The IAEA's Information Service for Radioactive Material Transport

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INTRODUCTION

In carrying out its mission "to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world" the International Atomic Energy Agency (IAEA) strives to foster the exchange of scientific and technical information concerning peaceful nuclear applications. In the transport safety area, this is achieved through the development and maintenance of Safety Series No. 6, the Regulations for the Safe Transport of Radioactive Material [IAEA a], the implementation of those Regulations and co-ordinated research programmes supporting the first two activities.

Under the implementation aspect of its transport safety programme the IAEA takes advantage of the increased availability of mass storage media to use databases for information exchange. Being in a unique position to facilitate information exchange, the IAEA initiated data collection activities on the recommendation of Member States as represented at SAGSTRAM, the Standing Advisory Group on the Safe Transport of Radioactive Material.

As recommended by SAGSTRAM, information is collected in the areas of national competent authorities, package design certificates, events in radioactive material transport, shipments, and exposure data. The main purposes of these data collection activities include:

- To serve as regulatory aids to the national competent authorities responsible in the Member States for the transport of radioactive material, both internationally and nationally;
- To foster the exchange of information among competent authorities and international modal organizations;
- To be used in support of the continuous review and revision process of the transport Regulations and their supporting documents; and
- To assist in answering public concerns.

The IAEA also provides for exchange of information through training activities and general information publications.

REGULATORY IMPLEMENTATION

List of National Competent Authorities

Since 1967 the IAEA has compiled information on the designated national competent authority within each Member State and the respective postal and telegraphic addresses. In Member States where the competent authority functions are distributed among two or more organizations, information is also provided on the functional responsibilities. The information is updated and published annually in the form of a directory [IAEA b] in a handy DIN A5 format (15 cm by 21 cm). List No. 26 was distributed in January 1995. The booklet is sent on publication at no charge to the IAEA's Member States, the offices listed therein and other registered interested parties.

For data verification purposes, information for the booklet is only accepted from either the national competent authority or the respective foreign ministry.

Competent Authority Approval Certificates for Package Design, Special Form Material and Shipment of Radioactive Material (PACKTRAM Database)

The IAEA maintains PACKTRAM, a database on package approval certificates that contains information about package designs approved for radioactive material transport such as assigned identification marks, periods of validity, dimensions, design descriptions and permitted contents.

The database is fully menu-driven and its system programs are available to Member States and registered users on diskette along with an accompanying User Guide [IAEA c]. The system program was originally written in dBaseIII+, but a compiled version was recently developed and should be available for distribution in early 1996. Depending on the volume of their input, Member States submit information either by diskette, using a data input form or by merely sending a copy of their certificates to the IAEA. In return, they receive electronic copies of the updated main data file together with an annual report, which is published in the form of a TECDOC [IAEA d].

The format of the annual report was established to provide concise information on the most important elements of the package approvals. Information is presented in a series of tables, as follows:

- Currently valid certificates are listed by originating Member State certificate number and information is provided about the certificate revision number, issue date, expiration date, package model, any serial number restrictions, authorized modes of transport, and edition of Safety Series No. 6 upon which the approval is issued. Certificates which expired since the beginning of the

last complete calendar year are listed in a separate table with similar information;
- Currently valid certificates which are endorsed by other Member States are listed in a table by country of origin certificate number with information about all of the revalidations (identification of revalidating country, certificate number, revision number, expiration date, etc.). The same information is provided in a separate table for certificates which expired since the beginning of the last complete calendar year;
- Information of a more technical nature is available in a table that lists certificate number, summary of authorized contents (activity and radioisotope), total package mass and a physical description (shape, external dimensions, materials of construction, identification of any shielding material) of all certificates on record;
- All certificates, both original issuances and revalidations, issued by a Member State are listed numerically by Member State in the last table.

To ensure quality of data, information for PACKTRAM is only processed if submitted by or through the competent authority. The following Member States currently participate: Argentina, Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Hungary, India, Italy, Japan, Netherlands, Poland, Russian Federation, South Africa, Spain, Sweden, Switzerland, United Kingdom and the USA.

Because of the concise way in which information is presented, users can easily consult the annual report for the salient aspects of any certificate provided that the identification mark of the package is known, and that the certificate has been reported to the database. The publication is therefore useful not only to competent authorities, but also to port authorities, manufacturers and shippers of radioactive material. The latter occasionally use the annual report to search for packages that are suitable for radioactive material that they wish to transport.

Technical Assistance Programme

The IAEA assists developing Member States through its Technical Co-operation Programme. Assistance in the transport area usually takes the form of provision of expert services, training courses, or organization of fellowship and scientific visits.

The IAEA annually organizes 3-week training courses that are open to officials of national regulatory and inspection bodies, and managers and technical staff of organizations undertaking the transport of radioactive material The courses aim to impart in-depth knowledge about the background, philosophy and requirements of the IAEA's transport Regulations, to demonstrate their practical and operational application and to provide an opportunity for information exchange regarding implementation experience.

The material taught at these courses is based on the contents of the IAEA-

developed training manual published in English in 1991 and since translated into Spanish and Russian. The manual is based on the 1985 edition of Safety Series No. 6 (As Amended). It covers subjects including the basic principles of radiation protection, the history and development of the transport Regulations, package design and testing, operational controls, approval requirements and national training responsibilities. Lectures are presented by international experts engaged by the IAEA and national experts assigned by the competent authority that is co-hosting the training course. Participants are given the opportunity for hands-on experience through practical exercises in laboratory situations and scientific visits to nuclear energy and radioisotope manufacturing facilities. In addition there are IAEA-developed case studies and exercises that participants solve in class in groups or as individual homework.

For future training courses, the IAEA is developing a set of visual aids that correspond to the 20 chapters of the training manual. When ready, the visual aids will complement the exercises and the manual to complete the standard kit of IAEA training material for transport safety training courses.

When requested, the IAEA is able to assist Member States in organizing national training workshops. These typically last a week and focus on the needs of the requesting country. Recently, for example, one such workshop was held in Panama. Its theme centered on port operations, and participants had an opportunity to visit aboard a dedicated nuclear transport ship that was in-transit in the Panama Canal area.

It is possible for nationals of developing Member States to be awarded fellowship grants that typically last a few months. Host institutes for such assignments can be either research laboratories or the offices designated to be the transport competent authority. A detailed programme of work is followed that gives the fellows ample on-the-job learning opportunities.

General Information Film

In 1994 the IAEA published a 28-minute video film that was shot on location in the United Kingdom, the Netherlands and Japan. It is available in all broadcast systems, can be used for public information and training purposes, and is available in English with an official Russian language version expected soon.

The film starts by explaining the basic principles for radiation protection and then goes on to describe the requirements for transporting radioactive material as laid down in the current edition of Safety Series No. 6. Emphasis is placed on safety being built into the package, which meets performance requirements graded according to the activity of the radioactive material being transported. Because it is the operational aspect that the public is more likely to come in contact with, this is described in detail in the film. There are examples of the radiation protection principles being put into practice, there is ample explanation

of package markings and labelling, and there is advice on what to do in case of an emergency.

Public Information Brochure

Additional material for public information purposes has been available since late 1992 in a small brochure in English, French, Russian and Spanish. The brochure describes the IAEA's transport safety programme by discussing the history and development of the transport Regulations, and describing their main provisions. There is a section that describes the services that the IAEA offers to assist its Member States in using the transport Regulations and there is a brief discussion of current issues and future trends. The brochure is available in small quantities at no cost.

RADIOLOGICAL IMPACT OF RADIOACTIVE MATERIAL TRANSPORT

In the 1980s an attempt was made to review the radiation exposure of workers and the public resulting from the transport of radioactive material. Data provided by a number of Member States was analysed, which resulted in the publication of a technical document that concluded that the exposures of most workers and of the public during normal conditions of transport were low[IAEA e]. It further indicated that the risk to workers and the public due to potential accidents and incidents in transport were also low. It had to be emphasized, however, that the conclusions could only be treated as an interim assessment as they were based on data available at the time, which was by no means complete. To enable a more meaningful assessment of the radiological impact of radioactive material transport SAGSTRAM recommended that the Secretariat obtain information regarding shipments, radiation exposures, and accidents/incidents.

Events in Radioactive Material Transport (EVTRAM Database)

Effort was made to collate information from national competent authorities about their respective practices in incident reporting. It was learned that although many Member States have reporting systems for accidents/incidents involving hazardous materials, it was not cost-effective for some Member States to implement these for radioactive material because of the relatively low rate of occurrence and minor consequences generally involved. In some Member States there is no legal requirement for such events to be reported. The extent of detail required by national reporting forms was also found to vary greatly.

A standardized data input form with the appropriate instructions for completion was developed. It is divided into two parts, the first asking for information on the event being reported; and the second requiring information on packages involved in the event, allowance having been made for the possibility of events

involving different types of packages and/or contents. Because of the time that it can take for an event to be fully investigated, Member States are requested to submit information in the September of the second year after which an event has occurred.

To achieve a wide reporting base, information was requested for events dating back to 1984. It was left to the discretion of the reporting competent authority, however, to select events to include in the database, especially considering those objectives of data collection that pertain to Regulations development and maintenance. Member State response has been quite variable, although 21 Member States have provided some information. Ten Member States reported actual events, 10 reported no events and 1 Member State indicated that it had no records. Most of the data covers the middle of the period, i.e., the years 1987 through 1989. Information for the years 1984 through 1986 and 1989 through 1993 is only sparsely reported. Being incomplete, the data cannot be used to determine trends during the 10-year period; however, they provide relevant examples of events occurring worldwide. It is anticipated that more comprehensive data will become available for subsequent reporting periods.

The EVTRAM database has 128 valid records of events from countries in three continents. There are differences in the levels of response from reporting countries, so the data have obvious limitations and a cautious approach has to be taken in their analysis. The following observations are based on the reported data that are by no means complete and should therefore only be considered within that context:

1. 78% of the packages involved in the reported events were either excepted, industrial or Type A packages; 16% involved Type B packages. As had been previously reported by Member States and other international organizations, there were no reported releases from Type B packages. Additional detail on damage to other types of packages can be obtained from a technical report that is currently in preparation.
2. 44% of the packages involved in the reported events suffered no damage; in 23% of the cases damage was unknown or "other", and in 15% of the cases (mainly Type A and excepted packages) partial crushing was reported.
3. 40% of the reported cases involved radiopharmaceuticals, as non-sealed sources; 12% involved nuclear fuel cycle material and 8% involved radiographic sealed sources.
4. Radiological consequences were only reported for 7% of all valid cases, in most of which the dose was less than 1 mSv. The maximum reported dose was 30 mSv which was received by a thief who had kept a stolen radioactive solution in his trouser pocket for about 12 hours.
5. The EVTRAM database makes use of a 7-point severity scale for radioactive material transport developed by the French competent authority. Only 2/3 of the reported events had information about severity level. The highest reported level (involving one Type A package) was 4, i.e., event resulting in limited

radiological releases (less than the maximum Type A content), or in a maximum radiation dose within the range of 5 to 50 mSv, or in appreciable chemical releases. In the reported events where severity levels were given, 55% of the cases were reported as level 1, i.e., event resulting in some disruption of normal transport conditions but without affecting the safety functions of the package. Detailed results are being compiled in a technical report being submitted to SAGSTRAM for review in early 1996.

Shipments of Radioactive Material (SHIPTRAM) Database) and Radiation Exposures resulting from Radioactive Material Transport (EXTRAM Database)

Two areas in which the IAEA also attempts to collect information are on the nature of radioactive material shipments and associated radiation exposure. Analysis of such data together with events data would complete the basis for assessing the radiological impact of transporting radioactive material.

An attempt in the early 1980s to collect shipment data revealed this to be potentially the most difficult information to obtain in any meaningful form. Therefore, it was recommended that shipment data be collected on a modest scale initially and that the system be developed gradually. It was further deemed useful to initially limit the required information to the nuclear fuel cycle for a single year and to take a reporting cycle of 5 years.

For 1990, Member States were asked to provide respective data on:
- the total number of shipments
- the total number of packages shipped
- the number by package type, and
- the number by mode of transport

and to further categorize the data for irradiated fuel, non-irradiated fuel, uranium from reprocessing and wastes.

Twenty-two Member States responded to the IAEA survey, and of these 15 provided data summaries. Of those countries providing actual data, only 4 belong to the group of approximately 20 Member States that contribute 90-95% of radioactive material packaging and transport activities. It was learned that the low rate of response could be attributed to several reasons: national reporting programmes vary; the objectives for data collection differ between the national and international levels; and limited resources.

For the database on radiation exposures, Member States were requested to provide information for 1990. It was asked that the main sources of radiation exposure during transport for workers be identified, and to estimate the collective dose due to all transport operations for members of the public. Similar problems regarding data collection were experienced as those discussed for shipment data.

Since the collected data were not sufficiently complete to support broad application, it was decided that an analysis of the data collection experience should be made before undertaking further efforts. An administrative report on the shipment data and collection efforts has been prepared; it will be reviewed by SAGSTRAM to obtain advice on future direction of that programme.

CONCLUSIONS

Although it is recognized that there is a difference in objectives between national and international information reporting systems, the latter have an advantage drawing from a wider scope. Information representing international transport facts and experience provides the much needed basis for the development and maintenance of Regulations. Additionally, the public is expressing an increased awareness in safety matters that makes imperative a joint effort by those in this industry to answer concerns raised.

To continue the tradition of uniformly implemented Regulations and to be able to answer the concerns raised by the public, it is vital that information exchange be encouraged. Its success is critically dependent on the active participation of all members of the transport and packaging field, whether they be regulatory bodies, research institutes or industrial establishments. The IAEA is committed to working with Member States to identify information needs and to meet these needs with cost-effective approaches.

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