Counter-Rocket, Artillery, Mortar (C-RAM) Delivers on Promises and Saves Lives

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Operational Environment

• Indirect fire is and will remain a staple of combat
• Weapons of choice for conventional & irregular foes, worldwide:
  – Mortars
    • Rapidly employed and used, acceptably accurate, difficult to locate
  – Rockets (all calibers and types)
    • Remote or delayed firing options, difficult to locate
  – Some possible use of lighter artillery (75mm-105mm)
    • More accurate, easier to move, easier to locate

• Present and future threats will exploit vulnerabilities of US/Coalition fixed sites, especially large bases, by indirect fire attacks
Current Operational Requirement

HQDA Validated OIF Operational Needs Statements (ONS)

Operational requirement for Integrated Force Protection based on Theater needs:

- 10 Sep 04 Army Strategic Planning Board Validated Theater ONS 306-04 for a Counter Rocket and Mortar Intercept and Destroy Capability

- Supports a Mar 05 HQDA G3-validated Theater ONS (260-4) for Sensor Interoperability to Digital Battle Command Systems

- Supports a Aug 05 HQDA G3-validated Theater ONS (05-466) for an Integrated Base Defense Security System capability
**C-RAM Requirement / Background**

- **C-RAM Requirement**
  - Jun 2004 – Theater submitted Operational Need Statement (ONS 306-04) for a system to destroy Mortar rounds
  - Sep 2004 – The ASPB validated theater ONS and directed ABO fund C-RAM Proof-of-Principle Test
  - Jan 2005 – Results of C-RAM POP test briefed to VCSA, SecNav, and Dep SecDef

- **C-RAM Capability**
  - Feb 2005 – Sense and Warn capability validated and initial fielding begins
  - Apr 2005 – Intercept capability validated and initial fielding begins
  - Jul 2005 – IOC of Sense, Warn, and Respond capability at FOB 1
  - Sep 05 – C-RAM supported successful attack of 2 insurgent mortar teams – 11 KIA, 5 captured
  - Mar 06 – FOC declared at FOB 1 and first combat intercept (first ever for a Phalanx system)

- **FMS and Lease Cases approved 2QFY06**
  - May 06 – First Coalition FOB fielded

- **IBDSoS funded 2QFY06 and fieldings begin in support of C-RAM Enhanced Response capabilities and ONS 05-466**

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C-RAM Sense and Warn capability fielded to 15 FOBs, 3 of which have Intercept capability, and IBDSoS is installed at 10 FOBs
Lessons Learned
System-of-Systems Integration

• Lesson Learned: System-of-Systems (SoS) PM must retain and execute integration responsibility for the SoS
  – SoS PM must conduct all trades in selection of component systems
    ▪ Avoids corporate biases
  – All DoD Program of Record (POR) systems should be assessed
    ▪ Avoids service biases
  – SoS PM must ensure support of the component system’s PM for any necessary modifications
    ▪ SoS PM must assess risk and cost for these modifications
  – When a suitable system is not available, selection of an S&T initiative or a COTS item may be appropriate
    ▪ SoS PM must ensure any S&T or COTS item has been adequately tested and is supportable

The Government Stakeholders Must be Bound to “Specified Time” to Avoid Schedule Slips and Cost Increases
Lessons Learned
SoS Capability Development

- Lesson Learned: To ensure requirements are met, work with independent test agency throughout system development
  - C-RAM Program Office successfully integrated Army, Air Force, USMC, and Navy Program of Record (POR) systems into the C-RAM SoS and fielded a SoS that meets requirement just 6 months after funding
    - Required working closely with Army Test and Evaluation Command (ATEC) in all tests, beginning with the very first proof-of-principle test in Nov 04
      - ATEC has been a partner in the C-RAM program
        » They supported development of all test and data collection plans to ensure adequate data would be available to prepare a Capabilities and Limitations report
        » No modifications were fielded without an ATEC Capabilities and Limitations Report
Lessons Learned
SoS Capability Development

- Lesson Learned: To reduce risk and ensure supportability, fund component system PORs to implement all changes to their systems.
  - Multiple changes were required in the C-RAM’s POR component systems
    - All such changes were agreed to between the C-RAM and POR PMs; developed by the POR PMs; funded by C-RAM; and then jointly tested
    - When there were conflicts between the POR system’s requirements and C-RAM requirements, the Combat Developer helped define courses of action
Lessons Learned
Training

• Lesson Learned. SoS PMs need to focus on Collective Training
  – Development of CONOPs, TTPs, and crew drills
    ▪ PM C-RAM provided Fires Center of Excellence (COE) tactical equipment to enable development of these essential operational procedures
  – Individual Training
    ▪ Provided equipment to Fires COE and trained-the-trainers to enable individual training
    ▪ Supported annual Mobile Training Team visits to theater to assess training and identify requirements for changes in both training and CONOPS/TTP
  – Collective Training
    ▪ Provided Fires COE tactical suite of equipment to support collective training of deploying C-RAM units and supported conduct of their Mission Readiness Exercises
    ▪ Fielded C-RAM equipment to Army and USMC Combat Training Centers (CTCs) to enable training of units rotating to theater
    ▪ Developed stimulation capability to support on-site unit training to maintain proficiency and to train for new threats
  – Warfighter Feedback
    ▪ PM C-RAM conducts weekly Secure VTCs with theater to provide Warfighter a direct link to C-RAM staff, the combat developer, and PMs of other component systems

Close Coordination with Combat Developer Has Ensured C-RAM Units are Prepared for Combat, and Identified Additional Changes Required in C-RAM
Lessons Learned
Responsive Support for the Warfighter

• Lesson Learned. PMs must plan for and be prepared to support urgent Warfighter changes
  – “No plan survives first contact”
  – C-RAM provides a personal PM representative on MNC-I staff to coordinate and respond to:
    ▪ Multiple changes in fielding locations and priorities
    ▪ Requirement to relocate / reinstall C-RAM capability from one FOB to another
    ▪ Changes in threat tactics
    ▪ Expansion of capabilities to support tracking of insurgent crews by integration and cuing of EO/IR sensors
    ▪ Additional available sensors at FOBs by integrating them (UTAMS, Shadow)

• Lesson Learned. PMs need to include collection and analysis of data on system performance concurrent with their fielding to enable rapid identification and localization of performance issues
  – C-RAM provides Warfighter:
    ▪ 24/7 forensics analysis team to analyze ALL events - successes and failures
      - Analysis is normally completed within 24 hours for major events
    ▪ Secure commercial SATCOM links back to C-RAM Program Office in Huntsville to enable immediate transmission of all classified forensics data

PM’s and TRADOC Should be Funded to do this in Peace-Time
Deployed System

User/Theater Requirements

Assess System Performance (Forensic Analysis)

Engineering Analysis

ID System Shortfalls

Modify System Design

Test Design ATEC C&L (JAT w/ ATEC)
Forensic Data Process (U)

1. Theater IDF Attack
2. SIPR Net / SDT
3. PD-CRAM 7 Days/Wk Monitoring
4. Critical Event?
   - N: Forensic Analysis Team
   - Y: Call in Forensic Team
5. Contractor Subject Matter Expert Support
6. Weekly VTC With Theater
7. Request for Info/Analysis
8. Repeat on Weekly Basis
SUMMARY

• Through judicious out-of-the-box thinking from the gitgo, PD C-RAM has taken a real-time, current warfighter threat and turned it into a long-term solution that addresses not only today’s tactical theater of operations, but many diverse ones in the future.

• The Counter-Rocket, Artillery, Mortar Program: continuing to deliver on its promises and saving warfighter lives TODAY.