



Ballistic Protection for Expeditionary Shelters



TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

JOCOTAS November 2009

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- Living, working, eating in tents and mobile shelters
- Protection Needed
 - Entry Operation
 - On the move
- **Mission Oriented** – quick and seamless integration



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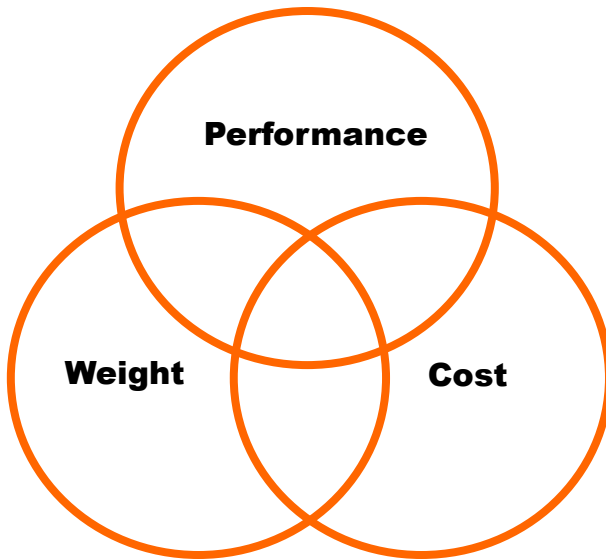
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- **Semi-Permanent Hardening**
- **Sandbags, concrete barriers, Hesco bastion**
- **Strengths:**
 - Robust
 - Defensive against multiple threats
- **Weaknesses:**
 - Labor intensive (sandbags/Hescos)
 - Require significant transportation assets(concrete)
 - Requires material handling equipment (concrete/Hescos)
 - Very low mobility once deployed (all)



- 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.



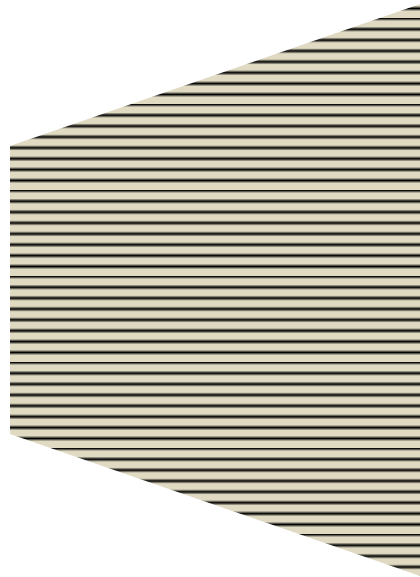


- **Tradeoff**
 - Tent camp - large surface area
 - Armoring low cost item

Developing a new capability

- Expeditionary shelter protection - new
- Design team developed specifications

Shelter Mission



Variables to Consider

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

- **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

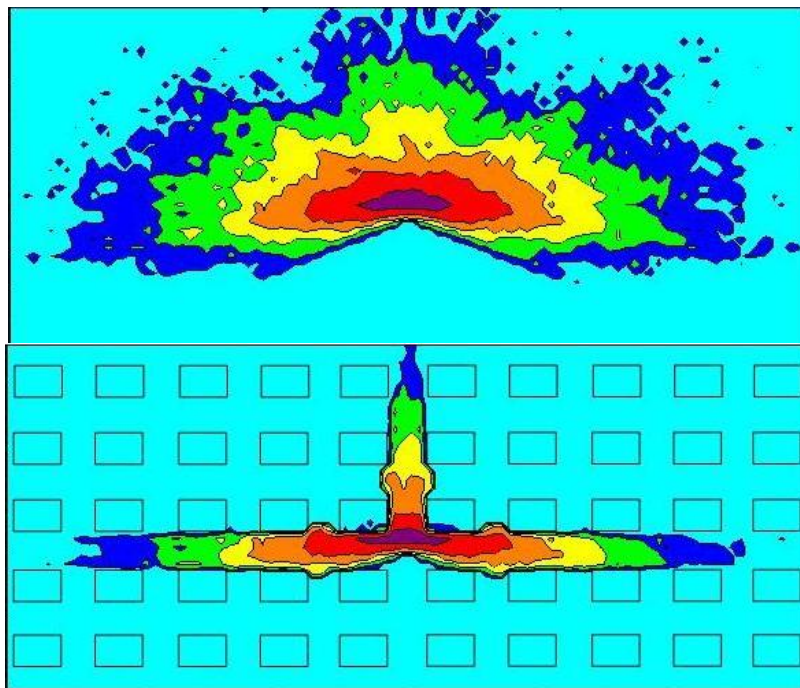


- Ballistic
- Blast Overpressure
- Arena Testing
- User Evaluation
- Developmental Testing
 - Durability / deployment times (20 cycles)
 - Transportability
 - High and low temperature
 - Snow and wind loading
- Flame



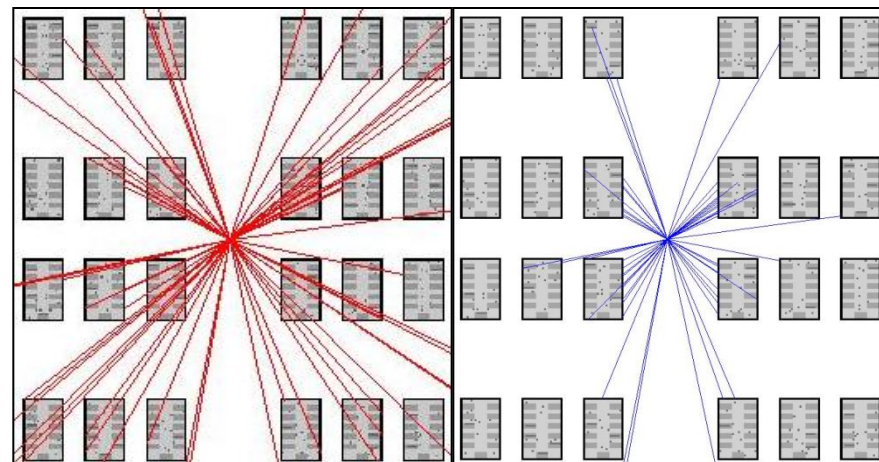
- **NSRDEC's Integrated Casualty Estimation Methodology (ICEM)**

- Fragment based analysis
- Determines the severity of injury both without and with the armor system in place



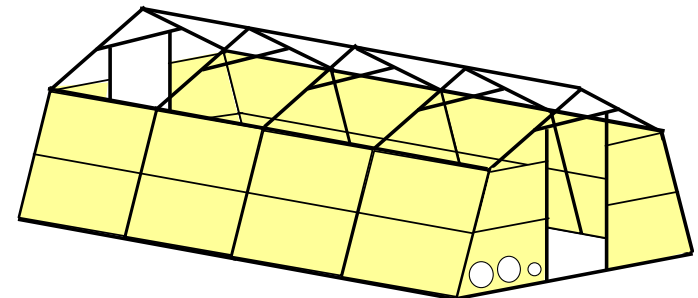
- **University of Maine Fragment Penetration Model**

- 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



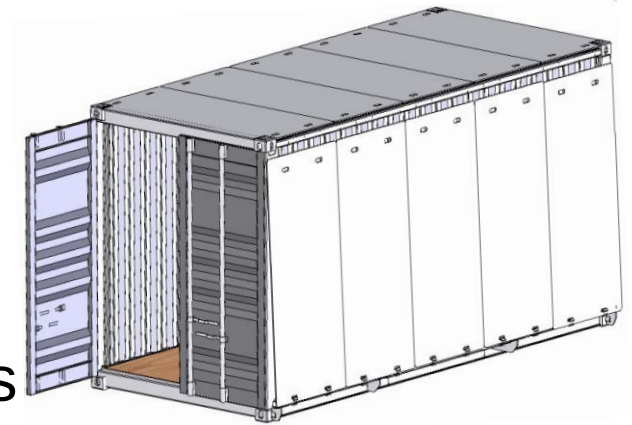
MBPS TEMPER:

- Integrated onto TEMPER tent
 - TEMPER: widely used standard tent
 - Simple strap connect/disconnect
 - Sliding endwall door
- Completed all testing
- In theater field evaluation



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



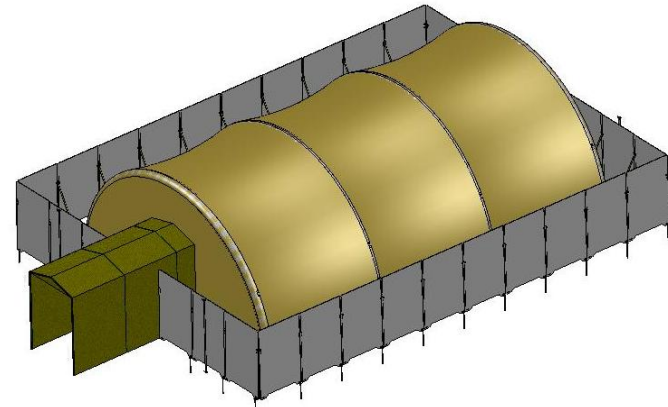
Mobile Kitchens

- 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



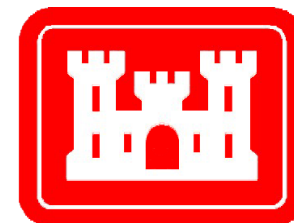
- **Product Manager, Force Sustainment Systems**
 - Materiel Developer and Total Life Cycle Manager for MBPS
 - Manages Formal Development Program and Transition Items to Field
- **University of Maine – AEWEC Center (Orono, ME) Congressional**
 - Development Partners of MBPS
 - Panel design, system designs, 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



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- **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



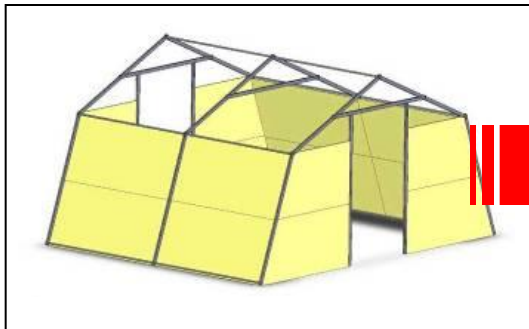


Ongoing efforts



- **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

- 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?