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IAEA Guidance on Managing the Interface between Safety and Security for Normal Commercial Shipments of Radioactive Material

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ABSTRACT

Regulations governing the safe transport of radioactive material have been developed and maintained at the international and national levels for more than six decades. Following the events of 9/11, a similar effort was initiated for security during the transport of radioactive material; however, safety and security provisions have generally been developed independent of each other. The responsibility for nuclear security within a State rests entirely with the State but as part of an international effort to address the provisions that complement or conflict with each other in the interface between safety and security during transport, the International Atomic Energy Agency (IAEA) convened a series of consultancy meetings beginning in October 2016, to (a) identify the needs and develop a plan to address those needs for the transport of low-activity radioactive material (defined for the purposes of this effort as "Normal Commercial Shipments") with respect to the interface between transport safety and transport security, (b) develop guidance on the interface between transport safety and transport security, and (c) development of a model workshop that will inform IAEA Member States of the interface between transport safety and security.

Specifically, the materials addressed in the IAEA Technical Report Series, TRS No. 1001 (in preparation), are those that are limited to low activity radioactive material (including nuclear materials) with activities below 3000 A_2 – as defined in the IAEA transport safety regulations – or activities below 10 D – as defined in the Code of Conduct on the Safety and Security of Radioactive Sources – depending on the radionuclide(s) involved. Emphasis was placed in the Technical Report on these materials since, worldwide, little effort has focused on security for their transport and such guidance could prove beneficial to regulators and operators in many developing countries. An IAEA Technical Report has been drafted and is currently undergoing final steps for publication. The Technical Report will address the issues identified during the consultancy meetings, with a focus on the needs and methods for clarifying safety–security interfaces. This paper will introduce the structure and contents of the Technical Report and provide an update on its progress toward publication. A separate PATRAM 2019 paper will outline the workshop materials developed to date.

INTRODUCTION

Nuclear safety and security share the same goal, i.e. 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 may 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 responsibility for nuclear security within a State rests entirely with the State but as part of an international effort to address the provisions that complement or conflict with each other in the interface between safety and security during transport, the IAEA convened a series of consultancy meetings beginning in October 2016, to initiate work identifying the needs for the transport of low-activity radioactive material with respect to the interface between transport safety and transport security, and to develop a plan for addressing those needs.

One result of this effort was the development of an IAEA Technical Report, TRS No. 1001 (in preparation) the purpose of which 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. The Technical Report, based on international good practices, outlines how this interface can be defined and understood to avoid conflicts when sometimes-disparate transport safety and security measures are applied.

A second result of this effort was the development of materials to be used in workshops addressing the safety/security interface. A separate paper being presented at PATRAM 2019, "Applying Immersive Learning Methodologies to the Safety and Security Interface Paradigm for Normal Commercial Shipments of Radioactive Material" provides the status of the workshop material and plans for workshops.

In developing the Technical Report, it was recognized that some Member State competent authorities are responsible for both safety and security of radioactive material in transport and provide national requirements to operators within a single set of regulations 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, because there exists an interface between IAEA safety requirements and security recommendations for the transport of radioactive material, the national regulations will need to avoid conflicts between their transport safety and security requirements. It was also recognised that the understanding and implementing of regulatory requirements by operators is of crucial importance to providing effective safety and security for both domestic and international shipments. And, for international shipments, it was also 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.

BASIS FOR DEFINING WHAT CONSTITUTES "NORMAL COMMERCIAL SHIPMENTS"

This effort was the first attempt by the transport safety and transport security elements of the IAEA to jointly address the transport safety–security interface. Thus, it was decided to limit the scope of the effort to lower activity radioactive materials thereby serving as a model for later expanding the interface effort to higher activity materials.

For the purposes of the Technical Report and the development of companion workshop materials, "normal commercial shipments" of radioactive material was defined as involving radioactive materials in transport that (a) only require prudent management practice, or (b) require both prudent management practice and basic transport security level measures as specified in NSS No. 9, Rev. 1 [1]. Specifically, these are radioactive material packages where the upper threshold values are:

(a) for specified radioactive material, 10 D and less;

(b) for most other radioactive material, 3,000 A_2 and less.

The radioactive material for which the 10 D limit apply, the specific 10 D values in terms of TBq for the 10 D threshold, and the basis for choosing these specific radioactive materials can be found in an appendix to NSS No. 9, Rev. 1. The A_2 values for all other radionuclides can be found in Table 2 of the IAEA Regulations for the Safe Transport of Radioactive Material – 2018 Edition, SSR-6, Rev. 1 [2].

In summary, "normal commercial shipments" are those which are low-activity radioactive material and may include nuclear material below Category III as defined in INFCIRC/225/Rev. 5 [3].

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 for this Technical Report generally constitute a large majority of the shipments made worldwide.

ACCOUNTING FOR ROBUST NATURE OF TRANSPORT PACKAGINGS WHEN DETERMINING APPROPRIATE SECURITY MEASURES

Many "normal commercial shipments" of radioactive material will be undertaken in package designs which, as prescribed in SSR-6, Rev. 1 [2], are not required to be resistant to the accident conditions of transport. This reflects the graded approach implemented in the IAEA Transport Safety Regulations [2] and various IAEA Nuclear Security recommendation and guidance documents [1][3][4][5], which require accident-approved packages for higher activity and risk materials as well as requiring reduced testing conditions for packages with lower activity and risk materials, called in SSR-6 "normal conditions of transport" (NCT).

On the one hand, since packagings accommodating lower activities could often be light weight, they may therefore present a greater attractiveness for theft by those with malicious intent. In that event, additional security measures may need to be considered to reduce accessibility by an adversary. On the other hand, these packagings may generally provide a significantly lower risk for safety-relevant events to the public due to the limited activity permitted by the Transport Regulations [2].

Conversely, in the case of "normal commercial shipments" of radioactive material in thick-walled/very robust package designs such as Type B packages, the risk of sabotage may be mitigated because significant efforts would be required to breach the containment of such packages. NSS No. 9, Rev. 1 [1] suggests that there may be a need to assign appropriate additional security measures to such packages depending upon the attractiveness of the material being shipped.

CONTENTS OF THE TECHNICAL REPORT

The Technical Report contains the following basic elements:

1. INTRODUCTION
2. BASIS FOR DEFINING WHAT CONSTITUTES NORMAL COMMERCIAL SHIPMENTS
3. SAFETY–SECURITY INTERFACE ISSUES
4. INTERFACE CONSIDERATIONS
5. INTERFACE TASKS
6. PROCESS FOR ADDRESSING TRANSPORT SAFETY-SECURITY CONFLICTS

- APPENDIX I. EXAMPLE TRANSPORT TASK QUESTIONS FOR RESOLVING TRANSPORT SAFETY-TRANSPORT SECURITY INTERFACE CONFLICTS

- APPENDIX II. GUIDE TO CLASSIFYING PACKAGES OF RADIOACTIVE MATERIAL FOR DETERMINING THE APPROPRIATE UN NUMBER AND SECURITY REQUIREMENTS

The first two of these elements have been summarized in the preceding text. The other elements are briefly highlighted in the following text.

SAFETY–SECURITY INTERFACE ISSUES

This section of the Technical Report discusses how 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, thereby raising interface issues that will need to be addressed. After elaborating on these interfaces and issues in general, this section of the Technical Report notes, within the context of the interface between transport safety and transport security, that:

(a) The safety measures of SSR-6, Rev. 1 [2], 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 [1] 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 the Technical Report;

(c) 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;

(d) 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;

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

(f) Unless approved by the competent authorities, operators should not introduce additional security measures without consideration of the effects on the compliance with the safety requirements.

To facilitate better understanding, this section of the Technical Report further elaborates on differences in terminology typically used in the transport safety and transport security arenas. For example, it notes that the SSR-6, Rev. 1 [2] and all ensuing applications thereof use the terms "fissile nuclides" and "fissile material", whereas IAEA security documents (e.g. NSS No. 13 [3]) use the term "nuclear material". As a result, this also introduces a potential communication interface issue between transport safety and transport security.

INTERFACE CONSIDERATIONS

This section of the Technical Report elaborates on the possible variations in security requirements which may arise from situations involving 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. It builds on the seven steps listed in NSS No. 9, Rev. 1 [1] that a State will need to take to ensure adequate interfacing of safety and security and provides guidance on actions to be taken by competent authorities and operators.

Briefly, these seven steps are:

1. Maintaining a balance between safety and security concerns;
2. Providing consistent regulatory requirements for both safety and security;
3. Ensuring safety requirements do not compromise security, and security requirements do not compromise safety;
4. Coordinating safety and security between responsible authorities;
5. Addressing safety and security cultures in an integrated fashion;
6. Accounting for safety and security measures during both normal and emergency situations; and
7. Ensuring that security measures during a response to a nuclear security event do not adversely affect safety.

This section further elaborates on the interface issues that may arise between consignors, carriers and consignees.

INTERFACE TASKS

This section of the Technical Report discusses twenty transport-related tasks and their potential for either conflicting or complementing the safety–security interface. These tasks are then elaborated further in Appendix I where example questions are provided that can be used to assist stakeholders in resolving interface conflicts.

Each of these tasks 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. As a result, operators need to ensure that all transport safety and security regulatory requirements are satisfied and that the associated transport safety–security interfaces are appropriately addressed. If, in this process, conflicts are identified, then the involved parties (which may include consignors, carriers and consignees) will need to coordinate and communicate with their relevant competent authorities to obtain direction and approval for any changes intended to resolve the conflict(s) that affect either safety or security.

The twenty tasks are:

1. General interface between safety and security,
2. Regulations and compliance,
3. Threat assessments,
4. Management of security-related information,
5. Operational controls,
6. Carrier qualifications,
7. Training and training records,
8. Personnel trustworthiness,
9. Personnel identification,
10. Safety and security inspections,
11. Design of transport packages,
12. Stowage and retention of packages during transport,

13. Locks and seals,
14. Monitoring and tracking of packages and vehicles,
15. In-transit storage of radioactive material during transport,
16. Communications,
17. Written instructions and documentation,
18. Marking and labelling of packages, and placarding of vehicles and freight containers,
19. Identification of consignees and authorization requirements, and
20. Surveillance

For each task, the methodology provided in Appendix I elaborates on issues related to that task and provides one or more questions that may need to be addressed. It then provides, in table form, areas where involved parties can answer how the issue is proposed to be resolved with respect to safety, security and the interface between the two. An example of this methodology is shown here as Table I for Task 20, "Surveillance".

TABLE I. EXAMPLE TRANSPORT TASK QUESTIONS TO ASSIST STAKEHOLDERS IN RESOLVING CONFLICTS WITH THE TRANSPORT SAFETY–SECURITY INTERFACE.

Issue	Safety	Security	Interface
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*" [6] 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.			
Q20.1: 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?			

PROCESS FOR ADDRESSING TRANSPORT SAFETY−SECURITY CONFLICTS

This section of the Technical Report describes a process to be followed by the operators and the safety and security authorities to resolve conflicts between safety requirements and security measures. It notes that the operators must comply with all safety and security requirements. In the event that an interface conflict results in a problem complying with a safety or security requirement, such a non-compliance will involve compensatory measures which must be approved by the safety and security competent authorities. For safety, the compensatory measures may include the requirement to ship under a special arrangement approval, which must be accomplished before the shipment begins. The process for resolving such non-compliances is shown in Figure 1.

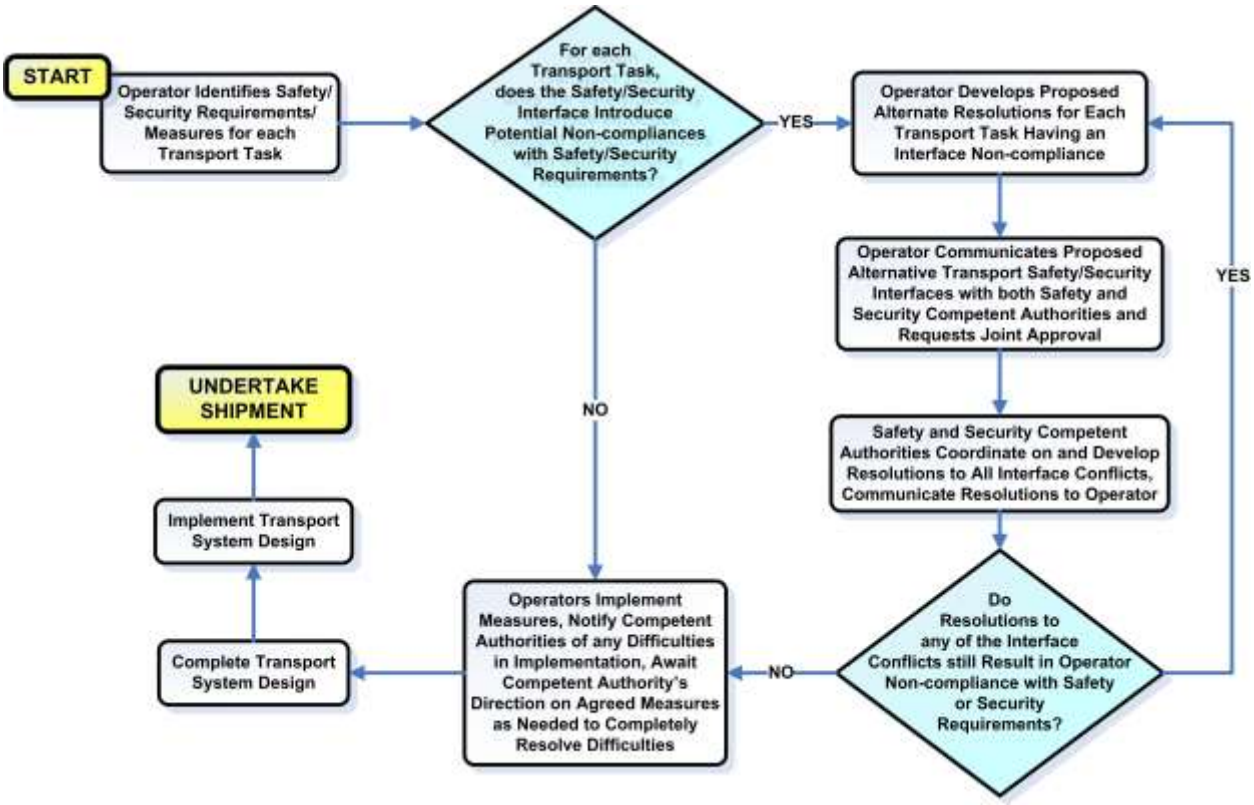

Fig. 1. Process for operators and safety and security competent authorities to follow in resolving transport safety–security interface conflicts.

In applying the process shown in Figure 1, the identification of a potential conflict will depend on the specifics of the consignment being planned. Here, the consignors will need to have all involved parties consider many factors, including (but not limited to):

(a) the radioactivity 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 Technical Report notes that the topically-related example questions which are provided in Appendix I (an example of which is shown in Table I above) can be used with this decision chart to further facilitate the resolution of such conflicts.

ADDITIONAL GUIDANCE

In addition to the guidance already discussed, Appendix II of the Technical Report provides additional insights into how to classify a package of radioactive material for determining the appropriate UN Number and the associated security requirements.

It emphasizes, for example, that if the contents of a package of radioactive material consists of any nuclear material (i.e. fissile nuclides), then the guidance in the Technical Report only applies to the security of transport of such packages that are categorized below category III (for nuclear material) as defined in NSS No.13 (INFCIRC/225/Revision 5) [3], where the radioactive nature of the material most likely will control the required level of security (for further insight, the user of the Technical Report is referred to NSS No. 9, Rev. 1 [1]).

To assist in this process, a comprehensive set of four tables are included in the Technical Report which correlate each UN Number with the necessary security level or levels of security that may apply to that 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. They then illustrate which security requirements apply for that given UN Number as set forth in NSS No. 9, Rev. 1 [1], NSS No. 14 [4], and NSS No. 26-G [5].

CONCLUSION

The effort described in this paper was accomplished through five Consultants Meetings convened at the IAEA beginning in October 2016, involving 19 transport safety–security experts from Belgium, Burkina Faso, Canada, France, Italy, the Russian Federation, the United Kingdom, and the United States of America; as well as the IAEA and the World Nuclear Transport Institute (WNTI).

The Technical Report that was developed is intended to provide guidance to all stakeholders involved in the transport of lower activity radioactive materials which are defined, for the purpose of the Technical Report and the associated Workshop materials, as “normal commercial shipments”. The guidance is directed toward helping the stakeholders identify and resolve any transport safety/transport security interface issues.

The Technical Report is undergoing the final process for publication by the IAEA, expected in 2020.

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