

*Aerospace Medicine*

**OCCUPATIONAL SAFETY AND HEALTH RADIATION PROTECTION/SAFETY PROGRAM**

**COMPLIANCE WITH THIS PUBLICATION IS MANDATORY**

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This instruction establishes procedures for the Radiation Protection Program, Radiation Safety Program and the As Low As Reasonably Achievable (ALARA) Program within the Louisiana Air National Guard (LA ANG) and gives guidance for all Unit Commanders, Unit Radiation Protection Officers (RPO), Unit Radiation Safety Officers (RSO), and all personnel whose duties may involve exposure to ionizing or non-ionizing radiation. This instruction is divided into two distinct parts; the Non-Ionizing Radiation Protection Program (RSO) and the Ionizing Radiation Protection Program (RPO). This instruction applies to all LA ANG units.

1. **References, Abbreviations, and Acronyms.** See attachment 1.

2. **Definitions:**

2.1. ALARA Concept: The ALARA concept is defined as that set of management and administrative actions taken to reduce personnel radiation doses to as low a level as possible consistent with existing technology, costs, and operational requirements. The ALARA concept was developed in response to scientific evidence that no level of radiation exposure is totally risk free (linear, no threshold dose effect relationship). While the established maximum permissible doses are conservative and offer low risks of adverse health effects compared to other hazards of life and occupation, it is prudent that every effort be made to reduce exposures to the lowest level reasonably achievable and lower the health risk associated with exposures.

2.2. Radiation Protection Officer (RPO): An individual designated by the wing commander to manage ionizing radiation protection programs. The RPO provides consultation advice on the hazards associated with radiation and effectiveness of measures to control these hazards. This individual is the most technically qualified person available to assure a capability commensurate with the assignment. The term "Radiation Protection Officer" is a functional title and is not intended to denote any rank or job classification in the Air Force. There are two distinct categories of RPOs on base:

2.2.1. Base RPO: An individual designated by the wing commander to manage the base ionizing radiation program. This individual is normally the Base Bioenvironmental Engineer. He or she conducts the base-wide radiation protection program which includes surveillance of all radioactive materials and radiation producing devices. The Base RPO coordinates and assists the Unit RPOs as necessary to ensure a comprehensive, coordinated radiation protection program.

2.2.2. Unit RPO: An individual designated by the unit commander and serves as the single focal point for ionizing radiation protection matters. Each operational unit using ionizing radiation producing devices or radioactive materials will appoint a unit RPO. This individual coordinates radiation surveys with the Base RPO, assists in investigations of suspected or actual overexposures and performs those radiation protection duties at the unit level which are commensurate with their training and experience. The organizations listed in paragraph 7.1. are required to appoint Unit RPOs.

2.3. Radiation Safety Officer (RSO): An individual designated by the wing commander to manage non-ionizing radiation protection programs. The RSO provides consultation advice on the hazards associated with non-ionizing radiation and effectiveness of measures to control these hazards. This individual is the most technically qualified person available to assure a capability commensurate with the assignment. The term "Radiation Safety Officer" is a functional title and is not intended to denote any rank or job classification in the Air Force. There are two distinct categories of RSOs on base:

2.3.1. Base RSO: An individual designated by the wing commander to manage the base non-ionizing radiation program. This individual is normally the Base Bioenvironmental Engineer. He or she conducts the base-wide radiation protection program which includes surveillance of all radioactive materials and radiation producing devices. The Base RSO coordinates and assists the Unit RSOs as necessary to ensure a comprehensive, coordinated radiation protection program.

2.3.2. Unit RSO: An individual designated by the unit commander and serves as the single focal point for radiation protection matters. This individual coordinates radiation surveys with the Base RSO, assists in investigations of suspected or actual overexposures and performs those radiation protection duties at the unit level which are commensurate with their training and experience. The organizations listed in paragraph 5.1. are required to appoint Unit RSOs.

3. **Responsibilities:** Direct any questions on the policies of this section to the Base Radiation Protection Officer (159 MEDS/SGPB).

3.1. 159 MEDS/SGPB, Bioenvironmental Engineering (BEE), is responsible for performing surveys and maintaining inventories of all LA ANG Radiofrequency (RF) emitters, conducting investigations of incidents of alleged or actual overexposures to radiation, reviewing and maintaining ionizing radiation reports and communicating with Unit RPOs and RSOs.

3.2. The 159 MEDS/SGPB and 159 MEDS/SGPM will provide annual Radiation Protection and Radiation Safety training for all Unit RPOs and RSOs.

3.3. The commanders of the sections listed in paragraph 5.1. will appoint Unit RSOs and send a copy of the appointment letter to 159 MEDS/SGPB. The Medical Squadron and Maintenance Squadron commanders will appoint Unit RPOs and send a copy of the appointment letter to 159 MEDS/SGPB.

3.4. All workcenter supervisors who have personnel working with or in the vicinity of ionizing or non-ionizing radiation emitters or sources will educate their personnel on the potential hazards associated with occupational exposure.

3.5. Unit RPOs and RSOs will prepare unit operating instructions (Operating Instructions (OI), Maintenance Operating Instructions, Logistics Group Operating Instructions, etc.) or policy letters to identify and control personnel access to areas that could have potentially hazardous radiation levels. The Unit RPO and RSO will send the OI or policy letter to the Base RPO and RSO for review prior to actual implementation or publication of the procedures in the document.

3.6 All personnel who work with or near radiation emitters or sources must know how to eliminate or reduce exposures and know the actions to take in the event of a suspected overexposure.

#### **NON-IONIZING RADIATION PROTECTION PROGRAM RADIOFREQUENCY (RF) RADIATION**

4. **General:** The majority of non-ionizing radiation sources within the LA ANG will generate RF. This is due in fact to the large variety of radio transceivers, radar units (both aircraft and fixed), and telecommunication equipment that is currently in the LA ANG inventory. Therefore, most references in this section of this HQ LA ANG instruction will be towards that of RF radiation. Guidance on other specific non-ionizing radiation sources (i.e., Ultraviolet (UV), Laser, etc.) can be obtained from the Bioenvironmental Engineering Office (159 MEDS/SGPB).

4.1. RF radiation as governed by this instruction is electromagnetic energy emitted at frequencies from 10 kilohertz to 300 gigahertz. AFOSH Standard 161-9, *Exposure to Radiofrequency Radiation*, is the Air Force Standard that governs the RF program. This section of this instruction provides guidance to implement the LA ANG RF Radiation Safety Program.

5. **Application:** This guidance applies to all military and civilian personnel in the LA ANG whose duties require that they supervise or work with sources of ionizing radiation or that they work in areas where exposure to ionizing radiation may occur.

5.1. The following organizations are required to appoint a primary and alternate Unit RSO for non-ionizing (RF, UV, Laser, etc.) radiation:

5.1.1. 159th Maintenance Squadron (MXS)

5.1.2. 159 MXS/Non Destructive Inspection (N.D.I.) Section

5.1.3. 159th Communications Flight

5.1.4. 159th Air Generation Squadron

5.1.5. 122nd Fighter Squadron/Operational Duty Center

5.1.6. 214th Electronics Installation Squadron

5.1.7. 236th Combat Communications Squadron

5.1.8. 122nd Air Control Party

5.1.9. 159th Security Forces Squadron

5.1.10. 159th Civil Engineering Squadron

5.2. The procedures and guidelines of this LA ANG Unit RSO program are stated in AFOSH Standard 161-9.

### **IONIZING RADIATION PROTECTION PROGRAM (ALARA)**

6 **General:** The ALARA concept governs the LA ANG Radiation Protection Program. This section of the instruction implements paragraph F.2. of the DoD Instruction 6055.8, *Occupational Radiation Protection Program*, March 31, 1989. When the term "Radiation" appears in this section, it means "Ionizing Radiation" or radiation in the part of the spectrum which can produce ions, Alpha and Beta particles and/or neutrons, directly or indirectly, by interaction with matter.

7. **Application:** This guidance applies to all military and civilian personnel in the LA ANG whose duties require that they supervise or work with sources of ionizing radiation or that they work in areas where exposure to ionizing radiation may occur. This applies to persons not occupationally exposed (general public) in that it addresses controls to protect the public from potential hazards from sources of ionizing radiation owned or operated by the LA ANG. This guidance does not apply to the exposure of patients by the Medical Services for diagnostic or therapeutic procedures, nor does it apply to exposures of personnel to radiation resulting from the employment of nuclear or thermonuclear weapons in combat.

7.1. The following organizations are required to appoint a primary and alternate Unit RPO for ionizing radiation:

7.1.1. 159th Logistics Group/Supply (Radiation Source Storage)

7.1.2. 159th Medical Squadron (x-ray)

## 7.1.3. 159 MXS/N.D.I. Section (x-ray)

8. **Policy:** The Air Force Policy for exposures to ionizing radiation is to maintain exposures within the ALARA concept. This means there should be no exposures to ionizing radiation without an expected benefit and the dose received should be the lowest possible, consistent with the state of technology, costs and operational requirements. Radiation exposures are kept as far below existing standards as possible.

9. **Requirements:**

9.1. Overview: The ALARA program requirements contained herein apply to all functional areas where radioactive materials or radiation producing devices are used and each respective RPO. Whenever the generic term RPO is used in this guidance, it refers to any or all of the categories of RPO defined above. It is the intent of this guidance that each RPO perform the required tasks for his or her specific area of responsibility. The Base RPO will coordinate a comprehensive unit-wide radiation protection program.

9.2. ALARA Program Requirements for the personal dosimetry are as follows:

9.2.1 Base RPO provides personal radiation dosimetry for all functional areas using the guidance established in the USAF Armstrong Laboratory (USAF/AL) Personnel Dosimetry Program Instruction Manual. Personnel in the following areas are routinely checked with Thermoluminescent Dosimeters (TLDs):

<i>AREA</i>	LOCATION	EXCHANGE FREQUENCY
<b>A</b>	Medical Z-Ray/159 MEDS	QUARTERLY
<b>B</b>	Dental Clinic/159 MEDS	QUARTERLY
<b>C</b>	NDI/159 MXS	MONTHLY

9.2.2. Both the Base and Unit RPOs will check and sign the dosimetry report (AL Form 1499, **Occupational Radiation Exposure Report**) when received from Armstrong Laboratory. On an annual basis AL will prepare an AF Form 1527, **History of Occupational Exposure to Ionizing Radiation**, for each person on the TLD program. The Base RPO will ensure these forms are sent to the Medical Records Section for filing in the AF Form 2100A, **Health Record - Outpatient (Orange)**.

9.2.3. Normally, the TLDs are exchanged the first week of each month for those areas on the monthly cycle. The quarterly TLDs are normally exchanged the first week in March, June, September and December. The Base RPO will also maintain an extra supply of TLDs for issue at specific times.

9.2.4. Quality Assurance Requirements: The Base RPO will establish personnel dosimetry action levels which are utilized as a guide in determining surveillance and control requirements. Action Levels will include:

9.2.4.1. Overexposure Action Level (OAL): OAL is defined as personnel dosimetry result which exceeds the maximum permissible whole body dose (3 REM/QTR not to exceed 5 REM per calendar year). Formal investigation and documentation of the incident is required IAW AFI 91-204, *Safety Investigation and Reports*.

9.2.4.2. Abnormal Exposure Action Level: Personnel dosimetry results which, if continued on an annual basis, would result in an overexposure. This equates to a whole body dose of 417 mREM on a monthly badge or 1250 mREM on a quarterly badge. A formal investigation to determine the cause of the exposure must be made IAW AFI 91-204.

9.2.4.3. Investigation Action Level: The ALARA program requires each facility to set Investigation Action Levels on dosimetry results in which action is taken to determine the reason for exposure. The following is a chart of the Investigation Action Levels for the LA ANG:

<b>TABLE 2: Investigation Action Levels</b>				
	<i>MONTHLY (mREM)</i>		<i>QUARTERLY (mREM)</i>	
	<b>I</b>	<b>II</b>	<b>I</b>	<b>II</b>
<b>Skin of Whole Body</b>	(1) 300	800	750	2250
<b>Whole Body</b>	(2) 50	100	125	375

**NOTE:** (1) Whole Body Shallow  
 (2) Whole Body Deep

9.2.4.4. Pregnant Female Action Level: Personnel dosimetry results which, if continued for the term of pregnancy would exceed 500 mREM exposure limit for the fetus (reference HQ NGB/SG policy letters, "Occupational Exposure of Fertile Women to Ionizing Radiation", ANGR 160-02, *Pregnancy of Air National Guard Personnel*). This equates to approximately 50 mREM on a monthly badge. Personal dosimetry results above this limit are investigated and results of the investigation reported to the Environmental Protection Committee or the Base RPO, as applicable. The Base RPO will notify the section supervisor when there are pregnant workers in their shops. The Base RPO will also ensure the radiation section (AL/RZD) at Brooks AFB, TX is notified when there is a pregnant worker in an ionizing radiation work area. AL will flag this individual in their computerized system and will call the personal dosimetry results to the BEE office. The BEE office in turn notifies the Unit RPO only if the results require and investigation. Positive efforts are made to limit the dose to no more than 50 mREM per month.

9.2.4.5. Unit RPOs involvement with the personal dosimetry program:

- Will review AL Form 1499 after they are sent to the section. The AL Form 1499 is maintained by the Base RPO (BEE Office) for those areas not belonging to the base. Unit RPOs are responsible for ensuring the enrollment of new personnel into the dosimetry program. Unit RPOs must also ensure TLDs are stored in the designated storage area near to, but outside the radiation area.
- Responsible for ensuring that TLDs are available for exchange on the day designated. Any lost, damaged, or suspected overexposed TLDs are reported to the Base RPO as soon as possible.
- Responsible for ensuring temporary duty (TDY) personnel are indoctrinated on the Louisiana Air National Guard TLD program and are issued temporary TLDs if needed. If personnel from the LA ANG go TDY to another installation the unit RPO reminds his or her personnel to carry their own TLDs on the TDY mission.

**10. Radiation Surveys:**

10.1. Base RPO:

10.2. Will conduct surveillance of all radioactive materials and radiation producing devices.

10.3. The survey is conducted with the Unit RPO as required. Specific items of interest covered during the survey include:

10.3.1. Review of dosimetry results.

10.3.2. Adequacy of storage areas.

10.3.3. Changes in operating procedures or equipment.

10.3.4. Physical layout of the shop.

10.3.5. Review of radiation training folder.

10.3.6. Review of Unit RPOs quarterly surveys.

10.3.7. Review of leak tests (if required).

10.3.8. Correct Air Force Technical Order forms placement.

10.3.9. Adequacy of reference material as needed.

10.3.10. Requirements for lead shielding.

10.3.11. Radiation measurements with survey meter or shielded instruments as needed.

10.3.12. Review of engineering controls.

10.3.13. Any other items required IAW current health physics practices.

10.4. Survey findings are forwarded through the unit commander to the Unit RPO for his or her information and any corrective action needed. The report's final destination is the shop itself.

10.5. Receiving and Shipping Radioactive Materials (Base RPO): Monitors all radioactive shipments and receipts as requested by LA ANG Transportation/LGTTW (Packing and Crating). Non-Air Force organizations that wish to bring radioactive materials onto or conduct operations on LA ANG property involving radioactive material must submit an application for approval to the Base RPO (BEE) at least 30 days before commencement of activities. The request for approval will include:

10.5.1. A description of the proposed activities.

10.5.2. Procedures established to ensure radiological health and safety of Air National Guard personnel and the public while on the installation.

10.5.3. A copy of the Nuclear Regulatory Commission (NRC) or Agreement State License.

10.5.4. A copy of the LA ANG contract or Navy contract describing the work to be performed and the inclusive dates during which the work will be conducted.

10.5.5. Review of Plans of Existing or New Facilities in which Radiation Producing Devices or Radioactive Materials are used.

10.5.5.1. All plans for modification of facilities or design of new facilities which involve the use of radioactive materials or radiation producing devices are reviewed by the Base RPO to ensure that ALARA is considered.

10.5.5.2. The review process and signing of plans by the BEE and the Base RPO (normally the same) are sufficient for this requirement. The pre-design conferences and stages of design review (35%, 65%, and 95% of completion) are critical in this process. It is the user's responsibility to inform the RPO and design engineering that the project involves radiation and that ALARA must be considered. The RPO will recommend engineering controls (e.g. lead shielding) if required to reduce the radiation exposures to ALARA.

10.5.5.3. The USAF Armstrong Laboratory, Radiation Services Division, can also be contacted for design reviews which are beyond the technical capabilities of the Base RPO.

#### 10.5.6. Training:

10.5.6.1. The Base RPO, will at the request of the Unit RPO assist in conducting radiation safety training for all individuals working in or frequenting any portion of an area where radioactive materials or radiation producing devices are used. The Unit RPO ensures that initial training is conducted before, or as soon as possible after assignment to work areas involving radiation exposures. Annual refresher training is conducted to reemphasize and reinforce training objectives. The level of training is tailored to the specific category of personnel and the hazard presented. Documentation of training is annotated on the individual's AF Form 55, **Employee Safety and Health Record**, with sign-in rosters forwarded to the BEE office.

- Risks encountered from radiation exposures.
- Health risks to embryo/fetus of women who are occupationally exposed to radiation during pregnancy.
- Protective measures required (tailored to specific work area).
- ALARA philosophy and practice.
- Unit RPOs are responsible to ensure the attendance of necessary personnel.

#### 10.6. Quality Assurance:

10.6.1. The Base RPO will conduct a quarterly radiation program review and document the findings. This review is presented to the Aerospace Medicine Council and will include:

10.6.1.1. A review of all personnel dosimetry results for the previous quarter to ensure that adverse trends are noted and that all personal dosimetry results which exceed the action levels are acted upon appropriately.

10.6.1.2. A review of all radiation survey results for the previous quarter to ensure that all surveys have been performed and documented properly and that corrective action, if necessary, has been accomplished. In addition, all quality assurance items stated in paragraphs 9.2.4 and 10.6 are summarized in the quarterly review.

10.6.2. The Base RPO will conduct an annual radiation program review and document the findings.

10.6.3. Base RPO will review all LA ANG publications and operating instructions concerning radiation on an annual basis. The review is presented to the Aerospace Medicine Council and the Environmental Protection Committee and will include:

10.6.3.1. A review of all local implementing directives (publications and operating instructions) to ensure they are current.

10.6.3.2. A review of all radiation survey results for the past year to ensure that all required surveys have been performed and documented properly and that corrective action, if necessary, has been accomplished.

10.6.3.3. A review of all personal dosimetry results for the past year to ensure that adverse trends are noted and appropriate action has been taken on results that exceed standards or action levels.

10.6.3.4. A quarterly update of the radiation source and radioactive material inventory.

10.6.3.5. A review of all USAF Radioactive Material permits and NRC licenses to ensure currency and compliance with requirements.

**11. Summary:**

11.1. The National Guard Bureau policy for exposures to ionizing radiation is to keep the levels ALARA. Through education, training and a stringent quality assurance program the ALARA concept can be achieved.

11.2. All radioactive materials belonging to the LA ANG must be inventoried quarterly and reported to the Base RPO. The Base RPOs approval must be given for:

11.2.1. Ordering of Radioactive Materials.

11.2.2. Use of Radioactive Materials.

11.2.3. Storage of Radioactive Materials.

11.2.4. Disposal of Radioactive Materials.

12. **Prescribed Forms.** AF Form 55, **Employee Safety and Health Record**, AF Form 1527, **History of Occupational Exposure to Ionizing Radiation**, AF Form 2100A, **Health Record - Outpatient (Orange)**, and AL Form 1499, **Occupational Radiation Exposure Report**.

BY ORDER OF THE GOVERNOR

A.M. STROUD, JR.  
Major General, LAARNG  
The Adjutant General

OFFICIAL

Signed

RUFUS L. WARREN, III, LTC, LA ANG  
Administrative Officer

Attachment:  
Glossary of References, Abbreviations, and Acronyms

## GLOSSARY OF REFERENCES, ABBREVIATIONS, AND ACRONYMS

**Section A--References**

AFI 91-204, *Safety Investigation and Reports*  
 ANGR 160-02, *Pregnancy of Air National Guard Personnel*  
 AFOSH Standard 161-9, *Exposure to Radiofrequency Radiation*  
 DoDI 6055.8, *Occupational Radiation Protection Program*, March 31, 1989

**Significant References**

AFI 40-201, *Managing Radioactive Materials in the USAF*  
 AFI 48-116, *Food Safety Program*  
 AFI 48-125, *The US Air Force Personnel Dosimetry Program*  
 AFR 67-8, *Radioactive Commodities in the DoD Supply Systems*  
 AFM 67-1, *USAF Supply Manual*.  
 AFOSH Standard 127-8, *Medical Facilities*  
 AFOSH Standard 161-10, *Health Hazards Control for Laser Radiation*  
 Title 10, *Code of Federal Regulations*, current edition  
 TO 00-110N-2, *Radioactive Waste Disposal*  
 TO 00-110N-3, *Requisition, Handling, Storage, and Identification of Radioactive Materials*  
 TO 00-110N-4, *Acquisition, Use, Storage, and Disposition of Nuclear Source Material*  
 TO 00-110N-7, *Handling and Disposition of Radioactive Electron Tubes and Spark Gaps*  
 TO 00-110N-10, *Requisition, Use and Disposition of Lensatic Compass*  
 TO 00-110N-13, *Requisitioning, Use and Disposition of Night Vision Adaptometer*  
 TO 00-110N-14, *Radioactive Test Sample, Krypton 85, Gamma, MX7338/PDR-27R*  
 TO 00-110N-15, *Requisition, Use, and Disposition of Lensatic Compass*  
 TO 31Z-10-4, *Electromagnetic Radiation Hazards*  
 TO 33B1-1, *Nondestructive Inspection Methods*

**Section B--Abbreviations and Acronyms**

AFOSH	Air Force Occupational Safety and Health
ALARA	As Low As Reasonably Achievable
AL	Armstrong Laboratory
BEE	Bioenvironmental Engineer
DoD	Department of Defense
IAW	in accordance with
LA ANG	Louisiana Air National Guard
NDI	Non Destructive Inspection
NRC	Nuclear Regulatory Commission
OAL	Overexposure Action Level
OI	Operational Instruction
RF	Radiofrequency
RPO	Radiation Protection Officer
RSO	Radiation Safety Officer
TDY	Temporary Duty
TLD	Thermoluminescent Dosimeters
USAF	United States Air Force