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SECRETARY OF THE AIR FORCE**



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Safety

**DIRECTED ENERGY WEAPONS
SAFETY**

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This instruction implements Air Force Policy Directive (AFPD) 91-4, *Directed Energy Weapons*. It provides the requirements for Directed Energy Weapon (DEW) safety certification and guidance for establishing an operational DEW safety program. This instruction applies to all acquisition programs and operational organizations that test, evaluate, train, operate, maintain, store, or decommission DEW systems, including the Air Force Reserve and the Air National Guard (ANG). This instruction also applies to Air Force research and development organizations when research efforts are ready to transition to an end user; this includes Air Force Research Laboratory (AFRL) programs identified as solutions for rapid capability fielding and/or rapid development programs given to an operational unit for evaluation. See Attachment 1 for abbreviations and acronyms used in this instruction. Send Major command (MAJCOM) supplements to HQ AFSEC/SEW, 9700 G Avenue SE, Kirtland AFB NM 87117-5670, for coordination and approval before publication. Ensure that all records created as a result of processes prescribed in this publication are maintained in accordance with Air Force Manual (AFMAN) 33-363, *Management of Records*, and disposed of in accordance with Air Force Records Disposition Schedule (RDS) located in Air Force Records Information Management System (AFRIMS). Refer recommended changes and questions about this publication to the Office of Primary Responsibility (OPR) using the AF Form 847, *Recommendation for Change of Publication*; route AF IMTs 847 from the field through the appropriate functional chain of command. The authorities to waive wing/unit level requirements in this publication are identified with a Tier ("T-0, T-1, T-2, T-3") number. See AFI 33-360, *Publications and Forms Management*, Table 1.1, for a description of the authorities associated with the Tier numbers.

Submit requests for waivers through the chain of command to the appropriate Tier waiver approval authority, or alternately, to the Publication OPR for non-tiered compliance items.

SUMMARY OF CHANGES

This interim change revises AFI 91-401 to comply with guidance for Tiered waiver authorities for unit level compliance items. In addition, Reference dates were updated in Attachment 1.

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Chapter 1

INTRODUCTION

1.1. Purpose. This instruction implements, IAW AFD 91-4, *Directed Energy Weapons (DEW)*, the Air Force DEW Safety Program to protect personnel, property, operational capability, and the environment from undue risk of damage or harm. The intent of this instruction is to implement a safety program throughout the lifecycle of a DEW program, including safety certification for operational use prior to fielding, (see [Chapter 3](#)) and the establishment of a unit level DEW safety program (DEWSP) once a system is operational (see [Chapter 6](#)).

1.2. Applicability.

1.2.1. This instruction applies to DEW systems using directed energy primarily as a direct means to kill, injure, disable, or temporarily incapacitate people or destroy, damage, or temporarily incapacitate property or material on the surface, in the air, or in space. Reference and supporting information provided in Attachment 1.

1.2.1.1. DEW systems create unique hazards that are different from conventional and nuclear weapons. Potential DEW systems covered by this instruction include, but are not limited to, high-energy lasers, microwave and millimeter wave beams, destructive effects in support of electronic attack missions, explosive-driven electromagnetic pulse devices, laser induced plasma channel systems, non-lethal directed energy weapons, and atomic-scale and subatomic particle beam weapons. The power levels of these DEW systems span a range from levels that are considered safe for human exposure, through levels that can induce pain but cause no permanent cell damage to levels that would be fatal to humans or that would destroy materiel.

1.2.1.2. This instruction applies to acoustic weapons, which are not part of the formal definition of DEW, but have similar properties and hazards.

1.2.2. This instruction does not apply to:

1.2.2.1. Directed energy devices that support or are an element of a conventional/nuclear weapon if directed energy from those devices is not intended to deny, disrupt, damage, or destroy enemy equipment, facilities, or personnel.

1.2.2.2. Directed energy devices that are not weapons including guidance radar, laser range finders, target designators, medical lasers, DEW trainers or simulators, electronic warfare systems not included in Section 1.2.1.1., aircraft self-defense laser systems designed solely to jam the seekers of air-to-air missiles, etc. The safety programs for these systems are detailed in other publications, such as Air Force Instruction (AFI) 48-139, *Laser and Optical Radiation Protection Program*, and Air Force Occupational Safety and Health Standard (AFOSH-STD) 48-9, *Electro-magnetic Frequency (EMF) Radiation Occupational Health Program*, and AFOSH-STD 48-20, *Occupational Noise and Hearing Conservation Program*.

1.2.2.3. Systems determined by the AF/SE to fall under other instructions.

1.2.2.4. Hazardous materials, electro-magnetic frequency energy, or electricity before they become part of the weapon system. DEW related hazardous materials will be managed like any other similar hazardous material under provisions of applicable safety guidance, (e.g. AFI 32-7086, *Hazardous Materials Management*, Air Force Joint Manual (AFJMAN) 23-209, *Storage and Handling of Hazardous Materials*). AFOSH-STD 48-9 applies to electro-magnetic frequency hazards and AFI 91-203, *Air Force Consolidated Occupational Safety Instruction*, for electrical hazards.

1.3. General DEWSB Policy. The DEWSB provides the safety certification of directed energy weapon systems for use by USAF personnel. For systems developed in an acquisition program of record or purchased as standardized systems, this takes the form of a safety certification. For informal acquisitions or certain tests, the DEWSB provides a hazard assessment based on all available information, in lieu of a full certification. Safety certification or approval by another US military service or foreign government does not replace DEWSB review requirements.

1.3.1. Certification Function. DEWSB safety certification is required for each DEW prior to operational and training use by USAF personnel. Milestone Decision Authorities (MDA) shall include DEW safety certification in their production and fielding decisions. Program Managers will include the certification in their program's Environment, Safety, and Occupational Health (ESOH) documentation. Certification is based on a DEW Technical Safety Study (DEWTSS) reviewed during a regular or special meeting. Results from the DEWTSS will be the basis for DEWSB certification recommendations. DEW certification will be requested through the MAJCOM/SE to HQ AFSEC/SEW.

1.3.2. Risk Assessment Function. If there is a compelling operational need for a system that cannot meet the standards of certification, the DEWSB issues a risk assessment to evaluate hazards prior to acceptance by the using organization.

1.3.3. Test Function. The DEWSB issues design safety assessments for testing uncertified DEW systems when testing live systems on USAF aircraft and ground platforms and/or involving USAF vehicles, personnel, and infrastructure as test subjects. Responsible Test Organizations (RTO) will seek DEWSB hazard analysis as a part of their Safety Review Board (SRB) process prior to conducting tests as outlined in AFI 99-103, *Capabilities-Bases Test and Evaluation*. DEWSB approval and proximity restrictions must be obtained prior to the testing or employment of DEWs with or in the vicinity of nuclear or conventional munitions to prevent inadvertent functioning or damage. The Test Hazards Assessment Review (THAR) conducted during a regular or special meeting supports test safety assessment. Programs may enter captive carriage test phases prior to DEWSB assessment of the live-launch or live-fire phases. Prepare a THAR as outlined in AFI 91-205, *Nonnuclear Munitions Safety Board*.

1.3.4. Informal Acquisition Function. Informal acquisitions, such as laboratory technology demonstration projects, must seek hazard assessment from the DEWSB prior to use by non-developmental USAF personnel, unless supervised on-site by development personnel. For this purpose, developmental personnel are defined as the developing government organization and its contractors.

Chapter 2

RESPONSIBILITIES AND AUTHORITIES

2.1. Assistant Secretary of the Air Force (Acquisition), (SAF/AQ): Serves as the Service Acquisition Executive (SAE) as delegated for AF programs and executes responsibilities as the senior corporate operating official for acquisition. Executes SAE responsibilities outlined in the DoD 5000-series for execution of AF acquisitions.

2.2. Assistant Secretary of the Air Force (Installations, Environment & Logistics), (SAF/IE): Ensures oversight and policy for all DEW installation, safety, and health issues.

2.3. Air Force Chief of Safety (AF/SE): The final authority for the AF DEW safety policy applicability including DEW certification and risk assessment.

2.4. Air Force Surgeon General (AF/SG):

2.4.1. Supports DEW safety with policy and standards for directed energy exposure (e.g. AFOSH-STD 48-9 and AFI 48-139).

2.4.2. Supports the certification process by providing health effects evaluation for the DEWSB and applies requirements of AFI 48-145, *Occupational and Environment Health Program*, for medical surveillance and control procedures.

2.4.3. Ensures base Bioenvironmental Engineering (BE) conducts health risk assessments of work areas where DEW are used or maintained, IAW AFI 48-145.

2.4.4. Provides health related input to AF/SE when additional guidance and/or resources are needed.

2.5. Director of Bases, Ranges, and Airspace (AF/A3O-B): Ensures DEW safety requirements are implemented in range operations policy.

2.6. Headquarters Air Force Safety Center (HQ AFSEC):

2.6.1. Develops Air Force DEW safety criteria and policy.

2.6.2. Chief, Weapons Safety Division (AFSEC/SEW) manages AF DEW certification processes for AF/SE.

2.6.2.1. Chairs the DEWSB and develops organizational charter.

2.6.2.2. Maintains the official record of all DEW certification documentation and risk assessment.

2.6.3. Maintains the DEW safety mishap database and distributes mishap prevention crosstalk.

2.6.4. Reviews MAJCOM DEW AFI supplements and staffs documents through AF/SE.

2.6.5. Ensures important DEW safety issues are addressed at the AF ESOH Council.

2.6.6. Ensures the effectiveness of MAJCOM DEWSPs.

2.6.7. Advises the Program Manager on all safety issues regarding DEW.

2.6.8. Supports the Milestone Decision Authority on DEW safety during Milestone Reviews and other processes as required.

2.6.9. Issues DoD Exemption Notifications through program managers to manufacturers for laser DEWs unable to comply with federal laser safety regulations.

2.7. MAJCOMs, FOAs, and DRUs:

2.7.1. Establish a MAJCOM DEWSP that implements the requirements of this instruction for each assigned DEW.

2.7.2. Ensure DEW systems are certified prior to operations or training.

2.7.3. Report DEW mishaps IAW AFI 91-204, *Safety Investigations and Reports*, and AFMAN 91-221, *Weapons Safety Investigations and Reports*.

2.7.4. Staff MAJCOM DEW AFI supplements through HQ AFSEC/SEW for AF/SE approval IAW AFPD 91-4.

2.7.5. Report developments/issues on DEW safety to the MAJCOM ESOH Council.

2.7.6. Chiefs of Weapons Safety and Weapons Safety Managers (WSMs) will provide policy guidance regarding DEW systems' compliance with DEW Program Office technical data, assisting Program Managers' efforts to assure the Operational Safety, Suitability, and Effectiveness (OSS&E) of the DEW systems. Program Managers provide the technical data that govern DEW operations and maintenance and communicate the ESOH risks.

2.7.7. Develop DEW site safety plan and coordinate as required. At a minimum, the plan should include a concept of operations (CONOPS) overview, identification of potential hazards (including those to personnel, equipment, interoperability, and the environment), a risk assessment, and planned mitigation.

2.8. Air Force Materiel Command (AFMC):

2.8.1. Maintains technical expertise to evaluate DEW health effects and safety in AF operations. The AFRL 711th Human Performance Wing Bioeffects Division (711 HPW/RHD) and Directed Energy Directorate (AFRL/RD) can provide an entry point for DEW questions.

2.8.2. Provides additional DEWSB members based on requirements for specific technical expertise.

2.8.3. Through AFRL and consistent with AF S&T investment priorities, conducts research on hazards associated with DEW systems, to include hazards to people, property, and materiel. Communicate new discoveries in DEW principles and effects in a timely manner to related capability development programs.

2.8.4. Maintains expertise on directed energy personnel protective technologies for AF use.

2.8.5. The Human Effectiveness Directorate (711 HPW/RH), will evaluate the human target effects of DEW when funded by a DEW Program Manager.

2.8.6. The United States Air Force School of Aerospace Medicine (USAFSAM) is responsible for conducting medical/health effects consulting and education/training. USAFSAM shall establish, administer, and maintain the DoD Electromagnetic Field (EMF)

Injury Hotline and Tri-Service Laser Injury Hotline to provide immediate expert medical advice in the event of an injury or suspected injury to DoD personnel from EMF and lasers. USAFSAM shall establish, administer, and maintain the EMF Overexposure Repository for DoD Components to access, analyze, and use in EMF protection programs.

2.8.7. USAFSAM shall provide 24/7 response and consultative capability to the unit DEW Safety Officer (DEWSO) and DEWSB for DEW health hazard evaluations including, as needed, sample collection, epidemiologic surveillance, and hazard assessment.

2.9. Program Manager (PM):

2.9.1. Complies with the DEW certification process.

2.9.2. Creates and manages the DEW Certification Plan (DEWCP). See Chapter 3 for DEWCP processes. The DEWCP may be considered as a section (or sections) of the Programmatic Environment, Safety, and Occupational Health Evaluation (PESHE) (required by Department of Defense Instruction (DoDI) 5000.02, *Operation of the Defense Acquisition System*). The DEWCP may be a section (or sections) of the Systems Engineering Plan (SEP). Identify the Directed Energy Weapons Safety Certification requirement in the SEP Table 4.6-1, Design Considerations, beginning with the Milestone A SEP."

2.9.3. Ensures DEW certification is an element of the Program's System Safety technical requirements which the Program Office manages as part of the overall Systems Engineering effort.

2.9.4. Ensures DEW safety criteria identified in the DEWCP is integrated into overall system safety, configuration control, and included in training manuals and technical orders (TOs) prior to fielding.

2.9.5. Maintains currency of DEW certification throughout the lifecycle of DEW systems.

2.9.6. Seeks DEWSB design safety assessment for tests of uncertified DEW when testing live systems on USAF aircraft and ground platforms and/or involving USAF vehicles, personnel, and infrastructure as test subjects.

2.9.7. Identifies funding needed for AF-directed AFRL research to conduct system safety analysis and to fully characterize human effects if data is lacking or unknown.

2.9.8. Identifies to operating MAJCOMs the funding needed to support Directed Energy surveillance from an occupational health standpoint.

2.9.9. Forwards DoD Exemption Notifications from HQ AFSEC to manufacturers for laser-specific DEW that are unable to comply with federal laser safety regulations.

2.9.10. Complies with DoDI 3216.02, *Protection of Human Subjects and Adherence to Ethical Standards in DoD-Supported Research*, and AFI 40-402, *Protection of Human Subjects in Biomedical and Behavioral Research*, restrictions regarding use of humans as test subjects. Contact 711 HPW/IR prior to testing for guidance and to determine if an Independent Review Board (IRB) is needed. PMs should begin this process early in the test planning phase as these requirements are often time consuming.

2.10. Commanders or Directors:

2.10.1. Commanders and Directors at all levels with a DEW mission are responsible for ensuring requirements of this instruction are met and personnel are appropriately trained (as outlined in AFOSH-STD 48-9, AFI 48-139, etc.). (T-1).

2.11. Range Commanders:

2.11.1. Ensures safe operations of DEW on their range IAW AFI 13-212, *Range Planning and Operations*, and guided by MIL-HDBK-828, *Range Laser Safety*.

2.12. Chiefs of Safety:

2.12.1. Selects personnel for the DEWSO position. The DEWSO position should be aligned as a discipline under the Weapons Safety Program (typically at the wing level) where applicable. To maintain DEW Safety continuity, consider requesting an Assignment Availability Code 39 for the DEWSO with 18 months for officer and 24 months for enlisted personnel IAW AFI 36-2110, *Assignments*.

2.12.2. Ensures DEWSOs receive additional training appropriate for the type of DEW used, (as outlined in AFI 48-109, *Electromagnetic Field Radiation (EMFR) Occupational and Environmental Health Program*, AFI 48-139, etc.). (T-2).

2.12.3. Appoints additional staff members to support the DEWSO as the mission requires.

2.13. Directed Energy Weapons Safety Officer:

2.13.1. Manages the unit level DEWSP. (T-1).

2.13.2. Ensures the unit safety program meets the requirements of this instruction. (T-1).

2.13.3. Develops tailored local guidance for storage, mishap prevention plans, etc. (T-1).

2.13.4. For more specific guidance on DEWSO responsibilities, see Chapter 6.

Chapter 3

DIRECTED ENERGY WEAPONS SAFETY CERTIFICATION PROCEDURE FOR PROGRAMS OF RECORD AND COTS/NDI

3.1. Overview.

3.1.1. DEWSB safety certification is required for all DEW prior to operational and training use by USAF personnel. The certification process is conducted in two phases. Phase I initiates no later than 60 days after acquisition Milestone B to develop safety design standards early in the acquisition cycle. Phase II occurs after acquisition Milestone C to review and determine DEW safety certification prior to operational and training use. The DEWSB oversees the DEW certification processes. Certification will include approval and proximity restrictions for DEW projects with or in the vicinity of nuclear or conventional munitions to prevent inadvertent functioning or damage.

3.1.2. The DEWCP details the strategy to ensure that the weapon is in compliance with applicable safety and health criteria.

3.1.3. The DEWSB will issue a Certification Statement to the PM following Phase II approval of the DEWCP.

3.1.4. Since Joint Capability Technology Demonstrations (JCTDs) have varying acquisition timelines and objectives, safety certification phasing will be handled on a case-by-case basis by the DEWSB. The certification phasing will be determined using the acquisition transition plan and an initial safety/hazards/environmental assessment from the JCTD Management Plan required by the Office of the Deputy Under Secretary of Defense for Advanced Systems & Concepts.

3.1.5. Some Commercial off-the-shelf (COTS) and Non-Developmental Item (NDI) systems have the potential to be used as DEW systems (e.g. laser dazzlers). Because the standard acquisition program milestones and phases do not exist for a COTS or NDI program, the purchasing organization will prepare a Phase II DEWCP (excluding portions identified by AFSEC/SEW as not applicable) and include within it elements of a Phase I DEWCP identified by AFSEC/SEW as applicable.

3.1.6. AFSEC/SEW will determine if DEW certification is required for any system that has already been fielded prior to implementation of this AFI.

3.2. Certification Requirements.

3.2.1. Safety Requirement. All fully-developed DEWs will be certified prior to operational or training use as required by AFPD 91-4. Demonstration systems that will be used temporarily will be assessed in accordance with Chapter 4 in lieu of certification.

3.2.2. DEW Certification Plan (DEWCP).

3.2.2.1. Purpose. The DEWCP communicates to the DEWSB the intent to comply with AF DEW safety criteria. The DEWCP will document the safety procedures and controls used to mitigate specific hazards within the operational DEWSP.

3.2.2.2. The PM will maintain configuration control and update the DEWCP to the DEWSB as it evolves with the program and prior to major program milestones.

3.2.2.3. At any time, the PM may request clarification of safety requirements, request feedback, or certification advice from the DEWSB through AFSEC/SEW.

3.3. Directed Energy Weapon Safety Board (DEWSB).

3.3.1. The DEWSB is the review panel for DEW certification.

3.3.2. DEWSB organization, membership, and policies provided in Attachment 2.

3.3.3. The DEWSB conducts an annual DEWCP review from the point the DEWSB determines that a review is necessary until DEW certification is completed.

3.3.4. The DEWSB evaluates the program-specific DEWCP to identify the likelihood of success in meeting safety criteria and applicable national/international scientific safety standards.

3.3.5. The DEWSB Executive Secretary will schedule DEWSB meetings and request additional technical advisors to review new acquisitions, modifications, or add-on capability.

3.3.6. Provides AF input into other Department of Defense (DoD) boards and international organizations.

3.4. DEW Certification Phase I.

3.4.1. Phase I certification begins upon initiation of a DEW acquisition program. Phase I certification provides early safety input and guidance from the DEWSB to the PM; to identify appropriate safety design standards and features into the DEW, thus minimizing potential rework.

3.4.1.1. The PM will submit the Phase I DEWCP to AFSEC/SEW as notification to begin the certification process no later than 60 days after completion of acquisition Milestone B.

3.4.2. Directed Energy Weapon Safety Board Functions.

3.4.2.1. AFSEC/SEW will notify the DEWSB organizations no later than 15 days following receipt of the Phase I DEWCP from the PM to establish a target Phase I DEWSB meeting date. AFSEC/SEW will provide DEWCP to DEWSB organizations.

3.4.2.2. Standing DEWSB members will determine their own requirements for technical support advisors to attend the DEWSB and request support from applicable organizations. These additional technical advisors (see Paragraph A3.3.2.) should be identified to the DEWSB Executive Secretary within 45 days after notification of the target Phase I DEWSB meeting.

3.4.2.3. The DEWSB Executive Secretary will finalize the DEWSB membership no later than 60 days after receiving the Phase I DEWCP.

3.4.2.4. The DEWSB will meet within 90 days of initial PM notification and evaluate the DEWCP. Findings and recommendations will be documented and supplied to the PM by the DEWSB Executive Secretary no later than 60 days from the DEWSB Phase I review of the DEWCP.

3.4.2.5. Refer to Table 3.1. for certification timetable.

3.4.2.6. The PM advises the DEWSB on the status of all findings until the DEWSB determines that all have been closed, or until Phase II certification.

3.4.3. DEWCP Phase I content: see Attachment 3.

3.4.4. At the completion of the DEWCP Phase I review, the safety concerns and recommendations identified by the DEWSB will be provided to the PM, allowing the PM to implement design safety and analyze risk mitigation techniques early in the acquisition program.

3.5. DEW Certification Phase II.

3.5.1. Phase II completion is required prior to DEW operational and training use by USAF personnel.

3.5.1.1. The PM will submit the Phase II DEWCP to the AFSEC/SEW no later than 120 days prior to the required certification date.

3.5.1.2. AFSEC/SEW will provide DEWCP to DEWSB members within 15 days of PM notification.

3.5.1.3. The DEWSB Executive Secretary will schedule the DEWSB no later than 60 days following receipt of the Phase II DEWCP.

3.5.1.4. Refer to Table 3.1. for certification timetable.

3.5.2. DEWSB Functions:

3.5.2.1. Evaluate the DEWCP. Findings, recommendations, and applicable certification statement will be documented and supplied to the PM no later than 60 days from the Phase II review of the DEWCP.

3.5.2.1.1. Certification is based on a DEWTSS reviewed during a regular or special meeting. Results from the DEWTSS will be the basis for DEWSB certification recommendation. The draft DEWTSS shall be prepared no later than 25 days prior to the DEWSB meeting. See Attachment 5 for preparation instructions.

3.5.2.2. The DEWSB reviews and reports the concurrence or non-concurrence with the DEW Certification Recommendation (DEWCR) section of the DEWCP. If the DEWSB non-concurs, they must document all safety criteria that are not met.

3.5.3. DEWCP Phase II Content: see Attachment 4.

Table 3.1. DEW Certification Action Timetable.

Certification Action	OPR	Phase I No Later Than Date	Phase II No Later Than Date
Request initiation of DEW Certification and provide DEWCP to AFSEC/SEW	PM	60 days after Milestone B	After Milestone C, 120 days prior to required certification date
Provide DEWCP to DEWSB	AFSEC/SEW	15 days after PM	15 days after PM

organizations and schedule board date		initiation	initiation
DEWSB organizations determine technical support personnel requirements	DEWSB organizations	45 days after PM initiation	N/A membership determined
Finalize DEWSB and technical support membership	AFSEC/SEW	60 days after PM initiation	N/A
DEWTSS prepared for review	HQ AFMC	N/A	35 days after PM initiation
THAR prepared for review	HQ AFMC	76 days after PM initiation	N/A
DEWSB meeting	AFSEC/SEW	90 days after PM initiation	60 days after PM initiation
Provide DEWSB results to PM	AFSEC/SEW	60 days after DEWSB meeting	60 days after DEWSB meeting

3.6. Certification Determination.

3.6.1. The DEWSB Chair will consider the findings and recommendations of the DEWSB.

3.6.2. If approved, the DEWSB Executive Secretary will provide a DEW Statement of Certification, signed by the DEWSB Chair, to the PM.

3.6.2.1. The statement will list the hardware, software, procedures, and interfaces evaluated and their certification status.

3.6.2.2. The Statement of Certification will be supplied to PM no later than 60 days after DEWSB convenes the Phase II review of the DEWCP.

3.6.3. If disapproved, the DEWSB Executive Secretary will send a Statement of Deficiencies to the PM.

3.6.3.1. The statement will list the items evaluated and their deficiencies.

3.6.3.2. The Statement of Deficiencies will be documented and supplied to the PM no later than 60 days after DEWSB convenes the Phase II review of the DEWCP.

3.7. Certification Procedure for DEW System Modifications.

3.7.1. The following guidance applies to modifications of a DEW system that has already been safety certified. This includes all physical and functional configuration changes to existing certified hardware, software, procedures, and interfaces; addition of new equipment; and new operational uses for existing equipment.

3.7.1.1. The recertification process can be tailored. The scope of DEWSB review will be dependent on the modification's impact on the DEW certification.

3.7.1.2. DEW Certification Statement. The PM will attach the current DEW Certification Statement to the new modification of the DEWCP.

3.7.1.3. No-Impact Statement. If the PM determines the system modification will have no impact to the existing DEW certification, the PM can submit a no-impact statement

(as an addendum to the existing DEWCP) with sufficient supporting analysis to justify this conclusion.

3.7.1.3.1. If the DEWSB determines that the no-impact statement is warranted, the DEW certification statement will be reissued for the modified system.

3.7.1.3.2. If the DEWSB non-concurs, the PM shall modify the DEWCP to address the areas of concern and resubmit to the DEWSB.

3.8. Certification Risk Assessment Procedure. Follow this process when the DEW fails to meet the requirements for certification or in situations of urgent military need where the operational necessity outweighs the operational risk.

3.8.1. Certification risk assessment:

3.8.1.1. In cases where a system component or safety requirement is preventing certification, the MAJCOM sends a risk assessment request letter to AFSEC/SEW.

3.8.1.2. The PM will include the DEWCR from Phase II of the DEWCP.

3.8.1.3. A risk assessment must include an independent hazard analysis, IAW MIL-STD-882E, which demonstrates how the proposed design satisfies the intent of safety certification requirements.

3.8.1.4. AFSEC/SEW in conjunction with the DEWSB will analyze the adequacy of compensatory measures when criteria cannot be met to determine if an adequate level of safety exists and if a risk acceptance is justified.

3.8.1.5. If approved, the DEWSB Executive Secretary will issue a certification risk assessment, signed by the DEWSB Chair, to the PM and MAJCOM.

3.8.1.6. If certification is denied again, the PM should seek other hazard mitigation alternatives to ensure deployment and mission success. The PM may reapply for certification when additional hazard mitigation techniques are completed.

3.8.2. Risk assessment for urgent operational needs.

3.8.2.1. If rapidly fielded capability solutions are requested by combatant commands to support an urgent operational need, the PM will request a certification risk assessment through the MAJCOM to AFSEC/SEW for DEWSB coordination and approval.

3.8.2.2. The rapid fielding request must include a Residual Risk Analysis (RRA). An RRA is an overall assessment of a system's suitability for emergency operations from a safety perspective. It should provide all information necessary to make informed risk management decisions. The RRA must address all items previously listed in the Statement of Deficiencies, Section 3.6.3., and should also include:

3.8.2.2.1. A risk analysis using the approach outlined in MIL-STD-882E.

3.8.2.2.2. Recommendations and strategies to mitigate mishap risks exposed through operations or maintenance.

3.8.2.2.3. A risk mitigation strategy approval by the appropriate Risk Acceptance Authority. Determine the appropriate Risk Acceptance Authority using the highest mishap category of the initial risks (while recommended actions are being

incorporated into the design) and residual risks (after all recommended actions have been incorporated). Refer to MIL-STD-882E, Table III, Risk Acceptance Matrix, and to DoDI 5000.02, Enclosure 12, Para. 6, to determine the required mishap Risk Acceptance Authority.

3.8.2.3. The PM will submit the operational necessity, the scope of intended use, and the period of time required to be excluded from the normal certification process.

3.8.2.4. If approved, AFSEC/SEW will provide a certification risk assessment to the PM. During the risk assessment period, data should be collected on safety related operational deficiencies and potential system improvements.

3.9. Operational Decertification:

3.9.1. The DEWSB may decertify items that have demonstrated inadequate safety through analysis, testing, or operational performance. Decertification may be required when critical components or systems have been improperly used, improperly stored, or not maintained according to the DEWCP. The decertification may involve a specific user organization or the entire inventory.

3.9.2. Any DoD agency may send a recommendation for decertification to AFSEC/SEW for DEWSB review. The recommendation must identify the DEW item and include documentation that supports the recommendation to decertify.

3.9.3. As the authority on decertification actions, the DEWSB reviews the recommendation and takes action to notify all affected parties. The DEWSB will then work with the PM to determine the best course of action to re-certify affected DEW systems.

3.10. Test Safety Assessment:

3.10.1. The DEWSB issues design safety assessments for testing uncertified, yet live, DEWs listed in Section 1.2.1 onboard USAF aircraft, aircraft not in the USAF inventory flown by AF pilots, USAF ground platforms, and/or involving USAF vehicles, personnel, and infrastructure as test subjects. DEWSB approval and proximity restrictions must be obtained prior to the testing or employment of DEWs with or in the vicinity of nuclear or conventional munitions to prevent inadvertent functioning or damage. The captive carriage phase of test programs are governed by the USAF SEEK EAGLE Program and may be entered prior to DEWSB assessment of live-launch or live-fire phases. DEWSB assessment is not required for tests of new DEWs that are non-functional or in by-pass mode when tested. DEW tests of live systems conducted in-laboratory are exempt from the DEWSB review, but must follow local safety and human use reviews as required.

3.10.2. Test hazards are assessed via the THAR conducted during a regular or special DEWSB meeting. THAR identified hazards are then evaluated by the RTO during the SRB process. An appropriate test approval authority then reviews the hazards and mitigating measures and approves the test to proceed or directs further mitigating actions / restrictions. Consult AFI 91-205 for instructions to prepare the THAR.

3.10.2.1. The PM will provide read-ahead information to support identification of test hazards at least 14 days prior to conducting a THAR. Such information may be a simple point paper for non-complex items, or it may be a comprehensive technical data package for test weapons that are potentially more hazardous.

Chapter 4

DIRECTED ENERGY WEAPONS SAFETY APPROVAL FOR INFORMAL ACQUISITION PROGRAMS

4.1. Overview.

4.1.1. This chapter addresses DEWs that are acquired outside of the DoD formal acquisition process, such as R&D, early concept prototypes, etc. Informal acquisitions are typically performed by AFRL, Air Force Institute of Technology (AFIT), United States Air Force Academy, etc. Often, these systems are developed as technology demonstrators which are pre-Milestone B and do not have the same documentation requirements as a standard DoD Program of Record. This chapter provides safety approval guidance for programs preparing for certain tests or for operations by non-developmental personnel.

4.2. DEW Activities Requiring DEWSB Review, Assessment, and Approval. All DEW activities will be governed by the activity's normal test safety review and approval processes, with the exception of the following cases:

4.2.1. DEW projects require DEWSB review and safety assessment prior to demonstration on non-US territory. Employment or other uses require DEWSB approval.

4.2.2. DEW projects require safety assessment prior to unsupervised operation, training, and maintenance by personnel other than the developers. For this purpose, developers are government personnel assigned to the organization (AFRL, AFIT, etc.) that developed the DEW project and its contractors.

4.2.3. DEW project field tests of live systems on board USAF aircraft, aircraft not in the USAF inventory flown by AF pilots, USAF ground platforms, and/or involving USAF vehicles, personnel, and infrastructure as test subjects require DEWSB review and safety assessment. DEW tests of live systems conducted in-laboratory are exempt from the DEWSB review, but must follow local safety and human use reviews as required.

4.2.4. DEW projects with or in the vicinity of nuclear or conventional munitions require DEWSB approval and proximity restrictions to prevent inadvertent functioning or damage.

4.3. Informal Acquisition Program Transition to Operations.

4.3.1. For those informal acquisition DEW projects that desire to transition to normal operational use or unsupervised Extended User Evaluations, follow the standard DEW certification process and requirements listed in Chapter 3 above. Due to the nature of informal acquisition, much of the documentation may not be readily available or will need to be developed. The developer PM or equivalent will be responsible for addressing any missing information and providing the appropriate documentation for the DEWSB to complete its review. The PM shall coordinate with the DEWSB Executive Secretary to specify review documentation requirements.

4.4. Information required for DEWSB informal acquisition safety approval: see Attachment 6.

4.5. Test Safety Assessment:

4.5.1. The DEWSB issues design safety assessments for field testing of uncertified, yet live, DEWs listed in Section 1.2.1. DEWSB approval and proximity restrictions must be obtained prior to the testing or employment of DEWs with or in the vicinity of nuclear or conventional munitions to prevent inadvertent functioning or damage. The captive carriage phase of test programs is governed by the USAF SEEK EAGLE Program and may be entered prior to DEWSB approval of live-launch or live-fire phases. DEWSB approval is not required for tests of new DEWs that are non-functional or in by-pass mode when tested.

4.5.2. Test hazards are assessed via the THAR conducted during a regular or special DEWSB meeting. THAR identified hazards are then evaluated by the RTO during the SRB process. An appropriate test approval authority then reviews the hazards and mitigating measures and approves the test to proceed or directs further mitigating actions / restrictions. Consult AFI 91-205 for instructions to prepare the THAR.

4.5.2.1. The PM will provide read-ahead information to support identification of test hazards at least 14 days prior to conducting a THAR. Such information may be a simple point paper for non-complex items or it may be a comprehensive technical data package for test weapons that are potentially more hazardous.

Chapter 5

DIRECTED ENERGY WEAPONS SAFETY CRITERIA

5.1. DEW Safety Analysis. The safety analysis conducted by the PM, in collaboration with appropriate subject matter experts, provides decision-makers with a process for identifying and evaluating data needed to reach conclusions regarding risks from use of a particular DEW. A comprehensive safety analysis may include modeling, test and evaluation, and an independent review of the DEW within its context of intended use.

5.1.1. Requirements. The safety analysis will apply the System Safety process in MIL-STD-882E to define DEW program-specific safety criteria.

5.1.1.1. Determine the hazardous effects of the DEW within the operational environment.

5.1.1.2. Complete a risk assessment, proposed risk mitigation, and analysis of residual risk for acceptance.

5.1.1.3. Consider all safety critical functions, safety critical components, and safety critical software of the DEW and its interfaces with the host platform.

5.2. Hazard Identification. The identification of DEW hazards provides the basis for safety control implementation.

5.2.1. Suggested hazards to review/measure. Include other system-specific hazards as appropriate. The process of identifying hazards should include potential unintended effects of the weapon and potential occupational exposures.

5.2.1.1. Weapon Power Source.

5.2.1.1.1. Consider hazards associated with DEW power source.

5.2.1.1.2. Consider potential hazards to personnel, equipment, and delivery platforms hosting the DEW.

5.2.1.1.3. Consider parking requirements for DEW equipped aircraft and ground platforms, if applicable, based on the method of DEW power generation. The power generation/conversion could be fuel cell driven, gas turbine power take off, chemical mixing, conventional munition driven (flux compression generator), or another method. Refer to AFMAN 91-201, *Explosives Safety Standards*, for systems using explosive components. DEW related hazardous materials will be managed like any other similar hazardous material under provisions of applicable safety guidance, (e.g. AFI 32-7086 and/or AFJMAN 23-209). AFOSH-STD 48-9 applies to electro-magnetic frequency and electric hazards.

5.2.1.2. Target Interaction and Scenario Dependent Effects.

5.2.1.2.1. Potential hazard of direct and reflected broadband energy (diffuse and specular).

5.2.1.2.2. Potential hazards due to biological effects from DEW.

- 5.2.1.2.3. Environmental effects (atmospheric, vegetation) such as exposure to burning materials.
- 5.2.1.3. Weapon User Effects. Consider hazards caused by energy delivery from DEW to target.
 - 5.2.1.3.1. Consider scattered, reflected, or sidelobe energy (diffuse and direct) throughout propagation path and interaction with target.
 - 5.2.1.3.2. Consider radiofrequency energy interference, ionizing radiation, and sensor oversaturation resulting in potential fratricide.
- 5.2.1.4. Weapon Accuracy Effects.
 - 5.2.1.4.1. Effects due to beam drifting, failure to achieve pointing accuracy, and failure to maintain pointing stability.
- 5.2.1.5. Personnel and Equipment Effects Due to Weapon Exposure.
 - 5.2.1.5.1. Health and safety risks to personnel from direct and indirect weapons effects.
 - 5.2.1.5.2. Risks of impacting infrastructure and legacy systems. Includes full spectrum of impact from temporarily disrupting operations to permanently damaging equipment.
 - 5.2.1.5.3. Potentially hazardous DEW effects to ordnance or fuel.
- 5.2.1.6. Maintenance and Storage.
 - 5.2.1.6.1. Review the potential hazards such as inadvertent chemical release, high pressure systems, electrical discharges, electromagnetic pulses, and confined space issues.
 - 5.2.1.6.2. Consider potential hazards such as transporting, handling, interoperability with existing infrastructure and legacy systems, chemical venting, and safety perimeters.
- 5.2.1.7. Transportation.
 - 5.2.1.7.1. Identify any hazards of system components in shipping, transport, or cruise configuration.
- 5.2.1.8. DEW Handling and System Operation.
 - 5.2.1.8.1. Identify potential hazards from DEW handling and system operations such as chemical exposures, high pressure systems, electrical discharge, high voltage, wave guide leakage, noise, and confined space entry. These hazards would be encountered during the day-to-day operation of the system.
- 5.2.1.9. End of Life/Disposal.
 - 5.2.1.9.1. Review potential safety issues for end of system life such as disposal of chemical containment systems and hazardous system components such as lasers exempt from FDA safety regulations.

5.3. Risk Assessment. The intent of the risk assessment is to evaluate hazards based on information gathered during the hazardous effects identification and achieve the appropriate level of risk mitigation or acceptance.

5.3.1. Determine acceptability of risks IAW MIL-STD-882E.

5.3.2. Evaluate consequences and uncertainties of the weapon in situations during intended use.

5.3.3. Evaluate consequences and uncertainties of the weapon during live-fire testing.

5.4. Safety Critical Functions and Safety Critical Components.

5.4.1. Safety critical functions are actions that control the sequence leading to DEW activation, directed energy propagation, and subsequent termination. Equipment (hardware and/or software) designed to mitigate risk, contain energy flows, and specific approved procedures must be in place. The design of the DEW will consider the following safety critical functions:

5.4.1.1. Safing. Ensures the DEW is incapable of arming, firing, or initiating the process of arming or firing to include initiation of chemical, electrical, or mechanical energy related to the arming process.

5.4.1.2. Targeting. The process of selecting and prioritizing targets and matching the appropriate response to them, considering operational requirements and capabilities.

5.4.1.3. Arming. Prepares the weapon for propagating energy short of the actual firing.

5.4.1.4. Firing. Used to release directed energy (post arming).

5.4.1.4.1. Inhibits. Prevents directed energy, side lobe energy, and energy leakage into Transmit Inhibit Zones (TIZ).

5.4.1.4.2. Audible and Visual Caution and Warnings. Indicates to operators when powering/operating DEW systems and when disabling DEW safety systems (e.g., TIZ inhibits) and engineering controls while energized.

5.4.1.5. Terminating. Halt directed energy propagation.

5.4.1.6. Weapon Energy Containment. Contain weapon energy, control its flow, conversion, or delivery.

5.4.1.7. Monitoring. Provides status of the other safety critical functions.

5.4.1.8. Transitions between system states. Ensures safe transition from inactive state to ready state or training state to ready state.

5.4.1.9. Any functions designated safety critical by the PM.

5.4.2. Safety critical components are those components (hardware or software) whose failure or fault would compromise safe operation of the entire system. The hazard mitigation and control shall be appropriate to the potential hazard of the DEW or its components. Use the following guidance to determine which DEW components are safety critical:

5.4.2.1. A component that controls a safety critical function is a safety critical component.

5.4.2.2. A component that controls a system state transition is a safety critical component.

5.4.2.3. A component whose failure produces a hazard with a catastrophic or critical mishap rating IAW MIL-STD-882E is a safety critical component.

5.4.2.4. Any components designated safety critical by the PM.

5.5. General Safety Requirements.

5.5.1. Exposure limits. The safety criteria will use, to the maximum extent practical, procedures and controls based upon sound radiation protection IAW DoDI 6055.08, *Occupational Ionizing Radiation Protection Program*, DoDI 6055.11, *Protecting Personnel from Electromagnetic Fields*, DoDI 6055.15, *DoD Laser Protection Program*, AFI 48-148, *Ionizing Radiation Protection*, AFI 48-139, and AFOSH-STD 48-9. Standards for acoustic systems can be found in AFOSH-STD 48-20.

5.5.1.1. Engineering Controls.

5.5.1.1.1. Engineering controls are the preferred method of controlling hazards. Use first and foremost to control hazards of DEW to DoD personnel and local community.

5.5.1.1.2. Design and build adjustable average power levels as appropriate to mission of the DEW.

5.5.1.1.3. Terminate the beam at the end of its useful path or establish exclusion zones commensurate with the expected hazard region surrounding the target.

5.5.1.1.4. System program managers should consider the suitability of limited aerospace and range areas available for training with the DEW and whether a training mode is required.

5.5.1.1.5. Control measures should be implemented to mitigate or reduce hazards IAW AFI 90-802, *Risk Management*, AFI 63-1201, *Life Cycle Systems Engineering*, AFI 91-202, *The US Air Force Mishap Prevention Program*, and MIL-STD-882E.

5.5.1.2. Personal Protective Equipment (PPE).

5.5.1.2.1. Where engineering and other controls are not adequate to mitigate DEW hazards/emissions to below Maximum Permissible Exposure (MPE), wear PPE as appropriate. Ensure PPE is recommended by and certified through Bioenvironmental Engineering (BE). With BE advising, work center provides adequate training on wear and limitations of the PPE to all personnel wearing the PPE.

5.5.1.2.2. The PM must evaluate the effectiveness and make recommendations for the safe use of PPE against the DEW emissions or other physical or chemical hazards inherent to the system. If adequate PPE doesn't exist, then the PM should contact USAFSAM/OEC and AFRL 711 HPW/RHD to initiate research into appropriate PPE or to determine alternate methods to protect personnel if they must be occupationally exposed.

5.5.1.3. Administrative Controls.

- 5.5.1.3.1. Training is critical to ensure safe operation of DEW. Personnel must be trained prior to using or maintaining DEW systems. See Section 6.2.3.11.3. for training topics.
- 5.5.1.3.2. System documentation including training manuals, TOs, and operating checklists can increase user awareness and prevent hazards. To the greatest extent possible, hazards and hazardous effects should be identified in system TOs or the equivalent and cover use, storage, and maintenance.
- 5.5.1.3.3. Use the minimum power level for the application being performed, if applicable.
- 5.5.1.3.4. Occupational health exam requirements for personnel engaged in DEW operations are determined by the base Occupational and Environmental Health Working Group IAW AFI 48-145, *Occupational and Environmental Health Program*, AFI 48-148, AFOSH-STD 48-9, and AFI 48-139.
- 5.5.1.3.5. Use a “training mode” where applicable to ensure personnel are not harmed.
- 5.5.1.3.6. If a DEW system is shipped to/from other locations aboard transport aircraft or ship, it should be configured in a non-energized system state with minimum fuel/chemicals. The hazards in shipping configuration may limit the mode of transportation. Establish shipment procedures and safety checklists for use with transportation units, as applicable and IAW AFI 32-7086.
- 5.5.1.4. Special Controls. This section is not an all-inclusive list, but meant to provide examples of additional special controls that may be required, given the type of DEW.
- 5.5.1.4.1. Install visual or audible beam-warning devices independent of DEW system in areas where personnel may be exposed to radiation in excess of the Maximum Permissible Exposure (MPE)/Threshold Limit Value (TLV), when it will not compromise the mission. Use appropriate warning signs on all outdoor ranges approved for DEW use.
- 5.5.1.4.1.1. Install a manually operated audible alarm in each location where DEW maintenance and/or testing requires isolation. The alarm must have two pull stations or initiation locations in each area (room or maintenance bay) where DEW operations occur.
- 5.5.1.4.2. Observe high voltage and arc flash safety criteria IAW AFI 91-203.
- 5.5.1.4.3. Be aware that ionizing and non-ionizing radiation from source generation may exceed allowable limits. Ionizing radiation exposure may require additional monitoring IAW AFI 48-148 and AFMAN 48-125, *Personnel Ionizing Radiation Dosimetry*.
- 5.5.1.4.4. Use Energy Isolation Devices to isolate (lock out/tag out) energy sources prior to the start of inspection, maintenance, or servicing actions until such activities are complete IAW AFI 91-203.
- 5.5.1.5. Sensor and Electronic Equipment Safety. As appropriate, safety criteria will consider creating requirements to protect sensors from damage and other implications on

electronic equipment IAW Department of Defense Directive (DoDD) 3222.3, *DoD Electromagnetic Environmental Effects (E3) Program*. Methods to protect other systems could include operational clear zones, controlling beam widths, sensor hardening, etc.

5.5.2. Environmental Impact. The safety criteria will consider the environment in areas such as: air quality, hazardous materials and waste, noise, water and biological resources, geology, and soils IAW 32 Code of Federal Regulations (CFR) 989, *Environmental Impact Analysis Process (EIAP)*.

Chapter 6

OPERATIONAL UNIT DIRECTED ENERGYWEAPON SAFETY PROGRAM GUIDANCE

6.1. Implementation.

6.1.1. Each MAJCOM with a DEW mission will establish a DEWSP for each assigned DEW. Ensure MAJCOM/NAF WSMs/DEWSOs receive the same training as wing/unit WSMs/DEWSOs.

6.1.2. Each unit conducting or directly supporting DEW operations, testing, or training must execute a DEWSP. (T-1).

6.2. Program Requirements.

6.2.1. The DEWSP must be a component of the operational unit safety program as required by AFPD 91-2, *Safety Programs*, AFPD 91-4, and AFI 91-202.

6.2.2. DEW Safety Criteria.

6.2.2.1. The DEWSP attempts to mitigate hazards by following the safety criteria as described in Chapter 5.

6.2.2.2. The safety criteria will be applied through the entire lifecycle of the DEW system.

6.2.3. Program Functions.

6.2.3.1. The unit DEWSO will review the DEWSP at least annually for each type of DEW operated by the unit. (T-2).

6.2.3.2. The unit DEWSO will ensure operational risks, not identified by the DEW PM in the PESHE, are accepted at the appropriate level of responsibility by using AFI 90-802, Air Force Pamphlet (AFPAM) 90-803, *Risk Management (RM) Guidelines and Tools*, and AFI 91-202. Use RM to assess risks associated with safety violations and other safety inspection findings. (T-2).

6.2.3.3. In rare circumstances, a DEW system may be needed for operational use prior to certification using a risk acceptance process (see [Chapter 3](#)). The unit DEWSO will review certification risk acceptance to established safety criteria. (T-2).

6.2.3.3.1. The unit DEWSO will advise commanders of the increased or decreased risk should the DEWSB issue a certification risk assessment. (T-2).

6.2.3.4. The operational unit DEWSO will conduct DEW unit inspections as described in AFI 91-202, Chapter 3. (T-1).

6.2.3.5. The operational unit DEWSO will collaborate with the unit Plans and Programs Directorate (XP), Civil Engineering Emergency Management (EM), and Fire and Emergency Services to assist in the development of emergency response plans for handling DEW-related emergencies. The operational unit DEWSO will coordinate laser DEW operations and safety plans with the Installation Laser Safety Officer per AFI 48-139. (T-2).

6.2.3.6. The operational unit DEWSO will monitor facilities and operations involving DEW. (T-2).

6.2.3.7. The operational unit DEWSO will develop and annually review a DEW operations and maintenance location map. Review the map in conjunction with the installation Comprehensive Plan Maps C-1, D-8, E-9 and M-3 (as applicable) to identify hazardous DEW effects to Potential Explosive Sites, including ordnance and fuel. (T-1).

6.2.3.8. The operational unit DEWSO will review hazards mentioned in DEW system TOs or equivalent for use, storage, transport, and maintenance (at a minimum). (T-2).

6.2.3.9. The operational unit DEWSO will evaluate and document to the user the unit's radio frequency weapons, laser weapons, and other DEWs for operational compatibility with ordnance, electronics, and fuel storage likely to be in the operating and maintenance environment of the DEW, IAW DoDD 3222.3 and AFMAN 91-201. (T-1).

6.2.3.10. The MAJCOM/A3 shall, in coordination with MAJCOM/SE, obtain clearances with required agencies and other safety elements. The unit DEWSO shall ensure clearance is obtained prior to use. (T-2).

6.2.3.10.1. Comply with policies and procedures in DoDI 3100.11 (O), *Illumination of Objects in Space by Lasers*, for laser weapons potentially directed at targets above the horizon. (T-2).

6.2.3.10.2. Contact other federal agencies as required (e.g. Federal Aviation Administration (FAA) Order 7400.2J, *Procedures for Handling Airspace Matters*, Chapter 29: *Outdoor Laser Operations*, or Federal Communications Commission (FCC) for frequency allocation). (T-2).

6.2.3.10.3. Obtain written legal review by the MAJCOM Office of the Staff Judge Advocate (SJA) concerning the applicability of domestic and foreign laws to US forces and US personnel use and possession of DEW during OCONUS missions. (T-2).

6.2.3.10.4. Establish CONOPS and training programs in accordance with DoD Policy prohibiting the use of lasers specifically designed to cause permanent blindness (11 Jan 97). The MAJCOM will ensure all operators are trained on those aspects particular to the use of DEW. The MAJCOM SJA will review guidance to ensure compliance with DoD policy and confirm the required reviews have been completed in accordance with DoDD 2311.01E, *DoD Law of War Program*, DoDD 3000.03E, *DoD Executive Agent for Non-Lethal Weapons (NLW)*, and *NLW Policy*, AFPD 51-4, *Compliance with the Law of Armed Conflict*, and AFI 51-402, *Legal Reviews of Weapons and Cyber Capabilities*.

6.2.3.11. The operational unit DEWSO shall develop and implement unit DEW safety training plans IAW AFI 91-202. (T-3).

6.2.3.11.1. Document existing DEW hazards and potential hazards due to local area infrastructure (e.g. fuel farms, weapon storage) and provide as a component of initial and recurring personnel safety training. (T-3).

6.2.3.11.2. Personnel conducting or directly supporting DEW operations, maintenance, testing, or training must receive training prior to use, within 30 days of assignment to unit, and every 15 months thereafter. (T-3).

6.2.3.11.3. Training topics include, but are not limited to, fundamentals of laser/radio frequency (RF) and other DEW operations, system CONOPS, use of all operating modes, hazardous effects (see [Chapter 5](#)), bioeffects of laser/RF radiation on the eye and skin, significance of specular and diffuse reflections (lasers), non-beam hazards (e.g. electrical, chemical, reaction by-products, etc.), ionizing and non-ionizing radiation hazards, laser classifications as applicable, control measures, safety critical functions/components, personal responsibilities, DEW transportation/shipping issues, MPE/TLV as applicable, medical surveillance requirements, and CPR for high-voltage environments. Training will include any system-level or platform hazards as a result of the DEW.

6.2.3.11.4. Supervisors shall document and maintain training completion as prescribed by the records disposition schedule (<https://www.my.af.mil/afirms/afirms/afirms/rims.cfm>), Table & Rule: T 91 - 04 R 24.00 or T 91 - 04 R 25.00. (T-3). The method of documentation is up to the supervisor, if not otherwise prescribed by the applicable MAJCOM or related chain of authority. When an individual deploys/transfers to another Air Force position/location, the training documentation product will be hand carried to the new supervisor by the individual. The new supervisor will review the training documentation product, transfer current and other onetime training completion dates as necessary to a new training documentation product, and retain the old product IAW the Air Force Records Disposition Schedule. (T-3). The supervisor will destroy the training documentation product after personnel are separated or retired. (T-3).

6.2.3.11.5. Annually review material covered in the training plan for accuracy. Consult installation Occupational Health Working Group for medical information as needed. (T-3).

6.2.3.12. The unit DEWSO will inform the MAJCOM/SEW and DEW Program Manager of any system-related hazards not previously identified and coordinate with the MAJCOM and Program Office to assess the risks, identify and implement mitigation measures, and ensure the residual risks are accepted in accordance with DoDI 5000.02. (T-3).

6.2.4. Program Inspections

6.2.4.1. MAJCOMs with operational DEW will perform DEWSP evaluations, assessments, and inspections IAW AFI 91-202.

6.2.4.2. The unit DEWSP will be evaluated based on the requirements of this section (6.2.).

6.2.5. Mishap Prevention, Reporting, and Investigation.

6.2.5.1. A complete program must include training, inspecting and monitoring, hazard identification, mishap reporting, and data analysis. These functions must be performed IAW AFI 91-202.

6.2.5.2. DEW mishaps must be reported and investigated according to the requirements and timelines defined in AFI 91-204 and AFMAN 91-221. When the mishap is categorized as a space, flight, or ground mishap, use the appropriate guidance (e.g. AFMAN 91-222, *Space Safety Investigations and Reports*, AFMAN 91-223, *Aviation Safety Investigations and Reports*, or AFMAN 91-224, *Ground Safety Investigations and Reports*). All DEW mishaps must be reported in Air Force Safety Automated System (AFSAS). The following scenarios will be reported:

6.2.5.2.1. If the DEW system doesn't perform as designed or if procedures are not followed, resulting in injury and/or property damage.

6.2.5.2.2. If a mishap occurs with another system within the range of the DEW which appears to be related to DEW operations.

6.2.5.3. Report injuries or suspected injuries resulting from exposure to a DEW system per AFI 48-139 or AFOSH-STD 48-9 as applicable. Also, contact the DoD EMF Hotline (1-888-232-3764), the ESOH Hotline (DSN: 798-3764, commercial: 937-938-3764), or send email to esoh.service.center@wpafb.af.mil, and/or the Tri-Service Laser Injury Hotline (1-800-473-3549).

6.2.5.4. Report over-exposures to RF radiation per AFOSH-STD 48-9. Report over-exposures to laser radiation per AFI 48-139.

6.2.5.5. Include the DEW PM in the mishap investigation process to assist in assessing mishap causes and potential design changes needed to reduce or eliminate the risk of the mishap occurring again.

6.2.6. Post-mishap Data.

6.2.6.1. Required data.

6.2.6.1.1. Include weapon engagement parameters such as operational state, time, platform location, weather, orientation and vector, beam intensity and duration, and beam angles if available, as applicable.

6.2.6.1.2. Data on other systems involved, including pre-mishap state, location, and extent of disruption and/or damage.

6.2.6.1.3. For airborne DEW platforms, determine which DEW data, if any, is included and which recording mechanisms are used IAW Air Force Handbook 63-14, *Aircraft Information Program*.

6.2.6.1.4. Personnel Exposure Reporting Data. Size of irradiated area; absorption, reflection, scattering properties, and locations of nearby material contributing to total exposure at DEW wavelength; intensity of beam on personnel; distance from source; presence on any shield or PPE; duration of exposure; and pulse repetition. Refer to AFOSH-STD 48-9 and AFI 48-139 for potential personnel overexposure.

6.2.7. Non-mishap Exposures.

6.2.7.1. There may be times when, due to critical operational need (training, system evaluation, CONOPs development, etc.), AF personnel will be intentionally exposed to a DEW.

6.2.7.1.1. Commanders must ensure that risks are appropriately weighed against their operational requirements. (T-2)

6.2.7.1.2. The unit DEWSO must ensure these exposures are performed in accordance with the guidance established in AFI 48-109 and AFI 48-139. **(T-0)**. For those rare cases where, because of the operational requirements of a system, the exposure may be above accepted limits, the DEWSO must ensure that the appropriate policy exemptions have been obtained (see Section A3.10.2.) and that alternative exposure requirements are met. **(T-0)**.

6.2.7.1.3. Exposures above established limits must be recorded per AFI 48-145 and become a part of the individual's occupational exposure record. (T-2).

6.2.7.1.4. If intentional exposure to a DEW is above accepted limits, the Occupational Health Working Group should be included in the review of the policy exemption and exposure plan. Additionally, a medical exam may be required immediately following the intentional over-exposure.

KURT F. NEUBAUER
Major General, USAF Chief of Safety

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

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Abbreviations and Acronyms

ACC—Air Combat Command

ACTD—Advanced Concept Technology Demonstration

AFGSC—Air Force Global Strike Command

AFI—Air Force Instruction

AFIT—Air Force Institute of Technology

AFJMAN—Air Force Joint Manual

AFMAN—Air Force Manual

AFMC—Air Force Materiel Command

AFOSH-STD—Air Force Occupational Safety and Health Standard

AFOTEC—Air Force Operational Test and Evaluation Center

AFPAM—Air Force Pamphlet

AFPD—Air Force Policy Directive

AFRC—Air Force Reserve Command

AFRL—Air Force Research Laboratory

AFSAS—Air Force Safety Automated System

AFSEC—Air Force Safety Center

AFSOC—Air Force Special Operations Command

AFSPC—Air Force Space Command

AMC—Air Mobility Command

ANG—Air National Guard

ANSI—American National Standards Institute

CFR—Code of Federal Regulations

CONOPS—Concept of Operations

COTS—Commercial Off the Shelf
DEW—Directed Energy Weapon(s)
DEWCP—Directed Energy Weapon Certification Plan
DEWCR—Directed Energy Weapon Certification Recommendation
DEWSO—Directed Energy Weapons Safety Officer
DEWSB—Directed Energy Weapon Safety Board
DEWSP—Directed Energy Weapon Safety Program
DEWTSS—Directed Energy Weapon Technical Safety Study
DoD—Department of Defense
DoDD—DoD Directive
DoDI—DoD Instruction
DRU—Direct Reporting Unit
DT&E—Developmental Test and Evaluation
EIAP—Environmental Impact Analysis Process
ESC—Electronic Systems Center
ESOH—Environment, Safety, and Occupational Health
FAA—Federal Aviation Administration
FCC—Federal Communications Commission
FOA—Field Operating Agency
IAW—in accordance with
IOT&E—Initial Operational Test and Evaluation
HAZMAT—Hazardous Materials
JCTD—Joint Capability Technology Demonstration
MAJCOM—Major Command
MDA—Milestone Decision Authority
MPE—Maximum Permissible Exposure
NDI—**Non**—Developmental Item
OPR—Office of Primary Responsibility
PESHE—Programmatic Environment, Safety, and Occupational Health Evaluation
PM—Program Manager
PPE—Personal Protective Equipment
RDS—Records Disposition Schedule

RF—Radio Frequency
RFR—Radio Frequency Radiation
RM—Risk Management
RRA—Residual Risk Analysis
RTO—Responsible Test Organization
SEP—Systems Engineering Plan
SRB—Safety Review Board
SSG—System Safety Group
THAR—Test Hazards Assessment Review
TIZ—Transmit Inhibit Zones
TLV—Threshold Limit Value
TO—Technical Order
USAFSAM—U.S. Air Force School of Aerospace Medicine
WSM—Weapons Safety Manager

Terms

Component—Subsystem, item or element. A component is hardware, software, procedures, interfaces, or a combination of any of the four.

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

Directed Energy—An umbrella term covering technologies that relate to the production of a beam or field of concentrated electromagnetic energy, atomic or subatomic particles.

Directed Energy Mishap—An Air Force mishap fitting one of the following subcategories:

- 1) Directed Energy Weapon. A mishap involving a directed energy weapon and/or unique directed energy weapon support equipment.
- 2) Directed Energy Device. A mishap involving a directed energy device. An example would be damage to an optical device by an aircraft laser range finder.

Directed Energy Weapon—A weapon system using directed energy primarily as a direct means to deny, disrupt, degrade (damage), or destroy enemy equipment, facilities, or personnel. Note that this differs slightly from the Joint definition by including deny and disrupt in order to cover additional systems and capabilities.

Emergency Operational Capability—The ability of a system currently under development (a system with limited capabilities or a limited number of systems) that could be deployed in an operational mode by warfighters during a crisis situation. The fielding of JSTARS during Desert Storm is an example.

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.

Maximum Permissible Exposure—(1) The level of laser to which a person may be exposed without hazardous effect or adverse biological changes in the eye or skin. Laser MPE values for eyes and skin are listed in ANSI Z136.1. Also refer to AFI 48-139. (2) The conservative threshold for the occurrence of potentially deleterious health effects in humans from electromagnetic fields. Electromagnetic field exposure standards are listed in IEEE C95.1. Also refer to AFOSH-STD 48-9.

Modification—All physical and functional configuration changes to existing certified hardware and software; addition of new equipment; and new operational uses for existing equipment.

Nonionizing Radiation—Any electromagnetic radiation incapable of producing ions directly or indirectly. Laser energy, microwaves, and radio frequency energy are forms of nonionizing radiation.

Safety Critical Functions—Functions that control the sequence leading to DEW activation and subsequent termination, (e.g. Targeting, Arming, Firing, Terminating, Monitoring, etc).

Safety Critical Components—System components that control safety critical functions, produce extreme hazards, or components whose failure or fault would compromise safe operation of the entire system.

Safety Critical Software—Those computer software components and units whose errors can result in a potential hazard, or loss of predictability or control of a system.

System Program Manager—The single individual specifically designated, under the integrated weapon system management architecture, to be responsible for the life cycle management of a system or end-item. The system program manager is the person vested with full authority, responsibility, and resources to execute and support an approved Air Force program.

System States—Control the safety critical functions and prevent the inadvertent or improper propagation of directed energy by the weapon, (e.g. Inactive, Ready, Active, and Maintenance). Alternate names and additional states may be employed.

Threshold Limit Value—The American Conference of Governmental Industrial Hygienists establishes limits of occupational exposure to physical agents of acoustic, ergonomic, mechanical, and thermal nature, that represent conditions under which it is believed that nearly all workers may be repeatedly exposed day after day, over a working lifetime without adverse effect. See AFOSHSTD 48-20 for occupational noise guidance.

Weapon Energy—Anything used to power, fuel, or provide energy for a DEW. Any source, which may be used for both DEW and another activity, becomes weapon energy when it is loaded and consumed for exclusive DEW use. Examples of weapon energy include chemical, electrostatic, electrodynamic, explosive, gas, light, or ionizing sources. An example of a source becoming weapon energy is chemicals that may be used for industrial or DEW use. Certain ground safety and occupational health standards govern the industrial use of the chemicals; however, once the chemicals are loaded into a weapon for the sole purpose of providing energy for beam generation, they become weapon energy. For weapon energy, DEW safety rules take precedence over other safety rules.

Attachment 2

DIRECTED ENERGY WEAPONS SAFETY BOARD

A2.1. Purpose. The DEWSB functions as the safety certification authority for program-specific Directed Energy Weapons (DEW) and conducts assessments, approvals, and certifications throughout DEW research, development, test and evaluation, production, deployment, and operational life cycle.

A2.1.1. For DEW intended for operational use by the AF, the DEWSB:

A2.1.1.1. Reviews and establishes design safety and qualification test criteria, standards, and requirements for DEW and related items.

A2.1.1.2. Provides guidance to program management authorities throughout the life cycle of DEW programs and ensures criteria for safety certification reviews receive adequate consideration during the design, development, test and evaluation, and operational deployment phases.

A2.1.1.3. Maintains safety awareness over all new or modified DEW, including those developed by the AF, those obtained from other US military services, and those obtained from foreign sources.

A2.1.1.4. Ensures safety certification or approval by another service or government does not replace the required DEWSB review and approval. However, certification and approval actions conducted jointly with another service's certification/approval authority may satisfy the DEWSB review and approval process.

A2.1.1.5. Systems approved via AFI 91-205 or other Air Force recognized approval processes may be accepted by the DEWSB, provided the DEW portion of the system was evaluated. The DEWSB reserves the right to review and approve uncertified, yet live, DEWs listed in Section 1.2.1 onboard USAF aircraft, ground platforms, and aircraft not in the USAF inventory flown by AF pilots.

A2.1.2. During the conduct of its safety study and review program, the DEWSB:

A2.1.2.1. Ensures DEWs are evaluated against AF safety criteria, standards, and requirements and evaluations are based on analysis results and data obtained from engineering, development, and operational testing.

A2.1.2.2. Verifies (through results of evaluations) that required level of design and performance safety is achieved during all of a DEW item's life cycle. An item's life cycle includes all phases of development, production, and AF operational use (including transportation, handling, maintenance, employment, and disposal) from program initiation through item removal from the AF inventory.

A2.1.2.3. Reviews the safety aspects of DEW operations, when requested by a DEWSB member or HAF office, and recommends to the responsible organization actions to improve safety or occupational health provisions of the operation.

A2.2. DEWSB Members and Advisory Personnel.

A2.2.1. DEWSB Members. The DEWSB is comprised of experienced individuals designated by their command or agency. Members must have expert knowledge of AF

DEW, related systems, and associated operational safety policies and procedures, and must be able to act as AF technical authorities for the purposes of the DEWSB.

A2.2.1.1. Members must also be knowledgeable of their command's unique policies, procedures and operational limitations and constraints. They will staff within their commands or agencies all read-ahead material, resolve differences, and bring command positions to the board meetings. In addition, members will thoroughly evaluate each study and review documents prior to a DEWSB meeting.

A2.2.1.2. Members actively participate in all DEWSB meetings. Members present their command's position and strive to resolve all conflicts based on the best interest of the AF. Members will arrange for a proxy when attendance at a meeting is not possible. When notified of appointment to the DEWSB, a new member will arrange for an orientation with the Executive Secretary. This orientation may be done in conjunction with a normally scheduled convening of all board members. If this option is used, the new member will coordinate his/her orientation with the Executive Secretary at least two weeks prior to the meeting.

A2.2.1.3. Members must possess the authority needed to ensure a comprehensive technical review within their command or agency of the safety studies and analyses on which DEWSB safety evaluations are based.

A2.2.1.4. DEWSB membership is composed of one voting representative from each of the following commands and agencies:

A2.2.1.4.1. Headquarters (HQ) AFSEC/SEW - DEWSB Chair

A2.2.1.4.2. AF/SG

A2.2.1.4.3. HQ Air Combat Command (ACC)

A2.2.1.4.4. HQ Air Education & Training Command (AETC)

A2.2.1.4.5. HQ Air Force Global Strike Command (AFGSC)

A2.2.1.4.6. HQ Air Force Materiel Command (AFMC)

A2.2.1.4.7. HQ Air Force Reserve Command (AFRC)

A2.2.1.4.8. HQ Air Force Space Command (AFSPC)

A2.2.1.4.9. HQ Air Force Special Operations Command (AFSOC)

A2.2.1.4.10. HQ Air Mobility Command (AMC)

A2.2.1.4.11. HQ Pacific Air Forces (PACAF)

A2.2.1.4.12. HQ United States Air Forces in Europe (USAFE)

A2.2.1.4.13. Air Force Operational Test and Evaluation Center (AFOTEC)

A2.2.1.4.14. Air National Guard (ANG)

A2.2.1.5. Non-voting members will be comprised of an Executive Secretary designated by the Chair, plus technical experts from the following:

A2.2.1.5.1. AFRL

A2.2.1.5.2. AFMC/96th Test Wing

A2.2.1.5.3. PMs

A2.2.1.5.4. Representatives of other services

A2.2.1.5.5. USAFSAM

A2.2.1.6. Program-Specific Technical Advisors. Program-specific technical advisors are individuals with expertise uniquely suited to the program's technical and operational specifications. The following areas should typically be represented:

A2.2.1.6.1. Directed Energy Weapon Safety

A2.2.1.6.2. Directed Energy Bioeffects

A2.2.1.6.3. Directed Energy Material Effects

A2.2.1.6.4. System Operations and Maintenance

A2.2.1.6.5. Range Testing

A2.2.1.6.6. Test & Evaluation Safety Planning

A2.2.1.6.7. As required: includes representatives (e.g. military, government civilians, advisory and assistance services contractors, contractors) with expertise deemed important by the PM or any of the standing board members.

A2.3. Chairperson and Member Duties.

A2.3.1. The Chair, or his/her designated representative, presides at DEWSB meetings. For a given matter before the Board, the Chair casts a vote only when a ballot of members present results in a tie.

A2.3.1.1. The Chair approves the composition of special ad hoc groups to provide DEWSB-related review and advisory services to special access programs.

A2.3.1.2. If not designated as the Chair, AFSEC/SEW will provide the DEWSB with a representative to function as an advisor or consultant to the DEWSB at every meeting.

A2.3.2. Members from HQ ACC, HQ AFMC, HQ AMC, HQ PACAF, HQ USAFE, and AFOTEC constitute a quorum for conducting DEWSB business. Under unusual situations, such as a short notice or conflicting requirements, quorum members may delegate their votes to another quorum member (proxy), provided the proxy member and the DEWSB Chair agree to the delegation. When the DEWSB reviews DEW where operational use is limited to other commands (e.g., HQ AFSOC), the members from those commands will be included in the quorum requirements.

A2.3.2.1. Individual DEWSB members may invite advisors and consultants, and will notify the Executive Secretary of those attendees well in advance of the meeting.

A2.3.3. Advisory Personnel. Advisory personnel are invited to attend DEWSB meetings, as required. At times, attendance by such advisors may be essential to the effective conduct of DEWSB business. Advisors do not exercise a vote during the formal proceedings. If the membership holds that inadequate advisory expertise is present to allow proper evaluation of DEWs, then at the discretion of the Chair, review of the item may be postponed until a subsequent meeting.

A2.3.4. If the Chair, the Executive Secretary, or member anticipates that operational limitations may be imposed as a condition of certification of DEWs for operational use, the Executive Secretary will advise the affected organization requesting DEWSB review. In addition, that organization will request participation by one or more advisory representatives of the affected AF Secretariat or Air Staff offices.

A2.3.5. The DEWSB may conduct joint reviews with the weapons safety certification bodies of other services for joint development programs. Joint reviews will normally be co-chaired, and can include participation of members from multiple Services. The DEWSB, however, reserves the prerogative to deliberate separately on a particular issue to achieve an AF position. Joint meeting minutes may also serve as official DEWSB minutes.

A2.4. Executive Secretary Duties.

A2.4.1. Serves as the principal administrative assistant and key advisor to the Chair and Board members for conducting DEWSB affairs.

A2.4.2. Consults with the AF procuring organizations, program offices, managers, or other agencies, as necessary, to clarify requirements specified in this instruction.

A2.4.3. Informs the Chair about DEWSB activities and issues that might affect DEWSB proceedings.

A2.4.4. Maintains a list of appointed DEWSB members and alternates and provides the administrative services necessary to conduct DEWSB meetings. He/she also provides new member orientation.

A2.4.5. Interacts with the Chair, members, AF procuring/modifying agencies, system program offices, or other agencies, as necessary, to ensure the effectiveness of the DEWSB safety review processes.

A2.4.6. Maintains up-to-date preparation instructions for technical read-ahead documentation and DEWSB presentations.

A2.4.7. Notifies the appropriate program management authorities of a change in certification status of DEWs when the AF/SE or a staff agency disapproves a DEWSB recommendation on certification or non-certification.

A2.4.8. Takes the following actions to schedule meetings authorized by the Chair.

A2.4.8.1. Issues meeting announcements at least 30 days in advance of regularly scheduled meetings.

A2.4.8.2. Polls Board members to determine their availability when the need for a special meeting is identified.

A2.4.8.3. Informs the agency requesting a DEWSB meeting that funding of the Chair's, Board members', and technical advisors' travel expenses will be a condition for conducting the meeting.

A2.4.8.4. Establishes meeting agendas.

A2.4.8.5. Establishes deadlines for submission of safety studies scheduled for review. Deadlines are normally 30-45 days prior to the meeting date.

A2.4.8.6. Invites appropriate advisors and special representatives to attend meetings as directed by the Chair.

A2.4.8.7. Provides all administrative services needed to support a meeting such as read-ahead packages and conference room(s).

A2.4.9. Examines all documentation intended for DEWSB review to ensure appropriateness and technical quality, and also performs the following actions:

A2.4.9.1. Circulates technical documents and presentations to DEWSB membership sufficiently in advance of a meeting to allow for review.

A2.4.9.2. Notifies the preparing organization when documentation is deemed unacceptable for DEWSB review and provides guidance on changes needed to produce acceptable quality. As a result, the preparing organization will make necessary changes and resubmit documentation to the Executive Secretary for approval.

A2.4.9.3. Ensures related studies, correspondence, and background material are available for the DEWSB meeting and establishes post-meeting liaison with agencies having a direct interest in the results of DEWSB proceedings.

A2.4.10. When authorized by the DEWSB, monitors follow-on actions established as a condition of approval to test or operate DEW in the vicinity of nuclear or non-nuclear munitions and issues the final approval and proximity restrictions when actions are completed.

A2.4.11. Notifies program management authorities, test organizations, and unit commanders of assessments and when it is permissible to proceed with planned activities and operations based on DEWSB recommendations.

A2.4.12. Notifies concerned agencies of the change in certification status if HAF disapproves a DEWSB recommendation.

A2.4.13. Notifies agencies responsible for implementing DEWSB recommendations following approval.

A2.4.14. Ensures DEWSB proceedings are fully documented and approved, and prior to review, are made available for review by the Board members as the last item of meeting business.

A2.4.14.1. Forwards final meeting minutes to the Chair for approval.

A2.4.14.2. Publishes and distributes final meeting minutes after approval.

A2.4.15. Manages status reporting actions that implement approved DEWSB recommendations. Specifically, he/she:

A2.4.15.1. Periodically requests action item status reports from designated action agencies.

A2.4.15.2. Reports action item status at each regularly scheduled DEWSB meeting.

A2.4.16. Maintains awareness of national and international standardization activities involving design and performance safety, analysis, and DEW testing, and offers such standards for possible DEWSB approval, as appropriate.

A2.4.17. Maintains all DEWSB historical records, including meeting proceedings and logs of administrative closures issued by the Executive Secretary. He/she will ensure the Board members are provided current copies of these indexes and logs and the DEWSB membership roster.

A2.4.18. Maintains the DEWSB certification database, prepares the catalogue of DEWSB actions, and distributes annual catalogue updates to Board members.

A2.5. Administrative Procedures.

A2.5.1. DEWSB meetings are held at least annually. Special meetings may be called to support time-critical acquisition program activities. Meetings of the DEWSB will be scheduled only by the Chair or his/her representative; generally not to exceed once each quarter. The Chair will decide on a case-by-case basis if the amount of DEWSB business warrants scheduling additional meetings. In addition to these regular DEWSB meetings, special meetings may be held when required to support time-critical DEW development program milestones.

A2.5.1.1. The DEWSB (members and advisory personnel) will meet in formal session when called by the Chair, or designated acting chairperson. The chair may authorize a virtual meeting (such as a video conference) to meet operational needs of participants.

A2.5.1.2. The Executive Secretary provides meeting notification at least 30 days in advance of a regularly scheduled meeting date.

A2.5.1.3. If a quorum member is not represented and proxy is unavailable, the Chair determines if the meeting will proceed with available members.

A2.5.1.4. For special meetings, the Executive Secretary informs the requesting agency that funding of the Board members' and Chair's travel expenses will be a condition for conducting the special meeting. The Executive Secretary polls members as to their availability before final special meeting dates are established.

A2.5.2. Protocol.

A2.5.2.1. Members will make a concerted effort to reach unanimous agreement for each matter requiring a Board position.

A2.5.2.2. When unanimous agreement is not possible, the majority position is established by open ballot of the members.

A2.5.2.3. The Chair casts a vote only when a ballot of the members present (including proxy votes) results in a tie.

A2.5.2.4. Members representing the minority position may, at their discretion, prepare a minority report for inclusion in the official meeting minutes.

A2.5.3. Presentations.

A2.5.3.1. All items appearing in a DEWSB meeting agenda will be supported by a structured presentation. The presentation is intended to answer questions arising during documentation review and to stimulate detailed discussions.

A2.5.3.2. Agencies preparing DEWSB presentations should ensure essential supporting personnel (e.g., AF program management authorities, contractor representatives, etc.) are present to participate as needed during the presentation and discussions.

A2.5.3.3. The Executive Secretary provides appropriate guidance to agencies charged with preparing and delivering DEWSB presentations.

A2.5.4. Meeting Minutes, Studies, and Board Actions.

A2.5.4.1. Minutes. For each meeting, document DEWSB proceedings with a comprehensive set of minutes. For each item under review, the minutes will include applicable findings, recommendations, and required additional actions. In addition, the Chair designates a primary action agency for items under review.

A2.5.4.1.1. DEWSB minutes certify DEWs studied are acceptable or not acceptable for further testing or use from a design safety viewpoint. When the minutes are signed by each member and approved by the Chair, they become the official DEWSB position. If unanimity cannot be achieved, minority reports may be prepared by the dissenting members and made a part of the official minutes.

A2.5.4.1.2. DEWSB meeting minutes constitute interim fulfillment of approval/certification of DEWs requirements and grant interim safety approval or certification for DEWs or related items. If a staff agency disagrees with meeting minutes, the Executive Secretary will notify applicable commanders of disapproval and/or subsequent modification, if required, of interim approval or certification.

A2.5.4.1.3. Commanders may proceed with DEW operations based on recommendations in DEWSB meeting minutes, pending HAF concurrence.

A2.5.4.1.4. The Executive Secretary finalizes meeting minutes. Also, the Executive Secretary submits the entire report to AFSEC/SEW to initiate the AF/SE and AF staff agency approval process.

A2.5.4.1.5. Signed DEWSB minutes, with relevant findings and recommendations, are forwarded to AFSEC/SEW, 9700 G Ave SE, Kirtland AFB NM 87117-5670. AFSEC/SEW acts as the coordinating agency to obtain staff agency review and approval.

A2.5.4.1.6. As appropriate, the Executive Secretary notifies program management authorities, test organizations, and unit commanders to proceed with planned activities and operations based on DEWSB's recommendations. If a staff agency disapproves a DEWSB recommendation, the Executive Secretary will notify concerned agencies of the change in certification status.

A2.5.4.2. Studies. Once notified of AF/SE approval, the Executive Secretary publishes the report in its final version and distributes it to DEWSB members and associates, agencies responsible for implementing DEWSB recommendations, and other interested organizations.

A2.5.4.2.1. Approval of a recommendation to develop or modify a system signifies staff agency awareness that such action would be desirable from a safety viewpoint. It does not mean that such an action will be officially proposed, initiated, or funded

by a staff agency as a direct result of the recommendation. This is the primary responsibility of the action agency.

A2.5.4.2.2. After a study is approved by HAF, the DEWSB's recommendations (as documented in the meeting minutes) are directive on the designated action agency. The action agency initiates and monitors action on the recommendations and makes periodic status reports to the Executive Secretary of the DEWSB until final action item closeout.

A2.5.4.3. Action Items. Once DEWSB meeting minutes are approved, actions to implement Board recommendations are monitored until completion. Action items will be tracked until closure.

A2.5.4.3.1. The Executive Secretary periodically requests action item completion status reports from designated action agencies.

A2.5.4.3.2. The Executive Secretary arranges for action item status reports at each regularly scheduled DEWSB meeting.

A2.5.4.3.3. The DEWSB determines when a recommended action item has been successfully completed.

A2.5.4.3.4. The DEWSB may delegate to the Executive Secretary the authority to close purely administrative action items or to close a given action item upon the completion of a specific event (for example, the publication of a technical order).

A2.5.4.3.5. When all action items related to DEW certification have been closed, final certification of a DEW item is granted. Final certification is documented in the minutes of the DEWSB meeting effecting closure.

Attachment 3

DEWCP PHASE I CONTENT

A3.1. DEW System Description.

A3.1.1. Describe the desired capabilities, the intended use, and the intended operational Environment.

A3.2. Primary Hazards Overview.

A3.2.1. Identify and document the damage mechanisms of the DEW and the resulting primary hazards. Identify and document hazards associated with operation of the DEW, including energy leakage, power generation, noise, chemical agents, solvents, etc. Use MIL-STD-882E to develop a hazard risk matrix. Describe the approach to complete the DEW safety analysis, risk mitigation measures, and residual risks.

A3.3. Safety Rules and Protocols.

A3.3.1. Identify and document the implementation of applicable system safety rules and protocols.

A3.3.2. Evaluate and document the DEW hardware, software, operator, procedures, interfaces, training, and operational environment.

A3.4. Range Testing.

A3.4.1. Initial plan for testing on specified test ranges. Known hazards and technical data (i.e. a Safety Release) are required prior to live-fire testing of DEW on ranges and is obtained from the Program Manager using a Safety Review Board (SRB) IAW AFI 99-103, *Capabilities-based Test and Evaluation*. Live-fire testing involves propagation of energy from the DEW itself as opposed to auxiliary DE devices.

A3.4.1.1. Laser DEWs tested on operational ranges require DEWSB review and certification prior to test. Contact AFRL 711 HPW/RHDO for a list of laser-certified ranges.

A3.4.2. All relevant ESOH hazards must have the applicable risks accepted prior to the start of testing.

A3.5. Safety Documentation.

A3.5.1. Present safety documentation, risk analysis per MIL-STD-882E, applied mitigation, and lessons learned to this point of the DEW program.

A3.6. Mishap Response Plan.

A3.7. Schedule that includes major certification and program milestones.

A3.8. Responsibilities of each agency identified in the DEWCP.

A3.9. Signature page that indicates coordination with all responsible agencies.

A3.10. Applicable Standards and Requirements.

A3.10.1. Identify standards and requirements applicable to the DEW.

A3.10.2. Identify any exemptions and authority for making the exemption. This is especially important in those rare cases when, because of the operational requirements of a DEW, AF personnel may be exposed in training, system evaluation, CONOPS development, etc, to levels above accepted limits. Contact the HQ AFSEC for questions on how to obtain policy exemptions.

A3.11. Appendices as needed.

A3.11.1. Applicable Security Classification Guides.

A3.11.2. Classified information should be limited to a classified attachment.

Attachment 4

DEWCP PHASE II CONTENT

A4.1. DEW Certification Recommendation (DEWCR).

A4.1.1. Submit a recommendation for full DEW certification approval or certification approval with restrictions. The recommendation acts as a 1-page executive summary of the planned use of the system and a statement that the risks have been properly mitigated.

A4.1.2. The recommendation will be evaluated by the DEWSB based on compliance with DEW safety policy and applicable risk assessments.

A4.2. Safety Criteria. Define the DEW-specific criteria for use in the DEWSP IAW Chapter 5.

A4.3. Compliance/Risk Mitigation Plan.

A4.3.1. Document the results of the safety risk assessment for the DEW.

A4.3.2. Document the results of the completed safety analysis.

A4.3.3. Identify specific methods for compliance verification.

A4.3.4. Identify approaches to address system-level certification issues (such as compatibility requirements for aircraft systems and technical data development).

A4.4. Safety Critical Functions and Safety Critical Components.

A4.4.1. Identify all safety critical functions and components. Include an analysis of failure consequences and probabilities (e.g. fault tree analysis, failure modes and effects analysis, etc.).

A4.4.2. Provide accompanying data to support how the hazard was mitigated to an acceptable level and provide the relative position on the system specific risk assessment matrix according to MIL-STD-882E.

A4.4.3. Justify the mitigation technique chosen if design mitigation was not used.

A4.4.4. Document results of modeling, simulation, and/or tests that show compliance.

A4.5. Additional Safety Critical Function Information.

A4.5.1. Identify which safety critical functions are required, as referenced in Section 5.4. Designate the level of criticality for each function. Provide justification.

A4.5.2. Provide information on methods to prevent the inadvertent or improper propagation of directed energy by the weapon.

A4.5.3. Identify methods for transition between system states.

A4.6. Additional Safety Critical Component Information.

A4.6.1. Identify the components/systems and/or software that control the safety critical functions.

A4.6.2. Provide a description stating how the equipment interacts to perform the safety critical function(s).

A4.7. Subsystem and functional elements safety information.

A4.7.1. Include all documentation and explanations of existing certification.

A4.8. Other certifications. (e.g. Aircraft Airworthiness Certification or Air Force Laser System Safety Review Board approval).

A4.9. Status of any policy exemptions required for operation of the system.

A4.10. System documentation. Include operator training program, manning requirements, personnel qualifications, standard operating procedures, safety rules, support equipment, storage and handling manuals, technical manuals, user manuals, maintenance procedures, etc.

A4.11. Appendices as needed.

Attachment 5

PREPARING A DIRECTED ENERGY WEAPON TECHNICAL SAFETY STUDY (DEWTSS)

A5.1. Purpose. The DEWTSS is a detailed safety study of DEW items and is used to document safety engineering findings and to submit safety recommendations for DEWSB review. A DEWTSS:

A5.1.1. Is prepared for each DEW and related items of which the DEWSB maintains awareness as specified in this instruction.

A5.1.2. Is prepared by a HQ AFMC system safety engineering organization or by any other organization possessing sufficient safety engineering expertise to support Phase II DEW Certification.

A5.1.3. Presents only the necessary design/performance details required for system evaluation and not as a source data for DEW. NOTE: Data in a DEWTSS may contain classified, proprietary, and/or privileged information.

A5.1.4. Is prepared following the start of developmental test and evaluation (DT&E), or following the start of the initial operational test and evaluation (IOT&E) portion of a combined DT&E/IOT&E.

A5.2. Information. A DEWTSS includes the following information, if applicable:

A5.2.1. A description of the DEW item.

A5.2.2. A sequential description of how a DEW item functions in its operational environment.

A5.2.3. A hazard analysis of the DEW system according to MIL-STD-882E. This analysis must deal with interfaces of the DEW item with other systems and subsystems, including test equipment and technical data.

A5.2.4. A summary of mishaps and undesirable design features of similar inventory items (lessons learned, if applicable). The mishap history may be obtained from HQ AFSEC/SEW.

A5.2.5. A safety-oriented evaluation of the technical data generated during development and engineering changes (including formal Engineering Change Proposals) of the DEW item, which encompass storage, maintenance, operation, surveillance, inspection, service life extension(s), demilitarization, and disposal procedures, as applicable, throughout the life cycle.

A5.2.6. Occupational health and environmental health assessment by bioenvironmental engineering, as required.

A5.2.7. Final or interim hazard classification data.

A5.2.8. Firefighting extinguishing agents, if available.

A5.2.9. Appendices containing essential information from specifications and test reports to support findings.

A5.2.10. Findings and conclusions of the preparing individual.

- A5.2.11. Findings and recommendations (after DEWSB review).
- A5.2.12. Action items (after DEWSB review).
- A5.2.13. Other information necessary to define the level of safety incorporated in the item.
- A5.2.14. A page for HAF approvals or comments.
- A5.2.15. An amendment or supplement if needed to reflect updated production or design changes.
- A5.2.16. The DEWTSS cover indicates its status and its authorized distribution.
- A5.2.17. Use a cover with the words "DRAFT" printed on it on the initial (draft) DEWTSS furnished to DEWSB members for review. This draft may contain (or have attached) copies of data and drawings. This data and drawings may be essential for the in-depth review required by the DEWSB, but are not necessary for further processing. In this event, remove the material after the DEWSB's review and insert a note to indicate the availability and location of the material.

A5.3. Distribution. Studies may be distributed by hard copy, disk (CD/DVD), or e-mail. If the information in the study is proprietary in nature, be sure to mark it as such and if sent electronically, encrypt it or password-protect the information/study.

- A5.3.1. The draft discussed in Section A5.2., above, is distributed only to the originating agency, the DEWSB Executive Secretary, AFSEC/SEW, and the DEWSB members. DEWSB members also may distribute it within their commands.
- A5.3.2. After the DEWSB has approved the study and made the necessary corrections, the Executive Secretary will add a section to the front of the study. This section shows the DEWSB's recommendations and includes a signature page for approval coordination.
- A5.3.3. Replace the cover with one annotated by the words "AIR STAFF APPROVAL COPY". Forward seven copies to AFSEC/SEW for staff agency review and HQ AF/SE approval if sent as hard copy or on disk.
- A5.3.4. When approved by AF/SE, the Executive secretary will publish the final DEWTSS edition. Replace the cover with one annotated with the words "HQ USAF APPROVED SAFETY REPORT".

Attachment 6

REQUIRED INFORMATION FOR INFORMAL ACQUISITION PROGRAMS

A6.1. DEW System Description.

A6.1.1. Describe the desired capabilities, the intended use, and the intended operational Environment.

A6.2. Primary Hazards Overview.

A6.2.1. Identify and document the damage mechanisms of the DEW and the resulting primary hazards. Identify and document hazards associated with operation of the DEW, including energy leakage, power generation, noise, chemical agents, solvents, etc. Use MIL-STD-882E to develop a hazard risk matrix. Describe the approach to complete the DEW safety analysis.

A6.3. Safety Rules and Protocols.

A6.3.1. Identify and document the implementation of applicable system safety rules and protocols.

A6.3.2. Evaluate and document the DEW hardware, software, operator, procedures, interfaces, training, and operational environment.

A6.4. Applicable Standards, Requirements, and Criteria.

A6.4.1. Identify standards and requirements applicable to the DEW.

A6.4.2. Identify any exemptions from standards and authority for making the exemption. Contact the HQ AFSEC for questions on how to obtain policy exemptions.

A6.4.3. Define the DEW-specific safety criteria for use in the DEWSP IAW Chapter 5.

A6.5. Safety Critical Functions and Safety Critical Components.

A6.5.1. Provide identification of all safety critical functions and components as referenced in Section 5.4. Include an analysis of failure consequences and probabilities (e.g. fault tree analysis, failure modes and effects analysis, etc.).

A6.5.2. Describe how the hazard was mitigated to an acceptable level and provide the relative position on the system specific risk assessment matrix according to MIL-STD-882E.

A6.5.3. Justify the mitigation technique chosen if design mitigation was not used.

A6.5.4. Document results of tests, as well as modeling and simulation, if performed, that show compliance with safety criteria.

A6.5.5. Provide information on methods to prevent the inadvertent or improper propagation of directed energy by the weapon.

A6.5.6. Identify methods for transition between system states.

A6.5.7. Identify the components/systems and/or software that control the safety critical functions.

A6.5.8. Provide a description stating how the equipment interacts to perform the safety critical function(s).

A6.6. Status of any policy exemptions required for operation of the system.

A6.6.1. During live-fire or developmental field testing of acquisition programs, DEW safety assessment is only necessary if the test involves propagation of energy from the DEW itself.

A6.7. Appendices as needed.

A6.7.1. Applicable Security Classification Guides.

A6.7.2. Classified information should be limited to a classified attachment.