MANAGING THE INTERFACE BETWEEN SAFETY AND SECURITY FOR LOW-ACTIVITY RADIOACTIVE MATERIAL IN TRANSPORT

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INTERNATIONAL ATOMIC ENERGY AGENCY

VIENNA, 20XX
Through its Nuclear Security Programme, the IAEA supports States to establish, maintain, and sustain an effective nuclear security regime. The IAEA has adopted a comprehensive approach to nuclear security. This recognizes that an effective national nuclear security regime builds on: the implementation of relevant international legal instruments; information protection; physical protection; material accounting and control; detection of and response to trafficking in such material; and national response plans and contingency measures. With its Nuclear Security Series, the IAEA aims to assist States in implementing and sustaining such a regime in a coherent and integrated manner.

The IAEA Nuclear Security Series comprises Nuclear Security Fundamentals, which includes objectives and essential elements of a State’s nuclear security regime; Recommendations; Implementing Guides; and Technical Guidance.

Similarly, through its nuclear safety programme, the IAEA has provided a reference set of transport safety requirements (currently the Specific Safety Requirements document SSR-6) and a set of associated safety guidance documents for the transport of radioactive material (which includes nuclear material). The transport safety requirements were first published in 1961, and multiple updated editions have been issued since; the associated safety guidance documents were also developed and updated during this time. The objective of SSR-6 is to protect people, property and the environment from the harmful effects of radiation during the transport of radioactive material. A graded approach is applied to the requirements for the ‘package type’ designs, preparation for transport and the accumulation of packages on a conveyance, while considering specified routine, normal and accident conditions of transport.

The transport safety requirements have been adopted for more than sixty years by international modal organizations for transport by air (ICAO Technical Instructions) and sea (SOLAS Convention and IMDG Code), and Member States national regulations for the safe transport of radioactive material. In doing so, the IAEA transport safety requirements have provided an exemplary record of safety during the worldwide transport of millions of packages of radioactive material.

Nuclear safety and nuclear security share the aim of protecting persons, property, society, and the environment from harmful effects of ionizing radiation. However, the activities that address nuclear safety and nuclear security are different, and sometimes actions taken to strengthen safety affect security, either positively or negatively, or vice versa. It is therefore essential to establish a well-coordinated approach to managing the interface between safety and security of radioactive material in transport so that relevant measures are implemented in a manner that does not compromise either nuclear safety or nuclear security and capitalizes on opportunities for mutual enhancement.

The aim of this publication is to provide technical guidelines and practical information to assist Member States, competent authorities and operators on the basis of international good practices, and to facilitate management of the interface between nuclear safety and security during transport of low activity radioactive material in an integrated and coordinated manner.

This publication was developed based on input from one IAEA Technical Meeting and four IAEA consultants meetings held from 2016 to 2018. In these meetings, the experience of Member States was gathered, which provided the basis for the guidelines, approaches, and examples used in this publication.

The IAEA wishes to thank the contributors to this publication for their efforts and valuable assistance.

The IAEA officers responsible for this publication were C.S. Bajwa and S. Whittingham of the Division of Radiation, Transport, and Waste Safety; and M. Shannon and D. Ladsous of the Division of Nuclear Security.
## CONTENTS

1. INTRODUCTION

1.1. Background

1.2. OBJECTIVE

1.3. Scope

1.4. Structure

2. TERMINOLOGY

3. SAFETY/SECURITY INTERFACE

4. INTERFACE CONSIDERATIONS

5. INTERFACE TASKS

5.1. General interface between security and safety

5.2. Compliance with regulations

5.3. Threat assessments

5.4. Management of security-related information

5.5. Operational controls

5.6. Carrier qualifications

5.7. Training and training records

5.8. Personnel trustworthiness

5.9. Personnel identification

5.10. Safety and security inspections

5.11. Design of transport packages

5.12. Stowage and retention of packages during transport

5.13. Locks and seals

5.14. Monitoring and tracking of packages and vehicles

5.15. Surveillance and alarms

5.16. In-transit storage of radioactive material during transport

5.17. Communications

5.18. Written instructions and documentation
<table>
<thead>
<tr>
<th>No.</th>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5.19. Marking and labelling of packages, and placarding of vehicles and freight containers</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>5.20. Identification of consignees and authorization requirements</td>
<td>21</td>
</tr>
<tr>
<td>3</td>
<td>6. TOOLS FOR ADDRESSING THE TRANSPORT SAFETY AND SECURITY INTERFACE</td>
<td>22</td>
</tr>
<tr>
<td>5</td>
<td>6.2. Example transport task questions for resolving transport safety–security interface conflicts</td>
<td>24</td>
</tr>
<tr>
<td>6</td>
<td>APPENDIX I. CLASSIFICATION OF RADIOACTIVE MATERIAL WITH THE APPROPRIATE UN NUMBER FOR PROPER INTERFACING</td>
<td>49</td>
</tr>
<tr>
<td>7</td>
<td>APPENDIX II. EXAMPLES OF CLASSIFICATION OF CONSIGNMENT OF LOW-ACTIVITY RADIOACTIVE MATERIAL</td>
<td>55</td>
</tr>
<tr>
<td>8</td>
<td>REFERENCES</td>
<td>57</td>
</tr>
<tr>
<td>9</td>
<td>CONTRIBUTORS TO DRAFTING AND REVIEW</td>
<td>58</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1. INTRODUCTION

1.1. BACKGROUND

Nuclear safety and security share the same ultimate goal, which is to protect people and the environment from harmful effects of ionizing radiation. However, the activities that address nuclear safety and security may be different, and sometimes actions taken to strengthen nuclear safety affect nuclear security, either positively or negatively, and vice-versa. It is therefore essential to establish a well-coordinated approach to managing the interface between nuclear safety and security of radioactive material in transport so that relevant measures are implemented in a manner that does not compromise either nuclear safety or security and aims to capitalize on opportunities for mutual enhancement.

The International Atomic Energy Agency (IAEA) first published its “Regulations for the Safe Transport of Radioactive Material”, Safety Series Number 6 in 1961; the latest edition of which is SSR-6 (2018) [1]. This publication sets forth for the international community a set of measures for the safe transport of radioactive material, including nuclear material, which are incorporated into the United Nations “Recommendations on the Transport of Dangerous Goods; Model Regulations” (henceforth “UN Model Regulations”) [2]. Both IAEA SSR-6 and the UN Model Regulations are recommendations, not requirements. However, these recommendations are then incorporated into international and regional modal dangerous goods transport regulations and recommendations and generally are also incorporated into Member States’ transport safety regulations.

More specifically, the following international modal regulations incorporate the the IAEA SSR-6 recommendations:

(a) the International Civil Aviation Organisation (ICAO) issues the Technical Instructions for the Safe Transport of Dangerous Goods by Air,

(b) the International Maritime Organization (IMO) issues the International Maritime Dangerous Goods (IMDG) Code,

(c) the UNECE’s Committee on Inland Transport maintains the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR),

(d) the UNECE’s Committee on Inland Transport also maintains the European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN), and

(e) the Intergovernmental Organisation for International Carriage by Rail (OTIF) issues the Regulations concerning the International Carriage of Dangerous Goods Rail (RID).

These regulations also adopt the transport security recommendations that are contained in the UN Model Regulations [2].

Many Member State competent authorities are responsible for both safety and security of radioactive material in transport and provide national requirements to operators that address both these topics. In other cases, multiple competent authorities issue separate regulations and requirements for safety and security of radioactive material in transport. In all cases, there exists an interface between safety and security requirements in the transport of radioactive material. To date, this interface in relation to the transport of low-activity radioactive material has only been partially addressed in separate IAEA safety and security publications.

Publications that focus solely on non-nuclear radioactive material transport security include:

(a) A recommendations publication, Nuclear Security Recommendations on Radioactive Material and Associated Facilities, IAEA Nuclear Security Series No. 14 (NSS No. 14) [3]; and
(b) An implementing guide, Security in the Transport of Radioactive Material, IAEA Nuclear Security Series No. 9 (NSS No. 9, Rev. 1) [4].

In addition, publications that focus solely on nuclear material transport security include:

(a) A recommendations publication, Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities (INFCIRC/225/Rev. 5), IAEA Nuclear Security Series No. 13 (INFCIRC/225/Rev.5; NSS No. 13) [5]; and

(b) An implementing guide, Security of Nuclear Material in Transport, IAEA Nuclear Security Series No. 26-G (NSS No. 26-G) [6].

Elements of these recommendations and guidance documents have been incorporated into the UN Model Regulations [2] and, as a result, into the modal regulatory documents, as well as into some Member State regulations. In the future, more of the IAEA transport security recommendations and guidance may become requirements at the international, regional and State level through the above-cited documents and future revisions thereto.

1.2. OBJECTIVE

The objective of this publication is to provide technical advice and practical information to Member States, competent authorities, and operators on the basis of international good practices, and to facilitate management of the interface between nuclear safety and security during transport of low activity radioactive material in an integrated and coordinated manner. It is important that the interface between transport safety and transport security for radioactive materials be defined, understood and is adequate to avoid conflicts when these sometimes disparate measures are applied.

The purpose of this publication is to define the interface between transport safety and transport security and the management of any consequential changes in the interface due to the need for additional security measures. To achieve effective management of changes to the interface, this document encourages dialogue and agreement between competent authorities involved.

1.3. SCOPE

The scope of this publication addresses those radioactive materials in transport that only require prudent management practice and/or basic transport security level measures as specified in NSS No. 9, Rev. 1 [4]. Specifically, these are radioactive material packages where the upper threshold values are (a) for specified radioactive sources, 10 D and less; and (b) for other radioactive material, 3,000 A; and less. These materials may include nuclear material below Category III as defined in INFCIRC/225/Rev. 5 [5].

This publication is limited to low-activity radioactive material because these are the materials for which a limited number of security recommendations and guidance IAEA publications have been developed, mostly because efforts at the international and State level have been focused on higher-activity radioactive material and on Category I, II, and III nuclear material. It is noteworthy that the low activity generally constitute a large majority of the shipments made worldwide.

With respect to the choice of these upper thresholds, Section I.3 of NSS No. 9, Rev. 1 [4] states the following:

“Although sources with an activity exceeding the D values specified …. are ‘dangerous’ (i.e., could result in the death of an exposed individual or a permanent injury that decreases the person’s quality of life) it is not considered realistic to implement enhanced security measures for all sources with an activity exceeding the D values. Considering this, a threshold of 10 times the D values is recommended to specify the enhanced transport security level for radionuclides included in the Code to include Category 1 and 2 sources.”
Thus, radioactive sources with activity of 10 $\text{D}$ or less, and all other radioactive material packages containing 3,000 $\text{A}_2$ or less, could still contain sufficient radioactive material to cause significant operational, economic, psychological, social, and/or political consequences due to:

(a) Loss of credibility and confidence of the population in those involved in regulating and shipping those material;

(b) Stress, panic or other psychological consequences within the population;

(c) Loss of use of important public places, transport or services due to radioactive contamination; and

(d) Economic burden arising from monitoring and cleanup resulting from malicious act (e.g. radiological dispersal device).

Many low-activity radioactive material shipments will be undertaken in package designs, which as prescribed in SSR-6 [1], are not required to be resistant to the accident conditions of transport. Since these packages are often light weight they may therefore present a greater attractiveness for theft and sabotage by those with malicious intent, and additional security measures may need to be considered in order to reduce accessibility by an adversary. Conversely, in the case of thick-walled and heavy weight packages containing low activity radioactive material, the risk of theft and sabotage may be mitigated because significant efforts would be required to either divert or breach the containment of such robust packagings.

This publication discusses the considerations to be made by State competent authorities for the establishment and ongoing management, at a national level, of the interface between safety and security during the transport of low-activity radioactive material. In addition, this publication recognises the crucial importance of the understanding and implementation of regulatory requirements by operators to provide effective safety and security for both domestic and international shipments. The interface situations that could arise in different States due to various State-specific needs are also discussed, including:

(a) the manner by which safety and security regulations are applied domestically, and

(b) specific security needs based on the conditions, threat levels and risks in a given State.

The interface with emergency preparedness and response is outside of the scope of this publication.

1.4. STRUCTURE

This publication is structured as follows. Section 2. provides a listing of key definitions. Section 0 discusses the transport safety–security interface. Section 4. elaborates on interface considerations. Section 5. outlines and provides a summary overview of twenty tasks associated with the transport of low activity radioactive material. Section 6. provides tools to assist competent authorities and operators in assessing the impact of the transport safety–security interface. Appendix I provides tools that can be used to determine the UN Number for a given a consignment. Appendix II provides two examples of the classification of consignments of low-activity radioactive material.
2. TERMINOLOGY

In the context of this publication, the following terms related to safety, security and their interface are used\(^1\). These definitions were derived through adaptations from References [[1], [3], [7], [8], [13]].

**carrier.** Any person, organization or government undertaking the carriage of nuclear or other radioactive material by any means of transport. The term includes both carriers for hire or reward (known as common or contract carriers in some countries) and carriers on own account (known as private carriers in some countries). [As defined in SSR-6 [1]]

**competent authority.** A governmental organization, institution, body, authority or person that has been designated by a State or otherwise recognized as such to carry out one or more safety or nuclear security functions. [Adapted from a combination of definitions in SSR-6 [1] and NSS No. 14 [3]]

**consignee.** Any person, organization or government that is entitled to take delivery of a consignment (also known as receiver in security publications, see footnote 1) [As defined in SSR-6 [1]]

**consignment.** Any package or packages, or load of radioactive material, presented by a consignor for transport. [As defined in SSR-6 [1]]

**consignor.** Any person, organization or government that prepares a consignment for transport (also known as shipper in security publications, see footnote 1). [As defined in SSR-6 [1]]

**conveyance.** For transport (a) by road or rail: any vehicle used for carriage of nuclear or other radioactive material cargo; (b) by water: any seagoing vessel or inland waterway craft, or any hold, compartment, or defined deck area of a seagoing vessel or inland waterway craft used for carriage of nuclear or other radioactive material cargo; and (c) by air: any aircraft used for carriage of nuclear or other radioactive material cargo. [Adapted from SSR-6 [1]]

**graded approach.** For nuclear security, the application of nuclear security measures proportionate to the potential consequences of a malicious act; and for nuclear safety, an application of safety requirements that is commensurate with the characteristics of the transport activities or the source considering the magnitude and likelihood of the exposures. [Adapted from NSS No. 14 [3] and the IAEA Safety Glossary [7]]

**insider.** An individual with authorized access to nuclear or other radioactive material in transport who could attempt unauthorized removal or sabotage, or who could aid an external adversary to do so. [Adapted from the definition in NSS No. 14 [3]]

**malicious act.** An act or attempt of unauthorized removal of radioactive material or sabotage. [As defined in NSS No. 14 [3]]

\(^1\) NOTE: Different IAEA safety and security publications use different terminology for the same entities. Specifically, the transport safety publications use “consignor” whereas the transport security publications use “shipper”; and the safety publications use “consignee” whereas security publications use “receiver”. The safety terms “consignor” and “consignee” are used herein.

Also, transport safety publications use the terminology “fissile material” whereas security publications use the terminology “nuclear material”. The security term “nuclear material” is used herein.
management system. A set of interrelated or interacting elements (system) for establishing policies and objectives and enabling the objectives to be achieved in an efficient and effective manner. [As defined in SSR-6 [1]]

operator. Any organization or person applying for authorization or authorized and/or responsible for transport safety and security when undertaking activities or in relation to transport of ionizing radiation. This includes, inter alia, any person, organization or government entity licensed or authorized to undertake transport, including consignors (also known as consignors in security publications), carriers, and consignees (also known as receivers in security publications). [Adapted from the IAEA Safety Glossary [7]]

prudent management practices. The practices and actions undertaken by the operator that are normally taken by consignors, carriers and consignees to protect the material against unauthorized removal as would be the case for any valuable commodity. [Adapted from text of NSS No. 9, Rev. 1, pg 33 [4]]

receiver. Any person, organization or government that prepares or offers a consignment of radioactive material for transport (also known as consignee in safety publications, see footnote 1). [As defined in NSS No. 14 [3]]

retention. The use of dunnage, braces, blocks or tie-downs, as appropriate, to restrain the package and prevent movement within or on a conveyance during routine transport. [Derived from para. 564.2 of SSG-26 Ref [13]]

sabotage. Any deliberate act directed against nuclear or other radioactive material in transport which could directly or indirectly endanger the health and safety of personnel, the public or the environment by exposure to radiation or release of radioactive substances. [Adapted from the definition in NSS No. 14 [3]]

shipment. The specific movement of a consignment (of nuclear or other radioactive material) from origin to destination. [Adapted from the definition in NSS No. 26-G [6]]

shipper. Any person, organization or government that prepares or offers a consignment of nuclear or other radioactive material for transport (also known as consignor in safety publications, see footnote 1). [As defined in NSS No. 14 [3]]

stowage. The locating within or on a conveyance of a package containing radioactive material relative to other cargo (both radioactive and non-radioactive). [Derived from para. 564.2 of SSG-26 [13]]

threat. A person or group of persons with motivation, intention and capability to commit a malicious act. [As defined in NSS No. 14 [3]]

threat assessment. An evaluation of the threats — based on available intelligence, law enforcement and open source information — that describes the motivations, intentions and capabilities of these threats. [As defined in NSS No. 14 [3]]

transport. The deliberate physical movement of radioactive material from one place to another. [Adapted from the IAEA Safety Glossary [7]]

transport security system. An integrated set of nuclear security measures that are used for the transport of nuclear or other radioactive materials. [Adapted from the definition of “nuclear security system” provided in NSS No. 20 [8]]
3. SAFETY–SECURITY INTERFACE

This section intends to provide an understanding of the meaning of the transport safety-security interface.

Transport safety-security interfaces occur when one or more aspects of the State transport safety regulations and State transport security regulations overlap. These interfaces may either complement or conflict with each other.

For safety, national transport safety regulations are derived from the IAEA’s Regulations for the Safe Transport of Radioactive Material (SSR-6) [1]. For security, National transport security regulations are based on, for transport of all dangerous goods, the recommendations provided by the UN Model Regulations [2] and modal regulations for sea and air, and in accordance with, for security of nuclear and other radioactive material, the recommendations and guidance in the IAEA’s Nuclear Security Series publications (e.g. Refs [3][4][5][6]). For each shipment of radioactive material, the operators must comply with the relevant State transport safety and transport security regulations.

To achieve the internationally agreed levels of safety during shipments, all the requirements stated in SSR-6, which align with the modal regulations for air and sea transport and should align with the Member State national land transport regulations, must be complied with in relation to the package type, and shipment preparation and consignment requirements.

From a security perspective, it is recommended that for low-activity radioactive material a Member State should adopt prudent management practices and basic transport security level measures as described in NSS No. 9, Rev. 1 [4]. If adopted by shipping, in-transit, and receiving States, these measures would become a common basis for transport security, as SSR-6 does for transport safety, thereby enabling the community of Member States involved in these shipments to implement transport security within a common set of practices.

The interface between the safety requirements and prudent management practices (for security) is intended to allow compliance in safety and security to be achieved with no compromises (Figure 1). It
is advised that this interface is discussed and agreed by the competent authorities responsible for
transport safety and transport security. Increases in security measures (additional security measures)
may have an adverse effect on safety and compensatory safety measures may become necessary. Close
collaboration between the competent authorities involved is therefore necessary to address any conflicts
to ensure the appropriate levels of safety and security during shipments are met. Agreement should also
be reached on the strategy to inform operators of actions they need to take in line with their duties
and responsibilities.

This document presents the management of the interface between transport safety and transport security
within the context that:

(a) The requirements of SSR-6, required by law, must be met to ensure safety during transport;

(b) Prudent management practices (for security) and basic transport security level measures
recommended in NSS No. 9, Rev. 1 do not conflict with safety when in compliance with SSR-
6;

(c) Changes in the compliance requirements for SSR-6 do not change but additional security
measures may be considered necessary by the Member State, and conflicts in the interface are
possible;

(d) The consequential effects of implementing additional security measures on the interface
between safety and security need to be assessed and if necessary compensatory safety
requirements introduced;

(e) Effective communication between safety and security authorities will ensure there are no
surprises and both safety requirements, including compensatory arrangements if necessary, and
additional security measures can be complied with;

(f) The operators are provided with clear mandates for safety and security; and

(g) The operators will not introduce additional security measures without approval from the
competent authority that compromise their ability to comply with the safety requirements.
4. INTERFACE CONSIDERATIONS

The possibility of variations in security requirements may arise from situations including a State’s regulatory framework, its application of regulations, a State’s (or even a consignor’s or carrier’s) assessment of transport security threats and risks, the perceived attractiveness of the material being shipped and its potential to cause harm.

NSS No. 9, Rev. 1 [4] lists seven steps a State needs to take to ensure adequate safety and security interfaces. Each of these has implications relative to the State’s competent authorities and the operators undertaking low-activity shipments. These seven steps are outlined in the first column of Table 1, while the second column lists recommended competent authority actions related to each respective step taken by a State and the third column lists recommended operator actions related to each respective step taken by a State.

### TABLE 1. PRACTICAL STATE/OPERATOR INTERFACE CONSIDERATIONS

<table>
<thead>
<tr>
<th>State Interface Considerations (NSS No. 9, Rev. 1 [4])</th>
<th>Competent Authority Actions</th>
<th>Operator Actions</th>
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</thead>
<tbody>
<tr>
<td>A balance is maintained between safety and security concerns throughout the nuclear security regime, from the development of the legislative framework to implementation of safety and security measures.</td>
<td>Establish a regulatory regime ensuring that the transport safety and security regulations are practical and balanced, and do not adversely impact each other.</td>
<td>Maintain awareness of regulations, communicate with competent authorities to ensure that the application of the regulations are practical and balanced, and do not adversely impact either safety or security.</td>
</tr>
<tr>
<td>Regulatory requirements are consistent, especially when responsibility for safety and security is assigned to different competent authorities.</td>
<td>Establish State transport safety requirements and State transport security requirements that do not compromise either safety or security. Inform operators in Member State of the regulatory regime.</td>
<td>Maintain awareness of all relevant regulations. Communicate with competent authorities in the event that transport security regulations for additional security measures adversely impact either safety or security.</td>
</tr>
<tr>
<td>Safety requirements do not compromise security, and security requirements do not compromise safety.</td>
<td>Collaborate between safety and security authorities to evaluate transport security regulations for additional security measures and resolve any conflicts to ensure safety requirements and security requirements are achieved. Inform operators of revised national arrangements.</td>
<td>Communicate with competent authorities to develop practical resolution should operational conflicts exist.</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>State Interface Considerations (NSS No. 9, Rev. 1 [4])</th>
<th>Competent Authority Actions</th>
<th>Operator Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coordination between authorities in charge of nuclear safety and of nuclear security is ensured, if applicable.</td>
<td>Ensure coordination between involved competent authorities is maintained to ensure effectiveness of collaboration when additional security measures are to be implemented.</td>
<td>Not applicable.</td>
</tr>
<tr>
<td>Safety and security interfaces are strengthened by promoting both safety and security cultures into the integrated management system;</td>
<td>Require that operators have a viable management system.</td>
<td>Implement an integrated management system that addresses the interface between transport safety and transport security.</td>
</tr>
<tr>
<td>Security measures for radioactive material in transport take into account those measures required for safety and vice versa, during both normal and emergency situations</td>
<td>Ensure continuing collaboration exists between the competent authorities involved for both normal and emergency situations, and resolve conflicts.</td>
<td>Comply with national requirements for transport safety and transport security.</td>
</tr>
<tr>
<td>Security measures during a response to a nuclear security event do not adversely affect the safety of transport personnel, emergency responders and the public, to the extent possible.</td>
<td>Evaluate whether security response measures required during a nuclear security event compromise safety to the transport personnel, emergency responders and public, and resolve conflicts.</td>
<td>Provide contingency response arrangements to compliment the national emergency response arrangements to a nuclear security event in order to provide assurances for the safety of transport personnel, emergency responders and members of the public.</td>
</tr>
</tbody>
</table>

In addition to the interface between the competent authorities and the operators as discussed in Table 1, consignors need to also consider the interfaces that will exist with their carriers. Low activity radioactive material shipments can involve a complex range of situations such as a carrier using a single, dedicated conveyance; a carrier using multiple dedicated conveyances; or even multiple carriers using multiple conveyances that are not dedicated to just the shipment involved.

Specific examples of these could range from:

(a) a single road vehicle dedicated to carrying the consignment from the consignor to the consignee;

(b) a road vehicle dedicated to transporting the consignment to a distribution point where the consignment would be transferred to a second dedicated road vehicle, which might also include in-transit storage of the consignment at the vehicle exchange point;
(c) the use of a courier delivery service (CDS) picking up the consignment using a non-dedicated road vehicle, delivery of the consignment to an airport for carriage on a CDS aircraft, and ultimately delivery of the consignment to the consignee using a non-dedicated CDS road vehicle.

Many variations of the shipment scenarios are possible. The consignor’s transport planning can be very complex. It can involve multiple carrier entities as well as a significant number of carrier personnel, multiple carrier competent authorities, and for international shipments potential changes in carriers or personnel at State borders. Thus, the consignor’s planning needs to consider the specific shipment situation, the entities involved, and define how to provide adequate control of both safety and security for the transport environment expected.
5. INTERFACE TASKS

A set of transport-related tasks are shown in Sections 5.1. through 5.20. Each of these tasks have the potential of either resulting in a conflict between transport safety and transport security interface, or complementing the safety–security interface. This potential for task conflicting or complementing the safety–security interface is briefly highlighted in this Section.

Each of the tasks identified here are then elaborated further in Section 6. The details of the basis for the requirements are elaborated and may have security functions, safety measures and potential interface issues that either complement or conflict.

Each of the transport safety/transport security interfaces elaborated in Section 5. and 6. may affect both the competent authorities when assessing how safety and security measures are applied for a given transport security system, and the operators when determining how to apply the regulatory requirements to their transport security system. Should conflicts exist, the involved parties need to coordinate and communicate with their relevant competent authorities.

The following twenty subsections list the various transport tasks, discuss the transport safety and security interface relating to each task, and elaborate on whether those interfaces introduce potential conflicts or whether the interface between safety and security complement each other. Where a conflict exists or may exist, a possible means for resolving the conflict is suggested.

5.1. GENERAL INTERFACE BETWEEN SECURITY AND SAFETY

Both transport safety regulations [1] and transport security recommendations and guidance [2][3][4][5][6] specify that radioactive materials shall be shipped where security provisions will recognize and accommodate safety provisions, and safety provisions will recognize and accommodate security provisions.

For safety, “The IAEA Safety Standards Section” of Safety Standards publications (e.g. SSR-6 [1]) states that

“Safety measures and security measures have in common the aim of protecting human life and health and the environment. Safety measures and security measures must be designed and implemented in an integrated manner so that security measures do not compromise safety and safety measures do not compromise security.”

The agreed interface measures between the safety requirements (SSR-6 [1]) and the prudent management practices (NSS No. 9, Rev. 1 [4]) are structured with a view to ensuring one does not detract from the other. Complying with all relevant dangerous goods transport regulations [2] should provide a high level of safety, while any conflicts introduced by security must addressed.

5.2. COMPLIANCE WITH REGULATIONS

For a given consignment of low-activity radioactive material, relevant domestic and international transport safety and security regulations will apply. Safety and security regulations may emanate from different competent authorities that are governed by different legal and regulatory regimes, thereby making it difficult for operators to develop an understanding of how to fully comply with both sides of the regulatory framework.

If the competent authorities governing transport safety are different from those for transport security, disparate sets of regulations may result and care must be taken to ensure close consideration of the regulatory interface is made by all competent authorities involved.
For transport safety and transport security, all relevant requirements and security measures required by national regulations must be satisfied. It is therefore essential that the safety and security authorities involved effectively communicate the national requirements to operators.

Where an interface conflict is identified between specific security and safety measures, steps should be immediately taken to initiate resolution of the conflict between the relevant competent authorities and the operators notified accordingly. By giving early priority to highlighting the transport safety–security interface problem and striving to evaluate and resolve the problem in an expeditious manner, choices/alternatives can be identified and resolutions developed in a timely manner by the involved competent authorities. If the Operators should then be informed of the agreed interface transport security arrangements to facilitate time for effective implementation before final plans and arrangements are made for the shipment(s).

5.3. THREAT ASSESSMENTS

SSR-6 [1] specifies package design and test requirements. The tests for demonstrating the ability of transport packages to withstand normal conditions of transport that are specified in paras 719-725 of SSR-6, and the tests for demonstrating the ability of transport packages to withstand accident conditions of transport that are specified in paras 726-737 of SSR-6 are applied on a graded approach basis to the performance requirements of transport package design ‘types’ which have defined external radiation doserate limits and requirements for the package to contain or permit release of its radioactive contents in the event of a transport accident. These tests have been historically demonstrated to address the threat of radiation exposure posed by transport accidents by considering routine, normal and accident scenarios and the permitted contents of defined package ‘types’.

NSS No. 9, Rev. 1 [4] specifies that those responsible for transport of radioactive material should take into consideration all available security threat information, including threat information provided by the regulatory body, when determining necessary actions applying necessary security measures to protect the material being shipped.

No interface conflicts exist between the transport safety–security for dealing with threat assessments. In addition, the relative robustness of a given package determined by its contents and design for satisfying the safety regulatory requirements may very often be useful to the designer of a transport security system in addressing specific issues that result from security threat and accident assessments.

5.4. MANAGEMENT OF SECURITY-RELATED INFORMATION

The management of sensitive, security-related information can potentially introduce a transport safety–security interface conflict. The potential conflict involves the transmittal of transport-specific information to meet safety requirements that may conflict with the challenges of maintaining control of this information for security purposes.

Specifically, in some cases the transfer of information may conflict with the need to protect security-sensitive information which may only be shared with those having a “need to know”.

SSR-6 specifies detailed information that is to be included in the transport documentation, including shipment notifications that need to be made, and sets forth those entities that should possess the information in the transport documents. This documentation may include:

(a) A description of the physical and chemical form of the material;
(b) The maximum activity of the radioactive contents during transport;
(c) Identification of the consignor and consignee; and
(d) The conditions when shipment notifications shall be made.
For transport security where only prudent management practices are to be applied, the operator should apply normal and sound business practices with respect to the manner by which it manages sensitive information.

NSS No. 9, Rev. 1 [4] describes prudent management practices as follows:

“Examples of prudent management practices include:

(a) Securing and storing the package while in transport (e.g., in a locked conveyance or storage area);

(b) Utilizing carriers with package tracking systems (e.g., bar code system to monitor the status of the shipment) as appropriate;

(c) Using closed vehicles;

(d) Not leaving packages or conveyances unattended for any longer than is absolutely necessary, for example, when deliveries are being made; and

(e) Provide drivers of road conveyances with effective communication capability.

The material should also be shipped in accordance with applicable dangerous goods regulations, particularly those applicable to radioactive material. Additional requirements will apply for classification, packaging, shipping papers, marking and labelling. These requirements inform carrier personnel of the need to handle and transport the packages with due care and diligence, providing appropriate protection against unauthorized removal or sabotage.”

For basic transport security level shipments, operators should take appropriate measures to protect sensitive information relating to transport operations, such as information on the schedule and route that could be used by an adversary to plan a malicious act.

Where transmitting information results in transport safety–security interface conflicts, the operator needs to coordinate its transport documents and other communications relating to a shipment with the relevant competent authorities to work around those conflicts. This will ensure that the information is transmitted and protected appropriately both for the purposes of security and safety.

At the basic transport security level, NSS No. 9, Rev. 1 recommends that the written procedures on required security measures provided to appropriate crew members should include information addressing how to respond to a security incident during transport and that “these written procedures to contain no more than basic details of emergency contacts”.

More detailed guidance on protection of security-related information can be found in NSS No. 26-G Ref. [6].

5.5. OPERATIONAL CONTROLS

The UN Model Regulations specify that low-activity radioactive material should be shipped in accordance with applicable dangerous goods regulations, both from the perspective of safety and security.

With respect to operational controls, SSR-6 [1] specifies that before each shipment the consignor shall ensure that at least the following are satisfied (paras 502 and 503):

(a) the package contains neither radionuclides different from those specified for the package design, nor contents in a form, or physical or chemical state, different from those specified for the package design;
(b) all the requirements specified in the relevant regulatory provisions and, as applicable, all
requirements in any relevant certificates of approval have been fulfilled; and

c) any lifting attachments associated with the package(s) either satisfy specified regulatory
requirements, or they have been removed or otherwise rendered incapable of being used for
lifting the package.

For security, NSS No. 9, Rev. 1 specifies that shipments requiring only prudent management practices,
the operator should undertake practices and actions normally taken by consignors, carriers and
consignees to protect the material against unauthorized removal as would be the case for any valuable
commodity.

For shipments requiring basic transport security level, NSS No. 9, Rev. 1 [4] recommends that the
consignee should verify package contents are as listed in shipping documents. The consignee should
also have a procedure in place for notifying the consignor and/or carrier if radioactive material is
discovered to be missing or when a package has not been delivered by the expected time. The consignor
and carrier also need to have procedures in place for responding to a notification from the consignee of
a missing shipment.

Thus, operationally-related controls for safety do not introduce conflicts with the transport safety–
security interface, and the interface between the two will generally complement the operationally-related
controls for security.

5.6. CARRIER QUALIFICATIONS

The UN Model Regulations specify that consignors only offer dangerous goods (including radioactive
materials) to carriers that have been appropriately identified (see Ref. [2] para. 1.4.1.2).

NSS No. 9 recommends that at the basic transport security level, the transfer of radioactive material
should only be made to authorized operators.

The requirements to use appropriately identified carriers, and for properly controlling the transfer of
materials to and between authorized operators does not create a conflict with the transport
safety/transport security interface. Such actions will generally be complementary between safety and
security.

5.7. TRAINING AND TRAINING RECORDS

All shipments of radioactive material other than those with UN Numbers UN2908 through UN2913\(^2\),
the UN Model regulations specify that safety training shall also include elements of security awareness
addressing the nature of security risks, methods to address and reduce such risks, and actions to be taken
in the event of a security breach. It is further specified that such training shall be provided or verified

\(^2\) These radioactive materials are:

UN 2908 RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — EMPTY PACKAGING;
UN 2909 RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — ARTICLES MANUFACTURED FROM
NATURAL URANIUM or DEPLETED URANIUM or NATURAL THORIUM;
UN 2910 RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — LIMITED QUANTITY OF MATERIAL;
UN 2911 RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — INSTRUMENTS or ARTICLES;
UN 2912 RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-I), non-fissile or fissile-excepted;
UN2913 RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-I or SCO-II), non-
fissile or fissile-excepted.
upon employment in a position involving dangerous goods transport and shall be periodically supplemented with retraining.

The UN Model Regulations, applicable Nuclear Security Series publications and SSR-6 all specify that records of training be maintained and made available upon request by the employee and competent authorities.

For security, with prudent management practice shipments the drivers should be provided with appropriate training that is simple to understand. This training should (a) explain their roles and responsibilities; (b) detail the expected security practices and precautions to ensure their safety and security as well as that of the cargo; (c) define their actions during both transport and interim stops; and (d) clarify their actions and responsibilities during unexpected events or emergencies; and (e), specify their actions upon delivery to the consignee including identifying the approved receiving agent.

For shipments requiring basic transport security level measures, the need for basic security awareness training is set forth in applicable Nuclear Security Series publications. Section 5 of NSS No. 9, Rev. 1 [4] provides details on recommended training that is be provided from the security perspective, and Paras 311-315 of SSR-6 [1] provides training requirement from the safety perspective.

The detailed safety training requirements complement and in no way conflict with the security training requirements specified in the UN Model Regulations and set forth in applicable Nuclear Security Series publications. To avoid a conflict with the transport safety–security interface, the training needs to be comprehensive; needs to include addressing basic security awareness, radiation protection and regulatory safety requirements commensurate with the individual responsibilities of each involved person; and as appropriate, needs to address function- and modal-specific requirements.

5.8. PERSONNEL TRUSTWORTHINESS

The need for establishing the trustworthiness of personnel involved in the transport of low-activity radioactive material is only set forth in security-related publications.

For safety, there are no requirements to establish personnel trustworthiness for safety.

For security, NSS No.9 recommends that personnel trustworthiness needs to be addressed (a) within a State’s legislative and regulatory framework, (b) as part of the State’s efforts in the use of the risk management approach for maintaining the risk of unauthorized removal or sabotage during transport at an acceptable level, and (c) in establishing the security management element of a transport security system. Specifically, NSS No. 9, Rev. 1 [4] states the following:

“Persons engaged in the transport of radioactive material should be subject to trustworthiness determination by the shipper, carrier, and receiver commensurate with their responsibilities.”

According to NSS No. 8 [9], trustworthiness determination is also important when striving to address insider threats.

No conflict exists with the transport safety–security interface with respect to establishing personnel trustworthiness.

5.9. PERSONNEL IDENTIFICATION

For transport security, all shipments of radioactive material other than those with UN Numbers UN2908 through UN2913 as noted above, the UN Model regulations specify that each crew member of road vehicles, trains and inland waterway craft transporting dangerous goods shall carry with them means of identification, which includes their photograph, during transport (see UN Model Regulations [2], para. 1.4.1.2).
For shipments of materials requiring basic transport security level measures, NSS No. 9, Rev. 1 [4]
recommends that each crew member of any conveyance transporting radioactive material should carry
a means of positive identification during transport. There are no requirements for establishing personnel
identification for safety.

5.10. SAFETY AND SECURITY INSPECTIONS

The UN Model Regulations specify that safety inspections should be performed on freight containers in
such a manner that appropriate security measures are addressed.

For transport safety, a management system and compliance management programme based on
international, national or other standards acceptable to the competent authority should be established
and implemented for all activities within the scope of SSR-6, as identified in para. 105 thereof, to ensure
compliance with the relevant inspection provisions of these Regulations. Also, the user should be
prepared to provide facilities for inspection during use.

For transport security, NSS No. 9, Rev. 1 [4] recommends for shipments requiring basic transport
security level measures that carriers perform security inspections of:

“conveyances with a frequency commensurate with the potential radiological consequences of
material transported, to verify that security measures associated with the conveyance are effective”.
Normally, “it is sufficient for the carrier to carry out a visual inspection of the conveyance to ensure
that nothing has been tampered with and that nothing has been affixed to the package or conveyance
ensuring that security measures remain effective during transport, and these should be performed
with a frequency commensurate with the potential harmful consequences of the material being
transported”.

By carefully combining security inspections with safety inspections, the provisions may complement
each other; a process that will assist in ensuring both the transport safety and transport security systems
are complete and that, for security, the system is prepared to satisfy all of the security functions.

If additional security measures are required that are not included in safety measures requirements due
to an arising threat or risk, there may be a conflict between the transport safety–security interface. These
inspection conflicts may be in terms of schedule, extent, documentation, etc. Should such a conflict be
identified, the operator needs to coordinate its pre-shipment planning with all of the relevant competent
authorities to resolve those conflicts prior to undertaking a shipment.

5.11. DESIGN OF TRANSPORT PACKAGES

For all shipments of radioactive material, the UN Model regulations, using the requirements originally
stated in SSR-6 [1], specify design requirements for transport packages following a graded approach.

For low-activity radioactive material shipments these packages could range from the least robust
designed excepted packages, to the moderately robust designed Industrial and Type A packages, to the
most robust designed Type B packages.

For safety, the design, testing and acceptance requirements for packages specified in SSR-6 [1] are
clearly and specifically specified. They follow a graded approach. That is, as the risk posed by the
contents of a package increases, the extent of the design, test and acceptance requirements also increases.
Thus for many packages, including those used for the transport of many low-activity radioactive
material, the package may be of a significantly robust design (e.g. Type B packages capable of
withstanding routine, normal and accident conditions of transport), while others on the lower end of the
activity contents spectrum may be designed to only be capable of withstanding routine and normal
conditions of transport such as Type A packages and some Industrial Packages.

For security, the design of a transport security system should take into account the robust nature of the
package(s) being used, especially where the robust nature of a package may contribute to deter and delay
functions of security. There may be situations, however, where satisfying the safety requirements may result in conflicts with satisfying security measures.

An example of a potential conflict would be the need to place an electronic tracking device (e.g., a radio frequency identification (RFID) tag with battery power) on a package for security purposes. This could not be added to a package until the safety assessment of the package included the presence of the attached or embedded device and the impacts this could have on the performance of the package under routine, normal, and accident conditions of transport as applicable to the individual package design.

Where there is the possibility of conflicts between specific package design features for safety and those needed for security, the operator needs to coordinate the development of its package and transport system with the relevant competent authorities to resolve those conflicts. Compensating security features may need to be added to the overall package design to satisfy the combined set of transport safety and transport security requirements. Specifically, the addition of security features to a package requires demonstrating that they don’t affect the safety functions of the packages.

5.12. STOWAGE AND RETENTION OF PACKAGES DURING TRANSPORT

For stowage, a conflict may arise with the transport safety–security interface. For example, with respect to stowage requirements for transport safety and security, with some producers of low-activity radioactive material a large number of small packages may be consigned onto a single conveyance. In this event, a common practice is to reduce the radiation exposure to vehicle drivers by placing those packages with the lowest external dose rates (e.g., White-I labelled packages) at the front of an enclosed cargo vehicle, while placing those producing the higher levels of external radiation (e.g., Yellow-II and/or Yellow-III labelled packages) to the rear of the vehicle. This stowage method, undertaken for radiation safety purposes, may not be the most desirable method of stowing such cargo from the perspective of security, i.e., loading Yellow-II and Yellow-III labelled packages rearmost may result in those package being more accessible to theft or sabotage. In these situations, the responsibility for stowage of the packages may fall more on the carrier than the consignor.

The retention of packages can prove to be complex, especially if the low-activity radioactive material being shipped is contained in light weight, small packages where tie down systems are generally not incorporated into the package design. From the perspective of security, it may be desirable to use a more robust retention systems than for safety purposes.

For safety, SSR-6 [1] specifies in para. 554(a) the following:

“Supplementary requirements for loading, stowage, carriage, handling and unloading of the package, overpack or freight container, including any special stowage provisions for the safe dissipation of heat (see para. 565), or a statement that no such requirements are necessary.”

“Consignments shall be securely stowed”. (para. 564 of SSR-6)

“Any tie-down attachments on the package shall be so designed that, under normal and accident conditions of transport, the forces in those attachments shall not impair the ability of the package to meet the requirements” of the Regulations. (para. 638 of SSR-6)

NSS No. 9, Rev. 1 [4] states that:

“The tie-downs required to secure a package to the conveyance may also be suitable for affixing security equipment such as locks. However, not all tie-downs are suitable for security purposes, such as those constructed of webbing or other materials that are not resistant to cutting.”

Thus the design of retention systems should be such that they do not impair the ability of the package to meet its regulatory design requirements.
5.13. LOCKS AND SEALS

For safety, SSR-6 [1] para. 637 states that Type A and Type B packages shall incorporate a feature on the outside of the package “such as a seal that is not readily breakable and which, while intact, will be evidence that the package has not been opened.”

For security, the integrity of the locks and seals should be verified before dispatch, before leaving any stopping point on-route, and upon arrival. Security measures should be used to provide detection such as tamper indicating devices and seals (packages and conveyances). These devices, while intact, can demonstrate that the package has not been opened.

In most respects, no conflict exists with the transport safety–security interface with respect to the addition of locks and seals for security.

However, such additions must not conflict with safety. If the addition of the locks and seals could in some way comprise a safety function of the package, such a conflict needs to be identified, the operator needs to coordinate the addition of the locks and seals with the package designer and relevant competent authorities in order to resolve the conflict prior to undertaking a shipment (see Section 5.11 for more details on this procedure).

5.14. MONITORING AND TRACKING OF PACKAGES AND VEHICLES

There are no safety requirements with respect to monitoring or tracking of packages and vehicles, or with respect to leaving vehicles unattended, establishing surveillance protocols during shipment for security purposes does not conflict with transport safety; and in fact can enhance safety during transport.

Packages or conveyances containing radioactive material should not be left unattended for any longer than is absolutely necessary.

Packages requiring prudent management security practices, it is recommended that carriers should consider utilizing package tracking systems such as a bar code system to monitor the status of the shipment.

For shipments requiring basic transport security level measures, use should be considered of a simple tracking system that can determine when the consignment has departed, when it is in-transit, and when the consignment has been received.

However, if monitoring or tracking requires additions be made to a package, such additions may conflict with safety. If the addition of the monitoring or tracking devices could in some way comprise a safety function of the package, such a conflict needs to be identified, the addition of the monitoring or tracking devices needs to be coordinated with the package designer and, as appropriate, with relevant competent authorities in order to resolve any package design conflicts prior to undertaking a shipment (see Section 4.11 for more details on this procedure).

5.15. SURVEILLANCE AND ALARMS

Other than the safety requirements for surveilling packages for excessive dose rate or contamination (e.g. see para. 309 of SSR-6 [1]), there are no safety or security requirements relating to the surveillance of low activity radioactive material packages during transport, nor is there a requirements for alarms.

However, conveyances used in the transport of these materials may have standard commercial alarm systems that could be used to improve security during transport.
5.16. IN-TRANSIT STORAGE OF RADIOACTIVE MATERIAL DURING TRANSPORT

For safety, the scope of SSR-6 (see para. 106) includes in-transit storage. Therefore all SSR-6 requirements are applicable for in-transit storage to ensure radiological and criticality safety.

For security, the UN Model Regulations [2] specify in para. 1.4.1.3 that operators need to have, for all shipments of radioactive material other than those with UN Numbers UN2908 through UN2913, transit sites properly secured, well-lit and, where possible, not accessible to the general public.

For prudent management practice shipments, during in-transit storage operators should secure and store packages, not leaving packages unattended for any longer than is absolutely necessary.

For shipments requiring basic transport security level measures, while in storage that is incidental to transport, operators should apply security measures where these measures are consistent with the category of the material and measures that are applied during use, storage and transit.

5.17. COMMUNICATIONS

For safety, Annex I of SSR-6 [1] details the prior notification provisions by type of package. It further notes that there may be deviations (exceptions, additions, etc.) relative to:

(a) National regulations relating to safety;

(b) Carrier restrictions; and

(c) National regulations relating to security, physical protection, liability, insurance, pre-notification and/or routing and import/export/transit licensing.

Annex I of SSR-6 also notes that additional measures may need to be taken:

“to provide appropriate physical protection in the transport of nuclear material and to prevent acts without lawful authority that constitute the receipt, possession, use, transfer, alteration, disposal or dispersal of nuclear material and which cause or are likely to cause, death or serious injury to any person or substantial damage to property”.

For prudent management practice shipments, it is recommended that carriers provide drivers of road conveyances with effective communication capability that are routinely tested before each shipment commences.

For basic transport security level shipments, it is recommended that operators cooperate with each other and with appropriate authorities to exchange information on applying security measures and responding to security incidents. In addition, crew members need the capability to communicate with their company or law enforcement personnel in order to request assistance. However, with all of these communications, sensitive information including that related to transport operations needs to be protected.

By complying with relevant domestic and international transport safety and security regulations with respect to pre-shipment notifications, the security provisions may either complement or be in conflict with those for safety.

There may be conflicts with respect to communications and the protection of sensitive information including those related to specific pre-shipment notification security and safety measures. In these cases, the operator needs to coordinate the pre-notification information with the relevant competent authorities to resolve those conflicts and to ensure that the exchange information on applying security measures and responding to security incidents is handled appropriately; that sensitive information is provided only to those who have a need to know; and that the crew members have the ability to effectively communicate with their company or law enforcement.
Should a non-compliance with respect to excessive radiation levels or contamination be identified during the shipment, SSR-6 requires that the non-compliance be reported to both the consignor and the relevant competent authorities. This notification “shall be made as soon as practicable and shall be immediate whenever an emergency exposure situation has developed or is developing” (see para. 309 of SSR-6 [1]).

5.18. WRITTEN INSTRUCTIONS AND DOCUMENTATION

For safety, SSR-6 [1] specifies the detailed contents of transport documents (paras 546-553), information to be provided to carriers (paras 554-556); and requirements for notification of competent authorities of shipments (paras 557-560), on possession of information by the consignor (para. 561), and for retention of shipping documentation by carriers (para. 584-588).

For security, when applying prudent management practices, an operator would normally be expected to develop safety and security documentation and maintain records associated with the shipment of a consignment.

For shipments requiring basic transport security level measures, carriers should provide appropriate crew members with written procedures on required security measures, which should include information addressing how to respond to a security incident during transport.

By complying with relevant domestic and international transport safety regulations with respect to documentation, the security provisions for written instructions and shipment documentation may either complement or be in conflict with those for safety. Where there are transport safety–security interface conflicts between specific safety written instruction and documentation requirements and those for security, the consignor or carrier need to coordinate the pre-notification contents of planning documents with the relevant competent authorities to work around those conflicts. In addition, consideration could be given to developing a series of separate documents, each of which may be provided only to those that need to know those parts of the planning documents.

5.19. MARKING AND LABELLING OF PACKAGES, AND PLACARDING OF VEHICLES AND FREIGHT CONTAINERS

For safety, it is important that the packaging and freight containers be clearly labelled as hazardous, so as to reduce the likelihood of an error due to a lack of information about the contents. For safety purpose:

(a) Markings on packages to facilitate understanding by all involved in transport of the package of the contents of the package;

(b) Labelling of packages facilitate radiological safety, communicating the dose rate outside the package and the specific contents of the package; and

(c) Placarding of vehicles, freight containers facilitate communication of potential hazards to emergency responders in the event of an accident.

For security labelling and placarding could provide a potential adversary with information that could assist the adversary in a performing a malicious act. Removal of these for security purposes reduces the ability to communicate radiological protection and emergency response information to operational personnel, freight handlers and emergency response personnel.

Where a possible conflict of safety and security measures involving placarding and/or labelling exists, NSS No. 9, Rev. 1 [4] recommends:

“...if a State were to determine, based on an analysis of the threat and on an exceptional basis, to remove external hazard communication, compensatory measures should be applied such as escorting personnel who can provide information on the nature and hazards of the material to emergency
response. Solutions to potential conflicts such as these should be assessed and approved by the regulatory bodies responsible for transport safety and security.”

Where it is determined that there is a conflict with satisfying safety hazard communication through the use of markings, labelling or placarding, compensatory measures, approved by competent authorities, should be applied through alternative communications methods which should ensure that in the event of an accident or emergency, life saving emergency response actions are able to take place without hinderance.

5.20. IDENTIFICATION OF CONSIGNEES AND AUTHORIZATION REQUIREMENTS

There are no apparent conflicts with the transport safety–security interface relative to the identification and authorization of receivers. Establishing identification and authorization requirements for receivers for security purposes does not conflict with transport safety; and in fact can enhance safety during transport.

For safety, with respect to the consignee (receiver), para. 564 of SSR-6 [1] requires that:

“The consignor shall include in the transport documents with each consignment the identification of the consignor and consignee, including their names and addresses…”.

SSR-6 also specifies the following:

“Where a consignment is undeliverable, it shall be placed in a safe location and the appropriate competent authority shall be informed as soon as possible and a request made for instructions on further action” (para. 583).

“The information applicable to the consignment shall accompany the consignment to its final destination. This information may be on the transport document or may be on another document. This information shall be given to the consignee when the consignment is delivered.”

For shipments requiring prudent management security practices, the consignor should know the consignee as would be the case for shipments of any valuable commodities.

For shipments requiring basic transport security level measures, consignors need to ensure that consignees are properly identified, authorized and prepared to receive the consignments.
6. TOOLS FOR ADDRESSING THE TRANSPORT SAFETY AND SECURITY INTERFACE

Operators need to ensure that all transport safety and security regulatory requirements are satisfied and the associated transport safety–security interfaces are appropriately addressed.

For safety, consignors are required to provide transport documents (see paras 545 – 553 of SSR-6 [1]). These can serve as a basis for managing their operations consistently with the application of a Management System (para. 306 of SSR-6) for transport (e.g. The Management System for the Safe Transport of Radioactive Material, TS-G-1.4 [10]).

Similarly, for security, the relevant recommendation and guidance publications, and the requirements that emanate from the UN Model Regulations to relevant Modal Regulations specify similar actions.

This section provides tools that can be used to assist them in satisfying the transport safety–security interfaces as follows:

(a) Section 6.1.: This section provides a process that can be followed by competent authorities and operators to resolve conflicts between complying with transport safety requirements and transport security measures for each of the twenty transport tasks identified in Section 5.

(b) Section 6.2.: This section provides example transport task questions to assist competent authorities and operators to resolve conflicts identified as part of the process outlined in Section 6.1. and (a) above that may occur for each of the twenty transport tasks identified in Section 5.

(c) Section Error! Reference source not found.: This section provides example information and a checklist that can be used by consignors of Type A and Type B packages to assess their practices in the context of the transport safety–security interface for low-activity radioactive material shipments.

6.1. DECISION PROCESS FOR ADDRESSING TRANSPORT SAFETY–SECURITY INTERFACE CONFLICTS

The decision chart (Figure 2) provides a logical process that both consignors and competent authorities can follow to identify and resolve, for each of the twenty transport tasks outlined in Section 5., possible conflicts with the transport safety–security interface for the shipment of low-activity radioactive material additional security measures (NSS No. 9, Rev. 1 [4]) are being considered.

The identification of a potential conflict will depend on the specifics of the consignment being planned. Here, the consigners will need for all involved parties to consider many factors, including (but not limited to):

(a) the radioactive and physical form of the radioactive contents in a package;

(b) the details of the package design that have been established to satisfy the safety requirements specified in relevant transport safety regulations; and

(c) the type(s) of conveyance, mode(s) of transport, and routes to be used.

The implementation of prudent management practices for security as detailed in IAEA NSS No. 9, Rev. 1 [4] should enable compliance with all the transport regulatory requirements specified in IAEA SSR-6 [1] to be achieved. The implementation of additional security measures may introduce scenarios in which the transport safety requirements cannot be met and in these situations this conflict of
compliance will require discussion between the competent authorities for safety and security to identify and agree on the compensatory safety measures needed.

If additional security measures are deemed necessary by the transport security competent authority, advice and agreement involving other competent authorities for safety and security should be achieved.

If additional security measures are considered necessary by the operator, they should assess if the additional security measures compromise compliance with the safety regulatory requirements. If compliance with safety requirements is compromised, then the operator should inform the safety and security regulators. The shipment should not proceed without instructions from the security regulator. This is advised because any resulting non-compliance with the transport safety requirements would be illegal unless the compensatory measures have been approved by safety competent authorities, a Special Arrangement approval has been issued to the operator, and any changes to national emergency response arrangements have been implemented. Therefore, the resolution process should be focused on the design of the transport system, considering the changes in the details of the interface between safety and security. The topically-related example questions provided in Section 6.2 can be used with this decision chart to further facilitate the resolution of such conflicts.

![Diagram](image-url)

**Fig. 2. Process for identifying if transport safety–security interface conflicts exist**
6.2. EXAMPLE TRANSPORT TASK QUESTIONS FOR RESOLVING TRANSPORT SAFETY–SECURITY INTERFACE CONFLICTS

Section 5 discussed twenty safety–security interface tasks that must be considered when addressing potential interface issues. As applicable, it considered for security both prudent management practice and basic transport security level measures that may be needed for the transport of low-activity radioactive material.

Although the IAEA publications, the UN Model Regulations and the international modal transport regulations establish the basis for applying prudent management practices for the transport of certain low-activity radioactive materials, a consignor may need to apply additional security measures due to an arising threat or risk in the State or States where shipments are to occur. The relevant competent authorities will specify the level of security needed for a given shipment, and this should be accompanied by any required compensatory safety measures to be applied.

In addition, for basic transport security level shipments, a consignor should consider applying the recommended measures from NSS No. 9, Rev. 1 [4], following consultation and approval with relevant safety and security competent authorities if the adoption of such recommended measures results in a non-compliance with safety requirements.

For basic transport security level, NSS No. 9, Rev. 1 [4] reads as follows:

“At the basic transport security level, measures should include requiring that shippers, carriers, receivers and others engaged in the transport of radioactive material implement security systems or other arrangements to deter, detect, delay and respond to malicious acts affecting the conveyance or its cargo, using a graded approach. These arrangements should be operational and effective at all times and include training and regular briefings to assist personnel in maintaining awareness and vigilance.”

In order to assist operators in fulfilling these requirements, two tables are provided in this section. Table 2 is provided here, Table 3 is provided in Sub-section Error! Reference source not found.. Use of these two tables, could be useful to the operators when preparing to undertake shipments of low-activity radioactive material. For example, for shipments of Type A and Type B packages, providing answers to the questions in Table 2 and completion of the information in Table 3 could be used by consignors/carriers to facilitate the preparation of necessary transport documents, incorporating safety–security interface information associated with the shipments of low-activity radioactive material while concurrently providing a basis for demonstrating compliance with safety requirements and security measures to competent authority inspectors.

In utilizing these tools, prior to preparing its shipment, the consignor will need to determine whether only prudent management practices are to be followed for transport security, or whether both prudent management practice and basic transport security level measures are to be followed (Table I-1 in Appendix I can assist the user in this process).

Table 2 elaborates upon the twenty tasks discussed in the Section 5, providing a brief summary of potential interface issues, and then lists one or more questions that can be used in an action list to facilitate demonstration of compliance with the safety–security requirements and recommendations prior to undertaking a shipment.

Thus, operators and competent authorities may explore the questions for each of tasks, listed in Table 2, responding to each of the three blank columns in the table (i.e. for safety, security and the interface), thereby helping them to understand the complexities of the safety–security interface.
TABLE 2. EXAMPLE TRANSPORT TASK QUESTIONS TO ASSIST STAKEHOLDERS IN RESOLVING CONFLICTS WITH THE TRANSPORT SAFETY–SECURITY INTERFACE.

<table>
<thead>
<tr>
<th>Issue</th>
<th>Safety</th>
<th>Security</th>
<th>Interface</th>
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<tbody>
<tr>
<td><strong>1. General interface between safety and security</strong></td>
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<tr>
<td>Compliance with all relevant dangerous goods transport regulations is needed to ensure that transport security measures are implemented so as to not detract from safety. Thus, the provisions set forth in all relevant transport safety and security regulatory documents should be implemented so as to provide a high level of safety and security, while any conflicts between safety and security are resolved by the relevant competent authorities working closely with the consignor and carriers.</td>
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<tr>
<td>Both transport safety regulations and transport security recommendations and guidance specify that radioactive materials shall be shipped where security provisions will recognize and accommodate safety provisions, and safety provisions will recognize and accommodate security provisions.</td>
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</tr>
<tr>
<td>The general interfaces between transport safety and security are structured with a view to ensuring one does not detract from the other. Complying with all relevant dangerous goods transport regulations should provide a high level of safety, while any conflicts introduced by security must be addressed.</td>
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</table>

**Question:** How can it be ensured that all applicable safety and security requirements for the transport have been considered by all involved stakeholders commensurate with their responsibilities?

**Question:** What steps have you taken to provide appropriate interface resolution?
TABLE 2. EXAMPLE TRANSPORT TASK QUESTIONS TO ASSIST STAKEHOLDERS IN RESOLVING CONFLICTS WITH THE TRANSPORT SAFETY–SECURITY INTERFACE (cont.)

<table>
<thead>
<tr>
<th>Issue</th>
<th>Safety</th>
<th>Security</th>
<th>Interface</th>
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2. Regulations and compliance

For a given consignment of low-activity radioactive material, relevant domestic and international transport safety and security regulations will apply. Safety and security regulations may emanate from different competent authorities that are governed by different legal and regulatory regimes, thereby making it difficult for operators to develop an understanding of how to fully comply with both sides of the regulatory framework.

For transport safety, all relevant requirements imposed by regulations must be satisfied. Similarly, for transport security, all relevant security measures imposed by relevant regulations must be satisfied. In the event that a failure to comply with requirements is identified, this should be communicated to the relevant competent authorities.

For international shipments it is possible that consignors and carrier(s) may operate under regulatory regimes based upon different editions of SSR-6 for safety, and national requirements for security that meet in part or full the IAEA Security recommendations. Possible conflicts in the international transport safety–security interface for a shipment should be identified and resolved.

Where an interface conflict is identified between specific security and safety measures, steps should be immediately taken to initiate resolution of the conflict between the consignor and carriers and the relevant competent authorities. By giving early priority to highlighting the transport safety–security interface problem and striving to evaluate and resolve the problem in an expeditious manner, choices/alternatives can be identified and resolution with the involved competent authorities can be facilitated before final plans and actions are taken for the shipment.

**Question:** What steps have you taken to ensure that both the consignor and carriers have determined the requirements they must satisfy for both safe and secure transport of this shipment?

**Question:** What steps have you taken to ensure that the consignor and carrier are both working from the same editions of recommendations and regulations?

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<th>Issue</th>
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**Question:** What steps have you taken to ensure that the consignor and carriers have identified
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<tr>
<th>Question: What steps have you taken to ensure that the consignor and carriers have interfaced with the competent authorities to resolve all conflicts?</th>
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</table>
TABLE 2. EXAMPLE TRANSPORT TASK QUESTIONS TO ASSIST STAKEHOLDERS IN RESOLVING CONFLICTS WITH THE TRANSPORT SAFETY–SECURITY INTERFACE (cont.)

<table>
<thead>
<tr>
<th>Issue</th>
<th>Safety</th>
<th>Security</th>
<th>Interface</th>
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<tbody>
<tr>
<td><strong>3. Threat Assessments</strong></td>
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<tr>
<td>There may be a safety–security interface between the package safety performance and the threat to the package during transport that will need to be resolved. The relative robustness of a given package design satisfying SSR-6 requirements, determined by its contents and design for satisfying the safety regulatory requirements may very often be useful to the designer of a transport security system in addressing specific issues that result from security threat and accident assessments.</td>
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<tr>
<td>The transport safety regulations require testing to demonstrate the ability of transport packages to withstand normal conditions of transport, and for some packages additional tests for demonstrating the ability of transport packages to withstand accident conditions of transport. These tests, which are applied on a graded approach to the design of packages, have been historically demonstrated to address the threat posed by accidents by considering routine, normal and accident scenarios and the contents of a specific package.</td>
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<tr>
<td>NSS No. 9, Rev. 1 [4] specifies that those responsible for transport of radioactive material should take into consideration all available security threat information, including threat information provided by the regulatory body, when determining necessary actions applying necessary security measures to protect the material being shipped.</td>
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<tr>
<td>In addition, the relative robustness of a given package determined by its contents and design for satisfying the safety regulatory requirements may very often be useful to the designer of a transport security system in addressing specific issues that result from security threat and accident assessments.</td>
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<tr>
<td><strong>Question:</strong> What steps have you taken to ensure that the robustness of the package has been considered when making a threat assessment?</td>
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<tr>
<td><strong>Question:</strong> What steps have you taken to ensure that information such as schedule, route, weather conditions, and the package design have been considered in the threat assessment?</td>
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</table>
4. Management of security-related information

The management of sensitive, security-related information can potentially introduce a transport safety–security interface conflict. The potential conflict involves the transmittal of transport-specific information to meet safety requirements that may conflict with the challenges of maintaining control of this information for security purposes. Specifically, in some cases the transfer of information may conflict with the need to protect security-sensitive information which may only be shared with those having a “need to know”.

Detailed safety information is to be included in the transport documentation, including shipment notifications that need to be made, and sets forth those entities that should possess the information in the transport documents.

For transport security where only prudent management practices are to be applied, the operator should apply normal and sound business practices with respect to the manner by which it manages sensitive information. For basic transport security level shipments, operators should take appropriate measures to protect sensitive information relating to transport operations, such as information on the schedule and route that could be used by an adversary to plan a malicious act.

Where transmitting information results in transport safety–security interface conflicts, the consignor and carriers need to coordinate its transport documents and other communications relating to a shipment with the relevant competent authorities to work around those conflicts.

| Question: What steps have you taken to ensure that shipping documents are accurate and complete? |  |
| Question: What steps have you taken to ensure that sensitive information has been appropriately identified, protected and communicated? |  |
TABLE 2. EXAMPLE TRANSPORT TASK QUESTIONS TO ASSIST STAKEHOLDERS IN RESOLVING CONFLICTS WITH THE TRANSPORT SAFETY–SECURITY INTERFACE (cont.)

<table>
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<tr>
<th>Issue</th>
<th>Safety</th>
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5. **Operational controls**

Low-activity radioactive material should be shipped in accordance with applicable dangerous goods regulations, both from the perspective of safety and security. Multiple operational controls are specified in the transport safety regulations, which are generally viewed as satisfying prudent management practices. For shipments requiring basic transport security level measures, additional operational controls are needed.

Although operationally-related controls for safety do not introduce conflicts with the transport safety–security interface, and the interface between the two will generally complement the operationally-related controls for security, steps should be undertaken to ensure no interface conflicts exist.

**Operational Controls: Prudent Management Practices**

**Question:** What steps have you taken to ensure that basic control and normal commercial practices have been completed to protect the material against unauthorized removal or sabotage as would be the case for any valuable commodity?

**Question:** What steps have you taken to ensure that appropriate security controls have been established to secure packages while in transit and storage in a manner that impedes unauthorized removal?

**Question:** What steps have you taken to ensure that the carrier is well known and experienced?

**Question:** What steps have you taken to ensure that the carriers are registered or
<table>
<thead>
<tr>
<th><strong>Question:</strong> What steps have you taken to ensure that the carrier’s equipment is properly maintained to ensure safe and secure transport of this shipment?</th>
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<tbody>
<tr>
<td><strong>Question:</strong> What steps have you taken to ensure that consignor and carrier personnel are appropriately trained?</td>
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</table>

licensed (if appropriate)?
### Issue 5. Operational controls (Continued)

Low-activity radioactive material should be shipped in accordance with applicable dangerous goods regulations, both from the perspective of safety and security. Multiple operational controls are specified in the transport safety regulations, which are generally viewed as satisfying prudent management practices. For shipments requiring basic transport security level measures, additional operational controls are needed.

Although operationally-related controls for safety do not introduce conflicts with the transport safety–security interface, and the interface between the two will generally complement the operationally-related controls for security, steps should be undertaken to ensure no interface conflicts exist.

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<tr>
<th>Question</th>
<th>Safety</th>
<th>Security</th>
<th>Interface</th>
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<tbody>
<tr>
<td><strong>What steps have you taken to ensure that effective procedures have been established for all phases of the transport, including a procedure for communications during transport?</strong></td>
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<tr>
<td><strong>What steps have you taken to ensure that the suitability or ability of the consignee to take receipt of the consignment has been confirmed, if appropriate?</strong></td>
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<tr>
<td><strong>What steps have you taken to ensure that the consignee has procedures to act, as appropriate, upon receipt or non-receipt of the consignment?</strong></td>
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<tr>
<td><strong>What steps have you taken to ensure that the consignor and/or carrier are prepared to act appropriately if notified of non-receipt of the consignment by the consignee?</strong></td>
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</table>
TABLE 2. EXAMPLE TRANSPORT TASK QUESTIONS TO ASSIST STAKEHOLDERS IN RESOLVING CONFLICTS WITH THE TRANSPORT SAFETY–SECURITY INTERFACE (cont.)

<table>
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<th>Issue</th>
<th>Safety</th>
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<tr>
<td><strong>6. Carrier Qualifications</strong></td>
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<tr>
<td>The use of appropriately identified carriers, and for properly controlling the transfer of materials to and between authorized operators does not create a conflict with the transport safety/transport security interface. Such actions will generally be complementary between safety and security. However, steps should be undertaken to ensure no interface conflicts exist.</td>
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<tr>
<td><strong>Question:</strong> What steps have you taken to ensure that, for basic transport security level shipments, the carriers are appropriately identified and, if required by national regulations, certified, registered or authorized; and are operators appropriately trained?</td>
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<tr>
<td><strong>Question:</strong> What steps have you taken to ensure that the use of public transport (e.g. taxis and buses) has been precluded unless specifically allowed by national regulations?</td>
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<tr>
<td><strong>Question:</strong> What steps have you taken to ensure that the carrier’s equipment is properly maintained to ensure safe and secure transport of this shipment?</td>
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<tr>
<td><strong>Question:</strong> What steps have you taken to ensure that any supplementary requirements specified by the competent authorities have been established between consignor and carriers?</td>
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</tbody>
</table>
7. Training and training records

All shipments of radioactive material other than those with UN Numbers UN2908 through UN2913, the UN Model regulations specify that safety training shall also include elements of security awareness addressing the nature of security risks, methods to address and reduce such risks, and actions to be taken in the event of a security breach. It is further specified that such training shall be provided or verified upon employment in a position involving dangerous goods transport and shall be periodically supplemented with retraining.

The UN Model Regulations, applicable Nuclear Security Series publications and SSR-6 all specify that records of training be maintained and made available upon request by the employee and competent authorities.

| Question: What steps have you taken to ensure that involved employees have been trained with respect to both safety and security for this shipment as required by regulations? |
|---|---|---|---|
| Safety | Security | Interface |

| Question: What steps have you taken to ensure that newly employed workers previous training has been verified? |
|---|---|---|---|
| Safety | Security | Interface |

| Question: What steps have you taken to ensure that records of all training of involved employees have been maintained as required by regulations? |
|---|---|---|---|
| Safety | Security | Interface |

| Question: What steps have you taken to ensure that the training records can be made available to either or both the employee or the competent authority upon request? |
|---|---|---|---|
| Safety | Security | Interface |
### Issue: 8. Personnel trustworthiness

The need for establishing the trustworthiness of personnel involved in the transport of low-activity radioactive material is only set forth in security-related publications. It is recommended that, for basic level of security, personnel trustworthiness needs to be addressed.

Trustworthiness determination is also important when striving to address insider threats.

**Question:** What steps have you taken to ensure that your national regulations allow you to establish an employee’s trustworthiness?

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<th>Issue</th>
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<tbody>
<tr>
<td>Personnel trustworthiness</td>
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</table>

**Question:** What steps have you taken to ensure that the trustworthiness of employees has been established commensurate with the employee’s responsibilities consistent with national regulations?

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<thead>
<tr>
<th>Question: What steps have you taken to ensure that the trustworthiness of employees has been established commensurate with the employee’s responsibilities consistent with national regulations?</th>
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</table>

**Question:** What steps have you taken to ensure that you have a viable mechanism to assess insider threats?

<table>
<thead>
<tr>
<th>Question: What steps have you taken to ensure that you have a viable mechanism to assess insider threats?</th>
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</table>
TABLE 2. EXAMPLE TRANSPORT TASK QUESTIONS TO ASSIST STAKEHOLDERS IN RESOLVING CONFLICTS WITH THE TRANSPORT SAFETY–SECURITY INTERFACE (cont.)

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<tr>
<th>Issue</th>
<th>Safety</th>
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<tbody>
<tr>
<td><strong>9. Personnel identification</strong></td>
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<tr>
<td>For basic transport security level shipments, each crew member of any conveyance transporting radioactive material should carry means of positive identification during transport. There are no requirements for establishing personnel identification for safety.</td>
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<tr>
<td><strong>Question:</strong> What steps have you taken to ensure that you have provided positive identification for all crew members involved in basic transport security level shipments?</td>
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</table>
TABLE 2. EXAMPLE TRANSPORT TASK QUESTIONS TO ASSIST STAKEHOLDERS IN RESOLVING CONFLICTS WITH THE TRANSPORT SAFETY–SECURITY INTERFACE (cont.)

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<th>Issue</th>
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<tr>
<td><strong>10. Safety and security inspections</strong></td>
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<tr>
<td>The safety and security inspection provisions may complement each other. Some security features may need to be added to inspection procedures. Inspections should ensure both the transport safety and transport security systems are complete and functional.</td>
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<tr>
<td>If additional security measures due to an arising threat or risk are required that introduce features that are not included in safety requirements, the inspections should incorporate these security measures. In some situations, different inspectors may be needed since some security features may not be divulged to safety inspectors.</td>
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<tr>
<td>The consignor and carriers need to coordinate their pre-shipment planning with all of the relevant competent authorities to ensure adequate inspection prior to undertaking a shipment.</td>
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<tr>
<td><strong>Question:</strong> What steps have you taken to ensure that safety and security inspections have been made from initiation to completion of this shipment, as required, to ensure safety and security measures are functioning?</td>
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<tr>
<td><strong>Question:</strong> What steps have you taken to ensure that the results of your pre-shipment inspections have been documented and the results thereof are available to the competent authorities for compliance purposes?</td>
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<tr>
<td><strong>Question:</strong> What steps have you taken to ensure that you have considered which security features can be inspected by safety inspectors?</td>
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<tr>
<td><strong>Question:</strong> What steps have you taken to ensure that your inspectors are properly qualified?</td>
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<tr>
<td><strong>Question:</strong> What steps have you taken to ensure that you have a process in place for resolving deficiencies identified during inspections?</td>
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11. Design of transport packages

For all shipments of radioactive material, the transport safety regulations specify design requirements for transport packages following a graded approach. For security, the design of a transport security system should take into account the design features of the packages being used.

Compensating security features may need to be added to the overall package design to satisfy the combined set of transport safety and transport security requirements. The addition of security features to a package could require demonstrating that they don’t affect the safety functions of the packages. Should there be conflicts between specific package design features for safety and those needed for security, the operator needs to coordinate the development of its package and transport system with the relevant competent authorities to resolve those conflicts.

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<th>Issue</th>
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<tr>
<td><strong>Question:</strong> If additional features have been added to the package design to satisfy security requirements, what steps have you taken to resolve any interface issues that may exist between safety and security?</td>
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<tr>
<td><strong>Question:</strong> How would you resolve any safety–security interface conflicts that have been introduced by adding additional package design features?</td>
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<tr>
<td><strong>Question:</strong> What steps have you taken to ensure any modifications to the package design satisfy the transport safety and security regulatory requirements?</td>
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12. Stowage and retention of packages during transport

The potential for transport safety–security interface conflicts exist when dealing with the stowage and retention of packages.

For stowage of packages, often the carrier/driver loads the packages according to the dose rates of each package. This means the packages with the highest dose rates are stored farthest from the driver near and therefore closes to the loading doors. Therefore, it is easy for the perpetrator to steal the package which most likely the most radioactive material inside.

For the retention of packages from the perspective of security, it may be desirable to use a more robust retention systems than for safety purposes. However, the design of retention systems should be such that they do not impair the ability of the package to meet its regulatory safety design requirements.

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<tr>
<td>12. Stowage and retention of packages during transport</td>
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**Question:** How do you balance the safety/security interface when stowing packages with different labels to satisfy both safety and security requirements?

**Question:** When packages have been altered to accommodate retention systems for security purposes, how has any conflicts been addressed?
TABLE 2. EXAMPLE TRANSPORT TASK QUESTIONS TO ASSIST STAKEHOLDERS IN RESOLVING CONFLICTS WITH THE TRANSPORT SAFETY–SECURITY INTERFACE (cont.)

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<th>Issue</th>
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<tr>
<td><strong>13. Locks and seals</strong></td>
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For safety, many packages shall incorporate a feature on the outside of the package such as a seal that is not readily breakable and which, whilst intact, will be evidence that the package has not been opened. Such tamper indicating devices may also be required for security purposes, but may need to be modified. Locks, not required for safety, may need to be used for security on the retention systems or the cargo compartment.

Any locks and seals added to a package to satisfy security requirements must not conflict with safety.

The integrity of any locks and seals should be verified before dispatch, before leaving any stopping point on-route, and upon arrival.

**Question:** For any modification to seals made for security purposes, how have you resolved any conflicts with safety?

**Question:** How will you ensure that the integrity of seals and of any locks used are satisfied prior to and during shipment, and upon delivery to the consignee?

**Question:** In the event that the integrity of a seal or any locks used is determined to be violated, what actions will you take?
### TABLE 2. EXAMPLE TRANSPORT TASK QUESTIONS TO ASSIST STAKEHOLDERS IN RESOLVING CONFLICTS WITH THE TRANSPORT SAFETY–SECURITY INTERFACE (cont.)

<table>
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<th>Issue</th>
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<tbody>
<tr>
<td><strong>14. Monitoring and tracking of packages and vehicles</strong></td>
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<tr>
<td>There are no safety requirements with respect to monitoring or tracking of packages and vehicles, or with respect to leaving vehicles unattended. Packages or conveyances containing radioactive material should not be left unattended for any longer than is absolutely necessary. Packages requiring prudent management security practices, carriers should consider utilizing package tracking systems such as a bar code system to monitor the status of the shipment. For shipments requiring basic transport security level measures, use should be considered of a simple tracking system that can determine when the consignment has departed, when it is in transit, and when the consignment has been received.</td>
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<tr>
<td>If the addition of monitoring or tracking devices could in some way comprise a safety function of the package, such a conflict needs to be identified, the addition of the monitoring or tracking devices needs to be coordinated with the package designer and, as appropriate, with relevant competent authorities.</td>
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<tr>
<td><strong>Question:</strong> If monitoring or tracking systems are in place consistent with security requirements, how does this affect the transport safety–security interface?</td>
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<tr>
<td><strong>Question:</strong> Have the procedures for operating any monitoring or tracking systems been evaluated for their potential impacts on the transport safety?</td>
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</table>
### TABLE 2. EXAMPLE TRANSPORT TASK QUESTIONS TO ASSIST STAKEHOLDERS IN RESOLVING CONFLICTS WITH THE TRANSPORT SAFETY–SECURITY INTERFACE (cont.)

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<tr>
<td><strong>15. Surveillance and alarms</strong></td>
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<tr>
<td>The development and application of commercially available surveillance and alarm systems in road vehicles are becoming increasingly common. Although the use of surveillance and alarms for low activity radioactive material shipments is not typically required for safety or security regulations, consignors should consider their use if they are available on the road vehicles offered by carriers.</td>
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<tr>
<td><strong>Question:</strong> If the consignor identifies road carriers having surveillance or alarms, has it decided to include the use of these in its transport planning and protocols, how would this information be used (a) in the case of an accident or security event, and (b) in identifying shipments not received on time?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TABLE 2. EXAMPLE TRANSPORT TASK QUESTIONS TO ASSIST STAKEHOLDERS IN RESOLVING CONFLICTS WITH THE TRANSPORT SAFETY–SECURITY INTERFACE (cont.)

<table>
<thead>
<tr>
<th>Issue</th>
<th>Safety</th>
<th>Security</th>
<th>Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>16. In-transit storage of radioactive material during transport</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For prudent management practice shipments, during in-transit storage operators should secure and store packages, not leaving packages unattended for any longer than is absolutely necessary.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For shipments requiring basic transport security level measures, while in storage that is incidental to transport, operators should apply security measures where these measures are consistent with the category of the material and measures that are applied during use, storage and transit.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Question:</strong> How have you determined the adequacy of planned in-transit storage sites, ensuring that they are capable of being properly secured consistent with the category of the material and measures applied during use, storage and transit, and are there any safety related issues with the sites?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Question:</strong> What measures are in place to ensure that the carrier retains control and security of the vehicle and its contents, as required, for this shipment?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Issue</th>
<th>Safety</th>
<th>Security</th>
<th>Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>17. Communications</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

By complying with relevant domestic and international transport safety and security regulations with respect to pre-shipment notifications, the security provisions may either complement or be in conflict with those for safety.

For prudent management practice shipments, it is recommended that carriers should provide drivers of road conveyances with effective communication capability. For basic transport security level shipments, it is recommended that operators cooperate with each other and with appropriate authorities to exchange information on applying security measures and responding to security events.

By complying with relevant domestic and international transport safety and security regulations with respect to pre-shipment notifications, the security provisions may either complement or be in conflict with those for safety. Specifically, there may be conflicts with respect to communications and the protection of sensitive information including those related to specific pre-shipment notification security and safety measures.

Should a non-compliance with respect to excessive radiation levels or contamination be identified during the shipment, the non-compliance must be reported as soon as practicable to both the consignor and the relevant competent authorities.

**Question:** What steps have you taken to ensure that appropriate communication capability has been established consistent with both the safety and security requirements considering the mode(s), route(s) and jurisdictions involved in this shipment?

**Question:** For known parts of the route where communication is not possible, have arrangements been put in place for communications to be transmitted immediately before entering and immediately upon leaving such parts of the route?
### 18. Written instructions and documentation

By complying with relevant domestic and international transport safety regulations with respect to documentation, the security provisions for written instructions and shipment documentation may either complement or be in conflict with those for safety.

For security, when applying prudent management practices, an operator would normally be expected to develop safety and security documentation and maintain records associated with the shipment of a consignment. For shipments requiring basic transport security level measures, carriers should provide appropriate crew members with written procedures on required security measures, which should include information addressing how to respond to a security incident during transport.

By complying with relevant domestic and international transport safety regulations with respect to documentation, the security provisions for written instructions and shipment documentation may either complement or be in conflict with those for safety. Where there are transport safety–security interface conflicts between specific safety written instruction and documentation requirements and those for security, the consignor or carrier need to coordinate the pre-notification contents of planning documents with the relevant competent authorities to work around those conflicts. In addition, consideration could be given to developing a series of separate documents, each of which may be provided only to those that need to know those parts of the planning documents.

<table>
<thead>
<tr>
<th>Question: Have you ensured that all written instructions are consistent with relevant safety and security regulations?</th>
<th>Safety</th>
<th>Security</th>
<th>Interface</th>
</tr>
</thead>
</table>

| Question: How do you provide to conveyance operators appropriate operational instructions and written procedures on how to respond to an abnormal or atypical event? | Safety | Security | Interface |
TABLE 2. EXAMPLE TRANSPORT TASK QUESTIONS TO ASSIST STAKEHOLDERS IN RESOLVING CONFLICTS WITH THE TRANSPORT SAFETY–SECURITY INTERFACE (cont.)

<table>
<thead>
<tr>
<th>Issue</th>
<th>Safety</th>
<th>Security</th>
<th>Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>19. Marking and labelling of packages, and placarding of vehicles and freight containers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>There is the potential for a conflict between the transport safety and security interface for marking and labelling of packages, and placarding of vehicles. For safety there is a need to mark and label packages, and placard vehicles to identify its contents to emergency responders. For security, marking, labelling and placarding can highlight the contents of the conveyance to the adversary. Where it is determined that there is a conflict with satisfying safety hazard communication through the use of markings, labelling or placarding, compensatory measures, approved by competent authorities, should be applied through alternative communications methods.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Question:</strong> If labels or placards have been removed for security purposes, what compensatory measure have been implemented?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Question:</strong> Has removal of labels or placards and implementation of compensatory measures been approved by relevant competent authorities?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### TABLE 2. EXAMPLE TRANSPORT TASK QUESTIONS TO ASSIST STAKEHOLDERS IN RESOLVING CONFLICTS WITH THE TRANSPORT SAFETY–SECURITY INTERFACE (cont.)

<table>
<thead>
<tr>
<th>Issue</th>
<th>Safety</th>
<th>Security</th>
<th>Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>20. Identification of consignees and authorization requirements</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>There are no apparent conflicts with the transport safety–security interface relative to the identification and authorization of consignees. Establishing identification and authorization requirements for consignees for security purposes does not conflict with transport safety; and in fact can enhance safety during transport. For shipments requiring prudent management security practices, the consignor should know the consignee as would be the case for shipments of any valuable commodities. For shipments requiring basic transport security level measures, consignors need to ensure that consignees are properly identified, authorized and prepared to receive the consignments. Should any identification security provision conflict with safety requirements, the operator needs to resolve those conflicts with relevant competent authorities prior to undertaking a shipment.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Question:</strong> How have you identified the consignee for this shipment, and how have you communicated to the carrier at what times the facility is able to receive the consignment?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX I. CLASSIFICATION OF RADIOACTIVE MATERIAL WITH THE APPROPRIATE UN NUMBER FOR PROPER INTERFACING

This publication addresses radioactive material, per package, in quantities below 3,000 $A_2$ for most radionuclides or, for a specified limited number of radionuclides, with activities below individually-specified 10D values, which may include fissile nuclides (i.e., nuclear material).

Should the contents of these packages of radioactive materials also consist of any nuclear material (i.e. fissile nuclides), then this publication only applies to the security of transport of such packages that are categorized below category III as defined in NSS No.13 (INFCIRC/225/Revision 5) [5], where the radioactive nature of the material most likely will control the required level of security (for further insight, see NSS No. 9, Rev. 1 [4]).

SSR-6 [1] specifies, for transport safety, a comprehensive list of UN numbers of radioactive materials that comply with the requirements of excepted packages, low specific activity (LSA) materials, and surface contaminated objects (SCOs).

Figure I-1 provides the flow diagram reproduced from the IAEA Schedules of Provisions of the IAEA Regulations for the Safe Transport of Radioactive Material (2012 Edition), SSG-33 [11]. In the figure, five consignments having one of five UN Numbers are circled in blue. These are the only ones that always will require only prudent management practice security. This flow diagram can be used to define the UN Number that is applicable to a given consignment.

All relevant UN Numbers are listed in Table I-1, including the UN Numbers for consignments that are beyond the scope of this publication (i.e. for the enhanced transport security level). The table correlates each UN Number with the necessary security level or levels of security that may apply to a given UN Number. The table includes. In the last two columns of the table, it also shows where recommendations and/or guidance can be found in three of the relevant Nuclear Security Series publications (i.e. NSS No. 9, Rev. 1 [4] for radioactive materials, and NSS No.13 (INFCIRC/225/Revision 5) [5] and NSS No. 26-G [6] for nuclear material).
FIG. 1-I(a). Flow Diagram for Selecting Proper UN Number for a Given Consignment (see SSG-33 [11]).
FIG. I-1(b). Flow Diagram for Selecting Proper UN Number for a Given Consignment (see SSG-33 [11]).
<table>
<thead>
<tr>
<th>Excepted package</th>
<th>Prudent Management</th>
<th>Basic Security</th>
<th>Enhanced Security</th>
<th>NSS No. 13, NSS No. 26-C</th>
<th>NSS No. 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>UN 2908 RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — EMPTY PACKAGING</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>UN 2909 RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — ARTICLES MANUFACTURED FROM NATURAL URANIUM or DEPLETED URANIUM or NATURAL THORIUM</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>UN 2910 RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — LIMITED QUANTITY OF MATERIAL less than $10^3$ A$_2$</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>UN 2910 RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — LIMITED QUANTITY OF MATERIAL greater than $10^3$ A$_2$</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>UN 2911 RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — INSTRUMENTS or ARTICLES less than A$_2$</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>UN 2911 RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — INSTRUMENTS or ARTICLES more than A$_2$</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>UN 2911 RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — INSTRUMENTS or ARTICLES more than 0.6 T bq</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>UN 3507 URANIUM HEXAFLUORIDE, RADIOACTIVE MATERIAL, EXCEPTED PACKAGE, less than 0.1 kg per package, non-fissile or fissile-excepted</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Low specific activity material</th>
<th>Prudent Management</th>
<th>Basic Security</th>
<th>Enhanced Security</th>
<th>NSS No. 13, NSS No. 26-C</th>
<th>NSS No. 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>UN 2912 RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-I), non-fissile or fissile-excepted</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>UN 3321 RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II), non-fissile or fissile-excepted</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>UN 3322 RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III), non-fissile or fissile-excepted</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>UN 3324 RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II), FISSILE</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>UN 3325 RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III), FISSILE</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Surface contaminated objects</td>
<td>Prudent Management</td>
<td>Basic Security</td>
<td>Enhanced Security</td>
<td>NSS No. 13</td>
<td>NSS No. 26-G</td>
</tr>
<tr>
<td>------------------------------</td>
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<td>--------------</td>
</tr>
<tr>
<td>UN 2913</td>
<td>RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-I), non-fissile or fissile-excepted</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>UN 2913</td>
<td>RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-II, SCO-III), non-fissile or fissile-excepted</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>UN 3326</td>
<td>RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-I, SCO-II or SCO-III), FISSILE</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>SCO-III was introduced in SSR-6 (Rev.1) and therefore is not currently in NSS Nos 9, 13 and 26-G</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type A package</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UN 2915</td>
<td>RADIOACTIVE MATERIAL, TYPE A PACKAGE, non-special form, non-fissile or fissile-excepted</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>UN 3327</td>
<td>RADIOACTIVE MATERIAL, TYPE A PACKAGE, FISSILE, non-special form</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>UN 3332</td>
<td>RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM, non-fissile or fissile-excepted</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>UN 3333</td>
<td>RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM, FISSILE</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Type B(U) package</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UN 2916</td>
<td>RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE, nonfissile or fissile-excepted</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>UN 3328</td>
<td>RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE, FISSILE</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Type B(M) package</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UN 2917</td>
<td>RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE, nonfissile or fissile-excepted</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>UN 3329</td>
<td>RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE, FISSILE</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>UN Number</td>
<td>Description</td>
<td>Prudent Management</td>
<td>Basic Security</td>
<td>Enhanced Security</td>
<td>NSS No. 13</td>
</tr>
<tr>
<td>-----------</td>
<td>------------------------------------------------------------------------------</td>
<td>--------------------</td>
<td>----------------</td>
<td>-------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>UN 3323</td>
<td>RADIOACTIVE MATERIAL, TYPE C PACKAGE, non-fissile or fissile-excepted</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>UN 3330</td>
<td>RADIOACTIVE MATERIAL, TYPE C PACKAGE, FISSILE</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>UN 2919</td>
<td>RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, non-fissile</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UN 3331</td>
<td>RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, FISSILE</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UN 2977</td>
<td>RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, FISSILE</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>UN 2978</td>
<td>RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, non-fissile or fissile-excepted</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX II. EXAMPLES OF CLASSIFICATION OF CONSIGNMENT OF
LOW-ACTIVITY RADIOACTIVE MATERIAL

Table 2 in Sub-section Error! Reference source not found. of this publication provides an example worksheet which lists information that a consignor needs to complete in order to assist in defining the safety and security requirements for the shipment of a low-activity radioactive material consignment. Completion of this worksheet is in addition to the transport safety regulatory requirement for the consignor to prepare the transport documents - paras 545 – 561 (Consignor’s Responsibilities) of SSR-6 [1].

Information required for this includes:

(a) The name or symbol of each radionuclide or, for mixtures of radionuclides, and an appropriate general description or a list of the most restrictive nuclides.
(b) Chemical form of the material
(c) Maximum activity
(d) UN Number
(e) Proper Shipping Name
(f) Subsidiary Hazard

Two examples demonstrating how these parameters are used to classify a consignment considering both safety and security issues are shown in Figures II-1 and II-2. These examples use the flow chart in Figure I-1 from Appendix I.

Based upon the basic information for the material to be shipped (activity, isotopes, physical and chemical properties, type of source, etc.), the transport safety classification can be determined by following the flow chart in Appendix II. By using the same information, the transport security categorization can also be defined following the procedures provided in chapters 3 and 5 of NSS No. 9, Rev. 1 [4].
**Scenario and Assumptions:**

A consignment of 200 kg of soil, slightly contaminated with $^{60}$Co (100 Bq/g) is to be shipped to a waste treatment facility.

The total activity in the consignment is $200 \times 10^3 \times 100 = 20$ MBq.

**Transport Safety Classification:**

The consignment is classified as UN 2910 RADIOACTIVE MATERIAL, LIMITED QUANTITY OF MATERIAL.

**Transport Security Categorization:**

Because the activity of the soil is far below the level of a Category 5 source, and the physical and chemical form do not present a subsidiary risk or special attractiveness.

Thus, prudent management practices will provide the appropriate level of protection for the security of this shipment.

---

**Scenario and Assumptions:**

A gamma radiography camera containing a special form $^{137}$Cs Source of 100 GBq is to be shipped to a plant that is under construction.

**Transport Safety Classification:**

The gamma radiography source is classified as UN 3332 RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM, non-fissile or fissile-excepted.

**Transport Security Categorization:**

The radioisotopes and activity of the source corresponds with a Category 3 source (as specified in the IAEA Code of Conduct [12]).

For a normal threat level, the application of prudent management practices and the basic transport security level measures is needed.

However, before the shipment is undertaken, the consignor should verify that all the permits, licenses, and authorisations for transport, possession and use are in place.

---

*FIG. II-1. Example – Classification of a Consignment of Contaminated Soil.*

*FIG. II-2. Example – Classification of a Shipment of a Gamma Radiography Camera.*
REFERENCES


NOTE: This is yet to be published.


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