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Analysis of Policy and Doctrine Supporting the Management of Operational Exposures to Ionizing Radiation

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Executive Summary

In 2014, the U.S. Army Office of the Surgeon General (OTSG) asked the Institute for Defense Analyses (IDA) to "review current DOD policies and doctrine on the medical management of radiological or nuclear casualties and operational exposure to ionizing radiation."[1] This document includes a review of policy at the Department of Defense, Chairman of the Joint Chiefs of Staff, and Service levels, as well as doctrine at the Joint Staff and Service levels. Policy supporting the management of operational exposures to ionizing radiation is somewhat fragmented, with the exception of the U.S. Air Force, which combines all policy related to ionizing radiation, regardless of location, into a single policy document. Doctrine for managing operational exposures to ionizing radiation is well established in Joint Publication 3-11. Doctrine for the management of radiation and nuclear casualties is contained in Army Techniques Publication (ATP) 4-02.83, *Multiservice Tactics, Techniques, and Procedures for Treatment of Nuclear and Radiological Casualties*; however, the academic nature of this document limits its applicability to the management of the individual patient.

[1] Project Order CA-6-3079 Amendment 6, CBRN Casualty Estimation and Support to the Medical CBRN Defense Planning & Response Project, signed 23 September 2014, Subproject 5, p. 4.

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Contents

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1. Introduction

A. Background and Objective

In 2014, the U.S. Army Office of the Surgeon General (OTSG) asked the Institute for Defense Analyses (IDA) to "review current DOD policies and doctrine on the medical management of radiological or nuclear casualties and operational exposure to ionizing radiation."[2] This study reviews and assesses current policy and doctrine within the Department of Defense (DOD) for managing operational exposures to ionizing radiation. It also reviews doctrine for the treatment and management of nuclear and radiation casualties.

B. Scope

This analysis is a quick look at existing doctrine and policy for the management of operational exposures to ionizing radiation and the treatment and management of casualties. As such, it concentrates on management in the operational setting, although it includes both administrative (garrison) and operational scenarios. The assessment addresses responsibilities, authorities, and, where available, techniques for managing operational exposures and for the treatment and management[3] of nuclear and radiation casualties.

This assessment concentrates on responsibilities within the Department of Defense. Where appropriate, it touches on recommendations at the national and international levels.

C. Document Organization

This document is organized by a general discussion of radiological doctrine and policy, background on existing doctrine and policy, and a discussion and analysis of policy at the DOD, Joint, and Service levels. It concludes with recommendations for changes to policy and doctrine.

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[2] Project Order CA-6-3079 Amendment 6, CBRN Casualty Estimation and Support to the Medical CBRN Defense Planning & Response Project, signed 23 September 2014, Subproject 5, p. 4.

[3] Patient management normally includes triage, assessment, treatment, and hospitalization of patients as necessary and is a more holistic term than treatment.

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2. Overview

A. General

Military forces have the potential to operate in a Chemical, Biological, Radiological, or Nuclear (CBRN) environment, including operations in a radiologically contaminated area as the result of a terrorist dispersion of radioactive material, nuclear accident, or nuclear detonation. Military doctrine traditionally addressed operations in a post-detonation nuclear environment, where commanders largely considered near to midterm health effects on their mission accomplishment and might have to accept significant risk of long-term health effects. Civilian occupational health standards apply to occupational ionizing radiation exposures, such as routine diagnostic radiography or industrial use of radioactive sources. Operational exposures are generally radiation exposures in the course of military operations that may, for the period of the operation, exceed occupational health standards that consider both short-term and lifetime exposure

The 2011 U.S. response to an earthquake and subsequent tsunami in Japan included operations in response to a nuclear reactor accident in Fukushima. The hazard area included uniformed and civilian support personnel, as well as uniformed and civilian permanent parties and their dependents. An after-action review performed by the U.S. Army Surgeon General's office with participation from the other Services found uncertainty in the doctrine for emergency response, Service differences in risk assessments, and challenges in establishing "safe" levels for radioactive material in the air, water, and food.[4] The participants in this after-action generally felt that neither peacetime occupational standards nor the generally higher, short term Operational Exposure Guidelines (OEGs) levels discussed later in this paper truly applied in this operation.

B. Background

Policy within the DOD is hierarchical. Department of Defense Directives (DODD) and Department of Defense Instructions (DODI) establish policy at and across the department and generally apply to all DOD components.[5] Chairman of the Joint Chiefs of Staff Instructions (CJCSI) and Manuals (CJCSM) establish policies, procedures, and guidance not containing joint doctrine or concerning employment of forces in joint operations and apply to the Joint Staff, Defense Agencies, Services, and Combatant

[4] "Operation Tomadachi: After Action Review-Medical Issues and Recommendations", U.S. Army Surgeon General, July 29-30, 2011.

[5] Department of Defense Directive (DODD) 5025.01, *DOD Issuances Program*, (Washington, DC: DOD, October, 2014).

Commands.[6] The Services and Military Departments typically implement DOD policy through regulations and instructions, such as Army Regulations or Air Force Instructions.

Doctrine can be Joint, multi-service, or Service-specific. Doctrine generally describes how to perform a function. Joint Publications describe how a Joint Force commander should plan, employ forces, and execute a Joint mission. Multi-service and Service-specific publications address tactics, techniques, and procedures for performing a function or set of functions.

C. Policy Guidance

Within DOD, policy documents at all levels address ionizing radiation safety to varying degrees and at different dispositions in the operational spectrum from the home station to the forward deployed force location. No single policy document establishes a holistic, DOD-wide radiation safety program or provides operational exposure guidance.

DODD 4715.1E addresses Environment, Safety, and Occupational Health (ESOH) and establishes that it is DOD policy to manage and apply the DOD's installation assets to sustain the DOD national defense mission and to use ESOH management systems in mission planning and execution across all military operations and activities, including acquisition, procurement, logistics, and facility management.[7]

The principles of occupational and environmental health (OEH) established in DODI 6055.05 apply within and outside the United States, including contingency operations, although statutory requirements applied by this instruction generally apply only within the United States. The instruction requires OEH risk assessments at all permanent and semi-permanent base camps or bed-down sites and risk management activities for deployment-specific health threats. It requires consideration, at a minimum, of health hazards from "infectious diseases; hazardous animals and plants; environmental factors (such as toxic industrial chemicals or materials, historical contamination, weapons of mass destruction, waste, or pollution in food, air, soil, or water); occupational health hazards such as hazardous chemicals or noise; chemical, physical, or biological agents; and any specific health hazards or threats identified in planning orders and intelligence-based reporting." The DODI further requires compliance with the requirements of part 20 of Title 10, Code of Federal Regulations for records of occupational exposure to NRC-regulated and other sources of radiation.[8]

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[6] Chairman of the Joint Chiefs of Staff Manual (CJCSM) 5701.01E, *Formats and Procedures for Development of CJCS, JS, and J-Directorate Directives*, (Washington, DC: CJCS: September, 2011).

[7] Department of Defense Directive (DODD) 4715.1E, *Environment, Safety, and Occupational Health (ESOH)*, (Washington, DC: DOD, March, 2005).

[8] Department of Defense Instruction (DODI) 6055.05, *Occupational and Environmental Health (OEH)* (Washington, DC: DOD, November, 2008).

DODI 6490.03 implements policies and prescribes procedures for deployment health activities to monitor, assess, and prevent Disease and Injury (DI) to control or reduce Occupational and Environmental Health (OEH) risks; to document and link OEH exposures with deployed personnel, including exposures to chemical, biological, radiological, and nuclear (CBRN) warfare agents; and to record the daily locations of deployed personnel. This instruction is largely focused on identifying, monitoring, and recording potential exposures for post-deployment use, and performing health risk management.[9] This instruction does not require that the information collected be immediately available to operational commanders, or that it be in a form useful to operational commanders to assist in making risk-based decisions.

DODI 6055.08 governs the Occupational Ionizing Radiation Protection Program. It establishes policy and updates requirements for the occupational ionizing radiation protection program for the Department of Defense in DOD workplaces, including military operations and deployments, and establishes a DOD Ionizing Radiation Working Group. It specifically does not apply to personnel exposed to ionizing radiation as a result of nuclear war or personnel engaged in military operations where an alternate standard has been implemented under North Atlantic Treaty Organization (NATO) or Military Service doctrine. It defines an occupational dose as a "dose received by an individual in the course of employment in which the individual's assigned duties involve exposure to ionizing radiation or to radioactive material", and establishes policy to maintain occupational and environmental exposures to a level as low as reasonably achievable (ALARA). It further provides for dosimetry and/or bioassays for various individuals, including those who may be exposed in the course of wartime or emergency operations where monitoring will be useful in preventive measures, treatment, or future inquiries.[10]

DODI 6055.01 establishes the DOD Safety and Occupational Health Program. Notably, it states that uniquely military equipment, systems, operations, or workplaces are excluded from federal standards distributed by OSHA, but DOD components must apply OSHA and other regulatory safety and health standards in whole or in part as practicable. Where standards are inappropriate, infeasible, or nonexistent for the military application, DOD Components must apply risk-management procedures.[11]

Army Regulation 385-10, The Army Safety Program, establishes overall policy for radiation safety within the Army. As an overall policy, exposure will be as low as

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[9] Department of Defense Instruction (DODI) 6490.03, *Deployment Health)* (Washington, DC: DOD, September 30, 2011).

[10] Department of Defense Instruction (DODI) 6055.08, *Occupational Ionizing Radiation Protection Program* (Washington, DC: DOD, December 15, 2009).

[11] Department of Defense Instruction (DODI) 6055.01, *DOD Safety and Occupational Health (SOH) Program* (Washington, DC: DOD, October, 2014).

reasonably achievable, operational exposure guidance may be used in a deployed setting, and military-unique dosimeters may be used during deployment operations.[12] Technical requirements are generally found in Department of the Army Pamphlet 385-25, except for (among others) personnel exposed to ionizing radiation as a result of nuclear war; or as a result of combat, peacekeeping, or peacemaking operations for which an alternate ionizing radiation protection standard is implemented in accordance with NATO or Military Service doctrine.[13] These standards generally allow for a greater, short term exposure as a function of mission importance and are discussed more in conjunction with the Air Force and in the doctrine section below.

Army Regulation 11-35 defines the Army Deployment Occupational and Environmental Health Risk Management (DOEHRM) Program. It specifically establishes that it is Army policy to protect Army personnel from potential and actual exposures to chemical, biological, radiological, nuclear, and high-yield explosives (CBRNE) warfare agents; endemic communicable diseases; food-, water-, and vector-borne diseases; ionizing and non-ionizing radiation; combat and operational stress; heat, cold, and altitude extremes; environmental and occupational hazards; toxic industrial chemicals and materials (TICs/TIMs); and other physical agents. It requires the use of the composite risk management (CRM) process to reduce potential and actual exposures from occupational and environmental hazards encountered during military operations to as low as practicable to minimize acute, chronic, and delayed health effects within the context of mission parameters. It mandates compliance with Federal, State, local, or host nation statutes and regulation governing OEH in garrison and training exercises, except for uniquely military applications, and extends that requirement to deployed operations with command authority to modify as appropriate. It requires CRM decisions that alter peacetime health standards to be made by the brigade commander or above and to be documented and archived. It allows decisions to be published in operational plans and orders, but requires reevaluation as mission parameters change. This regulation also codifies reporting requirements for potential operational exposures and unit locations for post-deployment assessment.[14]

Office of the Chief of Naval Operations (OPNAV) Instruction 6470.2C establishes an occupational ionizing radiation protection program for the Navy, but limits it specifically to peacetime.[15] Marine Corps Order (MCO) 5104.3B governs the Marine

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[12] Army Regulation 385-10, *The Army Safety Program* (Washington, DC: Army, November, 2013).

[13] Department of the Army Pamphlet 385-25, *Occupational Dosimetry and Dose Recording for Exposure to Ionizing Radiation* (Washington DC: Army, October, 2012).

[14] Army Regulation 11-35, *Deployment Occupational and Environmental Health Risk Management* (Washington, DC: Army, May, 2007).

[15] OPNAV Instruction 6470.2C, *Occupational Ionizing Radiation Protection Program* (Washington, DC: Navy, March, 2013).

Corps radiation safety program. It addresses the safety of Marine Corps owned or operated radioactive sources and emitters.[16]

Air Force Instruction (AFI) 48-148 addresses ionizing radiation protection within the U.S. Air Force. It provides for a comprehensive radiation safety program, including guidance during interventions. It states:

> Dose limits do not apply for interventions. Instead, the operational exposure guidance (OEG) is applicable. The commander's decision to allow this exposure should be based on the radiation exposure status (RES) category found in JP 3-11 and made in the context of the situation and balance the anticipated benefit with both short and long-term health risks the exposure may cause. The exposure will vary depending on whether the mission is critical, priority, or routine and the severity of the radiological threat (catastrophic, critical, marginal, or negligible). An OEG should be set for each mission with potential for exposure, for decontamination of personnel or equipment, or for immediate or operational decontamination.[17]

It also requires individual dosimeters if there is a potential to exceed 1 millisievert (mSv). Attachment 7 of the AFI incorporates Department of Homeland Security (DHS) and Environmental Protection Agency Protective Action Guides. The AFI also incorporates operational dose guidance from NATO Standardization Agreement 2473, with dose ranges, radiation exposure status categories, recommended actions, and an estimate of the increased risk of cancer. It also provides guidance for 7-day and 3-month operations for Alpha and Beta emitters.

D. Doctrine

Joint Publication 3-11 (JP 3-11) is the overarching doctrine for Joint Force Operations in CBRN environments. Joint doctrine established in this publication applies to the Joint Staff, commanders of Combatant Commands, sub-unified commands, joint task forces, subordinate components of these commands, Services, and combat support agencies. The guidance in this publication is authoritative; as such, this doctrine will be followed except when, in the judgment of the commander, exceptional circumstances dictate otherwise. If conflicts arise between the contents of this publication and the contents of Service publications, this publication will take precedence unless the CJCS, normally in coordination with the other members of the Joint Chiefs of Staff, has provided more current and specific guidance. Appendix D of JP 3-11 provides significant guidance for operations in a radiological hazard environment. Table D-1 provides acute effects and 40-year cancer

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[16] Marine Corps Order 5104.3B, *Marine Corps Radiation Safety Program* (Washington, DC: USMC, September, 2010).

[17] Air Force Instruction (AFI) 48-148, *Ionizing Radiation Protection* (Washington, DC: USAF, September 2011), p. 16.

probabilities as a function of acute radiation dose. Paragraph 3.d. discusses Risk Management, in particular:

> The staff planner should be aware that risk mitigation measures applied to reduce risk associated with one hazard may increase risk to another hazard. As part of the risk management process, applying radiation safety mitigation measures should act in concert with other risk mitigation measures to minimize the overall risk. The highest risk of significant casualties will usually occur from the conventional weapons threat. Increasing conventional risk to achieve the goal of ALARA may result in an increased total risk with higher probability of mission failure.

Paragraph 4 presents Radiation Exposure Status Categories and recommended actions (monitor, priority tasks only, critical tasks only, etc.) as a function of cumulative radiation dose (Table D-2). Paragraph 4.d. discusses Operational Exposure Guidance and Table D-3 summarizes Severity of Radiological Threat (Table 1), again as a function of dose. Table D-6 provides Recommended Operational Exposure Guidance Levels as a function of risk level and mission importance (Table 2).[18]

Joint Publication 4-02 provides doctrine for the planning, preparation, and execution of health service support across the range of military operations. It discusses planning for CBRN events in general terms, monitoring and recording exposures as part of a Force Health Protection program, and basic concepts of decontamination for patient movement.[19]

Field Manual (FM) 3-11 states "Radiological hazards are an emerging threat to U.S. military operations. These hazards can arise from many sources other than nuclear weapons and can be dispersed in a variety of ways." The bulk of this FM addresses traditional CBRN hazards, with the predominant radiation hazard being post-detonation nuclear weapons effects.[20] FM 3-11 does not address operational exposure guidance.

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[18] Joint Publication (JP) 3-11, *Operations in Chemical, Biological, Radiological, and Nuclear Environments* (Washington, DC: Joint Staff, October, 2013).

[19] Joint Publication (JP) 4-02, *Health Service Support*, (Washington, DC: Joint Staff, July, 2012)

[20] Field Manual (FM) 3-11, *Multi-Service Doctrine for Chemical, Biological, Radiological, and Nuclear Operations*, (Washington, DC: Army, July, 2011).

Table 1. Severity of Radiological Threat

Level of Severity	Mission Impact	Associated Potential Dose and Dose Rate
Catastrophic	• Expected loss of ability to accomplish mission	• Total dose > 450 centi-Grays • Encounter source/environment with dose rate > 200 centi-Grays per hour •
Critical	• Expected significant degradation of mission capabilities in terms of the required mission standard • Inability to accomplish all parts of the mission • Inability to accomplish the mission to standard if hazards occur during the mission •	• Total dose > 200 centi-Grays • Encounter source/environment with dose rate > 10 centi-Grays per hour
Marginal	• Expected degraded mission capabilities in terms of the required mission standard; mission capability will be reduced if hazards occur during the mission •	• Total dose > 75 centi-Grays • Encounter source/environment with dose rate > 0.5 centi-Grays per hour
Negligible	• Expected effect will have little or no impact on accomplishing the mission	• Total dose > 25 centi-Grays • Encounter source/environment with dose rate > 0.01 centi-Grays per hour

Source: Table D-3, Joint Publication 3-11.

Table 2. Recommended Operational Exposure Levels (cGy)

Mission Importance / Acceptable Risk	Critical	Priority	Routine
Extremely High	125	75	25
High	75	25	5
Moderate	25	5	0.5
Low	5	2.5	0.5

Source: Table D-6, Joint Publication 3-11.

Note: The commander has the authority to select any operational exposure guidance deemed appropriate, including exceeding 125 centi-Gray, if the circumstances warrant it.

FM 3-11.4, *Multiservice Tactics, Techniques, and Procedures for Nuclear, Biological, and Chemical (NBC) Protection*[21], devotes an appendix to radiation protection. This includes discussions of operational exposure guidance (OEG), radiation exposure status (RES), and low-level radiation. Initial discussions in the appendix relate to units minimizing unit-level exposures and calculating turnback dose and turnback dose rate as a function of OEG and previous exposure, based on radiation exposure status of the unit in combat operations. The appendix then presents a discussion of low-level radiation, including guidance for radiation exposures in "military operations other than war" and contamination control guidance for 7-day and 90-day missions for alpha and beta emitters. It also provides guidance on controls to maintain ALARA when peacetime regulations must be exceeded.[22]

Army Techniques Publication (ATP) 4-02.83 describes Multiservice Tactics, Techniques, and Procedures for Treatment of Nuclear and Radiological Casualties. Its purpose is to serve as a "guide and a reference on the recognition and treatment of nuclear and radiological casualties".[23] This publication is a multi-service document also adopted by the Navy, Marine Corps, and Air Force. It includes very detailed chapters on the nuclear and radiological threat, hazards of nuclear and radiological events, treatment of high-dose radiological and combined injury casualties, radioactive contamination, low-level radiation, and the psychological effects and treatment of combat and operational stress reaction casualties.

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[21] FM 3-11.4 is being replaced by Army Technical Publication (ATP) 3-11.32, *Multi-service Tactics, Techniques, and Procedures for Chemical, Biological, Radiological, and Nuclear Passive Defense*. This document is pending publication, but was approved for implementation by Commandant of the U.S. Army Chemical, Biological, Radiological, and Nuclear School.

[22] Field Manual (FM) 3-11.4, *Multiservice Tactics, Techniques, and Procedures for Nuclear, Biological, and Chemical (NBC) Protection* (Washington, DC: Army, June, 2003).

[23] Army Techniques Publication (ATP) 4-02.83, *Multiservice Tactics, Techniques, and Procedures for Treatment of Nuclear and Radiological Casualties* (Washington, DC: Army, May, 2014).

Chapter 3 of ATP 4-02.83 provides guidance on the treatment of high-dose radiological and combined injury casualties. This chapter is the primary doctrinal guidance on radiation casualties, including those resulting from a nuclear detonation. The chapter contains a great deal of information on the pathophysiology of radiation injury, including radio sensitivity of different cell types. It provides a discussion of the various subsyndromes of acute radiation syndrome, such as the hematopoietic syndrome, gastrointestinal syndrome, and neurovascular syndrome. It includes the use of dosimetry as well as biodosimetry to estimate radiation exposure and prognosis. It also provides guidance on the treatment of each subsyndrome, and on triage of radiation and combined injuries.

Chapter 4 of ATP 4-02.83 provides guidance on contamination and decontamination. It discusses internal contamination, including evaluating clinical specimens for radionuclides, methods for increasing elimination of contamination from the gastrointestinal system, as well as the use of blocking agents such as potassium iodide and chelators such as Calcium-diethylenetriaminepentaacetic acid (Ca-DTPA). Chapter 5 discusses low-level radiation exposures (doses of 75 centigray (cGy) or less) and incorporates NATO guidance for operational exposures. It includes guidance on medical assessment and medical monitoring of individuals are known or believed to have been exposed to radiation or radiation contamination.

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3. Conclusions and Recommendations

A. Conclusions

Defense-wide policy provides significant guidance for radiation safety, but is somewhat fragmented due to the limited scope of each major policy document. Basic principles of ionizing radiation safety are in place and applicable in the operational setting, but rather than establish operational exposure guidance, the directives and instructions generally defer to Service regulations and doctrine.

Policy documents at all levels address ionizing radiation safety to varying degrees and at different points in the operational spectrum from the fixed installation to the deployed force. No single policy document establishes a holistic, DOD-wide radiation safety program or provides operational exposure guidance.

Of the four Services, the Air Force has the most complete regulatory guidance for operational exposure, implementing NATO recommendations for operational dose (exposure) into their general ionizing radiation safety instruction. As would be expected, the Navy largely concentrates on safety of nuclear reactors, and the Army regulations are largely administrative, applying to occupational, rather than operational, radiation safety. The Air Force Instruction could be considered a model for future radiation safety regulations within the other Services.

The Army Deployment Occupational and Environmental Health Risk Management (DOEHRM) Program integrates occupational health into an operational setting through composite risk management. Composite risk management provides a framework for assessing risk and mitigation in the context of military operations. It requires a continuing assessment of long-term health risks balanced against risk to mission and other risks to the force.

ATP 4-02.83 is an excellent academic review of the effects of ionizing radiation and nuclear weapons. It provides an in depth review of the physics of ionizing radiation and the pathophysiology of radiation injury. It discusses the impact of combined blast, thermal, and radiation injury on patient management. However, this depth and detail makes it difficult to apply to the holistic management of a casualty or a group of casualties at the various roles of care to include the need for and impact on evacuation; management of combined injury patients at the various roles of care; and long-term management and recovery of those with survivable injuries.

- No single policy document establishes a holistic, DOD-wide radiation safety program or provides operational exposure guidance

- Both Joint (JP 3-11) and multi-service (FM 3-11.4, ATP 4-02.83) doctrine provide good overviews of operational exposure guidance.
- In particular, JP 3-11, Table D-6, provides a very good recommendation for operational exposure as a function of mission importance.
- ATP 3-11.32 incorporates operational exposure guidance at the tactical level.
- Other than a general discussion of the concept of ALARA and operational exposure guidance, much of the policy and doctrine surrounding low-level radiation exposures deals primarily with surveillance and monitoring for future health effects.
- The Army Deployment Occupational and Environmental Health Risk Management (DOEHRM) Program in particular does little to guide the commander in balancing an immediate risk of mission failure against a long term probabilistic chronic health effect.

B. Recommendations

- Consider moving much of the technical discussion in ATP 4.02.83 to an appendix, and structure the manual around treating the presenting syndrome through time.
- Provide commanders and their advisors better tools to determine when to use an alternate exposure guideline and which guideline to use.

Appendix A:
References

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Appendix B:
Illustrations

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Appendix C:
Acronyms

AFI	Air Force Instruction
ALARA	As Low as Reasonably Achievable
ATP	Army Techniques Publication
Ca-DTPA	Calcium-diethylenetriaminepentaacetic acid
CBRN	Chemical, Biological, Radiological and Nuclear
CBRNE	Chemical, Biological, Radiological, Nuclear, and High-Yield Explosives
cGy	centi-Gray
CJCSI	Chairman of the Joint Chiefs of Staff Instruction
CJCSM	Chairman of the Joint Chiefs of Staff Manual
CRM	Composite Risk Management
DODD	Department of Defense Directive
DODI	Department of Defense Instructions
DOEHRM	Deployment Occupational and Environmental Health Risk Management
ESOH	Environment, Safety, and Occupational Health
FM	Field Manual
IDA	Institute for Defense Analyses
JP	Joint Publication
MCO	Marine Corps Order
mSv	millisievert
NATO	North Atlantic Treaty Organization
NRC	Nuclear Regulatory Commission
OEG	Operational Exposure Guidance
OEH	Occupational and Environmental Health
OPNAV	Office of the Chief of Naval Operations
OSHA	Occupational Safety and Health Administration
OTSG	Office of the Surgeon General
RES	Radiation Exposure Status

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13. SUPPLEMENTARY NOTES

14. ABSTRACT

This document includes a review of policy at the Department of Defense, Chairman of the Joint Chiefs of Staff, and Service levels as well as doctrine at the Joint Staff and Service levels. Policy supporting the management of operational exposures to ionizing radiation is somewhat fragmented, with the exception of the U.S. Air Force which combines all policy related to ionizing radiation, regardless of location, into a single policy document. Doctrine for managing operational exposures to ionizing radiation is well established in Joint Publication 3-11. Doctrine for the management of radiation and nuclear casualties is contained in Army Techniques Publication (ATP) 4-02.83 (Multiservice Tactics, Techniques, and Procedures for Treatment of Nuclear and Radiological Casualties), however the academic nature of this document limits its applicability to the management of the individual patient.

15. SUBJECT TERMS

radiation, operational exposure guidelines, OEG, policy, doctrine, nuclear

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