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AIR FORCE**

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Safety

**AIR FORCE NUCLEAR WEAPONS INTRINSIC
RADIATION SAFETY PROGRAM**

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

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This instruction implements AFR 91-1, *Nuclear Weapons and Systems Surety*. It contains guidance needed to carry out intrinsic radiation (INRAD) safety program requirements and to ensure that exposure of personnel to INRAD is ALARA and does not exceed the maximum permissible dose. It applies to Air Force units with a nuclear mission and to personnel concerned with maintenance, security, on-load and off-load, transport, or storage of nuclear weapons and associated nuclear material and components. It does not apply to US Air Force Reserve and Air National Guard units and members. Before publishing send major command (MAJCOM) supplements to this instruction to HQ AFSA/SENA, 9700 Avenue G, Kirtland AFB NM 87117-5671) for coordination and HQ USAF/SE, 1400 Air Force Pentagon, Washington DC 20330-1400, for approval before publication.

(USAFE) AFI 91-108, 29 November 1993, is supplemented as follows: This supplement applies to United States Air Forces in Europe (USAFE) nuclear-capable units and to all personnel concerned with maintenance, security, on-load, off-load, transport or storage of nuclear weapons and associated nuclear material and components. It does not apply to Air Force Reserve Command (AFRC) or Air National Guard (ANTG) units or members. Ensure that all records created as a result of processes prescribed in this publication are maintained in accordance with Air Force Manual (AFMAN) 37-123 (will convert to AFMAN 33-363), Management of Records, 31 Aug 1994 and disposed of in accordance with the Air Force Records Disposition Schedule (RDS) located in AFRIMS (AF Portal).

SUMMARY OF CHANGES

This is the initial publication of AFI 91-108, revising AFR 122-28. It cross-references the list of terms and definitions used in Air Force 91-1 series directives; includes Air Force Chief of Safety responsibilities; and addresses Air Force Materiel Command responsibilities.

(USAFE) This document is substantially revised and must be completely reviewed. Extensive changes in policies and procedures required a complete revision of this publication.

Section A—Terms, Program Applicability, and Objectives

1. Terms. For definition of the terms used in this instruction, see AFI 91-101, *Air Force Nuclear Weapons Surety Program* (formerly AFR 122-1).

2. Program Applicability:

2.1. Implementation of the INRAD safety program and the "as low as reasonably achievable" (ALARA) concept must not compromise weapons safety, security, reliability, or operational mission considerations.

2.1.1. Units with a contingency or limited nuclear mission must comply with the ALARA concept.

2.1.2. Host bases that support nuclear-capable tenants must comply with this instruction.

2.2. Within the constraints imposed by logistics, weapons safety, and security requirements, use the following as primary methods to achieve ALARA:

- Minimize the time individuals spend in the vicinity of weapon systems.
- Increase personnel distance from weapon systems.
- Use shielding.
- Take a combination of these actions.

3. Program Objectives. The INRAD safety program implements the ALARA concept by:

3.1. Keeping exposure of persons to ionizing radiation ALARA consistent with operational requirements and ensuring that individuals are not intentionally exposed to INRAD levels exceeding the maximum permissible dose (MPD). For MPD see DoD Instruction 6055.8, *Occupational Radiation Protection Program*, 31 March 1989; and AFI 48-108, *Control and Recording Procedures - Occupational Exposure to Ionizing Radiation* (formerly AFR 161-8).

3.2. Reducing or eliminating INRAD hazards as much as possible at the engineering design stage of a weapon system (that is, before it becomes operational). If you cannot reduce exposures to acceptable levels through engineering design or personal protective procedures, use administrative controls (such as time restrictions) to keep exposures below the MPD.

3.3. Training Air Force personnel who are exposed to INRAD to be aware of the potential radiation hazards in their workplace and to protect themselves from those hazards.

3.4. Educating female personnel to the risks of ionizing radiation to the unborn and monitoring pregnant employees who continue to perform duties involving exposure to INRAD. For monitoring procedures, see AFI 40-207, *Personnel Dosimetry Program and the US Air Force* (formerly AFR 161-28).

Section B—General Responsibilities

4. Assistant Secretary of the Air Force for Acquisition (SAF/AQ):

4.1. Monitors the research and development conducted on the biological effects of INRAD and applies the results to the development cycle of new or modified nuclear weapon systems.

4.2. Ensures that the research, development, test, and evaluation (RDT&E) cycle properly considers INRAD exposure potential and control techniques.

4.3. Advises HQ AFSA/SEN as early as possible of the development of new weapon systems or weapon arrays and of any INRAD measurement data taken during the RDT&E cycle.

5. Air Force Chief of Safety (HQ USAF/SE) oversees the INRAD safety program. Acting for HQ USAF/SE, the Commander of the Air Force Safety Agency manages the program and directs HQ AFSA/SEN to:

5.1. Review implementation of, and compliance with, this instruction during Nuclear Surety Evaluation and Assistance Program visits to MAJCOMs and their field units. This does not preclude inspection of INRAD aspects of the base radiation protection program during a health services inspection.

5.2. Coordinate all radiation safety policy issues related to INRAD with the Air Force Surgeon General.

5.3. Provide guidance for safety programs associated with the INRAD hazards produced by nuclear weapons.

5.4. Coordinate with the Defense Nuclear Agency to include relevant INRAD measurement information in Technical Order (TO) 11N-20-7, *Nuclear Safety Criteria*.

5.5. Coordinate with the Armstrong Laboratory (AL) and field units or other appropriate organizations for monitoring and evaluating potential hazards associated with weapon systems, weapon arrays, special operations, operational weapon systems not yet measured and listed in TO 11N-20-7, or other operational situations.

6. Air Force Surgeon General (HQ USAF/SG):

6.1. Establishes safety policy for control of radiation hazards and medical surveillance of individuals exposed to radiation.

6.2. Sets and publishes the limits for exposure of personnel to radiation and the requirements for using personal dosimeters.

7. MAJCOMs and Agencies. Conduct activities in a manner consistent with the spirit and intent of this instruction.

7.1. MAJCOM Staffs:

7.1.1. Ensure that command actions relating to nuclear weapons and associated components comply with this instruction.

7.1.2. Ensure that base-level programs support the objectives of the INRAD safety program.

7.1.2.1. **(Added-USAFE)** Headquarters, United States Air Forces in Europe, Aerospace Medicine Division (HQ USAFE/SGP), Unit 3050 Box 130, APO AE 09094-0130, will conduct reviews of Intrinsic Radiation (INRAD) safety programs at USAFE main operating bases (MOB) and Munitions Support Squadrons (MUNSS) during HQ USAFE-sponsored Nuclear Surety Staff Assistance Visits (NSSAV) conducted according to USAFEI 91-125, Nuclear Surety Staff Assistance Visit (NSSAV) And Functional Expert Visit (FEV) Program Management.

7.1.2.2. **(Added-USAFE)** Wing Weapon Safety Managers (WSM) will conduct reviews of the base, unit and MUNSS INRAD safety programs as part of their annual nuclear surety inspections conducted according to AFI 91-101, Air Force Nuclear Weapons Surety Program, and as supplemented.

7.1.3. Send base-level requests for INRAD measurements of new weapon systems, new weapon arrays, special operations, operational weapon systems not yet measured and listed in TO 11N-20-7, or other operational situations to HQ AFSA/SEN.

7.1.3.1. **(Added-USAFE)** Forward requests for INRAD measurements, based on the considerations in basic paragraph, to Weapons Safety Division (HQ USAFE/SEW). HQ USAFE/SEW will review for validity and forward through official channels to Headquarters, Air Force Safety Center, Weapons, Space and Nuclear Safety Division (HQ AFSC/SEW), 9700 Avenue G, SE, Kirtland AFB, NM, 87117-5670.

7.2. Command Surgeon (Bioenvironmental Engineer and Environmental Health):

7.2.1. Asks HQ USAF/SG to provide specific ionizing radiation exposure criteria or standards for unique requirements not addressed in this instruction.

7.2.2. Ensures that the Medical Staff Assistance Program reviews the INRAD aspects of the base radiation safety program.

7.2.3. Advises and assists the base bioenvironmental engineering service and environmental health service in establishing and conducting an effective INRAD safety program.

7.2.4. **(Added-USAFE)** For MUNSS at geographically separated units, support medical treatment facilities will provide bioenvironmental engineering and public health support if it is beyond the capability of the assigned Independent Duty Medical Technicians (IDMT).

7.3. Air Force Materiel Command:

7.3.1. Establishes specifications and standards for research, development, and production of weapon systems to ensure that potential personnel hazards are identified to HQ AFSA/SEN and that adequate protection from hazards is provided.

7.3.2. Ensures that Air Force development programs incorporate the requirements of AFI 91-202, *The US Air Force Mishap Prevention Program* (formerly AFR 127-2), and MIL-STD-882, *System Safety Program Requirements*. These requirements ensure that safety, consistent with the

operational needs for the weapon system being developed, is designed into the system at the earliest stage possible.

7.3.3. Ensures procedures are developed to keep INRAD exposures ALARA and technical orders, handbooks, and similar publications contain the necessary precautions and procedures.

7.3.4. Identifies operational systems undergoing modifications to HQ AFSA/SEN.

7.3.5. Ensures that AL:

- Maintains the technical expertise needed to guide and assist the control of INRAD exposures.
- Maintains capability to measure weapon INRAD, including personnel dosimetry.
- Coordinates with HQ AFSA/SEN to obtain pertinent INRAD data acquired during the RDT&E cycle for weapon systems.
- Provides on-site surveys and consultation, as requested, to determine whether operating procedures or equipment is effective in keeping personnel exposures ALARA.

7.4. Air Education and Training Command:

7.4.1. Ensures that training courses for duties requiring personnel exposure to INRAD include radiation safety instructions.

7.4.2. Ensures that publications used for on-the-job and upgrade training in career fields requiring personnel to work with nuclear weapons contain appropriate radiation safety instructions.

Section C—Unit Programs and Requirements

8. Unit Programs. This section applies to wings, groups, tenants, and geographically separated units (GSU) that possess nuclear weapons or support a nuclear weapon mission.

8.1. When host and tenant units have a nuclear mission, the host unit commander may authorize merging the INRAD safety program under the host unit weapons safety and radiation program.

8.2. Commanders of tenant units with a nuclear mission appoint an individual as the unit radiation safety officer (RSO) to coordinate radiation protection activities with the base RSO. Do not apply this requirement if the host unit program takes responsibility. You may combine the weapons safety officer (WSO) and unit RSO functions.

8.3. GSUs not authorized a weapons safety staff receive weapons safety support from other locations (parent or support base). The GSU commander designates an individual to work with the WSO and RSO at the parent base in managing the GSU's weapons safety and INRAD safety program.

8.3.1. **(Added-USAFE)** Weapon safety staff at MUNSS will work with the weapon safety staff and Radiation Safety Officer (RSO) at parent base in managing the INRAD safety program with the assistance of the IDMT assigned to the MUNSS.

9. Unit Commander Requirements. Commanders of wings, groups, tenants, and GSUs are responsible for:

9.1. Keeping personnel exposures ALARA.

9.2. Ensuring that personnel radiation exposure levels are not above the limits specified in AFI 48-108, *Control and Recording Procedures Occupational Exposure to Ionizing Radiation* (formerly AFR 161-8).

9.2.1. **(Added-USAFE)** Limits are specified in AFMAN 48-125, Personnel Ionizing Radiation Dosimetry and AFI 48-148, Ionizing Radiation Protection.

9.3. Designating a unit RSO in writing.

9.4. Educating personnel whose weapon system duties expose them to INRAD to the potential hazards.

9.4.1. **(Added-USAFE)** Units can include INRAD training as an additional topic during nuclear surety training conducted according to AFI 91-101, Air Force Nuclear Weapons Surety Program, and as supplemented. Individuals receiving INRAD training during nuclear surety training fulfill basic AFI 48-148, Ionizing Radiation Protection, paragraph 3.3.1. requirements for either initial or annual INRAD training, as applicable. Separate documentation is not required.

9.5. Enforcing compliance with operating and safety procedures.

9.6. Documenting in the training records all individual and group radiation safety training specific to unit workplaces.

9.6.1. **(Added-USAFE)** Specific unit workplace training is fulfilled by providing subject knowledge to the level of terms, basic facts, and examples of application. There are no documentation requirements beyond that for nuclear surety training if INRAD training is conducted as noted in supplemental paragraph **9.4.1. (Added)**.

9.7. Establishing procedures to:

9.7.1. Notify the base RSO of any new weapon systems, new weapon arrays, special operations, or proposed facility modifications where weapon systems will be located, so that HQ AFSA/SEN (with AL) can evaluate potential personnel exposure. Send requests for evaluations to HQ AFSA/SEN through the MAJCOM. You do not need to inform the base RSO of routine receipt, maintenance, or shipment of weapons for which the unit is responsible.

9.7.1.1. **(Added-USAFE)** Forward requests for INRAD measurements based on basic paragraph considerations to Headquarters, United States Air Forces in Europe, Aerospace Medicine Division (HQ USAFE/SGP), Unit 3050 Box 130, APO AE 09094-0130, and HQ USAFE/SEW.

9.7.2. Immediately inform the base RSO and chief of safety of any suspected abnormal exposure or overexposure to INRAD or inhaled radioactive material.

9.7.3. Assist the base RSO in evaluating incidents that involve suspected abnormal exposure or overexposure to INRAD or inhaled radioactive material and preparing the investigation report.

9.7.3.1. **(Added-USAFE)** Use AFMAN 91-221, Weapons Safety Investigations and Reports, for reporting mishaps and incidents of this nature. Ensure HQ USAFE/SEW is an information addressee for all reports.

10. Base Radiation Safety Officer Requirements:

10.1. Integrate the INRAD safety program into the overall base weapons safety program and radiation protection program.

10.1.1. **(Added-USAFE)** Manage the MUNSS INRAD safety program. Provide support to the weapon safety staff and the IDMTs of MUNSS according to this publication, AFI 44-103, The Air Force Independent Duty Medical Technician Program, and as supplemented.

10.2. Know the INRAD hazards associated with weapon systems that are normally present.

10.2.1. **(Added-USAFE)** Radiation data for the weapon system associated with USAFE locations can be found in Air Force Technical Order (T.O.) 11N-20-7, Nuclear Safety Criteria.

10.3. Periodically review existing operations to identify any changes in operations, equipment, or source that might pose INRAD hazards to personnel. If you need INRAD measurements, send a request to HQ AFSA/SEN through the MAJCOM.

10.3.1. **(Added-USAFE)** Periodic reviews of operations will be conducted as indicated by AFI 48-148, Ionizing Radiation Protection.

10.4. Use AFI 40-207, *USAF Personnel Dosimetry Program* (formerly AFR 161-28), to evaluate any suspected abnormal exposure or overexposure to INRAD or inhaled radioactive materials. Consult AL in determining bioassay procedures for assessing potential internal exposures to radioactive materials. You need not report separately if you report the incident according to AFI 91-204, *Investigating and Reporting US Air Force Mishaps* (formerly AFR 127-4). The RSO assists the WSO in evaluating such incidents and documenting the necessary information in the mishap report.

10.4.1. **(Added-USAFE)** Current guidance to evaluate any suspected abnormal exposure or over exposure to INRAD or inhaled radioactive substances is AFMAN 48-125, Personnel Ionizing Radiation Dosimetry.

10.4.2. **(Added-USAFE)** Unless there is specific reason to report separately, the RSO will assist weapon safety staff in reporting mishaps and incidents of this nature according to AFMAN 91-221, Weapons Safety Investigations and Reports, and as supplemented. Ensure HQ USAFE/SEW and HQ USAFE/SGP are information addressees for all nuclear mishap reports of this nature.

10.5. Advise appropriate commanders when personnel need to use a dosimeter, engineering controls, personal protective equipment, administrative controls, and bioassay requirements. Include these requirements in the baseline and annual workplace evaluation.

10.6. Review unit operating instructions for the control of INRAD hazards and make appropriate recommendations to unit commanders. At a minimum, specify procedures and individuals to be contacted in case of suspected abnormal exposure or overexposure to INRAD or inhaled radioactive material.

10.7. Provide consultation on INRAD hazards to commanders, as requested. AL can provide assistance and guidance.

10.7.1. **(Added-USAFE)** Prior to contacting the Air Force Institute for Operational Health (AFIOH) (formerly known as Armstrong Laboratory), contact HQ USAFE/SGP and HQ USAFE/SEW for further information.

10.8. If necessary, provide personal dosimetry services according to AFI 40-207. When dosimetry is issued, review exposure reports from AL for adverse trends at least quarterly. Send the results of the dosimetry to personnel according to AFI 48-108 and other directives.

10.9. Evaluate a pregnant staff member's workplace for potential radiation exposure and recommend to Environmental Health Service that it keep the total dose below 500 mrem (50 mrem per month) during the pregnancy. Place pregnant women who continue to perform duties involving INRAD exposure on the dosimetry program and identify them for special processing and reporting of dosimetry results.

10.10. Address the INRAD safety program in the annual review and documentation of the overall radiation protection program.

11. Unit Radiation Safety Officer Requirements:

11.1. Coordinate with the base RSO to establish personal dosimetry requirements.

11.2. Coordinate with supervisors to ensure that all individuals whose duties expose them to INRAD receive initial and annual radiation safety training.

11.3. Review unit programs annually to determine whether requirements have changed and send results to the base RSO.

11.4. Monitor compliance with the ALARA concept through on-site inspections and interviews with maintenance technicians.

11.5. Support the base RSO in all aspects of the INRAD safety program.

11.6. **(Added-USAFE)** Weapon safety staff assigned to MUNSS will perform the requirements of the Unit RSO.

12. Environmental Health Service Requirements:

12.1. Monitor the occupational health examination program.

12.2. Provide technical advice and materials to supervisors who train personnel on the potential health hazards associated with INRAD.

12.3. Provide occupational health investigations for suspected or confirmed injuries or illness according to AFI 40-210, *The Aerospace Medical Program* (formerly AFR 161-33).

12.4. Provide investigation and consultation services to supervisors and pregnant employees who are at risk for radiation exposure. If exposure during pregnancy could exceed 500 mrem, conduct a medical evaluation in compliance with AFI 44-104, *Professional Policies and Procedures* (formerly AFR 160-12). Consider limiting duty to reduce or eliminate the potential for exposure.

13. Supervisor Requirements:

13.1. Schedule personnel to receive initial and annual radiation safety training and document the training in unit and individual records.

13.2. Enforce all applicable radiation safety requirements.

13.3. Periodically review personal dosimetry results (when issued) and work practices with the base and unit RSOs to ensure that doses received by personnel are ALARA.

13.4. Inform the environmental health office of pregnant employees whose duties expose them to radiation.

13.5. Assist the RSOs in evaluating a pregnant employee's potential radiation exposure.

14. Individual Requirements:

14.1. Follow all applicable radiation safety practices.

14.2. Perform all duties involving INRAD exposure in a manner consistent with Air Force requirements for keeping personnel exposure ALARA. Use the concepts of time, distance, and shielding.

14.3. Immediately inform supervisors and the unit RSO when you know of or suspect any situations that could result in excessive exposure to radiation or inhaled radioactive material. A person who suspects or knows she is pregnant must immediately notify a supervisor.

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Chief of Safety

(USAFE)

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Director of Safety

Attachment 1**GLOSSARY OF ABBREVIATIONS AND ACRONYMS*****Abbreviations and Acronyms***

AFI—Air Force Instruction

AFR—Air Force Regulation

AFSA—Air Force Safety Agency

AFSA/SEN—AFSA, Directorate of Nuclear Surety

AFSA/SENA—AFSA/SEN, Nuclear Systems Engineering Division

DoD—Department of Defense

GSU—Geographically-Separated Unit

HQ AFSA—Headquarters, AFSA

HQ USAF/SE—Headquarters, United States Air Force, Chief of Safety

HQ USAF/SG—HQ USAF, Surgeon General

INRAD—Intrinsic Radiation

MAJCOM—Major Command

MPD—Maximum Permissible Dose

mrem—Millirem (one thousandth rem; rem = roentgen equivalent in man)

RDT&E—Research, Development, Test, and Evaluation

RSO—Radiation Safety Officer

SAF/AQ—Office of the Secretary of the Air Force, Office the Assistant Secretary (Acquisition)

WSO—Weapon Safety Officer

Attachment 1 (USAFE)**GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION*****References***

AFI 44-103, The Air Force Independent Duty Medical Technician Program, 1 May 2005
AFMAN 48-125, Personnel Ionizing Radiation Dosimetry, 7 August 2006
AFI 48-148, Ionizing Radiation Protection, 12 October 2001
AFI 91-101, Air Force Nuclear Weapons Surety Program, 19 December 2005
AFMAN 91-221 Weapons Safety Investigations and Reports, 18 June 2004
TO 11N-20-7, Nuclear Safety Criteria, current edition
USAFEI 91-125, Nuclear Surety Staff Assistance Visit (NSSAV) and Functional Expert Visit (FEV) Program Management, 29 January 2007

Abbreviations and Acronyms

IDMT—Independent Duty Medical Technician
MUNSS—Munitions Support Squadrons
NSSAV—Nuclear Surety Staff Assistance Visit
USAFE—United States Air Forces in Europe