
Base Camp Protection / Survivability

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3 May 2005

Survivability Engineering Branch
Geotechnical and Structures Laboratory



Base Camp Protection

Objective

Provide an overview of ERDC Base Camp Protection R&D efforts and the associated rapid fielding initiatives



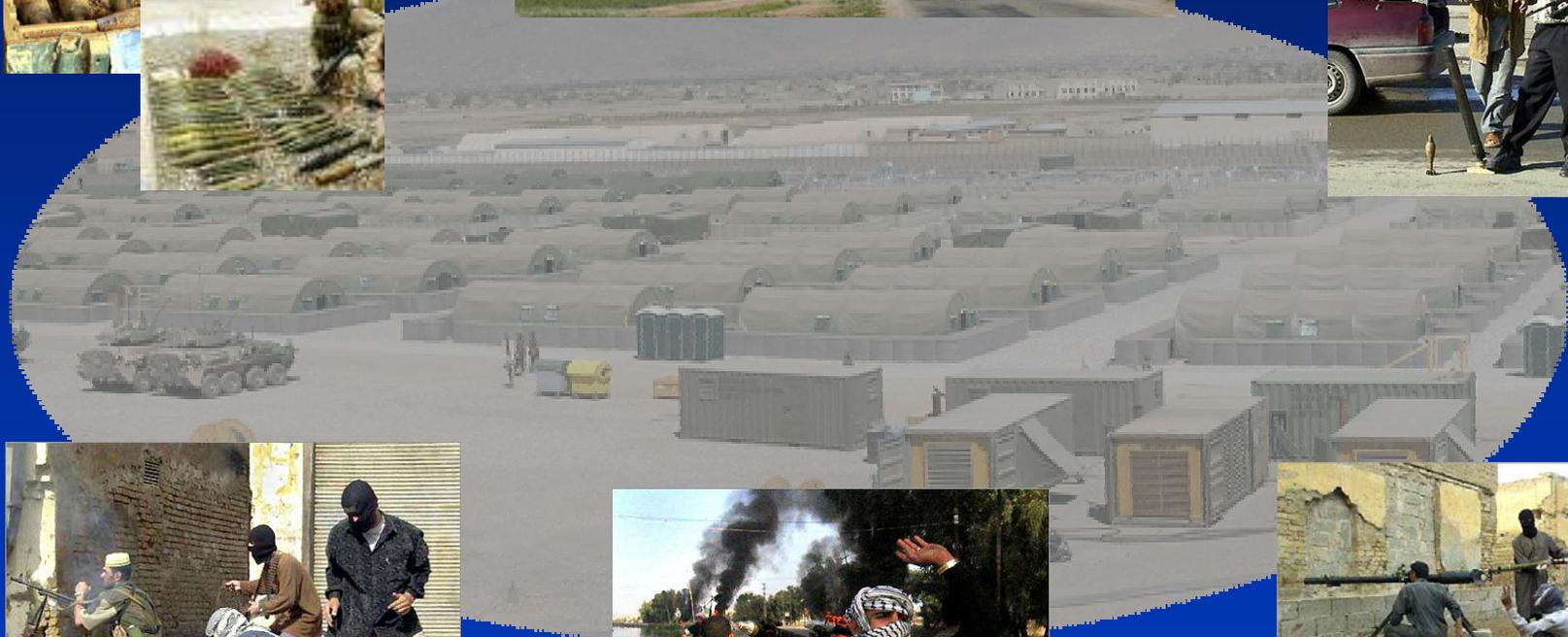
Thrust Areas

- Counter Rocket, Artillery, Mortar (RAM)
 - Overhead Cover
 - Compartmentalization
 - Sidewall Protection
 - Expedient Protective Positions
 - Conventional and Expeditionary Structure Protection
 - Entry Control Facility
 - Physical Security Sensor Tools
 - Camouflage, Concealment, and Deception
 - Survivability Planning Tools
-



Asymmetric Threat

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Overhead Cover

Initial Efforts



Overhead Cover Constructed
December 2004, Iraq



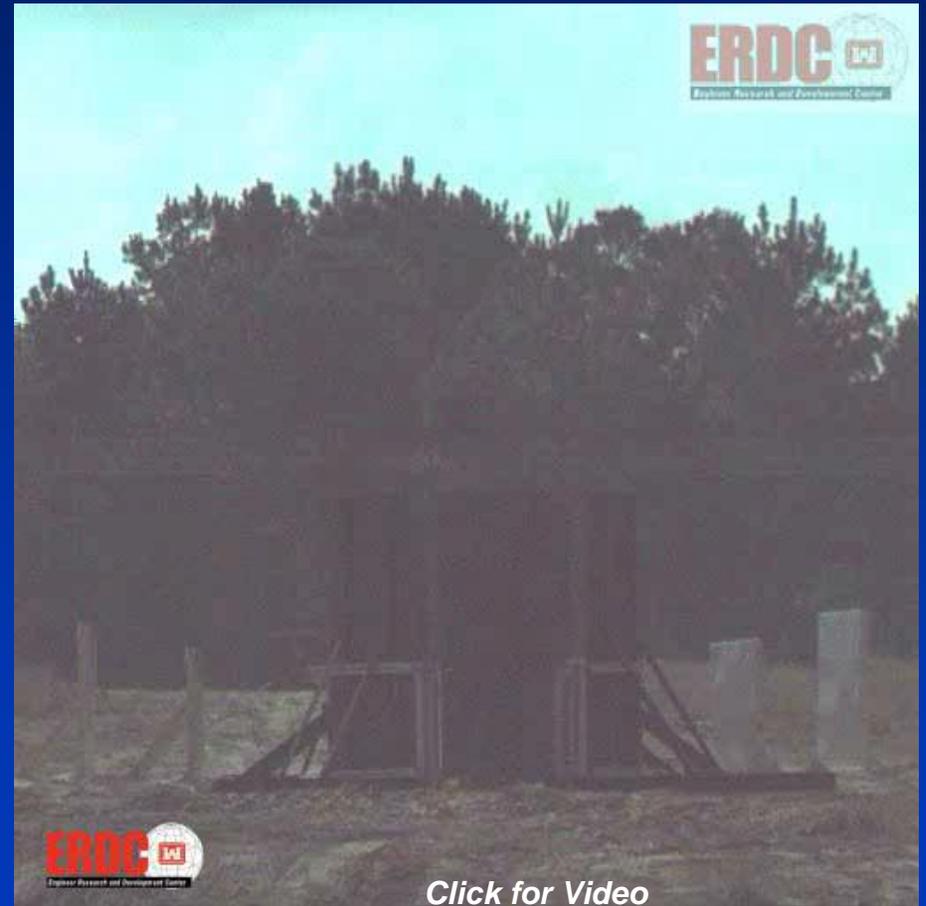
Fort Polk, March, 2004

*Validated first generation
solution to problem*



Overhead Cover

Fragment Defeat Studies



Overhead Cover

Fuze Initiation Studies



- Rockets tested in direct-fire trajectory
- 6 materials evaluated in live-fire tests
- Additional rocket types and materials to be tested June 2005



Overhead Cover



Full scale validation Fort Bliss, Nov. '04

- 8 Structure Types
 - Different combinations of pre-detonation and shielding layers
- First investigation of tent compartmentalization



Compartmentalization

Problem



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Compartmentalization



- 3 compartmentalization techniques/materials evaluated
- Construction procedures established for proven solutions

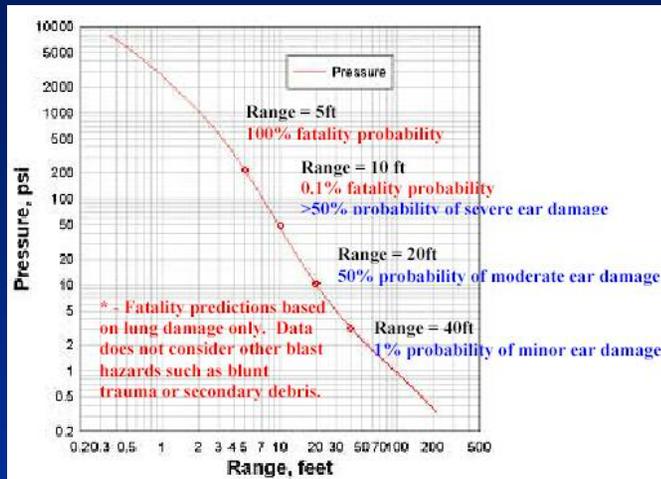


Fort Polk
January, 2005

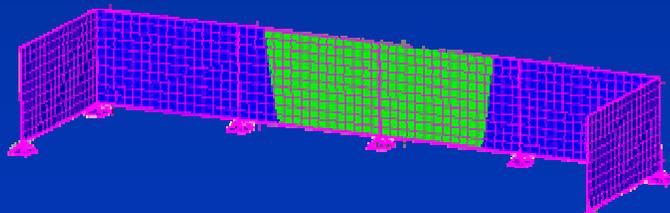
[Click for Video](#)

Compartmentalization

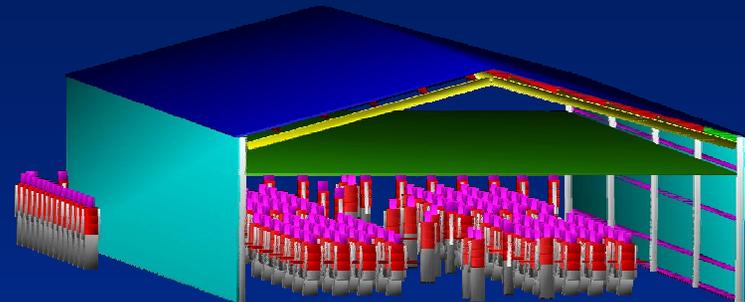
Numerical Analysis



BLASTX – physiological effects



ISS – dynamic structural response



COBRA – fragmentation analysis

- Input weapon characteristics, structure and protective material properties, and locations of personnel
- Simulates weapon attack on both unprotected and protected assets
- Allows quantified evaluation of survivability increases due to protective measures



Sidewall Protection

Corrugated Metal Revetment

- Initial request for evaluation, Spring 2004
- Developed designs, modeled, and experimentally validated within 6 months
- Coordinating fielding with CENTCOM through JIED-TF and REF, April 2005
- NSN's being established through DLA



Modular Concrete Bunker



- Eglin AFB and JRTC validation experiments July – Aug 04
- Designs suitable for above and below ground application
- Design requested by CENTCOM for construction by local contractors



Hesco Bastion Protective Designs



Small Observation Post



Aboveground ISO Bunker



Single-Bay Fighting Position



Large Observation Post

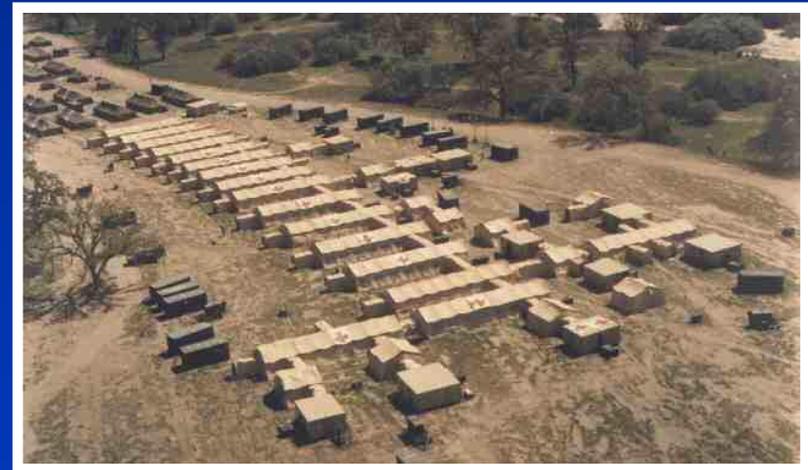
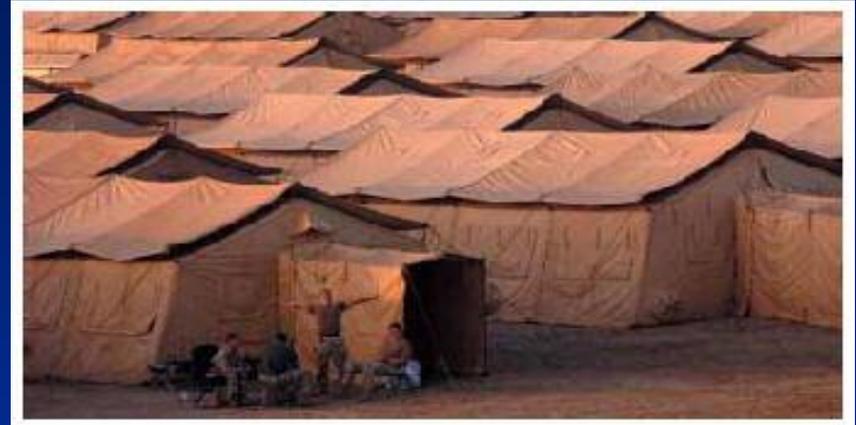


Two-Bay Fighting Position



Protective Retrofits for Expeditionary Structures

- **Determine vulnerabilities of typical structures**
 - Airblast Only – most common expeditionary shelters provide practically no fragment protection
- **Develop retrofits to increase protection**
 - Airblast
 - Fragmentation
- **Develop failure criteria for rapid survivability assessment of expeditionary structures**



Protective Retrofits for Expeditionary Structures

Joint SPICE 3



Pre-test MGPTS 7



Post-test MGPTS 7

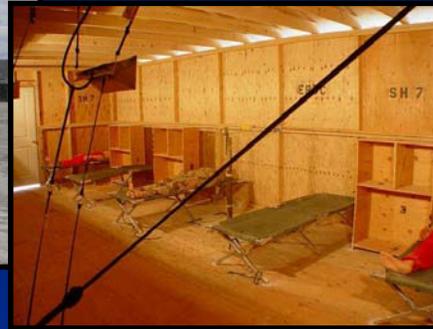


Exterior View of MGPTS 7



Protective Retrofits for Expeditionary Structures

SEA Huts Joint SPICE 3



Pre-test SEA Hut 7



Post-test SEA Hut 7



Protective Designs for Temporary Structures

Utah Tests

High Speed Film

Roll Labeled
SEA HUT

Joint SPICE 3 Interior View of Sea Hut 7



Elastomeric Retrofits

- Final Proof of Principle Evaluation, Eglin AFB April 2005, Thin Film Applique
- Fielding of Structural Retrofits through REF and JIED TF



[Click for Video](#)



New Technologies

High Performance Concrete Armor

- Newly developed ERDC mix design @ 40ksi+, no heat curing
 - Patent in preparation
 - Mass producible through existing industry capabilities
- Baseline benchmarking indicates ballistic performance comparable to many composite armors
- Best Paper Award, 24th Army Science Conference, Dec 04



Test Reports and Analysis

**August-September 2004
Live-Fire
Quick Results**

Executive Summary MortRocket.pdf
Mortar Test Bed.jpg
RAM Overview - Bliss.ppt
Mortar Videos
Rocket Videos
Test Photos
Plywood2 PreDet Still Images

[View the Contents of the CD](#)

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**Compartmentalization
Techniques Validation**

- Executive Overview & Summary of Results
- Supporting Calculations
 - BlastX Blast Predictions
 - COBRA Fragmentation Predictions
- Protective Materials Construction Drawings
- Plastic bin, soil wall Installation Guidance
- Detailed Experimental Results
 - Shot 1, 120 mm mortar, Wood bin, soil wall
 - Shot 2, 120 mm mortar, Ballistic E-Glass wall
 - Shot 3, 120 mm mortar, Plastic bin, soil wall
 - Shot 4, 122 mm rocket, Wood bin, soil wall & Ballistic E-Glass wall
 - Shot 5, 122 mm rocket, Plastic bin, soil wall
- IED

PRELIMINARY



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Protective Measures for High Troop Concentration Areas in U.S. Basecamps

December 30, 2004

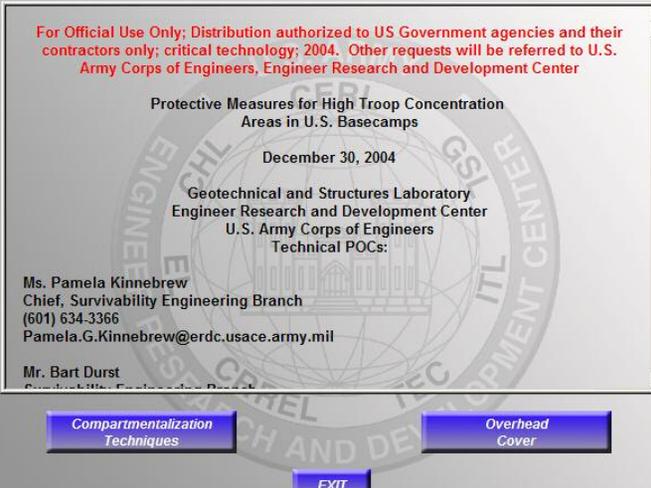
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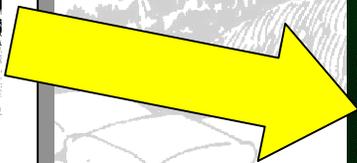
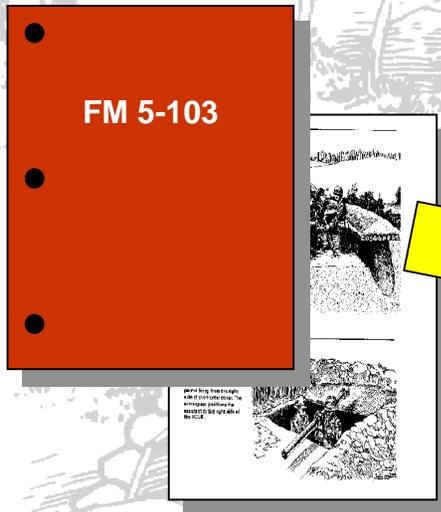
Compartmentalization Techniques Overhead Cover

EXIT



Simplified Survivability Assessment (SSA)

FM 5-103
"Survivability" Manual



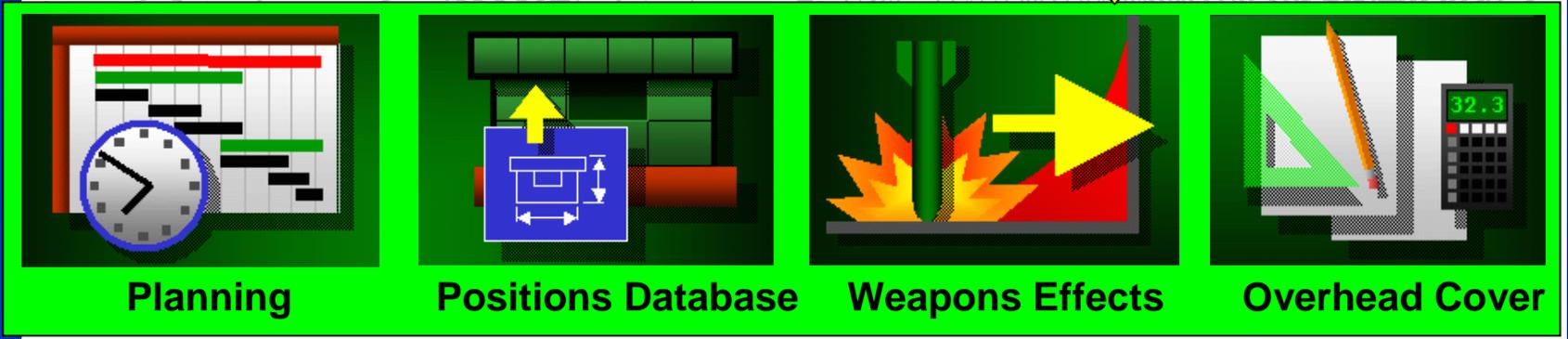
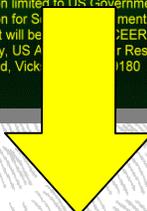
Simplified Survivability Assessment Version 1.0



US Army Engineer Research and Development Center



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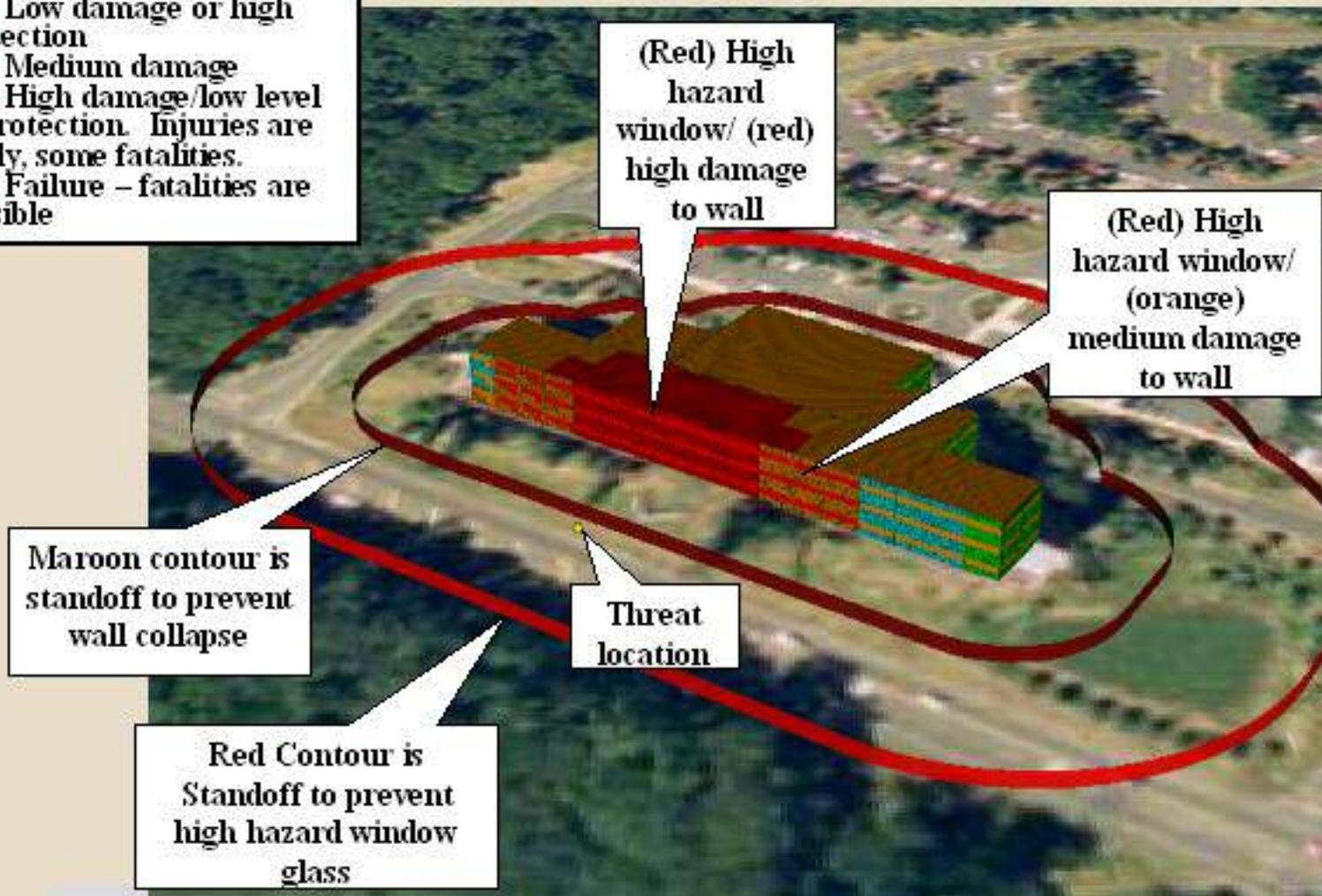


Antiterrorism (AT) Planner

Threat Standoff Assessment

Building Damage

- No damage
- Low damage or high protection
- Medium damage
- High damage/low level of protection. Injuries are likely, some fatalities.
- Failure - fatalities are possible



Status of Fielding Initiatives



Iraq - Jan, 2005



Iraq - Mar, 2005

- Backstop Protection Catalog
- Compartmentalization – 2 DFACs Equipped
- Full Backstop Protection – 5 DFACs currently being equipped through REF
- Overhead Cover – Effort underway
- Structural Blast Retrofits fielding through JIED Defeat Task Force



Questions

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Geotechnical and Structures Laboratory
Survivability Engineering Branch
Vicksburg, Mississippi

