CHAIRMAN OF THE JOINT CHIEFS OF STAFF INSTRUCTION

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NO-STRIKE AND THE COLLATERAL DAMAGE ESTIMATION METHODOLOGY

References: See Enclosure E.

1. Purpose. The purpose of this instruction is to document the Department of Defense (DoD) policy governing the No-strike process, management of No-strike entities, treatment of collateral objects, and the logic, processes, and procedures of the collateral damage estimation (CDE) methodology (CDM).

2. Cancellation. CJCSI 3160.01, 13 February 2009, "No-Strike and the Collateral Damage Estimation Methodology" is canceled.

3. Applicability. This instruction applies to the Joint Staff, Services, Combatant Commands (CCMDs), DoD combat support agencies (CSAs), and joint activities.

4. Policy. See Enclosures B through D, which establish Department of Defense (DoD) policy governing the No-strike process; management of No-strike entities; treatment of collateral objects; and the logic, processes, and procedures of the collateral damage estimation (CDE) methodology (CDM).

5. Definitions. See Glossary.

6. Responsibilities. See Enclosure A.

7. Summary of Changes. Changes primarily encompass:

a. Multiple technical updates to the methodology incorporating lessons learned from Operations ENDURING FREEDOM, ODYSSEY DAWN, and UNIFIED PROTECTOR.

b. New minimum collective standards for operational CDE capability and refined joint training standards for CDE, empowering the Services to organize/train/equip to provide CDE capability in support of Combatant Commanders (CCDRs).

8. Releasability. This instruction is approved for limited release and contains information exempt from mandatory disclosure under the Freedom of Information Act (exemption 2 applies). DoD Components (to include the CCMDs) and other Federal Agencies may obtain copies of this instruction through controlled Internet access only (limited to .mil and .gov users) from the CJCS Directives Home Page--http://www.dtic.mil/cjcs_directives. Joint Staff activities may access or obtain copies of this instruction from the Joint Staff Decision Support Environment. Combatant Command Foreign Disclosure Officers are authorized to release this instruction to foreign governments to support the planning of or execution of combined/allied operations. These foreign representatives will not be authorized to further disseminate the instruction.

9. Effective Date. This instruction is effective upon receipt.

For the Chairman of the Joint Chiefs of Staff

CURTIS M. SCAPARROTTI
Lieutenant General, U.S. Army
Director, Joint Staff

Enclosures:

A -- Responsibilities
B -- No-Strike Entities, Categories, Collateral Objects, Dual-Use, and Human Shields
C -- No-Strike Policy and Guidance
D -- Joint Methodology for Collateral Damage Estimation
E -- References
GL -- Glossary

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[1] JS/J26 will disseminate electronically.

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ENCLOSURE A

RESPONSIBILITIES

1. Overview. This enclosure delineates responsibilities for the many organizations that execute and support the No-Strike guidance and CDE methodology. The Joint Staff Director for Intelligence (J-2) Deputy Directorate for Warfighter Support and Integration (Joint Staff/J-26) is the lead agent for updates or changes to this instruction.

2. Joint Staff/J-26. The Joint Staff/J-26 is responsible for the development of No-Strike and CDE policy and guidance for the Chairman of the Joint Chiefs of Staff (CJCS). Joint Staff/J-26 fulfills this role in collaboration with CCMDs, designated service representatives, CSAs, and the Intelligence Community (IC). The following are Joint Staff/J-26 roles and responsibilities specific to No-Strike and the CDM:

a. Develop joint No-strike and CDE policy and guidance

b. Coordinate with the CCMDs, Services, CSAs, and the Joint Technical Coordinating Group for Munitions Effectiveness (JTCG/ME) to identify operational requirements that provide the framework for the CDM.

c. Assist in the development of Service or CCMD CDE programs.

d. Provide oversight of population density reference tables to facilitate IC support and ensure their standardized production and use.

e. Review and coordinate CDE automation requirements. Provide oversight of automated tool development to ensure policy, training, and tool automation is synchronized.

f. Notify DoD Components when new collateral effects radius (CER) tables are produced.

3. Joint Technical Coordinating Group/Munitions Effectiveness. The JTCG/ME is a joint organization chartered under the auspices of the Services' logistics commands. It directs working groups that focus on specific aspects of weaponeering, weapon effects, and collateral damage. The following are JTCG/ME roles and responsibilities specific to the CDM:

a. Develop and publish weapons effectiveness information for conventional weapons. JTCG/ME, in coordination with Joint Staff/J-26, develops, maintains, and distributes the CDE reference tables that are the foundation for the CDM.

b. Produce CDE CER and minimum target size (MTS) reference tables separate from this instruction as new weapons data become available.

c. Contribute technical updates to this instruction concurrent with the development and release of new weapons effects data and products.

d. Contribute updates to this instruction concurrent with the development and refinement of mitigation techniques authorized for use in the conduct of CDE.

e. Validate tools, sources, and methods used to display or calculate the CER and MTS values for the CDE reference tables and weapon effectiveness data.

4. Joint Staff/J-7 Joint Targeting School (JTS). The JTS provides joint targeting training for operations and intelligence personnel designated to Unified Commands, the Joint Staff, Combat Support Agencies, and Services. As part of its curriculum, JTS teaches CDM. The following are JTS roles and responsibilities specific to CDM:

a. Provide CDE certification training for personnel assigned to a position or billet performing CDE. CDE certification will meet the standards prescribed in the Joint Collateral Damage Estimation Program Standards (JCPS).

b. Maintain at least one standardization instructor as the program manager capable of certifying instructors.

c. Provide standardization, in concert with service/functional SMEs, via audit and accreditation of Service and CCMD CDE programs when directed to by Joint Staff/J-26, in accordance with the JCPS.

d. Maintain and make available to Service and CCMD CDE programs a current set of CDE training courseware and a master question file. The JTS master question file, developed in coordination with the services and CCMDs, will be the authoritative source for Service and CCMD CDE certification program academic evaluations.

e. Keep record of CDE-trained analysts and instructors who graduate from JTS (name, rank, date, and score).

f. Ensure CDE program complies with the JCPS.

5. Combatant Commands. Combatant commanders (CCDRs) must apply the CDM during the evaluation of proportionality for target engagements considering the mission specific rules of engagement (ROE) and higher Commander's

guidance during the planning and conduct of full spectrum operations. The following are CCMD roles and responsibilities specific to No-Strike and the CDM:

a. Identify positions requiring CDE training and certification on the joint manning document.

b. Promulgate CDE guidance based on theater-specific ROE and targeting guidance.

c. Ensure that personnel assigned to a CCMD position or billet that requires them to conduct CDE are certified and qualified as CDE analysts and understand theater-specific ROE and targeting tactics, techniques, and procedures. Update analyst's initial certification and annual currency via the Joint Staff/J-26 SIPRNET SharePoint site.

d. Send a letter of intent to Joint Staff/J-26 in accordance with (IAW) JCPS if desiring to establish a CDE program. JTS will initially certify the instructors and accredit the program via an audit of the program. Requesting organizations are responsible for funding their courses to include the training of their instructors and the accreditation of the program.

e. Ensure CDE programs comply with guidance issued in this document.

f. Identify a CDE program manager in writing to JS/J-26.

g. Prioritize requirements for population density tables with Oak Ridge National Labs.

h. Present the appropriate information as directed by this instruction and CJCSI 3122.06, Sensitive Target Approval and Review (STAR) Process (reference a) to support the evaluation of proportionality for target engagement decisions.

i. Prior to striking a target, commands should ensure imagery used to support CDE Analysis is not older than 90 days. This may be waived to 180 days if there are no indications of change in the area of interest.[2]

j. Geographic CCMDs. Supported by the IC, geographic CCDRs are responsible for identifying, developing, maintaining, and distributing to subordinate and supporting commands and supported functional commands a list of No-Strike entities (known as the No-Strike List (NSL)) for operation-specific assigned areas of operation and for those countries within their Unified Command Plan assigned area of responsibility (AOR) for which there is Guidance

[2] The 90/180-day imagery requirement does not imply intel-databasing or CDE graphic "refresh" standards.

for Employment of the Force documentation (formerly known as Contingency Planning Guidance) or Joint Strategic Capabilities Plan (JSCP) directed plans and/or operation orders (OPORDs).[3] The geographic CCDR, as the approving authority for the NSL, should designate a single No-Strike Coordinator to manage this process (see Enclosure C).[4]

k. Functional CCMDs. Functional CCMD with worldwide responsibilities are responsible for coordinating with geographic CCMDs to leverage relevant country-based NSL maintained for their respective countries of interest. It is critical for the functional CCMD to aggressively coordinate with the supporting geographic CCMDs to ensure NSL for countries of interest are current and valid (see Enclosure C).

6. Services. Due to the nature of operations and the potential strategic risk posed to the U.S. Government, due diligence is critical to ensure personnel are trained in the CDM. At the appropriate echelon of command, Services will ensure Service organizations/formations that deploy in support of CCDRs have an organic CDE capability, as defined in Appendix G to Enclosure D. The following are Service roles and responsibilities:

a. Ensure that personnel assigned to a Service component position or billet that may require them to conduct CDE are certified and qualified as CDE analysts.

b. Services will send a letter to Joint Staff/J-26 stating their intent to establish a CDE program. JTS will initially certify the instructors and accredit the CDE certification program via an audit. Requesting organizations are responsible for funding their programs to include the training of their instructors and the accreditation of the program.

c. Ensure CDE programs comply with guidance issued in this document.

d. Identify a CDE program manager in writing to JS/J-26.

e. Services will track personnel that are certified as CDE analysts or instructors and should consider establishing appropriate special skill/experience identifiers to facilitate the tracking of certified CDE analysts.

[3] Enclosure F of the JSCP provides Intercommand Targeting Guidance.

[4] For all other countries within an AOR, geographic CCDRs should compile NSLs to support crisis action planning as necessary. However, Modernized Integrated Database (MIDB) maintenance as done by Responsible Analytic Centers (RACs) is guided by the Defense Intelligence Analysis Program (DIAP) priorities. Those commands that elect to maintain an NSL for countries outside direction provided in subparagraph 3.b(1) cannot be assured of MIDB record detail to the level afforded DIAP priority countries. Each geographic CCMD and RAC must have procedures to task and respond effectively IAW crisis action planning criteria for non-priority countries.

f. Develop and distribute to appropriate commands tools to support the conduct of CDE within Service targeting processes, in order to meet joint requirements. .

7. DoD CSAs/Service Intelligence Production Centers. CSAs and Service Intelligence Production Centers are responsible to identify and report No-Strike entities to the appropriate RAC or CCMD. CSAs and Service Intelligence Production Centers with a designated No-Strike Coordinator must have the access and skills necessary to support the No Strike Process. Efforts include nomination of No-Strike entities, by function, location, and geospatial definition for entry into the Modernized Integrated Database (MIDB) by the appropriate RAC. This includes the designation of a geospatially accurate polygon (shape file) to define the facility outline of the NSE. (See Table 5 for hierarchy of geospatial coordinate sources.) The MIDB is the vehicle to archive requisite data on NSEs (see Enclosures B and C). Finally, the CDE process requires casualty estimates for Level 5 Analysis. CCMDs require demographic data for countries and/or regions in their AOR to support operational planning and execution.

8. Defense Threat Reduction Agency (DTRA). DTRA is responsible for developing and maintaining data and technical tools to conduct chemical, biological, or radiological (CBR) plume hazard estimation in support of CDE. DTRA maintains the expertise and capability to conduct timely plume hazard analysis in support of a Commander's CDE requirements. DTRA's population data requirements are documented with the IC for production and maintenance to support CDE.

9. Defense Intelligence Agency

a. DIA's Operational Environment Analysis Division. This Division is responsible for developing and maintaining a database of diplomatic, religious, cultural, historical, educational, water, humanitarian, and urban NSEs. It maintains the expertise and capability to identify and locate these NSEs in order to preserve and avoid collateral damage. The Operational Environment Analysis Division data requirements are documented with the IC for production and maintenance to support collateral damage estimation.

b. DIA's National Center for Medical Intelligence (NCMI). NCMI is responsible for developing and maintaining data and technical tools to assess significant human health risks associated with collateral damage. NCMI will assess human health risk from chemical contamination of air, food, water, or soil and from exposures that may result from accidental or intentional releases of toxic industrial chemicals. In addition, NCMI maintains the expertise and capability to identify and assess medical facilities in order to preserve and avoid collateral damage to medical infrastructure. NCMI does not assess health risks from the use of CBR weapons or from CBR releases from collateral damage. NCMI's

population data requirements are documented with the IC for production and maintenance in order to support collateral damage estimation.

10. Other organizations. Although not bound by this instruction, non-DoD United States Government agencies (e.g., Department of State) and Coalition partners should report operating locations within an AOR to the appropriate military command element or joint task force (JTF) to facilitate command and interagency coordination, and deconfliction of No-Strike entities that occur via the joint interagency coordination group (JIACG) (see reference b).

11. 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:

a. Establish positive identification (PID) and to accurately locate targets consistent with current military objectives and mission specific ROE. For purposes of this instruction, **"PID" is defined as follows: "The reasonable certainty that a functionally and geospatially defined object of attack is a legitimate military target in accordance with the LOW and applicable ROE."**

b. Identify potential collateral (i.e., No-strike) concerns in the vicinity of the valid military target prior to munitions release and target engagement (provide function and geospatial delimitations if able).

c. Apply the CDM with due diligence within the framework of the operational imperatives of accomplishing mission objectives, force protection, and collateral damage mitigation.

ENCLOSURE B

NO-STRIKE ENTITIES, CATEGORIES, COLLATERAL OBJECTS, DUAL-USE, AND HUMAN SHIELDS

1. Introduction

a. No-Strike entities (NSEs) are those designated by the appropriate authority upon which kinetic or non-kinetic operations are prohibited to avoid violating international law, conventions, or agreements, or damaging relations with coalition partners and indigenous populations. NSEs are protected from the effects of military operations (i.e., they have a "protected status"). The infliction of unnecessary suffering or damage to civilian persons or property that is excessive in relation to the concrete and direct military advantage anticipated is inconsistent with international law and is contrary to DoD policy outlined in this document and in references cand d.

b. The source and method for defining a person, place, or thing as an NSE is derived primarily from the body of international law collectively known as the Law of War (LOW) . The LOW incorporates international treaties and agreements adhered to by the U.S. Government, as well as customary international law, into a comprehensive set of guidance and requirements governing the conduct of modern warfare.

c. IAW CJCSI 3370.01, joint targeting recognizes five types of entities: facilities, individuals, virtual entities, equipment, and organizations. In this publication, the term "no-strike facility" (NSF) will be used when the facility entity type is the only entity type for which the guidance applies.

d. NSEs are categorized based on their sensitivity: CAT I (most sensitive) and CAT II (less sensitive). Because no sensitivity criteria have been established for entities other than facilities, the terms CAT I and CAT II will only be applied to NSFs.

2. No-Strike Categories. NSFs are represented by MIDB functional category codes (CATCODEs) for the purposes of intelligence production, target development, and standardized description of each functional category. Tables 1 and 2, below, show the NSFs by category type and tie specific CATCODEs to their description (number in parenthesis).

a. Category I NSFs. This category includes the most sensitive subset of NSFs addressed by the LOW, other international and domestic laws, and significant policy concerns. These objects typically constitute the core of the NSL (see Enclosure C, Appendix A).

(1) Diplomatic offices, foreign missions, and sovereign nonmilitary property of other nations within the AORs.

(2) Religious, cultural, historical institutions, cemeteries, and structures.

(3) Intergovernmental organizations (e.g., United Nations, North Atlantic Treaty Organization) and Nongovernmental organizations (e.g., International Committee of the Red Cross, Amnesty International) property, equipment, and personnel.

(4) Medical facilities (both civilian and military).

(5) Public education facilities including nonmilitary schools, colleges, universities, child/day care centers, and institutes.

(6) Civilian refugee camps and concentrations.

(7) Prisoner of war camps and concentrations and government detention facilities/prisons.

(8) Facilities whose engagement may result in pollution that cannot be contained to include contamination of standing water, streams, and rivers.

(9) Dams or dikes whose engagement may result in the flooding of civilian areas.

MIDB CATCODE	FUNCTION
42140	Thermal Power Plants, Nuclear (8)
43110	Water Supply Facilities, Treatment Plants (8)
43121	Water Supply Facilities, Storage Facilities, Reservoirs (9)
43200	Waste Facilities, General (8)
43210	Waste Facilities, Sewage Processing (8)
43400	Medical Facilities (4)
43410	Hospitals (4)
43420	Medical Clinics (4)
43430	Medical Dispensaries (4)
43440	Medical Laboratories (4)
43450	Blood Banks (4)
43460	Convalescent or Medical Rehabilitation Centers (4)
43470	Veterinary Hospitals or Clinics (4)
43480	Veterinary Laboratories (4)
43800	Dikes and Other Water Control Features, General (9)
43810	Dikes and Other Water Control Features, Critical Dike Sections (9)
43820	Dikes and Other Water Control Features, Water Control Features, Other Than Dikes and Dams (9)
43900	Dams, General (9)
43910	Dams, Concrete Dams (9)
43920	Dams, Earthen or Rock-Filled Dams (9)

MIDB CATCODE	FUNCTION
43930	Dams, Masonry Dams (9)
43940	Dams, Composite Dams, General Dam Entry (9)
43941	Dams, Composite Dams, Concrete Component of Composite Dam (9)
43942	Dams, Composite Dams, Earthen or Rock-Filled Components of Composite Dams (9)
43943	Dams, Composite Dams, Masonry Component of Composite Dam (9)
49600	Nonmilitary Schools, General (5)
49610	Nonmilitary Schools, Grammar Schools, Secondary Schools and High Schools (5)
49620	Nonmilitary Schools, Colleges and Universities (5)
49630	Nonmilitary Schools, Technical and Trade Schools (5)
49640	Nursery School, Preschool, Day Care (5)
49650	Nonmilitary Schools, Madrassas (5)
72000	Medical Training Facilities, Type Not Specified (5)
72100	Schools, Medical Unidentified (5)
72110	Schools of Medicine (5)
72120	Schools of Dentistry (5)
72130	Veterinary Schools (5)
72140	Schools of Nursing (5)
72150	Schools of Pharmacy (5)
72160	Paramedical Training Schools (5)
72170	Veterinary Technician Training Schools (5)
72300	Medical Interest Site (4)
75300	Civilian Refugee Camps (6)
75900	Prisoner of War (POW) Concentrations (7)
77500	Government Detention Facilities, General (7)
77510	Government Detention Facilities, Prisons, Nonmilitary (7)
77520	Government Detention Facilities, Prisons, Military (7)
77600	Religious, Cultural and Historical Institutions, General (2)
77610	Religious Institutions (2)
77620	Cultural and Historical Institutions (2)
77630	Cemeteries (2)
77700	Libraries (2)
77800	Diplomatic Offices and Foreign Missions, General (1)
77810	Diplomatic Offices and Foreign Missions, Embassies (1)
77820	Diplomatic Offices and Foreign Missions, Legations (1)
77830	Diplomatic Offices and Foreign Missions, Consulates (1)
77840	Diplomatic Residences (1)
77850	Foreign Missions and Government Offices (1)
77860	Designated Assembly Areas (1)
77870	Nongovernmental Organizations (3)

Table 1. Category I NSFs

b. Category II NSFs. This category includes the remainder of NSFs addressed by the LOW, other international and domestic laws, and significant policy concerns, and may be on the NSL.

(1) Nonmilitary billeting and accommodations including private civilian housing and family housing on military or government property.

(2) Civilian meeting places including athletic fields, stadiums, racetracks, parks, civic and convention centers, theaters, amusement parks, markets, and recreational facilities.

(3) Public utilities and facilities including those that generate, distribute, or transport electricity, petroleum or water intended for civilian consumption; commercial fuel service stations, civilian mass transit facilities, water supply facilities, waste facilities, urban gas supply, fire stations, postal facilities, police stations, civil defense facilities, and financial institutions.

(4) Agricultural processing and storage facilities that produce, market or distribute foodstuffs for civilian consumption.

(5) Public utilities, industrial facilities, and storage depots that have the potential to release toxic chemicals that may contaminate air, food, soil or water resources.

(6) Facilities and/or structures for which the functionality/purpose is unknown are classified as the last priority of Category II NSFs.

MIDB CATCODE	FUNCTION
18200	Agricultural Raw Materials, Vegetables, General (4)
18210	Agricultural Raw Materials, Grain Storage, General (4)
18211	Agricultural Raw Materials, Grain Storage, Underground or Earth-Covered Bunkers (4)
18212	Agricultural Raw Materials, Grain Storage, Elevators (4)
18213	Agricultural Raw Materials, Grain Storage, Horizontal Bulk (4)
18214	Agricultural Raw Materials, Grain Storage, On-Farm (4)
18300	Animal Raw Materials [Includes Fish] (4)
42000	Electrical Power Generating, Transmission, and Control (3)
42100	Thermal Power Plants, General (3)
42110	Thermal Power Plants, Steam Turbine (3)
42120	Thermal Power Plants, Gas Turbine (3)
42130	Thermal Power Plants, Diesel (3)
42150	Thermal Power Plants, Geothermal (3)
42190	Thermal Power Plants, Combination (3)
42200	Hydroelectric Power Plants, General (3)
42210	Hydroelectric Power Plants, Storage, General (3)
42211	Hydroelectric Power Plants, Storage, Base-of-Dam (3)
42212	Hydroelectric Power Plants, Storage, Diversion (3)

MIDB CATCODE	FUNCTION
42220	Hydroelectric Power Plants, Run-of-River, General (3)
42222	Hydroelectric Power Plants, Run-of-River, Diversion (3)
42230	Hydroelectric Power Plants, Pumped Storage (3)
42240	Hydroelectric Power Plants, Tidal (3)
42290	Hydroelectric Power Plants, Combination (3)
42300	Alternate Energy Power Plants (3)
42600	Electrical Power Substations, General (3)
42610	Electrical Power Substations, Transformer (3)
42620	Electrical Power Substations, Switching (3)
42630	Electrical Power Substations, Traction (3)
42640	Electrical Power Substations, Converter (3)
42650	Electrical Power Capacitor Substations (3)
42660	Electrical Power Taps (3)
42700	Electrical Power Control Centers, General (3)
42710	Electrical Power Control Centers, National (3)
42720	Electrical Power Control Centers, Regional (3)
42730	Electrical Power Control Centers, Local (3)
43000	Public Utilities (3)
43010	Urban Utility, Steam Heating Plant (3)
43100	Water Supply Facilities, General (3)
43120	Water Supply Facilities, Storage Facilities, General (3)
43122	Water Supply Facilities, Storage Facilities, Tanks (3)
43123	Water Supply Facilities, Storage Facilities, Towers and Standpipes (3)
43130	Water Supply Facilities, Pumping Stations (3)
43140	Water Supply Facilities, Sources, General (3)
43141	Water Supply Facilities, Sources, Wells (3)
43142	Water Supply Facilities, Sources, Springs (3)
43143	Water Supply Facilities, Sources, Rivers or Streams, Intake Points (3)
43144	Water Supply Facilities, Sources, Lakes, Intake Points (3)
43145	Water Supply Facilities, Sources, Salt Water Bodies, Intake Points (3)
43150	Water Supply Facilities, Irrigation Pump Stations (3)
43160	Water Supply Facilities, Water Pipeline Segments and Aquaducts (3)
43190	Water Supply Facilities, Water Drilling Towers (3)
43200	Waste Facilities, General (3)
43220	Waste Facilities, Solid Waste Processing, General (3)
43221	Waste Facilities, Solid Waste Processing, Transfer Stations (3)
43222	Waste Facilities, Solid Waste Processing, Landfills (3)
43300	Mass Transit Facilities, General (3)
43310	Mass Transit Facilities, Barns And Parks (3)
43320	Mass Transit Facilities, Repair Plants (3)

MIDB CATCODE	FUNCTION
43330	Mass Transit Facilities, Combined Parking and Repair Facilities (3)
43340	Mass Transit Facilities, Subway Facilities or Heavy Rail (3)
43500	Urban Gas Supply, General (3)
43510	Urban Gas Supply, Gas Manufacturing (3)
43520	Urban Gas Supply, Gas Storage, General (3)
43521	Urban Gas Supply, Gas Storage, Gasholders (3)
43522	Urban Gas Supply, Gas Storage, Storage Tanks (3)
43523	Urban Gas Supply, Gas Storage, Reservoirs, Underground (3)
43530	Urban Gas Supply, Gas Storage, Bottling Plants (3)
43600	Fire Stations (3)
43700	Postal Facilities (3)
44400	Ferry Facilities, Highway, General (3)
46000	Urban Services, General (3)
46100	Nonmilitary Motor Services (3)
46110	Commercial Fuel Service Stations (3)
46120	Nonmilitary Motor Pools (3)
46200	Recreational Facilities, Athletic Fields, Parks, Civic Centers, Theaters, General (2)
46210	Recreational Facilities (2)
46220	Athletic Fields (2)
46230	Stadiums (2)
46240	Race Tracks (2)
46250	Parks (2)
46260	Civic and Convention Centers (2)
46270	Theaters (2)
49700	Nonmilitary Billeting and Accommodations (1)
49710	Hotels, Motels, Inns to Include Hotels Motels, Inns, Bed and Breakfasts, and Hostels (1)
49720	Apartment Complexes (1)
49730	Residences, Non-Diplomatic (1)
58900	Food, Feed, Beverage, and Tobacco Storage (4)
77000	Merchandising, Retail and Government, General (3)
77100	Merchandising, Marketing, and Stores(3)
77110	Department Stores, Malls, Shopping Centers, and Shopping Plazas (3)
77120	Market, General (3)
77140	Restaurants (3)
77200	Financial Institutions, General (3)
77210	Central Government Banking, Financial, Economic, Commercial, Treasury or Trade Organizations (3)
77220	Domestic Banking, Insurance, Finance, Exchanges, Brokerage Houses or Gambling Establishments (3)
77230	Foreign Banking, Insurance, Finance, Exchanges, Brokerage

MIDB CATCODE	FUNCTION
	Houses or Gambling Establishments (3)
77240	Currency Dealers and Exchangers, Check Cashers, Money Transmitters or Hawala--Money Services Businesses (MSBS) (3)
77250	Global or Regional Lending Organizations Formed by Treaty or International Agreement -- Intl Financial Institutions (IFIS) (3)
77900	Trade, Commerce, and Financial, General (3)
77910	Stock Market (3)
77920	Chamber/Department of Commerce (3)
78100	Civil Defense Facilities, General (3)
78110	Civil Defense Facilities, Population Protection (3)
78120	Civil Defense Facilities, Civil Defense Training Facilities (3)
78130	Civil Defense Facilities, Civil Defense Forces Facility (3)
78140	Civil Defense Facilities, Civil Defense Reserve Storage Facilities (3)

Table 2. Category II NSFs

c. No-Strike categories may be modified by the Secretary of Defense (SecDef) or President as the military or political situation dictates. Changes to these categories will be reflected in operation-specific ROE and/or via strategic/operational command guidance.

3. Collateral Objects

a. Collateral objects are functionally defined NSFs that have a geospatial relationship to a target and may be affected or potentially affected by target engagement. Knowledge of the location and function of collateral objects is essential to target development, the No-Strike process, and the CDM. Treat collateral objects in accordance with policy and guidance prescribed in this instruction and operational ROE.

b. Collateral objects located within the collateral hazard area (CHA) are further defined as collateral concerns.

4. Dual-Use Facilities

a. Dual-use facilities are defined as those valid military targets characterized as serving both a military and civilian (i.e., noncombatant) purpose/function. In many cases, dual-use facilities are associated with senior governmental level command and control; national communications infrastructure; media centers; national power and petroleum, oil, and lubricants infrastructure; industrial facilities, and public utilities providing support to both the civilian population and the military effort.

b. Dual-use facilities may also consist of NSFs occupied by combatants. NSFs occupied by enemy combatants for the purpose of advancing military objectives lose their LOW protection and are not classified as dual-use.

Similarly, if the function of an NSF is determined to be supporting military operations and/or objectives exclusively, it is not classified as dual-use. Such entities are not considered collateral damage or NSFs and may be deemed lawful targets IAW reference c (also see Enclosure C, subparagraph 2.c., and supporting footnote).

c. Commanders are responsible for determining the predominant function of an NSF, based on current intelligence, and deciding if the target has lost its LOW protected status and is a valid military target, is a dual-use facility, or is an NSF. The ROE for a specific operation provides the authorizations and/or prohibitions for targeting dual-use facilities. Regardless of the ROE in effect, civilian personnel working within the geospatially defined outline of dual-use facilities are classified as noncombatant or civilian casualties for the purpose of casualty estimation (CE) under guidance provided in Enclosure D.

5. Human Shields

a. Human shields are civilian or noncombatant personnel placed in or around a valid military target to hinder attack of that target. In some instances, human shields are willing accomplices who support the belligerent nation and in this case they lose their protected status. In other instances, the belligerent nation may either forcibly place (involuntary) or deceptively encourage (unwitting) civilians or noncombatants to be present at valid military targets, and these personnel are considered protected persons. Involuntary, unwitting, or status unknown human shields must be accounted for in CE. The presence of one or more human shields in the CE automatically elevates the **target's collateral damage estimate to CDE 5.**

ENCLOSURE C

NO-STRIKE POLICY AND GUIDANCE

1. Introduction

a. No-Strike entities are those designated by the appropriate authority upon which kinetic or non-kinetic operations are prohibited to avoid violating international law, or agreements, or damaging relations with coalition partners and indigenous populations.

b. The basis for defining a person, place, or thing as a No-Strike entity is derived primarily from the body of international law collectively known as LOW. LOW comprises the international law related to the conduct of hostilities binding on the United States or its individual citizens, including treaties to which the United States is a party and applicable customary international law that regulates the conduct of armed hostilities.

2. General Guidance

a. The LOW requires all military personnel to take reasonable precautions to ensure that only military objectives are targeted and to avoid targeting (i.e., attacking) civilian or noncombatant persons or objects. NSLs identify and functionally characterize LOW-protected NSEs forming the strategic and operational basis for target deconfliction during operational planning. NSLs support CDE within the target development process and support deconfliction of Joint Fires during execution. See Enclosure D for additional guidance on CDE.

b. No-Strike Entities. NSEs can be both traditional and non-traditional in nature,[5] and consist of objects which are functionally characterized as civilian and/or noncombatant and therefore are protected from attack. NSEs may include but are not limited to medical, educational, diplomatic, cultural, religious, and historical sites, or other objects that do not, by their nature, location, purpose, or use, effectively contribute to the enemy's war-fighting or war-sustaining capability. These entities generally are not lawful targets under normal circumstances; however, if used to advance military or hostile force objectives, NSEs lose their protected status and may be subject to attack. For example, if a hospital structure is used to store weapons or is used for some other military purpose, a warning must be given and if unheeded, the facility

[5] For the purposes of this instruction, the term "traditional" refers to physical entities such as facilities, units, and other entities geospatially located within the geographic area of operation. "Nontraditional" refers to entities that are more abstract in nature and are usually associated with transnational information technology and global economic structures. These nontraditional entities may include such objects as computer networks, Web sites, IP addresses, and bank accounts.

forfeits its protected status under the LOW and becomes a lawful military target. When such a change in status occurs, the CCDR or authorized designee may approve the entity for attack (see Appendix B to this Enclosure, paragraph 6, for change of status guidance).

c. No-Strike Entities Located on Military Installations. When located on installations determined to be lawful military targets, NSEs should be evaluated for collateral damage concerns and mitigated IAW Enclosure D. It must be assumed these entities host protected functions unless confirmed otherwise.[6] NSEs must be geospatially defined, developed as separate facilities associated to the installation, and assigned a functional category code and O-suffix, as appropriate. Proximity of lawful military targets to NSEs does not preclude engagement of the lawful military target. However, in these circumstances the commander must weigh the anticipated loss of life, damage to property, or other negative effects incidental to the attack versus the military advantage expected to be gained by the attack. The anticipated injury or loss of civilian or noncombatant life, damage to civilian or noncombatant property, or any combination thereof, incidental to attacks must not be excessive in relation to the concrete and direct military advantage expected to be gained.

d. No-Strike Entities Versus Restricted Targets. Restricted targets are different from NSEs. Restricted targets are those valid military targets that support the attainment of operational objectives but have been restricted from specified means of engagement for operational, political, intelligence gain/loss, environmental, collateral damage, and/or ROE considerations.[7] CCDRs are required to identify, develop, maintain, and distribute a list of restricted targets (known as the Restricted Target List, or RTL) for tasked plans and/or OPORDs within their assigned AOR. The RTL provides the target identification, effects restrictions, nominating command/agency, rationale, and approval authority for target engagement and effects. The RTL must be separate and distinct from the NSL.

3. The No-Strike Process

a. General. Participation and cooperation among stakeholders is critical to the success of the No-Strike process. Non-DoD stakeholders, in particular, play a key role in protecting life and property by identifying the location and functionality of nonmilitary entities. Specific instructions on database and NSL development are provided in the appendices to this enclosure.

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[6] If the function of these entities is confirmed as supporting a military objective, it is not necessary to treat them as collateral damage concerns. These entities are deemed lawful targets IAW reference c, and any incidental damage sustained as a result of combat operations should be considered additional damage as defined in reference e.

[7] Valid targets are those that have been vetted as, "A part of target development that ensures all vetted targets meet the objectives and criteria outlined in the commander's guidance and ensures compliance with the law of armed conflict and rules of engagement." JP 3-60, Joint Targeting, reference f.

b. Identification, Characterization, and Nomination

(1) Identification, characterization, and nomination of NSEs are the first steps in the No-Strike process. All stakeholders have the responsibility to identify and characterize the functionality of NSEs as accurately as possible and report this information to the responsible CCMD, JTF, or U.S. Government Department or Agency in a timely manner. Every effort shall be made to verify NSE nominations; however, timeliness of the reporting is critical during the conduct of military operations.

(2) To increase the accuracy and currency of reporting on facilities, CCMDs should encourage organizations to periodically provide a precise center-point and corner points defining the facility outline for each potential NSE of interest along with an expected duration of occupancy. This information is essential to the collateral damage process and allows more efficiency via automated tools.

c. Development. No-Strike entities require the same accuracy in location and geospatial definition as that of lawful military targets. Accurate positioning and geospatial development of No-Strike entities and identification of collateral damage/effects concerns is part of both the deliberate and dynamic targeting processes and is a continuous process that does not end when military operations commence (see reference f for detailed discussion on the deliberate and dynamic targeting processes). The continuous identification and development of NSes, well in advance of and throughout military operations, is critical to campaign success.

d. List Generation and Maintenance. NSL generation and maintenance must be an assigned task with frequent and routine reviews by the CCMD No-Strike Coordinator. Participation by stakeholders and verification by the appropriate agencies will yield NSL additions, changes, and/or deletions on a regular basis. Active maintenance will ensure the most up-to-date information is available to planners and battle management systems supporting target planning and CDE. NSL approval is a CCDR responsibility, and the procedures governing NSL approval are a command function.

e. Dissemination. After approval, the geographic CCDR will ensure routine and timely dissemination of NSLs to all subordinate and supporting commands and supported functional commands with a periodicity appropriate for the tempo of operations. Subordinate and supporting commanders must then ensure the NSL is disseminated down to every level of their commands. See Appendix B to this Enclosure for additional guidance on NSL dissemination.

f. Execution. Deliberate and dynamic targets must be verified against the latest NSL prior to attack. CDE and mitigation will be accomplished IAW

Enclosure D and the governing ROE for the particular operation. Targets that cannot be mitigated for collateral damage will be forwarded for review and approval IAW reference a.

g. Follow-on Operations. Traditional No-Strike entities typically consist of facilities and locations important to planners in follow-on stability operations, such as hospitals, food distribution points, and refugee camps. These and similar locations could be inappropriately exploited by insurgent or terrorist groups, in which case they may lose their protected status. Consequently, the No-Strike process remains a U.S. government priority even after the cessation of major combat operations. By mitigating human suffering and property damage, the No-Strike process will accelerate recovery in post-conflict operations and minimize operational limitations routinely imposed as a result of international sensitivities over the humanitarian impacts of military operations.

APPENDIX A TO ENCLOSURE C

DATABASE DEVELOPMENT

1. No-Strike Entity Identification, Nomination, and Development

a. Table 3 lists the MIDB CATCODEs that will be used as the core foundation for NSLs (for any country or operation); they are listed *in priority order* of importance for IC production and verification of record accuracy.[8] This list represents the CATCODEs that must be used to develop an NSL due to LOW; however, it is not all inclusive. CCMDs may have other categories reflected on the NSL based on theater ROE. See Enclosure B for additional detail regarding these categories.

778XX	Diplomatic Facilities, Foreign Missions, and Nongovernmental Organizations
776XX	Religious, Cultural, Historical Institutions
434XX	Medical Facilities
721XX	Medical Schools
72300	Medical Interest Site
496XX	Civilian Schools
75300	Civilian Refugee Camps
75900	Prisoner of War Camps
775XX	Government Detention Facilities
43210	Waste Facilities, Sewage Processing
439XX	Dams
438XX	Dikes and Other Water Control Features
77700	Libraries

Table 3. Core No-Strike List Category Codes

b. Production Prioritization. If there is an existing Joint Target List (JTL) and/or RTL, they shall be used to focus the IC and prioritize their MIDB production and review efforts for possible NSEs. If a JTL/RTL does not exist, established special engagement zones, named areas of interest (NAI), or designated search areas may serve the same purpose. If none of these exist, CCMD personnel shall attempt to refine the scope of effort for the IC by geographic/regional priority. For urban areas, the priority is as shown in Table 4.

[8] Categories 41500, 41510, and 41520, Computer Networks, Computer Networks Service Providers, and Computer Networks, Information Production and Storage respectively, are also potential No-Strike categories depending on the protected function they support (e.g., Hospitals, Water Control).

Priority	City Size
1	National Capital
2	Regional/State Capital
3	Cities with population over 250,000
4	Cities with population over 100,000
5	Cities with population over 20,000
6	All other

Table 4. Urban Area Priority List

c. Development. No-Strike entities must be named distinctly with an assigned identification, e.g., Basic Encyclopedia (BE) number (BEN)/O-suffix), and classified by their functionality with an appropriate CATCODE IAW reference g. Facilities must be geospatially defined as discrete entities with a geographic center and corner point boundaries derived using the most accurate source material available. They must be entered in MIDB as soon as possible to support verification by the appropriate authority and realistic target deconfliction during the conduct of combat operations. If required, CCMDs may request IC support for NSE development. Development of new nominations should be requested via the nomination-database change request (NOM-DCR) process IAW subparagraph 2.c. below, with amplifying information provided via e-mail to the appropriate RAC. Requirements to support development of existing entities in MIDB should be submitted via Community On-Line Intelligence System for End Users and Managers (COLISEUM).

d. Coordinate Generation. Coordinates relating to physical NSEs are produced and maintained in MIDB. Accurate positioning of physical NSEs is essential for minimizing collateral damage and critical to the CDE process.[9] Since automated CDE tools depend on accurate plots of the NSL to ensure valid results, care must be exercised in the methods used to derive NSE locations. Coordinate sources listed below 1 meter controlled image base® (CIB®) on Table 5 are not accurate enough to provide reliable depictions using automated CDE tools. Coordinates should be used to cue and further refine No-Strike locations on imagery (reference h). Orthorectified mono imagery should be used whenever stereo imagery is not available. Sources for deriving positional data are listed in Table 5, in order, based on accuracy:

[9] Although related here in the context of traditional NSEs (e.g., entities such as facilities, units, geographic areas), the accurate identification and location of nontraditional NSEs (i.e., cyberspace elements) is just as important.

Priority	Coordinate Source
1	Digital Point Positioning Database (Stereo)
2	Multiple Image Geopositioning with National Technical Means (NTM) or commercial imagery sources
3	Precise Orthorectified Image Datasets
4	CIB® (1 Meter (1M), followed by 5M, then 10M
5	Uncontrolled NTM with Rapid Positioning Capability and Digital Terrain Elevation Data (DTED)

Table 5. Sources for Deriving Positional Data

2. New Nominations

a. NSE information is likely to come from a variety of sources: CSAs, Services, Components, JIACG, coalition partners, Interagency partners, etc. Regardless of source, each stakeholder must nominate NSEs that need to be maintained in MIDB.[10] Stakeholders must enter both graphic and textual data for each NSE. If stakeholders do not or cannot have access to MIDB, they must pass the required information to the appropriate Coordinator for data entry into MIDB. (NOTE: MIDB does not currently have a capability to store graphics; therefore, all graphics should be entered into GEMINI.)

b. Stakeholders may not regularly communicate with CCMDs, and the information they provide may be either incomplete or difficult to verify. To facilitate the positive identification, location, and verification of NSEs, CCMDs may utilize the JIACG, as well as command CSA and coalition partner liaisons. Commands must reach out to subordinate commands, allies, coalition partners, host nation, and the JIACG to refine NSE information and encourage stakeholder participation and feedback.

c. DIA's MIDB and/or GEMINI Web-based portal is the approved method for nominating new possible NSEs. When doing so, agencies shall follow the NOM-DCR guidelines and procedures established within MIDB or GEMINI. As nominations are developed, agencies shall provide as much information as possible. Location and source of information is critical. Identify the entity by CATCODE to ensure it is forwarded to the correct RAC. Agencies should ensure contact information in GEMINI profile is current. Despite the GEMINI process outlined below, CCMDs can expect to receive information from interested parties by fax, phone, e-mail, or visits from stakeholders.

[10] Currently applies to traditional NSEs only. See Appendix B, paragraph 2.b.

d. Important attributes in reporting potential new NSEs include but are not limited to: date of nomination, country, entity name, coordinates (suggested format DD.MM.SS.SSSX/DDD.MM.SS.SSSX) or location with GPS or priority 1, 2, or 3 coordinate sources (see Table 5) preferred using World Geodetic System 1984 Datum, coordinate accuracy, perimeter outline, number of personnel at the facility and work schedules (if known). Important attributes for reporting and/or nominating virtual NSEs include internet protocol or uniform resource locator addresses (or other uniquely identifying features in cyberspace) and the geospatial location of any physical systems or nodes that utilize the virtual network. Requestor provides point of contact, organization, e-mail address, phone, and fax telephone numbers for verification purposes.

APPENDIX B TO ENCLOSURE C

THE NO-STRIKE LIST

1. Overview

a. Purpose. To provide CCMDs practical guidance in developing and compiling the NSL for their operations.

b. Responsibilities. Internal authority for NSL approval within CCMDs will vary between commands and operations. As a practical matter, the Joint Staff recommends that the NSL, RTL, and JTL have the same approval authority for a given operation. However, given the mission critical importance of NSL accuracy, dissemination of NSL updates should be dynamic, providing timely situational awareness of newly identified NSEs.

2. NSL Generation

a. No-Strike Categories. Querying a core set of MIDB CATCODEs can begin generation of the NSL (see Table 3). The results from this query should become the foundation of the NSL (for any AOR country or operation). This set may be modified and/or expanded by the CCMDs in coordination with the Joint Staff based on approved operational ROE and as the military and political situation dictates.

b. Nontraditional NSEs. Guidelines for automated NSL generation contained in this instruction currently apply only for traditional NSEs produced and maintained in MIDB. If required, entry of nontraditional NSEs (e.g., individuals, accounts, computer networks) on NSLs may be manually accomplished until production policy, capability, and standardized procedures to database these entities mature. The JS/J-26 will update this instruction as policy, capability, and procedures develop for the handling and databasing of nontraditional NSEs.

c. Automated Production. In addition to querying CATCODEs in MIDB, there are also a number of ways to automate NSL generation. Two of the most prominent methods include the Joint Targeting Toolbox (JTT) and the MIDB interface known as the MORPHEUS portal. Query procedures are described in each tool's respective help functions. NSLs should include the following information, at a minimum: country code, entity identification (e.g., BE) number, O-suffix (where applicable), record status, CATCODE, entity name, associated geocoordinate, and coordinate derived (sorted in that order, from left to right). Lists should be saved with the naming scheme "COUNTRY, OPTIONAL CAT CODE, NSL ACRONYM," e.g., "AFGHANISTAN, CAT1 NSL."

d. Automated Display. Once generated and saved, the NSL can be displayed as an overlay in battle management systems such as the Global Command and Control System (GCCS) and Joint Automated Deep Operations Core System (JADOCS). Combining NSL entities in an overlay with geospatial intelligence, tasking and/or fires orders, and other operational data provides target planners enhanced situational awareness in collateral damage avoidance, particularly for dynamic targeting.

3. NSL and NSE Verification

a. Once the NSL is created, CCMDs must verify entities on the NSL are not on the JTL or RTL and vice versa. Whenever there is a change in the NSL, JTL, or RTL, CCMDs must compare the other lists to look for discrepancies. For dynamic targeting, each lawful target must be run against the NSL to ensure the target is not a protected entity and to perform CDE and mitigation as necessary. When applicable, a check of the JTL against the RTL will ensure that individual RTL target restrictions are not violated.

b. DIA is the responsible producer (RESPROD) for all No-strike facility CATCODEs. All NSF nominations go to DIA for approval. Approval includes verification that the CATCODE is accurately attributed. DIA will verify NSFs for database errors, problems, or inconsistencies. These will include:

(1) Inaccurate, incorrect, or city center coordinates.

(2) Multiple identification numbers and/or names for the same entity.

(3) Mismatched identification numbers and entity names.

(4) Improperly assigned CATCODE and/or O-suffix.

c. The CCMD should verify the NSEs do not contain database errors, problems, or inconsistencies.

d. Unverified Entities. At the discretion of the CCMD, unverified entities may be added to the NSL to ensure their protection. Efforts must be made to positively identify and locate the entity as soon as possible. However, if the nominated entity is at risk, its early addition to the NSL is a prudent action.

e. In circumstances where NSEs are found within the physical boundaries of a lawful military target, the lawful target is placed on the JTL and the NSE is placed on the NSL. The two might share the same identification (e.g., BE, unit ID) number but would be differentiated by CATCODE, O-suffix, and, in many cases, entity name. Proximity does not preclude engagement of the lawful

target as long as any conflict between the NSE and lawful target is resolved IAW Enclosure B and requisite approvals sought, if necessary, IAW reference a.

4. NSL Coordination and Approval

a. Coordination of the NSL should be accomplished with appropriate functional elements of the CCDR)/Joint Force Commander (JFC) staff, such as the Staff Judge Advocate, the JIACG, coalition liaisons, civil affairs, or other appropriate elements specific to the operation. Thorough coordination between each responsible agency is necessary, and failure to do so could result in injury to noncombatants, civilians, or friendly forces; the unintended destruction of property; or mission failure.

b. The JFC is responsible for NSL development and will designate an NSL approval authority. JFC must establish procedures for updating the NSL based on the needs of the mission and no less than once annually. Updates to procedures and timelines may vary between the planning and execution phases of an operation. Internal and external reviews may be limited to just the additions or deletions from the list, since entities on the original NSL were already verified.

5. NSL Dissemination

a. The primary means of disseminating NSLs is over the MIDB and GCCS replication architecture to Joint Worldwide Intelligence Communications Systems, SIPRNET, coalition systems, and other command-directed battle management systems for use by target planners and Joint/Service fires and effects coordinators.

b. Secondary mechanisms will likely be necessary for coalition and/or other units and organizations not connected to the MIDB architecture. Secondary dissemination shall occur via Web posting, e-mail, record message traffic, or other means to ensure widest distribution to components, JTFs, and federated targeting and combat assessment partners. CCMDs are responsible for timely updates to the NSL as changes are identified. Delaying the dissemination of changes to the NSL increases the risk of unnecessary and unintended collateral damage.

6. Change of Status

a. NSEs that lose their protected status should be removed from the NSL. NSEs lose their protected status if they are used for a military purpose. In such cases, they become lawful military targets. For example, if a community center or a place of worship is used for a purpose that is inconsistent with its

protected status, such as storing weapons, housing combatants or unlawful belligerents, or functioning as an observation post, the facility loses immunity from attack under the LOW and is subject to attack. Commanders with execution authority are ultimately responsible for determining a facility's predominant functionality when the normally protected status of that facility is in question.

b. Upon losing protected status, the entity's MIDB record must be updated to reflect the new characterization. When this occurs, a second CATCODE and O-suffix will be assigned reflecting the new functionality. Assigning a secondary CATCODE (i.e., related to objects used for military purposes by terrorists or insurgents) would not remove the initial No-Strike CATCODE from the associated facility record in MIDB, but would reside **in conjunction with** the No-Strike CATCODE. As long as this alternate "hostile" CATCODE assignment was in effect, the CCMD would have the option of striking the entity.

c. Before strikes can be approved and executed, the CCMD must remove the No-Strike CATCODE and entity identification number from the NSL and place the entity identification number with the appropriate secondary "hostile" CATCODE on the JTL (or RTL, as appropriate). Unless designated by higher authority, the CCDR or his/her designated representative is the only level of command authorized to change the status of an entity on the NSL. Close and timely coordination between the CCMD, JS/J-26, and the appropriate RACs will help minimize confusion. CCMDs must document changes to the NSL by date-time-group (DTG) and reason for the change.

d. Exceptions to guidance in paragraph c are those instances where (1) intelligence confirms the use of the NSE for a military purpose and the need to strike is time sensitive (whereupon it is nominated as a TST), and/or (2) troops are in contact and taking hostile fire from traditional NSEs. These entities do not have to be reflected on the JTL before they can be engaged. Unless this authority is expressly limited in SecDef-provided supplemental ROE, operational imperatives and established ROE, including the inherent right and obligation of self-defense, provide the requisite authority to engage in these instances.

e. From the time an NSE loses its protected status and is characterized as a lawful military target, periodic reviews of available intelligence are recommended at both the theater and national levels to ensure the most current and accurate characterization and categorization. If an NSE shows no indication of reverting to its primary function after 12 months, commands should work with the RACs to deactivate the primary CATCODE. Deactivated,

No-Strike-related CATCODEs should be removed from the NSL but kept under review by the RAC IAW DIAP guidelines and established MIDB business rules.

f. For those CCMDs that do not have RESPROD authority to assign insurgent CATCODEs and for all other categories of activities other than insurgency or terrorism, the CCMD **must** coordinate with the national RAC to affect a change in status per established NOM-DCR procedures. To facilitate change of status and recharacterization of NSEs, the CCMD **must** develop procedures to coordinate with national RACs to codify and institutionalize the process. If the need to prosecute becomes time-sensitive, coordination timelines compress. Procedures will include the ability to coordinate and expedite recharacterization of TST nominations. It is recommended the process include initial verbal coordination with the RAC, followed by written confirmation, and a formal NOM-DCR. The RAC must attempt to implement change requests within CCMD-specified timeframes.

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ENCLOSURE D

JOINT METHODOLOGY FOR CDE

1. Introduction

a. The LOW requires reasonable precautions to ensure only legitimate military objects are targeted. The LOW also requires combatants to refrain from intentionally targeting civilian or noncombatant personnel or facilities. It stipulates that anticipated civilian or noncombatant injury or loss of life and damage to civilian or noncombatant property incidental to attacks must not be excessive in relation to the expected military advantage to be gained.

b. Failure to observe these obligations would be considered a LOW violation. Furthermore, the United States could be subject to global criticism, which could adversely impact military objectives, alliances, partnerships, or national goals. The U.S. Government places a high value on preserving civilian and noncombatant lives and property. The U.S. military must emulate and represent these values through the conscientious use of force in the accomplishment of assigned military missions.

c. The CDM encompasses the joint standards, methods, techniques, and processes for a commander to conduct CDE and mitigate unintended or incidental damage or injury to civilian or noncombatant persons or property or the environment. It assists commanders in weighing risk against military necessity and in evaluating proportionality within the framework of the joint operations planning process. In short, the CDM is a means for a commander to adhere to the LOW.

d. The CDM is a balance of science and art that produces a conservative characterization of the risk of collateral damage for commanders and decision makers. As a science, the CDM uses a mix of empirical data, probability, historical observations, and complex modeling for CDE analysis. However, the science is inherently limited by the quantity and reliability of collected and analyzed weapons effects data, weapon delivery uncertainties, and target information. Furthermore, the science of the CDM cannot always account for the dynamics of the operational environment. Therefore, the art of the CDM is not only complementary but critical. Targeting professionals, intelligence analysts, and operations personnel should employ their combined expertise, experience, and current intelligence to tailor the science to the specifics of the operational environment. Taken together, the CDM's science and art provide essential information that the commander uses in context with other factors

and sound judgment to weigh risks versus gains in determining if the effects to be achieved against a given target warrant the use of kinetic (lethal) weapons.

e. Collateral Damage (CD) is defined as the unintentional or incidental injury or damage to persons or objects that would not be lawful military targets in the circumstances ruling at the time. To provide a common language framework, this publication further refines the following terms:

(1) Collateral Damage Analysis: The examination or evaluation of relations between targets, target engagement options and no-strike entities (NSE) to estimate or assess collateral damage.

(2) Collateral Damage Estimate: An approximate calculation of potential collateral damage derived through analysis prior to target engagement.

(3) Collateral Damage Estimation (CDE): The holistic process of determining the potential for collateral damage resulting from target engagement.

(4) Collateral Damage Estimation (CDE) Methodology (CDM): A body of joint standards, methods, techniques and processes to conduct collateral damage analysis and produce collateral damage estimates.

(5) Collateral Damage Assessment (CDA): An analytical judgment derived by determining the amount and effects of collateral damage post target engagement.

2. General Guidance

a. The CDM supports employment of conventional munitions across the spectrum of conflict. It provides commanders with an understanding of weapon effects, incidental consequences, and mitigation techniques enabling more balanced, comprehensive judgments.

b. The CDM is not an exact science. The supporting technical data and processes of the methodology are derived from physics-based computer models which generate statistical results, weapons test data, and operational combat observations. All of these sources contain some degree of inherent variability. **The CDM does not predict the actual outcome of weapon employment. The operational environment, weapon reliability, and fidelity of intelligence data are contributing factors that may account for a collateral damage estimate that differs from actual results.** Though the CDM follows a rigid process and generates estimated values, neither analysts nor commanders should be under the impression that these values in any way constitute ground truth, an exact science, or flawless data. Ultimately CDE is an estimative process to help inform a commander's decision making.

c. The CDM and the products derived from CDE are not the only input to a commander's decision making. Operational objectives, end-state considerations, LOW, ROE, target characteristics, risk to friendly forces, and strategic risk are examples of the many factors that contribute to a commander's decision making. These factors, either alone or in combination, may outweigh the value of the CDM input. This is not to say that collateral damage may not be an overriding issue depending on the operational environment at the time. Therefore, it is important that commanders, at all levels, who may be responsible for performing CDE, focus appropriate command attention and emphasis on the CDM.

d. Operation-specific ROE and other policy guidance issued by the Secretary of Defense and/or the President will dictate decision authorities and collateral damage thresholds. Thresholds are established consistent with the LOW, governing reporting requirements, and the delegated CDE responsibilities of strategic, operational, and tactical commanders.

e. The CDM must be applied as exhaustively and thoroughly as possible relative to commander's guidance and operation-specific constraints. The CDM must also be sufficiently flexible to accommodate the pace and tempo of operations. Collateral damage estimates are perishable. Therefore, the CDM must remain responsive to changes in the operational environment, scalable for tactical through strategic application, and common enough for most geographic areas or regions of conflict.

f. The CDM must be implemented consistently across all commands. Consistency minimizes confusion, maintains a joint standard, and provides commanders at all levels with a common construct and decision-making aid. Though commanders may explore and use innovative mitigation techniques, the following rules and limitations apply:

(1) Collateral damage mitigation techniques not expressly authorized in this directive cannot be presented exclusively as part of a collateral damage estimate. At a minimum, every collateral damage estimate must use those mitigation techniques authorized in the CJCS instruction using the CER values and resulting CHAs derived from the supporting CDE reference tables.

(2) A commander must be informed, either on a CDE graphical aid or verbally, of the assumptions, errors, and uncertainties accompanying the mitigation techniques employed, including the sources and fidelity of the supporting information. Information must comply with the minimum standards as prescribed in reference i.

g. Commanders apply the methodology, concepts, and outputs for planning fires below the operational level. The CDM has the flexibility to apply to time critical events and is designed to allow a trained CDE analyst to quickly produce an estimate.

(1) The CDM is not intended to deny a commander the ability to respond to time-sensitive targeting events and should not be used as the sole justification to impede or delay fires for time-sensitive targeting.

(2) The CDM does not limit a commander's inherent right of self-defense under the LOW. When the use of force in self-defense is necessary, including in situations with troops in contact, the nature, duration, and scope of force should not exceed that which is required to respond decisively to hostile acts or demonstrated hostile intent. The concept of proportionality in self-defense is consistent with attempts to minimize collateral damage and the other tenets of LOW during military operations.

h. The CDM establishes a means of accommodating policy or other limitations, such as foreign partner sensitivities, that the U.S. government may impose upon its forces, beyond LOW legal requirements. The CDM improves the efficiency of operations and should not be construed as state practice with respect to customary international law. Similarly, no part of this methodology is meant to abrogate U.S. obligations under the LOW. Nothing in the CDM limits or increases the rights and obligations of any U.S. military commander or Service member under the LOW.

i. Lastly, this instruction directly supports the STAR process, which outlines the procedures for CCDRs to identify and characterize targets as "sensitive" and/or "CDE High."

(1) CCDRs characterize targets as "sensitive" when the potential for damaging effects and/or injury to civilian or noncombatant property and persons and potential ensuing political consequences, or other significant adverse effects are estimated to exceed predetermined, situation-specific thresholds normally defined in the operation-specific ROE (see the glossary and reference a for sensitive target).

(2) The term "High CDE" applies to potential target engagements in which the CDE level is "5-High" based on the Joint CDE Methodology. A CDE Level 5-High is attained when the casualty estimate includes civilian and noncombatant casualties estimated to be greater than the noncombatant casualty cutoff value (NCV) as established in applicable ROE. All High CDE targets are sensitive targets, but not all sensitive targets are High CDE.

3. Limitations and Exclusions

a. **The CDM accounts for all conventional munitions currently in the U.S. inventory except as noted below and in the accompanying tables and a very few limited availability munitions.** It is not applicable to nuclear, nonkinetic, or nonlethal capabilities. In future updates, the CDM may account for (or provide references for) them. Until then, follow CCMD/SecDef guidance for targeting with these capabilities.

b. CDE as specified in this instruction is **not** required for surface-to-surface direct fire weapon systems (e.g., 120mm cannon on M1 Main Battle Tank, 25 mm Bushmaster, M-2 .50 Caliber Machinegun), **rotary-wing or fixed-wing air-to-surface direct fire weapon systems less than or equal to 105 mm** (e.g., 2.75 in rockets, M2A1 40 mm Bofors, GAU-8 30 mm Gatling gun, GAU-4 20 mm Gatling gun, and the M137A1 105 mm). The risk of collateral damage from these weapon systems is presented by the distribution of munitions in the target area and not from the explosive effects of the warhead. The LOW concepts of necessity, distinction, proportionality, and unnecessary suffering are considered for employment of direct fire weapon systems.

c. **The CDM does not account for weapon malfunctions, unknown delivery errors, or altered delivery tactics based on operator judgment**. The CDM assumes weapons will function as designed and will be delivered to achieve the desired effects.

d. **The CDM does not account for unknown transient civilian or noncombatant personnel and/or equipment in the vicinity of a target area**. This includes cars passing on roads, people walking down the street, or other civilian entities whose presence in the target area cannot be predicted to reasonable certainty within the capabilities and limitations of intelligence collection means. It is an inherent responsibility for commanders, at all levels, to employ due diligence to identify assemblies of civilian or noncombatant personnel and/or property in the target area and deconflict target engagements when possible.

e. **The CDM does not account for individual marking or adjusting rounds when employing surface-to-surface ballistic munitions (SSBM) in the Observer Adjusted (OA) method of engagement.** Commanders should remain cognizant of this fact and only employ the minimum number of marking or adjusting rounds required to achieve the desired effects on the target.

f. **The CDM does not account for the use of cluster or improved conventional munitions (ICM) beyond CDE Level 3** because of the greater

risk of unexploded ordnance and the limited weaponeering options available to mitigate the risk of collateral damage with these munitions.

g. **Rocket Assisted Projectiles (RAPs) or enhanced/extended range artillery, mortar, and naval gun munitions are not addressed beyond CDE Level 3** due to the considerable increase in ballistic errors associated with these munitions and the significant increase in risk associated with their use in urban areas.

h. **The CDM does not account for secondary explosions**. Collateral damage due to secondary explosions (i.e., weapons cache or fuel tanks for military equipment) cannot be consistently measured or predicted. Commanders should remain cognizant of any additional risk due to secondary explosions.

i. While the CDM can be applied to any geographic region, weapons effects may vary in different environments. In general, the CDM and supporting weapon effectiveness data use a combination of flat terrain, rolling hills, and soft soil as the base environment and terrain. Desert and jungle environments, as well as those with hard soil, for instance, may present conditions that change weapon effects. Commanders should consider unique environmental conditions and terrain features along with any analysis from the CDM.

j. The CDM is not applicable to live-fire training events, whether located on or off an approved range. In either case, service-specific range regulations and peacetime training risk mitigation apply. CDM and its underlying assumptions are built to support wartime targeting objectives and accept a greater level of risk than acceptable for training.

APPENDIX A TO ENCLOSURE D

THE CDM PROCESS

1. CDM Overview

a. Introduction. The technical methods detailed in the CDM enable a reasonable determination of collateral damage inherent in weapons employment. The CDM thereby addresses the LOW requirement for reasonable precautions to minimize effects of combat on the civilian or noncombatant population. The supporting technical data, mitigation techniques, and logic of the CDM recognize the intelligence limitations of what can reasonably be known about a given target, its surroundings, and collateral structure composition; the fidelity of available weapon's empirical data; and the operational realities and uncertainties of ordnance delivery in a combat environment.

b. The CDM is Simple and Repeatable. The steps outlined in Appendix B are designed so that the CDM can be used in a deliberate manner where time is not a factor or in situations where time is critical. In addition, the methodology and supporting data tables can be used with or without the aid of an automated CDE tool.

c. Elements of the Technical Framework. The framework of the CDM is built around five mutually dependent CDE Levels (CDE Levels 1 through 5). Each level is based on a progressively refined analysis of available intelligence, weapon type and effect, the physical environment, target characteristics, and delivery scenarios with specific risk thresholds established for each of the five CDE levels.

(1) Beyond the first level, the CDM assigns subgroupings: "A" for precision-guided munitions (PGM); "B" for Air-to-Surface Unguided Munitions (ASUGM); "C" for SSBM.

(2) At each CDE level (except levels 2B and 2C), an estimate of either low or high is produced. If collateral concerns are not within the computed CHA or if the specified level of risk to collateral concerns is not met, the estimate is low and a higher CDE level is not needed. If a low estimate is rendered the methodology supports engagement of the desired target with the conditions and restrictions specified by the CDE level where the low estimate was determined. If collateral concerns are within the CHA or the specified level of risk to collateral concerns is exceeded, the estimate is high; perform the next CDE-level analysis.

d. Risk and the CDM. **The CDM helps commanders balance the dynamic relationship between three principal categories of risk: risk to mission, risk to forces, and risk of collateral damage**. The intersection of the three is determined by the weaponeering restrictions required to reduce collateral damage to an acceptable level while achieving mission success and minimizing operational risk to forces. As the CDM progresses up through each CDE level, the number of weaponeering restrictions also increases, elevating the potential risk to friendly forces and mission accomplishment based on weapon, platform availability, and threats in the target area. Figure 1 depicts the risk continuum and the interaction between collateral damage and weaponeering restrictions for each CDE level.

e. Collateral Damage Thresholds. The outputs of the CDM provide commanders with easily recognizable measures of operational risk based on the CDE level required to achieve a final collateral damage estimate. The collateral damage threshold in CDE Levels 1, 2, and 3 mitigates risk to less than 10-percent probability of serious wounds from fragmentation or other primary damage mechanism to standing unprotected personnel. The collateral damage threshold in CDE Level 4 reduces this risk mitigation to less than 1 percent fractional structural damage to collateral structures from primary warhead blast effects. This is because CDE Level 4 imposes the specific requirement to fuze the warhead to detonate either in the target structure or below ground, which mitigates fragmentation effects by using the building or ground to absorb fragments. Of note, injury to personnel remains the primary concern in CDE Level 4. The link between personnel and structures from a collateral damage perspective is the assumption that noncombatants in structures are predominantly injured or killed by blunt trauma from structural collapse and secondary debris. The effects of blast induced debris have not been characterized; of note, blast induced debris has been operationally observed to be a significant hazard to noncombatant personnel.

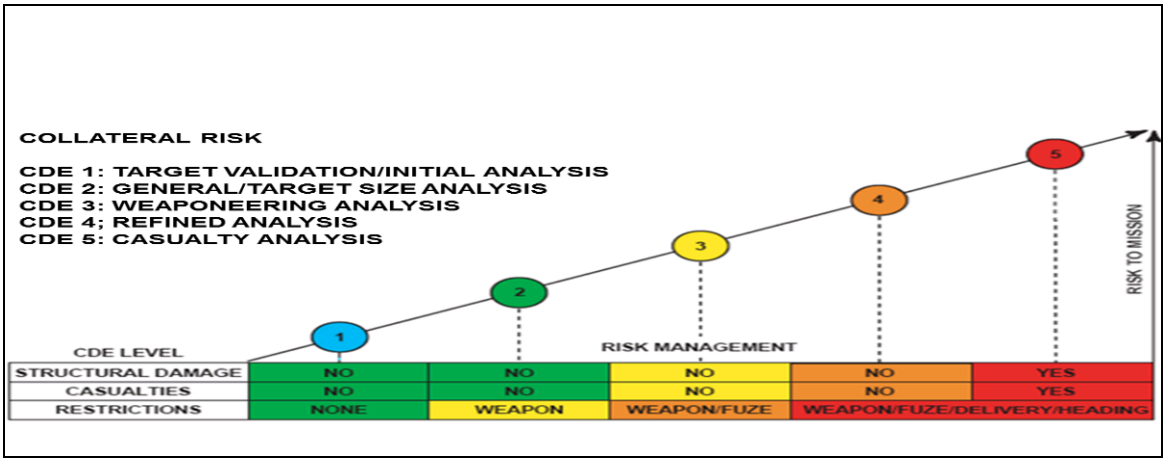


Figure 1. Risk and the Collateral Damage Estimation Methodology

f. Components of the CDE Levels. CER and CHA are two fundamental elements of the CDM that determine the progression from each CDE level.

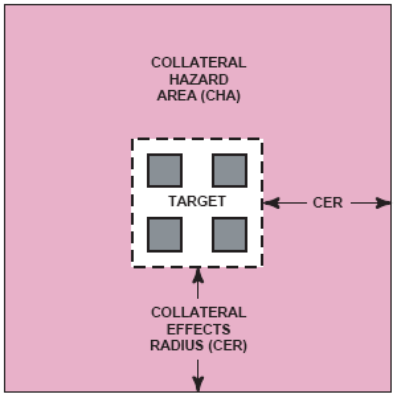
(1) CER. A CER is a radius representing the largest collateral hazard distance for a given warhead, weapon, or weapon class considering predetermined, acceptable collateral damage thresholds that are established for each CDE level. A CER value contains the total error associated with a specific munition and method of employment as well as the radius of dominant warhead effects. For cluster or ICM, the CER value includes the pattern radius of the sub-munitions.

(2) CHA. A CHA is formed by measuring a CER from either the edge of a target facility outline, the aimpoint for a point target, the edge of an engagement zone or artillery sheaf, or target area outline for an area target. A CHA may also be formed by accurate predictive models designed to illustrate plumes, flooding, fire or distribution or spillage of hazardous wastes for casualty estimation.

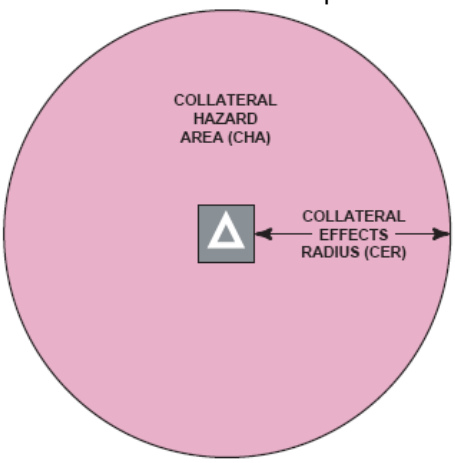
(3) Essentially, the CER is used to form the CHA. The analysis conducted at each CDE level is based on the existence of collateral concerns within the corresponding CHA. Within a CHA there is an unacceptable probability for damage or injury to collateral concerns, which include persons and objects. Each succeeding CDE level employs mitigation techniques and weaponeering restrictions designed to reduce the area of collateral effects to an acceptable level. Figure 2 illustrates the CER/CHA relationship.

g. Warhead Effects in the CDM. The maximum distance to achieve probability of damage and injury was developed for each warhead contained in the CDE reference tables. These include considerations for primary blast, fragmentation, crater ejecta, and blunt trauma from building collapse using damage criteria appropriate for each CDE level.

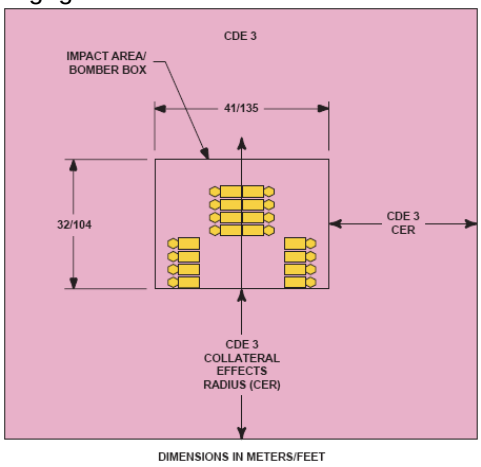
CHA measured from a installation/facility/target outline:



CHA measured from an aimpoint:



CHA for ASUGM Engagement Zone:



CHA measured from SSBM sheaves:

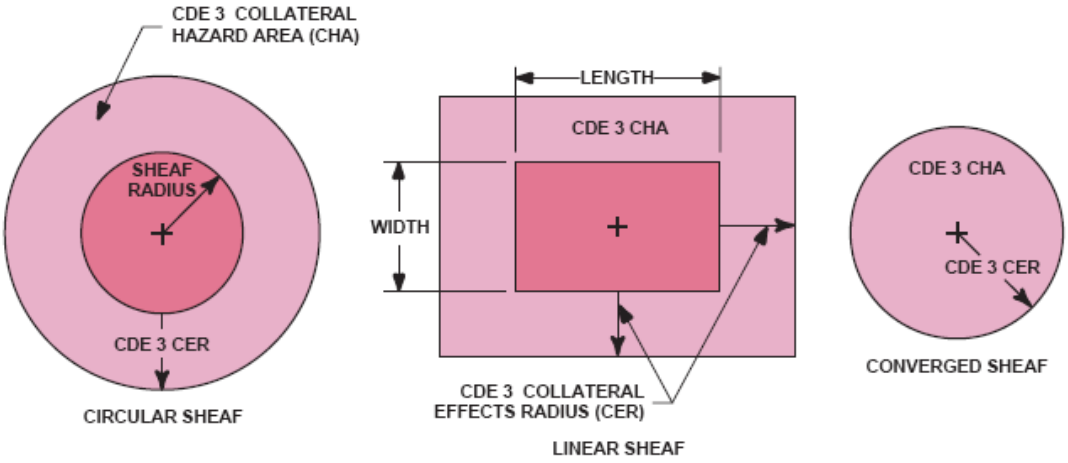


Figure 2. CER and CHA Relationships

h. Types of Error Used in the CDM. The CDM and supporting CDE reference tables involve three primary categories of error: delivery error, target location error, and total error.

(1) Delivery error is expressed in terms of circular error. Circular Error 90 (CE90) is the radius of a circle in the ground plane in which 90 percent of munitions are expected to impact around an aimpoint.

(2) Target location error (TLE), also expressed in terms of circular error, is the error associated with locating the true position of the target. Specifically, TLE90 describes the radius of a circle in the ground plane centered on the target coordinates such that 90 percent of the time the true target location is within.

(3) Total error 90 (TE90), expressed in terms of CE90, is the root sum square of the delivery error and the TLE90.

i. Cluster and ICM Pattern Radius. Worst-case pattern radii have been developed for each weapon, capable of dispensing sub-munitions, contained in the CER reference tables, based on operationally representative delivery conditions. The worst-case radii are combined with individual submunition CER and TE90 to produce CER values appropriate for each CDE level.

j. CDE Reference Tables. To support CDE, JTCG/ME produces and accredits CER and Minimum Target Size (MTS) Reference Tables annually. Additionally, new weapon values are produced and accredited as required. JTCG/ME maintains the tables on its SIPRNET Web page (https://jtcg.amsaa.army.smil.mil/jpias/index.html). Users must request access via the site as the tables are password protected. When new tables are developed JS/J-26 notifies DoD components via official message. Problems obtaining new tables on the Web site should be directed to your command or next higher echelon targeting office/directorate/division. Representatives from foreign governments supporting combined operations or planning with the United States should contact their local U.S. DoD representative.

(1) CER reference tables are tailored for each CDE level, considering collateral concern, the weaponeering capabilities, and limitations of each munition addressed in the tables. The tables represent the range of collateral weapon effects, measured from a warhead detonation, for each conventional munition in the U.S. inventory. CER reference table values are rounded up to allow for simplicity of operational use and a conservative estimate.

(2) Below is a list of the tables and the CDE level they support as posted on the JTCG/ME Web site:

CDE Level 1: Target Validation/Initial Analysis
- CDE Level 1 CER Reference Table

CDE Level 2: PGM General Analysis
- CDE Level 2A PGM CER Reference Table

CDE Level 2: ASUGM/SSBM Minimum Target Size Analysis
- CDE Level 2B ASUGM Minimum Target Size Reference Table
- CDE Level 2C SSBM Minimum Target Size Reference Table

CDE Level 3: Weaponeering Analysis
- CDE Level 3A PGM CER Reference Table
- CDE Level 3B ASUGM CER Reference Table
- CDE Level 3C SSBM CER Reference Table

CDE Level 4: Refined Analysis
- CDE Level 4A PGM CER Reference Table
- CDE Level 4B ASUGM CER Reference Table
- CDE Level 4C SSBM CER Reference Table

(3) Appendix C to this Enclosure summarizes the intended use for each reference table, the dominant hazard used in calculating the CER, the threshold criteria, and any assumed exclusions or limitations.

2. The Five Basic Questions of the CDM

a. Introduction. In its most basic form, the CDM centers on five simple questions that must be answered before engaging any target:

(1) Can I PID the object I want to affect? (For purposes of this instruction, "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 LOW and applicable ROE.") Note: Recent operational feedback indicates that most collateral damage incidents result from target misidentification.

(2) Are there protected or collateral objects, civilian or noncombatant personnel, **involuntary or unwitting** 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 striking 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?

b. CDE Level 1 Target Validation/Initial Analysis Overview. CDE Level 1 is the most important and complex step in the CDM. The information gained during CDE Level 1 is required to accomplish the remaining steps of the methodology. CDE Level 1 analysis answers the first two questions: "Can I PID the object I want to affect" and "Are there protected or collateral objects, civilian or noncombatant personnel, involuntary or unwitting human shields, or significant environmental concerns within the effects range of the weapon I would like to use to attack the target." CDE Level 1 evaluates the target's functionality for dual-use concerns, identifies potential CBR plume and environmental hazards, and identifies all collateral concerns within the CDE Level 1 CER (resultant CHA). This step reveals those targets or collateral concerns that may represent areas of strategic risk and therefore may also have to be evaluated via the STAR process (see reference a).

(1) CDE Level 1 is supported technically by the CDE Level 1 CER Reference Table. The CDE Level 1 CER Reference Table provides a single CER that includes the effects from any conventional weapon in the U.S. inventory (with exceptions noted in the table). The CDE Level 1 CER is used to form the coarsest CHA by using the CER as a radius measured from the edge of the outline drawn around the entity being targeted. This entity could be an installation, a facility, or an area target. The resultant CHA becomes the primary search area for the identification of collateral concerns near a target. Targets estimated as CDE Level 1 Low present the lowest probability of collateral damage and have no tactical restrictions on execution, thus presenting the least risk for the commander. Targets estimated as CDE Level 1 High present a greater probability of collateral damage and require CDE Level 2 analysis.

(2) Target Development. The CDE Level 1 analysis begins with characterizing the target's functionality/purpose, physical orientation and description, and the identity of the intended target by geospatially distinguishing the target from its surrounding environment. This is normally accomplished through imagery analysis; however, if imagery is not available

commanders should use the best sources available to geospatially separate the combatant function of the target from its civilian and noncombatant surroundings.

(a) The first step is to geospatially define the target by annotating the facility outline (FO) or target area outline (TAO) on a target graphic. If using the aimpoint method, or if the target is a point target, FO and TAO is not necessary.

(b) The next step is to identify and characterize the target's critical elements. This step identifies those elements whose engagement supports attainment of the commander's objectives and avoids targeting those LOW protected or collateral objects sometimes located on combatant installations and facilities.

(c) The final step in target development is to confirm current ROE authorize the target for engagement.

(3) Dual-Use Facility Analysis. Following target validation, determine if the target serves a combatant and a civilian/noncombatant purpose. Enclosure B provides definitions and treatment of dual-use facilities. If the facility is functionally characterized as dual-use, initiate intelligence analysis to estimate the population density of the facility, as all dual-use facilities require CDE Level 5 analysis. To ensure the most flexibility is given to organizations, two collateral damage estimates, one for dual-use and another for non dual-use, are authorized for planning purposes. Commanders are responsible for determining the predominant function of LOW protected facilities, based on current intelligence, and deciding if the facility is dual-use or not.

(4) Protected or Collateral Object and Human Shield Analysis. Once positive identification is established, define the CDE Level 1 CHA around the target based on the values contained in the CDE Level 1 CER Reference Table. This step is normally performed through annotations on imagery; however, in cases where imagery is not available, use the best sources available. Once the CDE Level 1 CHA is established, identify and characterize the collateral objects located within the CHA, hereinafter referred to as "collateral concerns." If available, review imagery to identify and characterize any collateral objects not contained in an NSL, paying special attention to identify all of the Category I Protected or Collateral Objects (see Enclosure C). Imagery used to support collateral damage estimation should not be older than 90 days. This is waived to 180 days if there are no indications of change in the area of interest.[11]

[11] The 90/180-day imagery requirement does not imply intel databasing or CDE graphic "refresh" standards.

(a) Collateral Objects. No structure will be disregarded in collateral damage estimation, regardless of square footage, unless the structure is clearly uninhabitable (e.g., animal pens, buildings with no roof). If time permits, a trained target imagery analyst should make the determination as to habitability and functionality of the structure in question.

(b) Human Shields. The U.S. LOW delineates between voluntary and **involuntary** human shields. Human shields are civilian or noncombatants placed around a valid military target by a combatant to hinder attack of that target. Voluntary human shields (i.e., civilians who voluntarily and intentionally place themselves in the line of fire so as to disrupt that line of fire) are considered to have shed their protected status and are instead direct participants in hostilities. In other instances, the belligerent nation may either forcibly place (involuntary) or deceptively encourage (unwitting) civilians or noncombatants to be present at valid military targets, and these personnel are considered protected persons. Therefore, only **involuntary or unwitting** human shields are accounted for in CDE Level 5 casualty estimation.

1. In cases where intelligence indicates the enemy is using involuntary or unwitting human shields, the CDE analyst will identify the presence, location, and number within the CDE Level 1 CHA. The CDE analyst will use the number of known **involuntary or unwitting** human shields during CDE Level 5 casualty estimate.

2. In cases where the status of human shields is not known, the more restrictive rule applies, and the human shields are to be protected as protected persons/collateral objects. The CDE analyst then follows the step above.

(5) CBR Plume Hazard Analysis. Once both the target and the collateral objects within the CDE Level 1 CHA are identified and characterized, evaluate the potential of producing a CBR plume hazard. The existence of this hazard is based on the characterized functionality of the target facility or one of the surrounding collateral objects. Examples of CBR plume hazards include nuclear, biological, or chemical production/storage facilities; nuclear power plants; fertilizer, pharmaceutical, pesticide/herbicide production/storage facilities; medical durable equipment manufacturing/storage facilities; petroleum refineries; and paper manufacturing facilities. **The presence of a CBR plume hazard (target or collateral object) may elevate the target to the STAR process even if the CDE is estimated as low due to environmental risks or the risk of expanding the effects of the conflict (see reference a). The presence of a CBR plume hazard will drive DTRA and/or NCMI analysis and requires a CDE Level 5 casualty estimate.**

(a) If the target facility is assessed as a plume hazard, weaponeer the target to achieve the desired effects and submit the target along with the weaponeering solution through the CCMD to DTRA for a Hazard Prediction Assessment Capability (HPAC) analysis. Add the HPAC casualty estimate to the overall CDE Level 5 casualty estimate.

(b) If the plume hazard is not the target but is a plume-producing collateral object located within the CDE Level 1 CHA, continue with collateral damage analysis to mitigate the potential weapon effects on the plume hazard. If unable to mitigate the weapon effects, submit the plume hazard along with the weaponeering solution through the CCMD to DTRA for HPAC analysis. Add the HPAC casualty estimate to the overall CDE Level 5 casualty estimate.

(c) If the two cases above do not apply, commanders must still be informed of the risk of errantly engaging a CBR plume hazard. Therefore, the CDE analyst must still submit the collateral concern plume hazard for HPAC analysis. In this instance, submit the weaponeering solution as in the above two cases but clarify that the selected weapon would have to malfunction, missing the intended target, and impact near the collateral concern plume hazard. Include the HPAC analysis and casualty estimate as a note to the final collateral damage estimate to provide the CCDR with a complete picture of the risk associated with engaging the intended target. However, **do not** add the HPAC casualty estimate to the overall CDE Level 5 casualty estimate.

(6) Environmental Damage Analysis. The final evaluation of hazards within CDE Level 1 identifies those objects whose engagement could produce widespread, long-term, and/or severe damage to the civilian or noncombatant population and/or the environment, including flooding, uncontrollable fire, and distribution or spillage of toxic chemicals or materials. **The presence of an environmental hazard (target or collateral object) may elevate the target to the STAR process even if the CDE is estimated as low due to the environmental risks and expanding the effects of the conflict (see reference a). The presence of a CBR plume hazard will drive DTRA and/or NCMI analysis and requires a CDE Level 5 casualty estimate.**

(a) If the target has the potential of causing an environmental hazard, weaponeer the target to achieve the desired effect and provide the weaponeering solution through the CCMD to NCMI for environmental hazard analysis via Chemical Hazard Area Modeling Program (CHAMP). Include CHAMP data in the final CDE, and add any estimated casualties to the overall CDE Level 5 casualty estimate.

(b) If the intended target does not present any environmental concerns, but there is an identified environmental hazard within the CDE

Level 1 CHA, continue with CDE analysis to mitigate the potential weapon's effects on the environmental hazard. If unable to mitigate the weapon's effects, submit the environmental hazard along with the weaponeering solution to NCMI for CHAMP analysis. Add CHAMP data to the overall CDE Level 5 casualty estimate.

(c) If the two cases above do not apply, commanders must still be informed of the risk of errantly engaging an environmental hazard. Therefore, the CDE analyst must still submit the collateral concern environmental hazard to NCMI for CHAMP analysis. In this instance, submit the weaponeering solution as in the above two cases but clarify that the selected weapon misses the intended target and impacts the collateral concern environmental hazard. Include the CHAMP data as a note to the final CDE estimate to provide the Combatant Command commander with a complete picture of the risks associated with engaging the intended target. However, in this case, do not add NCMI's CHAMP data to the overall CDE Level 5 casualty estimate.

(7) CDE Level 1 Evaluation

(a) PID/ROE/Defined Facility Outline Evaluation. Can I PID the object I want to affect? (For purposes of this instruction, 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 LOW and applicable ROE.")

1. If able to PID, continue with CDE Level 1 analysis.

2. If unable to PID, stop. Target must be PID'd before continuing.

(b) Dual-Use Evaluation. "Does the target facility provide products/services of both a civilian and military nature or is the facility primarily manned or operated by civilians?"

1. If the answer to either of these cases is yes, the facility is dual-use and estimated as CDE Level 1 High. Dual-use targets require a CDE Level 5 CE where all of the personnel within the target facility are characterized as civilian or noncombatant casualties.

2. If the answer is no, then the target is not considered dual-use and the CDE Level 1 analysis is continued.

(c) Protected, Collateral Objects and Human Shields Evaluation. "Are there any protected or collateral objects or **involuntary or unwitting** human shields located within the CDE Level 1 CHA?"

1. If the answer is yes, the target is estimated as CDE Level 1 High, and the CDE Level 1 analysis is continued.

2. If no, the target is eligible for engagement with any conventional weapon in the U.S. inventory with exceptions as noted in the CDE Level 1 CER Reference Table. Continue with CDE Level 1 analysis.

(d) CBR Plume Hazard Evaluation. "Does the target present a CBR plume hazard?"

1. If yes, the target is estimated as CDE Level 1 High and requires HPAC analysis and a CDE Level 5 casualty estimate.

2. If no, continue with CDE Level 1 analysis.

(e) Environmental Damage Evaluation. "Would engagement of this target cause widespread, long-term, and/or severe damage to the civilian or noncombatant population and/or the environment?"

1. If yes, the target is estimated as CDE Level 1 High and requires an environmental hazard CHAMP assessment and a CDE Level 5 casualty estimate.

2. If no, continue with CDE Level 1 analysis.

(f) CDE Level 1 Final Evaluation. If the target is PID'd, is not characterized as a dual-use facility, and does not present either a CBR plume or environmental hazard; and there are no collateral objects and/or **involuntary or unwitting** human shields within the CDE Level 1 CHA, the target is estimated as CDE Level 1 Low and may be cleared for engagement with every conventional weapon in the U.S. inventory with exceptions as noted in the CDE Level 1 CER Reference Table. If any of these conditions are not satisfied, the target is estimated as CDE Level 1 High and requires continued analysis (PID, ROE, DTRA, NCMI, casualty estimate). Ensure PID and ROE issues are resolved prior to continuing to CDE Level 2. **In addition, if the analysis requires a Level 5 Casualty Estimate (CE), ensure this is accomplished even if weapons effects are mitigated to a low estimate. As a result of these special circumstances, the target may also be subject to review via the STAR process (see reference a).**

c. CDE Level 2 General and Target Size Analysis Overview. CDE Level 2 begins the process of defining weaponeering options that both achieve the desired target effect and mitigate the potential for collateral damage. This step

addresses the third question of the CDM, "Can I mitigate damage to those collateral concerns by striking the target with a different weapon or with a different method of engagement, yet still accomplish the mission?" CDE Level 2 takes a low-risk approach to CDE with the least number of tactical and weaponeering employment restrictions. CDE analysts must use the weaponeering data given to them in the target folder or by the weaponeer. If the CDE analyst cannot achieve a desirable collateral damage estimate with the weaponeering solution presented, he or she must discuss other options with the weaponeer. A CDE analyst who is also a trained weaponeer could perform both actions, but either way the CDE analyst must work with weaponeering personnel to ensure collateral damage mitigation does not change the intended effects on the target. Two distinct analyses are employed within CDE Level 2 to guide weapon class selection (Minimum Target Size Analysis and PGM General Analysis).

(1) The **Minimum Target Size Analysis** evaluates the target engagement with ASUGM or SSBM based comparing the target's size with the weapon system's or delivery platform's delivery error. Minimum Target Size Analysis is technically supported by the CDE Level 2B ASUGM Minimum Target Size Reference Table and the CDE Level 2C SSBM Minimum Target Size Reference Table. **PGM General Analysis** evaluates target engagement with PGMs on individual aimpoints while minimizing the weaponeering restrictions to either unitary or cluster PGMs. PGM General Analysis is technically supported by the CDE Level 2A PGM CER Reference Tables.

(a) The **Minimum Target Size Analysis** provides a simple means to determine the feasibility of engaging a target with unguided or ballistic weapons. This analysis is accomplished through the comparison of target area to weapon system/delivery platform TE90. Minimum Target Size Analysis is based on the principle that weapon systems/delivery platforms with a TE90 less than or equal to the target area have a higher probability of achieving the desired target effect while reducing the risks of collateral damage. The inverse case significantly reduces the probability of achieving the desired target effect while greatly increasing the risks of collateral damage. To accomplish this analysis, CDE Level 2 is broken down into two separate CER Reference Tables: CDE Level 2B for ASUGM and CDE Level 2C for SSBM.

1. CDE Level 2B ASUGM Minimum Target Size Reference Table. The CDE Level 2B Reference Table defines delivery platform specific MTSs for evaluating ASUGM employment against a given target. The MTSs in the table represent either the diameter of a circle or the length of one side of a square based on each delivery platform's specific mean TE90. ASUGM mean TE90 equals the average TE90 for each of the listed delivery platforms using operationally significant delivery parameters. In practical terms, the MTS, if

taken to form a square, represents the area on the ground within which a single unguided weapon would impact with a 90 percent probability if delivered from the associated platform. Targets evaluated using the data contained in the CDE Level 2B CER Reference Table are not estimated as high or low since no warhead selection has been made. They are considered only for feasibility of engagement by the listed delivery platforms.

2. CDE Level 2C SSBM Minimum Target Size Reference Table. The CDE Level 2C Reference Table defines weapon system specific MTSs for evaluating the feasibility of SSBM employment against a given target considering the target's size. The MTSs represent either the diameter of a circle or the length of one side of a square based on the weapon system's mean Predicted TE90. In practical terms, the MTS, if taken to form a square, represents the area on the ground within which a single SSBM warhead would impact to a 90 percent probability if fired from the associated weapon system. Targets evaluated using the data contained in the CDE Level 2C Reference Table are not estimated as high or low since no shell/fuze selection has been made. They are considered only for feasibility of engagement by the listed weapon systems.

(b) CDE Level 2 ASUGM/SSBM Minimum Target Size Analysis. Large area targets may be engaged with ASUGMs or SSBMs based on the most efficient use of ordnance required to achieve the desired effect or when available weaponeering options are limited due to the tactical situation. Since ASUGMs and SSBMs incur a significantly greater delivery error than PGMs, target size is a major consideration. Additionally, the increased delivery errors associated with ASUGMs and SSBMs present higher risks of collateral damage than PGMs. **Therefore, the CDM does not support a CDE Level 2 Low estimate for these weapons and requires at least CDE Level 3 analysis**. This requirement for at least CDE Level 3 analysis provides the commander with a clear indication of the elevated risk of ASUGM or SSBM employment. The following procedures provide a rapid means to determine the suitability and rationality of employing unguided/ballistic munitions and the selection of appropriate delivery platforms and/or weapon systems.

1. Step 1. Review the target information produced in CDE Level 1 to identify protected or collateral objects located within the installation, facility outline, or target area (bounded area not restricted to a facility). Protected or collateral objects located within the boundaries of a valid military target are not authorized for attack unless there is clear evidence that the adversary is using them to support the war effort and the adversary has been warned to stop doing so and has not heeded the warning. For instance, a chapel has been converted into a command and control facility, or a hospital

is being used to store weapons. If clear evidence of LOW violations is not available, collateral objects retain their protected status.

2. Step 2. Determine and record the smallest side or diameter of the target, using one of the following methods (refer to Figure 3).

a. Rectangular Target Method. Measure the length and width of the target facility outline and record the smaller value. This is the shortest side or diameter of the target facility. Also known as "short side method."

b. Circle Method. Review and select the geographic center point of the target facility outline. Measure and record the distance from the center point to the nearest facility outline and multiply that distance by a factor of two, producing the shortest facility diameter.

c. Segment Method. Review and divide the target into logical rectangular segments based on the weaponeering options available. Measure and record the smaller of the length and width of each rectangular target segment and evaluate each segment individually in the following step.

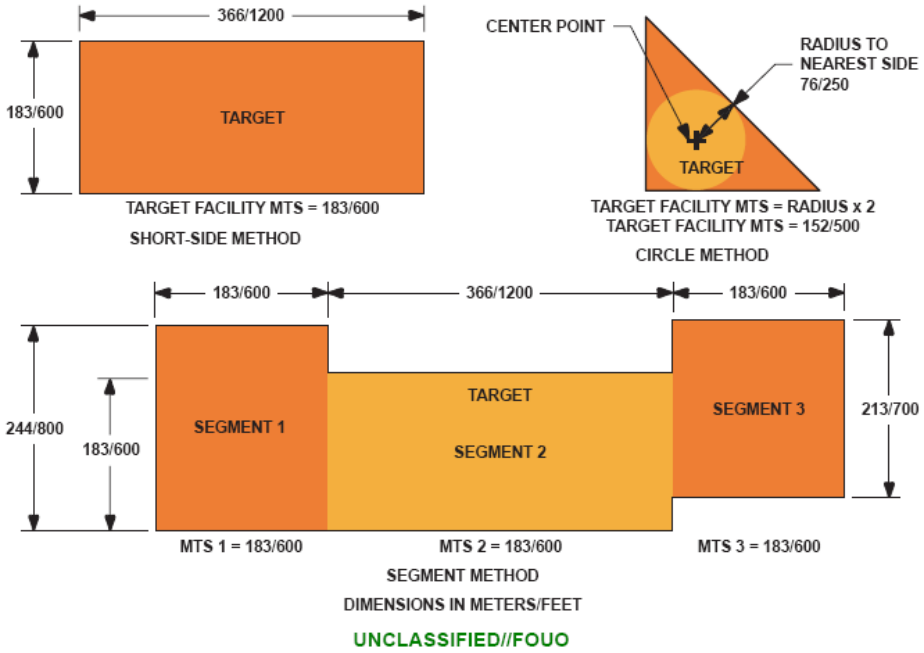


Figure 3. Minimum Target Size Methods

3. Step 3. Compare the target measurements derived in Step 2 with the delivery platform and weapon system-specific MTS values contained in the CDE Level 2B ASUGM and/or CDE Level 2C SSBM MTS Reference Tables.

(c) CDE Level 2 ASUGM/SSBM Minimum Target Size Analysis

1. If the delivery platform/weapon system MTS value is less than or equal to the recorded target or segment short side/diameter value, the delivery platform/weapon system is estimated as feasible for employment to engage the target as long as unguided deliveries can be constrained to within the MTS outline. Continue to CDE Level 3 and perform analysis considering the specific delivery system, weapon(s), range to target (for SSBM), and tactics required to achieve the desired target effect. CDE Level 2 is not a final step in the CDM for ASUGMs and SSBMs. CDE Level 3 analysis is required.

2. If the delivery platform/weapon system MTS value is greater than the recorded target or segment short side/diameter value, the delivery platform/weapon system is evaluated as unfeasible for employment to engage the target. **In this case, serious consideration must be given to engaging the target only with PGMs**. If PGM employment options are not available within the timeframe required to engage the target, continue to CDE Level 3 and perform CDE analysis considering the specific delivery system, weapon(s), and tactics to be employed. **A decision to continue presents increased risk of collateral damage.**

(2) **PGM General Analysis** estimates the risk of collateral damage by employing either a unitary or cluster PGM without having to select a specific unitary or cluster warhead. The CDE Level 2A CER Reference Table supports PGM General Analysis.

(a) CDE Level 2A PGM CER Reference Table. The CDE Level 2A CER Reference Table provides two CER values that define CHAs measured from an aimpoint for air-to-surface and surface-to-surface unitary or cluster PGMs. The two CER values are based on the largest PGM CER for unitary and cluster warhead type taken from the CDE Level 3A CER Reference Table with exceptions noted in CDE Level 2A CER Reference Table.

(b) The PGM Unitary values in the reference table combine the radius of collateral effects from the precision warhead with a TE90 value. The PGM Cluster values in the reference table combine the radius of collateral effects from the warhead, Precision TE90, and the submunition pattern radius.

(c) Targets estimated as CDE Level 2 Low present a very low probability of collateral damage but are tactically restricted for execution to PGMs only, slightly elevating the risk to mission.

(d) CDE Level 2 PGM General Analysis. Point targets and targets that present close-in collateral concerns are best serviced by PGMs. CDE Level 2 PGM General Analysis is a means to estimate risk of collateral damage while enabling maximum tactical flexibility, limiting the restrictions on target engagement to either Unitary or Cluster PGMs. There are two methods to perform the General Analysis. The **Aimpoint Method** estimates the risk of collateral damage engaging each individual aimpoint. This method provides a CDE Level 2 Low estimate for those aimpoints with no collateral concerns within the CHA generated from the appropriate CDE Level 2 CER Reference Table value. The Aimpoint method is applicable through all levels of CDE. The **Facility Method** estimates the risk of collateral damage for all aimpoints within a given target facility simultaneously by applying the appropriate CDE Level 2 CER Reference Table value measured from the target facility outline. The facility method can be used through CDE level 4.

1. Aimpoint Method. Using the aimpoint graphics produced in CDE Level 1, determine a CHA based on the CER value for either unitary or cluster PGMs from the CDE Level 2A CER Reference Table. Apply the CHA around each aimpoint and visually search for collateral objects located within each CHA. Target type will dictate whether a unitary or cluster weapon is appropriate.

2. Facility Method. Using the facility outline graphic from CDE Level 1, determine a CHA based on the CER for either unitary or cluster PGMs from the CDE Level 2A CER Reference Table. Apply the CHA from the facility outline and visually search for collateral objects located within the CHA. Target type will dictate the most appropriate weapon to employ. An example of an appropriate use of the facility method is in the target development phase of the Joint Targeting Cycle wherein the actual desired points of impact are not known.

(e) CDE Level 2 PGM General Analysis

1. If no collateral objects are located within the CHA, a CDE Level 2 Low (PGM Unitary (or Cluster)) estimate is made for the aimpoint or target facility (depending on the method used). Targets estimated to be CDE Level 2 Low may be engaged with any of the PGMs contained in the CDE Level 3A PGM CER Reference Table with exceptions as noted in the CDE Level 2A PGM CER Reference Table.

2. If collateral objects are identified within the CHA, a CDE Level 2 High estimate is made for the aimpoint or target facility (depending on the method used). CDE Level 3 analysis is then required.

Note: The overall target facility collateral damage estimate equals the highest or most restrictive aimpoint CDE estimate. For example, a target facility has three aimpoints. One aimpoint is estimated as CDE Level 2 Low; a second aimpoint is estimated as CDE Level 3 Low; and the third aimpoint is estimated as CDE Level 4 Low. The target's overall estimate is CDE Level 4 Low.

d. CDE Level 3 Weaponeering Analysis Overview. CDE Level 3 begins the process of refining weaponeering options that both achieve the desired effect on the target and mitigate collateral damage, thereby addressing the third question in the CDM process, "Can I mitigate damage to those collateral concerns by striking the target with a different weapon or with a different method of engagement, yet still accomplish the mission?" The goal of CDE Level 3 is to achieve a low collateral damage estimate while limiting the number of tactical weaponeering restrictions. Considering the weapon class and system, delivery platform, and/or PGM warhead type decisions from CDE Level 2, CDE Level 3 determines appropriate delivery systems, warhead, and fuze combinations that mitigate the risk of collateral damage while still achieving the desired effect on the target. There are three tables that support CDE Level 3 analysis and are defined below.

(1) CDE Level 3A PGM CER Reference Table. The CDE Level 3A CER Reference Table provides two columns of individual warhead CERs, measured from an aimpoint or facility outline, to define a CHA. The table lists warheads by type: air-to-surface unitary, air-to-surface cluster, and surface-to-surface unitary. The tables are arranged from larger to smaller CER value, enabling the rapid selection of alternate warheads in cases where the warhead restriction in the CDE estimate is not available at the point of execution. The values in the CDE Level 3A CER Reference Table **Unmitigated** column represent the hazard distance from weapon fragmentation (or blast if no weapon fragmentation or debris exists) to standing, unprotected personnel; while the values in the Mitigated column represent the hazard distance from crater ejecta to standing unprotected personnel. Only warheads capable of delay fuzing to achieve complete burial below grade or inside a building prior to detonation are provided CER values in the Mitigated column.

(a) CDE Level 3A PGM Unmitigated CERs. The dominant hazard for the **Unmitigated** column is from fragmentation to standing, unprotected personnel, dressed in a summer-weight uniform on open rolling terrain for a warhead fuzed for a surface detonation. The **Unmitigated** column values

combine the radius of collateral weapon effects and the Precision TE90 associated with the least accurate PGM guidance system and worst-case pattern radius for cluster munitions. This approach enables the development of warhead-specific CER values without considering individual weapon guidance systems. Targets estimated as CDE Level 3 Low (PGM with Unmitigated CER) present a very low probability of collateral damage. However, these targets are tactically restricted for execution to a specific warhead or a warhead with a smaller CER delivered in a PGM only mode, thereby slightly elevating the risk to mission.

(b) CDE Level 3A PGM Mitigated CERs. The Mitigated column numbers in the reference table combine the radius of collateral weapons effects and Precision TE90 associated with the worst case, or least accurate, PGM guidance system for each warhead capable of a delay fuze. Targets estimated as CDE Level 3 Low (PGM with a Mitigated CER) present a low probability of collateral damage. However, these targets are tactically restricted for execution to a specific warhead or one with a smaller CER, delivered in a PGM-only mode, thereby elevating the risk to mission because of the requirement to use a delay fuze.

(2) CDE Level 3B ASUGM CER Reference Table. The numbers in the CDE Level 3B CER Reference Table combine the mean Precision TE90 associated with individual delivery platforms, such as F-18, B-52, and F-16, and the CER for each air-to-surface unguided warhead. **There is no delay fuze or bomb burial option in the CDE Level 3B CER Reference Table.** The CDE Level 3B values are measured from either an aimpoint or facility outline for single warhead deliveries or from the edge of one or more engagement zones (EZs) for multiple warhead deliveries to form the CHA. Targets estimated as CDE Level 3 Low ASUGM present a low probability of collateral damage, but, are tactically restricted to a specific delivery platform and warhead and specific release parameters to define the EZ. As a result the risk to mission increases. Because delivery heading is a significant consideration for EZ orientation, a stated delivery heading restriction is required with CDE Level 3 for multi-warhead deliveries. This restriction further elevates the risk to mission.

(3) CDE Level 3C SSBM CER Reference Table. The numbers in the CDE Level 3C CER Reference Table combine the radius of collateral weapon effects and either the TE90 for the OA or Predicted methods of engagement based on either minimum to ½ or ½ to maximum range for each weapon system, shell, and fuze combination listed in the table. The table values are measured from an aimpoint when a converged sheaf is employed or from the outer edge of the dimensions of a circular or linear sheaf to form the CHA. It is important to note that the sheaf and method of engagement are normally specified in the call for fire and are employed consistently throughout the

conduct of the fire mission and the CDE analysis. Targets estimated as CDE Level 3 Low SSBM present a low probability of collateral damage, but are tactically restricted for execution to a specific weapon system, shell, fuze, method of engagement, sheaf type, and delivery in an SSBM only mode. Therefore, the risk to mission is increased. Targets estimated as CDE Level 3 Low for SSBMs using the OA method of engagement present an increased probability of collateral damage due to the requirement to employ marking or adjusting rounds and the significant increase in TLE90.

(4) CDE Level 3 Weaponeering Analysis

(a) CDE Level 3 PGM Weaponeering Analysis

1. Step 1. Measure and record the distance from each aimpoint or facility outline to the corresponding nearest collateral concern identified in CDE Level 1.

2. Step 2. Review the CDE Level 1 target information and weaponeer each aimpoint with the appropriate PGM warhead and fuze option to achieve the desired effect on the target.

3. Step 3. Select the appropriate CER value from the CDE Level 3A PGM CER Reference Table corresponding to either an unmitigated or mitigated weaponeering decision.

4. Step 4. Compare the CDE Level 3A PGM CER with the distance to the nearest collateral concern derived in Step 1.

5. CDE Level 3 PGM Weaponeering Analysis Evaluation

a. If the CDE Level 3 PGM CER for the selected weaponeering decision **is less than or equal to** the distance to the nearest collateral concern, the target is estimated as **CDE Level 3 Low PGM (*Warhead* [Unmitigated Case])** or **CDE Level 3 Low PGM (*Warhead*, Delay Fuze [Mitigated Case])**.

b. If the CDE Level 3 PGM CER for the selected weaponeering decision **is greater than** the distance to the nearest collateral concern, the target is estimated as **CDE Level 3 High** and requires higher level collateral damage analysis. If mitigation is employed in the CDE Level 3 estimate, continue to CDE Level 4. If mitigation is not employed due to a unitary warhead with no mitigation value available, continue to CDE Level 4. If mitigation is not employed in the CDE Level 3 estimate because of the weaponeering solution required to achieve the desired target effect, continue

directly to CDE Level 5 to estimate the number of civilian and noncombatant casualties.

(b) CDE Level 3 ASUGM Weaponeering Analysis

1. Step 1. Using the target information from CDE Level 1 and the delivery platform selection from CDE Level 2, determine an appropriate method of target engagement, either single or multiple warhead delivery. Continue to weaponeer the target to achieve the desired effect. If a multiple warhead delivery is required to achieve the desired effect, compute the length and width of the EZ, such as a bomber box or stick.

2. Step 2. If weaponeering a point target for single warhead delivery, annotate aimpoints on each of the desired target elements. If weaponeering an area target for a multiple warhead delivery, determine a center aimpoint for the target area, then annotate and orient the EZ to achieve the desired target coverage, ensuring the EZ excludes any collateral concerns located in the target facility. Some targets may require more than one EZ to achieve the desired effect. If a precise aimpoint coordinate mensuration capability or imagery is not available, CIB®, and Digital Terrain Elevation Data (DTED) are authorized to perform this step.

3. Step 3. Measure and record the distance from either the individual aimpoint(s) for single warhead deliveries or the outer edge of the EZ(s) for multiple warhead deliveries to the nearest collateral concern(s).

4. Step 4. Select the appropriate CER value from the CDE Level 3B ASUGM CER Reference Table corresponding to the delivery platform and warhead weaponeering decision for each aimpoint and/or EZ developed in Step 2 above. Compare the CER to the distance to the nearest collateral concern.

5. CDE Level 3 ASUGM Weaponeering Analysis Evaluation.

a. If the CER value for the selected weaponeering decision is less than or equal to the distance to the nearest collateral concern, the target is estimated as:

(1) Single Warhead: CDE Level 3 Low (ASUGM, Delivery Platform, Warhead).

(2) Multiple Warhead: CDE Level 3 Low (ASUGM, Delivery Platform, Warhead, Heading Restriction: degrees). Multiple warhead deliveries are restricted to the specific delivery heading oriented to the EZ.

b. If the CER value for the selected weaponeering decision **is greater than** the distance to the nearest collateral concern, the target is estimated as **CDE Level 3 High** and requires CDE Level 4 analysis.

c. The CDE Level 3B ASUGM CER Reference Table only provides unmitigated CERs.

d. For CDE Level 3 High estimates, serious consideration should be given to only engaging the target with PGMs. However, if PGMs are not available, continue to CDE Level 4.

(c) CDE Level 3 SSBM Weaponeering Analysis

1. Step 1. Using the CDE Level 1 target information, weapon system selection from CDE Level 2, range to target, and method of engagement and sheaf specified for the fire mission, weaponeer the target to achieve the desired effect.

2. Step 2. Select an aimpoint for each sheaf planned for employment against the target. Annotate and orient the sheaf(s) to achieve the desired target coverage, ensuring the sheaf(s) exclude any collateral concerns located on the target facility. Some targets may require more than one sheaf to achieve the desired effect.

3. Step 3. Measure and record the distance from either the individual aimpoint(s) for converged sheaf deliveries or the outer edge of the sheaf(s) for circular or linear sheaf deliveries to the nearest collateral concern identified in CDE Level 1 (refer to Figure 2).

4. Step 4. Select the appropriate value from the CDE Level 3C SSBM CER Reference Table corresponding to the weapon system, shell, fuze, method of engagement, and range to target (min to ½ or ½ to maximum) decision for each sheaf developed in Step 2, above. Compare the value from the table to the distance to the nearest collateral concern measured in Step 3. The method of engagement in the analysis is based on the method of target acquisition or location and must remain consistent throughout CDE analysis.

5. CDE Level 3 SSBM Weaponeering Analysis Evaluation

a. If the CER value from the table for the selected weapon system, shell, fuze, and engagement method **is less than or equal to** the distance to the nearest collateral concern, then the target is estimated as **CDE Level 3 Low (SSBM, *Caliber*, *Weapon System*, *Shell*, *Fuze, Range, OA [or "P" Predicted]*)**.

b. If the CER value from the table for the selected weapon system, shell, fuze, and method of engagement **is greater than** the distance to the nearest collateral concern, the target is estimated as **CDE Level 3 High** and requires CDE Level 4 analysis.

c. For CDE Level 3 High estimates, serious consideration should be given to only engaging the target with PGMs. However, if PGMs are not available, continue to CDE Level 4.

e. CDE Level 4 Refined Analysis Overview. CDE Level 4 completes the process of defining weaponeering solutions that achieve the desired effect on the target and mitigate the potential for collateral damage. This refines the answer to question three of the CDM, "Can I mitigate damage to those collateral concerns by striking the target with a different weapon or with a different method of engagement, yet still accomplish the mission?" CDE Level 4 is typically the point within the methodology where mitigation techniques besides fuzing are applied.

(1) CDE Level 4 is calculated for less than 1 percent probability of fractional structural damage from blast based on the assumption that noncombatant personnel will be located in noncombatant collateral structures that afford some measure of protection from fragmentation. Degree of protection from fragmentation is variable, and dependent on building construction. The assumption is supported by the realization that the location and number of transient noncombatant or civilian personnel cannot be accurately predicted in either space or time, therefore, limiting the ability to mitigate collateral effects to only those objects that can be seen, sensed, or known with collection assets. This assumption does not negate the responsibility to account for noncombatants or civilians in the open (e.g., in rush-hour traffic, at a soccer game, or in a parade) whose presence can be predicted based on available intelligence.

(2) CDE Level 4 requires PGM and ASUGM munitions to be fuzed to detonate either in a target structure or, at a minimum, 100 percent below grade for nonstructural targets to further mitigate fragmentation effects on unprotected noncombatant personnel. Unprotected personnel located in geospatially defined outdoor collateral concerns must be accounted for in CDE Level 5 using the CDE Level 3 CER and resultant CHA. **The goal of CDE Level 4 is to achieve a low collateral damage estimate while minimizing tactical restrictions.**

(3) CDE Level 4 has three supporting CDE Reference Tables, and their specific attributes are provided below with two noted exceptions: **Cluster/ICM**

Restriction (the CDM does not support use of cluster munitions or warheads within CDE Level; therefore, values for cluster weapons and ICMs are not provided within the CDE Level 4 CER Reference Tables) and **SSBM RAP and Extended/Enhanced Range Munitions Restriction** (RAP and enhanced range munitions are not addressed within CDE Level 4 due to the greatly increased delivery errors associated with these weapons). Hence, values for RAP and enhanced range munitions are not provided within the CDE Level 4 SSBM CER Reference Table.

(a) CDE Level 4A PGM CER Reference Table. The CDE Level 4A CER Reference Table provides individual PGM unitary warhead CER values for individual collateral structure types, measured from an aimpoint or facility outline, to define a CHA. The numbers in the table combine the radius of collateral weapon effects and the Precision TE90 associated with the worst case, or least accurate, PGM guidance system for each warhead. This approach enables the development of warhead-specific CER values without considering individual weapon guidance systems. Considering situations that limit or preclude characterizing a structure type, the CDE Level 4A CER Reference Table provides average values for each warhead versus an "unknown" collateral structure type and grades the listed structures on resistance to blast**. In addition, given the propensity for weapons to impact long of the target, a stated delivery heading restriction is required within CDE Level 4 for PGMs.** Targets estimated as CDE Level 4 Low PGM present a slightly elevated risk of collateral damage, but are tactically restricted for execution to a specific warhead (or one with a smaller CER), delivered with a delay fuze setting, and restricted to a specified delivery heading. As a result, the risk to mission is elevated. **Use of the CDE Level 4A PGM CER Table requires either complete warhead burial in the ground or complete internal detonation within a target structure to mitigate the fragmentation effects of the warhead.**

1 Accurate Characterization of Nearby Collateral Structures. This task can be difficult, as it is time consuming and intelligence intensive. CDE Level 4A CER Reference Table values include assumptions designed to account for this and to lower the risk of collateral damage due to mischaracterizing structure types. **In particular, the values are not reduced for the mitigating effects of internal or buried detonation in a target structure or for warhead detonation external to the collateral structure.**

2 Nearest, Weakest, or Multiple Collateral Concern. The nearest collateral concern generally is used to drive the CDM. In most cases this approach is valid because collateral structures located in the vicinity of a target are similarly constructed and an analyst can more easily characterize the structure types. However, there will be instances when construction types of

nearby collateral structures vary greatly, and an analyst may need to consider the weakest, not the nearest, collateral structure. In these cases, the weakest collateral structure is used to determine a single CER value for each aimpoint. This approach produces a conservative CDE Level 4A CER value for each aimpoint and may include collateral concerns that would not normally be considered at CDE Level 4. Another technique is to characterize each collateral structure near a target developing multiple CHAs and determine the risk of collateral damage to each of the collateral structures. While this method is more time consuming, it would tend to give a more refined casualty estimate for CDE Level 5. **The CDE analyst within the current ROE and policies needs to analyze the target area and use the method that most accurately reflects the situation at hand.** Realize that when using weaker structures, a higher casualty estimate in CDE Level 5 could result (more conservative approach), whereas if the stronger building type were used, a lower casualty estimate might result (less conservative approach). **Either way, the analyst needs to be consistent in the technique used, note all assumptions used when briefing the commander on the collateral damage estimate, and include those assumptions in the target folder (electronic or hardcopy).**

(b) CDE Level 4B ASUGM CER Reference Table. The numbers in the CDE Level 4B CER Reference Table combine the mean Precision TE90 associated with each delivery platform and the radius of collateral effects associated with each individual air-to-surface unguided warhead, such as a Mk-82. These table values are measured from an aimpoint or facility outline for a single warhead or the edge of one or more EZs for multiple warhead deliveries to form the CHA. In addition, given that delivery heading is a significant consideration for EZ orientation and that there is a propensity for weapons to impact long of the target, a stated delivery heading restriction is required within CDE Level 4 for ASUGMs. Targets estimated as CDE Level 4 Low ASUGM present an elevated risk of collateral damage. These targets are tactically restricted to a specific delivery platform and warhead with a delay fuze setting to achieve a complete detonation below grade, specific release parameters, and a specific delivery heading. These constraints further elevate the risk to the mission.

(c) CDE Level 4C SSBM CER Reference Table. The CDE Level 4C CER Reference Table values combine the radius of collateral weapon effects and either the TE90 for the OA or Predicted methods of engagement based on range to target for each weapon system, shell, and fuze combination listed in the table. These values are used to form a CHA measured from either an aimpoint when a converged sheaf is used, or from the outer edge of the dimensions of a circular or linear sheaf. For the CDM, a circular sheaf is the default. It is important to note that the sheaf and method of engagement are normally specified in the call for fire and are employed consistently throughout

the conduct of the fire mission and the CDE analysis. **In addition, the CDE Level 4C table values assume no civilian or noncombatant personnel are exposed in the open.** Targets estimated as CDE Level 4 Low SSBM present an elevated risk of collateral damage and are tactically restricted for execution to a specific weapon system, shell, fuze, method of engagement, and sheaf type, thereby elevating the risk to mission. Additionally, targets analyzed for SSBMs as CDE Level 4 Low when the OA method of engagement is employed present an increased probability of collateral damage due to the requirement to employ marking or adjusting rounds and the significant increase in TLE associated with OA missions.

(4) Mitigation Techniques. The CDM considers five mitigation techniques. Some of these techniques are built into the methodology as required restrictions; however, other mitigation techniques may be employed given the physical orientation of the target and collateral concerns. Any additional mitigation techniques will be applied in accordance with the guidance prescribed in this instruction (see Table 6).

Consideration	Delay Fuzing/ Bomb Burial	VT Fuzing/ Air Burst	Shielding	Delivery Heading	Aimpoint Offset
Fragmentation	1	N/A	3	4	5
Blast	1	2	3	N/A	5
Debris	N/A	2	3	N/A	5
Penetration	N/A	2	N/A	N/A	N/A
Thermal	1	N/A	3	N/A	N/A
Delivery Error	N/A	2	N/A	4	N/A
Notes:					
1 -- Delay Fuzing that achieves 100 percent bomb burial in the ground or internal detonation within a target structure provides the best mitigation for fragmentation and blast and may minimize thermal effects. Thermal effects should be considered when planning attacks on targets that present a high thermal sensitivity (i.e., wood structures, gas tanks).					
2 -- VT Fuzing that achieves an above ground/air burst detonation mitigates blast and debris effects and eliminates penetration effects. VT fuzing is applied as a significant mitigating factor for SSBMs in CDE Level 4 to account for inherent delivery errors.					
3 -- Shielding of collateral structures from fragmentation, blast, debris and thermal effects may be achieved by the presence of other combatant structures, walls, vegetation, and terrain features.					
4 -- Delivery Heading can mitigate fragmentation effects and minimize risk of delivery error. Testing has demonstrated that most fragmentation effects occur toward the front half of blast and fragmentation warheads. A delivery heading on an axis measured from the nearest collateral object to the target aimpoint should be used for PGMs delivery against targets analyzed at CDE Level 4 or Level 5. A delivery heading on an axis parallel to the nearest collateral object should be used for ASUGMs.					
5 – Aimpoint Offset may mitigate fragmentation, blast, and debris effects when using PGMs. In some cases, applying aimpoint offset allows employment of larger warheads that achieve the desired effect and mitigate collateral damage.					

Table 6. CDM Mitigation Techniques

(a) Delay Fuze/Warhead Burial. Delay fuzing for complete warhead burial prior to detonation is a very effective technique for mitigating warhead fragmentation and thus reducing the risk of collateral damage. However, warhead burial prior to detonation produces a significant secondary debris hazard from the material ejected from the resulting crater. This debris hazard prescribes the mitigated values in the CDE Level 3 PGM CER Reference Table. Warheads contained in the CDE Level 4A PGM CER Reference Table, with exceptions as noted within the table, are restricted to delay fuze settings to achieve either complete warhead burial below grade **or** complete burial within a target structure prior to detonation to mitigate the primary fragmentation effects of the warheads. Warhead burial reduces the risk of serious or lethal injury to unprotected civilians and noncombatants in the vicinity of the target. Warheads contained in the CDE Level 4B ASUGM CER Reference Table are also restricted to delay fuze settings to achieve complete warhead burial below grade prior to detonation to mitigate the primary fragmentation effects of the warheads. SSBMs currently have no delay fuze capability that will achieve complete warhead burial. **Caution should be taken when employing this mitigation technique to ensure the desired targeting effect is not compromised.**

(b) Variable Time (VT)/Proximity Fuze. Fuzing for an air detonation is an effective technique for mitigating the blast effects of warheads and reducing collateral risk to structures. However, the technique presents increased risk to unprotected civilian or noncombatant personnel as the fragmentation pattern is optimized. This mitigation technique is highly recommended in CDE Level 4 for SSBMs for two reasons. First, the assumption in CDE Level 4 is that the civilian and noncombatant population will seek cover in structures, thus protecting them from the fragmentation effects of warheads. Second, SSBMs are area fire weapons that present a significant delivery error problem. In fuzing for an air detonation, an SSBM will not impact a collateral structure near the target. As a result, there is a reduced risk of penetrating the structure and violating the protection afforded to the civilians and noncombatants inside.

(c) Delivery Heading Restrictions. Restricting the delivery heading of warheads is an effective technique for mitigating the risk of range delivery error. Regardless of delivery method, warheads generally have a tendency to impact long of the intended aimpoint. Additionally, weapon testing has revealed the majority of lethal effects occur in the forward quadrants of warhead detonation along the delivery heading. The lethal effects include both fragmentation and secondary debris from the target. **Therefore, delivery heading restrictions are built into CDE Level 4 process for both PGMs and ASUGMs to reduce the risk of warheads impacting nearby collateral concerns and to mitigate the fragmentation and secondary debris effects**

to collateral objects in the target area. PGMs and ASUGMs capable of terminal delivery heading designations are restricted in CDE Level 4 estimates to those headings that cause the warhead to impact away from and parallel to nearby collateral concerns. Delivery-heading restrictions mitigate two phenomena and effects: the occurrence of dominant lethal effects within the forward quadrants (between 270 and 90 degrees relative to the delivery heading) of warhead detonation and the range error probability that warheads impact long of an aimpoint. Delivery headings should be directed towards areas parallel and away from collateral concerns within 2 CEPs of the weapon used. **Delivery-heading restrictions may be impractical at the point of execution due to threats or other conditions in the target area**. In these cases, command policies, ROE, and target sensitivity will dictate the decision to forgo the delivery-heading restriction, re-weaponeer the target, achieve effects on the target via other means, or abort the mission.

(d) Shielding. Intervening structures, significant vegetation, and, in some very rare cases, terrain may shield collateral concerns from weapon effects. Shielding has proven a very effective technique for mitigating warhead fragmentation, blast, and debris. However, shielding can only be employed when an entity capable of shielding a warhead's effects is located between the intended aimpoint and a collateral concern. Since shielding is conditional on the target's presentation in the physical environment, it is not built into any of the CER tables, but should be considered at all levels of CDE.

(e) Aimpoint Offset. In some instances, depending on the target's composition, size, and the desired effect, the aimpoint may be altered or moved to a location whereby the associated CER and resulting CHA no longer affect a collateral concern. **Caution should be taken when employing this mitigation technique to ensure that the desired effect is not compromised by offsetting the aimpoint.** Like shielding, this final mitigation technique is conditional on the target's presentation in the physical environment and is not built into any of the levels of the CDM. However, aimpoint offset should be considered between CDE Levels 4 and 5, if appropriate.

(5) CDE Level 4 PGM Refined Analysis

(a) Step 1. Using the weaponeering decisions from CDE Level 3 and considering CDE Level 4 restrictions, either re-validate the weaponeering from CDE Level 3 or re-weaponeer the target to achieve the desired effect and CDE concerns.

(b) Step 2. Measure and record the distance between each aimpoint or facility outline and the collateral concern(s) in the vicinity. Characterize and record the structure type for the collateral concerns as defined in the CDE

Level 4A PGM CER Reference Table. If unable to determine the structure type, record it as "unknown" (Note: There are very hard and very soft building types in the list. Every effort should be made to identify the most reasonable match before choosing "unknown").

(c) Step 3. Decide if the nearest or weakest collateral structure will be used or if each collateral structure will be analyzed separately. Based on this decision and using the weaponeering decisions from Step 1, choose the appropriate value(s) from the CDE Level 4 PGM CER Reference Table.

(d) Step 4. Compare the value(s) selected from the CDE Level 4A CER Reference Table to the distances between the aimpoint or facility outline and collateral concerns measured in Step 2.

(e) CDE Level 4 PGM Refined Analysis Evaluation

1. If the CER value from the table for the selected weaponeering decision **is less than or equal to** the distance to the nearest collateral concern, the target is estimated as **CDE Level 4 Low (PGM, *Warhead*, Delay Fuze, Delivery Heading: *degrees* - *degrees*)**.

2. If the CER value for the selected weaponeering decision **is greater than** the distance to the nearest collateral concern, the target is estimated as **CDE Level 4 High** and referred to CDE Level 5.

(6) CDE Level 4 ASUGM Refined Analysis. **Commanders are strongly cautioned that ASUGM use is highly discouraged at CDE Level 4 and above**. Use of ASUGMs should only be attempted when PGMs are not available.

(a) Using the CDE Level 3 weaponeering decisions and distances to the nearest collateral concern(s) and considering the CDE Level 4 restrictions, refer to the CDE Level 4B ASUGM CER Reference Table. Enter the table by delivery platform. Read across to the unguided munition planned for use to determine if the value in the table is less than or equal to the distance to the nearest collateral concern.

(b) CDE Level 4 ASUGM Refined Analysis Evaluation

1. If the CER value for the selected weaponeering decision is **less than or equal to** the distance to the nearest collateral concern, the target is estimated as **CDE Level 4 Low (ASUGM** Restricted To (*the weaponeering solution(s) developed in CDE 3 above, either single warhead:* ***Delivery Platform, Warhead,*** **Delay Fuze, Delivery Heading*: degrees - degrees*** *or*

multiple warhead: ***Delivery Platform, Warhead*, Delay Fuze, Delivery Heading: *degrees*)**.

2. If the CER value for the selected weaponeering decision is greater than the distance to the nearest collateral concern the target is estimated as **CDE Level 4 High** and referred to CDE Level 5.

(7) CDE Level 4 SSBM Refined Analysis. **Commanders are strongly cautioned that SSBM use is highly discouraged at CDE Level 4 and above**. Use of SSBMs should only be attempted when PGMs are not available.

(a) Using the weaponeering decisions from CDE Level 3 and considering CDE Level 4 restrictions and the distance to the nearest collateral concern, refer to the CDE Level 4C SSBM CER Reference Table. Enter the table by weapon system, shell, fuze, and range to target. Read across to the appropriate technique of fire to determine the CER value.

(b) CDE Level 4 SSBM Refined Analysis Evaluation

1. If the CER value for the selected weaponeering decision is **less than or equal to** the distance to the nearest collateral concern, the target is estimated as **CDE Level 4 low SSBM** *(Restricted to the weaponeering solution(s) developed in CDE 3 above),* ***Caliber, Weapon System, Shell, Fuze, Range, OA (or "P" Predicted).***

2. If the CER value for the selected weaponeering decision is greater than the distance to the nearest collateral concern the target is estimated as **CDE Level 4 High** and referred to CDE Level 5.

f. CDE Level 5 Casualty Analysis Overview. CDE Level 5 is used when all reasonable and known mitigation techniques have been exhausted and some level of collateral damage appears unavoidable (CDE 4 High, CDE 3 High with outdoor concerns). In addition, CDE Level 5 is also performed when Level 1 analysis determines presence of involuntary or unwitting human shields, CBR, environmental, and/or dual-use targets are factors. **Once a target is analyzed under CDE Level 5 analysis, it remains classified Level 5 (regardless of the mitigation done previously) due to the level of risk and sensitive nature these factors represent for the CCMD and the national government.** The CDE Level 5 casualty estimate answers the fourth and fifth questions of the CDM, "How many civilians and noncombatants do I think will be injured/killed by the attack?" and "Do I need to elevate this decision to the next level of command to attack the target based on the ROE currently in

effect?" **Commanders must be aware that they are assuming significant risk of collateral damage when engaging a target analyzed under CDE Level 5.**

(1) Similar to the rest of the CDM, the casualty analysis is not an exact science. No precise means exists to predict noncombatant demographics, and this effort is limited to the knowledge of the unique characteristics and cultural behaviors of the region and country as well as the population distributions, customs, and cultural practices, as well as particular habits unique to a region. As a reminder, the CDM does not take into account transient civilian or noncombatant personnel or equipment (unless precise data are known). **Therefore, it is critical that CDE Level 5 estimates never be portrayed as an expected "casualty count."**

(2) However, the LOW requires combatants to refrain from intentionally targeting civilian or noncombatant populations or facilities. The anticipated injury or loss of civilian or noncombatant life, and damage to civilian or noncombatant property, or any combination thereof, incidental to attacks must not be excessive in relation to the concrete and direct military advantage expected to be gained. Failure to observe these obligations could result in disproportionate negative effects on civilians and noncombatants and be considered a LOW violation.

(3) The supporting data, tables, and procedures for CE assist in estimating civilian or noncombatant casualties and provide a standard method for computing casualty estimates. The commander then uses the CE to determine, under the ROE, if effects can be applied to the target and who may approve the application of effects on the target. The primary decision aid is the noncombatant and civilian casualty cutoff value (NCV) and is found in the applicable ROE. Other metrics, such as specific guidance from higher headquarters, may apply more restrictive measures altering the CDM and producing a high collateral damage estimate. **CDE Level 5 constitutes the only level within the methodology where a final collateral damage estimate of "high" may be rendered. If a high estimate is rendered, the STAR process is then followed (see reference a) unless approval authority has been delegated by appropriate orders/instructions.**

(4) CDE Level 5 Population Density Reference Table. The CDE Level 5 Population Density Reference Table provides a standardized format to assist in the development of data specific to a region or country.[12]

[12] Oak Ridge National Laboratory is the U.S. Government's premier institution for the study of human geography, and it is critical to the production of accurate population-density tables.

(a) Demographic data contained in the CDE Level 5 Population Density Reference Table (Appendix D) is stated as population per 1000 square feet for each of the listed collateral concern functionalities.

(b) Day and night factors are based on socialized cultural norms for daytime and nighttime functional activities. Episodic event factors are based on standard maximum population densities per 1000 square feet for the events described within the table. Combatant commands may use their discretion, experience, and current intelligence (e.g., pattern of life data) to determine daytime and nighttime cultural norms. If a reasonable assessment for daytime and nighttime cannot be made, the period of time between BMNT (begin morning nautical twilight) and EENT (end evening nautical twilight) for daytime and the period of time between EENT and BMNT for nighttime is the default.

(c) To aid the casualty estimation, commanders may use their discretion, experience, and current intelligence (e.g., pattern of life (POL) data) to determine daytime and nighttime cultural norms. In cases where current ground commander's assessment provides a more refined estimate of population density in a specific collateral concern, employ that data in the casualty estimate. The refined casualty estimate is only valid as long as PID and POL are maintained.

(5) CDE Level 5 CE Worksheet and Computations. The CDE 5 CE Worksheet provides the standardized means to develop casualty estimates ensuring the CDM's intent of a simple, reasonable, and repeatable process. The worksheet assists the analyst in computing a casualty estimate for those indoor and outdoor collateral concerns or structures, located within or affected by a CDE Level 3 or 4 CER. After each collateral concern is estimated, add casualties from any CBR or environmental hazards and any known **involuntary**, unwitting, or status unknown) human shields. The total is then rounded up to the next whole number to arrive at a total CE.

(a) Indoor and Outdoor Collateral Concerns. The dominant hazard to civilians or noncombatants located within indoor collateral concerns is blast, while the dominant hazard to civilians or noncombatants located within outdoor collateral concerns is fragmentation, secondary debris and/or crater ejecta from PGMs or ASUGMs and fragmentation from SSBMs. In these situations, the affected area of indoor collateral concerns is computed based on that portion of the indoor collateral concern located within or affected by the chosen warhead's CDE Level 4 CER and resulting CHA. The affected area of outdoor collateral concerns is computed based on that portion of the outdoor collateral concern located within or affected by the CDE Level 3 CER/CHA for ASUGMs or SSBMs, or the CDE Level 3 Mitigated CER/CHA for PGMs, depending on the weapon class selected for employment.

(b) Delay Fuzing. When delay fuzing is not possible, collateral damage mitigation ceases at CDE Level 3. Consequently, a CDE Level 3 CER and resulting CHA must be used to conduct CE in CDE Level 5. This situation is only applicable to certain PGMs and ASUGMs since SSBMs are not capable of delay fuzing to achieve complete warhead burial prior to detonation. In this case, fragmentation is the dominant hazard to civilians or noncombatants in indoor and outdoor collateral concerns. Civilian or noncombatant posture, such as indoor versus outdoor, or protected versus unprotected, plays a significant role in CE computations.

1. If ASUGMs are planned for employment in this case, the affected area of both the indoor and outdoor collateral concerns is computed based on that portion of the collateral concern located within or affected by the selected warhead's CDE Level 3 CER and resulting CHA.

2. If PGMs are planned, the affected area of indoor collateral concerns is computed based on that portion of the indoor collateral concern located within or affected by the chosen warhead's CDE Level 3 Mitigated CER and resulting CHA. The affected area of outdoor collateral concerns is computed based on that portion of the outdoor collateral concern located within or affected by the warhead's CDE Level 3 **Unmitigated** CER and resulting CHA.

3. Regardless if PGMs or ASUGMs are selected, the CER value used to determine the affected area of indoor collateral concerns is divided in half to create an inner and outer annulus. By creating an inner and outer annulus, the appropriate casualty factor can be applied to the CE calculations. This approach considers the protection collateral structures afford civilians or noncombatants located inside the structures.

(6) Casualty Factor. The casualty factor is based on the type of collateral concern (such as indoor, outdoor, or dual-use). **There are only two options with casualty factor, either 1.0 or .25.** For indoor collateral concerns, the casualty factor reflects the relative location of the collateral structure to the intended impact point of the warhead. **A casualty factor of 1.0 is specified for all outdoor collateral concerns and dual-use targets for which a warhead is planned. If any part of an indoor collateral concern is located within one-half, or the inner annulus, of the appropriate CER and resulting CHA, the casualty factor of 1.0 is also specified. A casualty factor of .25 is only specified if an indoor collateral concern is not in the inner half and there is some portion of the collateral concern within the outer half, or outer annulus, of the appropriate CER and resulting CHA.**

(7) Dual-Use CE. CE for dual-use facilities may follow the same procedures stated above using functionality population density values or a refined intelligence based estimate. Due to the sensitive nature of dual-use facilities, intelligence analysis is normally performed to estimate the facility's population density. If intelligence analysis was performed use this value as the casualty estimate for the dual use target. However, if the analysis was not performed, all personnel expected to be in a dual-use facility at the time of attack are considered civilian and/or noncombatant regardless of how much of the CHA covers the dual-use target. **Therefore, enter a "1.0" for percent affected and enter "1.0" for the casualty factor.**

(8) Environmental and CBR Plume Hazards. Environmental and CBR plume hazards are assessed based on target functionality, such as hydroelectric dams, chemical plants, and CBR storage. Special consideration must be given to the secondary and tertiary effects of engaging these types of targets.

(a) CBR plume hazard targets present the significant danger of releasing chemical, biological, or radiological clouds into the atmosphere, producing widespread and long-term lethal negative effects on civilians and noncombatants.

(b) Environmental hazard targets present the significant danger of widespread and long-term lethal effects on civilians and noncombatants from ground water contamination, flooding, uncontrollable fire, and spread of disease.

(c) Targets assessed as presenting a CBR plume hazard are referred through the Combatant Command to DTRA for HPAC analysis. Targets assessed by the Combatant Command as presenting other environmental hazards are referred to the NCMI for CHAMP environmental analysis. In both cases, characterization of these hazards occurs within CDE Level 1. When produced, casualty estimates from CHAMP and HPAC models are added to the CDE Level 5 CE worksheet as part of the total casualty estimate.

(9) CDE Level 5 Casualty Estimate. The following steps and supporting population density data for specific regions or countries enable development of CDE Level 5 CE.

(a) Step 1. Review the CDE Level 1 and Level 4 information and identify those collateral concerns adjacent to the target that are affected by the CDE Level 4 computed CHA. In cases where collateral concern functionality is outdoor in nature, use the computed CDE Level 3 CHA to evaluate for

casualties. Collateral concerns shielded from the target by other collateral concerns are not considered for CE.

(b) Step 2. Review the CDE Level 1 information and correlate the functionality of each of the collateral concerns identified in Step 1 to the functionalities contained in the appropriate region or country CDE Level 5 Population Density Reference Table. Record each of these collateral concerns on the CDE Level 5 CE Worksheet.

(c) Step 3. Record the number of floors, length, and width of the area contained within the CDE Level 3 or Level 4 CHA (as appropriate) for each of the collateral concerns recorded in Step 2 on the CDE Level 5 CE Worksheet. Simplify this process by measuring the length and width of the affected area for each collateral concern. Do not attempt to convert the measurements for the arc of the circle. Compute the total square footage (length x width x number of floors) that is encompassed within the CHA for each collateral concern and record this information on the CDE Level 5 CE worksheet.

(d) Step 4. Refer to the appropriate AOR's CDE Level 5 Population Density Reference Table. Enter the table by collateral concern functionality and then select the best match for the collateral concern being evaluated. Annotate the population density for day, night, and episodic events and determine the casualty factor for each collateral concern.

(e) Step 5. Compute CE for each collateral concern:

$$CE = \frac{\text{Total Area}}{1{,}000 \text{ sq ft}} \times \%\ \text{Affected Area} \times \text{Population Density per 1,000 sq ft} \times \text{Casualty Factor}$$

(f) Step 6. Repeat the above steps for each of the affected collateral concerns and add them together to compute an estimate of casualties.

(g) Step 7. If the target was analyzed as a CBR plume or environmental hazard in CDE Level 1, add any casualties derived from DTRA and/or NCMI analysis to the estimated casualties computed in step above. Add any known **involuntary or unwitting** (or status unknown) human shields. Round up to the next whole number and record this number as the total casualty estimate.

(10) CDE Level 5 Casualty Estimate Evaluation

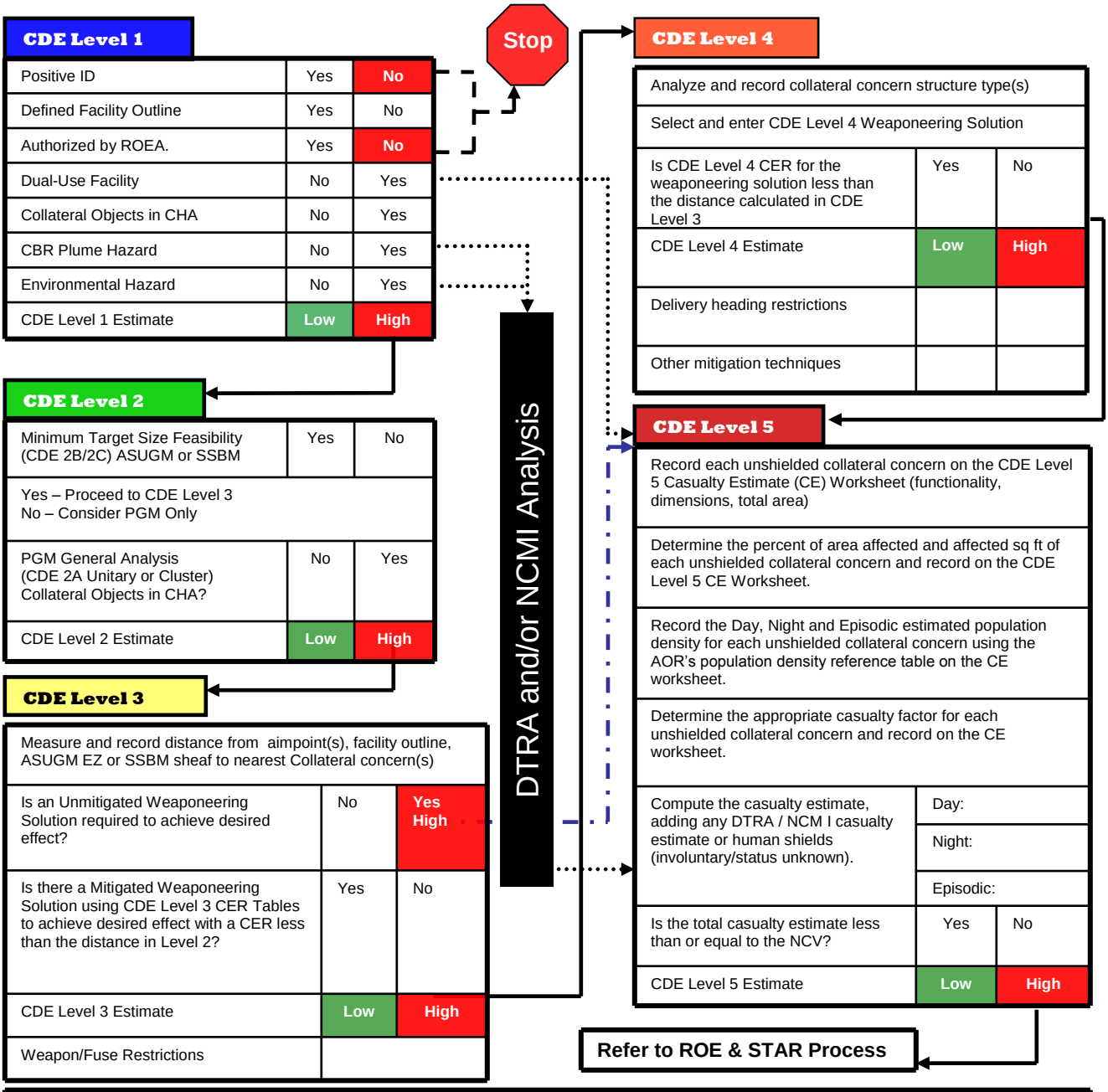
(a) If the CE is less than or equal to the established NCV, the target is estimated as CDE Level 5 Low Restricted to (***the weaponeering solution(s) developed in prior steps***), **CE= Day (**xx**), Night (**xx**), Episodic (**xx**)** *(where "xx" indicates the number of estimated casualties, annotating restriction if applicable).*

(b) If the CE is greater than the NCV, the target is estimated as **CDE Level 5 high Restricted to** (***the weaponeering solution(s) developed in prior steps***), **CE= Day (xx), Night (xx)**, **Episodic (xx)** (*where "xx" indicates the number of estimated casualties, annotating restriction if applicable*). **Authorizations to engage targets estimated as CDE Level 5 High require SecDef or Presidential approval (see reference a) unless approval authority has been delegated by appropriate orders/instructions.**

g. **Field CDE.** Field CDE is typically used in dynamic targeting when there is a time-constrained opportunity to engage a fleeting target. Field CDE differs from Formal CDE, which is conducted by certified/qualified CDE analysts, typically in a JOC/AOC/TOC. Field CDE is typically conducted by JTACs, FOs, or by aircrew. **Field CDE is a degraded mode of CDE, and creates the opportunity for increased risk**. A Field collateral damage estimate will typically be a verbal call, and should be documented for future review/analysis. CCDRs will establish authorities for Field CDE, as necessary. When authorizing Field CDE commanders should ensure Field CDE utilizes existing concepts and reference tables derived from the CDM, and that somebody in the Field CDE fires approval chain is a certified and qualified CDE analyst. Typically, CDE Level 4 analysis is not authorized for Field CDE.

APPENDIX B TO ENCLOSURE D

CDM QUICK GUIDE



Final Collateral Damage Estimate

CDE Level	Low/High	Weapon Class (PGM/ASUGM/SSBM)	Weaponeering Restriction	Heading Restriction	Casualty Estimate
CDE_____				_____-_____	D:____N:____E:____

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APPENDIX C TO ENCLOSURE D

CER REFERENCE TABLE SUMMARY

CDE Level	Intended Use	Dominant Hazard	CER/CHA Criteria and Weapon Restrictions
1	Initial analysis for all conventional weapons	Fragmentation versus personnel	Less than 10% probability of serious or lethal injury to standing personnel
2A	General analysis for unitary and cluster PGMs		
2B	Minimum target size analysis for ASUGM based on delivery platform	TE 90	Less than 10% probability of serious or lethal injury to standing personnel No low or high estimate – feasibility only
2C	Minimum target size analysis for SSBM based on weapon system		
3A	Analysis for each PGM warhead in an unmitigated case	Fragmentation versus personnel (or blast if no weapon fragments /debris exist)	Less than 10% probability of serious or lethal injury to standing personnel Fuze for surface detonation
	Analysis for each PGM warhead in a mitigated case	Crater ejecta/debris versus personnel (or blast if no ejecta/debris exist)	Less than 10% probability of serious or lethal injury to standing personnel Delay fuze for complete detonation below grade or complete detonation within target structure
3B	Analysis for each ASUGM based on delivery platform and warhead in an unmitigated case	Fragmentation versus personnel (or blast if no weapon fragments/debris exist)	Less than 10% probability of serious or lethal injury to standing personnel Fuze for surface or air detonation Heading restriction for multi-warhead delivery
3C	Analysis for each SSBM weapon system/ shell/fuze for Observer Adjusted method		Less than 10% probability of serious or lethal injury to standing personnel Fuze for surface or air detonation
	Analysis for each SSBM weapon system/shell/fuze for Predicted method		
4A	Refined analysis for each PGM warhead based on collateral structure type in a mitigated case	Blast versus structures leading to blunt trauma injury to personnel	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 heading restrictions
4B	Refined analysis for each ASUGM warhead and associated delivery platform based on nearest collateral structure in a mitigated case		
4C	Refined analysis for each SSBM weapon system/shell/fuze based on nearest collateral structure using Observer Adjusted method		Less than 1 % structural damage to collateral structure Excludes ICM, RAP and enhanced range munitions
	Refined analysis for each SSBM weapon system/shell/fuze based on nearest collateral structure using Predicted method		

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APPENDIX D TO ENCLOSURE D

CDE LEVEL 5 POPULATION DENSITY TABLE AND CE WORKSHEET

Valid for: (AOR/Country)

CDE Level 5 Population Density Reference Table			
Collateral Structure Functionality	**Estimated Population Density**		
	Day	**Night**	**Episodic Events**
Residential Structures			
Single Family Urban or Small Town, Upper and Middle Class			
Single Family Urban or Small Town, Lower Class and Slum			
Single Family Village or Rural Scattered, Lower Class			
Multi-Family Unit (Apartment, Condominium, Dormitory)			
Institutions/Public Service			
Religious			
Museum			
Library			
School			
College/University			
Hospital			
Public Service Outlet			
Store			
Restaurant			
Hotel/Motel			
Office Building/Industrial Facility			
Light Manufacturing			
Heavy Manufacturing			
Chemical, Refining, Cement			
Heat Processing (i.e. foundry)			
Craftworks			
Transportation Facility			
Station (Air, Rail, Bus, Subway, Gas)			
Transportation Repair (Garage, Hangar)			
Warehouse			
Recreation/Entertainment			
Indoor (Theater, Gymnasium)			
Outdoor Intensive (Stadium, Racetrack)			
Outdoor Extensive (Park, Zoo)			
Auction			
Indoor			
Outdoor/Intensive (Theater, Gymnasium, Casino)			

Notes:

1. The 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.

Casualty Estimation (CE) Worksheet														
Collateral Concern (dual-use is always the first entry)								**Estimated Population Density**			**Casualty Factor**	**Casualty Estimate**		
Functionality	ID#	Length	Width	# of Floors	Total Sq Ft	% Affected (.05 to 1.0)	Affected Sq Ft	Day	Night	Episodic	(0.25 or 1.0)	Day	Night	Episodic
Total Casualty Estimate (add DTRA, NCMI, and human shields estimate as applicable)**:**														

Notes:

1. This worksheet is used to compute casualty estimates based on the portion of the collateral concern located within a CDE Level 3 or Level 4 CHA with relevant weaponeering and mitigation.

2. Collateral concern information
   - Enter the functionality type from the appropriate CDE Level 5 Population Density Table for each affected collateral concern. Affected collateral concerns are those with any portion located within either the CDE Level 3 or 4 CHA, except those shielded from warhead effects. If the targeted facility is dual-use enter it on the first line to compute noncombatant and civilian casualties within the targeted structure.
   - Enter the assigned ID# to each collateral concern or the aimpoint for the targeted dual-use facility.
   - Enter the length, width, and # floors for each and compute the total sq ft using (L x W x #floors).
   - Estimate percentage affected for each collateral concern that is located within the appropriate CDE Level 3 or 4 CHA (in 5 percent increments) using the decimal system to show percentage (100% = 1.0, 35% = 0.35). The percentage affected for a dual-use facility is <u>always</u> 1.0.
   - Compute affected sq ft using (total sq ft x percent affected).

3. Enter the estimated population density for day, night, and episodic from the AOR's CDE Level 5 Population Density Reference Table based on the collateral concern functionality. For dual-use targets enter the intelligence based casualty estimate developed in CDE Level 1 (if available).

4. Enter the appropriate casualty factor for each collateral concern based on the following:
   Casualty factor = 1.0 for:
   - All dual-use facilities.
   - Outdoor collateral concern with any portion located within the CDE Level 3 (Mitigated) CHA when a CDE Level 4 analysis is performed.
   - Outdoor collateral concern with any portion located within the CDE Level 3 (<u>Unmitigated</u>) CHA when a CDE Level 3 analysis is performed as the final step due to inability to delay fuze the weapon. (This only occurs with PGM and ASUGM).
   - Indoor collateral concern with any portion located within the inner annulus (1/2 of the CER) of the CDE Level 4 CHA when a CDE Level 4 analysis is performed.
   - Indoor collateral concern with any portion located within the inner annulus (1/2 of the CER) of the CDE Level 3 (Mitigated) CHA when a CDE Level 3 analysis is performed as the final step due to inability to delay fuze the weapon. (This only occurs with PGM and ASUGM).
   Casualty factor = 0.25 for:
   - Indoor collateral concern only affected by the outer annulus of the CDE Level 4 CHA when a CDE Level 4 analysis is performed.
   - Indoor collateral concern only affected by the outer annulus of the CDE Level 3 CHA when a CDE Level 3 (Mitigated) CHA analysis is performed as the final step due to inability to delay fuze the weapon. (This only occurs with PGM and ASUGM).

5. Calculate a casualty estimate for each affected collateral concern for day, night and episodic using:
   - **Casualty estimate (CE) = (affected sq ft/1000) x (population density) x (casualty factor)**.

6. Sum the individual collateral concern casualty estimates for each of the periodic conditions (day, night & episodic) to determine the subtotal casualty estimate. Add DTRA, NCMI, or human shield casualty estimate (as applicable). Round up to next whole number. This total is now the total casualty estimate for the target.

APPENDIX E TO ENCLOSURE D

GUIDANCE FOR COLLATERAL CONCERNS

1. Facilities in General. Do not disregard any facility in collateral damage analysis, regardless of square footage, unless the facility is clearly uninhabitable (e.g., walls surrounding a roof-based water cistern, animal pens, buildings with no roof, dilapidated shacks). Current intelligence or "Ground Truth" may aid this determination. If time permits, a trained imagery analyst will make the determination as to habitability and functionality of the facility in question. For facilities determined to be sheds, storage or support buildings, apply functional activity evaluation values for "indoor" agricultural facility.

2. Cemeteries. Cemeteries are CAT I NSFs. Cemeteries are analyzed as outdoor extensive facilities using the appropriate CDE Level 3 CER based on weapon fuzing due to their vulnerability to fragmentation and crater ejecta. In cases where current intelligence is capable of providing a more refined estimate of population density for a specific collateral concern, that data should be employed in the casualty estimate (e.g., POL) for all cemeteries within the predicted CHA. All efforts should be made to determine POL of cemeteries on a case-by-case basis. POL should be documented when there is a zero casualty estimate. When not possible to establish POL for planning purposes, apply functional population density values for "outdoor extensive" recreation/entertainment.

3. Tents. If observed in the target area, tents will be accounted for when conducting collateral damage estimation. Tents made of unknown material, canvas or similar material are analyzed as outdoor facilities using the appropriate CDE level 3 CER based on weapon fuzing due to their vulnerability to fragmentation and secondary debris or crater ejecta. In cases where current intelligence is capable of providing a more refined estimate of population density for a specific collateral concern, that data should be employed in the casualty estimate (e.g., pattern of life also known as POL). When it is not possible to establish POL for planning purposes, apply functionality population density values for "single family village or rural scattered, lower class" residential.

4. Power Lines. Electrical transmission lines (ETLs) (e.g., significant electrical towers) that transport electricity for civilian consumption are CAT II NSFs regardless of size. Do not discount ETL in collateral damage analysis unless otherwise directed by appropriate ROE. ETLs are mitigated to CDE 4 Low using the unknown structure type CER in the CDE 4 table. If the weapons effects cannot be mitigated, the resulting estimate is CDE 5 Low, assuming there are no other collateral concerns affecting the estimate.

5. Borders. A sovereign country's border without a fence, wall, barrier or other supporting infrastructure is not an NSF. During target engagement, if weapons effects cannot be mitigated cross-border due to proximity to the border, the target is categorized a "Sensitive Target" and must be approved IAW the STAR process and applicable ROE.

6. Imagery Analysis. Imagery and/or CDE analysts should employ their combined expertise, experience, and current intelligence (e.g., POL data) to tailor the science to the specifics of the operational environment and annotate on CDE-G operational status and use (i.e., dry or not, private or public) of canals, waterways, wells or other similar collateral objects, if applicable for proper risk assessment to the commander.

7. Man-Made Waterways

a. Aqueducts, navigable canals, large water supply or drainage canals, distributary canals and Karez systems are CAT II NSFs and are further classified as infrastructure. Moderate to small sized (less than 3 meters in width) irrigation canals or ditches are classified as minor irrigation works and are neither considered infrastructure nor required to be accounted for in the collateral damage analysis.

b. Canals and waterways are not "outdoor" collateral facilities for casualty estimate purposes. Local populace use of the canal or waterway is transient in nature. Transient means mobile. Commanders should use their discretion, experience, and current intelligence (e.g., POL data) to determine daytime and nighttime population density norms for affected canals or waterways.

8. Above-Grade Waterways.

a. If an above-grade canal (does not include minor irrigation works) is engaged directly, the commander is responsible for determining the predominant function based on current intelligence and characterizing the target as dual-use or not dual-use. If the target has the potential of causing an environmental hazard, weaponeer the target to achieve the desired effect and provide the weaponeering solution for a Naval Oceanographic Office (NAVO) assessment. In addition, the presence of an environmental hazard may elevate the target to the STAR process even if the collateral damage estimate is low due to the environmental risks and expanding the effects of the conflict. The environmental damage estimate for an above-grade canal is not intended to deny a commander the ability to respond to TSTs and should not be used as the sole justification to impede or delay fires during target engagement.

b. If the above-grade canal is not engaged directly, dual-use determination and no-strike list (NSL) removal is not required. The above-grade canal or waterway collateral concern is mitigated; according to the paragraphs below. If the above-grade canal or waterway is dry but is subject to seasonal conditions, it is still an NSF and risk should be characterized accordingly.

(1) An above-grade canal is mitigated using the unknown structure type CER in the CDE Level 4 tables.

(2) If the above-grade canal falls within the CDE Level 4 CER, additional analysis is conducted. CDE analyst may use the inner-annulus of the CDE level 4 CER. If the canal falls outside the inner-annulus, the target is analyzed as CDE 4 Low.

(3) The target will remain a CDE 4 Low if the above-grade canal is outside of the inner-annulus of the CDE level 4 CHA. If the above-grade canal falls within the inner-annulus of the CDE level 4 CHA, the target is estimated CDE 5 Low pending further analysis. Additionally, an environmental damage estimate is required to analyze whether the target is sensitive.

(4) Weapons below the 500-pound class do not need analysis due to minimal explosive weights. For weapons in this category, if an above-grade canal falls inside the CDE level 4 CHA of this weapon class, the target is analyzed CDE 4 Low, assuming there are no other collateral concerns affecting the estimate.

9. Below-Grade Waterways. Water control features associated with below-grade canals are the only component of a below-grade canal that requires collateral damage analysis.

10. Karez Systems. Karez systems are not considered in collateral damage Level 1-3 analysis because they will remain unaffected by the fragmentation and ejecta effects of the weapon. Karez systems at CDE Level 4 and above are mitigated as per guidance for above-grade canals.

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APPENDIX F TO ENCLOSURE D

PLAIN LANGUAGE GUIDE TO CDE TERMINOLOGY

1. This enclosure provides suggested language to use when discussing collateral damage with senior military and civilian leadership.

a. Risk of collateral damage (CD) is defined as either “High” or “Low”

b. An estimate of High Collateral Damage is the result of either:

(1) The probability that civilian casualties will exceed an authorized level based on the weapon to be used and the proximity of civilians to the aimpoint (Note: Use the ROE stated noncombatant and civilian casualty cutoff value (NCV) to determine the authorized level referred to above), or

c. An estimate of Low Collateral Damage is given when civilian casualties or damage to a sensitive structure is not likely based on either:

(1) No presence of collateral structure or civilians in the objective area, or

(2) Structures or civilians are far enough away from the aimpoint so that the weapon to be used is unlikely to harm them.

d. Do not use terms such as “4 low” and “5 high” etc. Use “High” or “Low” terminology only, then state why it is high or low based on the above.

(1) Example 1: Target is estimated to have a high risk for collateral damage based on pattern of life indicating the potential for two women and three children in the target area.

(2) Example 2: Target is estimated to be a low risk for collateral damage, we have not identified any sensitive structures or civilians present in the target area.

e. When we must give a civilian casualty estimate but do not have an established pattern of life to clearly estimate the number of civilians present, discuss the casualty estimate as follows:

(1) Example 3: Target is estimated to have a high risk for collateral damage because pattern of life is inconclusive and we do not have a complete understanding of civilian activity in the area. Based on cultural norms and

population densities we estimate that there is a potential for as many as 12 civilians present during the day and 15 during the night.

f. When a number is associated with a risk estimate (e.g., 5 High), it represents a technical rating based on mitigating actions that must be taken (e.g. weapon selection, fuzing, attack heading, etc.) to minimize the probability of collateral damage. For example, a "1" means no mitigation is required, whereas a "4" means selection of a particular weapon, fusing, or direction of attack is necessary. This "technical" terminology is generally not relevant to discussions of collateral damage risk.

APPENDIX G TO ENCLOSURE D

JOINT CDE PROGRAM STANDARDS

1. Introduction

a. Services providing forces to a Joint Force Commander will ensure personnel conducting Collateral Damage Estimation (CDE) are properly trained IAW this instruction and proficiencies are maintained for the duration of an individual's assignment. Personnel tasked with conducting CDE are considered "CDE analysts."

b. Graduates of an accredited DoD Joint CDE certification program are considered a *certified* CDE analyst. Prior to conducting operational CDE they must complete a local workcenter *qualification* program. At a minimum, workcenter qualification must include verification that the individual is a graduate of an accredited CDE certification program, is proficient on tools used in the workcenter to produce collateral damage estimates, and has demonstrated proficiency by making accurate CDE calls under the supervision of qualified CDE analyst. Additionally, for organizations tasked with making operation CDE calls in support of a Combatant Command, workcenter CDE qualification will include theater specific targeting policies and ROE.

c. There are two types of CDE programs, both of which exist to enable an operational CDE capability:

(1) CDE Certification Program. CDE certification programs consist of academic and practical instruction based on the CDE Joint Mission Task List (JMTL). Certification programs can be thought of as CDE "schoolhouses." In order to be certified as a CDE analyst, students must complete the academic and practical portions of a certification program, and pass a comprehensive evaluation based on the JTS-maintained master question file with a minimum score of 80 percent.[14]

(2) CDE Qualification Program. CDE qualification programs are required in commands tasked with making operational CDE calls. A CDE qualification program takes a certified analyst and qualifies them to make operational CDE calls. When organizations are tasked with making operational CDE calls in support of a geographic Combatant Command, CDE analysts must be trained on theater-specific ROE, Special Instructions, etc.

[14] At the time of publishing, the following organizations have accredited CDE certification programs: JTS, USA, USAF, USN, USCENTCOM, USAFRICOM.

d. Operational CDE Capability. For purposes of this instruction, "operational CDE capability" is defined as the combination of the following components and their ability to operate as a whole (to include reachback capability) to produce collateral damage estimates: a collateral damage estimation methodology, training materials, proficiency development and maintenance procedures, work environment procedures and concept of operations, access to (and an ability to exploit) current imagery, and access to supporting intelligence and certified and qualified CDE analysts.

e. JTS will maintain a master list of accredited CDE programs. Any work those trained CDE analysts perform or will perform is backed by CJCSI 3160.01.

2. CDE Instructor Criteria

a. CDE Instructor. Instructors must be a graduate of CDE certification program with a score no less than 90 percent on the final evaluation. Additionally, instructors must complete an instructor certification program. CDE Instructors work in an approved CDE certification program and are authorized to teach the CDM to certify new CDE analysts.

b. CDE Standardization Instructor. Individuals scoring a minimum of 90 percent, with demonstrated expertise in the CDE process and weapons effects, followed by a period of instruction during which the instructor assists in teaching the certification program under the tutelage of a standardization instructor. Upon successful completion, a CDE Standardization Instructor is authorized to certify new instructors, as well as students. The CDE program manager maintains the Standardization Instructor criteria and is the authority to certify CDE Standardization Instructors. CDE program managers and standardization instructors will be identified to JS/J-26 in writing.

3. Proficiency and Currency

a. Commands providing direct support to Combatant Commands will provide opportunities (training or real-world) on a recurring basis for personnel assigned to a CDE billet or function in order to maintain their proficiency.

b. CDE analysts and instructors who do not perform collateral damage estimation for a period of twelve or more months must requalify. At a minimum, requalification follows the program as defined by the Service or Combatant Command CDE program manager.

4. CDE Standardization Process

a. To ensure the CDM is being taught consistently, the Joint Targeting School will utilize the following methods to ensure standardization across CDE programs:

(1) Annual Curriculum Review. A forum in which accredited CDE programs will compare programs, ensure standardization of CDM application, share best practices and lessons learned, and discuss potential improvements or adjustments to CDE certification and qualification programs. This review will take place once a year. Curriculum review can be conducted in person, via VTC, or virtually as needed.

(2) CDE Standardization Team. A team of individuals, formed and led by JTS responsible for conducting biennial CDE program reviews. The team shall consist of instructors from accredited CDE programs.

- JTS CDE SME (Active duty or DoD Civilian) Team Lead
- USAF- A/G SME
- USA- S/S SME
- USN- A/G SME

b. This team shall perform a standardization review and assessment of each accredited CDE certification program. This team will remain formed for the duration of the assessment. The JTS lead will release the team upon termination of the inspection once all associated tasks are complete and will ensure duration of team assignment has minimal impact. The results of the standardization review will be captured in writing, and distributed across all CDE programs to ensure standardization and consistent application of the CDM.

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APPENDIX H TO ENCLOSURE D

CDE JOINT MISSION TASK LIST (CDE-JMTL)

Understand the logic, composition, facts and assumptions of the Joint CDE Methodology (CDM).

Task 1.1: Describe why the U.S. Military requires a formal CDE Methodology to support Joint Military Operations.

Task 1.2: Describe combatant responsibilities within the framework of the Law of War.

Task 1.3: List and describe the Legal Imperatives underlying the logic of the CDM.

Task 1.4: Describe how the CDM assists commanders with their Law of War (LOW) requirement of "Distinction."

Task 1.5: Describe how the CDM assists commanders with their LOW requirement of "Necessity."

Task 1.6: Describe how the CDM assists commanders with their LOW requirement of "Proportionality."

Task 1.7: Detail the actions taken to address the Legal Imperatives of Necessity, Distinction, and Proportionality within each level of the CDM.

Task 1.8: Describe Command Responsibilities for the estimation and mitigation of Collateral Damage.

Task 1.9: Define the importance of the three Operational Imperatives of Mission, Force Protection and Collateral Damage within the framework of the CDM.

Task 1.10: Describe the role of the three Operational Imperatives on the commander's analysis of proportionality within the framework of the CDM.

Task 1.11: Explain how the Operational Imperatives of Mission, Force Protection and Collateral Damage are addressed and affected within each level of the CDM.

Task 1.12: Describe and explain the inter-relationship between the Legal and Operational Imperatives within the framework of the CDM.

Task 1.13: Describe how the CDM addresses the commanders analysis of proportionality and operational risk within the Joint Operations Planning Process (JOPP).

Task 1.14: Describe the two forms of Collateral Objects and explain why Senior U.S. Government Leadership is more concerned with one over the other and how this concern shapes the facts and assumptions surrounding the weaponeering logic employed within the CDM.

Task 1.15: Describe the types of weapon effects; the probabilities of damage/kill associated with each effect; and how the effects align with the Operational Imperatives.

Task 1.16: Describe and discuss the facts and assumptions associated with the three types of weapon effects.

Understand the legal requirements, basis, and importance of CDE to National and Senior Military Leadership.

Task 2.1: Explain the U.S. definition of Collateral Damage and describe the significance of this definition on how the U.S. Military conducts Collateral Damage Estimation (CDE).

Task 2.2: Explain the purpose of CDE and discuss its significance for U.S. military operations.

Task 2.3: Define Protected Persons/Objects and identify the documents that define them for a military operation.

Task 2.4: Describe the categories of Collateral Objects; the functions which are associated with each category and the significance of collateral categories within the CDE Methodology.

Task 2.5: Describe the No-Strike Policy and explain the responsibilities of Combatant Commanders and the National Intelligence Community in the No-Strike List (NSL) Development process.

Task 2.6: Describe and define the elements of an entity identifier considering the record identification system within the Modernized Integrated Database (MIDB).

Task 2.7: Define No-Strike entities, Restricted Targets, Dual Use Targets and Human Shields and explain their significance in Joint Targeting and CDE.

Task 2.8: Define the components of a Basic Encyclopedia (BE) Number and explain the significance of these components.

Task 2.9: Define the function and construct of a Category Code (CATCODE).

Task 2.10: Define the purpose and construct of an O-Suffix.

Task 2.11: Describe the difference between Lawful and Unlawful Collateral Damage.

Task 2.12: Explain why the National Government and Military is concerned with Collateral Damage.

Task 2.13: Define a Time-Sensitive Target and explain the CDE requirements surrounding the engagement of TSTs.

Task 2.14: Define Troops in Contact (TIC) and explain the CDE requirements relevant to the employment of force in a TIC situation.

Task 2.15: Define Joint Fires and explain which commanders are authorized to determine when a CDE Analysis is required prior to Tactical target engagements.

Task 2.16: Define command responsibilities designated within the Law of War and explain how these responsibilities are addressed within the CDE Methodology.

Task 2.17: Define the relationship and effect of the Law of War (LOW) and Rules of Engagement (ROE) on target categorization for a given operation.

Task 2.18: Describe the importance of No-Strike Object definition to the CDE process and its impact on military operations.

Task 2.19: Explain the difference between No-Strike List (NSL) Objects and Restricted Target List (RTL) Targets.

Task 2.20: Explain the rules regarding No-Strike Object treatment when located on military installations.

Task 2.21: Explain the rules and processes regarding targeting No-Strike Objects.

Task 2.22: Define a Dual-Use facility and describe the impact of Dual-Use designation on weapon's effects mitigation and collateral damage estimation.

Task 2.23: Describe the target functions normally associated with Dual-Use Targets.

Task 2.24: Explain how LOW protected facilities taken over by the enemy for the purpose of advancing military objectives are classified and treated within the JTC and CDE Methodology.

Task 2.25: Explain Command Responsibilities in relation to designating a target function as Dual-Use.

Task 2.26: Explain the importance of Rules of Engagement (ROE) to target planning and CDE.

Task 2.27: Define Human Shields and explain their importance and treatment within the CDE Methodology.

Task 2.28: Explain in which Collateral Object Category Human Shields are classified and describe the sensitivities surrounding them.

Task 2.29: Explain Command Responsibilities for the identification and treatment of Human Shields.

Task 2.30: Explain Command Responsibilities for making proportionality decisions and the factors which affect their decision making.

Task 2.31: Describe the National Values of the U.S. and explain the effect of these values on the employment of force in military operations.

Task 2.32: Discuss the importance of the conscientious application of force to Joint military operations (JMO)and how this impacts our implementation of CDE.

Task 2.33: Define the factors which impact Strategic Risk in the conduct of JMO.

Task 2.34: List and discuss the impact of excessive collateral effects on the analysis of Strategic Risk and the potential consequences of elevated Strategic Risk on the conduct of JMO.

Task 2.35: List and discuss the factors which drive the requirement to conduct CDE for individual target engagements for 21st Century Military Operations.

Task 2.36: Explain command responsibilities for risk management within the three operational imperatives.

Task 2.37: Describe how the CDE Methodology supports a commander's analysis and management of risk.

Task 2.38: Explain the relationship between increasing mitigation techniques and the operational imperatives and how this affects the commander's analysis of risk and proportionality in the conduct of JMO.

Task 2.39: Define when and explain the specific actions taken to address the Legal Imperatives within each CDE Level in the CDM.

Task 2.40: Explain how the outputs of the CDM assist commanders in the decision making process and describe Strike Approval Authority (SAA) considerations when making proportionality decisions.

Task 2.41: Define a Sensitive Target and explain the circumstances that may lead to a target being designated as Sensitive.

Understand the weaponeering and mitigation logic of the CDM, including, basic weaponeering principles, weapon's effects mechanisms, mitigation techniques, and how the relationship between terminal ballistic condition (TBC) and noncombatant posture (NCP) defines the dominant weapon's effects hazards within the CDM.

Task 4.1: Describe the operational causes of Collateral Damage.

Task 4.2: Identify and describe the factors that affect delivery accuracy.

Task 4.3: Identify the Five Primary Collateral Damage Effects of a conventional warhead and describe how these effects are measured.

Task 4.4: Identify the Five Elements of Accurate Predicted Fire and explain how
the CDE Reference Table framework addresses each of them.

Task 4.5: Explain the CDE Reference Table framework and define the Dominant Hazards within each CER or MTS Reference Table.

Task 4.6: Define and describe the five approved methods for mitigating collateral weapon's effects and explain why each meets the LOW Imperative of proportional.

Task 4.7: Define Positive Identification (PID), including the standards for the two components of PID.

Task 4.8: Describe the purpose and importance of the target facility outline.
Task 4.9: Define the components of a Collateral Effects Radius (CER) for a Unitary Weapon.

Task 4.10: Define the components of a CER for a Cluster/ICM Weapon.

Task 4.11: Define the components of Total Error 90% (TE90).

Task 4.12: Define Target Location Error (TLE); describe the elements which affect TLE and explain how TLE is computed.

Task 4.13: Explain the percentage of TLE accounted for in the Collateral Effects Radii (CER) and why this percentage is relevant in light of Law of War (LOW) requirements.

Task 4.14: Define the TLE90 values employed within the CER calculations and explain to which weapon class and/or method of engagement the values are associated.

Task 4.15: Define Circular Error Probable (CEP); describe the elements which affect CEP and explain how CEP is computed.

Task 4.16: Explain the percentage of Circular Error (CE) accounted for in the CERs and why this percentage is relevant in light of Law of War (LOW) requirements.

Task 4.17: Define the CE90 values employed within the CER calculations and explain how these values are derived based on the weapon class.

Task 4.18: Identify the forces which produce a ballistic trajectory and explain the impact of these forces on trajectory.

Task 4.19: Define and describe range and deflection error and the proportional relationship between them.

Task 4.20: Explain why weapons have a tendency to impact long of a target coordinate.

Task 4.21: Describe how TLE90 and CE90 are combined to form TE90.

Task 4.22: Describe how the CDM addresses the requirements of the Five Elements of Accurate Predicted Fire and the facts and assumptions employed in the development of the CERs.

Task 4.23: Define the components of a Minimum Target Size (MTS) value.
Task 4.24: Define the dominant hazard addressed by a MTS and the Reference Tables containing MTS values.

Task 4.25: Define the five primary collateral damage effects of a kinetic warhead and explain the chronological order in which they occur.

Task 4.26: Define the dominant hazard to standing exposed personnel.

Task 4.27: Define the dominant hazard to structures and the importance of this within CDE.

Task 4.28: Define the weapon effects threshold accounted for in the CERs within the CDM and the significance of this threshold in light of the requirements of the Law of War (LOW).

Task 4.29: Explain the standard weapon effects mitigations employed within each CDE Level and CDE Reference Table and the logic for the order in which the mitigations are applied.

Task 4.30: Describe and discuss the dominant components of a CER considering both the weapon class and CDE Level/Dominant Hazard.

Task 4.31: Discuss why polar fragmentation is not an authorized mitigation technique within the CDM.

Task 4.32: Define and discuss the five authorized mitigation techniques and which weapon effect each of the mitigation techniques is applicable.

Task 4.33: Describe why Delay Fuze is a primary mitigation technique within the CDM and explain which weapon effects are mitigated by this technique.

Task 4.34: Describe how and when VT Fuze can be employed and which weapon effects are mitigated by this technique.

Task 4.35: Explain why VT Fuze is a recommended mitigation technique for SSBM for targets located in an urban environment.

Task 4.36: Describe how and when Shielding can be employed and the weapon effects which are mitigated by this technique.

Task 4.37: Describe why Delivery Heading is a primary mitigation technique within the CDM and explain which weapon effects are mitigated by this technique.

Task 4.38: Explain the rules regarding the employment of a Delivery Heading restriction considering the CDE Level, Weapon Class, and nearby collateral concern types.

Task 4.39: Describe how and when Aimpoint Offset can be employed and which weapon effects are mitigated by this technique.

Task 4.40: Explain how Aimpoint Offset can affect casualty factor for casualty estimation.

Task 4.41: Describe the three mechanisms associated with a blast-frag warhead's lethality and discuss the importance of each for both lethality and collateral damage.

Understand the facts, assumptions, processes and data requirements to accomplish a CDE Level 1: Target Validation and Initial Analysis.

Task 5.1: Define PID, including the two components which enable PID.

Task 5.2: Describe the considerations for the development of a facility outline in
light of targeting principles and the CDE Legal and Operational Imperatives.

Task 5.3: Discuss the linkage between target functionality and ROE authorization.

Task 5.4: Identify the key elements of information required for annotation on a CDE Graphic in CDE Level 1.

Task 5.5: Define a Dual-Use Target and explain the rules regarding them in the CDE Methodology.

Task 5.6: Define the functionalities associated with CBR Plume targets and explain the rules associated with CBR Plume targets within the CDM.

Task 5.7: Define the five functionalities associated with Environmental Hazard targets and explain the rules associated with Environmental Hazard targets within the CDM.

Task 5.8: List the Agencies and identify the tools employed to conduct casualty estimation analysis on CBR Plume targets.

Task 5.9: List the Agencies and identify the tools employed to conduct casualty estimation analysis on Environmental Hazard targets.

Task 5.10: Discuss the steps within CDE Level 1 which are applicable to the first Basic CDE Question (Target Validation) and explain their significance to the logic of the CDE Methodology.

Task 5.11: Discuss the steps within CDE Level 1 which are applicable to the second Basic CDE Question (Initial Analysis) and explain their significance to the logic of the CDE Methodology.

Task 5.12: Define the Dominant Weapon Effects Hazard within the CDE 1 Collateral Effects Radius (CER) Reference Table and explain how the terminal ballistic condition (TBC) of the warhead compared to the Non-Combatant Posture dictates this Dominant Hazard.

Task 5.13: Describe from what point the CDE 1 CER is applied to form the CDE 1 Collateral Hazard Area (CHA).

Task 5.14: List the warhead/weapon exceptions (i.e. those not accounted for) within the CDE 1 CHA Analysis and explain why these warheads/weapons are omitted from the CDE 1 analysis.

Task 5.15: Define the limitations and exclusions that the CDE Methodology does not account for and explain why the CDM does not address these limitations and conclusions in light of the legal imperatives of proportionality and distinction.

Task 5.16: Describe how many CERs are contained in the CDE 1 CER Reference Table and discuss the logic surrounding this quantity of CERs.

Task 5.17: List the steps in CDE Level 1 which may cause termination of the CDE Analysis and explain why these steps are so critical to the conduct of a valid CDE Analysis.

Task 5.18: List the three steps in CDE 1 which may cause "mitigation failure" and lead to the conduct of a CDE Level 5 Casualty Estimate.

Task 5.19: Describe the sources of the munitions' technical data employed in the development of the CER and MTS Reference Tables and explain why these sources are important to the logic of the CDE Methodology.

Task 5.20: Produce an accurate CDE Level 1 Analysis.

Task 5.21: Identify the data elements and standards for the production of a CDE Level 1 Graphic.

Task 5.22: Identify the data-basing requirements for the completion of a CDE Level 1 Analysis.

Understand the facts, assumptions, processes and data requirements to accomplish a CDE Level 2: General/Target Size Analysis

Task 6.1: Define, in order, the CDE Levels which address the third Basic CDE Question (Mitigation) and explain how the order of the built-in mitigations affects the Operational Imperatives.

Task 6.2: Define the two different analysiss performed in CDE Level 2 and which weapon classes are associated with each analysis.

Task 6.3: Explain why CDE Level 2 is a decision point within the CDE Methodology and discuss the decision which must be made and the factors which affect this decision.

Task 6.4: Define the Dominant Weapon Effects Hazard within the CDE 2A Collateral Effects Radius (CER) Reference Table and explain how the terminal ballistic condition (TBC) of the warhead compared to the Non-Combatant Posture dictates this Dominant Hazard.

Task 6.5: Define the two CERs contained in the CDE 2A CER Reference Table and explain from which other table these CERs are taken.

Task 6.6: Define the weapon/warhead exceptions for a CDE 2 Low Analysis.

Task 6.7: Discuss the risk management logic for only allowing the PGM Weapon Class for a CDE 2 Low analysis.

Task 6.8: Explain the significance of target size for both Weaponeering for Mission and Collateral Damage when considering the employment of ballistic/un-guided munitions.

Task 6.9:Define and discuss the three processes for determining a target short side (TSS).

Task 6.10: Define the Dominant Weapon Effects Hazard within the CDE 2B/2C Minimum Target Size (MTS) Reference Tables and explain how this dominant hazard is derived.

Task 6.11:Explain the math rules within CDE Level 2 for both a PGM General Analysis and an ASUGM/SSBM MTS Analysis.

Task 6.12: Describe from what point the CDE 2A CER is applied to form a CDE Level 2 Collateral Hazard Area (CHA).

Task 6.13: Describe the geometry of a MTS and a TSS, and explain the rationale for their comparison.

Task 6.14: Define and Describe the key elements of information which are contained on a CDE Level 2 CDE Graphic.

Task 6.15: Explain the process for conducting a CDE 2 PGM General Analysis.

Task 6.16: Explain the process for conducting a CDE 2 ASUGM/SSBM MTS Analysis.

Task 6.17: Describe the actions taken if the CDE 2 ASUGM/MTS MTS Analysis is Feasible.

Task 6.18: Describe the actions taken if the CDE 2 ASUGM/SSBM Analysis is Unfeasible.

Task 6.19: Define a Nearest Collateral Concern (NCC) and explain the importance of the NCC in CDE.

Task 6.20: Define the math rule for the comparison of a CER to a NCC when performing a CDE Level 2 PGM General Analysis.

Task 6.21: Describe the mitigations employed within CDE Level 2 and how these mitigations affect the operational imperatives.

Task 6.22: Describe the format of a CDE Level 2 Low Analysis.

Task 6.23: Explain how the legal imperative of proportionality is addressed by a CDE Level 2 Low Analysis.

Task 6.24: Identify the data elements and standards for the production of a CDE Level 2 Graphic.

Task 6.25: Identify the data-basing requirements for the completion of a CDE Level 2 Analysis.

Understand the facts, assumptions, processes and data requirements to accomplish a CDE Level 3: Weaponeering Analysis.

Task 7.1: Describe why CDE Level 3 is named the Weaponeering Analysis.

Task 7.2: Explain the significance of weaponeering for desired military effects in light of the legal and operational imperatives.

Task 7.3:Identify the CER Reference Tables which support the CDE Level 3 Analysis and define which weapon class is associated with each CER Reference Table.

Task 7.4: Define the dominant weapons' effects hazards within the CDE 3A, 3B and 3C CER Reference Tables and explain the relationship between the warhead's terminal ballistic condition (TBC) versus noncombatant posture (NCP) associated with these dominant hazards.

Task 7.5: Describe the organization of and data elements required to identify an appropriate CER within the CDE 3A CER Reference Table.

Task 7.6: Describe the organization of and data elements required to identify an appropriate CER within the CDE 3B CER Reference Table.

Task 7.7: Describe the organization of and data elements required to identify an appropriate CER within the CDE 3C CER Reference Table.

Task 7.8: Define the TLE90s associated with the Observer Adjusted and Predicted Methods of Engagement for SSBM CDE Analysiss.

Task 7.9: Identify the Predicted Method of Engagement Aimpoint Standards for SSBM CDE Analysiss.

Task 7.10: Explain the math rules for conducting a CDE Level 3 Weaponeering Analysis.

Task 7.11: Describe from where a CDE 3A CER is applied to form a CDE Level 3 PGM Collateral Hazard Area (CHA).

Task 7.12: Describe from where a CDE 3B CER is applied to form a CDE Level 3 ASUGM, Single Warhead Delivery Collateral Hazard Area (CHA).

Task 7.13: Describe from where a CDE 3B CER is applied to form a CDE Level 3 ASUGM, Multiple Warhead Delivery Collateral Hazard Area (CHA).

Task 7.14: Describe from where a CDE 3C CER is applied to form a CDE Level 3 SSBM Collateral Hazard Area (CHA).

Task 7.15: Explain the process for performing a CDE Level 3 Weaponeering Analysis for PGM.

Task 7.16: Define the two methods of engagement for ASUGM and describe their significance to the CDE Level 3 Weaponeering Analysis Process.

Task 7.17: Explain the process for performing a CDE Level 3 Weaponeering Analysis for ASUGM, Single Warhead Delivery.

Task 7.18: Explain the process for performing a CDE Level 3 Weaponeering Analysis for ASUGM, Multiple Warhead Delivery.

Task 7.19: Define the two methods of engagement for SSBM and describe their significance to
the CDE Level 3 Weaponeering Analysis Process.

Task 7.20: Explain the process for performing a CDE Level 3 Weaponeering Analysis for SSBM with a Circular Sheaf.

Task 7.21: Explain the process for performing a CDE Level 3 Weaponeering Analysis for SSBM with a Linear Sheaf.

Task 7.22: Explain the process for performing a CDE Level 3 Weaponeering Analysis for SSBM with a Converged Sheaf.

Task 7.23: Explain how the method of engagement, employed in a CDE Level 3 SSBM Weaponeering Analysis addresses mitigation in light of the Five Elements of Accurate
Predicted Fire.

Task 7.24: Explain the importance of delivery heading for a CDE Level 3, ASUGM, Multiple Warhead Delivery Weaponeering Analysis.

Task 7.25: Describe the format of a CDE Level 3 PGM Weaponeering Analysis.

Task 7.26: Describe the format of a CDE Level 3 ASUGM, Single Warhead Delivery Weaponeering Analysis.

Task 7.27: Describe the format of a CDE Level 3 ASUGM, Multiple Warhead Delivery Weaponeering Analysis.

Task 7.28: Describe the format of a CDE Level 3 SSBM Weaponeering Analysis.

Task 7.29: Explain how the legal imperative of proportionality is addressed by a CDE Level 3 Low Analysis.

Task 7.30: Identify the data elements and standards for the production of a CDE Level 3 Graphic, when the target facility is estimated as CDE 3 Low.

Task 7.31: Identify the data-basing requirements for the completion of a CDE Level 3 Analysis.

Understand the facts, assumptions, processes and data requirements to accomplish a CDE Level 4: Refined Analysis.

Task 8.1: Describe why CDE Level 4 is named the Refined Analysis.

Task 8.2: Identify the CER Reference Tables used to support the CDE Level 4 Analysis and define which weapon class is associated with each CER Reference Table.

Task 8.3: Define the dominant weapons' effects hazards addressed within the CDE 4A, 4B and 4C CER Reference Tables.

Task 8.4: Identify the weaponeering restrictions / limitations imposed on PGM employment within the CDE Level 4 Refined Analysis and explain the rationale for these restrictions.

Task 8.5: Identify the weaponeering restrictions / limitations imposed on ASUGM employment within the CDE Level 4 Refined Analysis and explain the rationale for these restrictions.

Task 8.6: Explain why ASUGM is "highly discouraged" from use against targets requiring a CDE Level 4 Refined Analysis.

Task 8.7: Explain why VT/Proximity Fuzing is preferred for SSBM in CDE Level 4.

Task 8.8: Identify the weaponeering restrictions / limitations imposed on SSBM employment within the CDE Level 4 Refined Analysis and explain the rationale for these restrictions.

Task 8.9: Describe the organization of and data elements required to identify an appropriate CER within the CDE 4A CER Reference Table.

Task 8.10: Describe the organization of and data elements required to identify an appropriate CER within the CDE 4B CER Reference Table.
Task 8.11: Describe the organization of and data elements required to identify an appropriate CER within the CDE 4C CER Reference Table.
Task 8.12: Explain the math rules for conducting a CDE Level 4 Refined Analysis.

Task 8.12: Describe from where a CDE 4A CER is applied to form a CDE Level 4 PGM Collateral Hazard Area (CHA).

Task 8.13: Describe from where a CDE 4B CER is applied to form a CDE Level 4 ASUGM, Single Warhead Delivery Collateral Hazard Area (CHA).

Task 8.14: Describe from where a CDE 4B CER is applied to form a CDE Level 4 ASUGM, Multiple Warhead Delivery Collateral Hazard Area (CHA).

Task 8.15: Describe from where a CDE 4C CER is applied to form a CDE Level 4 SSBM Collateral Hazard Area (CHA).

Task 8.16: Explain the process for performing a CDE Level 4 Refined Analysis for PGM.

Task 8.17: Explain the importance of the Nearest Collateral Concern (NCC) Structure Type for the conduct of a CDE 4 PGM Refined Analysis.

Task 8.18: Define the two methods of engagement for ASUGM and describe their significance to the CDE Level 4 Refined Analysis Process.

Task 8.19: Explain the process for performing a CDE Level 4 Refined Analysis for ASUGM, Single Warhead Delivery.

Task 8.20: Explain the process for performing a CDE Level 4 Refined Analysis for ASUGM, Multiple Warhead Delivery.

Task 8.21: Explain the weaponeering facts for SSBM which allow the conduct of a CDE Level 4 SSBM Refined Analysis without two forms of mitigation.

Task 8.22: Define the two methods of engagement for SSBM and describe their significance to the CDE Level 4 Refined Analysis Process.

Task 8.23: Explain the process for performing a CDE Level 4 Refined Analysis for SSBM with a Circular Sheaf.

Task 8.24: Explain the process for performing a CDE Level 4 Refined Analysis for SSBM with a Linear Sheaf.

Task 8.25: Explain the process for performing a CDE Level 4 Refined Analysis for SSBM with a Converged Sheaf.

Task 8.26: Explain how the method of engagement, employed in a CDE Level 4 SSBM Weaponeering Analysis addresses mitigation in light of the Five Elements of Accurate Predicted Fire.

Task 8.27: Describe the Heading rules for a PGM or ASUGM, Single Warhead Delivery Analysis for a CDE Level 4 Refined Analysis on a Simple Target Facility.

Task 8.28: Describe the Heading rules for a PGM or ASUGM, Single Warhead Delivery Analysis for a CDE Level 4 Refined Analysis on a Complex Target Facility.

Task 8.29: Explain the importance of delivery heading for a CDE Level 4, ASUGM, Multiple Warhead Delivery Refined Analysis.

Task 8.30: Describe the format of a CDE Level 4 PGM Refined Analysis.

Task 8.31: Describe the format of a CDE Level 4 ASUGM, Single Warhead Delivery Refined Analysis.

Task 8.32: Describe the format of a CDE Level 4 ASUGM, Multiple Warhead Delivery Refined Analysis.

Task 8.33: Describe the format of a CDE Level 4 SSBM Refined Analysis.

Task 8.34: Explain how the legal imperative of proportionality is addressed by a CDE Level 4 Low Analysis.

Task 8.35: Identify the data elements and standards for the production of a CDE Level 4 Graphic, when the target facility is estimated as CDE 4 Low.

Task 8.36: Identify the data-basing requirements for the completion of a CDE Level 4 Refined Analysis.

Understand the facts, assumptions, processes and data requirements to accomplish a CDE Level 5: Casualty Estimate / Analysis

Task 9.1: List the Agencies and tools, and describe the process for conducting a casualty estimate on an Environmental Hazard Target.

Task 9.2: Explain how the output of an Environmental Hazard Target is included in the Target's Casualty Estimate.

Task 9.3: Define an Affected Collateral Concern.

Task 9.4: Given weapon class, weaponeering, mitigation and NCP, determine and apply correct CER value, and define associated dominant hazard(s).

Task 9.5: Describe the purpose of the CDE 5 Casualty Estimation (CE) Worksheet and define the construct and data fields contained within it.

Task 9.6: Explain the significance of an Affected CCs function for casualty estimation.

Task 9.7: Describe the process and math rule for determining the total area (square feet) of an Affected CC.

Task 9.8: Explain the rules and process for determining the percent affected for an Affected CC.

Task 9.9: Describe and discuss the rules for Shielding when conducting a Casualty Estimate and explain how Shielding is accounted for in the CDE 5 CE Worksheet.

Task 9.10: Describe the process and math rule for determining the affected area (square feet) of an Affected CC.

Task 9.11: Describe the purpose of the CDE 5 Population Density Reference Table and define the construct and data fields contained within it.

Task 9.12: Explain Combatant Command responsibilities for the development and maintenance of the CDE 5 Population Density Reference Table.

Task 9.13: Define how "socialized cultural norms" may affect the timeframes of day and night for Casualty Estimation.

Task 9.14: Define "episodic events" for casualty estimation.

Task 9.15: Define the relationship between an Affected CCs function and its population density for casualty estimation.

Task 9.16: Define a Casualty Factor (CF) and explain its purpose for Casualty Estimation.

Task 9.17: Determine correct CF, given target classification ("dual use" or "not dual-use" and the type and location of collateral concerns with respect to the inner and outer annulus.

Task 9.18: Describe the process and math rule for computing an Affected CC Casualty Estimate.

Task 9.19: Describe the process and math rule for computing a Target Facility's Total Casualty
Estimate.

Task 9.20: Define a Non-Combatant Casualty Cut-Off Value (NCV) and explain its significance and use within the CDM.

Task 9.21:Explain the process and math rules for comparing CE versus NCV and completing a CDE 5 Casualty Estimate.

Task 9.22: Define restriction statements and explain its significance, use and effect on a Collateral Damage Estimate.

Task 9.23: Describe the format of a CDE Level 5, PGM Aimpoint Analysis.

Task 9.24:Describe the format of a CDE Level 5, ASUGM, Single Warhead Delivery Aimpoint Analysis.

Task 9.25: Describe the format of a CDE Level 5, ASUGM, Multiple Warhead Delivery Engagement Zone Analysis.

Task 9.26: Describe the format of a CDE Level 5, SSBM Sheaf Analysis.

Task 9.27: Describe the additional data elements included in a Target Facility CDE Analysis which are not contained within an aimpoint, EZ, or sheaf CDE Analysis.

Task 9.28: Identify, in order, the Aimpoint, EZ or Sheaf promotion rules under the "Most Restrictive" criteria and discuss the logic for the prescribed order in relationship to the Operational Imperatives.

Task 9.29: Identify, in order, the Aimpoint, EZ or Sheaf promotion rules under the "Most Dangerous" criteria and discuss the logic for the prescribed order in relationship to the Operational Imperatives.

Task 9.30: Discuss the purpose of Aimpoint, EZ or Sheaf promotion for determining the Target Facility CDE Level Analysis.

Task 9.31: Explain what, if any, changes occur to the individual Aimpoint, EZ or Sheaf CDE Analysis when the Target Facility CDE Level Analysis is CDE 2, 3 or 4 Low.

Task 9.32: Explain what, if any, changes occur to the individual Aimpoint, EZ or Sheaf CDE Analysis when the Target Facility CDE Level Analysis is CDE 5 Low.

Task 9.33: Explain what, if any, changes occur to the individual Aimpoint, EZ or Sheaf CDE Analysis when the Target Facility CDE Level Analysis is CDE 5 High.

Task 9.34: Explain how the legal imperative of proportionality is addressed by a CDE Level 5 Low and a CDE Level 5 High Analysis.

Task 9.35: Identify the data elements and standards for the production of a CDE Level 5 Graphic, when the target facility is estimated as CDE 5 Low or CDE 5 High.

Task 9.36: Identify the data-basing requirements for the completion of a CDE Level 5 Casualty Analysis.

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ENCLOSURE E

REFERENCES AND RELATED PUBLICATIONS

PART I -- REFERENCES

a. CJCSI 3122.06 series, "Sensitive Target Approval and Review (STAR) Process (U)"

b. Joint Publication 3-0, 22 March 2010, "Joint Operations"

c. DoD Directive 2311.01E, 9 May 2006 (incorporating Change 1, dated 15 November 2010 and certified current as of 22 February 2011), "DoD Law of War Program"

d. CJCSI 5810.01 series, "Implementation of the DoD Law of War Program"

e. Defense Intelligence Report, DI-2820-2-03, 12 March 2003 (current as of 3 January 2006), "Battle Damage Analysis Reference Handbook"

f. Joint Publication 3-60, 13 April 2007, "Joint Targeting"

g. DIA MIDB Category Code Handbook, July 2011

h. DIA Defense Intelligence Reference Document DDB-2600-725-89, June 1989, "Point Reference Guide Book (U)"

i. DIA Instruction 3000.002, 15 July 2008, "U.S./Allied Targeting Analysis Program"

PART II -- RELATED PUBLICATIONS

CJCSI 3110.01 series, "Joint Strategic Capabilities Plan (U)"

General Defense Intelligence Program Directive No. 006, 31 October 2005, "Defense Intelligence Analysis Program"

JTCG/ME Publication, 61 JTCG/ME-05-4, 29 September 2008, "Collateral Damage Estimation (CDE) Table Development (U)", 29 September 2008

Title 10, U.S.C., section 153, "Chairman's Functions"

DoD Directive 5100.1, 21 December 2010, "Functions of the Department of Defense and Its Major Components"

DoD Directive 5105.21, 18 March 2008, "Defense Intelligence Agency (DIA)"

CJCSI 3370.01, "Target Development Standards"

GLOSSARY

PART I -- ABBREVIATIONS AND ACRONYMS

AOR	area of responsibility
ASUGM	air-to-surface unguided munition
BE	basic encyclopedia
BEN	basic encyclopedia number
BMNT	begin morning nautical twilight
CATCODE	category code
CBR	chemical, biological, and radiological
CCDR	Combatant Commander
CDA	collateral damage assessment
CDE	collateral damage estimation
CDE-G	collateral damage estimate-graphic
CDM	collateral damage estimation methodology
CE	casualty estimation
CE90	circular error (90 percent probability)
CER	collateral effects radius/radii)
CHA	collateral hazard area
CHAMP	Chemical Hazard Area Modeling Program
CJCSI	Chairman of the Joint Chiefs of Staff instruction
CIB®	controlled image base®
CSA	combat support agency
DoD	Department of Defense
DIA	Defense Intelligence Agency
DIAP	Defense Intelligence Analysis Program
DTRA	Defense Threat Reduction Agency
EENT	end evening nautical twilight
ETL	Electrical transmission line
EZ	engagement zone
FO	facility outline
GCCS	Global Command and Control System
GPS	Global Positioning System
HPAC	hazard prediction assessment capability
IAW	in accordance with
IC	intelligence community
ICM	improved conventional munitions
J-26	Joint Staff Intelligence, Deputy Director for Targets
JCPS	Joint Collateral Damage Estimation Program Standards
JCS	Joint Chiefs of Staff
JFC	Joint Force Commander
JIACG	Joint interagency coordination group
JSCP	joint strategic capabilities plan

JTCG/ME	Joint Technical Coordinating Group for Munitions Effectiveness
JTF	joint task force
JTL	joint target list
JTT	Joint Targeting Toolbox
JTS	Joint Targeting School
LOAC	law of armed conflict
LOW	law of war
MIDB	modernized integrated database
MTS	minimum target size
NAI	named area of interest
NCMI	National Center for Medical Intelligence
NCV	noncombatant and civilian casualty cutoff value
NOM-DCR	nomination-database change request
NSE	No-Strike entity
NSF	No-Strike facility
NSL	No-Strike list
OA	observer adjusted
OPORD	operation order
PGM	precision-guided munition
PID	positive identification
POL	pattern of life
RAC	responsible analytic center
RAP	rocket assisted projectile
RESPROD	responsible producer
RTL	restricted target list
ROE	rules of engagement
SecDef	Secretary of Defense
SIPRNET	Secret Internet Protocol Router Network
SSBM	surface-to-surface ballistic munition
STAR	sensitive target approval and review
TAO	target area outline
TE90	total error 90
TLE	target location error
TLE90	target location error (90 percentile)
TST	time-sensitive target
VT	variable time (fuze)

PART II -- TERMS AND DEFINITIONS

NOTE: Unless otherwise stated, the terms and definitions contained in this glossary are for the purposes of this instruction only.

additional damage. Unintentional or incidental injury or damage to combatant persons or objects that would be lawful military targets in the circumstances ruling at the time.

ballistic munition. A munition that does not rely upon aerodynamic surfaces to produce lift and consequently follows a ballistic trajectory when thrust is terminated.

ballistic trajectory. The trajectory traced after the propulsive force is terminated and the body is acted upon only by gravity and aerodynamic drag.

casualty. Any person who is lost to the organization by having been declared dead, duty status-whereabouts unknown, missing, ill, or injured. (JP 1-02. Source: JP 4-02)

casualty estimate. The estimated total number of noncombatant and civilian casualties that result from military operations executed on a given target. Also called CE.

casualty factor. A number (either 1.0 or .25) that represents the fraction of personnel inside a collateral structure or outside in an outdoor area likely to become casualties.

civilian. A person who is not a member of the military and who is not taking a direct part in hostilities against a party to the conflict in an armed conflict.

collateral concern. A collateral object located inside the collateral hazard area.

collateral damage. Unintentional or incidental injury or damage to persons or objects that would not be lawful military targets in the circumstances ruling at the time. Also called CD. (JP 1-02. Source: JP 3-60)

collateral damage analysis. The examination or evaluation of relations between targets, target engagement options and no-strike entities (NSE) to estimate or assess collateral damage.

Collateral Damage Estimate. An approximate calculation of potential collateral damage derived through analysis prior to target engagement.

Collateral Damage Estimation (CDE). The holistic process of determining the potential for collateral damage resulting from target engagement.

Collateral Damage Estimation (CDE) Methodology (CDM). A body of joint standards, methods, techniques and processes to conduct collateral damage analysis and produce collateral damage estimates.

Collateral Damage Assessment (CDA). An analytical judgment derived by determining the amount and effects of collateral damage post target engagement.

collateral damage estimation/casualty estimation high. The calculated level of concern exceeds a specified level of risk to civilian and/or noncombatant personnel, facilities and/or environment around the target. Also called CDE/CE high.

collateral damage estimation/casualty estimation low. The calculated level of concern is below a specified level of risk to civilian and/or noncombatant personnel, facilities and/or environment around the target. Also called CDE/CE low.

collateral effects radius/radii. A radius representing the largest collateral hazard distance for a given warhead, weapon, or weapon class considering predetermined, acceptable collateral damage thresholds that are established for each CDE level. Also known as CER. (Formerly known as Effective Miss Distance or EMD)

collateral hazard area. An area formed by measuring a CER from either the edge of a target facility outline, the aimpoint for a point target, or the edge of an engagement zone or artillery sheaf for an area target. Also called CHA.

collateral object. Civilian and noncombatant buildings, structures, vehicles, and material that do not support the activities and/or functions of the enemy's military or fighting capability.

cyberspace. A global domain within the information environment consisting of the interdependent network of information technology infrastructures, including the Internet, telecommunications networks, computer systems, and embedded processors and controllers (JP 1-02. SOURCE: CJCS CM-0363-08).

dual-use. Targets characterized as having both a military and civilian purpose/function.

enemy combatant. In general, a person engaged in hostilities against the United States or its coalition partners during an armed conflict. Also called EC. (JP 1-02. SOURCE: DODD 2310.1E) environmental hazard analysis.

Analysis of significant human health implications resulting from exposure to contaminated air, water, and/or soil caused by collateral damage.

Intelligence Community (IC). Elements of any department or agency as may be designated by the President, or designated jointly by the Director of National Intelligence and the head of the department or agency concerned, as an element of the IC. (Public Law 108-458, section 1073)

intergovernmental organization. An organization created by a formal agreement between two or more governments on a global, regional, or functional basis to protect and promote national interests shared by member states. Also called IGO. (JP 1-02. SOURCE: JP 3-08)

joint interagency coordination group. A staff group that establishes regular, timely, and collaborative working relationships between civilian and military operational planners. Also called JIACG. (JP 1-02. SOURCE: 3-08)

joint target list. A consolidated list of selected targets, upon which there are no restrictions placed, considered to have military significance in the joint force commander's operational area. Also called the JTL. (JP 1-02. SOURCE: JP 3-60)

lawful enemy combatant. Those combatants, who abide by the laws of war and who are entitled to protections under the Geneva Conventions.

Modernized Integrated Database. The national-level repository for the general military intelligence available to the entire Department of Defense Intelligence Information System community and, through Global Command and Control System integrated imagery and intelligence, to tactical units. This data is maintained and updated by the Defense Intelligence Agency. Commands and Services are delegated responsibility to maintain their portion of the database. Also called MIDB. (JP 1-02. Source: JP 3-13.1)

named areas of interest. The geospatial area or systems node or link against which information that will satisfy a specific information requirement can be collected. Also called NAI. (JP 1-02. SOURCE: JP 2-01.3)

noncombatant. Military medical personnel, chaplains, and those out of combat, including prisoners of war and the wounded, sick, and shipwrecked.

noncombatant and civilian casualty cut-off value. The casualty threshold for any anticipated effects, which if exceeded, would require the CCMD to forward a target to the Secretary of Defense or President for national-level review as a sensitive target unless delegated otherwise according to the established rules of engagement. Also called NCV.

nongovernmental organization. A private, self-governing, not-for-profit organization dedicated to alleviating human suffering; and/or promoting education, health care, economic development, environmental protection, human rights, and conflict resolution; and/or encouraging establishment of democratic institutions and civil society. (JP 1-02. SOURCE: JP 3-08))

No-Strike entities. Physical and virtual objects defined by the laws of war which are functionally characterized as civilian and/or noncombatant in nature and, therefore are protected from the effects of military operations under international law and/or rules of engagement.

No-Strike process. A process used to identify, analyze, verify, catalog, and disseminate information about entities that are to be protected from negative effects of military operations.

No-Strike list. A list of objects or entities characterized as protected from the effects of military operations under international law and/or rules of engagement. (JP 1-02. SOURCE: JP 3-60)

positive identification. For purposes of this instruction, "positive identification" is defined as the reasonable certainty that a functionally and geospatially defined object of attack is a legitimate military target in accordance with the LOW and applicable ROE. Also called PID.

precision-guided munition. A weapon that uses a seeker to detect electromagnetic energy reflected from a target or reference point and, through processing, provides guidance commands to a control system that guides the weapon to the target. Also called PGM. (JP 1-02. SOURCE: JP 3-09.1)

responsible analytic center. The intelligence organization that has responsibility for specified topic(s) and/or issue(s) under the Defense Intelligence Analysis Program. Also known as RAC.

restricted target. A valid target that has specific restrictions placed on the actions authorized against it due to operational considerations. (JP 1-02. SOURCE: JP 3-60).

restricted target list. A list of restricted targets nominated by elements of the joint force and approved by the joint force commander. Also called RTL. (JP 1-02. SOURCE: JP 3-60).

rules of engagement. Directives issued by competent military authority that delineate the circumstances and limitations under which United States forces

will initiate and/or continue combat engagement with other forces encountered. Also called ROE. (JP 1-02. SOURCE: JP 1-04)

sensitive target. Those targets for which planned actions warrant the Secretary of Defense or President of the United States' review and approval.

serious injury. Incapacitation that will require personnel with wounds to receive treatment at a medical facility. This criterion is only used for risk and collateral damage estimates; it has no post-wounding time or tactical role associated with it.

target. 1. An entity or object considered for possible engagement or other action. 2. In intelligence usage, a country, area, installation, agency, or person against which intelligence operations are directed. 3. An area designated and numbered for future firing. 4. In gunfire support usage, an impact burst that hits the target. (JP 1-02. SOUCE: J P 3-60)

target location error. The difference between the coordinates generated for a target and the actual location of the target. Also called **TLE**. (JP 1-02. SOURCE: JP 3-09.3)

time-sensitive target. A JFC-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. Also called TST. (JP 1-02. SOURCE: JP 3-60).

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