Flight Controlled Mortar (FCMortar) for Precision Urban Mortar Attack (PUMA)

NDIA Fuze Conference
19-21 May 2009
Flight Controlled Mortar
FCMortar

• What is FCMortar?
  – Guidance Kit for 81mm HE ammunition
    • Adds precision capability to M821A1/A2 & M889A1/A2 Family of Ammunition
    • Upgrade performed at Depot level
    • Core weapon system for Precision Urban Mortar Attack (PUMA)

• Why FCMortar?
  – 81mm mortar systems currently area fire weapons
    • Can’t provide fire support in confined areas/difficult access terrain
    • No precision capability
  – Brings light-weight precision capability to the company/platoon level
    • Utilized within USMC Enhanced Company Operations (ECO) framework
    • Timely, Organic Fire Support

Does not replace existing 81mm Mortar Inventory
Flight Controlled Mortar
“Difficult Terrain”

Engagements in New Terrain Types Hampered by Topology
Flight Controlled Mortar
Projected Capabilities

• Precision Delivery
  – GPS & SAL
    • SAASM + Anti-Jam GPS
    • Micro-Pulse Laser Designation (MPLD) Seeker
  – Access to new/difficult terrain types
    • Urban (MOUT), Canyons, Mountains, Reverse Slope
    • Accomplished through advanced trajectory shaping techniques

• Built on existing mortar capabilities
  – Retains fuzing functions & propulsion system
  – Comparable engagement ranges

• Cost Driven solution
  – $3,200 - $5,000 AUPC
Flight Controlled Mortar
Current Design Overview

- Existing Primer & Propellant Increments
  Leveraged directly from M821/M889

- Existing Warhead Body
  Unmodified M821/M889

- Canard Actuator
  Inside GNC/Fuze Assembly

- Articulating Canards
  Deployed at Start of Guided Flight

- Stabilizing Tail Fins

- GPS Receiver
  Mayflower C/A
  GPS Receiver for Phase I

- Terminal Seeker
  MPLD
DoD Development Team

• Sponsor
  – Office of Naval Research, Code 30 Fires

• Principal Investigator
  – Naval Surface Warfare Center Dahlgren Division
    • Code G33 – Precision & Advanced Systems Branch

• Guidance Kit Development, Integration, & Testing
  – Army Research Laboratory, Aberdeen Proving Ground
    • Advanced Munitions Concepts Branch

• Fuzing
  – Armament Research, Development and Engineering Center (ARDEC)
    • Fuze Division, Adelphi

• Terminal Seeker Development
  – Micro-Pulse Laser Designation
    • Naval Surface Warfare Center Dahlgren Division
      – Code G31– Expeditionary Weapon Systems Branch
        » Targeting Engagement Systems Center of Excellence (TESCE)
Flight Controlled Mortar Program Schedule

• Phase I (FY09-11)
  – Development of system architecture
    • Sub-system development & demonstration
  – Terminal seeker technology maturation
  – GPS only guided flight & trajectory shaping demonstrations

• Phase II (FY12-14)
  – Terminal Seeker Integration
  – Guided flight & trajectory shaping demonstrations w/ Terminal Seeker
  – PUMA Demonstrations
    • End-to-end demonstration including ground & UAS designation systems
    • Intended to be as realistic as feasible
  – Transition to Acquisition
• First Demonstration Event
  – ARDEC Sub-Sonic Wind Tunnel, Picatinny Arsenal
    • 9-12 February 2009
• Validated most aerodynamic predictions
  – Supports simulations showing vertical approach & range extension capabilities
  – Minor design change needed to enhance static margin
    • Tail-kit redesign completed
• Forward section of guidance kit replaces existing M734/935 mortar fuzes
  – Maintains existing fuzing capability
    • PD, PD Delay, HOB
    • Additional modes possible
      – Time, Point-in-Space, etc…
  – Utilizes existing production components where feasible
  – New components currently being investigated for applicability
    • HOB antenna, 2\textsuperscript{nd} Arming environment sensors, MEMS fuzing components
• Supplements existing 81mm mortar inventory with precision capability

• Allows engagement of targets in previously inaccessible terrain

• Reduces cost & creates a more mobile alternative to existing precision fire support systems

• Supports Enhanced Company Operations (ECO) Framework as part of PUMA system of systems approach