US ARMY RDECOM

U.S. Army Research, Development and Engineering Command

Malcolm Baldrige National Quality Award 2007 Award Recipient

ARMAMENT RESEARCH, DEVELOPMENT AND ENGINEERING CENTER PICATINNY ARSENAL, NJ

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

SWEAT Course (Soldier Weapon, Equipment, and Test)

Sponsored By JSSAP

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Background

- Small Arms CBA – Priority Findings

- Requirements for Improving Small Arms Analyses
  - Adopt an effects based standard (Probability of Incapacitation, P_i)
  - Develop higher fidelity, operationally relevant metrics to enable effective analysis of the performance of specific current (and projected) non-materiel and material combinations
  - Develop the modeling and simulation base that enables sensitivity analyses of Soldier and small unit performance to add quantitative and qualitative value to threshold and objective requirements.

Background

- Effects Base Standard
  - “Stopping” or “Knockdown” Power are ambiguous and not measurable
  - Hits on a target do not guarantee an inability to shoot back
  - A human target is complex and requires an understanding of
    - Where a hit occurs
    - What part of the body in impacted by bullet/fragment
    - How much damage is produced by the bullet/fragment
    - Whether the damage is relevant to the target's task performance
    - When effect occurs or is realized
  - Must consider both delivery and terminal performance
  - Probability of Incapacitation facilitates evaluating Soldier System performance from bullet delivery through terminal effect
- Soldier + Training + Weapon + Enablers (Optics) + Ammo = Effect

Introduction

- The US Army needs an objective system to measure and analyze the performance of the soldier together with his
  - Weapon
  - Equipment
  - Training
- SWEAT Course
  - As envisioned by the US Infantry School, is to provide a standard live fire course that is fired in a realistic urban setting
  - Baselined by trained solders with current weapons, equipment, and ammunition
- Soldier Weapon Evaluation and Test (SWEAT)
  - Generate capability comparisons
  - Any Soldier + Training + Weapon + Optic + Ammo combo
  - Performance as a function of time and range
  - Relevant operational framework

SWEAT Course

- Multi-phase and Multi-year project
- Currently, Phase I is being completed by SAIC and its subcontractors

- This brief will provide an update on the progress and results of Phase I

SWEAT Course

Goal:

- To design, develop, model, test, and build a modular prototype SWEAT Course. A joint Industry and Government team will investigate the concept and design the course.

Value to Warfighter:

- The current measure of effectiveness is the weapons qualification course. It has remained virtually unchanged for 30 years. The SWEAT Course will update the measure of effectiveness of the Warfighter.

SWEAT Course Team

Sponsors

- Joint Armed Warfighters supported through the Joint Service Small Arms Program (JSSAP) Office
- Joint Service Small Arms Synchronization Team (JSSAST) (Army, Navy, Air Force, Marine Corp, Coast Guard, SOCOM)

Endorsements

- Maneuver Center of Excellence

Contractor Development Team

- SAIC (Science Applications International Corporation) (Prime)
- SDE (System Design Evaluation Ltd)
- AIS (Advanced Interactive Systems)
- County College of Morris (New Jersey)

FY 2010 – 11 Tasks

A. Determine physical layout required to accommodate the +/- 28 shooting stations desired. COMPLETED

B. Determine the number, type and mobility for the targets at each station. COMPLETED

C. Identify the sensors, lighting, signals and audio required at each station. COMPLETED

D. Determine the ballistic protection and bullets traps required for each station. COMPLETED

E. Identify safety zones for each station for the full range of weapons and ammunition. COMPLETED

F. Determine method of target damage assessment, computational requirements, and target reaction for each station.

G. Determine the system required to overlay target vulnerability, impact location and damage assessment in real time to allow target reaction.

H. Investigate alternate techniques to accomplish the required functions including both technical maturity and financial aspects.

I. Determine the Modeling and Simulation effort necessary to integrate the physical concepts with M&S programs such as America's Army and IWARS.

K. Determine requirements for After Action Review Tools

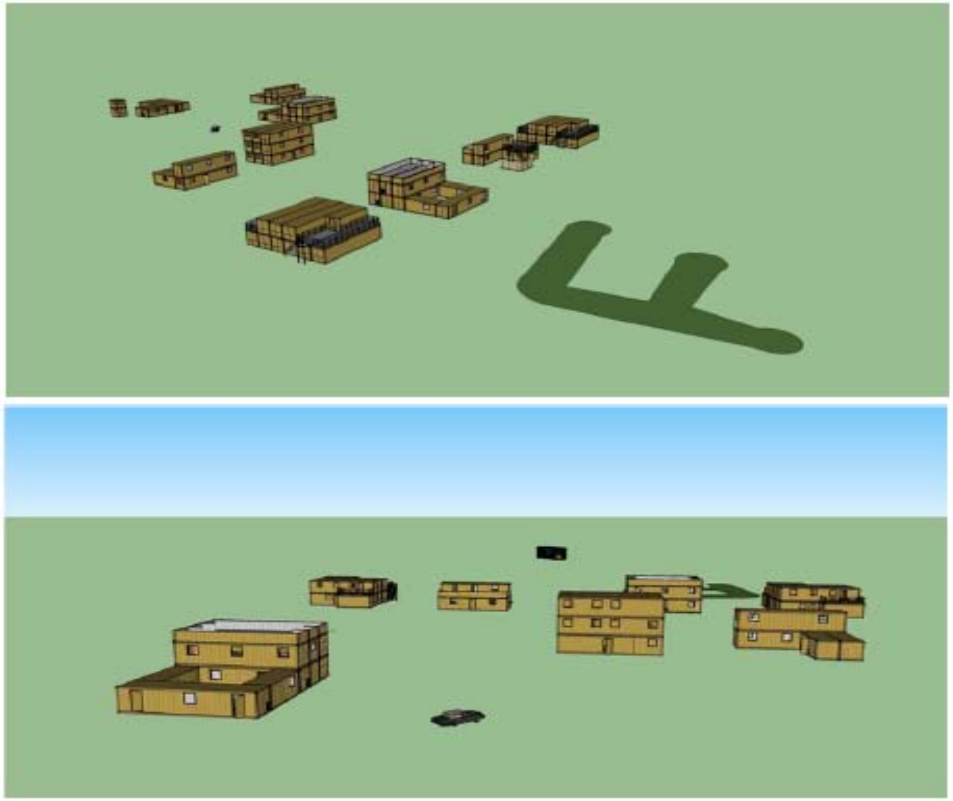
Task A

- Determine Physical Layout to Accommodate the 26 Shooting Stations
  - Layout is finalized
  - May change slightly in Phase II to accommodate necessary adjustments discover through proof of concept testing

Course Layout

Isometric View

SWEAT Course: Phase I



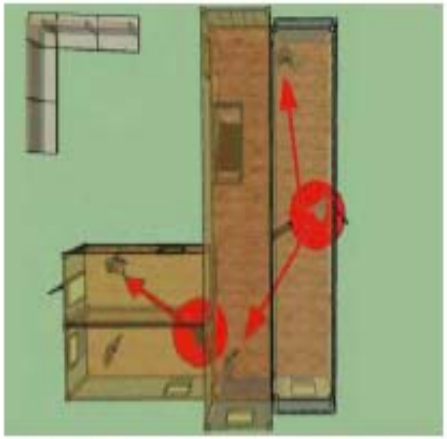
Task B

- Determine the Number, Type, and Mobility for Each Target Station
  - Identified at each station
    - Shot Position Indicator
    - Lifters
    - Targets
  - Ancillary technology to fulfill engagement requirements identified
  - Multiple options for each station
    - Researched
    - Will be priced at end of Phase I

Sample Shooting/Target Station

SP14

SWEAT Course: Phase I



Task C

- ID Sensors, Lighting, Signals and Audio for Each Target Station
  - Shooter tracking
    - Waypoint
    - Continuous
  - Goal: Target presentation needs to be automatic

Task C

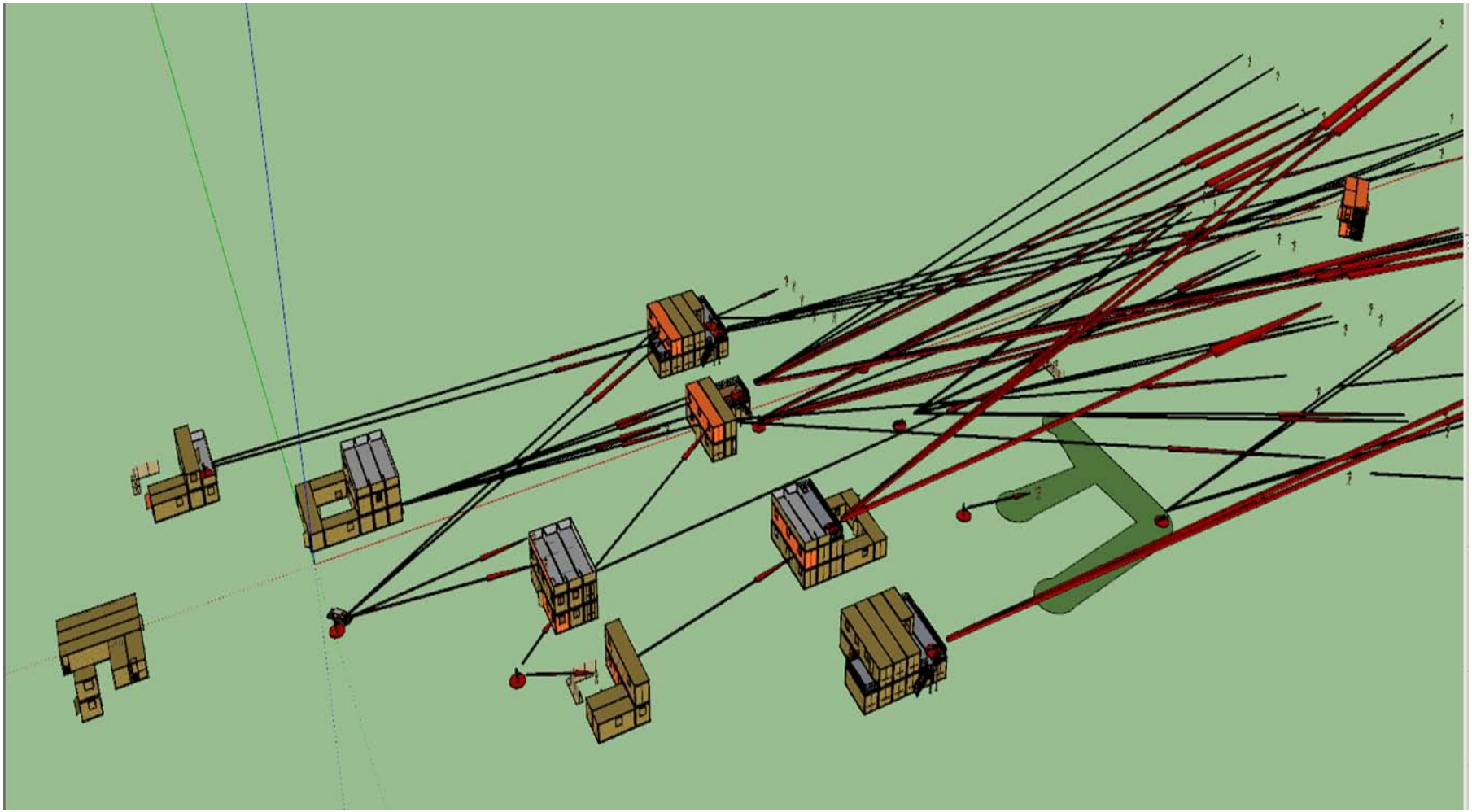
- Triggering the Target
  - High Speed Video
  - Potential Solutions
    - GPS Sensors
    - I
    - PIR Sensors

- Cueing the Shooter
  - Audio Speaker
  - Intra Squad Radio
  - Combined System
  - Gunfire Simulator

Task D

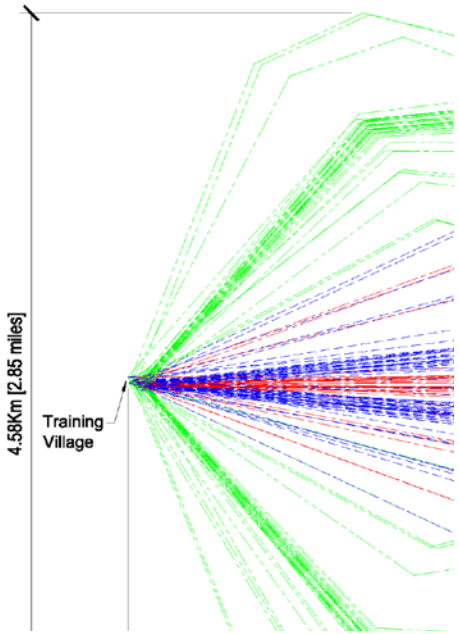
- Determine the Ballistics Protection/Bullet Traps for Each Station
  - Ballistic protection plan designed to preserve overall lifetime of course and keep a low total of cost ownership
  - Design Considerations
    - Create safe and realistic environment
    - Ammunition
      - 9mm
      - 5.56 (M855A1 in Phase II)
      - 5.7mm
      - 6.5mm
      - 6.8mm
      - 7.62
    - Maintenance life-cycle cost
    - Durability

Course Layout with Firing Lines



Task E

- ID Safety Zones for Each Station for Full Range of Weapons and Ammunition
  - May change base on site range regulations



Task F

- Scoring System (*Details yet to be finalized at time of this presentation's release*)
  - Methodology for assessing the effectiveness of an individual or form of equipment used on the SWEAT course
  - A preference for a single overall number at the conclusion of a completed run through SWEAT has been specified/requested
  - Should be inherent output of the SWEAT system
  - Key Scoring Factors
    - Accuracy
      - Shots
      - Lethality
    - Time
      - Physical Movement Time
      - Shot Set-Up Time
      - Target Completion Time
    - Other Factors
      - Biometrics?
      - Path Selection?
      - Shot Protocol?
  - Discussion/Question of Things to add
    - Shooter Exposure
    - Friendly Hits

Current and Future Work

- Tasks F-K
- Add-On Task
  - Survey of Warfighters on Two Topics
    - Realism of target behavior profiles
    - Realism of course scenario

Questions?

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