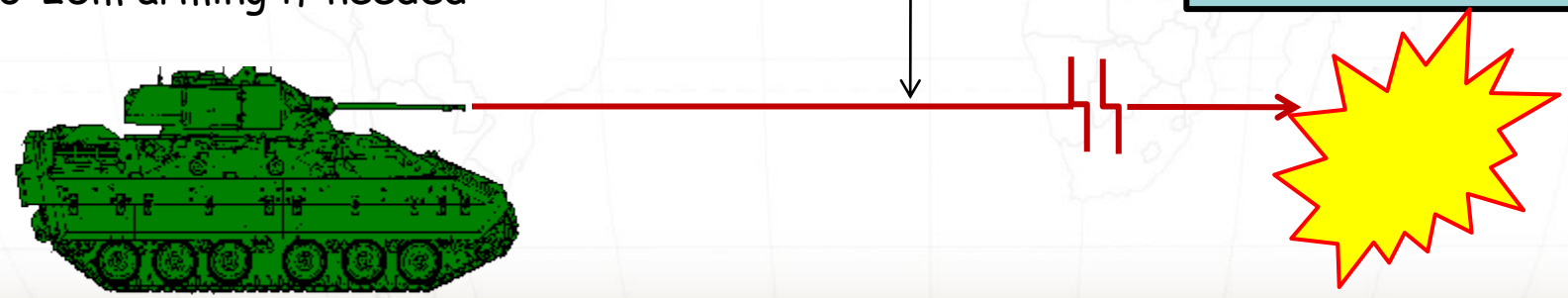
Fuze arms at preset flight time beyond the safe separation range or gunner selected "short" range

Step 3, Terminal Effects

- Airburst on target
- Point Detonation-Immediate
- Point Detonation Delay
- Self Destruct

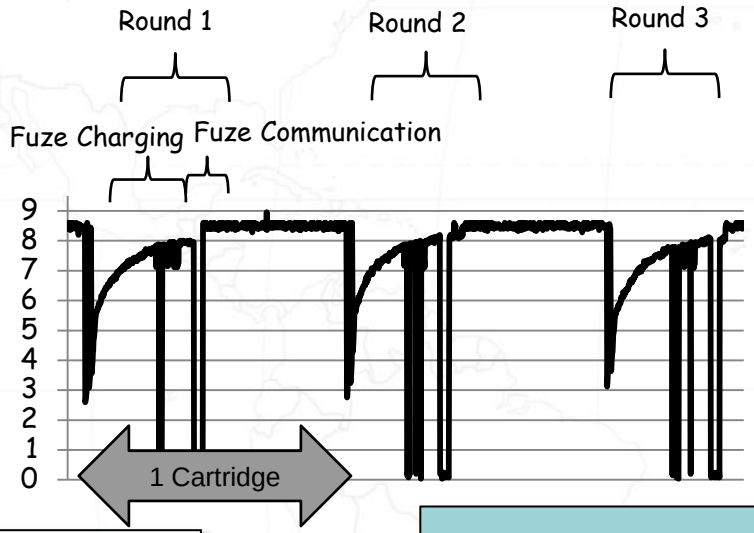
Target:

- Anti-personnel in open or defilade
- Light armor vehicle
- Hardened urban walls

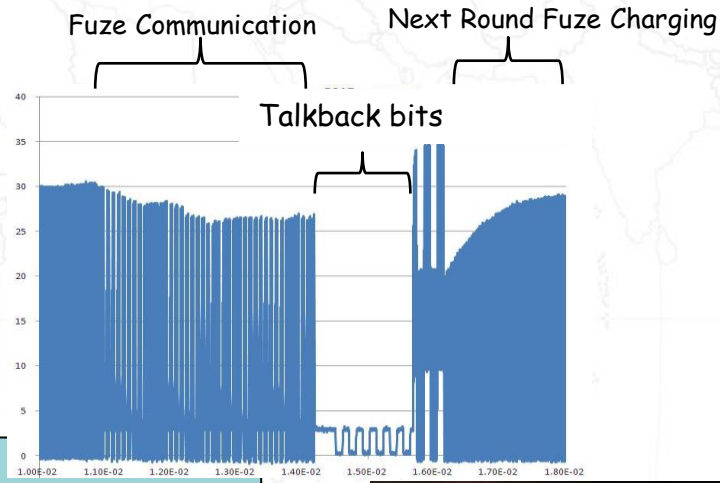


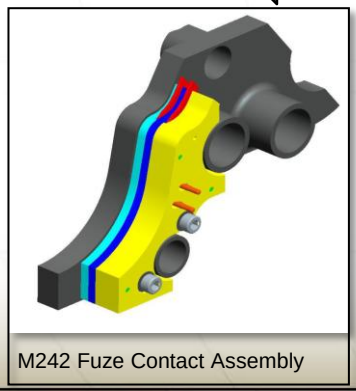
Fuze Communication – Contact & Inductive Set

Valid Airburst Contact Set Fuze Communication after 5000 Cartridge Cycles (2,500 ea M910 & 2,500 ea M793) 206 shots per minute



Valid Airburst Inductive Fuze Communication capable of 200 shots per minute fire rate





M242 Fuze Contact Assembly

Fuze interface assembly bolts to the weapon using existing holes in the feeder frame for both contact and inductive set

Airburst Fuze Summary

Precision Airburst Fuze

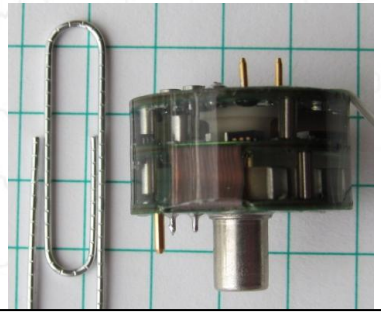
- Precision airburst with Muzzle Velocity Correction (MVC)
- Gunner selectable PD/PD delay
  - PD: Explode on a target
  - PD Delay: Penetrate and explode inside a target
- Gunner selectable arming via a Command to Arm Safe and Arm (S&A) device.
  - Default arming: Projectile arms at safe separation distance, 50-100m
  - Short arming: Projectile arms within 10-25m for short range engagements

Fuze development efforts continue using:
- IRAD funding for 25mm applications
- CRAD funding for US Army applications

Airburst Fuze Application: 25mm

Forward Warhead Assembly:
- Hardened Urban Wall Penetration
- Airburst Lethality for Targets in Defilade or in the Open

Base Mounted Airburst Fuze with Command to Arm S&A



Fuze Electronics Module

Standard M793/M792 Propulsion System

Airburst fuze technology allows one round to performs the roll of multiple

Points of Contact:

Marketing:

Matt Solverson

- Marketing Director

General Dynamics – OTS

6658 Rt. 148 South

Marion, IL 62959

(618) 993-9306

Engineering:

David A. Andersen

– R&D Engineer

General Dynamics – OTS

6658 Rt. 148 South

Marion, IL 62959

(618) 993-9393