Leveraging Proven Systems to Develop a Guided Mortar for APMI
Agenda

- Overview of Accelerated Precision Mortar Initiative (APMI) Program
- Mortar Guidance Kit (MGK) – ATK’s Solution to APMI
- Leveraging Proven Systems – Design Methodology
- Development Timeline
- Summary of Test Results
- Current APMI Program Status
Current Threat Requires Precision Capability

- Seeks cover in reinforced structures and vehicles
- Executes widely dispersed, often well-equipped, small unit operations
- Seeks sanctuary in urban and complex terrain
- Intentionally uses civilians as obstacles
- Exploits terrain and geography
- Capitalizes on media’s response to U.S. military power.

Logistics challenges and the need to avoid collateral damage make it difficult, if not impossible, to provide indirect fire support using conventional munitions.
Accelerated Precision Mortar Initiative (APMI)

APMI responds to an Operational Need Statement (ONS) from troops deployed in Afghanistan

- Requested a responsive, all-weather precision 120mm mortar capability
- Need precision capability to
  - Minimize collateral damage
  - Respond to smaller, fleeting targets
  - Reduce risk to soldiers by providing first round effects, and
  - Reduce logistics burden

APMI is a complete precision system

- 120mm XM395 precision munition
- Fuze setter and fire control software

APMI provides affordable precision capability for the battalion commander
APMI – A System of Systems

XM395, 120mm HE Cartridge

UMR Four Systems

M32 Lightweight Handheld Mortar Ballistic Computer Software v4.0

Mortar Fire Control System M150/M151 Dismounted Software v6.1

Precision Lightweight Universal Mortar Setter System (XM701 PLUMSS)
XM395 Required Capabilities

- **Accuracy**: 10m Circular Error Probable (CEP) (Threshold); 5m (Objective)
- **Lethality**: Similar kinetic effects of current munitions
- **Maximum Range**: 6.2km (Threshold); 7.0km (Objective)
- **Guidance**: GPS Selective Availability Anti-Spoofing Module (SAASM)
- **Compatibility**: US 120mm Smooth Bore Mortar System

**XM395 meets or exceeds all threshold requirements**
XM395 – JDAM for the Infantry Soldier

- Proven folding fin design induces body spin
- Standard M1020 igniter
- Proven high-hat M47 charge increments

- Standard M934 body
- Obturating ring for pressure seal
- Comp B explosive fill
- Modified for deep intrusion fuze

- PGK nose assembly with minor modifications
- Fixed canard assembly
- GPS receiver
- Safe & Arm
- PGK booster assembly
- Canard cover Enhanced Portable Inductive Artillery Fuze Setter (EPIAFS) interface

Direct application of ATK’s PGK guidance fuze reduces cost, risk, and schedule
Leveraging Proven Systems – Fin Assembly

• Folding fin assembly developed under Precision Guidance Mortar Munition (PGMM) program

• Gun-hardened design proven successful in numerous PGMM shots

• Modified for MGK:
  – Shortened fin span
  – Optimized hub cant to improve spin rates

• Benefits of Leveraging:
  – Proven design concept
  – High confidence of passing qualification testing, such that separate fin/tail assembly testing wasn’t necessary
Leveraging Proven Systems – Mortar Body

- Modified for MGK – Explosive content machined away to create deep intrusion fuze well

- **Benefits of Leveraging:**
  - *Utilizes current M934 loaded mortar bodies*
  - *Only requires simple modification to enable interface with MGK fuze*
  - *Maintains lethality of existing M934 cartridge*
Leveraging Proven Systems – Fuze Assembly

- Fuze assembly adapted from Precision Guidance Kit (PGK), which is designed to guide a 155mm spin-stabilized projectile

- Modified for MGK:
  - Added thermal battery for power management
  - Integrated common mortar S&A to accommodate lower spin rates
  - Modified fuze thread interface
  - Optimized electronics for operating in a mortar environment

- Benefits of Leveraging:
  - Utilize proven guidance, navigation, and control system
  - System proven on PGK under more severe artillery launch environment
  - Commonality of parts allows for purchasing efficiencies
Reduced Development Timeline

- APMI is part of an Urgent Material Release (UMR) due to the critical operational need
- ATK was selected as winner of competitive demonstration in April 2010
- Completed UMR system qualification testing in February 2011
- UMR Qualification received and Lot 1 fielded to theater in March 2011
- Less than 1 year from Qualification Program Award to first unit fielded

Use of existing proven systems allowed for rapid development to meet APMI urgent need request
Qualification Testing Summary

Qualification Objectives

• **Demonstrate performance to CEP and reliability requirements** in operational environments such as temperature extremes, blowing rain, sand and dust, thermal shock, low altitude, high elevation

• **Demonstrate no safety issues** with cartridge after exposure to sequential environments representing extreme storage, transportation and handling; Electromagnetic Environmental Effects (E3) and other safety-related exposures; fuze safety – jolt, jumble, thermal shock, temperature and humidity cycling, vibration

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<tr>
<th>Requirement</th>
<th>CEP ≤10 m</th>
<th>Reliability ≥90%</th>
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<tr>
<td>~60 Rounds Fired for Performance Scoring</td>
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<tr>
<td>~150 Rounds Fired Overall in Qualification – ALL SAFE</td>
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APMI meets or exceeds all threshold requirements
XM395 Program Status

- ATK under contract for full UMR production quantity – February 2011
- Urgent Material Release of APMI approved – March 2011
- First lot of production hardware shipped to Afghanistan – March 2011
- Production builds continue at ATK facilities
Summary

• APMI addresses an Urgent Material Release to provide the Army war fighter with a precision mortar capability

• ATK was able to respond rapidly to this request by integrating proven systems to shorten the lifecycle to field deployment

• Keys to Rapid Development and Deployment
  – Leveraging success of other programs by implementing proven design concepts
  – Optimizing existing systems to be more effective in a new application

• XM395 is now in production and in the field

• APMI gives the battalion commander needed precision capability
  – Effective attack of fleeting targets with limited collateral damage and first round effects
  – Fewer rounds to complete mission with significantly reduced logistics burden

APMI will change the way infantry units fight
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