Agenda

• Background
• References
• Targeting and Collateral Damage
  – Definitions
  – Targeting Overview
  – Targeting Cycle key elements
  – Collateral Damage Estimation
• Summary
• Questions/Discussion
• CJCSI 5810.01, “Implementation of the DOD Law of War Program”
• CJCSI 3160.01, “No-Strike and Collateral Damage Estimation Methodology”
• CJCSI 3122.06, “Sensitive Target Approval and Review (STAR) Process”
• Joint Publication 3-60, 13 April 2007, “Joint Targeting”
• DIA Instruction 3000.002, 15 July 2008, “U.S./Allied Targeting Analysis”
• JTCG-ME Publication, 61 JTCG/ME-05-4, 29 September 2008”, Collateral Damage Estimation (CDE) Table Development”
• JTCG-ME Accredited CDE Tables, 9 January 2009
Joint Targeting Definitions and Processes
Targeting and Fires Definitions

- Targeting: the process of selecting and prioritizing targets and matching the appropriate response to them, considering operational requirements and capabilities
  - The purpose of targeting is to integrate and synchronize fires into joint operations
  - Targeting supports the process of linking desired effects of fires to actions and tasks at the joint force component level

- Fires: the use of weapon systems to create a specific lethal or nonlethal effect on a target (JP 1-02)
Target Definition

Target: An entity or object considered for possible engagement or other action

Area
Complex
Installation
Force
Equipment
Capability
Function
System
Entity
Individual
Behavior

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Joint Targeting Cycle (JTC)

End State and Commander’s Objectives

What is our goal?

Target Development and Prioritization

What targets must we effect to achieve our goal?

Commander’s Decision and Force Assignment

Best means to effect the target

Capabilities Analysis

Joint Targeting Cycle

Mission Planning and Force Execution

Are we accomplishing our goal?

Component targeting and engagements

Assessment

Are we accomplishing our goal?

What targets must we effect to achieve our goal?

Best means to effect the target

Joint Targeting Cycle

Commander’s Decision and Force Assignment

What targets must we effect to achieve our goal?

Capabilities Analysis

Mission Planning and Force Execution

Assessment

End State and Commander’s Objectives

Designed to provide a means to support achievement of JFC’s objectives .... JP 3-60
End State and Commander’s Objectives

• Guidance:
  – Ground Rules/Policies
  – Establishes Scope/Restrictions
  – Drives subsequent phases of the targeting cycle

• Comes From:
  – Pres/SECDEF, CoCom, JFC
  – Law of Armed Conflict
  – Rules of Engagement

What is our goal?

Provides the critical link to Military Necessity
What targets must we engage to achieve our goal?

**Target Development and Prioritization**

- **Target Vetting**
  - Collective effort of the Intelligence Community
  - Examines:
    - Target Identification, location, function, description, significance, critical elements, target expectation, functional characterization/collateral objects of concern, intel gain/loss
    - IC votes and provides advice on each target

- **Target Validation**
  - Compliance with commander’s objectives
  - Law Of War (LOW)/Law Of Armed Conflict (LOAC) and Rules of Engagement (ROE)
    - Target’s relevancy within the target system
Joint Targeting Coordination Board (JTCB)

Target Nomination:
“Here’s a possible target”

Intel Review:
“Does the intelligence support?”

Effects and Legal Review:
“Will target engagement further the CDR’s objectives?”

Target Listing:
“Which CDR’s objective(s) apply?”

LETHAL/NON-LETHAL ACTION

JTC Phase 3, 4, 5
Capabilities Analysis

- Evaluate available capabilities vs. desired effects to determine options
  - Effectiveness & efficiency of forces
  - Estimate the effects of attacks (kinetic & non-kinetic)
  - Weighs available forces w/ COAs
  - Inline with JFC’s Objectives
- Weaponeering:
  - Weapon/system to achieve effect
  - Efficient & effective use of resources
  - Objectives and desired effects
- Collateral Damage Estimation:
  - Unintended or incidental damage to persons or objects not the intended target and are not lawful targets

JOINT TARGETING CYCLE

End State and Commander’s Objectives
Target Development and Prioritization
Commander’s Decision and Force Assignment
Assessment
Mission Planning and Force Execution
Capabilities Analysis

Best means to engage the target
Cdr’s Decision and Force Assignment

- Critical step in transitioning plans to execution
- Review previous steps for execution
- Validate target list changes
- Consolidate target development and capabilities analysis results
- Collateral damage decisions and Strike Approvals
  - Verify authorities—seek higher approval
- Assign responsibilities for engagement
Mission Planning and Force Execution

- Detailed planning conducted by tactical level forces
  - Based on commander’s guidance/orders
  - Facilitated by open access to planners at the operational & strategic level
- Execution is continually monitored for
  - How the adversary responds/changes
  - Achievement of effects & Cdr’s objectives
  - Performance of forces
  - Changes in the operational environment
• Measures progress toward achieving the commander’s objectives
  – MOP / MOE

• Provides:
  – Status
  – Benchmark for validating actions
  – Munitions effects assessment
  – Collateral Damage Assessment

• Generally the level at which a specified operation, task, or action is planned and executed should be the level at which such activity is assessed.
Collateral Damage Estimation (CDE)

- Commanders must conduct a proper proportionality analysis to use the amount of force required to achieve a direct and concrete military advantage.

- CDE Methodology provides the process to predict and mitigate collateral damage from conventional, non-nuclear kinetic strikes:
  - Facilitates risk estimation and mitigation.
  - Identifies target engagement’s sensitivity and associated risks.
  - Required on every target in accordance with Rules of Engagement.
  - Target is weaponeered to balance accomplishing the mission with the risks to U.S. forces and the risk for collateral damage.
All Munitions Technical Data is based on:

- Data approved by the Joint Technical Coordinating Group/Munitions Effectiveness (JTCG/ME)
  - Data updated every 6 months
- The CDE Methodology does not account for:
  - Weapon Malfunction
  - Operational Delivery Errors
  - Altered tactics
  - Unknown Transient Non-Combatant Personnel and/or Property
The 5 Basic Questions of CDE

CDE methodology is five questions to be answered before engaging a target:

1. Can I PID the object I want to affect?
2. Are there protected or collateral objects, civilian or noncombatant personnel, involuntary human shields, or significant environmental concerns within the effects range of the weapon I would like to use to attack the target?
3. Can I mitigate damage to those collateral concerns by attacking the target with a different weapon or with a different method of engagement, yet still accomplish the mission?
4. If not, how many civilians and noncombatants do I think will be injured or killed by the attack?
5. Are the collateral effects of my attack excessive in relation to the expected military advantage gained and do I need to elevate this decision to the next level of command to attack the target based on the ROE in effect?
Commanders are responsible to evaluate and balance mission requirements and threat to friendly forces while taking all reasonable steps to mitigate the potential for Collateral Damage.

The CDE Methodology codifies and standardizes the collateral damage estimate process supporting the Commander’s Evaluation of Risk in the Military Decision Making Process (MDMP).
Summary of CDE in Joint Targeting

- Never before has a nation taken such measures and resources to reduce the likelihood of civilian casualties
  - Our processes and procedures are rigorous
  - The methodology is derived from physics based computer modeling backed up by weapons testing data and direct combat observations
  - Estimates are applied by commanders exercising informed judgment to mitigate civilian casualties while balancing their responsibility to accomplish the mission while defending themselves and their forces
Questions/Discussion
Back-Up
(Vignette)
• High Value Target: A target the enemy commander requires for the successful completion of the mission. The loss of high-value targets would be expected to seriously degrade important enemy functions.

• High Payoff Target: A high value target whose loss to the enemy will significantly contribute to the success of the friendly course of action. High-payoff targets are those high-value targets that must be acquired and successfully attacked for the success of the friendly commander’s mission.

• Time Sensitive Target: A joint force commander designated target requiring immediate response because it is a highly lucrative, fleeting target of opportunity or it poses (or will soon pose) a danger to friendly forces.
Risk Management & CDE

- CDE 1: Target Validation / Initial Assessment
- CDE 2: General / Target Size Assessment
- CDE 3: Weaponeering Assessment
- CDE 4: Refined Assessment
- CDE 5: Casualty Assessment

CD Risk Management

<table>
<thead>
<tr>
<th>CDE Level</th>
<th>Structural Damage</th>
<th>Casualties</th>
<th>Tactical Restrictions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NO</td>
<td>NO</td>
<td>Weapon</td>
</tr>
<tr>
<td>2</td>
<td>NO</td>
<td>NO</td>
<td>Weapon/Fuse</td>
</tr>
<tr>
<td>3</td>
<td>NO</td>
<td>NO</td>
<td>Weapon/Fuse/Delivery Heading</td>
</tr>
<tr>
<td>4</td>
<td>NO</td>
<td>NO</td>
<td>Weapon/Fuse/Delivery Heading</td>
</tr>
<tr>
<td>5</td>
<td>YES</td>
<td>YES</td>
<td>Weapon/Fuse/Delivery Heading</td>
</tr>
</tbody>
</table>
Lawful Military Objectives

- Lawful Military Objectives
  - Contribute to the enemy’s warfighting/war sustaining effort and its destruction would constitute a definite military advantage
  - Four elements that allow targets to be lawful military objectives:
    - Nature
    - Location
    - Purpose
    - Use

Each target is assessed holistically on these elements

Critical Analytical Component in CDE Methodology
“It is an inherent responsibility of all commanders, observers, air battle managers, weapons directors, attack controllers, weapons systems operators, intelligence analysts, and targeting personnel to (CJCSI 3160.01):

– Establish Positive Identification (PID) and to accurately locate targets consistent with current military objectives and mission specific Rules of Engagement.

– PID is defined as the reasonable certainty that a functionally and geospatially defined object of attack is a legitimate military target in accordance with the Law of War and applicable Rules of Engagement.

– Identify potential collateral concerns prior to munitions release and target engagement (provide function and geospatial delimitations if able)

– Apply the Collateral Damage Methodology (CDM) with due diligence to mission objectives, force protection, and collateral damage.”
• Targets characterized as having both a military and civilian purpose/function are considered dual-use.
• In most cases, dual-use Targets consist of facilities/structures associated with providing support to the civilian population and the military effort (e.g., senior governmental level command and control, media centers, public utilities).
• Commanders are responsible to determine the predominant functionality of LOW Protected Structures, based on current intelligence, and decide if the target is dual-use or not.
• ROE provides the authorizations and prohibitions regarding targeting Dual-Use Facilities.
• Regardless of the ROE in effect, civilian personnel working within the boundary of dual-use targets must be considered as noncombatant casualties for the purposes of casualty estimation.
No-Strike Policy

• Combatant Commanders identify, develop, maintain, and distribute to subordinate and supporting commands a list of No-Strike Objects for each Country within Area of Responsibility (AOR) and each OPLAN/OPORD Areas of Operation (AO)

• The National Intelligence Community will support and assist the COCOMs with No-Strike Object research, development, and production; validate additions to COCOM generated No-Strike Lists (NSL)

• A NSL is a list of all identified objects within a specified geographic area (Country or AO) functionally characterized as non-combatant / civilian in nature.

Updated and disseminated daily

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Categories of Collateral (No Strike) Objects

- Category 1:
  - Diplomatic Facilities
  - Religious/Cultural/Historical
  - Non-Governmental Orgs.
  - Medical Facilities
  - Public Education Facilities
  - Civilian Refugee Camps
  - Prisoner of War (POW) Camps
  - Facilities with Environmental Concerns
  - Dams and dikes

- Category 2:
  - Non-Military Billeting (Housing, Hotels/Motels)
  - Civilian Meeting Places (Arenas, Theaters, Parks, Stadiums, Markets, Convention Centers)
  - Public Utilities (Power, Water, Electric, Gas, Fire & Police Stations, Banks, etc.)
  - Agricultural Storage or Processing Facilities
  - Facilities whose functionality is unknown
Initial Collateral Damage Estimate (CDE)

PID

Boundary

LOW/ROE

Dual-Use

CBR Plume Hazard

Environmental Hazard

CDE 1

Validates targets
Nature
Location
Purpose
Use

Casualty Estimation

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If Collateral Concern is **Out** of the CHA, CDE = **Low**

**Dominant Hazard = Fragmentation to Standing Personnel**

*CER = Collateral Effects Radius*
CDE Level 2

Collateral Hazard Area (CHA)

CDE 1 CER

CER measured from individual aimpoints

CDE 2 Low, PGM-Unitary

CDE 2 High

Continue to CDE 3

Collateral Concerns

Dominant Hazard = Fragmentation to Standing Personnel
CDE Level 3

Collateral Hazard Area (CHA)

CDE 1 CER

Dominant Hazard = Fragmentation to Standing Personnel (Unmitigated)
Ejecta to Standing Personnel (Mitigated)

CDE 3 Low
(Mitigated)

CDE 3 High
(Un-Mitigated)

CDE 3 High
(Mitigated)

Continue to CDE 4

CER measured from individual aimpoints

Collateral Concerns

Measure and record distance from aimpoint(s), ASUGM EZ or SSIM shear to nearest Collateral concern(s)

Is an Unmitigated Weaponization Solution required to achieve desired effect?

No

Yes High

Is there a Mitigated Weaponization Solution using CDE Level 3 CER Tables to achieve desired effect with a CER less than the distance in Level 2?

Yes

No

CDE Level 3 Assessment

Weapon/Fuse Restrictions

Low

High

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CDE Level 4

Dominant Hazard = Blast to Structures

CER measured from individual aimpoints

CDE 1 CER

CDE 1 CER

CDE 1 CER

CDE 2 Low

CDE 3 Low (Mitigated)

CDE 4 Low

Collateral Concerns

STOP

Assess and record collateral concern structure type(s)
Select and enter CDE Level 4 Weaponing Solution
Is CDE Level 4 CER for the weaponing solution less than the distance calculated in CDE
CDE Level 4 assessment
Low High
Delivery heading restrictions
Other mitigation techniques

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• Casualty Estimation is not an exact science—pattern of life assists
• There are no precise means to predict non-combatant demographics
• Combatant Commanders are responsible to develop estimated non-combatant demographic factors
  – Factors for Day and Night are based on socialized cultural norms for the applicable AOR/Country
• Casualty Estimates are computed based on three key factors
  – Affected Area of collateral concerns
  – Estimated Population Density of the effected collateral concerns
  – Casualty Factor (Multiplier)
CDE Level 5 (cont’d)

Target (Bridge)

CDE 3 (Un-Mitigated) CER

CDE 3 (Mitigated) CER

Restaurant

Garage

Inner Annulus

Outer Annulus

1/2 CDE 3 (Mitigated) CER

Outdoor Collateral Concern
Soccer Stadium

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### Population Density Tables

<table>
<thead>
<tr>
<th>Collateral Structure Functionality</th>
<th>Estimated Population Density</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Day</td>
</tr>
<tr>
<td>Residential Structures</td>
<td></td>
</tr>
<tr>
<td>Single Family Urban or Small Town, Upper and Middle Class</td>
<td></td>
</tr>
<tr>
<td>Single Family Urban or Small Town, Lower Class and Shrunken</td>
<td></td>
</tr>
<tr>
<td>Single Family Village or Rural Scattered, Lower Class</td>
<td></td>
</tr>
<tr>
<td>Multi-Family Unit (Apartment, Condominium, Dormitory)</td>
<td></td>
</tr>
<tr>
<td>Institutions/Public Service</td>
<td></td>
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<tr>
<td>Religious</td>
<td></td>
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<tr>
<td>Museum</td>
<td></td>
</tr>
<tr>
<td>Library</td>
<td></td>
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<tr>
<td>School</td>
<td></td>
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<tr>
<td>College/University</td>
<td></td>
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<tr>
<td>Hospital</td>
<td></td>
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<tr>
<td>Public Service Outlet</td>
<td></td>
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<tr>
<td>Store</td>
<td></td>
</tr>
<tr>
<td>Restaurant</td>
<td></td>
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<tr>
<td>Hotel/Motel</td>
<td></td>
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<tr>
<td>Office Building/Industrial Facility</td>
<td></td>
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<tr>
<td>Light Manufacturing</td>
<td></td>
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<tr>
<td>Heavy Manufacturing</td>
<td></td>
</tr>
<tr>
<td>Chemical, Refining, Cement</td>
<td></td>
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<tr>
<td>Heat Processing (i.e. foundry)</td>
<td></td>
</tr>
<tr>
<td>Craftworks</td>
<td></td>
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<tr>
<td>Transportation Facility</td>
<td></td>
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<tr>
<td>Station (Air, Rail, Bus, Subway, Gas)</td>
<td></td>
</tr>
<tr>
<td>Transportation Repair (Garage, Hangar)</td>
<td></td>
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<tr>
<td>Warehouse</td>
<td></td>
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<tr>
<td>Recreation/Entertainment</td>
<td></td>
</tr>
<tr>
<td>Indoor (Theater, Gymnasium)</td>
<td></td>
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<tr>
<td>Outdoor Intensive (Stadium, Racetrack)</td>
<td></td>
</tr>
<tr>
<td>Outdoor Extensive (Park, Zoo)</td>
<td></td>
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<tr>
<td>Auction</td>
<td></td>
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<tr>
<td>Indoor</td>
<td></td>
</tr>
<tr>
<td>Outdoor/Intensive (Theater, Gymnasium, Casino)</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
1. This table is based on population density per 1000 square feet.
2. Combatant commands are responsible for tables for their assigned AOR. Combatant commands may use multiple tables to account for the disparity in population density throughout different regions of various countries.
3. Day and night refer to socialized cultural norms for daytime/nighttime functional activities. Special consideration must be given to unique cultural practices and periodic events (i.e., religious holidays) that may influence the population density during daytime/nighttime hours as well as episodic events.
The CDE Methodology (CDM) supports the identification of "sensitive targets".

Sensitive Targets are those whose engagement present:
- the potential for damage and/or injury to non-combatant property and persons,
- potential political consequences,
- or other significant effects estimated to exceed predetermined, situation-specific threshold criteria.

Sensitive Targets are normally those assessed as CDE 5 High or those designated by the President or Secretary of Defense whose engagement present unacceptable strategic risk.

Sensitive (STAR) Targets require approval by either President or Secretary of Defense.
CDE in the Joint Targeting Cycle

Methods to prevent civilian casualties permeates the cycle
## Mitigating Weapon Effects

<table>
<thead>
<tr>
<th>Effect</th>
<th>Delay Fuzing</th>
<th>Proximity Fuzing</th>
<th>Shielding</th>
<th>Delivery Heading</th>
<th>Aimpoint Offset</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frag.</td>
<td>√</td>
<td></td>
<td>√</td>
<td></td>
<td></td>
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<tr>
<td>Blast</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td></td>
<td></td>
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<tr>
<td>Debris</td>
<td></td>
<td>√</td>
<td>√</td>
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<tr>
<td>Pen. &amp; Cratering</td>
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<tr>
<td>Thermal</td>
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<tr>
<td>CBR</td>
<td></td>
<td></td>
<td>√</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Delivery Error</td>
<td></td>
<td></td>
<td></td>
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<td>√</td>
</tr>
<tr>
<td>CDE Level</td>
<td>Intended Use</td>
<td>Dominant Hazard</td>
<td>CER/CHA Criteria and Weapon Restrictions</td>
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<td></td>
</tr>
<tr>
<td>-----------</td>
<td>------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Initial assessment for all conventional weapons</td>
<td>Fragmentation versus personnel</td>
<td>Less than 10% probability of serious or lethal injury to standing personnel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2A</td>
<td>General assessment for unitary and cluster PGMs</td>
<td>Delivery error only</td>
<td>Less than 10% probability of serious or lethal injury to standing personnel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2B</td>
<td>Minimum target size assessment for ASUGM based on delivery platform</td>
<td></td>
<td>No low or high assessment — feasibility only</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2C</td>
<td>Minimum target size assessment for SSBM based on weapon system</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>3A</td>
<td>Assessment for each HGM warhead in an unmitigated case</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>3B</td>
<td>Assessment for each ASUGM based on delivery platform and warhead in an unmitigated case</td>
<td>Fragmentation versus personnel (or blast if no assem plants/debris exist)</td>
<td>Less than 10% probability of serious or lethal injury to standing personnel Fuze for complete detonation below grade</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3C</td>
<td>Assessment for each SSBM weapon system/shell/for Observer Adjusted method</td>
<td></td>
<td>Less than 10% probability of serious or lethal injury to standing personnel Fuze for surface or air detonation Head restriction for multi-warhead delivery</td>
<td></td>
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</tr>
<tr>
<td>4A</td>
<td>Refined assessment for each HGM warhead based on collateral structure type in a mitigated case</td>
<td>Blast versus structures leading to blunt trauma injury to personnel</td>
<td>Less than 1% structural damage to collateral structure Delay fuze for complete detonation below grade or complete detonation within target structure Excludes cluster munitions Requires delivery neaing restrictions</td>
<td></td>
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<tr>
<td>4B</td>
<td>Refined assessment for each ASUGM warhead and associated delivery platform based on nearest collateral structure in a mitigated case</td>
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</tr>
<tr>
<td>4C</td>
<td>Refined assessment for each SSBM weapon system/shell/for Observer Adjusted method</td>
<td></td>
<td>Less than 1% structural damage to collateral structure Excludes ICM RAP and enhanced range munitions</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CDE Program of Instruction

1. CDE Methodology Program of Instruction – Overview (1 hr )
2. CDE Methodology - Introduction (3 hrs)
3. Measuring and Mitigating Weapons’ Effects (4 hrs)
4. CDE Level 1 – Target Validation / Initial Assessment (2 hrs)
5. CDE Level 2 – General / Target Size Assessment (2 hrs)
6. CDE Level 3 – Weaponeering Assessment (2 hrs)
7. CDE Level 4 – Refined Assessment (2 hrs)
8. CDE Level 5 – Casualty Estimation / Assessment (4 hrs)
9. CDE Automation – JADOCS CDE Wizard (4 hrs)
10. Practical Exercises (8 hrs)
11. CDE Methodology - Review (4 hrs)
12. Examination (4 hrs)
Better intelligence and proportional precision engagement allows us to better discriminate valid military objectives from civilian population.

Resource Allocation – Find/Fix versus Engage
• Rules of Engagement give the appropriate permissions to approve strikes based on Collateral Damage Estimation (CDE) call and target type
• Approvals, Rules of Engagement, and Collateral Damage Estimation (CDE) for strikes in Afghanistan are driven by nationality of the selected strike platform:
  – United States Rules of Engagement apply to all U.S. assets when used to strike targets
  – Other Rules of Engagement apply to all non-US assets when used to strike targets
START: (Target Identified)

Communication link established with effected units

ISAF/USFOR-A TARGETS Cell

REQUESTER

Collateral Damage Estimation

*CAOC

USCENTCOM TARGETS Cell

Collateral Damage Estimation Analysis Complete

Commander briefed on strike

Commander's approval relayed to all parties

Commander Approves/Disapproves strike

Reach back to Intelligence Community (IC) when necessary

STOP

*CAOC = Combined Air and Space Operations Center
Dynamic Targeting Cycle

1. Find
- Intelligence Collection
- Detection

2. Fix
- Focus Sensors
- Locate
- Identify
- Determine Time Available

3. Track
- Prioritize ISR
- Maintain Track
- Update Time Available

4. Target
- Decide
- Target Area Clearance
- Risk Assessment
- Select Method

5. Engage
- Determine Resources
- Develop Options
- Maintain Track
- Weaponeer
- Satisfy Restrictions
- Deconflict

6. Assess
- Order Engagement
- Transmit Order
- Monitor/Manage
- Strike

Assess
Report Results
Re-Attack
Recommendations