MANAGING THE INTERFACE BETWEEN SAFETY AND SECURITY FOR NORMAL COMMERCIAL SHIPMENTS OF RADIOACTIVE MATERIAL

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FOREWORD

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 (security); 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) sea (SOLAS Convention and IMDG Code), road (ADR), rail (RID), and inland waterways (ADN), other regional organizations, 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 people, property 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 based on international good practices, and to facilitate management in an integrated and coordinated manner of the interface between nuclear safety and security during normal commercial shipments of radioactive materials that pose a low radiological consequence if attacked by an adversary.

This publication was developed based on input from one IAEA Technical Meeting and five IAEA consultants meetings held from 2016 to 2018 and more than 200 comments provided by many reviewers. In these meetings and through the resolution of these comments, the experience of Member States and non-governmental organizations was gathered, which provided the basis for the guidelines, approaches, and examples used in this publication. In order to define – for the purposes of this document – shipments of radioactive material that pose a low radiological consequence if attacked by an adversary, the term “normal commercial shipments” was chosen by the consultants, is unique to this document, and is defined herein. The IAEA wishes to thank the contributors to this publication for their efforts and valuable assistance.
The IAEA officers responsible for this publication were D. Ladsous and M. Shannon of the Division of Nuclear Security, and S. Whittingham and C.S. Bajwa of the Division of Radiation, Transport, and Waste Safety.
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1. INTRODUCTION

1.1 BACKGROUND

Nuclear safety and security share the same 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, Rev. 1 (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, Rev. 1 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 and regional modal regulations incorporate the IAEA SSR-6 provisions in a relatively timely fashion following the publication of each edition of the Regulations:

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

(b) the International Maritime Organization (IMO) maintains 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),

(e) the Intergovernmental Organisation for International Carriage by Rail (OTIF) maintains the Regulations concerning the International Carriage of Dangerous Goods Rail (RID), and

(f) the Agreement for the Facilitation of Dangerous Goods Transportation in Latin America (MERCOSUR)

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

Publications that focus solely on radioactive material other than nuclear 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


In addition to the above cited safety and security documents, the application of SSR-6 (Rev.1) is supported through a significant number of guidance documents which are listed in the Bibliography.

Some elements of these recommendations and guidance documents (e.g. transport security thresholds) have been incorporated into the UN Model Regulations [2]. However, the security provisions of UN Model Regulations remain recommendations as they are adapted into the modal regulations such as the ICAO Technical Instructions and the IMO IMDG Code. In addition, there are general security requirements mandated by relevant international conventions (e.g., Annex 17 of the Convention on International Civil Aviation, and Chapter XI-2 of SOLAS Convention), and transport security provisions for radioactive material will need to be consistent with these requirements.

Some 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 any case, there exists an interface between safety requirements and security recommendations in the transport of radioactive material; the national regulations will need to avoid conflicts between transport safety and security requirements. It must also be recognized that national security requirements may vary between States since they may be determined based upon threat assessments for radioactive material transport of each State.

States need to therefore establish national security requirements taking into account international safety requirements to avoid conflicts between them. To date, this interface in relation to the transport of radioactive material has only been partially addressed in separate IAEA safety and security publications.

1.2 OBJECTIVE

The objective of this publication is to provide technical advice and practical information to Member States, competent authorities, and operators based on international good practices, and to facilitate management of the interface between nuclear safety and security during normal commercial shipments of 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 and ultimately with operators of shipments.

1.3 SCOPE

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 normal commercial shipments of radioactive material. In addition, this publication recognises the crucial importance of the understanding and implementing 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) how 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 discussion of the basis for defining what constitutes “normal commercial shipments”, which are the shipments that this document addresses. Section 3 outlines the safety–security interface issues that will be faced in normal commercial shipments. Section 4 reviews interface considerations. Section 5 outlines and provides a summary overview of twenty tasks associated with the transport of normal commercial shipments of radioactive material. Section 6 presents a decision process that can be used for resolving safety-security conflicts. Appendix I provides example questions for each of the twenty tasks discussed in Section 5 that can be used to assist in resolving safety-security conflicts. Appendix II provides a guide to classifying a package of radioactive material for determining the appropriate UN Number and security requirements. These are followed by a list of references used, a bibliography of addition documents of interest, and a glossary to assist users in understanding the intent of the document. The glossary is provided since the potential exists for interface issues to arise with respect to the terminology used for safety and security because different IAEA safety and security publications, and other international documents frequently use different terminology for the same words.
2. BASIS FOR DEFINING WHAT CONSTITUTES NORMAL COMMERCIAL SHIPMENTS

For the purpose of this publication, normal commercial shipments of radioactive material involve radioactive materials in transport that only require prudent management practice or both prudent management practice and 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;
(b) for most other radioactive material, 3,000 A\textsuperscript{2} and less.

Thus, for this publication normal commercial shipments are those which are Category 3, 4 and 5 radioactive sources, other low-activity radioactive material, and may include nuclear material below Category III as defined in INFCIRC/225/Rev. 5 [5].

2.1 BASIS FOR UPPER THRESHOLD FOR NORMAL COMMERCIAL SHIPMENTS

With respect to the choice of the upper thresholds of 10 D and 3,000 A\textsuperscript{2}, Section I.3 of NSS No. 9, Rev. 1 [4] states the following:

“Although sources with an activity exceeding the D values ..... 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 less than 10 D for certain 25 radionuclides, and all other radioactive material packages containing less than 3,000 A\textsuperscript{2} are of sufficient security concern that, except for some that are of very limited concern, they 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 clean-up resulting from malicious acts (e.g. radiological dispersal device).

2.2 BASIS FOR APPLYING PRUDENT MANAGEMENT PRACTICES ONLY

With respect to some packages containing very low levels of radioactive material that are of very limited concern, para. 3.12 of NSS No.9, Rev. 1 [4] notes the following:

“A State should also define which radioactive material poses very low potential radiological consequences if subject to unauthorized removal or sabotage and thus does not represent a substantial security concern. Packages containing such materials do not need to be assigned a transport security level and only need to be controlled through prudent management practices.”

Para. 3.13 of NSS No.9, Rev. 1 then states that these materials include

“….radioactive material transported in excepted packages and for Low Specific Activity (LSA-I) and Surface Contaminated Objects (SCO-I) ..... no specific security measures beyond the control
measures required by the safety regulations and prudent management practices already
implemented by shippers and carriers are recommended.”

Para. 5.5 of NSS No. 9, Rev. 1 describes prudent management practices as:

“Some packages and types of radioactive material are identified ... as requiring no further
security measures other than basic control measures and normal commercial practices. These
practices include actions by shippers, carriers and receivers to protect the material against
unauthorized removal or sabotage, as would be the case for any valuable commodity”.

With respect to excepted packages, NSS No.9, para. 3.14 of NSS No. 9, Rev. 1 specifies that the
following will need more than prudent management practices for security purposes:

- UN2910 RADIOACTIVE MATERIAL, EXCEPTED PACKAGE – LIMITED QUANTITY
  OF MATERIAL with activity greater than $10^3$ A$_2$, and
- UN 2911 RADIOACTIVE MATERIAL, EXCEPTED PACKAGE – INSTRUMENTS OR
  ARTICLES with activity greater than A$_2$.

In addition, situations may arise where a SCO-I shipment could require more than prudent management
practice for security purposes if the contaminating radioactive material were nuclear material.

Hence, this publication is limited to addressing normal commercial shipments of radioactive material as
specified above. For these materials a limited number of IAEA security recommendation and guidance
publications have been developed, mostly because efforts at the international and State level have been
focused on shipments of higher-activity radioactive material and on Category I, II, and III nuclear
material. It is noteworthy, however, that normal commercial shipments of radioactive material as
defined in this document generally constitute a large majority of the shipments made worldwide.

Many normal commercial shipments of radioactive material will be undertaken in package designs,
which as prescribed in SSR-6, Rev. 1 [1], are not required to be resistant to the accident conditions of
transport. This reflects the graded approach implemented in both the IAEA Nuclear Security
recommendation and guidance documents [3][4][5][6], and the IAEA Transport Safety Regulations [1],
which requires accident approved packages for higher activities and risk as well as reduced testing
conditions for packages with lower activities called normal conditions of transport. On the one hand,
since these packages are often light weight, accommodating lower activities, they may therefore present
a greater attractiveness for theft and sabotage by those with malicious intent. In that event additional
security measures may need to be considered in order to reduce accessibility by an adversary. On the
other hand, these packages may generally provide a significantly lower risk for safety-relevant events
to the public due to the limited activity permitted by the Transport Regulations Conversely, in the case
of normal commercial shipments of radioactive material in thick-walled and heavy weight packages
such as Type B packages, 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. NSS No. 9, Rev.
1 [4] suggests that there may be a need to assign appropriate enhanced security measures depending
upon the attractiveness of the material being shipped; this same approach may need to be taken with
respect to the level of robustness of packagings being used in normal commercial shipments.
3. SAFETY–SECURITY INTERFACE ISSUES

3.1 GENERAL SAFETY–SECURITY INTERFACE ISSUES

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 essentially based on the UN Model Regulations [2], which incorporate the IAEA’s Regulations for the Safe Transport of Radioactive Material (SSR-6, Rev.1) [1]. For security, national transport security regulations may be based on the UN Model Regulations [2] and/or the international and regional modal regulations, which adopt the security threshold values of the IAEA’s Nuclear Security Series publications (e.g. [4][5]). For each shipment of radioactive material, the operators must comply with the relevant State transport safety and transport security regulations.

To achieve internationally agreed levels of safety during shipments, all the safety measures set forth in SSR-6, Rev. 1, which align with the requirements in the international and regional modal regulations for air, sea and land transport and which should also align with the Member State national land transport regulations, must be complied with in relation to the package type, shipment preparation and consignment requirements. Safety requirements put forth by SSR-6, Rev. 1 as subsequently implemented by the international conventions and agreements for air, sea and land transport have to be completely respected. Compensatory measures that may need to be imposed to address security concerns may only be considered by special arrangements that are provided in the Transport Safety Regulations (SSR-6, Rev. 1). Special arrangements require multilateral approvals in all countries involved in the transport and may result in a significant effort for consignors and carriers to obtain the necessary competent authority approvals. The introduction of compensatory measures will need to be carefully balanced with security recommendations provided by implementing guides such as NSS No. 9, Rev. 1 [4].

If prudent management practices and basic transport security level measures are mutually adopted by in-transit, and receiving States, these measures would then become a common basis for transport security, as safety measures arising from SSR-6, Rev. 1 do for transport safety. This could thereby enable the community of Member States involved in these shipments to implement transport security within a common set of practices.

The interface between the IAEA safety measures and prudent management practices (for security) is intended to allow compliance in both safety and security to be achieved with no compromises. This interface will need to be discussed and agreed by the competent authorities responsible for transport safety and transport security.

Safety requirements recommended by the Transport Regulations and subsequently implemented by international agreements for land, sea and air transport need to be completely respected. Compensatory measures can only be considered by special arrangements provided in the Transport Regulations. For international shipments, special arrangements require multilateral approvals in all countries involved in the transport; this can result in a significant effort for consignors and carriers to obtain the necessary approvals. The introduction of compensatory measures will need to be carefully balanced with security recommendations provided by implementing guides such as NSS No. 9, Rev. 1.

Because any increases in security measures above prudent management practices may affect the safety/security interface, such changes in the interface will need to be discussed and agreed by the competent authorities responsible for transport safety and transport security. Competent authorities will need to recognize that increases in security measures may have an adverse effect on safety and compensatory safety measures may then become necessary. Close collaboration between the competent authorities involved will be needed to address any conflicts so that appropriate levels of safety and
security during shipments are achieved. Agreement will also need to be reached on the strategy by competent authorities for expeditiously and effectively informing operators of actions they will need to impose in line with their duties.

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

(a) The safety measures of SSR-6, Rev. 1 [1], if imposed by law, will need to be met to ensure safety during transport;

(b) Prudent management practices (for both safety and security) and, as applicable, basic transport security level measures included in NSS No. 9, Rev. 1 [4] for normal commercial shipments of radioactive material will not, in general conflict with safety when in compliance with the safety measures of SSR-6, Rev. 1; however, some areas of potential conflict may exist which are addressed in this publication;

(c) If changes in the safety measures specified in SSR-6, Rev. 1 are not made, the addition of security measures may then need to be considered by the Member State and, as a result, further conflicts in the interface may result;

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

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

(f) Involved competent authorities will need to provide operators with clear mandates for safety and security; and

(g) Unless approved by the competent authorities, operators will need to not introduce additional security measures.

3.2 TERMINOLOGY–RELATED SAFETY–SECURITY INTERFACE ISSUES

In addition to the general interface issues described above, the potential exists for interface issues to arise with respect to the terminology used for safety and security.

Different IAEA safety and security publications use different terminology for the same words. For example, 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.

Further, the SSR-6, Rev. 1 [1] uses the terms “fissile nuclides” and “fissile material”, whereas IAEA security documents (e.g. NSS No. 13 [5]) use the term “nuclear material”. As a result, this also introduces a potential interface issue between transport safety and transport security.

Specifically, fissile nuclides and fissile material are defined as follows [para. 222 of SSR-6, Rev. 1 [1]]:

“Fissile nuclides shall mean uranium-233, uranium-235, plutonium-239 and plutonium-241. Fissile material shall mean a material containing any of the fissile nuclides. Excluded from the definition of fissile material are the following:

“(a) Natural uranium or depleted uranium that is unirradiated;

“(b) Natural uranium or depleted uranium that has been irradiated in thermal reactors only;
“(c) Material with fissile nuclides less than a total of 0.25 g;
“(d) Any combination of (a), (b) and/or (c).

“These exclusions are only valid if there is no other material with fissile nuclides in the package or in the consignment if shipped unpackaged.”

By comparison, Table I of NSS 13 [5] defines “nuclear material” as follows:
- Unirradiated plutonium except that with isotopic concentration exceeding 80% in plutonium-238;
- Unirradiated uranium-235 at various levels of enrichment and irradiated uranium-235 having specified unshielded radiation levels;
- Unirradiated uranium-233 and irradiated uranium-233 having specified unshielded radiation levels; and
- Irradiated fuel.

Thus, care will need to be taken with the transport safety-security interface when dealing with these materials.
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 will need 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 provided in the first column of Table 1, while the second column lists potential competent authority actions related to each respective step taken by a State and the third column lists potential operator actions related to each respective step taken by a State.

<table>
<thead>
<tr>
<th>Table 1. PRACTICAL STATE/OPERATOR INTERFACE CONSIDERATIONS</th>
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<tr>
<td><strong>State Interface Considerations (NSS No. 9, Rev. 1 [4])</strong></td>
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<tr>
<td>1. “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>
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<td>2. “Regulatory requirements for safety and security are consistent, especially when responsibilities for safety and security are assigned to different competent authorities.”</td>
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<tr>
<td>3. “Safety requirements do not compromise security, and security recommendations do not compromise safety.”</td>
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TABLE 2. PRACTICAL STATE/OPERATOR INTERFACE CONSIDERATIONS (CONTINUED)

<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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<tr>
<td>4. “Authorities in charge of nuclear safety and of nuclear security coordinate, as 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>5. “Safety and security cultures are both addressed in an integrated management system.”</td>
<td>Require that operators have a viable integrated management system that addresses the interface between transport safety and transport security cultures.</td>
<td>Implement an integrated management system that addresses the interface between transport safety and transport security cultures.</td>
</tr>
<tr>
<td>6. “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. Ensure operators are aware of the national requirements and their duties and responsibilities.</td>
<td>Comply with national requirements for transport safety and transport security.</td>
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<td>7. “Security measures in place during a response to a nuclear security event do not adversely affect the safety of the transport personnel 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>
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The fifth interface consideration in Table 1 deals with the importance of interfacing and strengthening safety culture with security culture which may be accomplished by applying a viable integrated management system. Ultimately, a sound safety and security culture, and their proper interfacing will be dependent on individuals, policy makers, regulators, managers, individual employees and even to a certain extent members of the public (e.g. see “Nuclear Security Culture”, IAEA Nuclear Security Series No. 7, NSS No. 7 [7]). Two documents that are available can be used to guide individuals and organizations to determine how to evaluate their safety and security cultures through self-assessment (e.g. see “Performing Safety Culture Self-assessments”, IAEA Safety Reports Series No. 83 [8]; and “Self-assessment of Nuclear Security Culture in Facilities and Activities”, IAEA Nuclear Security Series No. 28-T [9]).
In addition to the interface considerations between the competent authorities and the operators as discussed in Table 1, consignors will need to also consider the interfaces that will exist with their carriers. Normal commercial shipments of radioactive material 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, possibly changing to a second CDS aircraft at an interchange point, and ultimately delivery of the consignment to the consignee using a non-dedicated CDS road vehicle.

Many variations of the shipment scenarios are possible. As a result, 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–related competent authorities and, for international shipments, potential changes in carriers or personnel at State borders. Thus, the consignor’s planning will need 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 each of the twenty tasks conflicting or
complementing the safety–security interface is briefly highlighted in this Section.

Each of the tasks identified here are elaborated further in Appendix I. That appendix provides a process
that can be followed by competent authorities and operators to assist them in identifying and resolving
conflicts when striving to comply with transport safety requirements and transport security measures for
each of the twenty transport tasks. Specifically, the details of the basis for the requirements are
elaborated, identifying where there may be security functions, safety measures and potential interface
issues that either complement each other or conflict with each other.

Each of the transport safety/transport security interfaces elaborated in this section may affect both the
competent authorities when assessing how safety and security measures are to be applied for a given
transport system, and the operators when determining how to apply the regulatory requirements to their
specific transport security system. Operators need to ensure that all transport safety and security
regulatory requirements are satisfied and the associated transport safety–security interfaces are
appropriately addressed. If conflicts exist, the involved parties will need to coordinate and communicate
with their relevant competent authorities and obtain direction and approval for any changes that affect
either safety or security.

For safety, consignors are required to provide transport documents (see paras 545 – 553 of SSR-6, Rev.1 [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 (also see “The Management System for the Safe
Transport of Radioactive Material”, TS-G-1.4 [10]).

Similarly, the relevant security recommendation and guidance publications, and the applicable
requirements from relevant international and regional modal regulations (that emanate from the UN
Model Regulations [2]) and relevant State regulations will need to be addressed.

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 may introduce potential
conflicts or whether the interface between safety and security will likely 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][2] and transport security recommendation and guidance documents
[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.

that

“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.”

A similar statement is provided in SSR-6, Rev. 1 [1]. The agreed interface measures between the safety
requirements (SSR-6, Rev. 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] will provide a high level of safety, while any conflicts
introduced by security will need to be addressed.
5.2 COMPLIANCE WITH REGULATIONS

For a normal commercial shipment of radioactive material, relevant domestic and international transport safety and security regulations will apply. Safety and security regulations may emanate from different competent authorities, thereby making it difficult for operators to develop a comprehensive understanding of how to fully comply with both sides of the regulatory framework. This interface can be further complicated if the radioactive material in the shipment possesses other dangerous properties, in which case provisions for both safety and security due to the other dangerous properties will apply (e.g. see paras 110 and 507 of SSR-6, Rev. 1 [1] and para. 1.5.5.1 of the UN Model Regulations [2]).

If the competent authorities governing transport safety are different from those for transport security, disparate sets of regulations may result, and care will need to be taken to ensure close consideration of the regulatory interface is made by all competent authorities involved. 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 safety requirements and security recommendations, steps will need to be immediately taken to initiate resolution of the conflict between the relevant competent authorities, and the operators will need to be notified accordingly by the 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 resolutions developed in a timely manner by the involved competent authorities. When the Operators are then informed of the agreed resolution to the interface, sufficient time will be available for effectively implementing needed changes before final plans and arrangements are made for the shipment(s).

5.3 THREAT ASSESSMENTS

SSR-6, Rev. 1 [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 dose rate 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 events by considering routine, normal and accident scenarios and the permitted contents of defined package ‘types’.

Para. 5.10 of NSS No. 9, Rev. 1 [4] states that “Shippers, carriers, receivers and others engaged in the transport of radioactive material should take into consideration all available threat information, including threat information provided by the regulatory body, when implementing security measures”.

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 may introduce a transport safety–security interface conflict. A potential conflict could involve 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”.

For basic security level shipments, para.5.11 of NSS No. 9, Rev. 1 [4] states that “Appropriate measures
should be taken to protect sensitive information relating to transport operations, such as information on the schedule and route”.

Thus, for basic transport security level shipments, operators may need to 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 will need to coordinate its transport documents and other communications relating to a shipment with the relevant competent authorities to work around those conflicts. Competent authorities are responsible to resolve such conflicting issues, whereas operators can only notify authorities when such issues exist and then follow instructions from the authorities. Applying this process will ensure that the information is transmitted and protected appropriately both for the purposes of security and safety.

At the basic transport security level, para. 5.14 of NSS No. 9, Rev. states that “Carriers should provide crew members, as appropriate, with written procedures on security measures required by the regulatory body. These procedures should include information addressing how to respond to a security incident during transport. At the basic transport security level, it is generally sufficient for these written procedures to contain no more than details of emergency contacts.”

More detailed guidance on protection of security-related information can be found in “Security of Nuclear Information”, IAEA Nuclear Security Series No. 23-G [12].

5.5 OPERATIONAL CONTROLS

Paragraph 1.1.1.4 of the UN Model Regulations [2] indicates that “…the safety of persons and the protection of property and the environment are assured when these Regulations are complied with. Confidence in this regard is achieved through quality assurance and compliance assurance programmes.” Specifically, for security, Paragraph 1.4.1.1 of the UN Model Regulations further states that “[A]ll persons engaged in the transport of dangerous goods shall consider security requirements for the transport of dangerous goods commensurate with their responsibilities”.

Thus, operational controls used in the shipment of radioactive material will need to be in accordance with all applicable international and domestic dangerous goods regulations, both from the perspective of safety and security.

With respect to operational controls, para. 502 of SSR-6, Rev. 1 [1] specifies that “[B]efore each shipment of any package, it shall be ensured that the package contains neither:

(a) “Radionuclides different from those specified for the package design, nor

(b) “Contents in a form, or physical or chemical state, different from those specified for the package design.”

In addition, para. 503 of SSR-6, Rev. 1 states, in part, that: “Before each shipment of any package, .... the following requirements shall also be fulfilled, if applicable:

(a) “It shall be ensured that lifting attachments that do not meet the requirements of para. 608 [of SSR-6, Rev. 1] have been removed or otherwise rendered incapable of being used for lifting the package.”

Hence, it is incumbent upon operators to strive for full compliance with all relevant safety and security regulations and to work with competent authorities to resolve outstanding safety-security interface issues.
For shipments requiring only prudent management practices, para. 5.5 of NSS No. 9, Rev. 1 [4] states that “[S]ome packages and types of radioactive material are identified in Section 3 as requiring no further security measures other than basic control measures and normal commercial practices. These practices include actions by shippers, carriers and receivers to protect the material against unauthorized removal or sabotage, as would be the case for any valuable commodity”.

Para. 5.6 of NSS No.9, Rev. 1 then provides examples of prudent management practices, including:

(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; and
(e) “Provide drivers of road conveyances with effective communication capability.”

For shipments requiring basic transport security level, the consignee will need to verify package contents are as listed in shipping documents. The consignee will also need to 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 will need to be developed so they do not introduce conflicts with the transport safety–security interface, and the interface between the two will generally complement each other.

5.6 CARRIER QUALIFICATIONS

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

Para. 5.19 of NSS No. 9, Rev 1 [4] specifies that at the basic transport security level the shipment will need to be offered only to registered or authorized carriers and only transferred to authorized carriers and receivers.

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, UN2909, UN2910 (less than $10^{-3}$ A$_2$), UN2911 (less than 1 A$_2$), UN2911 and UN2913 (SCO-I), para. 1.4.2 of the UN Model regulations [2] 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 [2], applicable Nuclear Security Series publications and SSR-6, Rev. 1 [1] all specify that records of training be maintained and made available upon request by the employee and competent authorities.

For shipments requiring only prudent management practices, the drivers will need to be provided with appropriate training that is simple to understand. This training will need to (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. Paras 5.15 and 5.16 of NSS No. 9, Rev. 1 [4] provide details on recommended training that should be provided from the security perspective, and Paras 311-315 of SSR-6, Rev. 1 [1] provide training requirements that are to be satisfied 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 [2] and set forth in applicable Nuclear Security Series publications. To avoid a conflict with the transport safety–security interface, the training will need to be comprehensive; will need to include addressing basic security awareness, radiation protection and regulatory safety requirements commensurate with the individual responsibilities of each involved person; and as appropriate, will need to address function- and modal-specific requirements.

5.8 PERSONNEL TRUSTWORTHINESS

The need for establishing the trustworthiness of personnel involved in normal commercial shipments of radioactive material at the basic security level is only set forth in security-related publications.

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

For security, NSS No.9, Rev. 1 [4] states for the basic security level that personnel trustworthiness will need to be addressed (a) within a State’s legislative and regulatory framework, (b) by the State’s regulatory body, consistent with national practices, “for ensuring the trustworthiness of persons with authorized access to sensitive information or to radioactive material during transport or who have specific security responsibilities during transport and establishes trustworthiness verification and/or security clearance procedures for such persons commensurate with their responsibilities: while ensuring that trustworthiness determinations are made using a graded approach; and (c) addressed by operators by providing a conveyance and crew that complies with crew fitness for duty requirements related to trustworthiness. Specifically, Table 1 of NSS No. 9, Rev. 1 [4] states that for basic security level shipments, steps will need to be taken to ensure trustworthiness and reliability of authorized individuals through background checks.

According to “Preventive and Protective Measures Against Insider Threats”, IAEA Nuclear Security Series No. 8 [13], 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 [2] specify that carriers are appropriately identified (see UN Model Regulations [2], para. 1.4.1.2).

For shipments of materials requiring basic transport security level measures, para. 5.18 of NSS No. 9, Rev. 1 [4] specifies that each crew member of any conveyance transporting radioactive material will need to carry a means of positive identification during transport. There are no requirements for establishing personnel identification for safety.
No conflict exists with the transport safety–security interface with respect to establishing personnel trustworthiness.

5.10 SAFETY AND SECURITY INSPECTIONS

Para. 7.2.4.4 of the UN Model Regulations [2] specifies that “[S]afery inspections on cargo transport units shall cover appropriate security measures”.

For transport safety, a management system and compliance management programme based on international, national or other standards acceptable to the competent authority will need to be established and implemented for all activities within the scope of SSR-6, Rev. 1 [1], as identified in para. 105 thereof, to ensure compliance with the relevant inspection provisions of these Regulations. Also, the user will need to be prepared to provide facilities for inspection during use.

For transport security, para. 5.22 of NSS No. 9, Rev. 1 [4] specifies that for shipments requiring basic transport security level measures that carriers perform security inspections as follows:

“Just prior to commencing transport, carriers should perform their own security inspections of the package or conveyance, commensurate with the potential radiological consequences of material transported, to verify that security measures associated with the conveyance are effective. In normal circumstances and as appropriate to the mode of transport, it is sufficient for the carrier to carry out a visual inspection of the package or conveyance to ensure that nothing has been tampered with and that nothing has been affixed to the package or conveyance that might affect the security of the consignment. Such inspections may be performed by transport personnel using their own knowledge of the conveyance or by other security personnel.”.

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 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. If such a conflict is identified, the operator will need to coordinate its pre-shipment planning with all 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 [2], using the requirements originally stated in SSR-6, Rev. 1 [1], establishes design requirements for transport packages following a graded approach. For normal commercial shipments of radioactive material 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, Rev. 1 [1] are clearly and specifically established. They follow a graded approach to maintain the same level of safety for all package types. 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 many of those used for the type of material considered in this TECDOC, 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 may be designed to only be capable of withstanding routine and/or normal conditions of transport which includes Type A packages, Industrial Packages and excepted packages.

For security, the design of a transport security system will need to consider 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 placing of 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 imposed for security, the operator will need 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 require 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. If a stowage conflict arises, the carrier and consignor may need to work together to resolve the conflict.

For example, with respect to stowage operations, some producers of radioactive material may consign many small packages onto a single road vehicle. In this event, a common practice is to reduce the radiation exposure to the vehicle drivers by placing those packages with the lowest levels of external radiation (e.g. White-I labelled packages) at the front of the enclosed cargo vehicle, while placing those producing the higher levels of external radiation (e.g. Yellow-II and Yellow-III labelled packages) to the rear of the vehicle. Loading Yellow-II and Yellow-III labelled packages rearmost may satisfy requirements for radiological protection of operators but result in those packages being more accessible to theft or sabotage.

The retention of packages can also prove to be complex, especially if for the type of material considered in this TECDOC are 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 system than for safety purposes.

For safety:

- Para. 554(a) of SSR-6, Rev. 1 [1] states that “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.”.
- Also, para. 564 of SSR-6, Rev. 1 states that “Consignments shall be securely stowed”.
- While, Para 638 of SSR-6, Rev. 1 further states that “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.

Far security, para. 2.60 of NSS No. 9, Rev. 1 [4] states that “the tie-downs required to secure a package to the conveyance can 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 will need to be such that they do not impair the ability of the package to meet its regulatory design requirements. In most respects, no conflict exists with the transport safety–security interface with respect to the stowage and retention.

### 5.13 LOCKS AND SEALS

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

For basic security, the integrity of the locks and seals will need to be verified before dispatch, before leaving any stopping point on-route, and upon arrival. Security measures will need 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, steps will need to be taken to ensure that any such additions do 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 will need to be identified, the operator will need 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.

Care will need to be taken to ensure that packages or conveyances containing radioactive material are not be left unattended for any longer than is absolutely necessary.

For shipments requiring basic transport security level measures, the use of a simple tracking system may need to be considered 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 will need to be identified, the addition of the monitoring or tracking devices will need 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 IN-TRANSIT STORAGE OF RADIOACTIVE MATERIAL DURING TRANSPORT

For safety, the scope of SSR-6, Rev. 1 [1] (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 are to have, for all shipments of radioactive material other than those with UN Numbers UN2908, UN2909, UN2010 (less than $10^3$ A$_2$), UN2911 (less than 1 A$_2$), UN2912 and UN2913 (SCO-I), transit sites such as airside warehouse, marshalling yards and other temporary storage areas, properly secured, well-lit and, where possible, not accessible to the general public.
For prudent management practice shipments, during in-transit storage operators will need to 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 will need to apply security measures where these measures are consistent with the category of the material and measures that are applied during use, storage and transit.

In-transit storage may introduce transport safety−security interface conflicts that will need to be identified and resolved.

5.16 COMMUNICATIONS

For safety, Annex I of SSR-6, Rev. 1 [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 routeing and import/export/transit licensing.

Specifically, prior notification is required for Type B(U) and Type C packages containing radioactive material with an activity greater than 3000 $A_1$ or 3000 $A_2$, as appropriate, or 1000 TBq, whichever is the lower; Type B(M) packages; and shipments under special arrangement only.

Annex I of SSR-6, Rev. 1 [1] 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, carriers will need to provide drivers of road conveyances with effective communication capabilities that are routinely tested before each shipment commences.

For basic transport security level shipments, operators will need to cooperate with each other and with appropriate authorities to exchange information on applying security measures and responding to security incidents. In addition, crew members will need to have 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 will need 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 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 will need to coordinate the pre-notification information with the relevant competent authorities to resolve those conflicts and to ensure that the exchange of 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.

If a non-compliance with respect to excessive radiation levels or contamination is identified during the shipment, SSR-6, Rev. 1 [1] states 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, Rev. 1 [1]).

5.17 WRITTEN INSTRUCTIONS AND DOCUMENTATION

For safety, SSR-6, Rev. 1 [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 will need to provide appropriate crew members with written procedures on required security measures, which will need to 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 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 will 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.

5.18 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 purposes, the SSR-6, Rev. 1 specifies that the following are required:

(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 to facilitate radiological safety, communicating the dose rate outside the package and the specific contents of the package; and

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

For security labelling and placarding might provide a potential adversary with information that could assist the adversary in a performing a malicious act. Removal of labels, placards or both 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, para. 2.62 of NSS No. 9, Rev. 1 [4] states the following:

“... 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...”
responders. Solutions to potential conflicts such as these should be assessed and approved by the regulatory bodies responsible for transport safety and security.”

5.19 IDENTIFICATION OF CONSIGNEES AND AUTHORIZATION REQUIREMENTS

Where it is determined that there is a conflict with satisfying safety hazard communication through the use of markings, labelling or placarding, then compensatory measures, approved by competent authorities will need to be applied through alternative communications methods which ensure that in the event of an accident or emergency, lifesaving emergency response actions are able to take place.

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, Rev. 1 [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, Rev. 1 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.” (para. 585)

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

For shipments requiring basic transport security level measures, consignors will need to ensure that consignees are properly identified, authorized and prepared to receive the consignments.

5.20 SURVEILLANCE

NSS No. 9, Rev. 1 [1] does not specify surveillance of shipments that require prudent management practices or the basic or enhanced security levels. However, if additional security measures are determined to be necessary by a competent authority due to considerations of a result of changes in threat levels, etc.; then para. 5.65 of NSS No. 9 Rev. 1 indicates that surveillance is an additional measure that might be considered.

A conflict between safety and security if surveillance is required is unlikely.
6. DECISION PROCESS FOR ADDRESSING TRANSPORT SAFETY – TRANSPORT SECURITY CONFLICTS

Operators will need to ensure that all transport safety requirements and security recommendations 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, Rev. 1 [1]). These can serve as a basis for managing their operations consistently with the application of a Management System (see 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 [2] and relevant Modal Regulations as established in State regulations specify similar actions.

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.

Figure 1 provides a decision chart illustrating 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 normal commercial shipments of radioactive material, additional security measures (NSS No. 9, Rev. 1 [4]) are being considered.

![Decision Process Diagram](process-diagram.png)

Fig. 1. Process for identifying if transport safety–security interface conflicts exist
The identification of a potential conflict will depend on the specifics of the consignment being planned. Here, the consignors 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] can enable compliance with all the transport regulatory requirements specified in IAEA SSR-6, Rev. 1 [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 will need to be sought.

If additional security measures are considered necessary by the competent authorities, they will need to ask operators to assess if the additional security measures compromise compliance with the safety regulatory requirements. If compliance with safety requirements is compromised, then the operator will need to 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 will need to 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 Appendix I can be used with this decision chart to further facilitate the resolution of such conflicts.
APPENDIX I. EXAMPLE TRANSPORT TASK QUESTIONS FOR RESOLVING
TRANSPORT SAFETY – TRANSPORT SECURITY INTERFACE CONFLICTS

Section 5 discussed twenty safety–security interface tasks that will need to be considered when
addressing potential interface issues. As applicable, it considered, for security, both normal commercial
shipments of radioactive material requiring only prudent management practices and for the type of
material considered in this TECDOC requiring both prudent management practices and basic transport
security level measures.

For shipments that require only prudent management practices, the safety-security interface will
probably not introduce conflicts.

However, for shipments requiring both prudent management practices and basic transport security level,
a consignor may consider applying the security measures set forth in NSS No. 9, Rev. 1 [4], following
consultation and approval with relevant safety and security competent authorities especially if the
adoption of such measures results in a non-compliance with safety requirements. For basic transport
security level shipments, para. 5.9 of NSS No. 9, Rev. 1 [4] reads as follows:

“At the basic transport security level, the regulatory body should require 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.”

Finally, a competent authority may require a consignor to apply additional security measures due to an
arising threat or risk in the State or States where normal commercial shipments of radioactive material
are to occur. The relevant competent authorities will specify the basis for determining the necessary
level of security and the appropriate security measures for a given shipment. If these measures lead to
conflicts between safety and security, this will need to be accompanied by any required compensatory
safety measures that are to be applied.

To assist operators in fulfilling these requirements, Table I-1 elaborates upon the twenty tasks discussed
in the Section 5, providing a brief summary of potential interface issues, and then lists one or more
typical questions that can be used in an action list to facilitate demonstration of compliance with relevant
safety requirements/security recommendations prior to undertaking a shipment. This table could also
assist operators in identifying conflicts between safety and security and resolving those conflicts with
their relevant competent authorities.

Operators and competent authorities may explore these typical questions for each of the tasks listed in
Table I-1, responding to each of the three blank columns in the table (i.e. for safety, security and the
interface), thereby helping them to better understand the safety–security interface. Specifically,
application of this table, could be useful to the operators when preparing to undertake normal
commercial shipments of radioactive material. For example, for these shipments, providing answers to
the questions in Table I-1 could be used by operators to facilitate the preparation of necessary transport
documents, incorporating safety–security interface information associated with the shipments while
concurrently providing a basis for demonstrating compliance with safety requirements and security
measures to competent authority inspectors.

In utilizing this tool, 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 II-1 in
Appendix II can assist the user in this process. The consignor will also need to determine whether the
contents of the shipment pose other dangerous characteristics and, if so, will need to determine what
additional security measures if any need to be applied due to those subsidiary hazards.
TABLE I-1. 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>
</tr>
</thead>
<tbody>
<tr>
<td>1. General interface between safety and security</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Compliance with all relevant dangerous goods transport regulations is necessary 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 will need to 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.

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.

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 can provide a high level of safety, while any conflicts introduced by security will need to be addressed.

**Question:** What steps have been taken to address applicable safety requirements and security recommendations for the transport by all involved stakeholders commensurate with their responsibilities?

**Question:** What steps have been taken to resolve outstanding safety-security interface issues?
TABLE I-1. 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>2. Regulations and compliance</td>
<td></td>
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</tbody>
</table>

For a given normal commercial shipment of 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. If a failure to comply with requirements is identified, this will need to be communicated to the relevant competent authorities.

For international shipments it is possible that consignor(s) and carrier(s) may operate under regulatory regimes based upon different editions of SSR-6, Rev. 1 [1] 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 will need to be identified and resolved.

Where an interface conflict is identified between specific security and safety measures, steps will need to 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:** Have both the consignor and carriers determined the requirements and recommendations they are required to satisfy for both safe and secure transport of this shipment?

**Question:** What steps have been taken to resolve differences that may have arisen if different versions of the regulations and recommendations are imposed by different involved regulators?

---

1

2
3. Threat Assessments

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, Rev. 1 [1] 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.

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.

Para. 5.10 of NSS No. 9, Rev. 1 [4] specifies that those responsible for transport of radioactive material will need to 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.

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.

<table>
<thead>
<tr>
<th>Question: Has the consignor considered the robustness of the package when making a threat assessment?</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Question: Has the consignor considered information such as schedule, route, and the package design in the threat assessment?</td>
<td></td>
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</tbody>
</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 are to be made, and sets forth those entities that will need to possess the information in the transport documents.

For transport security where only prudent management practices are to be applied, the operator will need to apply normal and sound business practices with respect to how it manages sensitive information. For basic transport security level shipments, operators will need to 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 will need to coordinate their transport documents and other communications relating to a shipment with the relevant competent authorities to work around those conflicts.

<table>
<thead>
<tr>
<th>Question:</th>
<th>What steps have the consignor and carrier taken to ensure that shipping documents are accurate and complete?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question:</td>
<td>What steps have the consignor and carrier taken to appropriately identify, protect and communicate sensitive information?</td>
</tr>
</tbody>
</table>
TABLE I-1. 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>5. Operational controls</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Normal commercial shipments of radioactive material will need to be undertaken 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 will be needed.

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

**Operational controls: Prudent Management Practices**

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

**Question:** What appropriate security controls have the consignor and carrier established to secure packages while in transit and storage in a manner that impedes unauthorized removal (e.g. in a locked conveyance or storage area)?

**Question:** What steps has the consignor taken to ensure that the carrier is well known and experienced?
5. Operational controls (Continued)

Normal commercial shipments of radioactive material will need to be undertaken 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 will be 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 will need to be taken to ensure that no interface conflicts exist.

**Operational controls: Basic Transport Security Level**

**Question:** What steps has the competent authority taken to ensure that consignor and carrier personnel are appropriately trained?

<table>
<thead>
<tr>
<th>Question: What steps have the consignor and carrier taken to establish effective procedures for all phases of the transport, including a procedure for communications during transport?</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Question: What steps has the consignor taken to confirm the suitability or ability of the consignee to take receipt of the consignment, if appropriate?</th>
</tr>
</thead>
</table>
5. Operational controls (Continued)

Normal commercial shipments of radioactive material will need to be undertaken 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 will be 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 will need to be taken to ensure that no interface conflicts exist.

Operational controls: Basic Transport Security Level (Continued)

<table>
<thead>
<tr>
<th>Question: At the basic security level, what steps has the competent authority taken to ensure that the consignee has procedures to act, as appropriate, upon receipt or non-receipt of the consignment?</th>
</tr>
</thead>
</table>

| Question: At the basic security level, what steps has the competent authority 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? |   |   |   |
6. Carrier Qualifications

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 will need to be undertaken to ensure no interface conflicts exist.

<table>
<thead>
<tr>
<th>Question: What steps has the consignor taken to appropriately identified that the carriers are, if required by national regulations, certified, registered or authorized; and are drivers appropriately trained?</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Question: What steps has the competent authority taken to ensure that the use of public transport for packages with a White-I label (e.g. buses) has been precluded unless specifically allowed by national regulations?</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Question: At the basic security level, what steps has the consignor and carrier taken to implement any supplementary security requirements specified by the competent authorities?</th>
</tr>
</thead>
</table>
### 7. Training and training records

All shipments of radioactive material other than those with UN Numbers UN2908 through UN2913, the UN Model regulations [2] 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 specifies that such training will need to be provided or verified upon employment in a position involving dangerous goods transport and will need to be periodically supplemented with retraining. (Section 1.4.2 of the UN Model Regulations)

The UN Model Regulations [2], applicable Nuclear Security Series publications and SSR-6, Rev. 1 [1] all specify that records of training will need to be maintained and made available upon request by the employee and competent authorities.

<table>
<thead>
<tr>
<th>Question: What steps have been taken to ensure that involved employees have been trained with respect to both safety and security for this shipment as required by regulations?</th>
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</thead>
</table>

<table>
<thead>
<tr>
<th>Question: What steps have been taken to ensure that records of all training of involved employees have been maintained as required by regulations?</th>
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</thead>
</table>

<table>
<thead>
<tr>
<th>Question: What steps has the operator taken to ensure that the training records can be made available to either or both the employee or the competent authority upon request?</th>
<th></th>
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</tr>
</thead>
</table>
TABLE I-1. 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>8. Personnel trustworthiness</strong></td>
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<td></td>
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</tr>
<tr>
<td>The need for establishing the trustworthiness of personnel involved in normal commercial shipments of radioactive material is only set forth in security-related publications. For basic level of security, personnel trustworthiness will need to be addressed. Also, para. 5.12 of NSS No. 9, Rev. 1 [4] indicated that trustworthiness determination is an important element in addressing and controlling insider threats.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Question:</strong> What steps has the operator taken to ensure that the trustworthiness of employees has been established commensurate with the employee’s responsibilities and consistent with national regulations?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Question:</strong> Does the trustworthiness process address insider threats?</td>
<td></td>
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<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>9. Personnel identification</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For basic transport security level shipments, each crew member of any conveyance transporting radioactive material will need to carry means of positive identification during transport. There are no requirements for establishing personnel identification for safety.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Question:</strong> When possible, what steps has the operator taken to provided positive identification for all crew members involved in basic transport security level shipments?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TABLE 1.1. 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>
</table>

### 10. Safety and security inspections

The safety and security inspection provisions may complement each other. Some security features may need to be added to inspection procedures. Inspections will need to ensure both the transport safety and transport security systems are complete and functional and that appropriate corrective actions have been completed and documented.

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 will need to incorporate these security measures. In some situations, different inspectors may be needed since some security features may not be divulged to safety inspectors.

The consignor and carriers will need to coordinate their pre-shipment planning with all the relevant competent authorities to ensure adequate inspection prior to undertaking a shipment.

**Question:** For basic security level shipments, what steps have the operators taken to perform and document, as required by relevant regulations, safety and security inspections from initiation to completion of this shipment, to confirm safety and security measures are functioning?

**Question:** What steps has the carrier taken to carry out visual inspection of the package or conveyance to ensure that nothing has been tampered with and that nothing has been affixed to the package or conveyance that might affect the security of the consignment?
TABLE 1-1. 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>11. Design of transport packages</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>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 will need to take into account the design features of the packages being used.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Compensating security features may need to be added to the overall package design to satisfy the combined set of transport safety requirements and transport security recommendations. The addition of security features to a package could require demonstrating that they don’t affect the safety functions of the packages. If conflicts between specific package design features for safety and those imposed for security, the operator will need to coordinate the development of its package and transport system with the relevant competent authorities to resolve those conflicts.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Question:</strong> If additional features have been added to the package design to satisfy security recommendations, what steps has the consignor taken to resolve any interface issues that may exist between safety and security?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Question:</strong> How has the consignor resolve any safety–security interface conflicts that have been introduced by adding additional package design features?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Question:</strong> Question: For any modification to the package design, what steps has the consignor taken to satisfy the transport safety regulatory requirements and the security recommendations?</td>
<td></td>
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</tr>
</tbody>
</table>
### Issue 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. Thus, attention may be needed to the methods used for stowage and retention of packages in a conveyance and how these may affect satisfying safety requirements and security recommendations.

| Question: What steps has the operator taken to ensure that stowage and retention of packages in a conveyance has not detracted from satisfying safety requirements and security recommendations? |

| Question: When packages have been altered to accommodate retention systems for security purposes, how have any conflicts been addressed? |

<table>
<thead>
<tr>
<th></th>
<th>Safety</th>
<th>Security</th>
<th>Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**TABLE I-1. 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>13. Locks and seals</strong></td>
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<tr>
<td>For safety, other than Excepted, Type IP-1 and Type IP-2 packages, 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. Steps will need to be taken to ensure that any locks and seals added to a package to satisfy security recommendations do not conflict with safety requirements. The integrity of any locks and seals will need to be verified before dispatch, before leaving any stopping point on-route, and upon arrival.</td>
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</tbody>
</table>

**Question:** For basic security level shipments, if any modifications have been made to seals for security purposes, has the consignor resolved any conflicts with safety?

**Question:** For basic security level shipments, how will the operator establish proper controls to assure the integrity of seals and of any locks used prior to and during shipment, and upon delivery to the consignee?

**Question:** For basic security level shipments, in the event that the integrity of a seal or any locks used is determined to be violated, what actions will the operator take?
### 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. Steps will need to be taken to ensure that packages or conveyances containing radioactive material are not left unattended for any longer than is absolutely necessary. For shipments requiring prudent management level measures, package tracking systems are not required. For shipments requiring basic transport security level measures, carriers will need to consider using a simple monitoring system such as a package tracking system that can determine when a shipment has departed, when it is in transport and when the consignment has been received.

If the addition of monitoring or tracking devices could in some way comprise a safety function of the package, such a conflict will need to be identified. The addition of the monitoring or tracking devices will need to be coordinated with the package designer and, as appropriate, with relevant competent authorities.

<table>
<thead>
<tr>
<th>Question: For basic security level shipments, if monitoring or tracking systems are in place consistent with security requirements, how does this affect the transport safety–security interface?</th>
<th>Safety</th>
<th>Security</th>
<th>Interface</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Question: For basic security levels shipments, have the procedures for operating any monitoring or tracking systems been evaluated for their potential impacts on the transport safety?</th>
<th>Safety</th>
<th>Security</th>
<th>Interface</th>
</tr>
</thead>
</table>
### TABLE I-1. 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>15. In-transit storage of radioactive material during transport</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For shipments requiring only prudent management practices, during in-transit storage operators will need to 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 will need to 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> Have the consignor and consignee determined (a) the adequacy of planned in-transit storage sites; (b) whether the package(s) are capable of being properly secured consistent with the category of the material and measures applied during use, storage and transit; and (c) if there are 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 verify that the carrier retains control and security of the package(s) when placed in in-transit storage?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


### 16. Communications

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 conflict with those for safety.

For prudent management practice shipments, carriers will need to provide drivers of road conveyances with effective communication capability.

For basic transport security level shipments, operators will need to 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 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.

In the event that a non-compliance with respect to excessive radiation levels or contamination is identified during the shipment, the non-compliance will need to be reported as soon as practicable to both the consignor and the relevant competent authorities.

<table>
<thead>
<tr>
<th>Question: What steps have the consignor and carrier taken to establish appropriate communication capability consistent with both the safety requirements and security recommendations considering the mode(s), route(s) and jurisdictions involved in this shipment?</th>
</tr>
</thead>
<tbody>
<tr>
<td>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?</td>
</tr>
</tbody>
</table>

---

1
### TABLE I-1. 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>17. Written instructions and documentation</strong></td>
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</tr>
<tr>
<td>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 conflict with those for safety.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For shipments requiring only 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 will need to provide appropriate crew members with written procedures on required security measures, which will need to include information addressing how to respond to a security incident during transport.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>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 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 will need to coordinate the pre-notification contents of planning documents with the relevant competent authorities to work around those conflicts.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Question:</strong> Has the operator verified that all written instructions are consistent with relevant safety regulations and security recommendations?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Question:</strong> How does the consignor and carrier provide to conveyance operators appropriate operational instructions and written procedures on how to respond to an abnormal or atypical event?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
18. Marking and labelling of packages, and placarding of vehicles and freight containers

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 security conflict with satisfying safety hazard communication through the use of markings, labelling or placarding, compensatory measures, approved by competent authorities, will need to be applied through alternative communications methods.

<table>
<thead>
<tr>
<th>Issue</th>
<th>Safety</th>
<th>Security</th>
<th>Interface</th>
</tr>
</thead>
<tbody>
<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>
<tr>
<td>Issue</td>
<td>Safety</td>
<td>Security</td>
<td>Interface</td>
</tr>
<tr>
<td>-------</td>
<td>--------</td>
<td>----------</td>
<td>-----------</td>
</tr>
<tr>
<td><strong>19. 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.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For shipments requiring prudent management security practices, the consignor will need to know the consignee as would be the case for shipments of any valuable commodities. For shipments requiring basic transport security level measures, consignors will need to ensure that consignees are properly identified, authorized and prepared to receive the consignments.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In the event that any identification provisions imposed for security conflict with safety requirements, the operator will need 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 has the consignor identified the consignee for this shipment, and how has the consignor 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>
### 20. Surveillance

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 normal commercial shipments of radioactive material is not typically required by safety regulations or security recommendations, consignors might consider their use if they are available on the road vehicles offered by carriers.

Specifically, Chapter 8.4, para. S21 of “Economic Commission for Europe Committee on Inland Transport, ADR – European Agreement Concerning the International Carriage of Dangerous Goods by Road” [14] requires that most packages in transport shall be subject at all times to supervision to prevent any malicious act and to alert the driver and competent authorities in the event of loss or fire unless the packages are carried in a locked compartment or are carried otherwise to protect against illicit unloading.

**Question:** If the consignor identifies road carriers having surveillance or alarms, has consideration been given to include the use of these in its transport planning and protocols?
APPENDIX II. GUIDE TO CLASSIFYING PACKAGES OF RADIOACTIVE MATERIAL FOR DETERMINING THE APPROPRIATE UN NUMBER AND SECURITY REQUIREMENTS

This publication addresses radioactive material, per package, in quantities below 3,000 A2 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).

If 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, Rev. 1 [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 II-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 [15]. In the figure, four consignments having one of four UN Numbers are circled in blue. These are the only ones that will always require only prudent management practice security.

All UN Numbers relevant to radioactive material are listed in Table II-1 through Table II-4. These tables, coupled with the flow diagram in Figure II-1 can be used to define the UN Number that is applicable to a given package of radioactive material and the level of security required and which IAEA Nuclear Security Series documents provide recommendations on needed security measures.

Tables I-1 through I-4 correlate each UN Number with the necessary security level or levels of security that may apply to each given UN Number. The tables include both those UN Numbers for consignments that are within the scope of this document and also those which may be beyond the scope of this publication.

Specifically, the four tables address:

- Consignments, as shown in Table II-1, with UN Numbers for excepted packages where, since the contents are such that they generally pose a very low potential for radiological consequences from the security perspective and only require prudent management practices, their consideration has been excluded from this document. The three exceptions in this table are:
  (a) UN2910 with contents greater than $10^3$ A2; and
  (b) UN2911 with contents greater than A2; and
  (c) UN2911 with contents greater than 10 D.

- Consignments, as shown in Table II-2, containing LSA-II and LSA-III material and SCO-II and SCO-III objects where, depending upon the activity and/or material of contents, they may require either just prudent management practices; or prudent management practices and basic security level; or prudent management practices, basic security level and enhanced security level for proper protection from those with malicious intent. For example, they could contain radionuclide(s) with values above 10 D.

- Consignments, as shown in Table II-3, with UN Numbers for Type A and Type B packages where, depending upon the activity or material of contents they may require either prudent management practice and basic security level (i.e. within the scope of this document); or prudent management practice, basic security level, and enhanced security level (i.e. beyond the scope of the document).
• Finally, as shown in Table II-4, consignments with UN Numbers for Type C packages (i.e. beyond the scope of this document); UN Numbers for special arrangement shipments (some of which may be within the scope of this document), and UN Numbers for uranium hexafluoride in other than excepted packages (where they will be beyond the scope of this document due to the toxic nature of the material).

The last two columns of the tables show 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] and NSS 14 [3] for radioactive materials, and NSS No. 26-G [6] for nuclear material). NSS No. 26-G is included since it provides guidance on how to deal with security for nuclear materials at Category III and below (e.g. see Figure I of NSS No. 26-G).

As was noted in Appendix I above, a consignor will also need to determine whether the contents of the shipment pose other dangerous characteristics. If so, the consignor will need to determine what additional security measures if any will need to be applied to adequately address those subsidiary hazards. In particular, a consignor of uranium hexafluoride (UN3507, UN2978 and UN2977) will need to pay special attention to security requirements since these shipments are designated as high consequence dangerous goods shipments irrespective of the quantity of uranium hexafluoride in a package.
II.1. FLOW DIAGRAM FOR SELECTING PROPER UN NUMBER FOR A GIVEN CONSIGNMENT

Prudent Management Practice only, solely for these UN numbers

FIG. II-1(a). Flow Diagram for Selecting Proper UN Number for a Given Consignment (see SSG-33 [15]).
FIG. II-1(b). Flow Diagram for Selecting Proper UN Number for a Given Consignment (see SSG-33 [15]).
II.2. TABLES OF UN NUMBERS, RECOMMENDED TRANSPORT SECURITY LEVELS, AND APPLICABLE IAEA PUBLICATIONS

TABLE II-1. UN NUMBERS, RECOMMENDED TRANSPORT SECURITY LEVELS, AND APPLICABLE IAEA SECURITY PUBLICATIONS FOR EXCEPTED PACKAGES.

<table>
<thead>
<tr>
<th>Excepted package</th>
<th>Prudent Management</th>
<th>Basic Security</th>
<th>Enhanced Security</th>
<th>NSS No. 26-G</th>
<th>NSS No. 9 (Rev. 1)</th>
<th>NSS No. 14</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>UN 2908</strong> RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — EMPTY PACKAGING</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>UN 2909</strong> RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — ARTICLES MANUFACTURED FROM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NATURAL URANIUM or DEPLETED URANIUM or NATURAL THORIUM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>UN 2910</strong> RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — LIMITED QUANTITY OF MATERIAL</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(less than $10^{-3} A_2$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>UN 2910</strong> RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — LIMITED QUANTITY OF MATERIAL</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(greater than $10^{-3} A_2$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>UN 2911</strong> RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — INSTRUMENTS or ARTICLES</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(less than $A_2$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>UN 2911</strong> RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — INSTRUMENTS or ARTICLES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(special form, more than $A_2$)</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>UN 2911</strong> RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — INSTRUMENTS or ARTICLES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(more than 10 D)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>UN 3507</strong> URANIUM HEXAFLUORIDE, RADIOACTIVE MATERIAL, EXCEPTED PACKAGE</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(less than 0.1 kg per package, non-fissile or fissile-excepted)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Due to its high toxicity, uranium hexafluoride is designated as a high consequence dangerous good for the application of Chapter 1.4 of the UN Model Regulations irrespective of the quantity of material per package (See Para. 2.0.3.1 and Special Provision 369 of Chapter 3.3 of the UN Model Regulations [2]).
<table>
<thead>
<tr>
<th>UN number</th>
<th>Description</th>
<th>Prudent Management</th>
<th>Basic Security</th>
<th>Enhanced Security</th>
<th>NSS No. 26-G</th>
<th>NSS No. 9 (Rev. 1), NSS No. 14</th>
</tr>
</thead>
<tbody>
<tr>
<td>UN 2912</td>
<td>RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-I), non-fissile or fissile-excepted</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UN 3321</td>
<td>RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II), non-fissile or fissile-excepted</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>UN 3322</td>
<td>RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III), non-fissile or fissile-excepted</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>UN 3324</td>
<td>RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II), FISSILE</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UN 3325</td>
<td>RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III), FISSILE</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UN 2913</td>
<td>RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-I, SCO-II, SCO-III), non-fissile or fissile-excepted</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></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>
<td>X</td>
</tr>
</tbody>
</table>
TABLE II-3. UN NUMBERS, RECOMMENDED TRANSPORT SECURITY LEVELS, AND APPLICABLE IAEA SECURITY PUBLICATIONS FOR TYPE A AND TYPE B PACKAGES.

<table>
<thead>
<tr>
<th>Type</th>
<th>UN Number</th>
<th>Description</th>
<th>Prudent Management</th>
<th>Basic Security</th>
<th>Enhanced Security</th>
<th>NSS No. 26-G</th>
<th>NSS No. 9, Rev. 1</th>
<th>NSS No. 14</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type A package</strong></td>
<td></td>
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<td></td>
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<td></td>
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<tr>
<td></td>
<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></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UN 3327</td>
<td>RADIOACTIVE MATERIAL, TYPE A PACKAGE, FISSILE, non-special form</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<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></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>UN 3333</td>
<td>RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM, FISSILE</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Type B(U) package</strong></td>
<td></td>
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<td></td>
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<tr>
<td></td>
<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></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UN 3328</td>
<td>RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE, FISSILE</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Type B(M) package</strong></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<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></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UN 3329</td>
<td>RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE, FISSILE</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TABLE II-4. UN NUMBERS, RECOMMENDED TRANSPORT SECURITY LEVELS, AND APPLICABLE IAEA SECURITY PUBLICATIONS FOR TYPE C PACKAGES AND SPECIAL ARRANGEMENT; AND FOR URANIUM HEXAFLUORIDE IN OTHER THAN EXCEPTED PACKAGE.

<table>
<thead>
<tr>
<th>Type C package</th>
<th>Prudent Management</th>
<th>Basic Security</th>
<th>Enhanced Security</th>
<th>NSS No. 26-G</th>
<th>NSS No. 9, Rev. 1, NSS No. 14</th>
</tr>
</thead>
<tbody>
<tr>
<td>UN 3323 RADIOACTIVE MATERIAL, TYPE C PACKAGE, non-fissile or fissile-excepted</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>UN 3330 RADIOACTIVE MATERIAL, TYPE C PACKAGE, FISSILE</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Special arrangement</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>UN 2919 RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, non-fissile or fissile-excepted</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>UN 3331 RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, FISSILE</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Uranium hexafluoride</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>UN 2977* RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, FISSILE</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>UN 2978* RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, non-fissile or fissile-excepted</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
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</tr>
</tbody>
</table>

* Due to its high toxicity, uranium hexafluoride is designated as a high consequence dangerous good for the application of Chapter 1.4 of the UN Model Regulations irrespective of the quantity of material per package.
II.3. CLASSIFICATION OF NORMAL COMMERCIAL SHIPMENTS OF RADIOACTIVE MATERIAL – TWO EXAMPLES

A consignor will need to determine which UN Number applies to its shipment, and that in turn can facilitate determining which security levels would be required for that shipment, and in preparing the transport documents - paras 545 – 561 that are required for safety (Consignor’s Responsibilities) of SSR-6, Rev. 1 [1].

Information required for this process 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 diagram (Figure II-1).

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 applying Figure II-1 and Table II-1 through Table II-4; and
- 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.

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**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 on the Safety and Security of Radioactive Sources” [16]).

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

However, before the shipment is undertaken, the consignor will need to verify what security measures are needed and that all the permits, licenses, and authorisations for transport, possession and use are in place.

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

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


NOTE: This is yet to be published; expected Fall of 2018.


BIBLIOGRAPHY


This glossary is provided since the potential exists for interface issues or misunderstandings to arise with respect to the terminology used for safety on the one hand, and for security on the other hand, because different IAEA safety and security publications and other regulatory documents frequently use different terminology. Where differences exist, or where unique definitions are not readily available, this is noted following the definition.

**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).” [1]

**competent authority.** For safety, “[A]ny body or authority designated or otherwise recognized as such for any purpose in connection with these Regulations”. [1] For security, “A governmental organization or institution that has been designated by a State to carry out one or more nuclear security functions. For example, competent authorities include regulatory bodies, law enforcement, customs and border control, intelligence and security agencies, and health agencies.” [3]

**consignee.** “[A]ny person, organization or government that is entitled to take delivery of a consignment.” [1] Note: consignee is also known as receiver in security publications.

**consignment.** “[A]ny package or packages, or load of radioactive material, presented by a consignor for transport.” [1]

**consignor.** “[A]ny person, organization or government that prepares a consignment for transport.” [1] Note: consignor is also known as shipper in security publications.

**conveyance.**

“(a) For transport by road or rail: any vehicle;

“(b) For transport by water: any vessel, or any hold, compartment, or defined deck area of a vessel;

“(c) For transport by air: any aircraft.” [1]

**graded approach.** For nuclear security, “The application of nuclear security measures proportional to the potential consequences of a malicious act.” [3] For safety, “For a system of control, such as a regulatory system or a safety system, a process or method in which the stringency of the control measures and conditions to be applied is commensurate, to the extent practicable, with the likelihood and possible consequences of, and the level of risk associated with, a loss of control.” [“IAEA Safety Glossary – Terminology Used in Nuclear Safety and Radiation Protection 2007 Edition” [17]]

**insider.** “An individual with authorized access to associated facilities or associated activities or to sensitive information or sensitive information assets, who could commit or facilitate the commission of criminal or intentional unauthorized acts involving or directed at nuclear material, other radioactive material, associated facilities or associated activities or other acts determined by the State to have an adverse impact on nuclear security.” [9] Note: in the context of this document, “associated activities” means the transport of nuclear or other radioactive material.

**malicious act.** “An act or attempt of unauthorized removal of radioactive material or sabotage.” [3]

**management system.** “[A] set of interrelated or interacting elements for establishing policies and objectives and enabling the objectives to be achieved in an efficient and effective manner.” [1]

**normal commercial shipment.** For the purpose of this document, normal commercial shipments of radioactive material are those shipments that consist of one or more packages of radioactive material where the contents of the individual packages do not exceed (a) an activity of 10 D for those specific...
radioactive sources specified in NSS No. 9 Rev. 1 [1], and (b) an activity of 3,000 A₂ for all other radioactive material. Note: This terminology is unique to this document. It was developed based upon the threshold values established in NSS No.9, Rev. for transitioning from Basic Security Measures to Enhanced Security Measures. Furthermore, although the UN Model Regulations [2] exclude UN 2908, UN 2909, UN 2910 and UN 2911 with an activity level not exceeding an A₂ value, and LSA-I and SCO-I from security provisions, these are all considered in this document as being normal commercial shipments where prudent management practices may need to be viewed as applicable security measures for these shipments.

**operator.** Any organization or person applying for authorization or authorized and/or responsible for nuclear, radiation, radioactive waste or transport safety when undertaking activities or in relation to any nuclear facilities or sources of ionizing radiation. This includes, inter alia, private individuals, governmental bodies, consignors or carriers, licensees, hospitals, self-employed persons, etc. ” [17]

**prudent management practices.** The actions normally undertaken by consignors, carriers and consignees “as requiring no further security measures other than basic control measures and normal commercial practices. These practices include actions by shippers, carriers and receivers to protect the material against unauthorized removal or sabotage, as would be the case for any valuable commodity. ... Prudent management practices apply regardless of the radioactive material.” [See, e.g. paras5.5 and I.15 of NSS No. 9, Rev. 1 [4]] Note: This definition is unique to this document.

**retention.** “[T]he 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” [See para. 564.2 of “Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material (2012 Edition)”, SSG-26 [18]].

**sabotage.** “Any deliberate act directed against an associated facility or an associated activity that 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.” [3] Note: radioactive substance and radioactive material have the same meaning. Also, in the context of this document, “associated activity” means the transport of nuclear or other radioactive material.

**shipment.** “The specific movement of a consignment from origin to destination.” [1]

**shipper.** “Any person, organization or government that prepares or offers a consignment of nuclear or other radioactive material for transport (i.e. the consignor).” [3]

**stowage.** “[T]he locating within or on a conveyance of a package containing radioactive material relative to other cargo (both radioactive and non-radioactive).” [See para. 564.2 of SSG-26 [18]]

**threat.** “A person or group of persons with motivation, intention and capability to commit a malicious act.” [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.” [3]

**transport.** “The deliberate physical movement of radioactive material (other than that forming part of the means of propulsion) from one place to another.” [17]

**transport security system.** “Any integrated set of nuclear security measures.” [“Objective and Essential Elements of a State’s Nuclear Security Regime”, IAEA Nuclear Security Series No. 20 [19]]. Note: for transport security, this may be interpreted to mean any integrated set of nuclear security measures that are used for the transport of nuclear or other radioactive materials.
CONTRIBUTORS TO DRAFTING AND REVIEW

Bairot, X. Transnubel S. A., Belgium
Bajwa, C.S. International Atomic Energy Agency
Chaudry, R. Consultant, Canada
Clemente, C. Institut de Radioprotection et de Sûreté Nucléaire (IRSN), France
Devaney, M. Oak Ridge National Laboratory (ORNL), USA
Dixon, T. World Nuclear Transport Institute (WNTI), United Kingdom
Ershov, V. Emergency Response Center (ERC) of ROSATOM, Russian Federation
Gray, P. Consultant, Canada
Ladsous, D. International Atomic Energy Agency
Nabayaogo, D. Autorité Nationale de Radioprotection et de Sûreté Nucléaire, Burkina Faso
Pope, R. Consultant/Oak Ridge National Laboratory (ORNL), USA
Presta, A. World Nuclear Transport Institute (WNTI), United Kingdom
Reber, E. International Atomic Energy Agency
Saenger, R. Consultant, France
Sannen, H. Consultant, Belgium
Shannon, M. International Atomic Energy Agency
Thériault, M. Canadian Nuclear Safety Commission (CNSC), Canada
Trivelloni, S. Institute for Environmental Protection and Research (ISPRA), Italy
Whittingham, S. International Atomic Energy Agency

Consultants Meetings