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Safe Transport of Radioactive Materials. Security in Transport of Radioactive Materials.

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Abstract
Transport of radioactive material is closely regulated to provide a high degree of safety, and transport safety regulations have been in effect throughout most of the world for decades. However, transport security recommendations for many types of radioactive material have only recently been developed. The interfaces between safety and security are numerous, and while some of the interfaces are complementary, others require careful consideration to ensure an appropriate degree of both safety and security during transport.

Several significant steps have been taken in defining and implementing appropriate security approaches for transport. The International Atomic Energy Agency (IAEA) implementing guide *Security in the Transport of Radioactive Material* provides a baseline of security approaches and measures suitable for adoption by countries and international transport modal organizations. The IAEA, U.S. Department of Energy Global Threat Reduction Initiative, and other international partners are working with States to implement transport security programs. However, there is still much to be accomplished before transport security is on par with transport safety.

This paper briefly reviews the transport safety requirements and describes the development and implementation of transport security recommendations. It identifies several safety and security areas that are complementary and some where regulatory authorities may wish to consider approaches that provide appropriate safety and security without compromising one or the other.

1. Introduction

Transport of radioactive material is an activity that was largely "born regulated." In the early stages of nuclear technology development, it was recognized that these materials presented unique hazards during transport. Initially, countries independently developed their own approaches to safety. However, in the late 1950s, efforts were undertaken that led to the publication of the first international regulations on radioactive material transport safety, the *IAEA Regulations for the Safe Transport of Radioactive Material* [1] which have been periodically updated, the latest edition of which is the 2005 edition (hereafter, Transport Regulations).

The Transport Regulations have a long history of implementation that has resulted in their rather uniform application throughout the world. Most developed countries and the international transport modal organizations use them as the basis for their requirements. Shippers and carriers have designed their transport operations to comply with these requirements, and compliance is generally found to be very good.

Except for some fissile materials (also called nuclear material in international instruments), the security of radioactive materials during transport was not a major concern prior to September 11, 2001. Normal commercial practices were considered adequate to prevent loss of the material, and there was little concern that anyone would want to acquire the material for malicious purposes. That belief has been disproven by the revelation that adversaries not only have examined the possibility of using radioactive materials for malicious acts, but also have planned such acts and demonstrated a willingness to use all means at their disposal to carry them out. The IAEA and Member States have worked cooperatively to develop a new guidance document "*Security in the Transport of Radioactive*

Material" [2] and have initiated activities to assist Member States in addressing the need for transport security in a comprehensive manner.

2. Transport Safety

2.1. Development of the Transport Regulations

As early as 1951 it was recognized that the unique hazards of radioactive materials need to be addressed to ensure the safety of persons and property during transport [3]. As countries explored potential applications for nuclear and other radioactive material technologies, the need for more comprehensive safety regulations became evident.

In 1953 a United Nations (UN) Committee of Experts was established by the Economic and Social Council (ECOSOC) to develop a system of recommendations on the safe transport of all dangerous goods. It was intended that these recommendations would reduce the risks inherent in the rapidly increasing international transport of dangerous goods and that they could also be adopted as national requirements. The UN Committee of Experts developed the well recognized dangerous goods classification and labeling system that is still in use today.

The IAEA was established by statute on October 23, 1956, by the Conference on the Statute of the International Atomic Energy Agency, which was held at UN headquarters. Among its functions, the agency was charged with establishing "standards of safety for protection of health."

In 1959 the UN Committee of Experts recognized the desirability of coordinating with the IAEA to draft recommendations relating to the safe transport of radioactive material. ECOSOC requested that the UN Secretary General inform IAEA of ECOSOC's desire that IAEA be entrusted with drafting recommendations on the transport of radioactive material, provided the recommendations would be (1) consistent with the principles adopted by the UN and (2) formulated in consultation with the UN and relevant specialized agencies. The ECOSOC request complemented IAEA's mandate to establish safety standards.

Following the ECOSOC decision, IAEA developed its first Transport Regulations, published in 1961, for application to the national and international carriage of radioactive material by all modes of transport. Subsequent reviews, conducted by the IAEA Secretariat in full consultation with IAEA Member States and the relevant specialized UN agencies, have resulted in five comprehensively revised versions (published in 1967, 1973, 1985, 1996, and 2005). All versions of the Transport Regulations have taken into account technical advances, operational experience, evaluation of new information on transport accidents (including risk assessments), and the latest radiation protection principles, while maintaining a stable framework of regulatory requirements.

During the 47 years that the Transport Regulations have been available, they have been extensively used as the basis for national and international requirements. In response to an IAEA survey in 1998, 30 of 31 nuclear power countries and 88% of the responding countries indicated that they had legally binding regulations based on the Transport Regulations. Because the Transport Regulations also provide the basis for radioactive material provisions in the UN Model Regulations for the Transport of Dangerous Goods, the international modal organizations (International Civil Aviation Organization, International Maritime Organization, etc.) and many countries have been adopting them relatively uniformly.

Widespread implementation of the Transport Regulations has had very favorable results—there have been no deaths or serious injuries resulting from the radioactive nature of materials being transported in accordance with the regulations. Compliance with the Transport Regulations is also reported to be good [4] and is a key factor in this enviable safety record. Shippers and carriers have attributed the high degree of compliance with the safety regulations to the fact that the regulations have been uniformly adopted and applied. The following were the major factors identified for accomplishment of a high degree of compliance:

1. Adoption of uniform transport safety regulations by countries and the international modal organizations—this facilitates training and procedures that are simple to apply.
2. Consistency with other dangerous goods requirements—this eases the compliance burden on shippers and especially carriers that do not transport radioactive shipments on a frequent basis. While requirements unique to radioactive material are inevitable, keeping such requirements to a minimum reduces potential problems for carriers that are familiar with other dangerous goods requirements.
3. Uniform interpretation and application of the regulations—in most cases, the regulatory requirements are interpreted and applied similarly by IAEA Member States although there are cases where Member States exercise their right to apply differing or more stringent requirements.
4. Avoiding unique regulatory requirements—country-specific requirements are easy to overlook when they are inconsistent or in addition to the international requirements. Some shippers noted that the International Air Transport Association's Dangerous Goods Regulations were particularly helpful because they identified both carrier- and country-specific variations.

2.2. Key Provisions of the Transport Regulations

The Transport Regulations are designed to provide protection of persons, property and the environment from the hazards posed by radioactive material during transport. The original drafters of the regulations formulated them with four primary objectives in mind: (1) containment to prevent spread of the radioactive material, (2) shielding to prevent harmful exposure to radiation, (3) criticality safety for fissile material, and (4) heat management to safely dissipate decay heat. While the Transport Regulations themselves are very detailed, these four objectives have proven to be sufficient to ensure safe transport over many decades.

In the Transport Regulations, primary responsibility for safety is placed on the consignor (i.e., shipper, the entity or person preparing and offering radioactive material for transport) since this entity knows the most about the material being shipped and is in the best position to ensure it is properly packaged and prepared for transport. Actions taken by the carriers of the material are limited to a few simple operational controls such as limiting the accumulation of packages and separating personnel from packages to limit exposure.

Because the consignor has overall responsibilities for the proper packaging and preparation of radioactive material for transport, detailed knowledge of the Transport Regulations is imperative. The IAEA has an in-depth training course available that can assist Member States and other involved in the transport of radioactive material in understanding and applying the Transport Regulations [5]. While the course is primarily intended for regulatory authorities, it can also assist consignors and carriers in recognizing their responsibilities and provide them with a detailed understanding of how to comply with the Transport Regulations.

The transport safety objectives are accomplished by a structured approach that includes
- identification of the material being transported,
- classification of the material to determine packaging and other requirements,
- hazard communication,
- packaging, and
- other controls.

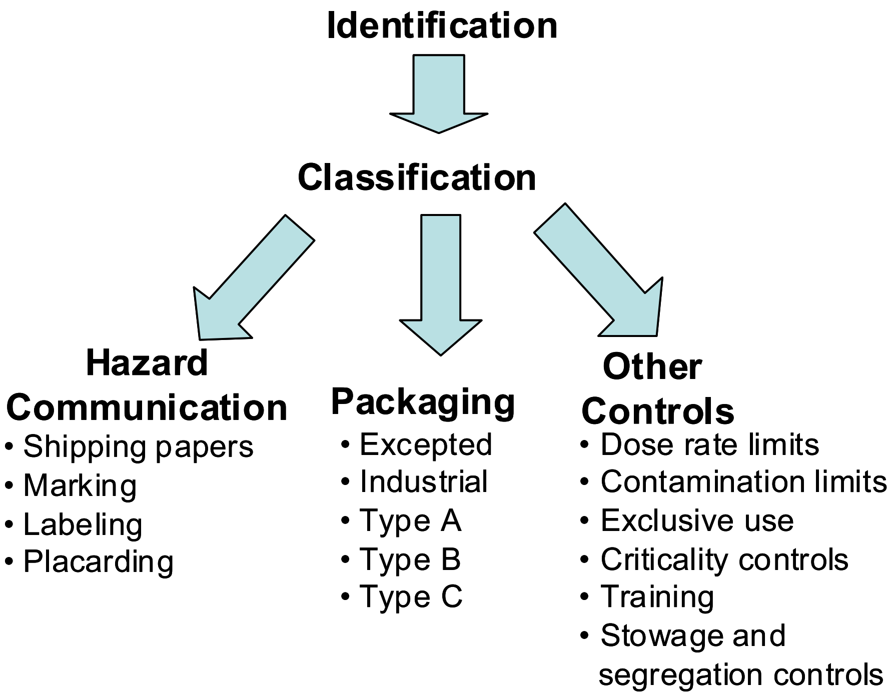

FIG. 1. Major components of transport safety [6].

Application of the Transport Regulations requires that a knowledgeable user understand and apply them in their totality. There is much interdependence between the contents, packaging, hazard communication, and other controls in actual practice. The descriptions in Sections 2.2.1 to 2.2.5 of this paper only highlight some important aspects of the regulations and are not a full representation of what is necessary to properly prepare a package for shipment.

2.2.1. Identification

The first step in safely transporting radioactive material is to fully identify and characterize the contents to be shipped. Many decisions must be made by the consignor based on knowledge of the material, including radionuclides present, form of the material (special form or not special form), chemical and physical nature of the material, activity of each radionuclide and total activity, activity concentration of the material, mass of fissile radionuclides, and any subsidiary hazard classification of the material such as corrosiveness. Some natural materials, while radioactive, have sufficiently low activity concentrations that they are not subject to the Transport Regulations (Section I), and some other materials have sufficiently low activity or activity concentrations that they are exempt from them as well (Sections II and IV).

2.2.2. Classification

One of the most complicated steps in preparing a consignment is properly classifying the material. Key provisions in the Transport Regulations that affect proper classification include those below.

- Section II, "Definitions": A_1 and A_2 (activity limits for individual radionuclides in non-accident resistant packages); fissile material; low dispersible material; low specific activity material; radioactive material; special form radioactive material; specific activity; surface contaminated object; unirradiated thorium; unirradiated uranium; and uranium—natural, depleted, and enriched
- Section IV, "Activity Limits and Material Restrictions": A-values for radionuclides; activity limits for package types
- Section V, "Requirement and Controls for Transport": Consideration of other dangerous properties of the contents

2.2.3. Hazard communication

Safety requires open and accurate communication of information on the hazards presented by the package and the potential hazards of the contents in case there is an accident involving damage to the package or release of the contents. Markings applied to the outside of each package communicate the type of package and in some cases information on the contents. Specific information about the contents is included on the labels applied to the outside of each package and listed on the shipping papers (documentation). Labels also communicate information necessary to limit the accumulation of packages for radiation protection and criticality safety purposes (transport index and criticality safety index). Placards or enlarged labels are used on the external surfaces of freight containers and tanks to visually communicate the nature of the contents at a distance.

2.2.4. Packaging

Proper packaging is the cornerstone for meeting the four objectives of safe radioactive material transport (containment, shielding, criticality safety, and heat management). Package types that are not designed to withstand severe accidents are restricted to contents that present limited hazards. These include

- excepted packages with very limited contents;
- industrial packages with contents limited on the basis of activity concentration or surface contamination, and dose rate from the unshielded contents; and
- Type A packages with contents limited such that if they are released from the package or if shielding is degraded, there will be limited radiation exposure to persons.

Packages designed to withstand severe accidents are permitted to transport contents that could have high potential consequences if released. Type B packages are designed to withstand impact/crush, penetration, thermal, and water immersion tests that represent the forces that could be encountered in the event of a severe accident. Type C packages are required to withstand puncture/tearing, enhanced thermal, and higher impact velocity tests that represent the forces that could be encountered in a severe aircraft accident. Type B and Type C package designs must be approved by the competent authority and used in accordance with that approval.

Fissile materials have special packaging requirements designed to protect against the criticality hazards the contents may pose. Uranium hexafluoride has special packaging requirements designed to protect against its chemical hazards and unusual physical characteristics.

2.2.5. Other controls

There are a number of other controls that must be fulfilled by the consignor and carrier to ensure that the package does not present a hazard during transport and that it is handled safely.

The consignor must ensure that:

- the external dose rates emanating from the package and the conveyance do not exceed specified limits
- removable contamination on the outer surfaces of the package does not exceed specified limits
- exclusive use carriage conditions are provided in the case of high radiation level packages and shipments of certain fissile packages

Similarly, the carrier must ensure that their personnel have received training in the proper handling of radioactive material shipments. These handling provisions include proper loading, separation from personnel, and segregation from other goods (film and certain other dangerous goods). These "other controls" complete the suite of transport safety measures that contribute to the enviable safety record for these shipments.

3. Transport Security

Security of nuclear (fissile) material, including during international transport, has been addressed since 1979 under the umbrella of the Convention on the Physical Protection of Nuclear Material [7].

States that are party to the Convention are obligated to abide by the security provisions specified in it. However, the same situation does not exist for security of non-fissile radioactive material during transport. Heightened awareness of the need to secure such materials during transport has led to a series of developments aimed at defining and supporting uniform implementation of transport security requirements.

3.1. Dangerous Goods Transport Security

Recognizing the need for increased security following the events of September 11, 2001, the UN Committee of Experts introduced measures to enhance security for the transport of all dangerous goods in the 12th revised edition of the Model Regulations. These security measures were developed with input from many affected parties and reflect what the committee feels is a balanced approach to transport security. The measures are included in Chapter 1.4 of the Model Regulations, which contains basic security requirements applicable to the transport of all dangerous goods and additional requirements for high consequence dangerous goods. An indicative list of high consequence dangerous goods is provided in the chapter.

3.2. Radioactive Material as Class 7 Dangerous Goods

As part of the process to develop the dangerous goods security requirements, the Committee of Experts consulted with the IAEA regarding the definition of high consequence radioactive material. With very little time for consultation with Member States, the IAEA provided the committee with its recommendation based on other provisions within the Transport Regulations.

Beginning with the early versions of the Transport Regulations, there has been a threshold for denoting what constitutes a "large quantity" of radioactive material. In the current Transport Regulations, this is 3,000 A_1 for special form material and 3,000 A_2 for non-special form material. IAEA agreed that this was a suitable threshold for identifying high consequence radioactive material, with the observation that the dangerous goods security requirements should not apply to nuclear (fissile) material that is already subject to physical protection requirements during transport as a result of the Convention on the Physical Protection of Nuclear Material and the supporting guidance in INFCIRC/225. These recommendations provided the basis for the Class 7 (radioactive material) requirements in the Model Regulations.

3.3. IAEA Transport Security Guidance

Although the security measures and definition of high consequence radioactive material added to the Model Regulations were recognized as a very positive step, the IAEA initiated a review of these provisions to ensure they were technically sound and consistent with other approaches used in nuclear and radioactive material security. A series of consultant and technical meetings were held between October 2003 and January 2006 to review the transport security provisions and develop guidance to assist Member States in implementing appropriate measures. The recommendations of the Technical Meeting to Review Guidance for Security in the Transport of Radioactive Material held January 23–27, 2006, at the IAEA headquarters in Vienna, provided a good summary of the conclusions of this series of meetings.

1. Some radioactive materials, such as excepted packages, low specific activity materials, and surface contaminated objects that can be shipped unpackaged, do not warrant security measures above prudent management practices.
2. Two categories of security measures, basic and enhanced (differentiated by a radioactivity threshold) are sufficient for specifying appropriate measures and are consistent with the approach used for other dangerous goods in the UN Model Regulations.
3. The threshold for high consequence radioactive material should be revised to take into account analyses done on the consequences of intentional dispersal and developments in the safety and security of radioactive sources.
4. While the security requirements in the Model Regulations are an adequate set of baseline measures, there are additional measures that Member States might wish to consider when the

national Design Basis Threat indicates it might be appropriate, in situations of increased threat, or for particularly attractive material.

These recommendations result in three groups of security measures which are illustrated in Figure 2.

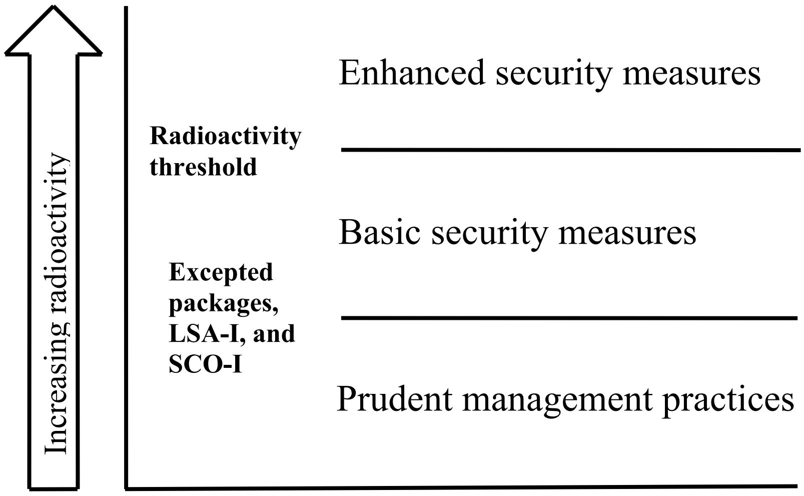

FIG. 2. Incremental security measures.

3.3.1. Exceptions from security requirements

Malicious use of radioactive material could involve exposure to radiation (a radiation exposure device) or dispersal of the radioactive material (a radiological dispersal device). Small quantities of radioactive and low activity concentration materials would not be very effective in such applications because the consequences of their use would be low. Therefore, the draft guidance recommends that no transport security measures above prudent management practices be required for the following:

- excepted packages with contents limited to the activity allowed for non-special form material,
- low specific activity material in category LSA-I that can be shipped unpackaged, and
- surface contaminated objects in category SCO-I that can be shipped unpackaged.

3.3.2. Two categories of security measures

Radioactive materials present a very wide spectrum of attractiveness for malicious use. Materials and packages with potentially significant but limited consequences such as Type A packages, LSA-II, LSA-III, and SCO-II have some attractiveness. By contrast, packages containing high activities such as large sealed sources or large quantities of radionuclides (especially in dispersible form) could be very attractive for malicious use. Even with this broad spectrum of attractiveness, it was concluded that two security categories could be used to specify appropriate measures, particularly in light of the desirability to be consistent with the Model Regulations.

Two security categories were recommended—basic level and enhanced level. The specific security measures recommended for each level were drawn from the Model Regulations and, where necessary, tailored for application to radioactive material shipments.

At the basic level the security measures include security awareness training and periodic retraining, maintenance of training records, use of known or identified carriers, and use of properly secured in-transit storage areas.

Enhanced level security measures include recommendations that consignors, carriers, and others (including infrastructure managers) develop, adopt, implement, and comply with a security plan that addresses the following:

- allocation of responsibilities and authority to fulfill these responsibilities;
- material transport records;
- reviews of operations and assessments of vulnerabilities;
- clear statement of measures to be used to reduce security risks;
- procedures for reporting and dealing with security threats, breaches, and incidents;
- testing, periodic review, and updating of security plans; and
- security of information including limiting distribution of it.

3.3.3. Threshold for enhanced level of security

Extensive discussions were held on how the threshold for the enhanced level of security should be defined. From a strict security standpoint, there are advantages to using a per-conveyance basis as this best identifies conveyances that are carrying a total quantity of material that should be protected. From an operational standpoint, a per-package basis is much more feasible to implement because it does not require carriers to keep a tally of the activity on the conveyance. It was concluded that the per-package basis was acceptable, and a radioactivity threshold was then defined to identify those packages that should be subject to the enhanced security measures.

Because the transport of nuclear (fissile) material is already subject to security requirements as specified in the Convention for the Physical Protection of Nuclear Material and the supporting guidance in INFCIRC/225 [9], there is some overlap between the two sets of recommendations. A comparison of INFCIRC/225 and the draft transport guidance shows that for

- Category I nuclear material, the security measures of INFCIRC/225 are more stringent than the enhanced security measures (e.g., requiring escorts), but this is appropriate given the much greater potential consequences that an improvised nuclear device could have when compared to a radiological dispersal device;
- Category II nuclear material, the security measures of INFCIRC/225 are roughly comparable to the enhanced security measures; and
- Category III nuclear material, the security measures of INFCIRC/225 are roughly comparable to the basic security measures.

Consequently, if Category III nuclear material with an activity per package that exceeds the radioactivity threshold for the enhanced level of security is being transported, the shipment should meet the enhanced security measures because of its radiological potential for malicious use.

Analysis of potential consequences such as denying the use of an area due to dispersed radioactive material was performed. As a benchmark the radioactivity required for causing the resettlement of 1 km^2 land area was calculated for a set of representative radionuclides. A simple planar distribution model was used to determine the radioactivity required to cause a 1,000 mSv lifetime dose (the criteria recommended by the International Commission on Radiological Protection for resettlement). Using the long term dose conversion factors for deposited radionuclides from IAEA TECDOC-955 [8], the radioactivity required to cause resettlement was calculated for a list of representative radionuclides.

The IAEA *Code of Conduct on the Safety and Security of Radioactive Sources* (the Code) [10] is being implemented by many countries. Ninety-two countries have notified the IAEA of their intent to implement the Code. Among other requirements, the Code and its supplement, *Guidance on the Import and Export of Radioactive Sources* [11], require certain measures such as notification and consent before the import or export of Category I and II radioactive sources. The desire to ensure consistency between the transport security measures and the Code was strongly held by many countries. Consequently, it was decided to align the radioactivity threshold for the 25 radionuclides contained in the Code with the Category II radioactive source threshold.

For radionuclides not included in the Code, it was recommended that a multiple of the A_2 values used in the Transport Regulations be adopted. Based on the dispersion analysis, a threshold of 3,000 A_2 was determined to be a reasonable threshold value. As a result the recommended threshold is 3,000 A_2 in a single package except for the radionuclides in the following table.

Table 1. Transport security thresholds for certain radionuclides

Radionuclide	Transport Security Threshold (TBq)	Radionuclide	Transport Security Threshold (TBq)
Am-241	0,6	Pd-103	900
Au-198	2	Pm-147	400
Cd-109	200	Po-210	0,6
Cf-252	0,2	Pu-238	0,6
Cm-244	0,5	Pu-239	0,6
Co-57	7	Ra-226	0,4
Co-60	0.3	Ru-106	3
Cs-137	1	Se-75	2
Fe-55	8000	Sr-90	10
Ge-68	7	Tl-204	200
Gd-153	10	Tm-170	200
Ir-192	0,8	Yb-169	3
Ni-63	600		

3.3.4. Additional security measures

While the basic and enhanced security measures are generally consistent with the Model Regulations, there may be instances when a country feels that the security situation calls for additional measures. For instance, additional measures may be warranted in elevated threat conditions, when the Design Basis Threat for the country indicates measures are appropriate, or when the attractiveness of the material is high. The guidance document provides a list of possible additional security measures that countries might wish to consider imposing when appropriate. Such measures include

- additional training for transport personnel,
- licensing of transport operators,
- real time tracking of shipments and the use of a transport control centre,
- guards,
- specially designed conveyances, and
- additional measures to protect the confidentiality of information.

While country-specific measures might create more difficulty in making international shipments, they are clearly warranted under high or elevated threat conditions.

4. Transport Safety and Security Interfaces

Transport safety is a deterministic based discipline. Specific tests and limitations are applied on the assumption that certain conditions and events may occur during transport. It is not assumed these will occur during any given transport (there is a probabilistic chance that they will), but each package must be designed, tested, and prepared for transport as if it is expected that they will occur. For example, packaging tests are defined based on assumed accident conditions, which while unlikely, establish the basis for package design and testing.

Transport security is a threat based discipline. It is not feasible to establish a single set of security measures that are suitable for use in all situations without seriously overdesigning the security system for anything but the highest threat conditions. This would be very costly and ineffective. Instead, the recommendations are intended to provide an appropriate level of security under normal threat conditions, and provisions are included that allow the adjusting of the measures to meet current threat conditions.

There are inevitable interactions between some safety and security measures in transport planning, preparation, and operations. These can be categorized on the basis of whether they are complementary or potentially conflicting and requiring decisions on what approaches satisfy both purposes. That is, some measures provide benefits in both areas, whereas some measures may benefit one while having a potentially adverse effect on the other. It is this latter category of measures that requires careful consideration by the regulatory authorities, consignors, and carriers to develop approaches that provide appropriate levels of protection in each area.

This can be illustrated with the major components of transport safety described in Section 2.2.

4.1. Identification
Identification of the material being transported is required for both safety and security. This step collects information on the material being transported that is necessary to determine what specific safety or security provisions apply based on the hazards (safety) or potential adverse consequences of malicious use (security).

4.2. Classification
In general, higher hazard radioactive materials require more stringent safety and security measures. However, this is not always the case. For example, a special form capsule of an alpha-emitting radionuclide presents a low safety hazard because the encapsulation is robust (containment), and no shielding is needed. At the same time, this material may be very attractive to an adversary because of its potential use in a radiological dispersal device. Consequently, safety and security need to be considered separately to determine what set of measures should be applied.

4.3 Hazard Communication
Hazard communication (safety) and information security (security) have conflicting objectives. From a safety perspective, it is desirable to warn workers, the public, and emergency responders of the presence of radioactive material. Marking, labeling, placarding, and shipment documentation are designed to clearly indicate the presence of radioactive material and the degree of caution that should be exercised. This can also be considered as advertizing to adversaries "here is the good stuff" and is contrary to maintaining a key element in transport security—unpredictability in when and where shipments are being made.

Some countries have developed pragmatic approaches to ensuring security while also ensuring that the functions supported by hazard communication can still be performed. For example, when escorts accompany a shipment, they can provide the communication to emergency responders that placards ordinarily do.

4.4. Packaging
Packaging is an area in which safety measures may or may not provide substantial security benefits. For example, large, heavily shielded Type B packages provide security benefits through delay (increasing the adversary task time) and sabotage resistance. The mass and construction of the packages provide protection of the contents, and the robust closures often require specialized tools and techniques to open the packages. However, lightweight drum-type Type B packages may contain

material with the potential for very high radiological consequences and yet be easily moved by a person. Some transport packages are intentionally designed for portability (well logging sources and radiography cameras). In these cases specific security measures are needed that take into account the speed and ease with which an adversary could complete acquisition of a package.

4.5. Other Controls
Most of the other transport safety controls described in Section 2.2 have little bearing on security. An exception is when exclusive use of the conveyance is required for safety purposes as this gives the consignor control over loading and unloading, routing, scheduling, and other operational aspects of the transport. While these safety controls are primarily focused on radiation protection (dose rate, contamination limits, etc.) security must address both access/removal of the packages from the conveyance and the seizure of the conveyance.

The Transport Regulations specify (in paragraph 108) that "These Regulations do not specify controls such as routeing or physical protection which may be instituted for reasons other than radiological safety. Any such controls shall take into account radiological and non-radiological hazards, and shall not detract from the standards of safety which these Regulations are intended to provide." Thus, a consignor should consider the possible impact of security measures on the safety measures required by Transport Regulations, and vice versa.

5. Conclusion

Transport safety and security for radioactive material have very different developmental histories and often require differing approaches to ensure accomplishment of their objectives. As transport security becomes more fully developed and integrated into the national regulatory frameworks of more countries, the regulatory authorities, consignors, carriers, and receivers of radioactive material shipments will be challenged to fully implement programs that address not only the well recognized requirements for safety, but also those for security. The IAEA, U.S. Department of Energy Global Threat Reduction Initiative, and other international partners are working with Member States to implement transport security programs and resources such as guidance, training programs, security assessments, and upgrades assistance are available. Working together, the international community can ensure that this critical need is addressed.

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