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***Aerospace Medicine***

**USAF RADIATION SAFETY AND AS LOW AS  
REASONABLY ACHIEVABLE (ALARA)  
PROGRAM**

**COMPLIANCE WITH THIS PUBLICATION IS MANDATORY**

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This instruction outlines the responsibilities for ensuring proper management of radioactive materials and ionizing radiation producing devices, maintaining a quality personnel dosimetry monitoring program for personnel occupationally exposed to ionizing radiation, and maintaining exposures to ionizing radiation as low as reasonably achievable (ALARA). It implements AFI 40-201, Managing Radioactive Materials in the USAF; Title 10, Code of Federal Regulations, Part 20 (10 CFR, Part 20), Standards for Protection Against Radiation; and AFI 48-125, the US Air Force Personnel Dosimetry Program. It pertains to all units (including tenants) using or handling radioactive materials or radiation producing devices, and personnel exposed to ionizing radiation.

This instruction requires the collection and (or) maintenance of information protected by the Privacy Act of 1974. The authorities to collect and (or) maintain the records prescribed in this instruction are 10 USC Chapter 55 and 10 USC 8012. Privacy Act statement required by AFI 37-132, Air Force Privacy Act Program, is DD Form 2005, Privacy Act Statement - Health Care Record. The requester will show, and on request give, the affected individual a privacy act statement for each form, format, or form letter used to collect personal data, before asking for the information.

***SUMMARY OF REVISIONS***

This revision updates the ALARA Investigation Action Level for Total Effective Dose Equivalent (TEDE) from 50 millirems/quarter (mrem/qtr) to 500 mrem/qtr for all areas, with the exception of 6th Medical Group Radiology Department personnel which will not change from the 125 mrem TEDE. Adds requirement that Squadron Radiation Safety Officer (RSO) will be appointed in writing by squadron commander. Changes unit RSO to Squadron RSO. Changes 6 SUPS/SUD to 6 SUPS/LGSDS and changes 6 LSF/LSFT to 6 MXS/RSSC/PMEL.

**1. TERMS EXPLAINED:**

**1.1. As Low as Reasonably Achievable (ALARA) Program:** A set of management and administrative actions taken to reduce personnel radiation exposures to as low as reasonably achievable. The ALARA concept was developed in response to scientific evidence that suggests no level of ionizing radiation exposure is totally risk free.

**1.2. Thermoluminescent Dosimeter (TLD):** The personnel dosimeter is used to indicate a close approximation of the exposure dose to ionizing radiation to ensure exposures are maintained ALARA. The packet is exchanged monthly or quarterly depending on the area where an individual works.

**1.3. Occupationally Exposed to Ionizing Radiation:** Likely to be exposed in excess of 10 percent of the applicable quarterly Radiation Protection Standard in accordance with 10 CFR, Part 20.

**1.4. ALARA Investigation Action Levels:** Locally established radiation exposure limits less than the Air Force established criteria; used to flag exposure above the normal or higher than expected. Requires, as a minimum, telephone investigation to find out the specifics of the exposures, such as a change in tasks or position. ALARA levels are 125 mrem/qtr for the TEDE for the 6th Medical Group Radiology Department personnel, 500 mrem/qtr for the TEDE for all other areas, 1875 mrem/qtr of extremities for all areas.

**1.5. Abnormal Exposure Action Level:** Air Force established radiation exposure limits of 417 mrem per month for collar or body TLDS. Requires an informal investigation as outlined by Armstrong Laboratory (AL) and AFI 48-125.

**1.6. Overexposure Action Level:** Air Force established Radiation Protection Standard, when exceeded, requires a formal investigation in accordance with 10 CFR, Part 20.

**1.7. Pregnant Worker Action Level: Occupational Exposure to Ionizing Radiation:** An annual summary of radiation exposure data for each individual enrolled in the TLD program.

**1.8. General License items** are byproduct material contained in devices designed and manufactured for the purpose of detecting, measuring, gauging, or controlling thickness, density, level, interface location, radiation, leakage, or qualitative or quantitative chemical composition, or for producing light or an ionized atmosphere (10 CFR 31.5).

## 2. PROCEDURES:

2.1. Contractors who are required to transport radioactive materials onto MacDill Air Force Base (AFB) as part of contract performance, or who conduct operations that require the use of radioactive materials on MacDill AFB, must obtain approval from the Base RSO. The RSO is located in the Bioenvironmental Engineering Office, 6th Medical Group.

2.1.1. The 6th Contracting Squadron must inform contractors of the requirement to contact the RSO, at least 30 days prior to the date the material is scheduled to be transported on base, and to obtain necessary approval and instructions. This requirement must be delineated in the contract performance criteria.

2.1.2. Requests must be in writing and should include the following: brief description of proposed activities; copy of Nuclear Regulatory Commission license, name, local address, and telephone number of the contractor's local project manager; name, address, and telephone number of the contractor's RSO; a copy of the portion of the contract requiring the use of radioactive material; and the inclusive dates the radioactive material will be on base.

2.1.3. By submission of a bid, quote, or proposal, the contractor acknowledges and agrees that the base RSO has the right to conduct periodic inspections of the work site where radioactive material is being used and or stored, without prior notice. The purpose of these inspections is to ensure that contractor personnel are following prescribed radioactive material safety practices to prevent radiation exposure to the base populace. If adequate safety practices are not being followed, the contractor may be required to cease operations until adequate safety procedures are in place.

2.2. The 6th Supply Squadron (6 SUPS), Hazardous Material Pharmacy, will attempt to identify all type cargo code A and general license items with an issue exception code 9 to allow Bioenvironmental Engineering the opportunity to review and approve the distribution of radioactive materials. Procurement procedures are outlined in the flow diagram at [Attachment 1](#). 6 SUPS will provide Bioenvironmental Engineering a list of all radioactive material items issued or due out by national stock number, item, quantity, and user. This product will be provided quarterly. The point of contact is Hazardous Material Pharmacy.

2.3. Squadrons using or handling radioactive material or radiation producing devices must appoint Squadron RSOs (primary and alternate) according to AFI 40-201, Attachment 4, and develop a written program that details local procedures that ensure radiation safety and compliance with Air Force Instructions and Federal Regulations.

2.4. Functional areas using or handling radioactive material or radiation producing devices must formally implement the ALARA concept to minimize exposure to ionizing radiation. This may include the use of TLDs.

2.5. The following are examples of procedures that implement the ALARA concept:

- 2.5.1. Minimizing the number of personnel exposed.
- 2.5.2. Performing operations when personnel are not normally in the area.
- 2.5.3. Restricting entrance into the area during operations.
- 2.5.4. Using personal shielding such as aprons, gloves, thyroid shields.
- 2.5.5. Placing a barrier or distance between personnel and the source.
- 2.5.6. Minimizing the length of the operation.

### **3. RESPONSIBILITIES:**

3.1. Base RSO will:

- 3.1.1. Serve as the wing commander's single point of contact for all radiation safety matters.
- 3.1.2. Assist in the proper maintenance of USAF Radioactive Material Permits.
- 3.1.3. Ensure Squadron RSOs are assigned and annually trained for all units that may use, possess, or come in contact with ionizing radiation.
- 3.1.4. Review plans and design specifications for any use of radioactive materials or radiation producing equipment.
- 3.1.5. Exert oversight of all Squadrons and/or permit RSOs to ensure all requirements are met.
- 3.1.6. Review the Radiation Safety and ALARA program quarterly and report annually to the Aeromedical Council.

3.1.7. Assist or direct his Bioenvironmental Engineering staff to assist unit RSOs with development of training plans tailored for the specific hazards and type of radiation producing device/source.

3.2. The 6th Aerospace Medicine Squadron, Bioenvironmental Engineering Flight (BEF) (6 AMDS/SGPB), will:

3.2.1. Determine those persons who require monitoring under the TLD program.

3.2.2. Enroll those personnel in the USAF Personnel Dosimetry Program as described in the USAF/AL Instruction Manual (on file in BEF).

3.2.3. Exchange badges and forward them to the USAF AL/OEBSD, Brooks AFB, Texas, for processing. Brief personnel on the hazards of ionizing radiation and the use, care, and handling of the dosimetry badges at the time of initial enrollment in the program.

3.2.4. Receive, review, and maintain in the Bioenvironmental Engineering office files the AL Listing 1499, Report of Occupational Exposure to Ionizing Radiation, until the AF Form 1527 is received for that time period. Upon receipt of AF Form 1527, the AL Listing 1499 may be destroyed in accordance with AFMAN 37-139, Records Disposition Schedule.

3.2.5. Forward a copy of the AL Listing 1499 along with the names of area personnel whose TLD results exceed ALARA, abnormal exposure, or over exposure action levels to the appropriate TLD monitor and/or unit RSO.

3.2.6. Perform annual scatter radiation survey of Test, Measurement, and Diagnostic Equipment (TMDE), 6 SUPS, Radiology, and any other areas identified as using ionizing radiation sources/equipment. Perform triennial scatter surveys of Office of Special Investigations and Explosive Ordnance Disposal.

3.2.7. Perform an annual radiation protection inspection of each area handling radioactive material or radiation producing devices.

3.2.8. Provide Public Health Services (6 AMDS/SGPM) with a listing of enrolled hospital personnel upon request.

3.3. Squadron RSOs will:

3.3.1. Be appointed in writing by squadron commanders.

3.3.2. Establish a squadron radiation safety and ALARA program, and provide annual training for personnel exposed to radiation. Training will include their unit's specific responsibilities, the radiation hazards associated with those duties, the ALARA concept, and the specific ALARA procedures implemented in their area. Training documentation will be provided to Public Health Services using AF Form 2767, Occupational Health Training and Protective Equipment Fit Testing.

3.3.3. Keep an inventory of and accountability for all radioactive materials (including War Readiness Materiel and general license items) and devices producing radiation belonging to or handled by the unit. Inventories will be accomplished at least semiannually and a copy forwarded to the Base RSO upon completion.

3.3.4. Maintain copies of all permits issued by the radioisotope committee for radioactive materials in their unit.

- 3.3.5. Ensure procedures are in place to control access to general license materials in unrestricted areas.
- 3.3.6. Be the point of contact for disposal instructions for their unit. He/she will coordinate disposal instructions with the Base RSO.
- 3.3.7. In addition, the 6th Maintenance Squadron, Precision Measurement Equipment Laboratory (6 MXS/RSSC/PMEL), RSO will (when sources are on base):
  - 3.3.7.1. Establish and maintain management binder on TMDEs in accordance with AFI 40-201, para 1.22.2.4., under the direction of the permit/base RSO.
  - 3.3.7.2. Perform leak testing on sealed source. Testing must not exceed 6 months. Provide results to base RSO.
  - 3.3.7.3. Properly coordinate shipments of permitted calibration sources with Wright-Patterson AFB, Ohio, the base RSO, and the 6th Transportation Squadron (6 TRNS) RSO.
- 3.3.8. Packing and Crating (6 TRNS/LGTFF) will:
  - 3.3.8.1. Ensure radioactive material/wastes are handled and shipped in accordance with Technical Order (T.O.) 00-110N-2.
  - 3.3.8.2. Ensure radio logical monitors are trained on their duties and responsibilities as outlined in T.O.00-110-N-3 and AFJMAN 24-204, Preparing Hazardous Materials for Military Air Shipments.
  - 3.3.8.3. Ensure adequate radio equipment is available for surface and transportation index monitoring of radioactive shipments.
- 3.3.9. Storage and Issue (6 SUPS/LGSDS) will ensure radioactive storage areas in Storage and Distribution are maintained and radioactive materials/waste are handled in accordance with T.O. 00-110N-2 and T.O. 00-110N-3.
- 3.4. The 6th Medical Operations Squadron, Medical Equipment Repair Center (6 MDOS/MERC), will:
  - 3.4.1. Notify the Bioenvironmental Engineer of any newly installed or modified x-ray systems (ref AFI 41-201, para 2.28).
  - 3.4.2. Notify the Base RSO (Bioenvironmental Engineer) upon replacement of any major component of an x-ray system to determine the need for a radiation protection survey (ref AFI 41-201, para 2.28).
  - 3.4.3. Maintain documentation of all scheduled and unscheduled maintenance performed on radiology equipment, including semiannual post-calibration radiation inspection results (AF Form 2025, Post-Calibration Radiation Inspection Record-Radiographic, and AF Form 2026, Post-Calibration Radiation Inspection Record-Fluoroscopic) (ref AFI 41-20 1, para 2.29).
  - 3.4.4. Document actions taken to resolve discrepancies noted on radiation protection surveys and provide copies to the Bioenvironmental Engineer (ref AFI 41-201, para 2.28).
- 3.5. Area TLD Monitors will:
  - 3.5.1. Have newly assigned personnel make an appointment with and report to BEF so enrollment procedures into the TLD program can be accomplished.

- 3.5.2. Notify BEF by telephone of personnel departing MacDill AFB for permanent change of station, separation, or retirement so clearance procedures can be accomplished. TLD monitors will collect TLD badges on these personnel and turn in to BEF monthly.
  - 3.5.3. Provide a TLD storage rack/board, away from the radiation source, that is capable of storing TLDs for all department personnel on the TLD program.
  - 3.5.4. Ensure the TLD badge, when not worn during work, is stored at the storage rack. Storage in areas other than the specialized rack (desk drawers, clothing, vehicle glove compartments, etc.) is prohibited as such actions may bias results.
  - 3.5.5. Brief all personnel on the requirements of the dosimetry program and ensure personnel comply with the requirements of wearing the badge and returning the badge to the storage rack when departing the immediate work area.
  - 3.5.6. Notify Bioenvironmental Engineering of any TLD wearer being employed in a second job that involves ionizing radiation.
  - 3.5.7. Notify Bioenvironmental Engineering of any TLD wearer going temporary duty (TDY) where they will be exposed to ionizing radiation, therefore, requiring their TLD.
  - 3.5.8. Ensure all TLDs are present and accounted for during Bioenvironmental Engineering's monthly/quarterly exchange. Report instances where TLDs cannot be located to the section superintendent.
  - 3.5.9. Apprise personnel of any TLD results that exceed ALARA, abnormal exposure, or overexposure action levels.
- 3.6. Personnel enrolled in the TLD Program will:
- 3.6.1. Store TLDs, when not worn, on the provided storage board with the control TLD. Storage anywhere else will bias results, therefore, it is strictly prohibited.
  - 3.6.2. Wear TLDs whenever performing primary duties that may expose them to ionizing radiation, including TDYs. The TLD must be worn only within the normal work area.
  - 3.6.3. Wear TLD outside of normal clothing but beneath any leaded aprons or other whole body protective clothing used.
  - 3.6.4. Not wear their TLD at any time when they are receiving diagnostic or therapeutic x-rays.
  - 3.6.5. Not hold patients during x-raying (family members may hold patients). If this is not possible, then non-occupationally exposed Medical Technicians, wearing lead aprons/gloves or shielded as much as feasible, should hold the patient.
  - 3.6.6. Immediately advise BEF and SGPM of pregnancy.
- 3.7. Public Health Services will:
- 3.7.1. Maintain and monitor each unit/shop's radiation safety training documentation on AF Form 2767 filed in the shop folder.
  - 3.7.2. Assist RSO in investigation and follow-up of potentially exposed individuals.

3.7.3. Brief female workers potentially exposed to ionizing radiation on hazards of radiation during pregnancy and procedures to follow if pregnant. This training will be documented in the individual's medical record.

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Commander

Attachment 1

PROCUREMENT FLOW DIAGRAM

MACDI 48-100

Attachment 1

10 July 1997

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PROCUREMENT FLOW DIAGRAM

