2009 International Infantry & Joint Services Small Arms Systems Symposium

System Analysis: Infantry Studies and Simulations

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

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System Analysis, ARDEC

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Background

- July 2007 – Completed Breaching and Marking/Tagging studies for Ft. Benning Infantry School
- May 2008 – Presented briefing at NDIA Small Arms Symposium
- Providing continuous support to JSSAP Advanced Fire Control and Advanced Lethal Armaments ATOs

Overview

1. The Role of Modeling and Simulation in the Small Arms Acquisition Process
2. Modeling and Simulation Tools
3. Examples of Small Arms Analyses Performed
4. Modeling and Simulation Outlook

Improving Small Arms through Modeling and Simulation

- **How does Modeling and Simulation improve the Small Arms Acquisition process?**
  - Sensitivity analyses indicate which parameters can be changed to best address capability gaps
  - Technology concepts can be compared according to applicable metrics

Guidance

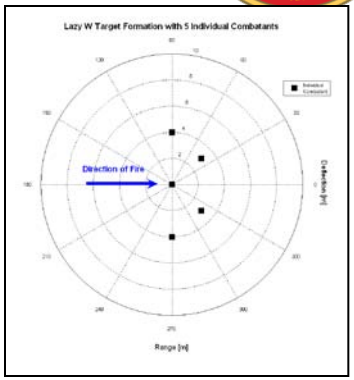
- Guidance from Subject Matter Experts (eg: Infantry School at Ft. Benning)
- Working in coordination with other efforts to support Army Technology Objectives
- Major Demands
- Given this information, what input provides the system with the best performance according to the MOE's?

Tools: CASRED and FBAR

Weapon Characteristics
- Fragmentation Data[1]
-Terminal velocity [2]
- Angle of Fall [2]

Delivery Accuracy
- Baseline Case
- Improved Range Finder
-Improved MV
- Improved Range & MV

Target Formation
- 5 combatants
- Lazy W [3]



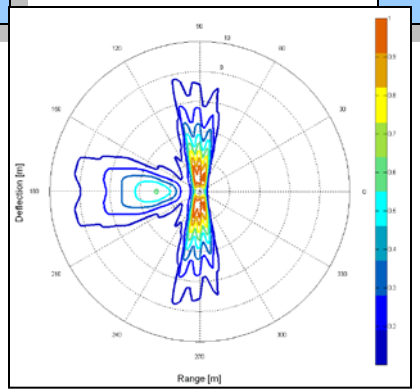
CASRED (Lethality)

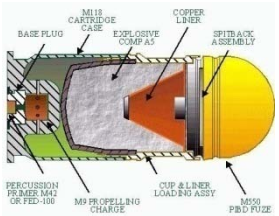
Pk Contour files

FBAR (Effectiveness)
50,000 Monte Carlo Trials

Expected Fractional Casualty Values

Individual Soldier Data
-Winter Uniform
-No Armor / No Helmet
-Standing Posture
- 5-min Assault Criteria





Allows examination of lethality of theoretical weapon systems in comparison to ones in use today.

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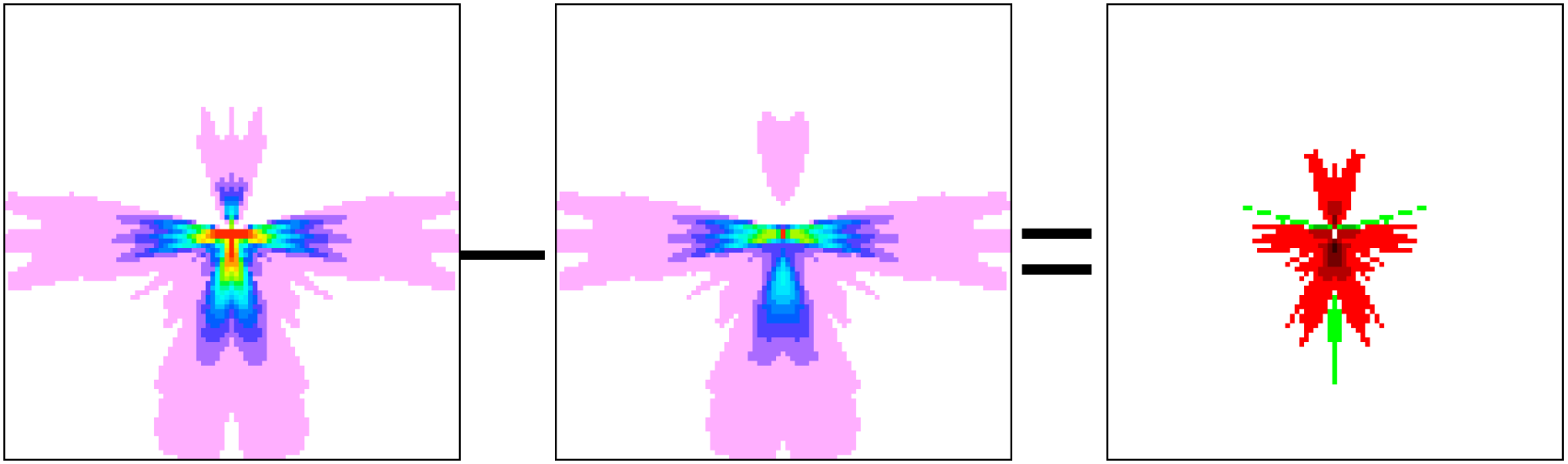
Item Level Effectiveness



Concept 1 — Concept 2 = Performance Improvement

- CASRED gives detailed representations of lethality
  - Details lethality from fragmentation in a specified area
  - Can accommodate modifications to several variables
  - Improvements can be tracked from one concept to another, to give a picture of comparative effectiveness

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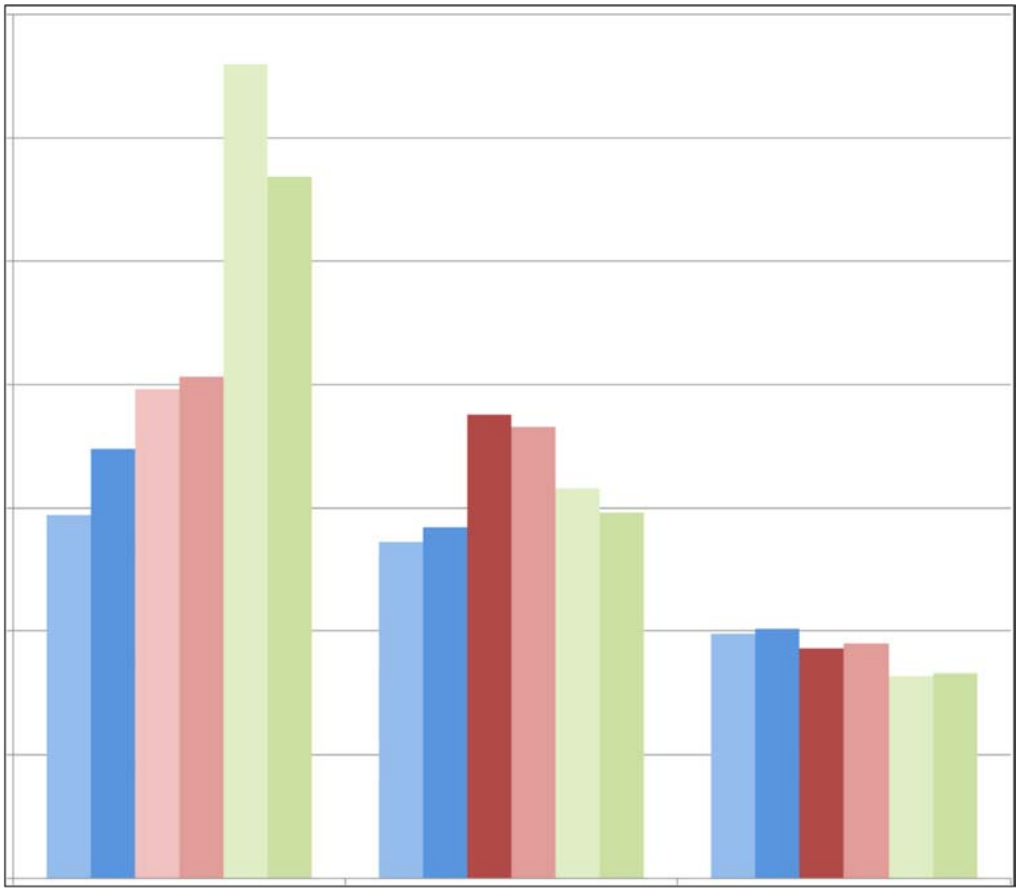
Item Level Effectiveness

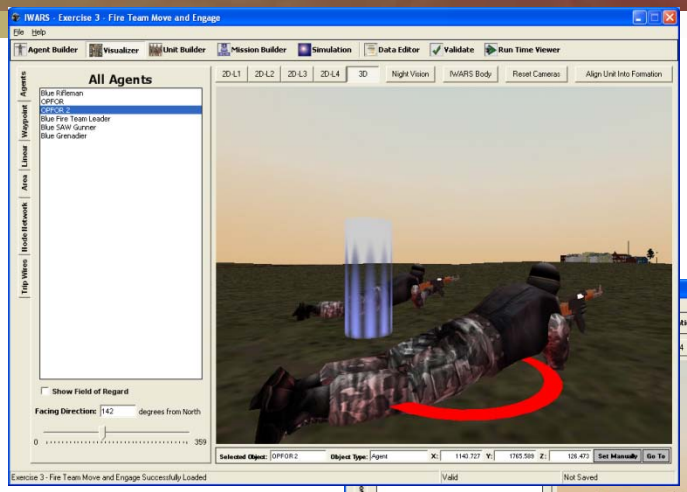


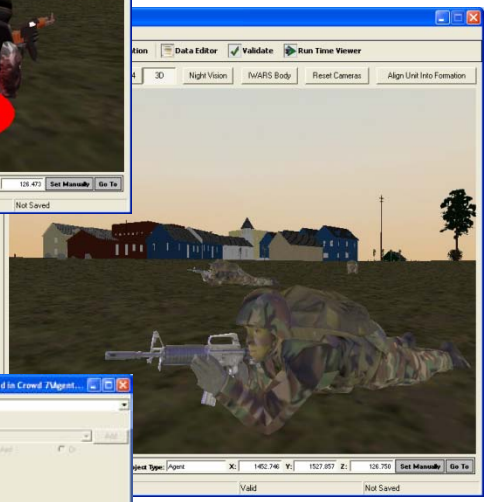
- FBAR uses CASRED output as input
- Uses delivery errors to model the actual firing of the weapon
- Output is Expected Fractional Casualty Value

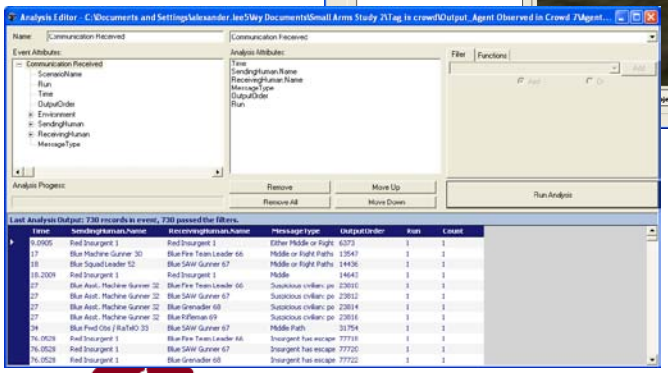
Item Level Effectiveness

- Item level tools have several uses
  - Sensitivity analyses to find avenues of highest potential payoff
  - Comparative analyses of proposed weapons concepts

Tools: IWARS







IWARS (Infantry Warrior Simulation) – AMSAA approved model

- Force-on-Force Analysis
- High resolution Dismounted Infantry model
- Programmable Small Infantry Engagements
- 3-D representation and run time viewer
- Output analysis tool

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Missed Moving Targets

Acquisition includes the following:

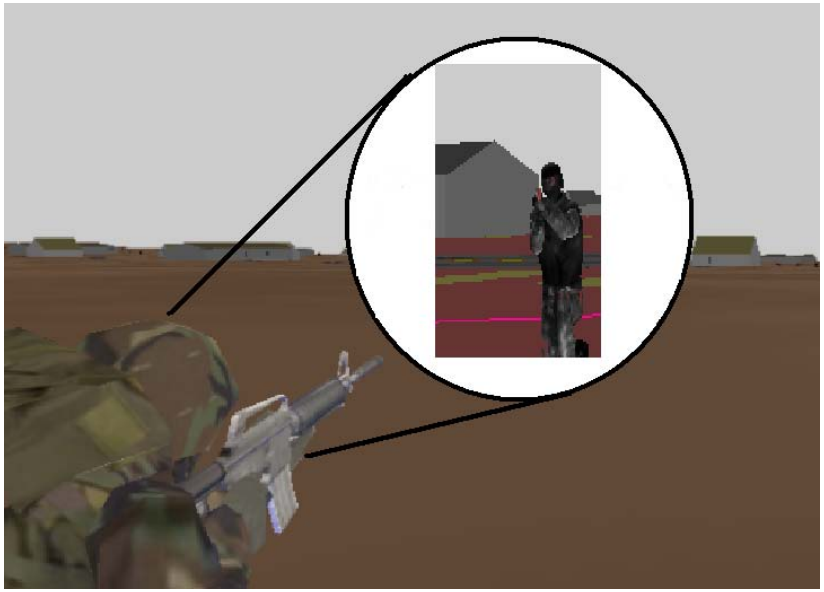
- Detection
- Recognition
- Correct ID

Some variables affecting acquisition time:

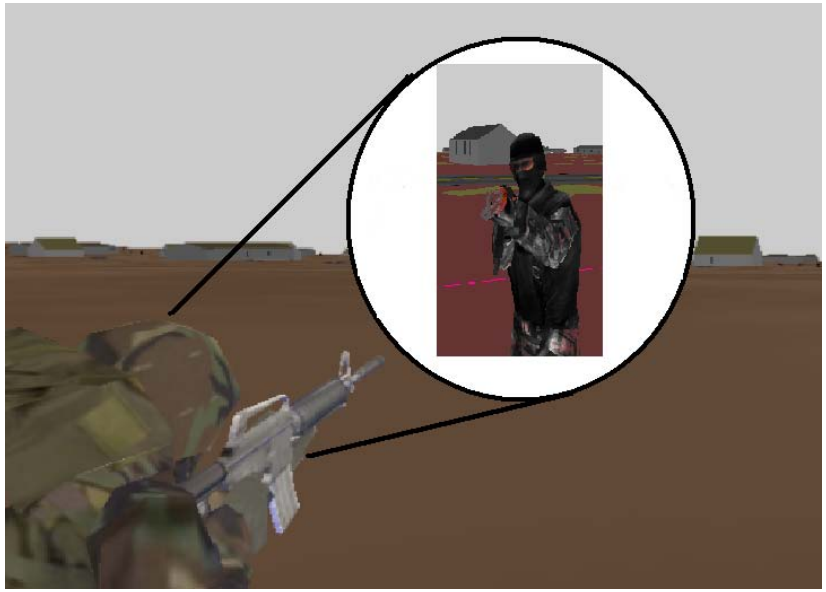
1. Visual sensor characteristics
2. Environment
3. Target characteristics
3. Training and experience

Missed Moving Targets

A.



B.



- Warfighter B has better visual resolution than A.
  - Better eyesight
  - Better experience or technology

Work in Progress

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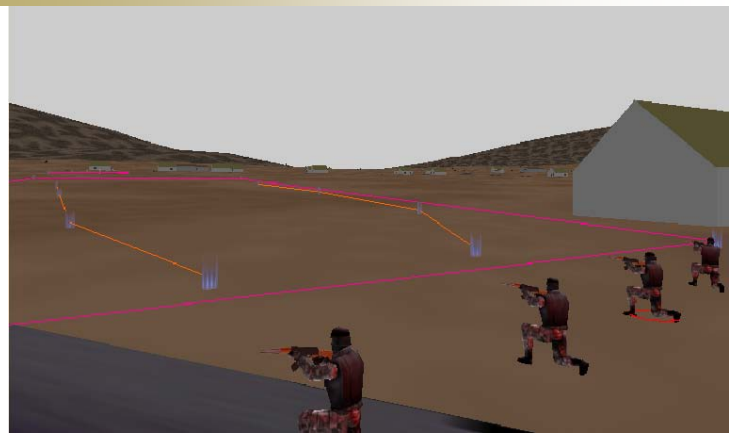
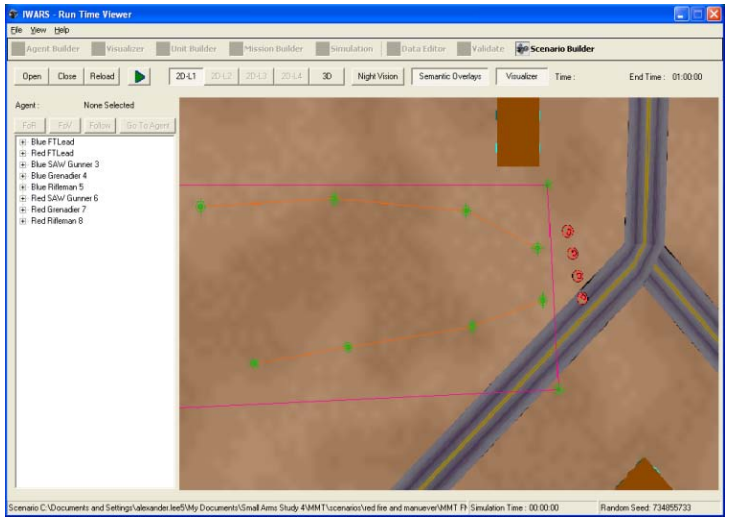
Missed Moving Targets Scenario





-Red OPFOR attempts to fire and maneuver

-BLUFOR is pinned down and engages targets.

-New weapon systems, sights, etc. can be simulated.

-Many metrics can be used to measure system performance

Work in Progress

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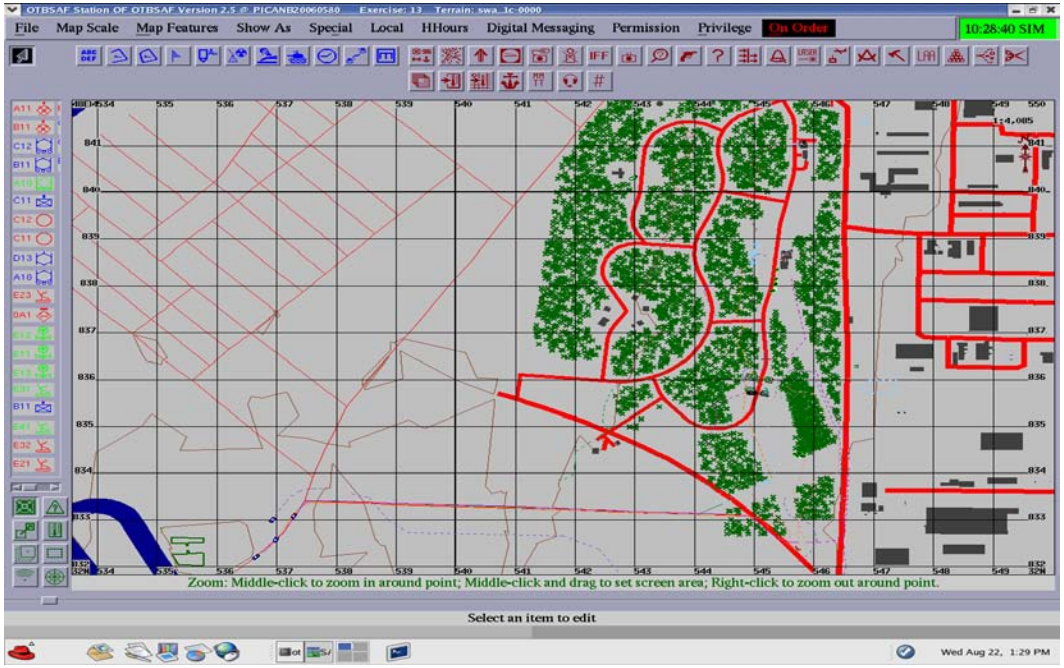
Tools: One Saf Test Bed (OTB)



- Distributed force-on-force simulation
  - A macro perspective allows large force-on-force engagements
  - Shows what technology can do under operation conditions

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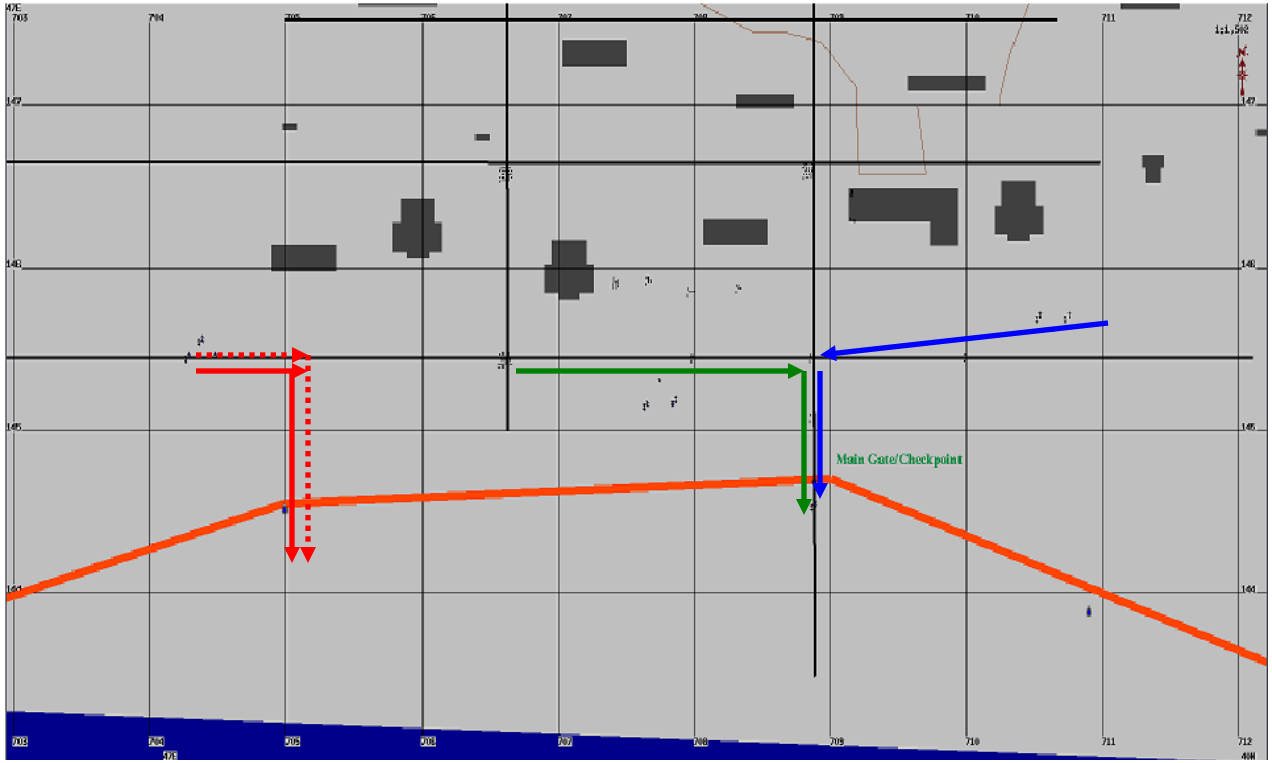
Truck Bomb



- Group of civilians head to checkpoint to cause distraction
- Blue forces converge onto checkpoint in support
- Red, to west, drive into unguarded section of gate with truck bomb
- Red soldiers on foot enter hole in gate
- Blue force retaliates

- Allows us to test the capability of M16.
- Change accuracy of weapon to determine which characteristics give the best results (Most Red Kills and Least Blue Kills)

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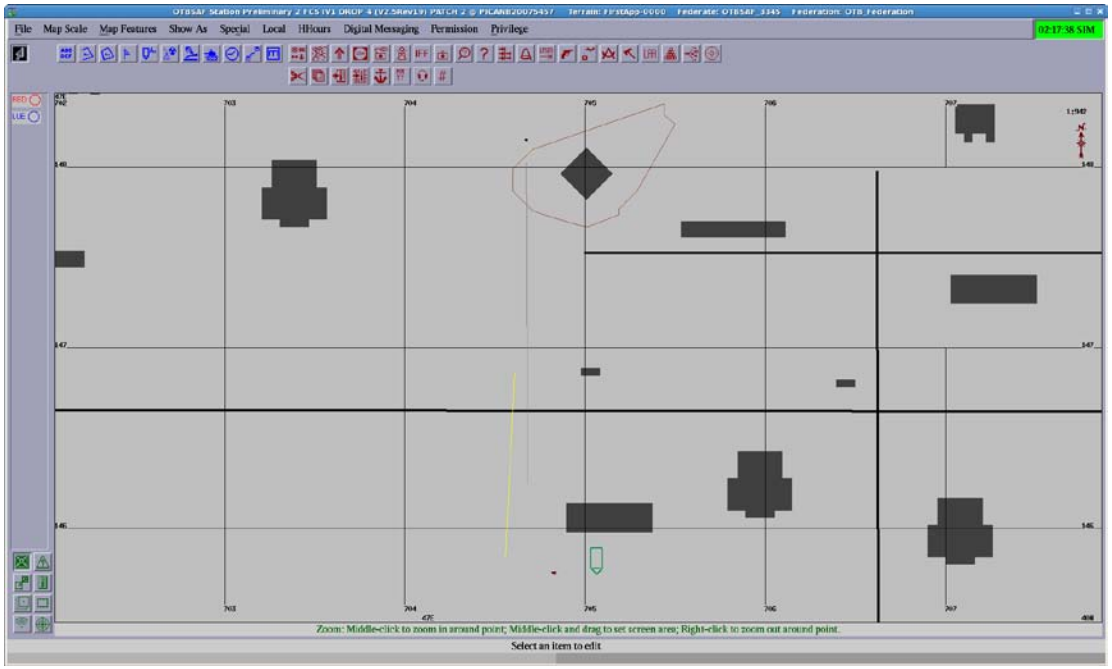
One on One



- Blue with M4 vs. Red with M4
  - ~240 meters apart
  - Red does not shoot
  - Red runs for cover behind building
    - Exposed for about 3-5 seconds

- Running this very simple vignette in two models (IWARS and OTB) will let us find a baseline for both to use.
- Able to change characteristics of the M4 in OTB to more closely match IWARS.
- This will allow us to transition more easily from squad-on-squad to force-on-force

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Infantry Study Outlook

- Continue to support the development of improvements (materiel or otherwise) to support the warfighter.
- Help to optimize R&D efforts to bring the most benefit to the warfighter.
- Continue to implement new tools to expand our effort.

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