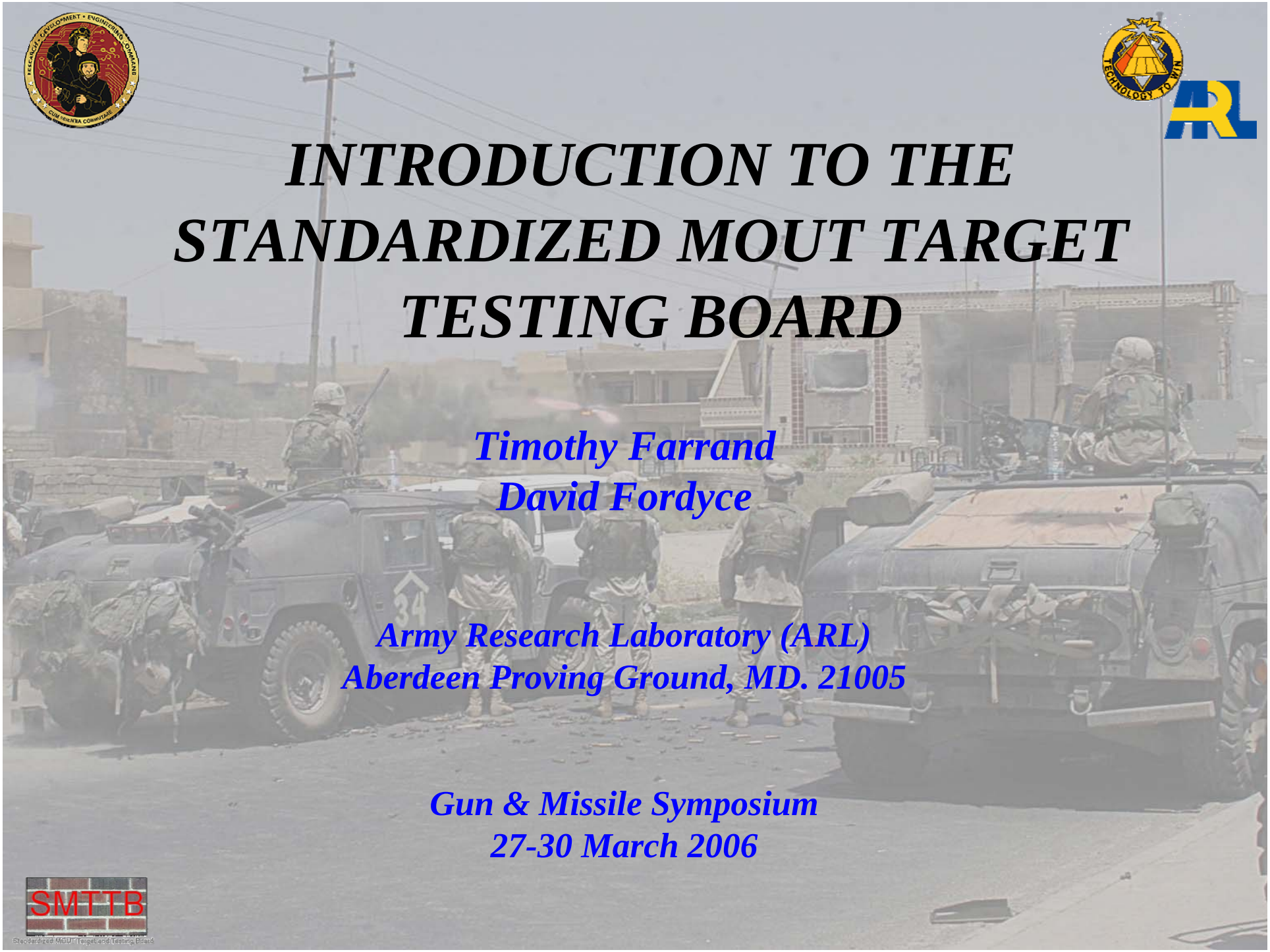


INTRODUCTION TO THE STANDARDIZED MOUT TARGET TESTING BOARD

Timothy Farrand
David Fordyce

Army Research Laboratory (ARL)
Aberdeen Proving Ground, MD. 21005

Gun & Missile Symposium
27-30 March 2006

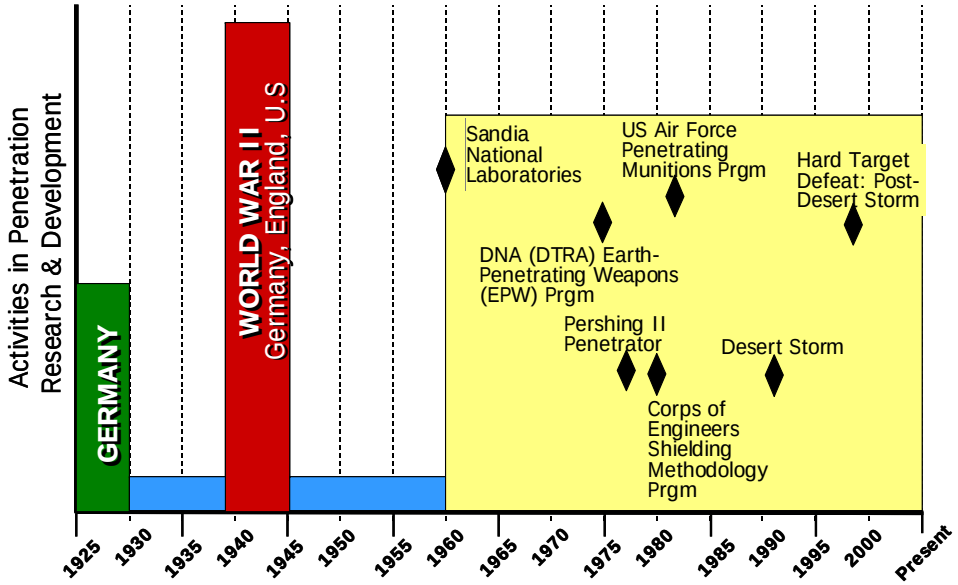
Objective

- Definitions
  - MOUT – Military Operations in Urban Terrain
  - SMTTB – Standardized MOUT Target Testing Board
- History of MOUT
- SMTTB Goals, Needs, Structure, and Procedures
- Welcome members to the board

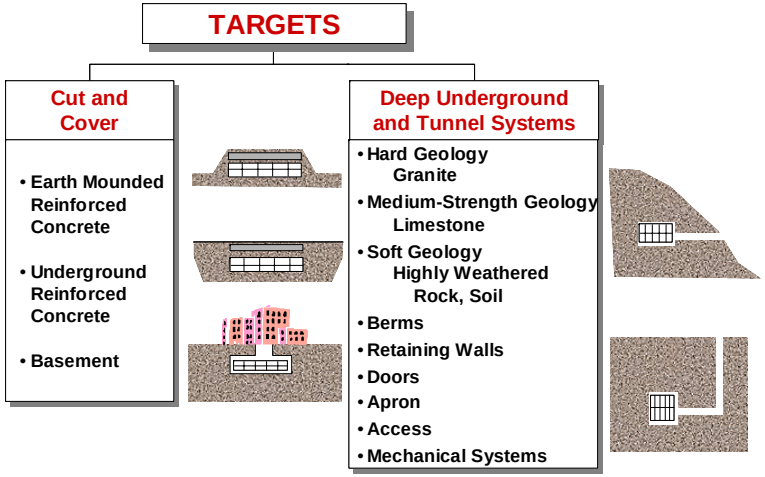
History of MOUT

Weapons & Materials Research Directorate *Survivability/Lethality Analysis Directorate*

~$1.0 Billion



Small Target Set in Past Research Requirements



The historical investment has been for large air-delivered weapons against hardened structures (fairly simple 2-dimensonal problem), not for Army tactical munitions (many munitions, many structures), designed for a variety of desired possible effects.

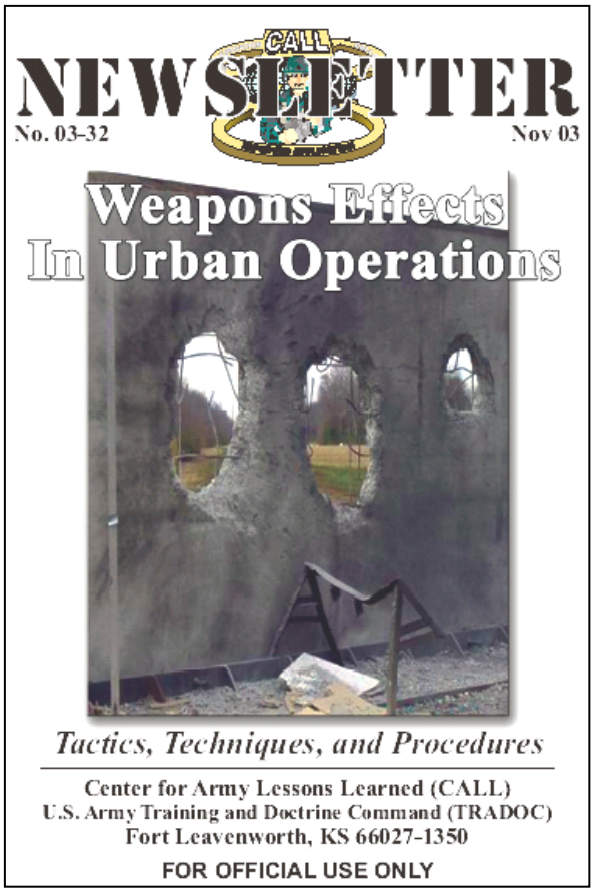
SMTTB Goals

- DoD-wide Standard for MOUT testing
  - Targets
  - Test Procedures
  - Modeling & Simulation
  - PRODUCT - GUIDEBOOK
- Who will Benefit
  - USERS
  - Program Managers
  - Contractors
  - Evaluators
  - Testing Community
- Establish a forum to discuss MOUT testing

SMTTB concept originated with Mr. William Clay, AMSAA in early 2003

Current USER Need

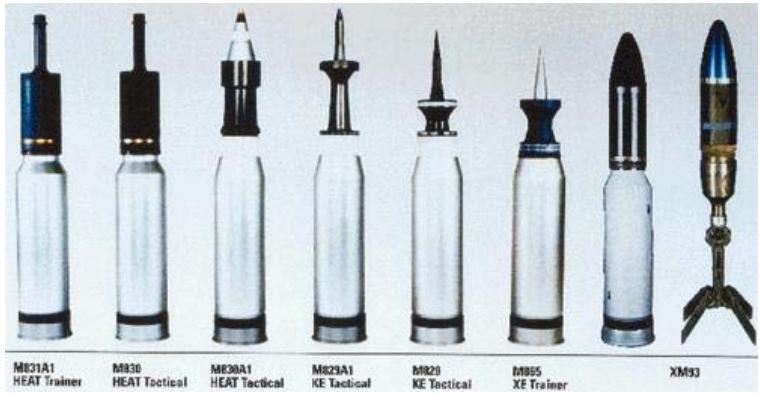
Weapons & Materials Research Directorate | *Survivability/Lethality Analysis Directorate*



Summary of Weapons Effects in Urban Operations, CALL Newsletter No. 03-32, Nov 03		
	Round Effect on Structure	Effectiveness vs Structures in MOUT
M14/M4/M249	Penetration	Not Understood
M60/M240	Penetration	Not Understood
M2 (.50 cal)	Penetration	Not Understood
M72 (LAW)	Penetration, Blast	Some Understanding
AT4	Penetration, Blast	Not Understood
M3 (Carl Gustav)	Penetration, Blast	Some Understanding
M47 (Dragon)	Penetration, Blast	Unevaluated
Javelin	Penetration, Blast	Unevaluated
TOW 2A/2B/BB	Penetration, Blast	Some Understanding for BB
M2/M3 (M242)	Penetration or Blast	Some Understanding
M1A1 (Abrams)	Penetration or Blast	Some Understanding
Mortar Systems	Blast	Some Understanding
Artillery Systems	Penetration or Blast	Not Understood
Copperhead	Penetration Blast	Limited Understanding
A10/F15/F16 Systems		
Hellfire Missile	Blast	Not Understood
2.75 FFAR	Penetration or Blast	Some Understanding
M230 Cannon, M789 HEDP	Blast	Some Understanding
C4 (Walls)	Blast	Some Understanding
C4 Untamped/tamped (Floors)	Blast	Some Understanding
MICLIC	Blast	
Grenade Launchers, 40-mm (M203 & MK-19)	Blast	

Programs Need

- Bombs
  - Air Force
- Mortars
  - PGMM
- Rocket/Missile Systems
  - GMLRS
  - APKW (Navy)
  - Joint Common Missile
  - Javelin
- Small/Medium Caliber
  - 25mm
  - 30mm
- Large Caliber
  - LOS-MP
  - Canister



This just touches on Programs to be used in MOUT

Test Community Need

- Develop Similar criteria for all warheads
  - Established targets
  - Established test methods
  - Established data collection methods
    - Compare systems
    - Input into models

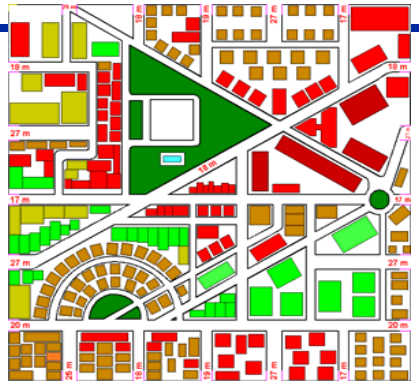
Target selection

Weapons & Materials Research Directorate

Survivability/Lethality Analysis Directorate

City Slice

Real World
Higher Level Analysis
Wargame Modeling



Representation of the real world through geo-typical urban terrain representation.

Set of several buildings

Collateral Damage
Personnel Kills
Engineering Modeling
Wargame Modeling
Operational Tests

Examine collateral damage and direct comparison with engineering or operational tests.

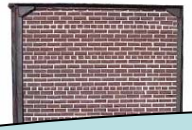
Individual building or room

Functional Kills
Personnel Kills
Collateral Damage Model
Experimental & Controlled test
Penetration, Blast, Secondary frags
Operational tests

Examine building functional kills and specific phenomena such as air blast.

Test wall

Damage mechanisms:
Penetration, blast, etc…
Modeling
Controlled experimentation and test



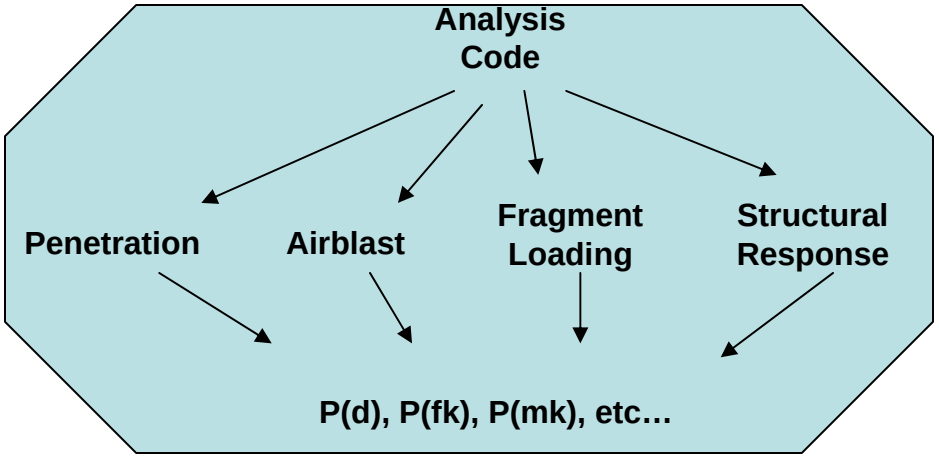
examine particular weapons effects phenomena.

Driven by the purpose of the analysis, test or experiment

SMTTB
Standardized MOUT Target and Testing Board

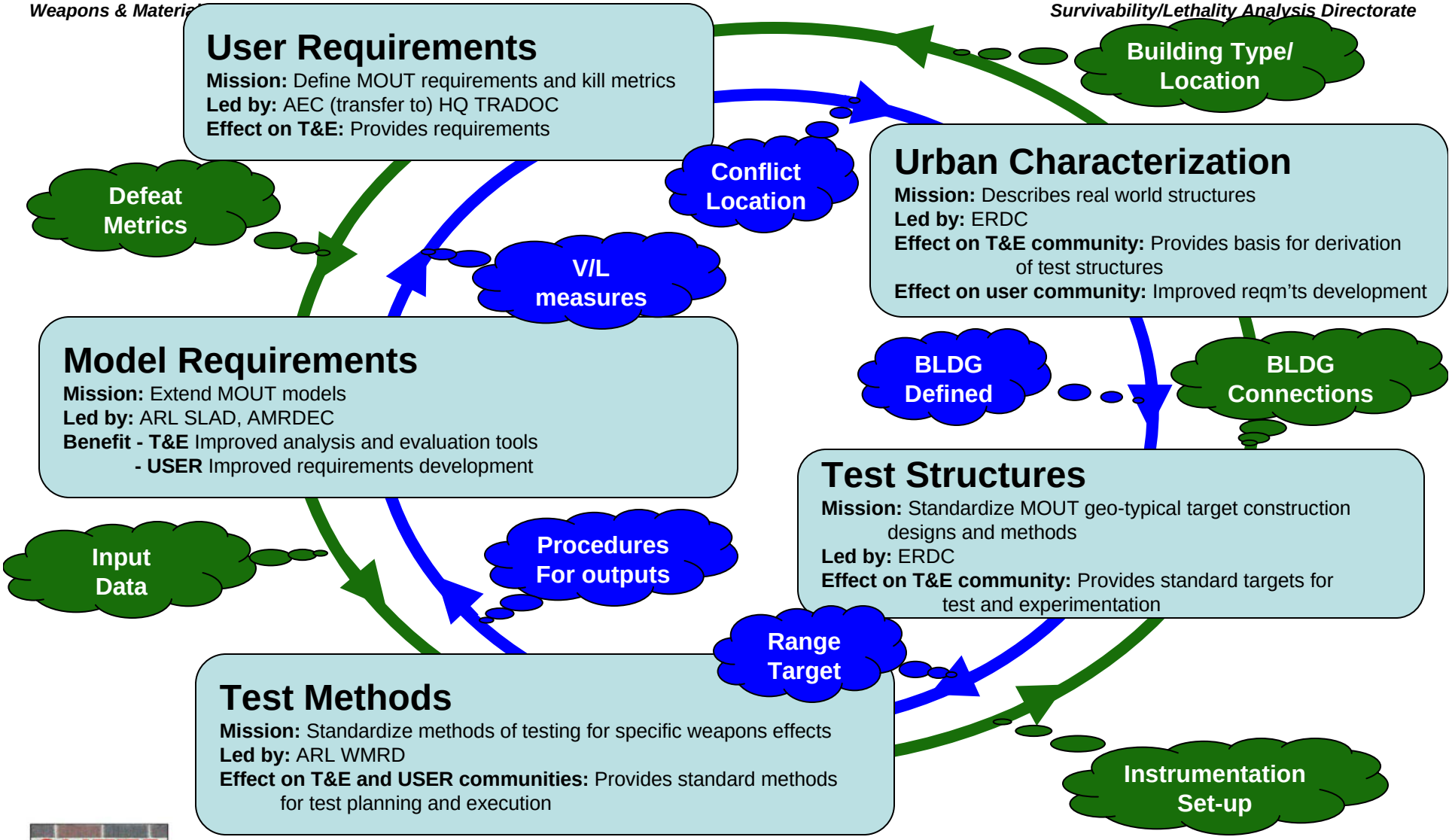
Current Voids

- Quantifiable MOUT Defeat Requirements
- Standard "Range" Targets
- Standard Test Methods
- Good MOUT V/L models
  - Penetration
    - Rigid Body
    - Deforming
    - Obliquity effects &/or– deflection
  - Structural Damage
    - Blast & fragments
    - Collapse
      - Instantaneous
      - Progressive
  - Secondary fragments on personnel or light materiel
    - Penetrating
    - Blunt trauma
  - Incapacitation Models




AFRL
ARL
ERDC
RTTC
DARPA
ATC
AMCOM
ATEC
JFCOM
Standardized MOUT
Target & Testing Board
NGIC
TRAC-MTRY
SMTTB
Standardized MOUT Target and Testing Board
NSWC
Dahlgren
DTRA
DEFENSE THREAT REDUCTION AGENCY
DTRA
MCCDC*,
MCSC
AMSAA
USAIC
USAFAS
USAARMC*
DOT&E
*Proposed

SMTTB Organization
Subgroups and Their Interaction



USER SUBGROUP

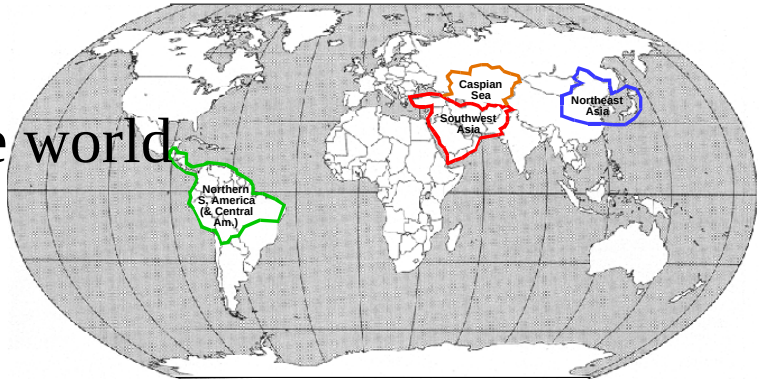
- To SMTTB
  - Requirements
    - Location desired
    - Result desired for mission
  - Desired Mission results

DEFEAT BUNKER
Prob Inc
Prob Kill
Collapse

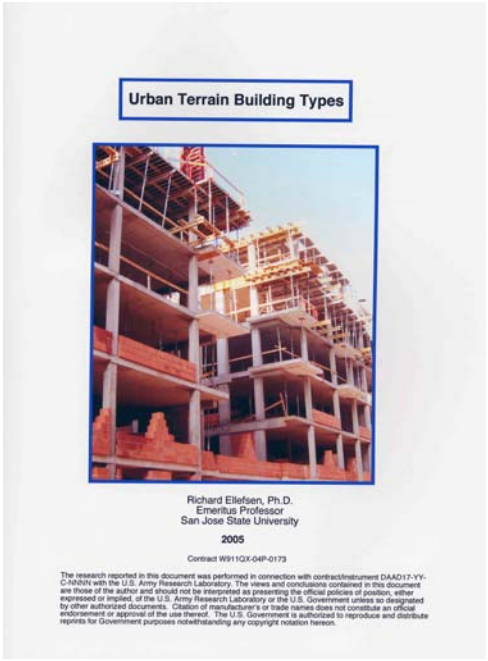
- To Subgroup
  - Provide Measurable or Quantifiable Metrics
    - Pk, PI, damage level, etc…
  - Demonstrate what these metrics reflect
  - Structures in location of mission

Urban Characterization SUBGROUP

- Provide to SMTTB
  - Defines Structures throughout the world
  - Types of structures
    - Construction methods
    - Materials
    - Uses - function
    - Sizes

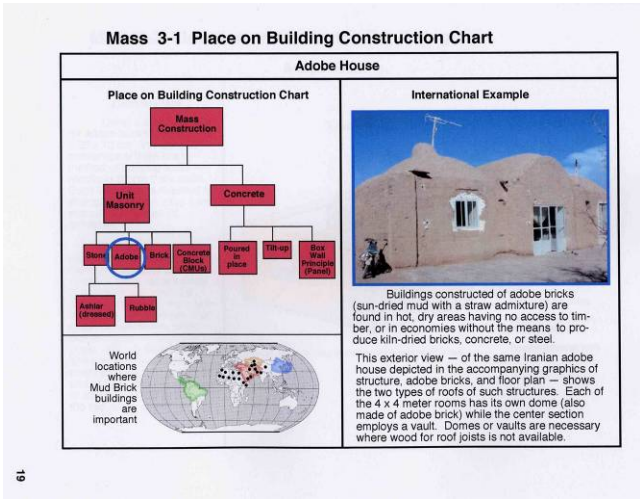


- Provided to SUBGROUP
  - USER priorities
    - Desired areas of the world
    - Typical buildings to be attacked



Urban Characterization

URBAN TERRAIN BUILDING TYPES



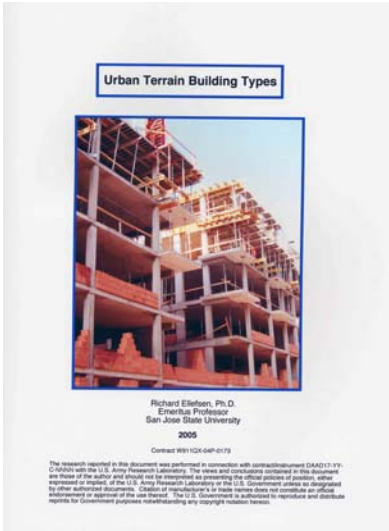
BUILDINGS DEFINED

40 structures total

20 mass const. & 20 framed const.

Goal of UTBT guide:

1) *All major types of buildings Worldwide defined*
2) *Satisfy Broad Urban Operations community*
   - wide variety of interests
3) Provide *all Building data* to UO throughout the world

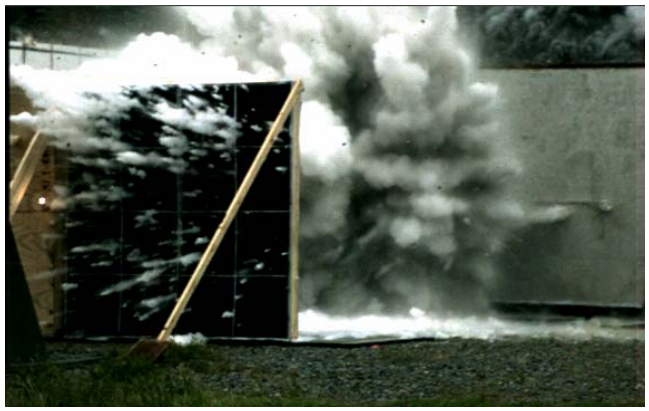


Test Structures SUBGROUP

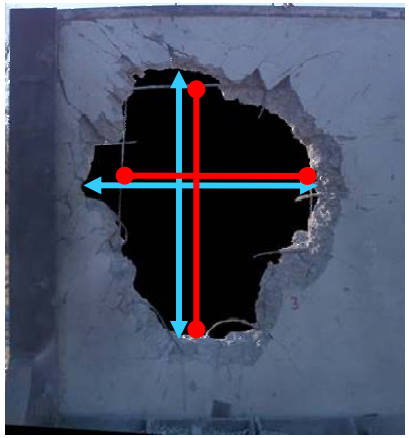
- Provide to SMTTB
  - Target Designs
    - Buildings, rooms, walls, etc.
  - Target set-up
    - Range test target

- Provide to Subgroup
  - Structures – Size, Materials, Uses, etc.
  - Desired instrumentation
  - Restrictions on test set-up

Test Methods SUBGROUP



- Provide to SMTTB
  - Target Test methods
    - Shopping List of data to be collected
      - Buildings, rooms, walls, etc.
  - Limitations for gathering this data
    - Specifics for test set-up
    - If conflict in collecting two types of data
      - Pressures and fragments?



- Provide to Subgroup
  - Target design and set-up
  - Required input into M&S codes
    - For Pk, Pi, etc…

Test Methods SUBGROUP

Weapons & Materials Research Directorate *Survivability/Lethality Analysis Directorate*

Data Type	Sensors	Description	Product	Test Arrangement?	Advantages
Primary Fragments					
Velocity					
	Video	High Speed Cameras	Impact velocity	Scale in Field of View	Video does not impact projectile - No effect on target
	X-rays	X-rays	Striking velocity	Fixtures for film and Tube heads - Fiducial markings	Faster exposure time than cameras - Ability to see through fire ball and dust
	Radar	Doppler Radar	Velocity as a function of range	Set up at gun	Designed for long range - Can be used at short ranges with caution
	Make or Break-Screens	Screens set up down range	One velocity per each set of screens	Screens placed along shot-line	Cost - Can be used to trigger other instruments
	Sky-screens	Break field of view - Screens set up down range	One velocity per each set of screens	Screens placed along shot-line	Can be used to trigger other instruments
Orientation					
	Video	Orthogonal High Speed Cameras	Orientation, Impact velocity	Scale in Field of View	Video does not impact projectile - No effect on target
	X-rays	Orthogonal X-rays	Orientation	Fixtures for film and Tube heads - Fiducial markings	Faster exposure time than cameras - Ability to see through fire ball and dust
	Yaw Cards	Paper or Cardboard along Shot-line	Orientation, Yaw Cycle	Paper or Cardboard along Shot-line	Gives full cycle - Easy - Cheap
Spin Rate					
	Radar	Doppler Radar	Velocity as a function of range and spin	Set up at Gun - Marking on projectile	Designed for long range - Can be used at short ranges with caution
	Video	high Speed Cameras	Spin Rate	Paint the projectile,	Does not impact projectile - No effect on target

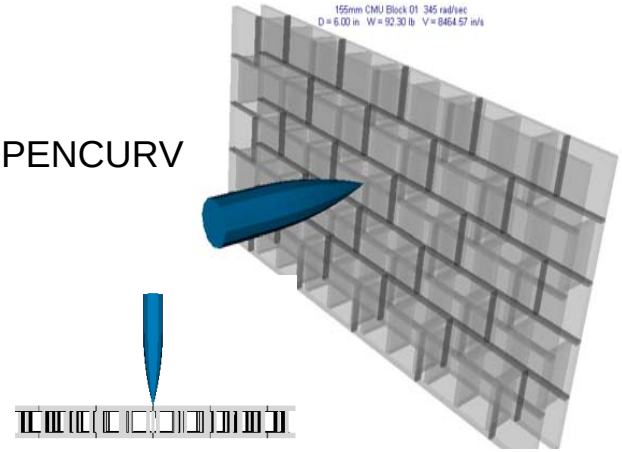
Data Type	Sensors	Description	Product	Test Arrangement?	Advantages
Primary Fragments					
Velocity					
	Video	High Speed Cameras	Impact velocity	Scale in Field of View	Video does not impact projectile - No effect on target

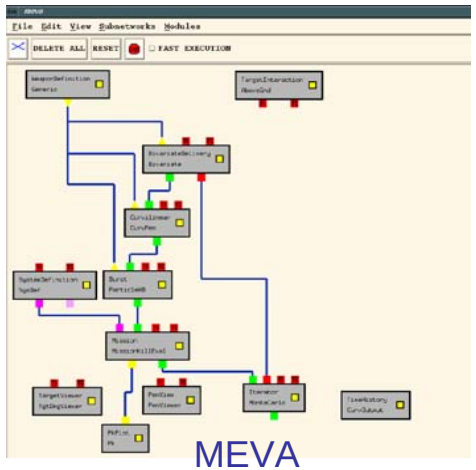
Modeling & Simulation SUBGROUP

- Provide to SMTTB
  - Output of Models
    - Pk, PI, collapse, etc…
    - For USER to use in defining quantifiable requirements
  - Input to Models
    - Test Methodology Subgroup to define data collection
  - System Performance

- Provide to Subgroup
  - Model Inputs – Test Products
  - USER Requirements

ERDC- PENCURV





MEVA

(Modular Effectiveness & Vulnerability Assessment)

Progress

- Urban Terrain Building Types catalog completed (Jan 05)
- Downselected 40 BLDGS to 14 structures & 9 Building Types
  - Rationale document (Sept 05)
- NGIC reviewed –
  - ➢ "very positive" Feedback
  - ➢ Expect endorsement
- Briefed DA level Validation Working Group (VWG) July/Oct 05
  - ➢ Developed cost estimates for "detail design" blueprints
- Human Vulnerability Best Practices MOUT Guidebook chapter (Dec 05)
- Preliminary Test Methodology Spreadsheet (Dec 05)
- Keeping DOT&E keenly aware of SMTTB activities

Conclusion

- Significant data, target, M&S shortfalls exist for MOUT
- Standarderization is required
  - targets, test methods, Model improvements
  - great benefit to USERS, evaluators, PMs, Test Community, etc
- SMTTB source to resolve these issues
  - reduce shortfalls/voids
  - provide a single focus (POC)
- Currently no dedicated funding
- Official endorsements are occuring