

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION National Policy

ORDER 3900.85

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SUBJ: Flight Standards Service Ionizing Radiation Safety Program

The Flight Standards Service (FS) Ionizing Radiation Safety Program (RSP) is an element of the FS Occupational Safety and Health (OSH) Program and establishes the minimum requirements for the protection of FS employees from ionizing radiation in the workplace. This order describes the requirements to achieve an effective RSP.

If desired by responsible Flight Standards office management, this program may be enhanced to address local workplace conditions. Office-specific programs developed at the office level are allowed so long as they are equal to or more stringent than this RSP.

The requirements detailed in this order are based on Federal Aviation Administration (FAA) Order 3900.19, Federal Aviation Administration (FAA) Occupational Safety and Health Policy, Chapter 7, Occupational Health and Environmental Controls; the FAA Radiation Management Plan; the Occupational Safety and Health Administration's (OSHA) Title 29 of the Code of Federal Regulations (29 CFR) part 1910; the Nuclear Regulatory Commission's (NRC) 10 CFR part 835; and industry consensus standards. FS management and employees shall implement the requirements found herein.

Exposure to ionizing radiation can present a potential biological health risk to workers from radioactive materials and radiation-emitting equipment unless worker exposure is controlled below established limits and as low as reasonably achievable (ALARA). Adverse biological effects include cell damage and potential increased risk of undesirable health effects such as radiation-induced cancer, radiodermatitis, cataracts, sterility, and genetic damage.

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Chapter 1. General Information

1. Purpose of This Order. The purpose of this order is to provide requirements and guidelines to protect Flight Standards Service (FS) personnel from exposure to hazardous ionizing radiation in the workplace. Worker protection is accomplished through the implementation of comprehensive radiation protection practices as documented in this FS Ionizing Radiation Safety Program (RSP).

a. RSP Requirements. Key program elements and responsibilities defined in this FS RSP are consistent with the Occupational Safety and Health Administration's (OSHA) Title 29 of the Code of Federal Regulations (29 CFR) part 1910, § 1910.1096; the Nuclear Regulatory Commission's (NRC) 10 CFR part 835; Federal Aviation Administration (FAA) Order 3900.19, Federal Aviation Administration (FAA) Occupational Safety and Health Policy, Chapter 7, Occupational Health and Environmental Controls; and the FAA Radiation Management Plan. The FS RSP addresses required practices that shall be implemented by FS offices to identify and control employee exposure, such as exposure monitoring methods, control techniques, employee training, and medical surveillance.

b. OSHA Requirements. The FAA also recognizes the OSHA-required safety program elements for ionizing radiation as defined in § 1910.1096 (e.g., for labeling, personal monitoring triggered by a certain radiation level, reporting, and recordkeeping).

c. Consensus Standards. The FAA has adopted the current employee exposure criteria published by the American Conference of Governmental Industrial Hygienists (ACGIH). Current ACGIH safety standards include exposure dose limits relevant to FS work environments and the application of the "as low as reasonably achievable" (ALARA) principle.

2. Audience. This program is applicable to all FS personnel and managers involved in surveillance activities at airports, aircraft maintenance facilities, and other related work where there is potential exposure to ionizing radiation from radioactive materials, radiation-generating devices, and other sources. The RSP also applies to accident investigations involving aircraft transporting or containing ionizing radiation sources.

3. Where You Can Find This Order. You can find this order on the MyFAA employee website at https://employees.faa.gov/tools_resources/orders_notices and the Dynamic Regulatory System (DRS) at https://drs.faa.gov. Operators and the public can find this order on the FAA's website at https://www.faa.gov/regulations_policies/orders_notices and DRS.

4. Effective Date. FS office managers must ensure the RSP is implemented in their office if employees have potential exposure to radioactive materials. Initial radiation safety training will be implemented within 1 year of the publication date of this order. The training will follow the course requirements included in Chapter 6, Radiation Safety Training. Training provided prior to employment with the FAA does not meet the requirements of this order.

5. Distribution. This order is distributed to FS management, all FS offices, and all FS employees involved with work around sources of ionizing radiation.

6. Directive Feedback Information. Direct questions or comments to the FS Occupational Safety and Health (OSH) Program Team or via the FS OSH mailbox at 9-NATL-AVS-AFS-OSH@FAA.gov. For your convenience, FAA Form 1320-19, Directive Feedback Information, is the last page of this order. Note any deficiencies found, clarifications needed, or suggested improvements regarding the contents of this order on FAA Form 1320-19.

Chapter 2. Roles and Responsibilities

1. Executive Director, Flight Standards Service (AFX-1). AFX-1 shall:

a. Ensure that resources (funding and personnel) are available to implement this FS-wide RSP effectively throughout the FS organization.

b. Oversee the overall implementation and maintenance of the RSP in the FS organization.

c. Ensure the FS OSH Program Team has the resources to effectively oversee and manage the RSP and to provide the necessary technical support to the FS offices.

2. FS Division Managers. The FS division managers shall:

a. Provide oversight of the RSP for their division.

b. Be knowledgeable or informed of potential radiation hazards that may be encountered at external industry workplaces within their jurisdiction.

c. Ensure applicable employee participation in the radiation safety training and radiation monitoring.

3. FS Office Management. FS office management, with consultation from the FS OSH Program Team and FS Radiation Safety Officers (RSO), shall:

a. Implement the requirements of this program for their office.

b. Designate an Office Collateral Duty OSH (CDOSH) Point of Contact (POC) that will support office management and applicable employees in RSP implementation and assisting with obtaining and management of monitoring devices (dosimeter badges) for the office.

c. Ensure that the designated Office CDOSH POC has received FS radiation safety training that meets the basic requirements of this RSP.

d. Ensure that office employees who work at external industry workplaces complete FAA Form 3900-50, Flight Standards Radiation Safety Determination Form (RSDF), which identifies the employees whose assigned duties have the potential for exposing them to ionizing radiation hazards.

e. Review and sign employees' FAA Form 3900-50 and send a copy of it to the FS OSH mailbox at 9-NATL-AVS-AFS-OSH@faa.gov.

f. Ensure those employees whose job duties are in A, B, C, and/or D on FAA Form 3900-50 are enrolled in the FS RSP and the RMP.

g. Develop office-specific implementation procedures for radiation safety within their respective office, if that office has employees potentially exposed to ionizing radiation hazards.

h. Notify the FS OSH Program Team of any employees who declare they are pregnant so the FS OSH Program Team can assist those FS employees with implementing additional prudent precautions to limit radiation exposure.

i. Confer with the FS OSH Program Team regarding monitoring devices (dosimeter badges) and supplies necessary to implement this program.

j. After an employee works around ionizing radiation hazards while wearing a dosimeter badge, ensure that the employee completes FAA Form 3900-51, Flight Standards Radiation Dosimetry Activity Report, and provides the report and the badge to the Office CDOSH POC.

k. Ensure that these employees identified using FAA Form 3900-50 receive FS radiation safety training prior to performing those field activities around ionizing radiation.

Note: General employee safety and health training, radiation safety training provided by former employers, or host employer-provided radiation safety training do not qualify an individual to perform their duties in potential radiation exposure areas.

l. Ensure the performance of annual self-evaluations of office implementation of RSP requirements and report results as defined in this program.

4. FS Occupational Safety and Health (OSH) Program Team. The FS OSH Program Team shall:

a. Establish the FS RSP and maintain the program, ensuring it is current with FAA, OSHA, NRC, ACGIH, and other applicable standards and regulations.

b. Provide technical support for the implementation of radiation protection requirements by FS offices and evaluate the offices regarding the implementation of this program.

c. Serve as the POC regarding technical aspects of the FS RSP and provide consultation to any FS office regarding issues relating to radiation safety and implementation of these program requirements.

d. Designate one or more FS RSOs to oversee the program to provide technical support to FS offices as needed.

e. Develop the training curriculum for radiation safety and ensure that the training is available to applicable employees.

f. In collaboration with the FS RSO, perform Safety Hazard Analyses (SHA) and radiation surveys to identify new operations or modifications to the work environment that may increase the potential for radiation exposure hazards.

g. Assist the RSO with the development and implementation of the FS RMP, posted on the FS OSH web page at https://my.faa.gov/go/AFSOSH, which includes the procedures for the

employee RMP, how to review dosimetry results, and how to manage a database of ionizing radiation measurements data collected.

h. Develop and implement other FS radiation safety-related documents, including FAA Form 3900-50, the RMP, and FAA Form 3900-51, and revise periodically as needed.

i. Ensure that all radiation exposure records are maintained in accordance with 29 CFR § 1910.1020.

j. Maintain and update radiation survey equipment inventory and ensure that equipment calibrations are maintained in accordance with manufacturer recommendations.

k. Assist those FS employees who declare themselves pregnant with implementing additional prudent precautions to limit radiation exposure.

I. Evaluate program effectiveness annually.

m. Collaborate with other internal and external entities to promote program effectiveness and information sharing, when needed.

5. FS Radiation Safety Officer (RSO). The FS RSO shall:

a. Have the education, training, and/or experience to be qualified as an RSO to evaluate the potential for short- and long-term health effects associated with ionizing radiation.

b. Serve as the technical focal point for radiation exposure issues and FS employee concerns or requests for interpretations relating to alleged radiation hazards from inspections of radioactive cargo and Nondestructive Testing (NDT) procedures, accident investigations, while en route, and other potential exposures when these concerns cannot be resolved at the office level.

c. Perform SHAs and radiation surveys to identify new operations or modifications to the work environment that may increase the potential for radiation exposure hazards.

d. Develop and implement a dosimetry/radiation monitoring plan, which includes a method to review dosimetry results and manage a database of ionizing radiation data collected.

e. Ensure radiation exposure data is forwarded to the FAA Occupational Medical Surveillance (OccMed) group/mailbox for inclusion in the Employee Medical Folder (EMF).

f. Coordinate with other qualified medical and occupational health professionals for mitigating employee radiation exposure, including forwarding requests for medical interpretation to Federal Occupational Health (FOH) and/or the Office of Aerospace Medicine (AAM), when needed.

6. Office Collateral Duty OSH (CDOSH) POC. The Office CDOSH POC shall:

a. Receive FS-provided radiation safety training as required by the FS OSH Program Team.

b. Support the office management and employees in the implementation of this program and the RMP; and coordinate with the FS RSO and OSH Program Team, as needed.

c. Collect and maintain FAA Form 3900-50 from the employee/manager and send a copy of it to the FS OSH mailbox at 9-NATL-AVS-AFS-OSH@faa.gov.

d. Manage the office radiation monitoring by:

(1) Ensuring dosimeter (badges) are available;

(2) Ensuring dosimeters (badges) are issued and assigned to those who meet the criteria on FAA Form 3900-50 in accordance with the FS RSP and the FS RMP posted on the FS OSH web page at https://my.faa.gov/go/AFSOSH;

(3) Ensuring employees enrolled in the RSP complete FAA Form 3900-51 after the employees work around ionizing radiation hazards wearing the dosimeter (badge); and

(4) Ensuring a copy of the report and the badge are sent to the laboratory and keeping a copy of the report in accordance with the FS RMP.

e. Audit the office's radiation safety training completions with assistance from the FS OSH Program Team and/or the FS Training Management Branch (AFB-520).

f. Perform or arrange for annual evaluation of the office RSP.

g. Maintain records and documentation per the FS RSP and the FS RMP.

7. FS Employees Who Work at External Industry Workplaces. FS employees who work at external industry workplaces shall:

a. Assist in identifying activities with potential radiation hazards and exposures, understanding activities that could pose an ionizing radiation exposure hazard, and using appropriate testing, monitoring, and worker protection measures to comply with this RSP and any associated responsible Flight Standards office program or implementation procedures.

b. Complete FAA Form 3900-50 and send to their Front Line Manager (FLM) for signature.

c. In accordance with the requirements outlined in the FS RMP, posted at https://my.faa.gov/go/AFSOSH, wear a dosimeter badge whenever working around radiation sources and after the activities, complete FAA Form 3900-51, and send a copy of the report along with the badge to the Office CDOSH POC.

d. Complete the FS radiation safety training, acquiring an understanding of and capability to implement the requirements of this RSP, and properly use monitoring devices (dosimeter badges).

e. Understand that they are not required at any time to subject themselves to unprotected exposure to ionizing radiation exposure.

f. Exercise their opportunity to submit an Unsatisfactory Condition Report (UCR) per Chapter 3, Radiation Safety Program Requirements, paragraph 1.

g. Properly wear the dosimeter badge in accordance with the FS RMP procedures and the FS radiation training.

h. If pregnant, notify FLM for possible additional precautionary measures, if desired.

Chapter 3. Radiation Safety Program Requirements

1. Unsatisfactory Condition Report (UCR).

a. Background. No FS employee is expected to perform work activities that subject themselves to an unsafe or unhealthful work condition. If an employee is potentially exposed to a safety hazard, the employee must not perform the task until the hazard is remediated. If it cannot be corrected or alternate measures are not feasible to address the hazard, the employee must not complete the activity.

b. UCR Reporting. Preferably, the hazardous condition should be discussed with the FLM to abate the unsafe condition. However, any employee or employee representative who believes that an unsafe or unhealthful working condition exists has the right to make a report of the unsafe or unhealthful working condition to an appropriate agency safety and health official and request an inspection of the workplace.

c. Filing a UCR. A UCR may be submitted electronically on FAA Form 1800-1, Unsatisfactory Condition Report. FS personnel can access the electronic UCR form via their Microsoft Edge bookmarks under "AVS Resource Links" or by going to "Electronic UCR Form" and on the Safety Management Information System (SMIS) at https://smis.faa.gov/home.asp. Refer to FAA Order 1800.6, Unsatisfactory Condition Report, for further instructions.

2. Aviation Safety (AVS) OSH Policy Statement. Per the AVS OSH Policy Statement, employees who determine their duties cannot be performed due to unsafe work activities or working environments must disengage from the activity or work environment and immediately notify their frontline supervisor.

3. Scope of FAA at External Industry Workplaces. This RSP addresses FS employees working in external industry workplaces where the FAA does not have the authority to abate hazardous conditions. FS employees work at external industry workplaces (multi-employer) that the FAA does not control (such as an airport, cargo ramp, and aircraft repair facility). FAA employees should request information on radiation sources when they arrive at external industry workplaces.

4. Identification of Potential Ionizing Radiation Sources, Radioactive Materials, and Other Radiation Hazards. FS employees in the course of surveillance and investigation activities may work in areas that contain ionizing radiation sources and radioactive material, observe work being performed in these areas, inspect packaging that contains radioactive materials, and observe loading and unloading of these packaged sources and materials. In addition, some aircraft contain radioactive components (e.g., depleted uranium (DU)) which are sources of radiation. These types of work areas, devices, materials, components, and activities present the potential for exposure to ionizing radiation.

a. Potential Exposures for FS Personnel. Common areas and/or work activities with a potential for radiation exposure for FS employees include, but are not limited to:

(1) Radiopharmaceutical cargo on special permit carriers, cargo aircraft, etc.;

(2) Cargo sorting facilities;

(3) Aircraft accidents that contain radioactive components or packaged radioactive materials and sources;

(4) NDT, which utilizes a radioactive source, often for the larger aircraft parts;

(5) A maintenance, repair, and overhaul (MRO) facility that uses x ray (however, FS employees should not be in the x ray room when x ray is conducted); and

(6) Ground operations radar, which is usually off upon taxiing to the gate (however, testing of radar may emit radiation).

Note: Under normal conditions, applicable FS employees would likely not be exposed to radiation at levels higher than the general population. However, monitoring is required to document FS employee exposures.

b. Increased Levels of Potential Exposure for FS Personnel. During inspection of certain operations, facilities, or cargo, and/or when host employers are repairing/testing equipment using radioactive sources, higher levels of exposure may be encountered for a limited period. Examples of work activities that may have higher levels of radiation exposure include, but are not limited to:

(1) Inspections of radioactive material shipments performed under special permits;

(2) Inspections of cargo sorting facilities;

(3) Work in or around any area, device, or material with damaged or breached packaging, containments, or shielding;

(4) Work around a radioactive aircraft component that is being disrupted or subjected to high heat;

(5) Investigation of aircraft accidents that contain radioactive components or packaged radioactive materials and sources, or other similar instances; and

(6) Work at a facility with a radioactive source for NDT of larger aircraft components.

c. Protective Measures. If feasible, FS employees should avoid the area or take special protective measures to evaluate and mitigate the hazard prior to proceeding.

5. Fundamentals of Radiation Exposure Dosimetry and Terminology.

a. Radiation Dosimetry. Radiation dosimetry in the fields of health physics and radiation protection is the measurement, calculation, and assessment of the ionizing radiation dose absorbed by the human body. This applies both internally, due to ingested or inhaled radioactive substances, or externally due to irradiation by sources of radiation.

b. Radiation Dosimetry Use. Dosimetry is used extensively for radiation protection and is routinely applied to monitor occupational radiation workers, where irradiation is expected.

c. Radiation Dose Terminology.

(1) Roentgen. A unit of radiation exposure equal to the quantity of ionizing radiation that will produce 1 electrostatic unit of electricity in one cubic centimeter of dry air at 0° Celsius and standard atmospheric pressure.

(2) Rem (Roentgen Equivalent Man). OSHA defines the rem as a measure of the dose of any ionizing radiation to body tissue in terms of its estimated biological effect relative to a dose of 1 roentgen of x rays.

(a) A rem unit of measurement can be converted to the sievert, the International System of Units (SI) derived unit, by dividing by 100 (e.g., 1 millirem (mrem) equates to 0.01 millisieverts (mSv)).

(b) For general purposes, most physicists agree that the roentgen, rad, and rem may be considered equivalent.

(3) Sievert. The SI unit for a dose equivalent equal to 1 joule/kilogram. One sievert = 100 rem. Named for physicist Rolf Sievert.

(4) Curie. One of three units used to measure the intensity of radioactivity in a sample of material. Radon is measured in picocuries per liter (pCi/L).

d. FS RMP. Since FS has employees who may be exposed to sources of radiation, the FS RMP posted on https://my.faa.gov/go/AFSOSH is established to outline the required FS dosimetry procedures in accordance with OSHA 29 CFR § 1910.1096(d).

e. Additional References. See Chapter 4, Radiation Safety Exposure Criteria Requirements, and the FS RMP for more specific exposure limits and required FS procedures.

f. FS Historical Exposure Data. Past radiation surveys show that the probability of FS employees getting near the quarterly limit is very low. The RMP is in place to show employees their work-related exposure and to document that FS is not exposing its employees above established regulations and standards.

g. Importance of Dosimeter Badges. This is why it is essential for employees to wear the radiation dosimeter badge whenever working around radioactive sources included in this RSP and document times around the sources using FAA Form 3900-51.

6. Radiation Hazard Control Measures.

a. As indicated in the ACGIH guidelines, the guiding principle of radiation protection is to avoid all unnecessary exposure by optimizing work practices and maintaining exposures (both short-term and accumulated) as far below recognized dose and dose-rate limits as practicable.

b. Radiation exposure is minimized through the ALARA principle that employs time, distance, and shielding as keys to exposure control.

c. It is recommended that the employee ask the external industry workplace about their RSP and known radiation levels and if they can provide generalized input on their monitoring data. These actions assure that exposure to radiation above normal background is minimized and that ALARA is achieved.

d. FS employees enrolled in the FS RSP shall maintain their exposures to radiation ALARA by following the time, distance, and shielding methods:

(1) Time: Minimize the time spent in areas and around radiation sources and radioactive materials by planning the surveillance activity, conducting the activity in an efficient manner that limits the time in the area;

(2) Distance: Maintain the maximum distance possible from the radiation source or material while still being able to conduct the surveillance effectively; and

(3) Shielding: Ensure that shielding, containment, and packaging are in place, not breached, and respond appropriately if containment or shielding is compromised.

e. Other hazard control measures include radiation safety training, radiation surveys, personal dosimetry, use of personal or other protective equipment in certain cases, and avoidance of areas in cases of potentially excessive radiation exposure.

f. Applicable FS employees shall follow, as a minimum, the ALARA-based restrictions specified by the external industry workplace.

g. Any potential checkride or surveillance from the flight deck or jump seat of small aircraft (e.g., Cessna, Learjet) carrying radioactive packages must be approved by the RSO and include the requirements and procedures for radiation monitoring in the FS RMP located at https://my.faa.gov/go/AFSOSH. If feasible, perform inspection activities at the start and/or finish locations to avoid flying with the radioactive cargo.

7. Medical Surveillance. The FS RSO, with the assistance of technical medical services (e.g., FOH, FAA OccMed, etc.), shall ensure personal dosimetry results are included in the EMF as part of the overall FAA OccMed program.

8. Declared Pregnant Worker. Female FS employees have the right to voluntarily declare that they are pregnant and they are afforded precautionary protections as defined below.

a. All pregnant female FS inspectors are encouraged to voluntarily notify their FLM via email when they are pregnant.

b. The FLM must notify the FS OSH Program Team of a declared pregnant worker, so the FS OSH Program Team and/or RSO can assist the declared pregnant worker and their FLM with precautionary measures.

c. For a declared pregnant worker who continues working where workplace radiation exposure may result, the radiation dose limits found in Table 4-1, Public and Occupational Limits for Exposure to Ionizing Radiation, will apply.

d. If the dose to the embryo/fetus is determined to have already exceeded 500 mrem when the employee provides notification of their pregnancy, then they must not be assigned to tasks where additional occupational radiation exposure is likely during the remainder of the pregnancy.

e. The declaration of pregnancy is a voluntary measure taken by the expectant parent. No special dose limitations may be applied to pregnant workers without their advance written consent.

f. The FS RSO should be contacted regarding any questions regarding this policy.

9. Recordkeeping and Documentation. The FS RSO and the FS OSH Program Team shall develop processes and responsibilities for record and data management to include potential database systems necessary to support the program. The FS RSO shall maintain and/or ensure that other responsible and assigned authorities (e.g., FAA OccMed, FS Workforce Development Division (AFB-500)) maintain the following documents and records:

a. Written FS RSP and all revisions;

b. Program evaluations at the FS and office levels plus corrective actions taken;

c. Radiation surveys and other hazard analyses;

d. If provided, any host employer radiation surveys and exposure assessments, as warranted to assist in FS hazard analyses;

e. Personal dosimetry records, database, and notifications to employees;

f. All radiation-related training records using the FAA's electronic Learning Management System (eLMS) learning record system;

g. Employee accumulated dose records for comparison to annual and 5-year limits (see Table 4-1) and associated notifications and reports; and

h. Records and documents associated with pregnancy declarations and subsequent accommodations.

10. Performance Assurance and Program Evaluations. The FS RSO and Office CDOSH POC are responsible for performing or arranging for periodic RSP evaluations and implementing program improvements and revisions based on information gathered. In addition, information and data gained from radiation surveys and any personal dosimetry results shall be used to continually improve the program.

a. The FS RSO shall collect and analyze radiation survey and personal dosimetry data to evaluate potential and actual employee exposures and take appropriate action to modify and improve the RSP accordingly.

b. Testing and dosimetry strategies, training, hazard control measures, and other program aspects shall be optimized based on data collected over time.

c. The FS RSO or designees shall perform annual program reviews that assess the status of implementation at representative, selected offices. Office CDOSH POCs shall assist in this process. Based on the program reviews, written program revisions, training enhancements, or intensified monitoring and testing programs shall be undertaken as warranted.

d. The Office CDOSH POCs shall perform annual evaluations of their office's implementation of RSP requirements and provide feedback and lessons learned. The evaluation shall be in writing and maintained at the office. A copy of the office program evaluation shall be provided to the FS OSH Program Team and the FS RSO within 30 calendar-days of its completion.

e. At the FS RSO's discretion, external evaluations from qualified resources can also be arranged to assess the integrity and effectiveness of the program.

Chapter 4. Radiation Safety Exposure Criteria Requirements

1. Performing Radiation Surveys.

a. The FS RSO and Office CDOSH POC and/or designees shall perform SHAs to include radiation surveys, technical literature reviews, and reviews of applicable reports (e.g., special permit data) to identify and characterize potential exposures from the sources of ionizing radiation related to FS work activities including those shown in Table 4-2, Potential Sources of Ionizing Radiation Exposure Associated With FS Work Activities, below.

b. From these SHAs and radiation surveys, the FS RSO developed the FS RMP posted on https://my.faa.gov/go/AFSOSH, which includes the required dosimetry procedures relating to employees' use of dosimeters when working in areas with potential radiation exposure.

c. The FS RSO shall coordinate the acquisition of sufficient instrumentation necessary to conduct radiation surveys, including dosimeters and handheld radiation detectors.

d. The FS RSO and the FS OSH Program Team shall develop a radiation survey strategy including schedule, appropriate implementing procedures, data collection, and analysis processes.

e. The FS RSO shall work with the Office CDOSH POC and office management to implement the strategy and collect and analyze exposure data over time.

f. Host employer data shall also be gathered to support the radiation survey strategy, establish survey priorities, and supplement FS-collected data, where feasible.

g. The FS RSO shall lead the data evaluation process and determine appropriate personal dosimetry and hazard control measures based on the SHAs.

2. FAA and FS Radiation Exposure Criteria. The FAA has established exposure limits based on ACGIH guidelines and OSHA and NRC regulations.

a. See Chapter 3, paragraph 5 for radiation dose terminology and Table 4-1, Public and Occupational Limits for Exposure to Ionizing Radiation, for a summary of these FAA limits for public and occupational exposures.

b. FS personnel and, if applicable, their fetuses shall not be exposed to ionizing radiation at levels exceeding those given in Table 4-1.

c. OSHA defines a radiation area as any area, accessible to personnel, in which there exists radiation at such levels that a major portion of the body could receive in any 1 hour a dose in excess of 5 millirem.

d. The dosimetry/monitoring program for FS employees will monitor these measurements to record and track the data.

	Ex	posure Limits
Public Limit to Ionizing Radiation NRC limit for public exposure to ionizing radiation	2	2.0 mrem/hour
Radiation Area Where personnel can enter for job duties	>	> 5 mrem/hour
FS Action Level Triggers employee inclusion in RSP, RMP, and other requirements such as adoption of administrative controls to project annual accumulated dose and limit further radiation exposure so annual effective dose limits are not exceeded	2.5 mrem/hour	
FS Yearly Permissible Limit FS will monitor those in the RMP to ensure no one is exposed above half of the OSHA permissible exposure limit (PEL)	ed 2,500 mrem/year	
Measure	Dose Limits	
 Annual Effective Dose (total allowable exposure per year) OSHA 29 CFR § 1910.96 PEL; and ACGIH 2021 Threshold Limit Values and Biological Exposure Indices 	50 mSv	5,000 mrem
 Effective Dose Averaged over 5 Years ACGIH 2021 Threshold Limit Values and Biological Exposure Indices 	20 mSv	2,000 mrem per year (10,000 mrem over 5 years)
Equivalent Dose to the Embryo-Fetus (monthly limit after pregnancy has been declared)	0.5 mSv	50 mrem
Radon Radon level for FS leased facilities		~4 pCi/L

Table 4-1. Public and Occupational Limits for Exposure to Ionizing Radiation

3. ALARA. As stated previously, regardless of established radiation exposure limits, it is an FAA requirement that employee radiation exposure shall be maintained ALARA.

4. Radon Exposure Criteria.

a. FS leases shall include a clause similar to the following: Lessor must provide the FAA with a Radon Evaluation Report for the leased facility when requested. Radon air levels in leased premises to the FAA must meet applicable standards of four (4) picocuries per liter (pCi/L). If radon levels are found to be at or above 4 pCi/L, the Lessor will develop and promptly implement a plan of corrective action, including testing, to ensure radon air levels are maintained below 4.0 pCi/L at all times. Testing shall be done in accordance with Environmental Protection Agency (EPA) State Radon Contract requirements.

b. Use the EPA Radon Zones Map for reference.

Figure 4-1. EPA Radon Zones Map (2021)



5. FS Sources of Ionizing Radiation Exposures. Table 4-2 below provides general sources of ionizing radiation exposure potentially associated with FS work activities, along with additional details regarding the nature of potential exposures.

a. The list in Table 4-2 includes currently known ionizing radiation sources in the FS workplace. This listing shall be updated as other potential sources of exposure are identified.

b. The FS RSO, Office CDOSH POCs, or designees shall perform initial and periodic hazard characterizations associated with each of the potential sources of exposure identified.

c. The hazard characterizations utilize the FAA Form 3900-50 to identify FS employee exposures based on realistic assumptions (e.g., duration of exposures, frequency, adequacy of protective controls, etc.) and assesses risk in accordance with adopted occupational exposure limits.

d. FS employees having potential exposure to ionizing radiation from the identified sources shall be provided with specific training and shall observe ALARA principles.

Ionizing Radiation Source	Summary
 Radioactive Cargo – En Route Inspection 	 Applicable FS employees may conduct en route inspections in proximity to cargo containing sources of ionizing radiation. Special permits and governmental regulations dictate requirements such as maximum allowable radiation emissions, packaging, and labeling, and also specify exposure monitoring protocols for the protection of the stakeholder employees, FS employees/visitors, and the public. Most radioactive materials packages contain radioactive drugs (biomedical isotopes/radiopharmaceuticals) that are being transported to hospitals. Radioactive materials are also used by industry and by research laboratories.
 Radioactive Cargo – Loading/Unloading/Storage 	 See #1, above. There is special exposure consideration associated with radioactive cargo prior to its ultimate disposition on board an aircraft for transportation. During loading/unloading/storage, standard exposure control measures (e.g., time, distance, shielding) may not be fully in place, requiring additional scrutiny and controls. For example, a truck carrying radiopharmaceuticals to the aircraft, conveyer, etc. for loading the packages onto the aircraft.
 Radioactive Cargo – At Accident Sites 	 Although radioactive materials are generally assumed to be packaged for safe handling and transport, in the case of an accident these containers may breech and release radioactive material or otherwise increase the likelihood of exposure. In case of an accident, <u>do NOT</u> handle packages of radioactive materials and avoid the area where the packages are located until qualified authorities remove them and deem the area safe.

Table 4-2. Potential Sources of Ionizing Radiation Exposure Associated With
FS Work Activities

Ionizing Radiation Source	Summary
	• Cargo sorting facilities often have radioactive cargo that can be shipped in 55-gallon drums, boxes, and other metal (cask that looks like a beer keg) or cardboard packaging.
4. Cargo Facility Inspections	 X ray scanners used for scanning unit load devices (ULD), which are used to carry cargo on aircraft, may result in ionizing radiation exposures to nearby FS employees.
5. Depleted Uranium (DU) Counterweights	 DU counterweights have been used primarily in wide-body aircraft on rudders, outboard ailerons (wing assembly), and outboard elevators (tail assembly). Counterweights come in a variety of weights and shapes. The DU counterweight can range in weight from 0.50 to 170 pounds (0.23 to 77 kg). Some aircraft used for military and cargo also use DU counterweights, including the Lockheed C-130 and C-141, Jetstar, and S-3A. The Boeing Company produced helicopters utilizing DU as a rotor tip weight prior to 1979. One to three weights were installed per blade. However, virtually all of them manufactured prior to 1979 have newer blades that do not contain DU weights. External radiation exposure may result during the installation of DU counterweights. The annual dose equivalent to workers responsible for installation, storage, and transport of DU counterweights was reported to be 90 mrem/yr.
6. Radioactive Nondestructive Testing (NDT)	 Generally, maintenance, repair, and overhaul (MRO) facilities have procedures in place to reduce or eliminate exposure to visitors from radioactive NDT. Large NDT operators with a radioactive source for detecting flaws/welds in large aircraft components. Avoid the area when radioactive NDT is occurring.

Ionizing Radiation Source	Summary
7. Testing the Radar on Aircraft	• Usually, MROs do not test the radar on an aircraft in the hangar and will test outdoors or in flight. If MRO employees are testing the radar near an FS employee, they need to leave the area.
8. Radon Gas in Buildings	• Per Chapter 4, paragraph 4 above, lessors are responsible for providing radon survey data on their building, where feasible.

6. External Industry Workplace Information and Coordination.

a. Per the AVS OSH Policy Statement, employees who determine their duties cannot be performed due to unsafe work activities or working environments must disengage from the activity or work environment and immediately notify their FLM.

b. If the FLM is notified of a condition like this, they should seek assistance from the FS RSO and/or OSH Program Team for an assessment of the employee's potential exposure, the ability to mitigate the hazard, and the potential mitigation activities.

c. FS employees should coordinate with the external industry workplace to obtain briefing, information, and instruction regarding safe versus hazardous locations onsite.

d. When it is necessary for FS employees to be in the proximity of an ionizing radiation device, they shall wear the dosimeter and observe ALARA principles to reduce the amount of energy absorbed, or they shall avoid the area.

e. For ramp inspection of radioactive cargo shipments performed under special permits, FS employees shall observe the practices described above and wear personal dosimetry devices as outlined in the FS RMP.

Chapter 5. Radiation Safety Exposure Monitoring Requirements

1. FS RMP.

a. The FS RSO, along with the FS OSH Program Team, shall develop formal processes for all aspects of the FS RSP. This includes:

(1) Identification of employees to be monitored, which is accomplished using FAA Form 3900-50;

(2) Issuance and use of dosimeters, laboratory support, collecting and reporting of results, notification of employees of exposures, and tracking employees' annual accumulated dose and exposures over their career, which is accomplished by following the required actions in the FS RMP; and

(3) Developing FS radiation safety training, which will be available within 12 months of the publication of this RSP.

b. The FS RMP posted on the FS OSH web page at https://my.faa.gov/go/AFSOSH outlines the required steps to ensure that employees are monitored for all potential radiation exposure and results are tracked. This information is available to the RSO and the employee and is filed in their EMF with the FAA OccMed program.

2. Personal Dosimetry. Based on SHAs and FAA Form 3900-50, employees enrolled in the FS RSP will be required to use personal dosimetry when working around radiation to ensure effective dose monitoring and to assist in obtaining historical data on dosage from jobs or locations involving radiation hazards.

a. Criteria and guidance is included in the FS RMP to implement radiation dose monitoring to ensure that permissible exposure limits are not exceeded. The dosimetry strategy utilized in the FS RMP is based on the results of SHAs and radiation survey data discussed in this RSP.

b. Findings from the SHAs and radiation surveys provided data to identify those employees, work tasks, and work environments that have the potential to result in FS employee ionizing radiation exposure and are included on FAA Form 3900-50.

c. Findings from the SHAs and radiation surveys also provided data for the training course and any other pertinent aspects of this RSP.

d. The FS RSO, Office CDOSH POCs, and designees shall implement the personal dosimetry process included in the FS RMP.

e. Applicable employees identified using FAA Form 3900-50 shall be issued dosimeters and instructed on all requirements included in the FS RMP, which includes completing FAA Form 3900-51, and sending the dosimeter and the report to the laboratory.

f. Office CDOSH POCs shall receive training on dosimeters that requires them to manage for their office and overall implementation procedures.

g. FS employees included in the RMP can request a dosimeter from their Office CDOSH POC. If the Office CDOSH POC is unavailable or unable to do so, the FS RSO shall evaluate the request.

h. Monitoring devices (dosimeter badges) are used for measuring and registering accumulated exposure to ionizing radiation or real-time dose rates and can include personal monitoring devices such as digital dosimeters, optically stimulated luminescent detectors (OSL), thermoluminescent dosimeters (TLD), self-reading dosimeters (SRD), and film badges. Per the FS RMP, FS will be using the digital dosimeters.

i. The FS RSO shall arrange for dosimetry services from companies with accreditation from the National Voluntary Laboratory Accreditation Program (NVLAP) of the National Institute of Standards and Technology (NIST).

Chapter 6. Radiation Safety Training

1. Radiation Safety Training. At a minimum, all FS employees who are potentially exposed to ionizing radiation as identified using FAA Form 3900-50 shall complete the initial FS radiation safety training. The FS radiation safety training will be a web-based training (WBT) eLMS course.

2. Training Requirements. Training requirements are summarized below.

a. Training Frequency. FS RSOs must be trained as an RSO and refreshed every 2 years.

b. FS Radiation Safety Training.

(1) FS employees who are potentially exposed to ionizing radiation shall complete FS radiation safety training in eLMS.

(2) FLMs of FS employees who are potentially exposed to ionizing radiation shall also complete FS Radiation Safety in eLMS.

(3) The Office CDOSH POCs must complete the FS radiation safety training so they can manage the dosimeters for their office and overall implementation procedures.

(4) This training class includes more detailed radiation safety information that is specific to the FS exposure profile and includes data collected from SHAs, radiation surveys, and dosimetry.

(5) The topics of the training include:

(a) Information on ionizing radiation (sources and types);

(b) Specific FS activities and areas where employees may encounter radiation sources and potential radiation sources and duration;

(c) Reasons to minimize exposure including health effects and FS policies;

(d) Radiation-related signs, labeling, and barriers;

(e) Application of ALARA principles of time, distance, and shielding;

(f) Completing FAA Form 3900-50 and FAA Form 3900-51;

(g) How to wear, store, and use the radiation dosimetry badges, badge storage, and badge limitations; and

(h) Other hazard control measures, such as host employer briefings, area avoidance, and the employee right to disengage from unsafe working conditions.

(6) The FS RSO will modify the FS radiation safety training to include any new radiation safety concerns or practices.

c. Radiation Safety Awareness Training. FS employees who visit external industry workplaces but are not enrolled in the RSP and RMP after completing FAA Form 3900-50 must complete the Radiation Safety Awareness Training.

d. Previous Training. Training received while employed by previous employers shall not be a substitute for mandatory FS radiation safety training requirements.

Appendix A. Definitions

1. Action Levels. Action levels are employee exposure levels that trigger the implementation of this Radiation Safety Program (RSP). When these levels are exceeded, protective steps must be initiated to guarantee the safety of employees, such as increased employee awareness of radiation hazards (through improved communication or updated training), additional radiation measurements, labeling and signage, and/or the initiation of controls to reduce exposure to below the action levels.

2. ALARA. Acronym for "as low as reasonably achievable" (i.e., making every reasonable effort to maintain exposures to ionizing radiation as far below the dose limits as practical). This principle utilizes the three primary mitigation methods for reducing radiation exposure: time, distance, and shielding.

3. Dosimetry. Equipment/devices used for measuring and registering accumulated exposure to ionizing radiation. This equipment/device includes personal monitoring devices such as digital dosimeters, thermoluminescent dosimeters (TLD), optically stimulated luminescent detectors (OSL), self-reading dosimeters (SRD), and film badges.

4. Ionizing Radiation. Either particulate or electromagnetic radiation that is sufficiently energetic—with photon energies more than 12.4 electron volts (eV)—to ionize the matter absorbing it. It includes subatomic particles (such as electrons, protons, neutrons, or energetic alpha particles and heavier ions) and electromagnetic radiation (x rays and gamma rays).

5. Nonionizing Radiation. Applies to electromagnetic radiation with photon energies less than 12.4 eV, which cannot ionize atoms and molecules. It includes all frequencies at and below the ultraviolet (UV) portion of the spectrum. Examples include the spectrum of UV, visible light, infrared (IR), microwave (MW), radio frequency (RF), and extremely low frequency (ELF).

6. Radiation Area. Defined by the Occupational Safety and Health Administration (OSHA) as any area, accessible to personnel, in which there exists radiation at such levels that a major portion of the body could receive in any 1 hour a dose in excess of 5 millirem (mrem), or in any 5 consecutive days a dose in excess of 100 mrem.

7. Radiation Safety Officer (RSO). The FAA official charged with serving as the principal point of contact (POC) and coordinator for issues involving employee exposure to ionizing and nonionizing radiation. This individual is qualified by education, training, and/or experience to evaluate the potential for short- or long-term health effects from exposure to ionizing radiation in FAA workplaces. See Chapter 2, Roles and Responsibilities, for RSO responsibilities.

8. Radioactive Material. Defined by OSHA as any material that emits, by spontaneous nuclear disintegration, corpuscular or electromagnetic emanations.

9. Units of Measure for Radiation.

a. Curie. One of three units used to measure the intensity of radioactivity in a sample of material. Radon is measured in picocuries per liter (pCi/L).

b. Rem (Roentgen Equivalent Man). OSHA defines the rem as a measure of the dose of any ionizing radiation to body tissue in terms of its estimated biological effect relative to a dose of 1 roentgen of x rays.

(1) A rem unit of measurement can be converted to the sievert, the International System of Units (SI) derived unit, by dividing by 100 (e.g., 1 mrem equates to 0.01 millisieverts (mSv)).

(2) For general purposes, most physicists agree that the roentgen, rad, and rem may be considered equivalent.

c. Roentgen. A unit of radiation exposure equal to the quantity of ionizing radiation that will produce one electrostatic unit of electricity in one cubic centimeter of dry air at 0° Celsius and standard atmospheric pressure.

d. Sievert. SI unit for a dose equivalent equal to 1 joule/kilogram. One sievert = 100 rem. Named for physicist Rolf Sievert.

Directive Feedback Information

Please submit any written comments or recommendation for improving this directive, or suggest new items or subjects to be added to it. Also, if you find an error, please tell us about it.

Subject: FAA Order 3900.85, Flight Standards Service Ionizing Radiation Safety Program

To: Flight Standards Directive Management Officer, AFB-120 Directives Mailbox (9-AWA-AFB-120-Directives@faa.gov)

(Please check all appropriate line items)

An error	(procedural	or typographical) has been noted in paragraph	on
page			

Recommend paragraph ______ on page ______ be changed as follows: (attach separate sheet if necessary)

In a future change to this order, please cover the following subject: (briefly describe what you want added)

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