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SECRETARY OF THE AIR FORCE**

**DEPARTMENT OF THE AIR FORCE
POLICY DIRECTIVE 91-4**



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Safety

DIRECTED ENERGY SYSTEM SAFETY

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This Department of the Air Force Policy Directive (DAFPD) establishes Air Force and Space Force military-specific directed energy system safety policy. Directed energy systems provide unique capabilities and produce a broad spectrum of hazards. This DAFPD implements the applicable portions of Department of Defense (DoD) Instruction (DoDI) 3200.19, *Non-Lethal Weapons (NLW) Human Effects Characterization*; DoDI 6055.15, *DoD Laser Protection Program for Military Lasers*; and DoDI 6055.11, *Protecting Personnel from Electromagnetic Fields*. This publication applies to the United States Space Force, Regular Air Force, the Air Force Reserve, and the Air National Guard. Ensure all records generated because of processes prescribed in this publication adhere to Air Force Instruction 33-322, *Records Management and Information Governance Program*, and are disposed in accordance with the Air Force Records Disposition Schedule, which is located in the Air Force Records Information Management System. Refer recommended changes and questions about this publication to the office of primary responsibility using the DAF Form 847, *Recommendation for Change of Publication*; route DAF Form 847 from the field through the appropriate functional chain of command. This publication may not be supplemented. Major Commands, Field Commands, Field Operating Agencies, and Direct Reporting Units, if applicable, will not issue instructions that implement this policy directive without Air Force Chief of Safety (AF/SE) approval.

SUMMARY OF CHANGES

This document has been revised and should be completely reviewed. Changes include enhanced safety and oversight of directed energy (DE) systems across the Department of the Air Force. Key revisions include the expansion of the purpose statement to incorporate relevant Department of Defense instructions and establish a unified Air Force and Space Force policy for military-specific DE system safety. The definition of DE systems was updated to align with Joint Publication 3-85, *Joint Electromagnetic Spectrum Operations*, providing clarity and consistency in the identification and management of these systems. Furthermore, the document now encompasses a broader range of organizations, including Major Commands, Field Commands, and Direct Reporting Units, as well as Air Force Materiel Command, Space Systems Command, and other acquisition organizations, ensuring a comprehensive and standardized approach to DE system safety. The roles and responsibilities of key stakeholders, including the Air Force Chief of Safety and the Space Force Director of Test and Evaluation, were refined to provide clear guidance on certification authority and safety oversight, ultimately strengthening the safety posture of the Air Force and Space Force.

1. Overview.

1.1. The Department of the Air Force, which includes both US Air Force and US Space Force, will ensure military-specific directed energy systems receive treatment distinct from conventional or nuclear systems because of their characteristics which may include speed-of-light delivery, range, and varied effects. Directed energy systems require a scalable, risk-based approach to safety that is commensurate with the hazard potential of each system.

1.1.1. A directed energy system may be a weapon or device using concentrated electromagnetic energy or atomic or subatomic particles to achieve a desired effect. Military-specific directed energy systems are defined, for this publication, as those systems used for combat, combat training, or are classified in the interests of national security. Directed energy weapons are a weapon or system that uses directed energy to incapacitate, damage, or destroy enemy equipment, facilities, and/or personnel. Devices, as non-weapon systems, use directed energy primarily for a purpose other than as a weapon.

1.1.2. Military-specific acoustic systems use sound across the entire frequency spectrum to kill, injure, disable, or temporarily incapacitate people or destroy, damage, disable, or temporarily incapacitate property or materiel. A military-specific acoustic system may be a weapon or a device. Military-specific acoustic systems, although outside the joint definition of directed energy systems, have effects and hazards more similar to directed energy systems than to conventional weapons. Military-specific acoustic systems will follow the same safety policy as military-specific directed energy systems.

1.2. The Department of the Air Force will ensure protection of personnel, property, operational capability, and the environment from undue risk of damage or harm from military-specific directed energy systems, consistent with mission requirements.

2. Policy. The Department of the Air Force will:

2.1. Establish and conduct a military-specific directed energy safety program to ensure the safe research, development, testing, operation, training, maintenance, storage, decommissioning, and disposal of these systems. As an element of this program, the

Department of the Air Force will use applicable DoD regulations, and federal laws and regulations, as well as appropriate standards developed or adopted by national or international engineering, science, and safety organizations.

2.2. Establish and conduct a safety certification process for military-specific directed energy systems. Directed energy systems must have a safety certification from the AF/SE prior to fielding or operational testing, training, or operation by non-developmental personnel. Developmental personnel verify the system is built correctly in accordance with the specification and contract, while non-developmental personnel are operators that validate the system under test can effectively execute its mission in a realistic operational environment when operated against representative threats. To support provisional efforts such as demonstrations and early operational assessments, non-developmental personnel may operate uncertified systems when directly supervised by developmental personnel and in controlled environments approved by the Service Level Review Coordinator, Service Level Review Authority and Range Review Assessor.

2.3. Investigate mishaps involving military-specific directed energy systems in accordance with DAFPD 91-2, *Safety Programs*, and other directives as appropriate.

3. Roles and Responsibilities.

3.1. The Assistant Secretary of the Air Force for Energy, Installations, and Environment (SAF/IE) will provide guidance, direction and oversight for safety and occupational health policy for military-specific directed energy systems.

3.2. The Assistant Secretary of the Air Force (Acquisition, Technology & Logistics) (SAF/AQ) and Space Acquisition and Integration (SAF/SQ) will:

3.2.1. Ensure inclusion of military-specific directed energy systems safety requirements in acquisition policy.

3.2.2. Ensure military-specific directed energy systems are evaluated by the Air Force Research Laboratory or an Air Force Safety Center and Air Force Research Laboratory acceptable third party for the effects of directed energy on human targets.

3.3. The Air Force Chief of Safety (AF/SE) will:

3.3.1. Develop military-specific directed energy systems safety policy and procedural guidance.

3.3.2. Ensure compliance with safety policy and development by maintaining instructions to implement this directive. Maintain certification authority and may delegate the certification authority for directed energy system safety, as appropriate.

3.3.3. Determine the utility and applicability of standards developed or adopted by national or international scientific safety organizations.

3.3.4. Establish military-specific directed energy systems testing and employment proximity restrictions pertaining to nuclear and conventional weapons.

3.3.5. Appoint subject matter and technical experts as appropriate to support the Human Effects Review Board specified in DoDI 3200.16 and the working groups specified in DoDI 6055.11 and DoDI 6055.15.

3.4. The Air Force Surgeon General (AF/SG) will:

3.4.1. Issue directive policy for the protection of the Department of the Air Force personnel and the general public from overexposure to noise, nonionizing radiation, and ionizing radiation in accordance with DAFPD 48-1, *Aerospace & Operational Medicine Enterprise (AOME)*, to include requirements for:

3.4.1.1. Completing health risk assessments.

3.4.1.2. Recommending health risk controls.

3.4.1.3. Documenting human exposure.

3.4.2. Identify medical monitoring requirements and identifying diagnostic and therapeutic modalities for injuries and diseases related to military-specific directed energy systems operations.

3.4.3. Appoint subject matter and technical experts as appropriate to support the Human Effects Review Board specified in DoDI 3200.16 and the working groups specified in DoDI 6055.11 and DoDI 6055.15.

3.5. The Director of Test and Evaluation (AF/TE) and Space Force Director of Test and Evaluation (SF/TE) will:

3.5.1. Provide direction and guidance to developmental and operational test organizations to ensure adequate safety planning and execution is conducted.

3.5.2. Direct safety reviews to assess whether the T&E project's safety plan has identified and mitigated all health and safety hazards.

3.6. The Deputy Chief of Staff for Operations (AF/A3) and Deputy Chief of Space Operations (SF/COO) will ensure military-specific directed energy systems safety requirements are implemented in military range and operations policy.

3.7. Major Commands, Field Commands, and Direct Reporting Units (DRU) will:

3.7.1. Advocate for developmental and operational testing of military-specific directed energy systems.

3.7.2. Advocate for funding, research, development, test and evaluation, and manpower to ensure sufficient resources are available to develop and implement the military-specific directed energy system safety program.

3.8. Air Force Materiel Command (AFMC) and Space Systems Command (SSC) and other Acquisition Organizations, in addition to the roles and responsibilities in [paragraph 3.7](#), will:

3.8.1. Support development of safe military-specific directed energy systems.

3.8.2. Evaluate the human target effects of directed energy systems in concert with data produced by the Air Force Research Laboratory.

3.8.3. Conduct medical and health effects consulting, education, and training.

3.9. Air Education and Training Command (AETC) commander and Space Training and Readiness Command (STARCOM) commander, in addition to the roles and responsibilities in [paragraph 3.7](#), will:

3.9.1. Develop directed energy curricula and provide training and education to satisfy career field requirements.

3.10. Commanders at all levels will:

3.10.1. Understand the capabilities and hazards of directed energy systems as applicable to their mission.

3.10.2. Incorporate military-specific directed energy system safety and health considerations, consistent with applicable test, training, or operational requirements in their mission planning, decisions, and operations.

3.10.3. Be aware of safe-use requirements and applicable host nation laws and advise subordinate commanders when outside the United States, its territories, or possessions.

Troy E. Meink
Secretary of the Air Force

Attachment 1**GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION*****References***

DoDI 3200.19, *Non-Lethal Weapons (NLW) Human Effects Characterization*, 17 May 2012

DoDI 6055.11, *Protecting Personnel from Electromagnetic Fields*, 12 May 2021

DoDI 6055.15, *DoD Laser Protection Program for Military Lasers*, 25 August 2023

JP 3-85, *Joint Electromagnetic Spectrum Operations*, 22 May 2020

DAFPD 48-1, *Aerospace & Operational Medicine Enterprise (AOME)*, 26 December 2024

DAFPD 91-2, *Safety Programs*, 25 June 2024

AFI 33-322, *Records Management and Information Governance Program*, 23 March 2020

FDA Exemption No. 76EL-01, *Department of Defense Exemption from the FDA Performance Standard for Laser Products*, 23 Aug 1976

FDA Laser Notice No. 52, *Guidance on the Department of Defense Exemption from the FDA Performance Standard for Laser Products*, 12 July 2002

Adopted Forms

DAF Form 847, *Recommendation for Change of Publication*

Abbreviations and Acronyms

AETC—Air Education and Training Command

AFMC—Air Force Materiel Command

AFPD—Air Force Policy Directive

AOME—Aerospace & Operational Medicine Enterprise

DAFPD—Department of the Air Force Policy Directive

DE—Directed Energy

DoD—Department of Defense

DoDI—Department of Defense Instruction

DRU—Direct Reporting Units

NLW—Non-Lethal Weapons

SSC—Space Systems Command

STARCOM—Space Training and Readiness Command

Office Symbols

AF/A3—Deputy Chief of Staff for Operations

AF/SE—Air Force Chief of Safety

AF/SG—Air Force Surgeon General

AF/TE—Director of Test and Evaluation

AFSEC/SEW—Air Force Safety Center / Weapons Safety Division

SAF/AQ—Assistance Secretary of the Air Force for Acquisition

SAF/IE—Assistant Secretary of the Air Force for Energy, Installations, and Environment

SF/COO—Deputy Chief of Space Operations

SF/DS—Director of Staff of the United States Space Force

Terms

Acquisition—The conceptualization, initiation, design, development, test, contracting, production, deployment, integrated product support, modification, and disposal of weapons and other systems, supplies, or services (including construction) to satisfy DoD needs, intended for use in, or in support of, military missions.

Damage—Non-transitory upset or burnout of a target sufficient to reduce its operational utility.

Developmental Personnel—Personnel who conduct work to ensure that system's design is satisfactory and that all technical specifications and contract requirements have been met. Work may be done under controlled, laboratory conditions or conducted at government test facilities by government or combined government and contractor test teams.

Directed Energy—An umbrella term covering technologies that relate to the production of a beam or field of concentrated acoustic or electromagnetic energy or atomic or subatomic particles. Although acoustic energy is excluded from the Joint definition, it has effects and hazards closer to directed energy than conventional systems.

Directed Energy System—A system that uses directed energy to achieve a desired effect.

Directed Energy Weapon—A device that uses directed energy and is designed to kill, injure, disable, or temporarily incapacitate people or destroy, damage, disable or temporarily incapacitate property or materiel.

Effect—The physical or behavioral state of a system that results from an action, set of actions, or another effect; the result, outcome, or consequence of an action; a change to a condition, behavior, a degree of freedom.

Electromagnetic Energy—The propagation of energy in the form of electromagnetic waves through space.

Harm—refers to any adverse effect or damage caused by the interaction of directed energy with a target, including humans, animals, or physical objects. This can manifest as thermal, photochemical, photomechanical, or biological effects, resulting in injuries such as eye damage, skin burns, or disruption of normal biological processes. Harm from directed energy can also include damage to materials, structures, or equipment, compromising their functionality or safety.

Hazard Classification—To identify the relevant data regarding the hazards of a chemical; review those data to ascertain the hazards associated with the chemical; and decide whether the chemical will be classified as hazardous according to the definition of hazardous chemical in accordance with AFI 90-821, *Hazard Communication (HAZCOM) Program*. In addition, classification for

health and physical hazards includes the determination of the degree of hazard, where appropriate, by comparing the data with the criteria for health and physical hazards.

Incapacitate—to prevent or deprive from functioning in a normal way.

Ionizing Radiation—Any electromagnetic or particulate radiation capable of producing ions directly or indirectly in its passage through matter. Ionizing radiation includes gamma rays, X rays, alpha particles, beta particles, neutrons, protons, and other particles and electromagnetic waves capable of producing ions.

LASER—An acronym for Light Amplification by Stimulated Emission of Radiation. Any device that can be made to produce or amplify electromagnetic radiation in the x-ray, UV, visible, and infrared or other portions of the spectrum by the process of controlled stimulated emission of photons.

Military Specific Laser Systems—Those systems, regardless of hazard classification, used for combat, combat training, or are classified in the interests of national security.

Mishap—An unplanned occurrence, or series of occurrences, which results in damage to Department of Defense (DoD) property; occupational illness to DoD personnel; injury to on- or off-duty DoD military personnel; injury to on-duty DoD civilian personnel; or damage to public or private property, or injury or illness to non-DoD personnel, caused by DoD activities. Mishaps are classified by total direct mishap cost and the severity of injury/occupational illness.

Non-developmental personnel—Individuals who are typical operators that validate that the system under test can effectively execute its mission in a realistic operational environment when operated against representative threats. These personnel verify that the system is built correctly in accordance with the specification and contract to validate that the system can successfully accomplish its mission in a realistic operational environment.

Non-ionizing Radiation—Electromagnetic radiation that does not have enough energy to remove an electron from an atom, meaning it cannot create ions in matter. Non-ionizing radiation includes LASERs, visible light, infrared, microwaves, radio waves, and radiofrequency.

Overexposure (hearing)—Any accumulated or one-time exposure exceeding the limits mandated by 29 CFR 1910.95.

Overexposure (ionizing radiation)—Any accumulated or one-time ionizing radiation exposure exceeding the limits mandated by DoDI 6055.08.

Overexposure (non-ionizing radiation)—Any accumulated or one-time ionizing radiation exposure exceeding the limits mandated by 29 CFR 1910.97.

Safety—Freedom from conditions that can cause death, injury, occupational illness, damage or loss of equipment or property, or damage to the environment.

System Safety—The application of engineering and management principles, criteria, and techniques to optimize safety within the constraints of operational effectiveness, time, and cost throughout all phases of the system life cycle.

Test—Any program or procedure that is designed to obtain, verify, or provide data for the evaluation of any of the following: progress in accomplishing developmental objectives; the performance, operational capability, and suitability of systems, subsystems, components, and

equipment items; and the vulnerability and lethality of systems, subsystems, components, and equipment items.

Test and Evaluation—The act of generating empirical data during the research, development or sustainment of systems, and the creation of information through analysis that is useful to technical personnel and decision makers for reducing design and acquisition risks. The process by which systems are measured against requirements and specifications, and the results analyzed to gauge progress and provide feedback. These efforts are distinct from experimentation.