

**BY ORDER OF THE
SECRETARY OF THE AIR FORCE**

AIR FORCE INSTRUCTION 91-110

28 JUNE 2002

**30TH SPACE WING
Supplement 1**

10 AUGUST 2004

Safety



**NUCLEAR SAFETY REVIEW AND LAUNCH
APPROVAL FOR SPACE OR MISSILE USE OF
RADIOACTIVE MATERIAL AND NUCLEAR
SYSTEMS**

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

NOTICE: This publication is available digitally on the AFDPO WWW site at:
<http://www.e-publishing.af.mil>

OPR: HQ AFSC/SEWE (Maj Bill Kralik)

Certified by: HQ AFSC/SEW
(Col Daniel Tompkins)

Supersedes AFI 91-110, 18 Mar 1994

Pages: 37

Distribution: F

This instruction implements AFD 91-1, *Nuclear Weapons and Systems Surety*. It defines the nuclear safety review and launch approval procedures for using radioactive materials in space or missiles. This instruction does not apply to the Air Force Reserve and Air National Guard. Send major command (MAJCOM) supplements to this instruction to the Air Force Safety Center (HQ AFSC/SEWE, 9700 Avenue G, Kirtland AFB NM 87117-5670) for coordination and to HQ USAF/SE, 1400 Air Force Pentagon, Washington DC 20330-1400, for approval before publication. **Attachment 1** lists abbreviations and acronyms used in this instruction.

(30SW) The OPR for this supplement is 30SW/SESI. This supplement implements and extends the guidance of Air Force Instruction (AFI) 91-110, *Nuclear Safety Review And Launch Approval For Space Or Missile Use Of Radioactive Material And Nuclear Systems*, dated 28 June 2002. The AFI is published word-for-word without editorial review. 30SW supplemental material is indicated in bold face. This supplement describes 30SW procedures for use in conjunction with the basic AFI. Upon receipt of this integrated supplement discard the Air Force basic publication.

SUMMARY OF REVISIONS

This document is substantially revised and must be completely reviewed.

Range Nuclear Safety Surveys are replaced by Range Nuclear Safety Inspections. The MAJCOM is assigned responsibility for performing these inspections. Range commanders are tasked with developing and exercising radiological safety and contingency plans for space and missile launches carrying radio-

logical materials. They are also responsible for ensuring radiological issues have a more prominent place in launch readiness reviews. In addition, threshold quantities for radioactive materials have been increased to match threshold values for the safe transport of radioactive materials as outlined in the *International Atomic Energy Agency's, Safety Series 6, Regulations for the Safe Transport of Radioactive Material, 1996 (Revised)*. These threshold values are now listed in Terabecquerels (TBQ) instead of Curies to conform with international standards.

(30SW) This document is substantially revised and must be completely reviewed.

(30SW) A bar (|) indicates a revision from the previous edition.

Section A	General Information	3
1.	Defining Scope and Requirements.	3
2.	Reporting Radiological Mishaps.	3
3.	Obtaining Exemptions or Waivers.	3
Section B	General Responsibilities	3
4.	HQ Air Force Safety Center.	3
5.	Major Commands (MAJCOM) and Air Force Program Executive Offices (AFPEO):	4
6.	Range Commanders.	4
Table 1.	Nuclear Safety Review, Approval, and Reporting Procedures.	6
Table 2.	(Added-30SW) RADSAFCOM Members.	7
Attachment 1—GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION		12
Attachment 2—ANALYSIS THRESHOLD QUANTITIES FOR RADIOACTIVE MATERIALS		13
Attachment 3—GUIDE FOR SAFETY ANALYSIS SUMMARY (SAS)		32
Attachment 4—LAUNCH FORECAST REPORT FORMAT		34
Attachment 5—(Added-30SW) MISSION ASSESSMENT DESCRIPTION		35
Attachment 6—(Added-30SW) EMERGENCY RESPONSE PLAN		36

Section A General Information

1. Defining Scope and Requirements. This instruction defines the nuclear safety review and launch approval process for using radioactive materials aboard a space or missile system. These requirements add to AFI 40-201, *Control of Radioactive Material* (formerly AFR 161-16), which allows Air Force installations to possess radioactive materials. This instruction implements Presidential Directive/National Security Council Memorandum-25, *Scientific or Technological Experiments with Possible Large-Scale Adverse Environmental Effects and Launch of Nuclear Systems Into Space*, December 14, 1977 (revised by letter, 8 May 1996), Department of Defense (DoD) Directive 3200.11, *Major Range and Test Facility Base*, January 26, 1998. and DoDD 3100.10, *DoD Space Policy*, September 14, 2000.

1.1. Nuclear safety review and launch approval procedures apply to:

1.1.1. Agencies that use any radioactive materials aboard a space or missile system (atmospheric, ballistic, orbital, or earth escape), including radioactive materials that the US Nuclear Regulatory Commission (NRC), Agreement States, or other Military Services exempt from licensing.

1.1.2. Any materials held under section 91b of the Atomic Energy Act of 1954, currently found in 42 USC 2121 (b).

1.1.3. Air Force agencies that develop, test, or have operational responsibility for radioactive materials in space.

1.1.4. Other agencies or organizations that plan to use an Air Force range to launch radioactive materials and have not completed a range-approved equivalent nuclear safety review..

1.2. These procedures do not apply to radioactive materials in gravity weapons or manned aircraft where they are used as structural material, instruments, or ballast.

2. Reporting Radiological Mishaps. Follow AFI 91-204, *Investigating and Reporting US Air Force Mishaps*, to report accidents involving radioactive material. If the radioactive material has a permit from the US Air Force Radioisotope Committee or an NRC license, also follow AFI 40-201 and Title 10, Code of Federal Regulations, *Energy*.

3. Obtaining Exemptions or Waivers. The Air Force Chief of Safety (HQ USAF/SE) may approve requests for exemptions or waivers to this instruction. The Air Force Vice Chief of Staff or higher-level authority grants waivers for special access programs, which must be in writing. Send requests for exemptions and waivers to HQ AFSC/SEWE, 9700 Avenue G, Kirtland AFB NM 87117-5670.

Section B General Responsibilities

4. HQ Air Force Safety Center. HQ AFSC/SEW:

4.1. Performs Nuclear Safety Analysis and Review by:

4.1.1. Evaluating safety analysis reports.

4.1.2. Providing the DoD coordinator for the Interagency Nuclear Safety Review Panel (INSRP).

4.1.3. Assigning members to the technical subpanels for INSRP.

4.1.4. Providing technical help to organizations developing systems that incorporate significant amounts of radioactive material.

4.2. Grants or obtains nuclear safety launch approval for launches, based on the threshold quantities defined in [Attachment 2](#). HQ AFSC establishes the nuclear safety position for Air Force launches that require higher approval. When the radioactive material exceeds threshold quantity, HQ AFSC requests nuclear safety launch approval from the Office of the Assistant to the Secretary of Defense (Nuclear, Chemical and Biological Defense Programs (OATSD (NCB))).

4.3. Performs launch forecast and notification by sending OATSD (NCB) a quarterly forecast of projected Air Force space or missile launches using radioactive material.

5. Major Commands (MAJCOM) and Air Force Program Executive Offices (AFPEO):

5.1. MAJCOMs and AFPEOs that develop, test, or operate any programs or systems involving radio-active material must:

5.1.1. Notify HQ AFSC/SEW of the potential use of radioactive material as early as possible in the development or acquisition phase of the program.

5.1.2. Prepare a safety analysis summary (SAS), if required. An SAS must be prepared for any planned launch of radioactive material when the total quantity of radioactive material exceeds the analysis threshold quantity listed in [Attachment 2](#). See [Attachment 3](#) for an SAS format.

5.1.2.1. If a Safety Evaluation Report (SER) is written by the INSRP, this report, along with its references Final Safety Analysis Report (FSAR) will be sufficient to meet this requirement.

5.1.3. Forecast and report all launches involving radioactive material to HQ AFSC/SEW. See [Attachment 4](#) for a report format.

5.1.4. Ensure coordination with higher authorities, per DoDI 3100.12, is accomplished.

5.2. The Air Force or INSRP reviews may require MAJCOMs to provide technical support.

5.3. Air Force Space Command (AFSPACECOM) must track systems with radioactive material throughout the system's life. AFSPACECOM can provide information on non-Air Force systems.

5.4. Perform Range Nuclear Safety Inspections that evaluate:

5.4.1. Safety procedures for launching radioactive material and contingency plans for responding to a radiological mishap.

5.4.2. Safety measures to prevent radiological mishaps.

5.4.3. These inspections may be performed in conjunction with other MAJCOM inspections.

5.4.4. MAJCOMS should report the results of these inspections to HQ AFSC/SEWE.

6. Range Commanders. Range commanders must ensure that all parties comply with [Table 1](#). notification, reporting, and launch approval requirements.

6.1. Develop and exercise radiological safety and contingency plans for launch-related radiological mishaps.

6.1. (30SW) Range commanders must ensure that all parties comply with [Table 1](#). in AFI 91-110; this includes notification, reporting, and launch approval requirements.

6.1.1. (Added-30SW) It is the responsibility of the Commander of the 30SW, or their representative, to control the use of radioactive material on VAFB. Air Force policy regarding space and missile utilization of radiation sources is described in AFI 91-110. Radioactive materials (RAM) are covered under the NRC License and USAF Permits held by the 30SW or tenant units, from arrival at VAFB to the time of launch.

6.2. Review radiological issues at launch readiness reviews for launches containing radioactive material.

6.2. (30SW) RADSAFCOM (Radiation Safety Committee):

6.2.1. This review should include:

6.2.1. (30SW) The 30SW Radiation Safety Committee (RADSAFCOM) is the controlling body for nuclear safety review and launch approval on VAFB.

6.2.1.1. Types and quantities of radiological materials on board the launch vehicle and payload.

6.2.1.2. Review of radiological safety plans and procedures in place.

6.2.1.3. Review of plans and operations in place, to include coordination with external agencies (Department of Energy, NASA, US Navy, etc.), regarding contingency, clean up, or recovery plans.

Table 1. Nuclear Safety Review, Approval, and Reporting Procedures.

S T E P	A	B	C	D
	Who	What	To	When
1	MAJCOM system program director, AFPEO, or project manager	initially notifies	HQ AFSC/SEW	as early as possible in the acquisition process.
2		prepares and sends a safety analysis (if required)		at least 180 calendar days before launch for HQ AFSC/SEW approval; as directed by HQ AFSC/SEW for higher approval.
3	HQ AFSC/SEW	evaluates safety analysis. If program needs higher approval establishes Air Force safety position and sends nuclear safety launch approval request	OATSD (NCB)	at least 150 calendar days before launch
4	Range commander	makes sure that the launch of radioactive materials or nuclear systems has required approvals. Provides type and quantity of radioactive material in prelaunch message	HQ AFSC/SEW	at least 5 calendar days before launch.
5		notifies of successful launch		within 5 calendar days after launch.

6.2.2. (Added-30SW) The RADSAFCOM members are, as approved by the Commander, 30SW, as follows:

Table 2. (Added-30SW) RADSAFCOM Members.

30SW/CV	Chairperson
30SW/SE	System Safety/Recorder
30MDOS/SGOAB	Base Radiation Safety Officer
2 ROPS/DOUF	Range Operations
30CES/CED	Explosive Ordnance Disposal (EOD)
30CES/CEX	Readiness
30CES/CEF	Fire Protection
30SW/SEW	Weapons Safety

Other representatives as necessary

6.2.3. (Added-30SW) The RADSAFCOM reviews and evaluates Safety Analysis Summaries (SAS), Radiation Protection Plans (RPP), and briefings for the use of radioactive materials. This ensures conformance to the codes and regulations of the NRC and Air Force for the protection of personnel.

6.2.4. (Added-30SW) The RADSAFCOM will meet quarterly. Minutes will be distributed within 30 days. Radioactive material must be briefed by the Launch Agency to the RADSAFCOM two quarters (six months) prior to the arrival of RAM. Special RADSAFCOM meetings may be requested by the Launch Agency through 30SW/SESI by calling (805) 605-7246, DSN 275-7246.

6.2.5. (Added-30SW) RADSAFCOM approvals

6.2.5.1. (Added-30SW) The RADSAFCOM will grant “ground processing approval” after all briefings and regulation requirements have been met.

6.2.5.2. (Added-30SW) The Range User submits a request for launch approval, and the RADSAFCOM will grant “launch approval” after all requirements have been met. Launch approvals are normally granted approximately one month prior to launch.

6.3. (Added-30SW) 30SW/CV Responsibilities:

6.3.1. (Added-30SW) Ensures compliance with AFI 91-110. Enforces compliance with 30SWI91-110.

6.3.2. (Added-30SW) Chair RADSAFCOM

6.3.3. (Added-30SW) Issue Radiation Safety Committee Ground Processing Approval. Approval is given at the RADSAFCOM.

6.3.4. (Added-30SW) Issue Radiation Safety Committee Launch Approval for each launch containing RAM.

6.4. (Added-30SW) System Safety Responsibilities (30SW/SESI):

- 6.4.1. (Added-30SW) Ensure all parties comply with 30SWI91-110. Advises RADSACOM Chair of new programs with RAM.
- 6.4.2. (Added-30SW) OPR for the RADSACOM. Act as Recorder and conduct RADSACOM meetings.
- 6.4.3. (Added-30SW) Act on behalf of 30SW/CV for coordination of RADSACOM support in any RAM recovery effort.
- 6.4.4. (Added-30SW) Prepare Pre-Launch and Post-Launch message notification in accordance with **Table 1.**, Step 4 and Step 5 (in AFI91-110).
- 6.4.4.1. (Added-30SW) Message will be sent to the following addresses:
 - 6.4.4.1.1. (Added-30SW) /HQ AFSC KIRTLAND AFB NM//SEN//SEW
 - 6.4.4.1.2. (Added-30SW) /30SW VANDENBERG AFB CA// SESI/SEGW//
 - 6.4.4.1.3. (Added-30SW) /30MDOS VANDENBERG AFB CA//SGOAB//
 - 6.4.4.1.4. (Added-30SW) /30CES VANDENBERG AFB CA//CED//
 - 6.4.4.1.5. (Added-30SW) /30CES VANDENBERG AFB CA//CEX//
 - 6.4.4.1.6. (Added-30SW) / 2ROPS VANDENBERG AFB CA//DOUF//
- 6.5. (Added-30SW) Base Radiation Safety Officers (RSO) duties:
- 6.5.1. (Added-30SW) Under supervision of the Base Radiation Safety Officer (RSO) 30MDOS/SGOAB, field project managers are charged with ensuring employees who work with radioactive materials are properly protected and dosimeter administration is properly maintained, if required (30SWI40-101, ***Managing Radioactive Material on VAFB***).
 - 6.5.1.1. (Added-30SW) A description of personnel protection must be provided, which may include the use of film badges, dosimeters, shielding, radiation instrumentation, and air sampling equipment and exposure estimates of each operation.
 - 6.5.1.2. (Added-30SW) The RSO monitors radiation levels and ensures exposure to handlers is as low as reasonable achievable. Allowable limits are prescribed by Title 10, United States Code of Federal Regulations (10 U.S.C.) and other appropriate Air Force instructions (30SWI40-101, ***Managing Radioactive Material on VAFB***).
 - 6.5.2. (Added-30SW) Provide launch, uprange missile accident and RAM recovery support.
- 6.6. (Added-30SW) 30CES/CED Explosive Ordnance Disposal (EOD) Responsibilities:
- 6.6.1. (Added-30SW) Provide launch, uprange missile accident, and RAM recovery support.
 - 6.6.1.1. (Added-30SW) Advise, escort, and recover hazardous materials.
 - 6.6.1.2. (Added-30SW) Dispose of explosive residue as required.
 - 6.6.1.3. (Added-30SW) Recover radioactive components.
- 6.7. (Added-30SW) 30CES/CEF Fire Protection Responsibilities:
- 6.7.1. (Added-30SW) Provide launch and missile accident support.

- 6.7.2. (Added-30SW) Assist in determining isolation area and downwind evacuation area, as required.
- 6.7.3. (Added-30SW) Perform rescue operations, setup initial patient treatment areas, perform emergency medical services, and prepare for patient transportation (air and ground).
- 6.7.4. (Added-30SW) Provide full offensive Hazardous Materials response, including emergency and full decontamination for patients and first responders.
- 6.7.5. (Added-30SW) Perform fire suppression operations.
- 6.7.6. (Added-30SW) Assist in establishing and maintaining adequate monitoring.
- 6.7.7. (Added-30SW) Provide 911 Emergency Services.
- 6.8. (Added-30SW) 30CES/CEX Readiness Responsibilities:
 - 6.8.1. (Added-30SW) To confirm or deny the presence of radiological contamination.
 - 6.8.2. (Added-30SW) Provide Initial Perimeter Definition (IPD) to determine the location of radiological contamination, as needed.
 - 6.8.3. (Added-30SW) Provide the Contamination Control Station (CCS) upwind of the incident at the designated Entry Control Point (ECP), as needed.
 - 6.8.4. (Added-30SW) Will assist the On-Scene Commander (OSC) in preparation for the arrival of the Response Task Force (RTF), as needed.
- 6.9. (Added-30SW) 2ROPS/DOUF responsibilities:
 - 6.9.1. (Added-30SW) Provide Program Support Manager (PSM) as interface to Range User to coordinate requirements with the 30SW.
 - 6.9.2. (Added-30SW) Schedule Range assets via OD 5134, *Errant Missile Search and Recovery*, to support RAM recovery.
 - 6.9.3. (Added-30SW) Financial POC for range and support range (if required) recovery support.
- 6.10. (Added-30SW) Range User's responsibilities:
 - 6.10.1. (Added-30SW) MAJCOM, AFPEO, or AFSC provide launch forecast at least 180 days in advance of bringing radioactive material onto VAFB.
 - 6.10.2. (Added-30SW) Notify 30SW/SESI (System Safety) and 30MDOS/SGOAB (Bioenvironmental Engineering) of their intent to bring radioactive material onto VAFB. This must be done at least 180 days in advance of bringing radioactive material onto VAFB.
 - 6.10.3. (Added-30SW) Brief the RADSAFCOM on how the radioactive material will be used, handled, and stored. (See **Attachment 5 (Added)**)
 - 6.10.4. (Added-30SW) The Range user must possess and provide a copy of and NRC license or Air Force permit to 30SW/SE and 30MDOS/SGOAB to bring the radioactive material onto VAFB.
 - 6.10.5. (Added-30SW) For launches with RAM less than the threshold values, a Mission Assessment (MA) must be provided to 30SW/SESI. Threshold values are detailed in **Attachment 2** of AFI 91-110.

6.10.6. (Added-30SW) For launches with RAM greater than the threshold amounts a SAS (Safety Analysis Summary) and a RPP (Radiation Protection Plan) must be provided to 30SW/SESI and 30MDOS/SGOAB. Requirements for the SAS are detailed in [Attachment 3](#). The RPP is included as an attachment to the SAS.

6.10.6.1. (Added-30SW) The RPP provides a complete plan for how radioactive material will be handled from arrival at the Range through launch and recovery (if necessary). This plan shall include any non-flight sources that will be used during Range processing, calibration, or testing. Provide a description of personnel protection, to include the use of film badges, dosimeters, shielding, radiation instrumentation, and air sampling equipment, and exposure estimates of each operation.

6.10.6.2. (Added-30SW) Provide 30SW/SESI, 30MDOS/SGOAB, and 2ROPS/DOUF with an Emergency Response Plan. (See [Attachment 6 \(Added\)](#))

6.10.7. (Added-30SW) All procedures for handling of radioactive material must be submitted to the 30SW/SESI and 30MDOS/SGOAB for review and approval.

6.11. (Added-30SW) Accountability for and Disposition of RAM after an unsuccessful launch:

6.11.1. (Added-30SW) Notify RADSAFCOM within 24 hours.

6.11.2. (Added-30SW) All radioactive material (RAM) launched at VAFB must be accounted for and disposed of properly. Every reasonable effort must be made to recover radioactive materials (booster & payloads) after a failed launch. The launch agency will provide a detailed Recovery & Disposition Plan as required in the SAS. In all cases, the Range User is responsible for coordinating and funding the recovery of all radioactive material. The 2 ROPS/DOUF shall coordinate any wing support for the recovery of RAM (OD 5134, *Errant Missile Search and Recovery*).

6.11.3. (Added-30SW) Following a launch failure, 30SW/SEO (Mission Flight Control) will determine a preliminary debris impact location and pass this information to 2RPOS/DOU, 30SW/SE, the launch agency, and RADSAFCOM. The Range User will coordinate with the RADSAFCOM on the status of the RAM. The RADSAFCOM will notify the launch agency and appropriate wing agencies if recovery of RAM is required (OD 5134, *Errant Missile Search and Recovery*). See [Attachment 6 \(Added\)](#) for the ERP (Emergency Response Plan).

6.11.3.1. (Added-30SW) For uprange, VAFB area, land and shallow water (less than six feet) impact, the Launch Support Team and the Base RSO will accomplish impact area safing and monitoring under control of the on-scene commander. The Base Readiness Support Team will accomplish initial area monitoring with Explosive Ordnance Disposal (EOD) personnel. Security will be accomplished according to the 30SW Oplan 32-1, *Disaster Preparedness Operations Plan*. The 30SW RADSAFCOM and appropriate accident or incident investigating board will be convened. Recovery will be accomplished in accordance with SAS and wing instructions.

6.11.3.2. (Added-30SW) For downrange water impact, the RADSAFCOM or Range User shall determine if recovery is required, the Range User will coordinate RAM recovery in accordance with the SAS. The Base Radiation Safety Officer (RSO) and EOD are available to assist in the recovery effort.

6.11.3.3. (Added-30SW) Downrange land impact is the Range User's responsibility, and the downrange RSO may assist.

GREG ALSTON, Colonel, USAF
Acting Chief of Safety

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

DoDD 3200.11, *Major Range and Test Facility Base*

DoDD 3100.10, *DoD Space Policy*, September 14, 2000

AFI 40-201, *Control of Radioactive Material*

AFPD 91-1, *Nuclear Weapons and Systems Surety*

AFI 91-204, *Investigating and Reporting US Air Force Mishaps*

Presidential Directive/National Security Council Memorandum-25, *Scientific or Technological Experiments with Possible Large-Scale Adverse Environmental Effects and Launch of Nuclear Systems Into Space*

International Atomic Energy Agency's, Safety Series 6, Regulations for the Safe Transport of Radioactive Material, 1996 (Revised)

Abbreviations and Acronyms

AFI—Air Force Instruction

AFPEO—Air Force Program Executive Office

AFR—Air Force Regulation

AFSC—Air Force Safety Center

AFSC/SEW—AFSC, Weapons, Space and Nuclear Safety Division

AFSC/SEWE—AFSC/SEW, Space and Engineering Branch

AFSPACECOM—Air Force Space Command

OATSD (NCB)—Office of the Assistant to the Secretary of Defense (Nuclear, Chemical and Biological Defense Programs)

DoD—Department of Defense

HQ AFSC—Headquarters, Air Force Safety Center

INSRP—Interagency Nuclear Safety Review Panel

MAJCOM—Major Command

NRC—Nuclear Regulatory Commission

OPR—Office of Primary Responsibility

SAS—Safety Analysis Summary

Attachment 2

ANALYSIS THRESHOLD QUANTITIES FOR RADIOACTIVE MATERIALS

A2.1. The threshold quantity determines the level of launch approval and depth of analysis. Local range requirements guide launch approval of radioactive materials below the threshold quantity.

CAUTION: *Threshold quantities do not apply to reactors or other devices when a potential for criticality is present.* The end of this attachment shows the analysis threshold quantities for mixed fission or unlisted radionuclides and mixtures of radionuclides. HQ AFSC/SEW determines the necessary level of safety review and approval for quantities that exceed the threshold and for reactors or other devices where the potential for criticality exists. NOTE: 1 TBq ~ 27.03 Ci

Table A2.1. Allowable Limits for Radioisotopes.

<u>ELEMENT</u>	<u>ISOTOPE</u>	<u>QUANTITY TBq</u>
Actinium (89)	Ac-225 (a)	6×10^{-3}
	Ac-227 (a)	9×10^{-5}
	Ac-228	5×10^{-1}
Silver (47)	Ag-105	2×10^0
	Ag-108m (a)	7×10^{-1}
	Ag-110m (a)	4×10^{-1}
	Ag-111	6×10^{-1}
Aluminium (13)	Al-26	1×10^{-1}
Americium (95)	Am-241	1×10^{-3}
	Am-242m (a)	1×10^{-3}
	Am-243 (a)	1×10^{-3}
Argon (18)	Ar-37	4×10^1
	Ar-39	2×10^1
	Ar-41	3×10^{-1}

<u>ELEMENT</u>	<u>ISOTOPE</u>	<u>QUANTITY TBq</u>
Arsenic (33)	As-72	3×10^{-1}
	As-73	4×10^1
	As-74	9×10^{-1}
	As-76	3×10^{-1}
	As-77	7×10^{-1}
Astatine (85)	At-211 (a)	5×10^{-1}
Gold (79)	Au-193	2×10^0
	Au-195	6×10^0
	Au-198	6×10^{-1}
	Au-199	6×10^{-1}
Barium (56)	Ba-131 (a)	2×10^0
	Ba-133	3×10^0
	Ba-133m	6×10^{-1}
	Ba-140 (a)	3×10^{-1}
Beryllium (4)	Be-7	2×10^1
	Be-10	6×10^{-1}
Bismuth (83)	Bi-205	7×10^{-1}
	Bi-206	3×10^{-1}
	Bi-207	7×10^{-1}
	Bi-210	6×10^{-1}
	Bi-210m (a)	2×10^{-2}
	Bi-212 (a)	6×10^{-1}
Berkelium (97)		
	Bk-247	8×10^{-4}
	Bk-249 (a)	3×10^{-1}

<u>ELEMENT</u>	<u>ISOTOPE</u>	<u>QUANTITY</u> <u>TBq</u>
Bromine (35)	Br-76	4×10^{-1}
	Br-77	3×10^0
	Br-82	4×10^{-1}
Carbon (6)	C-11	6×10^{-1}
	C-14	3×10^0
Calcium (20)	Ca-41	Unlimited
	Ca-45	1×10^0
	Ca-47 (a)	3×10^{-1}
Cadmium (48)	Cd-109	2×10^0
	Cd-113m	5×10^{-1}
	Cd-115 (a)	4×10^{-1}
	Cd-115m	5×10^{-1}
Cerium (58)	Ce-139	2×10^0
	Ce-141	6×10^{-1}
	Ce-143	6×10^{-1}
	Ce-144 (a)	2×10^{-1}
Californium (98)	Cf-248	6×10^{-3}
	Cf-249	8×10^{-4}
	Cf-250	2×10^{-3}
	Cf-251	7×10^{-4}
	Cf-252	3×10^{-3}
	Cf-253 (a)	4×10^{-2}
	Cf-254	1×10^{-3}

<u>ELEMENT</u>	<u>ISOTOPE</u>	<u>QUANTITY</u> <u>TBq</u>
Chlorine (17)	Cl-36	6×10^{-1}
	Cl-38	2×10^{-1}
Curium (96)	Cm-240	2×10^{-2}
	Cm-241	1×10^0
	Cm-242	1×10^{-2}
	Cm-243	1×10^{-3}
	Cm-244	2×10^{-3}
	Cm-245	9×10^{-4}
	Cm-246	9×10^{-4}
	Cm-247 (a)	1×10^{-3}
	Cm-248	3×10^{-4}
Cobalt (27)	Co-55	5×10^{-1}
	Co-56	3×10^{-1}
	Co-57	1×10^1
	Co-58	1×10^0
	Co-58m	4×10^1
	Co-60	4×10^{-1}
Chromium (24)	Cr-51	3×10^1

<u>ELEMENT</u>	<u>ISOTOPE</u>	<u>QUANTITY</u> <u>TBq</u>
Caesium (55)	Cs-129	4×10^0
	Cs-131	3×10^1
	Cs-132	1×10^0
	Cs-134	7×10^{-1}
	Cs-134m	6×10^{-1}
	Cs-135	1×10^0
	Cs-136	5×10^{-1}
	Cs-137 (a)	6×10^{-1}
Copper (29)	Cu-64	1×10^0
	Cu-67	7×10^{-1}
Dysprosium (66)	Dy-159	2×10^1
	Dy-165	6×10^{-1}
	Dy-166 (a)	3×10^{-1}
Erbium (68)	Er-169	1×10^0
	Er-171	5×10^{-1}

<u>ELEMENT</u>	<u>ISOTOPE</u>	<u>QUANTITY</u> <u>TBq</u>
Europium (63)	Eu-147	2×10^0
	Eu-148	5×10^{-1}
	Eu-149	2×10^1
	Eu-150 (short lived)	7×10^{-1}
	Eu-150 (long lived)	7×10^{-1}
	Eu-152	1×10^0
	Eu-152m	8×10^{-1}
	Eu-154	6×10^{-1}
	Eu-155	3×10^0
	Eu-156	7×10^{-1}
Fluorine (9)	F-18	6×10^{-1}
Iron (26)	Fe-52 (a)	3×10^{-1}
	Fe-55	4×10^1
	Fe-59	9×10^{-1}
	Fe-60 (a)	2×10^{-1}
Gallium (31)	Ga-67	3×10^0
	Ga-68	5×10^{-1}
	Ga-72	4×10^{-1}
Gadolinium (64)	Gd-146 (a)	5×10^{-1}
	Gd-148	2×10^{-3}
	Gd-153	9×10^0
	Gd-159	6×10^{-1}

<u>ELEMENT</u>	<u>ISOTOPE</u>	<u>QUANTITY</u> <u>TBq</u>
Germanium (32)	Ge-68 (a)	5×10^{-1}
	Ge-71	4×10^1
	Ge-77	3×10^{-1}
Hafnium (72)	Hf-172 (a)	6×10^{-1}
	Hf-175	3×10^0
	Hf-181	5×10^{-1}
	Hf-182	Unlimited
Mercury (80)	Hg-194 (a)	1×10^0
	Hg-195m (a)	7×10^{-1}
	Hg-197	1×10^1
	Hg-197m	4×10^{-1}
	Hg-203	1×10^0
Holmium (67)	Ho-166	4×10^{-1}
	Ho-166m	5×10^{-1}
Iodine (53)	I-123	3×10^0
	I-124	1×10^0
	I-125	3×10^0
	I-126	1×10^0
	I-129	Unlimited
	I-131	7×10^{-1}
	I-132	4×10^{-1}
	I-133	6×10^{-1}
	I-134	3×10^{-1}
I-135 (a)	6×10^{-1}	

<u>ELEMENT</u>	<u>ISOTOPE</u>	<u>QUANTITY TBq</u>
Indium (49)	In-111	3×10^0
	In-113m	2×10^0
	In-114m (a)	5×10^{-1}
	In-115m	1×10^0
Iridium (77)	Ir-189 (a)	1×10^1
	Ir-190	7×10^{-1}
	Ir-192	6×10^{-1}
	Ir-194	3×10^{-1}
Potassium (19)	K-40	9×10^{-1}
	K-42	2×10^{-1}
	K-43	6×10^{-1}
Krypton (36)	Kr-81	4×10^1
	Kr-85	1×10^1
	Kr-85m	3×10^0
	Kr-87	2×10^{-1}
Lanthanum (57)	La-137	6×10^0
	La-140	4×10^{-1}
Lutetium (71)	Lu-172	6×10^{-1}
	Lu-173	8×10^0
	Lu-174	9×10^0
	Lu-174m	1×10^1
	Lu-177	7×10^{-1}
Magnesium (12)	Mg-28 (a)	3×10^{-1}

<u>ELEMENT</u>	<u>ISOTOPE</u>	<u>QUANTITY TBq</u>
Manganese (25)	Mn-52	3×10^{-1}
	Mn-53	Unlimited
	Mn-54	1×10^0
	Mn-56	3×10^{-1}
Molybdenum (42)	Mo-93	2×10^1
	Mo-99 (a)	6×10^{-1}
Nitrogen (7)	N-13	6×10^{-1}
Sodium (11)	Na-22	5×10^{-1}
	Na-24	2×10^{-1}
Niobium (41)	Nb-93m	3×10^1
	Nb-94	7×10^{-1}
	Nb-95	1×10^0
	Nb-97	6×10^{-1}
Neodymium (60)	Nd-147	6×10^{-1}
	Nd-149	5×10^{-1}
Nickel (28)	Ni-59	Unlimited
	Ni-63	3×10^1
	Ni-65	4×10^{-1}
Neptunium (93)	Np-235	4×10^1
	Np-236 (short lived)	2×10^0
	Np-236 (long lived)	2×10^{-2}
	Np-237	2×10^{-3}
	Np-239	4×10^{-1}

<u>ELEMENT</u>	<u>ISOTOPE</u>	<u>QUANTITY</u> <u>TBq</u>
Osmium (76)	Os-185	1×10^0
	Os-191	2×10^0
	Os-191m	3×10^1
	Os-193	6×10^{-1}
	Os-194 (a)	3×10^{-1}
Phosphorus (15)	P-32	5×10^{-1}
	P-33	1×10^0
Protactinium (91)	Pa-230 (a)	7×10^{-2}
	Pa-231	4×10^{-4}
	Pa-233	7×10^{-1}
Lead (82)	Pb-201	1×10^0
	Pb-202	2×10^1
	Pb-203	3×10^0
	Pb-205	Unlimited
	Pb-210 (a)	5×10^{-2}
	Pb-212 (a)	2×10^{-1}
Palladium (46)	Pd-103 (a)	4×10^1
	Pd-107	Unlimited
	Pd-109	5×10^{-1}
Promethium (61)	Pm-143	3×10^0
	Pm-144	7×10^{-1}
	Pm-145	1×10^1
	Pm-147	2×10^0
	Pm-148m (a)	7×10^{-1}
	Pm-149	6×10^{-1}
	Pm-151	6×10^{-1}

<u>ELEMENT</u>	<u>ISOTOPE</u>	<u>QUANTITY</u> <u>TBq</u>
Polonium (84)	Po-210	2×10^{-2}
Praseodymium (59)	Pr-142	4×10^{-1}
	Pr-143	6×10^{-1}
Platinum (78)	Pt-188 (a)	8×10^{-1}
	Pt-191	3×10^0
	Pt-193	4×10^1
	Pt-193m	5×10^{-1}
	Pt-195m	5×10^{-1}
	Pt-197	6×10^{-1}
	Pt-197m	6×10^{-1}
Plutonium (94)	Pu-236	3×10^{-3}
	Pu-237	2×10^1
	Pu-238	1×10^{-3}
	Pu-239	1×10^{-3}
	Pu-240	1×10^{-3}
	Pu-241 (a)	6×10^{-2}
	Pu-242	1×10^{-3}
	Pu-244 (a)	1×10^{-3}
Radium (88)		
	Ra-223 (a)	7×10^{-3}
	Ra-224 (a)	2×10^{-2}
	Ra-225 (a)	4×10^{-3}
	Ra-226 (a)	3×10^{-3}
	Ra-228 (a)	2×10^{-2}

<u>ELEMENT</u>	<u>ISOTOPE</u>	<u>QUANTITY TBq</u>
Rubidium (37)	Rb-81	8×10^{-1}
	Rb-83 (a)	2×10^0
	Rb-84	1×10^0
	Rb-86	5×10^{-1}
	Rb-87	Unlimited
	Rb (nat)	Unlimited
Rhenium (75)	Re-184	1×10^0
	Re-184m	1×10^0
	Re-186	6×10^{-1}
	Re-187	Unlimited
	Re-188	4×10^{-1}
	Re-189 (a)	6×10^{-1}
	Re (nat)	Unlimited
Rhodium (45)	Rh-99	2×10^0
	Rh-101	3×10^0
	Rh-102	5×10^{-1}
	Rh-102m	2×10^0
	Rh-103m	4×10^1
	Rh-105	8×10^{-1}
Radon (86)	Rn-222 (a)	4×10^{-3}
Ruthenium (44)	Ru-97	5×10^0
	Ru-103 (a)	2×10^0
	Ru-105	6×10^{-1}
	Ru-106 (a)	2×10^{-1}
Sulphur (16)	S-35	3×10^0

<u>ELEMENT</u>	<u>ISOTOPE</u>	<u>QUANTITY TBq</u>
Antimony (51)	Sb-122	4×10^{-1}
	Sb-124	6×10^{-1}
	Sb-125	1×10^0
	Sb-126	4×10^{-1}
Scandium (21)	Sc-44	5×10^{-1}
	Sc-46	5×10^{-1}
	Sc-47	7×10^{-1}
	Sc-48	3×10^{-1}
Selenium (34)	Se-75	3×10^0
	Se-79	2×10^0
Silicon (14)	Si-31	6×10^{-1}
	Si-32	5×10^{-1}
Samarium (62)	Sm-145	1×10^1
	Sm-147	Unlimited
	Sm-151	1×10^1
	Sm-153	6×10^{-1}
Tin (50)	Sn-113 (a)	2×10^0
	Sn-117m	4×10^{-1}
	Sn-119m	3×10^1
	Sn-121m (a)	9×10^{-1}
	Sn-123	6×10^{-1}
	Sn-125	4×10^{-1}
	Sn-126 (a)	4×10^{-1}

<u>ELEMENT</u>	<u>ISOTOPE</u>	<u>QUANTITY TBq</u>
Strontium (38)	Sr-82 (a)	2×10^{-1}
	Sr-85	2×10^0
	Sr-85m	5×10^0
	Sr-87m	3×10^0
	Sr-89	6×10^{-1}
	Sr-90 (a)	3×10^{-1}
	Sr-91 (a)	3×10^{-1}
	Sr-92 (a)	3×10^{-1}
Tritium (1)	T(H-3)	4×10^1
Tantalum (73)	Ta-178 (long lived)	8×10^{-1}
	Ta-179	3×10^1
	Ta-182	5×10^{-1}
Terbium (65)	Tb-157	4×10^1
	Tb-158	1×10^0
	Tb-160	6×10^{-1}
Technetium (43)	Tc-95m (a)	2×10^0
	Tc-96	4×10^{-1}
	Tc-96m (a)	4×10^{-1}
	Tc-97	Unlimited
	Tc-97m	1×10^0
	Tc-98	7×10^{-1}
	Tc-99	9×10^{-1}
	Tc-99m	4×10^0

<u>ELEMENT</u>	<u>ISOTOPE</u>	<u>QUANTITY TBq</u>
Tellurium (52)	Te-121	2×10^0
	Te-121m	3×10^0
	Te-123m	1×10^0
	Te-125m	9×10^{-1}
	Te-127	7×10^{-1}
	Te-127m (a)	5×10^{-1}
	Te-129	6×10^{-1}
	Te-129m (a)	4×10^{-1}
	Te-131m (a)	5×10^{-1}
	Te-132 (a)	4×10^{-1}
Thorium (90)	Th-227	5×10^{-3}
	Th-228 (a)	1×10^{-3}
	Th-229	5×10^{-4}
	Th-230	1×10^{-3}
	Th-231	2×10^{-2}
	Th-232	Unlimited
	Th-234 (a)	3×10^{-1}
	Th (nat)	Unlimited
Titanium (22)	Ti-44 (a)	4×10^{-1}
Thallium (81)	Tl-200	9×10^{-1}
	Tl-201	4×10^0
	Tl-202	2×10^0
	Tl-204	7×10^{-1}

<u>ELEMENT</u>	<u>ISOTOPE</u>	<u>QUANTITY</u> <u>TBq</u>
Thulium (69)	Tm-167	8×10^{-1}
	Tm-170	6×10^{-1}
	Tm-171	4×10^1
Uranium (92)		
	U-230 (fast lung absorption) (a) (c)	1×10^{-1}
	U-230 (medium lung absorption)(a) (d)	4×10^{-3}
	U-230 (slow lung absorption) (a) (e)	3×10^{-3}
	U-232 (fast lung absorption) (c)	1×10^{-2}
	U-232 (medium lung absorption) (d)	7×10^{-3}
	U-232 (slow lung absorption) (e)	1×10^{-3}
	U-233 (fast lung absorption) (c)	9×10^{-2}
	U-233 (medium lung absorption) (d)	2×10^{-2}
	U-233 (slow lung absorption) (e)	6×10^{-3}
	U-234 (fast lung absorption) (c)	9×10^{-2}
	U-234 (medium lung absorption) (d)	2×10^{-2}
	U-234 (slow lung absorption) (e)	6×10^{-3}
	U-235 (all lung absorption types)(a), (c), (d), (e)	Unlimited

<u>ELEMENT</u>	<u>ISOTOPE</u>	<u>QUANTITY TBq</u>
	U-236 (fast lung absorption) (c)	Unlimited
	U-236 (medium lung absorption) (d)	2×10^{-2}
	U-236 (slow lung absorption) (e)	6×10^{-3}
	U-238 (all lung absorption types) (c), (d), (e)	Unlimited
	U (nat)	Unlimited
	U (enriched to 20% or less) (f)	Unlimited
	U (dep)	Unlimited
Vanadium (23)	V-48	4×10^{-1}
	V-49	4×10^1
Tungsten (74)	W-178 (a)	5×10^0
	W-181	3×10^1
	W-185	8×10^{-1}
	W-187	6×10^{-1}
	W-188 (a)	3×10^{-1}
Xenon (54)	Xe-122 (a)	4×10^{-1}
	Xe-123	7×10^{-1}
	Xe-127	2×10^0
	Xe-131m	4×10^1
	Xe-133	1×10^1
	Xe-135	2×10^0

<u>ELEMENT</u>	<u>ISOTOPE</u>	<u>QUANTITY</u> <u>TBq</u>
Yttrium (39)	Y-87 (a)	1×10^0
	Y-88	4×10^{-1}
	Y-90	3×10^{-1}
	Y-91	6×10^{-1}
	Y-91m	2×10^0
	Y-92	2×10^{-1}
	Y-93	3×10^{-1}
Ytterbium (70)	Yb-169	1×10^0
	Yb-175	9×10^{-1}
Zinc (30)	Zn-65	2×10^0
	Zn-69	6×10^{-1}
	Zn-69m (a)	6×10^{-1}
Zirconium (40)		
	Zr-88	3×10^0
	Zr-93	Unlimited
	Zr-95 (a)	8×10^{-1}
	Zr-97 (a)	4×10^{-1}

(a) Values include contributions from daughter nuclides with half-lives less than 10 days.

(b) The quantity may be determined from a measurement of the rate of decay or a measurement of the radiation level at a prescribed distance from the source.

(c) These values apply only to compounds of uranium that take the chemical form of UF₆, UO₂F₂ and UO₂(NO₃)₂ in both normal and accident conditions of transport.

(d) These values apply only to compounds of uranium that take the chemical form of UO₃, UF₄, UCl₄ and hexavalent compounds in both normal and accident conditions of transport.

(e) These values apply to all compounds of uranium other than those specified in (c) and (d) above.

(f) These values apply to *unirradiated uranium* only.

A2.1.1. Treat a mixture of radionuclides resulting from the natural decay of a single-parent radionuclide as a single source of the parent.

A2.1.2. When using several isotopes or a mixture of isotopes, base the required nuclear safety review on the normalized total quantity of radioactive material present. The normalized total is the sum of the ratios of the individual isotopes to their respective threshold quantities as shown in **Figure A2.1**. If the normalized totals exceeds 1.00 a safety analysis summary is required. HQ AFSC/SEW must complete a nuclear safety review and obtain launch approval from OATSD(NCB).

Figure A2.1. Mixed Isotopes.

$$\frac{\text{Isotope A (TBq)}}{\text{Threshold A (TBq)}} + \frac{\text{Isotope B (TBq)}}{\text{Threshold B (TBq)}} + \frac{\text{Isotope C (TBq)}}{\text{Threshold C (TBq)}} + \dots < 1.00$$

Example:

1.2×10^{-4} TBq of Pu-238 is 1.2×10^{-4} TBq / 1.0×10^{-3} or 12 percent of the analysis threshold limit for Pu-238.

0.5 TBq of Nb-95 is 0.5Tbq/1.0Tbq, or 50 percent of the analysis threshold limit for Nb-95.

7.0 TBq of Be-7 is 7.0TBq/20 TBq, or 35 percent of the analysis threshold limit of BE-7.

Therefore, the normalized total is 97 percent and an SAS would not be required.

Attachment 3

GUIDE FOR SAFETY ANALYSIS SUMMARY (SAS)

A3.1. Safety Analysis Summary (SAS). You must prepare an SAS for any planned launch of radioactive material when the total quantity of radioactive material exceeds the analysis threshold quantity listed in **Attachment 2** or as specified by HQ AFSC/SEW. Prepare the SAS according to this attachment and send two copies to HQ AFSC/ SEWE.

A3.1.1. **Mission Description.** Include system, radioactive material, and mission profile descriptions.

A3.1.1.1. **System Description:**

A3.1.1.1.1. Program name.

A3.1.1.1.2. Launch vehicle description.

A3.1.1.1.3. Spacecraft or missile, and payload description.

A3.1.2. Describe each radionuclide separately, if applicable. Each radioactive material description consists of:

A3.1.2.1. Radionuclides.

A3.1.2.2. Modes of decay and associated intensities.

A3.1.2.3. Activity (in Terabecquerels).

A3.1.2.4. Radiation levels, with particular emphasis on areas accessible to personnel.

A3.1.2.5. Proposed use.

A3.1.2.6. Location on launch vehicle and payload.

A3.1.2.7. Manufacturer and source identification number.

A3.1.2.8. Nuclear Regulatory Commission or Agreement State sealed source and device registry number and the license or permit authorizing possession, if applicable.

A3.1.2.9. Source construction, including the chemical and physical form.

A3.1.2.10. Construction materials.

A3.1.2.11. Dimensions.

A3.1.2.12. Design criteria.

A3.1.2.13. Other information pertinent to assessing source integrity in normal and extreme operating conditions and potential accident environments.

A3.1.3. **Mission Profile:**

A3.1.3.1. Launch facility identification.

A3.1.3.2. Proposed launch date.

A3.1.3.3. Launch azimuth.

A3.1.3.4. Mission profile description, including orbital or flight parameters.

A3.1.3.5. Mission duration.

A3.1.3.6. Impact predictions, if applicable.

A3.2. Normal Mission Analysis. This analysis should address:

A3.2.1. Nuclear and radiation safety considerations throughout the mission, including handling from installation through flight and post-flight.

A3.2.2. Disposing of radioactive material. Identify the license or permit under which you will receive recovered materials, if applicable.

A3.3. Accident Evaluation. This evaluation should address:

A3.3.1. All mission phases, including prelaunch, launch, ascent, orbital, reentry, impact, and post impact.

A3.3.2. Potential accident scenarios, environments, and contingency options.

A3.3.3. Mission failure evaluation, including launch vehicle, payload, and source failure mode analyses and associated probabilities.

A3.3.4. Source response to accidents and potential consequences to the public and the environment.

A3.3.5. Any additional information pertinent to the SAS.

Attachment 4**LAUNCH FORECAST REPORT FORMAT**

A4.1. A forecast of all scheduled launches involving radioactive materials or nuclear systems during the next quarter must reach HQ AFSC/SEW at least 15 calendar days before the start of each calendar-year quarter. This report is exempt from the requirements of AFI 37-124, *Management and Control of Information Report* (formerly AFR 4-38). The forecast should include:

A4.2. Program name.

A4.3. Launch vehicle, site, and date.

A4.4. Impact area or orbital parameters.

A4.5. Specific radioisotopes and associated activities (in Terabecquerels).

A4.6. Type of nuclear system or device, if applicable.

Attachment 5 (Added-30SW)**MISSION ASSESSMENT DESCRIPTION**

A5.1. (Added-30SW) For launches that use quantities of radioactive material less than the analysis threshold quantity (as specified in **Attachment 2**) a mission assessment (MA) will be required. The MA will be required to contain the following information:

- A5.1.1. (Added-30SW) Mission description
- A5.1.2. (Added-30SW) Point of Contact (POC), to include contact information
- A5.1.3. (Added-30SW) Single launch or series
- A5.1.4. (Added-30SW) Program Name
- A5.1.5. (Added-30SW) Launch vehicle
- A5.1.6. (Added-30SW) Launch facility
- A5.1.7. (Added-30SW) Launch date
- A5.1.8. (Added-30SW) Impact predictions
- A5.1.9. (Added-30SW) Location (payload or vehicle)
- A5.1.10. (Added-30SW) Date, type and result of last swipe test
- A5.1.11. (Added-30SW) Intended use
- A5.1.12. (Added-30SW) Radioactive material
- A5.1.13. (Added-30SW) Radionuclide
- A5.1.14. (Added-30SW) Activity
- A5.1.15. (Added-30SW) License or permit
- A5.1.16. (Added-30SW) Normal mission analysis
- A5.1.17. (Added-30SW) Handling procedures
- A5.1.18. (Added-30SW) Monitoring procedures
- A5.1.19. (Added-30SW) Disposition/Ultimate fate of the material
- A5.1.20. (Added-30SW) Accident evaluation: contingency options and operations

A5.2. (Added-30SW) At the discretion of the Range Commander, include the radiation protection plan and the environmental assessment or statement as appendices to the SAS. (See AFI 32-7061, *Environmental Assessment & Statements*).

A5.3. (Added-30SW) In addition, 30SW Range Safety may require assessment of the accident risk as defined in Mil-Std-882D, *System Safety Program Requirements*, from the System Program Office (SPO) or program manager. This can be included as part of the Safety Assessment Report (SAR).

Attachment 6 (Added-30SW)**EMERGENCY RESPONSE PLAN**

A6.1. (Added-30SW) If RADSAFCOM directs the Range User to recover radioactive material, the RADSAFCOM will support the Range User's Recovery Team. The Recovery Team will be composed of the following personnel, as required:

- A6.1.1. (Added-30SW) 30SW/SESI System Safety
- A6.1.2. (Added-30SW) RSO (Radiation Safety Officer) 30MDOS/SGOAB Bioenvironmental Engineering
- A6.1.3. (Added-30SW) 30CES/CEX Explosive Ordnance Disposal (EOD), 30CES/CEF Fire Protection, 30 CES/CED Readiness
- A6.1.4. (Added-30SW) PSM (Program Support Manager) 2ROPS/DOUF
- A6.1.5. (Added-30SW) Launch Disaster Control Group representative (ground impact)
- A6.1.6. (Added-30SW) Recovery Agency, NAWC or US Navy (water impact)
- A6.1.7. (Added-30SW) Range User(s) system expert knowledgeable about all vehicle hazards, mainly radiation and explosives hazards.
- A6.1.8. (Added-30SW) Others, as necessary (e.g. DOE, NRO, payload specialist, etc.)

A6.2. (Added-30SW) The agency responsible for the actual salvage operation will develop the recovery plan. The Recovery Agency will need the following information:

- A6.2.1. (Added-30SW) Exact location of debris or best available information.
- A6.2.2. (Added-30SW) Type of ordnance, radioactive material or other hazards on board.
- A6.2.3. (Added-30SW) Approximate size, weight and type of material to be recovered.
- A6.2.4. (Added-30SW) Classification of material to be recovered.
- A6.2.5. (Added-30SW) Recovered debris disposition.
- A6.2.6. (Added-30SW) Funding information.
- A6.2.7. (Added-30SW) Launch agency and 30SW POC: Name, Phone #, and Mailing address

A6.3. (Added-30SW) Prior to implementation of the Recovery Plan, the Recovery Team will be briefed (by the Range User) on the following information:

- A6.3.1. (Added-30SW) Exact location of debris or best available information.
- A6.3.2. (Added-30SW) Type of ordnance and other hazards on board.
- A6.3.3. (Added-30SW) Radioactive material status
- A6.3.4. (Added-30SW) Approximate size, weight and type of material to be recovered.
- A6.3.5. (Added-30SW) Classification of material to be recovered.
- A6.3.6. (Added-30SW) Recovered debris disposition.

A6.4. (Added-30SW) The Recovery Plan shall contain the following information:

A6.4.1. (Added-30SW) Names and contact information of each team member

A6.4.2. (Added-30SW) Explosives information

A6.4.2.1. (Added-30SW) Safe handling and storage

A6.4.2.2. (Added-30SW) Clearance areas for non-essential personnel

A6.4.2.3. (Added-30SW) Safing devices that would be required

A6.4.2.4. (Added-30SW) Hot work permits (if necessary)

A6.4.2.5. (Added-30SW) Transportation requirements

A6.4.3. (Added-30SW) Radioactive material

A6.4.3.1. (Added-30SW) Radiological support group

A6.4.3.2. (Added-30SW) Monitoring and surveillance

A6.4.3.3. (Added-30SW) Safe handling and storage

A6.4.3.4. (Added-30SW) Approved containers

A6.4.3.5. (Added-30SW) Guidance and consultation

A6.4.3.6. (Added-30SW) Transportation requirements

A6.4.4. (Added-30SW) Toxic material

A6.4.4.1. (Added-30SW) Containers to be used

A6.4.4.2. (Added-30SW) Labeling of the containers

A6.4.4.3. (Added-30SW) Leak detection methods

A6.4.4.4. (Added-30SW) Processes for handling leaks

A6.4.4.5. (Added-30SW) Transportation requirements

A6.4.5. (Added-30SW) Disposition of the RAM

A6.4.6. (Added-30SW) 30SW and Range support required

A6.5. (Added-30SW) A schedule for execution of the Recovery Plan shall be developed. Status reporting shall be presented (at an agreed to frequency) to the RADS AFCOM. The RADS AFCOM shall reconvene as often as necessary.