

Fuzing Innovations for Air Burst Munitions: A 25mm Case Study

Mark Tomes
Program Manager

49th Annual Fuze Conference
April 2005



This briefing will discuss the details of:

- ATK's IR&D Program
- Overview of XM25 system
- Range Estimation by Turns Counting
- Fuze Safety & EOD
- Air Burst Video
- Common Fuze Design for All Medium Caliber Projectiles



XM25 Weapon

XM25 Modes:

- Airburst
- Point Detonate (PD)
- Backup mode (PD) – No Fire Control
- Self-Destruct



25mm HE Airburst



25mm Projectiles

ABM Requirements	
Performance	ATK Approach
Settable Fuze	Inductive Set
Burst at Desired Range	Turns Counting
Point Detonate	Default Mode
Variable Arming Distance	Command Arm
On Board Power Source	Setback Generator
Safety	ATK Approach
Gun Launch Verification	Measure Rate of Spin
Safe Separation	Turns Count Accumulation
EOD	Master Timer for Self-Destruct
	No Residual Power

ATK's Design Meets or Exceeds The Requirements

Key Safety Capabilities of ATK's Airburst Round:

- Inductive setting
 - Requires valid setting to enable fuze in air burst mode
 - Point detonate is always available when valid launch is detected

- Setback Generator Power Source
 - Requires high g setback to activate
 - Arming and detonating can only occur from setback power

- Turns Counting
 - Fuze must continue to accumulate turns to function

- Spin Rate Test
 - Fuze must measure the correct spin rate, and correct number of turns to arm.

- Self-destruct mode at maximum mission time
- Duds rendered safe through power discharge
 - Finite power from setback generator
 - Power discharged in seconds compared to minutes or days for other power sources
 - 30 minute requirement easy to meet
 - No chemical hazard

Inductive Fuze Setting

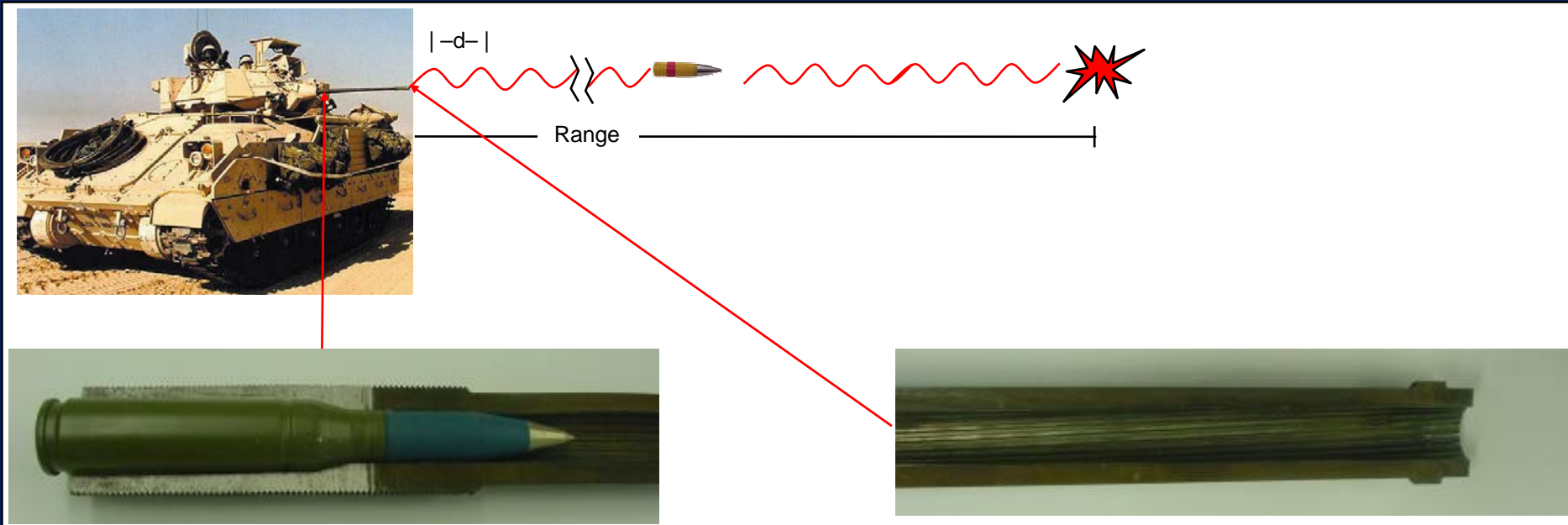
- It's proven
- It's safe
- It's rugged and reliable
- Handles high rate-of-fire requirements (>400 shots per minute)
- No maintenance or cleaning required
- It's used on multiple fielded weapon systems

Reliable Communication and High Rate of Fire in all
Environments

Range Estimation by Turns Counting

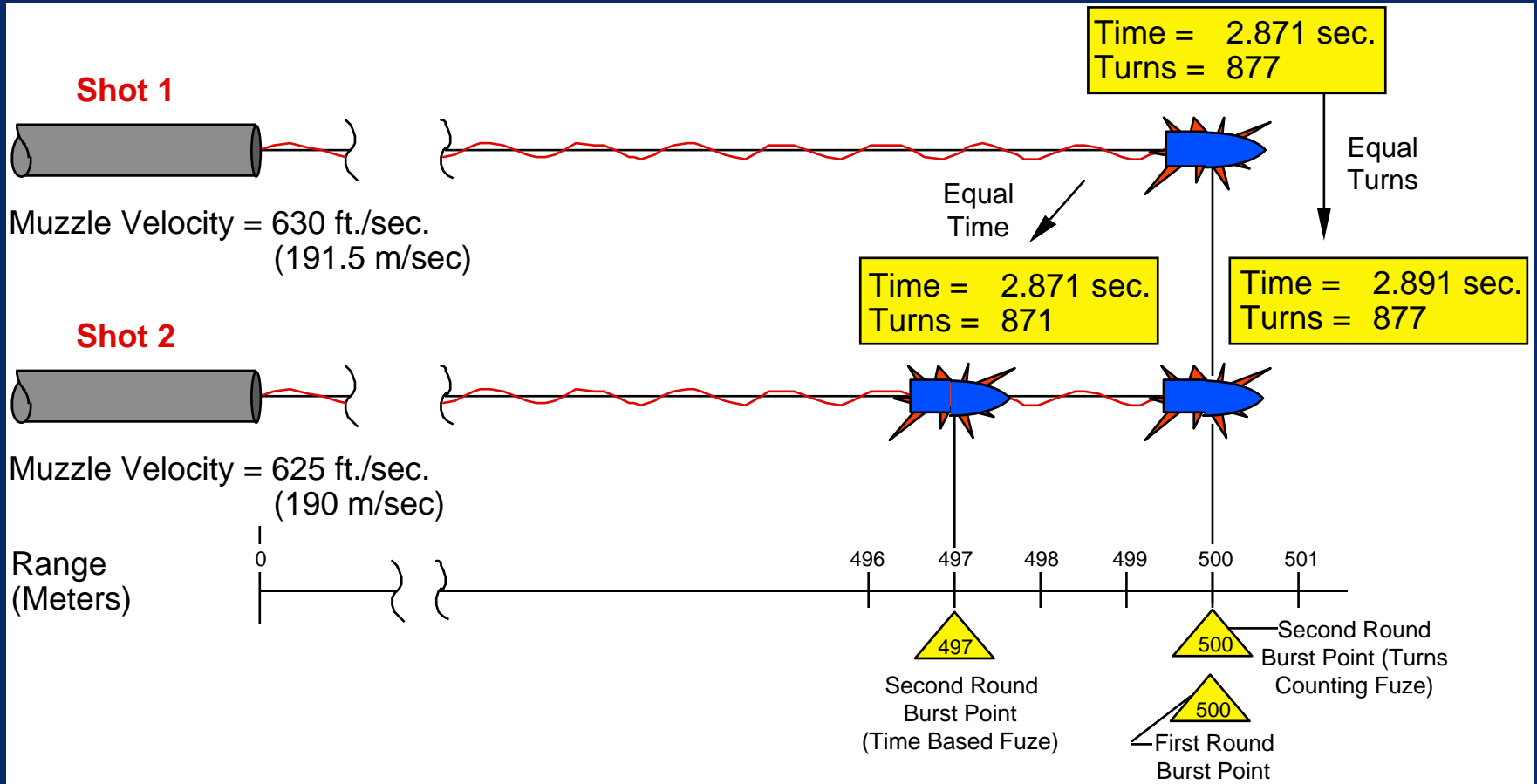


An advanced weapon and space systems company



- Barrel twist relates spin rate to range independent of muzzle velocity
- Velocity correction is built into the cartridge and does not require external sensing and feedback into the round
- A synthesis of turns and time (hybrid) provides improved accuracy at all ranges

Example Target @ 500 Meters

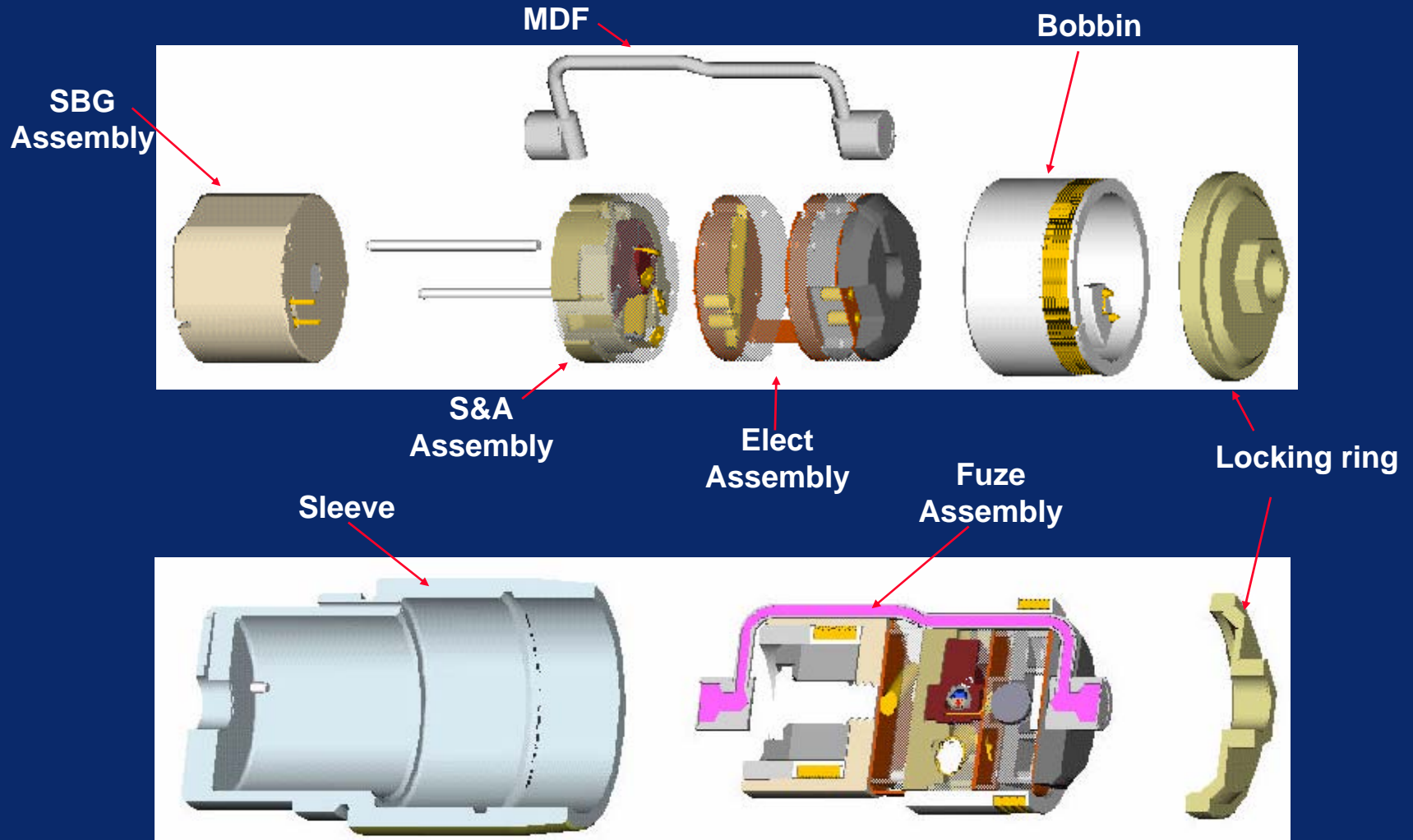


- Turns counting is less sensitive to muzzle velocity variations than a time based fuze for ranges < 2.5 km

Next Generation 25mm Fuze Assembly



An advanced weapon and space systems company

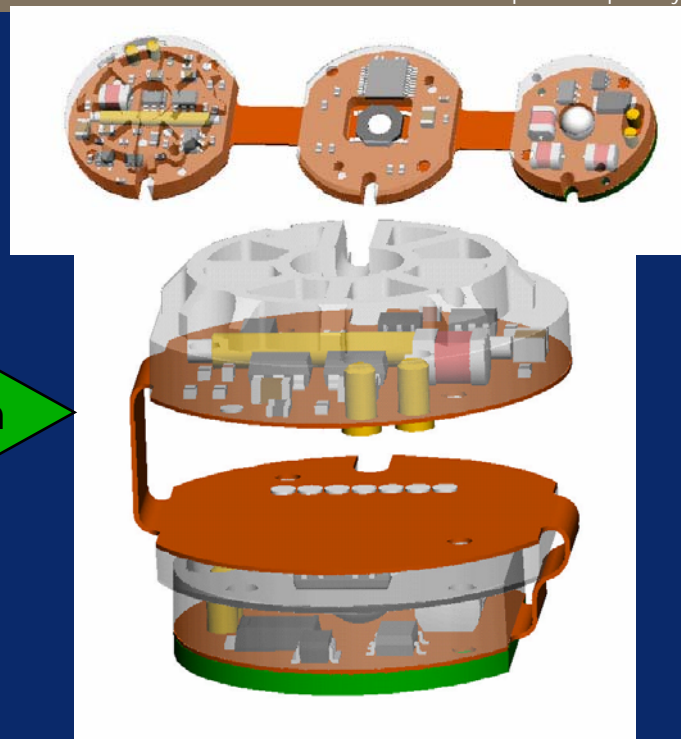


Simple Modular Design



Prior Configuration

Component Reduction



Next Generation Configuration

New Fuze Requires 1/10 the Power of Prior Design

- **Advantages:**

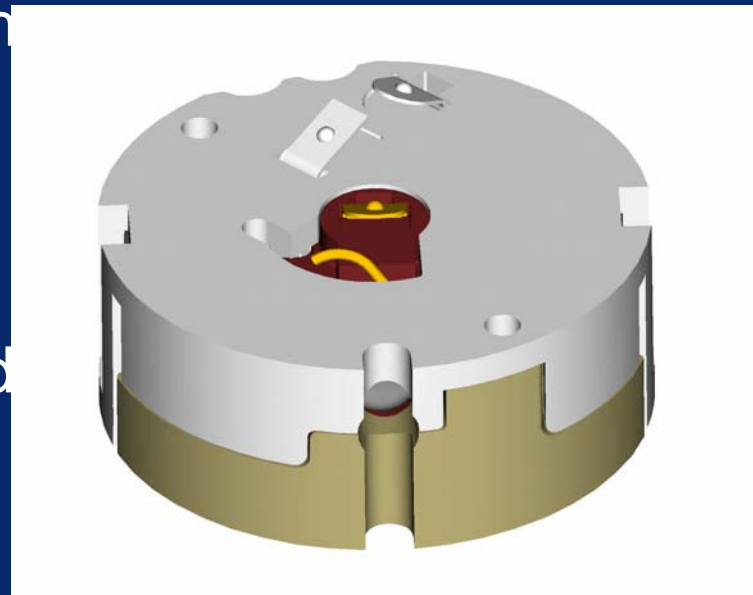
- Environmentally induced power
- Supports ATK's modular fuze approach
- Safe for 7ft drop
- Fits all projectiles 20mm – 40mm
- Provides power for long-range shots to 4000m (30mm)
- Allows point detonate mode without need for fire control and fuze setter
- Meets temperature and storage requirements
- No rise time issues
- No chemicals
- Low UPC cost



ATK Power Source Eliminates Batteries In
Medium Caliber Applications

ATK utilizes a command arm approach to Airburst fuzing

- Setback unlocks S&A
- S&A remains safe until commanded to arm by the electronics after safe separation distance
- Inline S&A ready to ignite explosive train upon reaching air burst point or impact with the target
- Same S&A compatible with multiple projectiles and weapon systems



Command Arm for Target Engagement Flexibility

XM25 25mm Airburst Video



An advanced weapon and space systems company



- Common fuze approach for medium caliber ammunition (20mm–40mm)
 - Power source, electronics, and S&A same for each application
 - Explosive train is unique to its application
- 95% common components between 25mm and 30mm ammunition
 - Low cost
 - Reduces development time
- Command arm fuzing allows engagement at short and long ranges
- Inductive set provides reliable communication and high rate of fire in all environments
- Development of low cost setback generator provides fuze power for all missions and environments

Common Design  Lower Cost

Common Fuze Design for All ABM Systems



An advanced weapon and space systems company

- ATK has demonstrated turns count fuzing with many air bursting projectiles
 - 20mm, 25mm, 30mm, 40mm
 - Common Electronics, S&A, and Power Source
 - Arming Distance Easily Accommodated for Different Applications or New Modes



20mm
Projectile



25mm
Non-Lethal
Projectile



25mm
Projectile



30mm
Projectile



40mm Projectile

- Power Source
 - Setback generator replaces batteries
- Fuze Electronics
 - Low power (1/10 the power consumption of prior fuze)
 - Reduced component count (cheaper and smaller)
- Safe and Arm Device & Explosive Train
 - Molded parts
 - Simplified explosive train
- Inductive Fuze Setter
 - High firing rate in all environments

ATK's Approach to a Common Fuze
Leads to Lower Cost Ammunition