Ballistic Protection for Expeditionary Shelters

JOCOTAS November 2009
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**Report Documentation Page**

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<th>2. REPORT TYPE</th>
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Approved for public release; distribution unlimited

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std Z39-18
• Living, working, eating in tents and mobile shelters
• Protection Needed
  – Entry Operation
  – On the move
• Mission Oriented – quick and seamless integration
• Semi-Permanent Hardening
• Sandbags, concrete barriers, Hesco bastion

• Strengths:
  – Robust
  – Defensive against multiple threats

• Weaknesses:
  – Labor intensive (sandbags/Hescos)
  – Require significant transportation assets (concrete)
  – Requires material handling equipment (concrete/Hescos)
  – Very low mobility once deployed (all)
Modular Ballistic Protection System (MBPS) - Objectives

- Provides **fragmentation** protection
- Withstands blast pressures
- Rapidly deployed
- Man-portable and reusable
- Integrates with standard mobile shelters
- **MBPS:** not direct replacement for permanent, long term forms of force protection.
• Tradeoff
  – Tent camp - large surface area
  – Armoring low cost item
Setting the Requirements

Developing a new capability

- Expeditionary shelter protection - new
- Design team developed specifications

Variables to Consider

- Level of Protection
- Weight (lbs)
- Cube
- Set up time
- Signature
- Compatibility with existing systems
- No Special Tools
- Flexibility of Use
- Cost
Setting the Requirements

• **Ballistic Requirement**
  – Fragmentation – in theater threats

• **Blast Requirement**
  – Withstand blast in accordance with *Unified Facilities Criteria*

• **Live Munitions Requirement**
  – Perform satisfactorily against live munitions

• **Performance**
  – Transportability: track and wheeled vehicles, aircraft, helicopters
  – Deployment / Strike times: 4 soldiers/30 minutes
  – Extreme climate
  – Durability
  – Snow and wind loading
  – Fire
  – Off-gassing
Testing

• Ballistic
• Blast Overpressure
• Arena Testing
• User Evaluation
• Developmental Testing
  – Durability / deployment times (20 cycles)
  – Transportability
  – High and low temperature
  – Snow and wind loading
• Flame
Preliminary Modeling

- NSRDEC’s Integrated Casualty Estimation Methodology (ICEM)
  - Fragment based analysis
  - Determines the severity of injury both without and with the armor system in place

- University of Maine Fragment Penetration Model
  - Tracks the path of a number of fragments from a threat based on fragment speed/weight/trajectory
  - These fragments are determined to either stop on an armor panel or penetrate
MBPS TEMPER:

- Integrated onto TEMPER tent
  - TEMPER: widely used standard tent
  - Simple strap connect/disconnect
  - Sliding endwall door

- Completed all testing

- In theater field evaluation
Application/Status

MBPS – Rigid Wall

• Containers used in theater for living space
• Integrates directly on CONEX containers with ISO corners
• Rail and ratchet attachment system
• Completed Developmental Testing, ATEC
• Completed User Evaluation August 09
• Engineer Battalion, Ft McCoy
• In theater evaluation
Mobile Kitchens

- Muddy Boots Council
- Prototype Designed for Containerized Kitchen (CK) and Modular Kitchen Trailer (MKT)
- Used existing panel design
- Preliminary Blast Test – May ‘09
- Structural FEA
- Redesign and test
• MBPS Airbeam
  – Force Provider tent camps transitioning to airbeam shelter systems
  – Airbeam unique response to blast loading
    • Dynamic response
  – Stand alone design being considered
  – Second blast test Nov 09
Partnerships

• Product Manager, Force Sustainment Systems
  – Materiel Developer and Total Life Cycle Manager for MBPS
  – Manages Formal Development Program and Transition Items to Field

• University of Maine – AEWC Center (Orono, ME) Congressional
  – Development Partners of MBPS
  – Panel design, system designs, ballistic and blast modeling, manufacturing, testing

• KaZaK Composites, Inc. (Woburn, MA) Congressional
  – Panels for rigid-walled design
  – Pultrusion manufacturing

• Texas Research Institute Austin (Austin, TX) SBIR
  – High performance panels research
• Army Corps of Engineers
  – Munitions expertise
  – Blast resistance and blast testing techniques

• Air Force Research Lab (AFRL)
  – Blast and fragmentation testing

• Army Research Lab (ARL)
  – Fragmentation Response Modeling
  – Ballistic Material Expertise

• NSRDEC – WARPAD Directorate
  – Ballistic protection and blast resistance
  – Ballistic performance modeling
Ongoing efforts

• Panel improvements:
  – Weight / Cost / Performance

• Manufacturability:
  – Reduce cost, increase production rates

• Design refinements:
  – Continuously upgrades
  – SBIR for flexible ballistic material

• Technology transition:
  – Through PM, FSS : Entered formal Army Acquisition process: Milestone A – 1QFY10
  – Rapid Equipping Force (REF) support – accelerated testing
  – Force Provider Capability Production Document – ballistic kit
Accomplishments

• Successful partnerships with academia, industry, and military groups

• Adapted initial design for multiple shelter platforms

• Rapid transition from conceptual design to field-ready prototype

• All development accomplished with congressional and SBIR funding
Questions?