



# Integrated Casualty Estimation Methodology (ICEM)

## General Description:

ICEM is a software toolset that simulates the casualty effects of munitions against personnel with or without body armor. The model can be used to assess the effectiveness of body armor systems or munitions in terms of ballistic challenge, operational casualties, and injuries. ICEM replaces the Casualty Reduction (CASRED) model. Development has been overseen by an Integrated Product Team (IPT) co-chaired by representatives of the Natick Soldier Center, the U.S. Army Materiel Systems Analysis Activity (AMSAA), and the U.S. Army Research Lab - Survivability & Lethality Directorate (ARL-SLAD).

## Objectives:

ICEM meets the need for improved casualty estimation tools and provides analysts with desktop functionality for applications ranging from engineering level body armor design questions to support for war games and simulations for force-on-force analysis.

## Facts:

The user defines a target grid, consisting of 3D geometric representations of personnel. These targets can be positioned in various postures (standing, kneeling or prone) and orientations (random, fixed, directional) or squad specific formations. Also, the user explicitly defines the body armor configuration. Explicit body armor representation allows the user to specify the actual location of the armor on each body part, and is a vast improvement over CASRED's percentage area of armor coverage.

The user chooses the munition characteristics such as angle of fall, height of burst, and terminal velocity. ICEM simulates munitions fragment bursts using standard Joint Munitions Effectiveness Manual (JMEM) fragmentation files. Fragment hits in the target grid are measured and the environmental drag and body armor protection are calculated.

ICEM incorporates the ARL/SLAD Operational Requirements-Based Casualty Assessment (ORCA) model to obtain injury characterization and operational casualty measures. The penetrating fragments are passed to the ORCA Library to estimate casualties and/or personnel performance degradations.

## Schedule:

ICEM version 1.0 Army Verification and Validation (V&V) is scheduled for end of 1Q FY04. Current ICEM capabilities include a single munition round fragmentation burst against target arrays that generate ballistic challenge patterns, incapacitation probability patterns, ORCA operational capability patterns, and ORCA injury measure patterns. An ICEM version 1.2 Joint Technical Coordinating Group/Munitions Effectiveness (JTCCG/ME) Accreditation Support Package - Phase I (ASP-1) is being developed and scheduled for completion in July 2004.

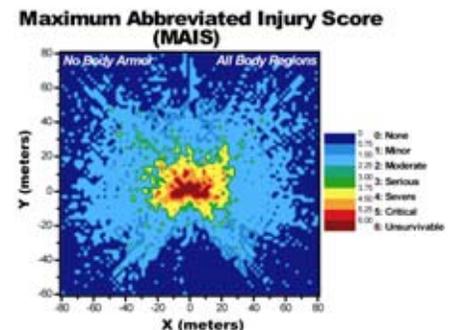
## Point of Contact:

### Modeling & Analysis Team

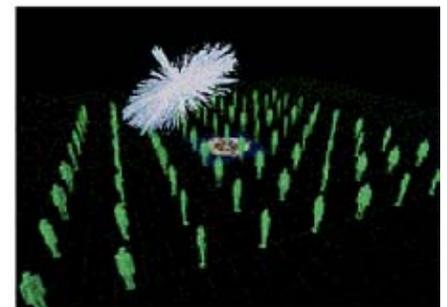
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Sample ORCA Output



3D View of Sample Burst Over Target Array

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Rev 8-21-03