Fostering Member State Implementation of the IAEA's Transport Regulations

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1.0 INTRODUCTION

Man has been using radioactive materials for more than a century in ever-increasing numbers and types of applications, making them indispensable in modern life. Their use is not limited to energy production and the health and medical field, but also includes widespread applications in food production and processing, water resources management, industry, and research for education and analytical purposes. Typically, radioisotopic sources are prepared in one location, and transported by a combination of air and/or surface modes to the place or facility where they will actually be used. Because transport occurs in the public domain, it was early on recognized that safety requirements are needed during transport to ensure the protection of the public, as well as that of property and the environment, from the potential harmful effects of exposure to ionising radiation from radioisotopic sources.

Based on a 1959 mandate from the United Nations Economic and Social Council, international safety requirements are embodied in the "*Regulations for the Safe Transport of Radioactive Material*" that were first published by the International Atomic Energy Agency in 1961 and revised in 1967, 1973, 1985 and 1996 to keep them abreast of scientific and technical developments. The requirements are incorporated into the regulatory documents of the International Civil Aviation Organization for air transport, and the International Maritime Organization for marine transport. As the requirements of the latter documents are legally-binding for the member states of the corresponding organizations, the IAEA safety requirements thus also become mandatory in those countries. The same situation applies for the surface modes in Europe, by means of the regulatory documents of the European Community for rail, road and inland waterways.

The IAEA's transport Regulations have been in worldwide use since the 1960's. In the 1980's an assessment of the radiological impact of the transport of radioactive material reached the conclusion that "from the information available there has never been an accident or incident involving radioactive material transport which has led to the significant exposure of a member of the public". Media concerns in the mid-1990's caused discussions at the highest politico-technical level, the IAEA's General Conference, which recognized in 1998 that "compliance with regulations that take account of the Agency's Transport Regulations is providing a high level of safety during the transport of radioactive materials".

Nevertheless, the IAEA has not relaxed its efforts to ensure that its Transport Regulations stay abreast of scientific and technical developments; on the contrary, it has been undertaking a regular and vigorous review of its safety requirements, and continues to do so with the assistance of Member States and relevant international organizations.

Beyond providing the regulatory basis for the safe transport of radioactive material, however, the IAEA also offers a work programme under which it assists Member States in complying with the regulatory requirements. This assistance comes in the form of providing training on the safety requirements, and publishing documents that facilitate the exchange of information.

2.0 THE IAEA TRANSPORT SAFETY TRAINING PROGRAMME

The IAEA first started offering training on the requirements of its Transport Regulations in the early 1980's as a response to requests from certain Member States for national training courses. The first training course lasted for one week and was delivered to an audience comprising nationals of one country by a single lecturer who had to prepare his own lectures, visual aids and class exercises. The second training course was also organized for the officials of one country, but the IAEA had learned from its first experience and sent several lecturers who, however, also prepared their own lectures, visual aids and class exercises.

The need to provide training to more countries became apparent in the mid-1980's and the IAEA thus organized two 2½-week inter-regional training courses making possible the participation of one or two participants each from 10-15 countries worldwide. Yet again, however, the two sets of lecturers for the two separate training courses had to prepare their own teaching material for these training courses. This experience made it clear that preparing teaching material for each training course on the same subject was not only a waste of resources but also made for varying levels in the quality and uniformity of training material.

Thus, the idea was born to develop a standardized approach for the IAEA's training programme on the safe transport of radioactive material.

2.1 The Philosophy of IAEA Transport Safety Training

The aim of the IAEA's transport safety training programme is to ensure an internationally consistent and uniform level of understanding of the safety requirements embodied in the IAEA's "Regulations for the Safe Transport of Radioactive Material" by providing training to persons who bear the responsibility in their respective countries for providing national legislation and ensuring implementation of and compliance with IAEA standards.

In general, Member States recognize three categories of duties and responsibilities relating to the safe transport of radioactive material. Personnel from all entities that are involved in the transport of radioactive material can be grouped into:

- policy makers and senior managers,
- managers and similar responsible persons, and
- practitioners and hands-on persons.

The difference in the scope of duties and responsibilities among the groups also characterizes the difference in their respective training needs, hence the grouping is also used as the basis for defining the different audiences requiring training.

Policy makers and senior managers require training that addresses a wide scope of topics, but only to such a depth as to help them understand the need for legislation and the extent of cooperation required among the various involved government agencies in their respective countries and at an international level. Managers and similar responsible persons require in-depth training on a selection of topics that will enable them to carry out the objectives of their organizations. And, practitioners and hands-on persons require detailed training on very specific topics to help them carry out their particular assignments.

The IAEA is authorized by statute to provide training and, in view of limited resources, proposes to provide such training only at the international and regional level, leaving it for Member States to bear the responsibility for providing training at the country level. The primary target audience for IAEA training courses are staff of Member States' competent authorities for the safe transport of radioactive material and their counterparts from relevant national government agencies.

Being the United Nations organization responsible for developing and maintaining the international regulations for the safe transport of radioactive material, the IAEA likewise bears the obligation of providing training on the full requirements (i.e., for countries with a nuclear energy programme) of its Transport Regulations. On the other hand, Member State training on the IAEA's Transport Regulations may differ in scope and content from IAEA-provided training to address, for example, reduced scope for those countries that do not have a nuclear energy programme but expanded content to address additional or different national safety requirements, if any.

Under a train-the-trainer concept, it is considered the responsibility of IAEA-trained persons to disseminate the international-level knowledge and skills gained from IAEA training courses to their countrymen at country-level training courses.

2.2 Standardized IAEA Transport Safety Training Material

To address the problem described earlier about lecturers having to bear the burden of preparing their own lecture material, the IAEA collated the lectures that were presented at a regional training course in late 1980's and published them in a single IAEA training manual. The intent of preparing the training manual was two-fold: to provide a documentation of the extent of training received to those who participate at an IAEA training course, and

to provide to prospective lecturers the lecture material that they are expected to cover at their respective presentations. On the understanding that the training manual is used as the basis for teaching a training course, this step not only brought cost-reductions in the preparation of training material, but also set the standard for the content and level of lectures at IAEA training courses.

As an aside, it might be interesting to note that the first edition of the training manual for transport safety also marked the start of a series of IAEA publications, the Training Course Series.

In addition, the IAEA invited and received the advice of Member State subject matter and training experts who recommended that the concept of training modules be considered and developed, i.e., a "module" discusses a specific topic and contains terminal and enabling objectives, lecture text, visual aids and exercises to gauge the trainee's understanding of the topic. The topics should be addressed in a pre-determined sequence in a training course to ensure correct understanding of the safety requirements; they are:

1. Introduction;
2. Review of radioactivity and radiation;
3. Review of radiation protection principles;
4. Regulatory terminology;
5. Basic safety concepts: materials and packages;
6. Activity limits and material restrictions;
7. Selection of optimal package type;
8. Test procedures: materials and packages;
9. Requirements for transport (consignor's responsibilities);
10. Control of material in transport (consignor's and carrier's responsibilities);
11. Fissile material: regulatory requirements and operational aspects;
12. Quality assurance;
13. National competent authority;
14. Additional regulatory constraints for transport;
15. International liability and insurance;
16. Emergency planning and preparedness;
17. Training; and
18. Services provided by the IAEA.

Hand-in-hand with keeping the Transport Regulations abreast of scientific and technical developments comes the responsibility for updating the corresponding training material. Thus, for the 1996 edition of its Transport Regulations, the IAEA also upgraded and published the *third edition* of its Training Course Series No. 1, the training manual for the safe transport of radioactive material. This involved expanding the contents of the previous edition to reflect additional requirements introduced by the new Transport Regulations, re-arranging the presentation of topics to be consistent with the sequence listed, presenting a by-chapter reference list as needed, and adding exercise questions at the end of every chapter.

In addition, the new training manual is provided in the inside back-cover with a CD-ROM that contains:

1. The text of the training manual;
2. Visual aids linked to the chapters of the training manual and containing terminal and enabling objectives for:
   - 2.1 A comprehensive training course for competent authorities, i.e. addressing all the requirements of the Transport Regulations;
   - 2.2 A condensed training course for competent authorities, i.e. for countries without a nuclear energy programme;
   - 2.3 A training course for consignors and carriers;
   - 2.4 A training course for emergency first responders (for accidents involving the transport of radioactive material);
3. Visual aids for seminars:
   - 3.1 For countries whose national regulatory documents are being updated from the former edition of the IAEA's Transport Regulations;
   - 3.2 Providing an overview of the 1996 Edition of the Transport Regulations;
4. Visual aids for a module on instructor skills;
5. Tools for designing transport safety training courses;
6. A tool to help decide whether or not to apply the Transport Regulations; and

7. Software for viewing the visual aids.

All the visual aid files on the CD-ROM are provided as slide shows i.e. ready for immediate use, and in editable presentation files. The second format is provided to enable those Member States preparing national training programmes to add material that addresses additional national requirements, if needed.

The training manual and its CD-ROM insert are available in English; translations into the official Agency languages will be prepared as resources become available.

Any future major revision of the Agency's *Regulations for the Safe Transport of Radioactive Material* and the corresponding advisory material will require a corresponding revision of the training material. And, the training material for any topic requiring exhaustive treatment can be developed from the material already available in the current training manual.

2.3 Organizing International-Level Training

The IAEA organizes international-level training courses through its Department of Technical Co-operation with the assistance of Member State Governments willing to host such activities. The training courses are rotated among the five regions, namely, Africa, East Asia and the Pacific, Europe, Latin America and West Asia. Training is mainly offered to nationals from developing countries, but in very exceptional cases nationals from industrialized countries may be accepted.

Taking account of staff turnover at Member States' competent authority for the transport of radioactive material and relevant regulatory bodies, it is important for the IAEA to offer training in each of the regions repeatedly. Thus the following schedule of training courses is proposed:

Year	Region				
	Africa	**East Asia & Pacific**	**Europe**	**Latin America**	**West Asia**
2005			Tentative		
2006	Tentative			Tentative	
2007		Tentative			Tentative
2008			Tentative		
2009	Tentative			Tentative	
2010		Tentative			Tentative
2011			Tentative		
2012	Tentative			Tentative	
2013		Tentative			Tentative
2014			Tentative		

The schedule will ensure that training can be made available to all regions at three-year intervals, and the recurring pattern will help to facilitate the planning for and carrying out of each training course. However, the success of this programme depends on the availability of resources both at the IAEA and among those Member States who can potentially host the training courses.

IAEA training on transport safety is usually linked to Technical Co-operation funding and, to sustain a training programme, it is crucial to continue identifying appropriate Technical Co-operation projects whose scope and objectives include training on transport safety. That done, it is IAEA practice to shoulder the costs of participants from developing countries and a few international-level lecturers, training material (the training manual and relevant IAEA publications), and some administrative items. On the other hand, a hosting Member State provides the services of a Course Director, the classroom facilities, national-level lecturers and technical visits.

The IAEA's standardized approach to transport safety training includes a recommended programme for a two-week training course showing the sequence in which the topics mentioned earlier should be taught, as well as the time to be allocated for each topic. The sequence of topics coincides with the sequence of chapters in the training manual, and the training course can thus be delivered by simply following the training manual. The time allocated for each topic includes theoretical and practical parts, the theoretical parts corresponding to the text contained in the chapters of the training manual, and the practical parts consisting of written exercises at the end of each chapter.

The programme details for a particular training course are very much influenced by the availability of national resources, however, and variations from the recommended programme will thus be agreed on a case-to-case basis between the Course Director and the IAEA.

In addition the course programme foresees the inclusion of technical visits at which the practical application of the safety recommendations are demonstrated. Ideally, three technical visits should be arranged:

1. To the assembly line of a manufacturer of radioisotopes – to observe how radioactive material packages are marked and labelled, the procedures followed for stowing the packages on a vehicle, implementation of placarding requirements, and the provision of shipping documentation and emergency response information to the vehicle driver;
2. To an air- or sea-port – to observe the procedures for receiving packages containing radioactive material for onward transmission and to understand the typical problems encountered by carriers; and
3. To the facilities of a company licensed to carry radioactive material packages – to learn about and observe emergency preparedness and response arrangements. Course organizers can enhance the pedagogic value of this visit by carrying out a simulated emergency response exercise involving the transport of radioactive material. The scenario for such an exercise is available from the IAEA.

2.4 Organizing Country-Level Training

As already mentioned, Member States bear the responsibility for providing country-level training for their respective regulatory officials and industry representatives. Such training can be patterned after the IAEA's approach:

- nationally-trained officials bear the responsibility for providing training at provincial and city levels, and officials in charge of ensuring regulatory compliance bear the responsibility for providing training to those that have to comply with those requirements; and
- training material for the different types of training courses must be approved at the national level to ensure a consistent high quality.

The training courses in a national training programme would – as for international training courses – also need to be offered at regular intervals, and could be arranged in repeating cycles as follows:

Type of training event	**Year 1**				**Year 2**				**Year 3**				**Year 4**			
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
1. One-week national course for staff of regulatory bodies	x								x							
2. One-day course for emergency first-responders		x								x						
3. Three-day course for consignors and carriers			x								x					
4. One-day course for drivers and clerical staff				x				x				x				x

or in a variation of cycles as appropriate to a country's needs. This can help to ensure the regular availability of training at all levels for all those involved in the safe transport of radioactive material.

Country-level training will address international safety requirements and whatever additional national requirements are applicable, if any. And the training material can also be patterned after the IAEA's approach, i.e., a national training manual based on the IAEA's training manual with appropriate material addressing national requirements added to each chapter as needed. This will ensure that the treatment of international safety requirements is at a level consistent with IAEA standards. Practice-specific training material, e.g. for drivers, may then be developed

from the national training manual to treat in detail only such chapters (or parts of chapters) as are relevant to the practice.
To support this concept, the IAEA has sent copies of its training manual – a non-priced publication - to those designated competent authorities responsible with respect to the safe transport of radioactive material whose identity have been communicated by the Member States to the IAEA, to all participants who have attended IAEA transport safety training courses since 1996, and to all parties that have asked for copies. Thus the IAEA's training manual has been widely distributed and been made available for Member States to use also in their respective national training programmes.

3.0 OTHER TOOLS FOR REGULATORY IMPLEMENTATION

The IAEA not only offers a standardized training programme but also publishes documents that can help Member States in implementing the Transport Regulations. These are periodical reports prepared from data that Member States provide to IAEA databases and are described briefly. The current versions of the respective publications may be accessed from the List of Documents and Publications from the Website:
http://www-ns.iaea.org/tech-areas/radiation-safety/transport.htm

3.1 Member States Regulatory Infrastructure

Since 2000 the IAEA has been collecting information on how Member States regulate the transport of radioactive material, and in particular if their national regulations comply with the requirements of the 1996 edition of the IAEA's Transport Regulations. The data is compiled in a "Survey of Member States' Regulatory Infrastructure". At the time of writing, 61 of the IAEA's 137 Member States have provided information to the survey, 46 reporting that they are implementing the 1996 Edition of the IAEA's Transport Regulations. The other respondents report being at various phases in the development of national legislation to reach the same goal.

The IAEA will update the survey annually by the IAEA until the General Conference is satisfied with the response rate.

3.2 List of National Competent Authorities

This unpriced booklet contains contact information of Member States' designated competent authorities responsible with respect to the safe transport of radioactive material. It has been published annually since 1967 by the IAEA, based on information provided by the Member States themselves. The number of competent authorities and their scopes of expertise differ among Member States, depending on their respective legal infrastructure. On publication, the booklet is distributed to all offices listed in it, senior regulatory officials attending transport safety meetings at the IAEA and to a number of individuals and institutes on a publication-specific mailing list.

3.3 Annual Report of PACKTRAM Database

For over a decade, the IAEA has been maintaining the PACKTRAM database on Competent Authority approval certificates for package design, special form material and shipment of radioactive material to assist national competent authorities in regulating radioactive material movements in their country. The database contains administrative and technical information on package approval certificates and carries information on extant certificates and those that expired within the last complete calendar year. Administrative data include issue and expiry dates, package identification, package serial numbers, modes for which the package/shipment is approved and the edition of the IAEA's Transport Regulations on which the approval has been based. Technical information include package mass, authorized contents, detailed and general description of the package.

Data is entered directly into the database at periodical intervals by the issuing competent authority using an online internet-based tool. The general public can view and search PACKTRAM data.

The annual report presents the status of PACKTRAM data for a given cut-off date in 6 different tables and has been published since 1991 under the IAEA's TECDOC series of publications: 1991 Edition – TECDOC 617, 1992 Edition – TECDOC 662, 1993 Edition – TECDOC 723, 1994 Edition – TECDOC 758, 1995 Edition – TECDOC 826, 1996 Edition – TECDOC 903, 1997 Edition – TECDOC 956, 1998 Edition – TECDOC 1038, 1999 Edition – TECDOC 1107, 2000 Edition – TECDOC 1171, 2001 Edition – TECDOC 1237, 2002 Edition – TECDOC 1302, 2003 Edition – TECDOC 1377. At the time of writing, the 2004 Edition was in press for publication.

On publication, the annual report is sent to all offices in the List of National Competent Authorities, senior regulatory officials attending IAEA transport safety meetings to a number of individuals and institutes on a publication-specific mailing list.

4. CONCLUSION

The IAEA's work programme on the safety of transport of radioactive material not only involves the development, maintenance and publication of safety standards for the subject, but also comprises activities and publications that foster Member State implementation of those safety standards. The two aspects of the work programme complement each other, and rely heavily on Member State support to be successful. The measure of success will be simple: a continuing high level of safety during the transport of radioactive material that is carried out smoothly.

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