IAEA Safety Standards Applications — TranSAS-3

Provision for the Application of the IAEA Safety Standards

Appraisal for the United Kingdom of the Safety of the Transport of Radioactive Material

INTERNATIONAL ATOMIC ENERGY AGENCY, VIENNA, 2002

APPRAISAL FOR THE UNITED KINGDOM OF THE SAFETY OF THE TRANSPORT OF RADIOACTIVE MATERIAL

The following States are Members of the International Atomic Energy Agency:

AFGHANISTAN
ALBANIA
ALGERIA
ANGOLA
ARGENTINA
ARMENIA
AUSTRALIA
AUSTRIA
AZERBAIJAN
BANGLADESH
BELARUS
BELGIUM
BENIN
BOLIVIA
BOSNIA AND HERZEGOVINA
BOTSWANA
BRAZIL
BULGARIA
BURKINA FASO
CAMBODIA
CAMEROON
CANADA
CENTRAL AFRICAN REPUBLIC
CHILE
CHINA
COLOMBIA
COSTA RICA
CÔTE D'IVOIRE
CROATIA
CUBA
CYPRUS
CZECH REPUBLIC
DEMOCRATIC REPUBLIC OF THE CONGO
DENMARK
DOMINICAN REPUBLIC
ECUADOR
EGYPT
EL SALVADOR
ESTONIA
ETHIOPIA
FINLAND
FRANCE
GABON
GEORGIA
GERMANY
GHANA
GREECE
GUATEMALA
HAITI
HOLY SEE
HUNGARY
ICELAND
INDIA
INDONESIA
IRAN, ISLAMIC REPUBLIC OF
IRAQ
IRELAND
ISRAEL
ITALY
JAMAICA
JAPAN
JORDAN
KAZAKHSTAN
KENYA
KOREA, REPUBLIC OF
KUWAIT
LATVIA
LEBANON
LIBERIA
LIBYAN ARAB JAMAHIRIYA
LIECHTENSTEIN
LITHUANIA
LUXEMBOURG
MADAGASCAR
MALAYSIA
MALI
MALTA
MARSHALL ISLANDS
MAURITIUS
MEXICO
MONACO
MONGOLIA
MOROCCO
MYANMAR
NAMIBIA
NETHERLANDS
NEW ZEALAND
NICARAGUA
NIGER
NIGERIA
NORWAY
PAKISTAN
PANAMA
PARAGUAY
PERU
PHILIPPINES
POLAND
PORTUGAL
QATAR
REPUBLIC OF MOLDOVA
ROMANIA
RUSSIAN FEDERATION
SAUDI ARABIA
SENEGAL
SIERRA LEONE
SINGAPORE
SLOVAKIA
SLOVENIA
SOUTH AFRICA
SPAIN
SRI LANKA
SUDAN
SWEDEN
SWITZERLAND
SYRIAN ARAB REPUBLIC
TAJIKISTAN
THAILAND
THE FORMER YUGOSLAV REPUBLIC OF MACEDONIA
TUNISIA
TURKEY
UGANDA
UKRAINE
UNITED ARAB EMIRATES
UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND
UNITED REPUBLIC OF TANZANIA
UNITED STATES OF AMERICA
URUGUAY
UZBEKISTAN
VENEZUELA
VIET NAM
YEMEN
YUGOSLAVIA, FEDERAL REPUBLIC OF
ZAMBIA
ZIMBABWE

The Agency's Statute was approved on 23 October 1956 by the Conference on the Statute of the IAEA held at United Nations Headquarters, New York; it entered into force on 29 July 1957. The Headquarters of the Agency are situated in Vienna. Its principal objective is "to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world''.

Printed by the IAEA in Austria
September 2002
STI/PUB/1143

IAEA SAFETY STANDARDS APPLICATIONS — TRANSAS-3

APPRAISAL FOR THE UNITED KINGDOM OF THE SAFETY OF THE TRANSPORT OF RADIOACTIVE MATERIAL

INTERNATIONAL ATOMIC ENERGY AGENCY
VIENNA, 2002

VIC Library Cataloguing in Publication Data

Appraisal for the United Kingdom of the Safety of the Transport of Radioactive Material . — Vienna : International Atomic Energy Agency, 2002.
p; 24 cm. — (IAEA safety standards applications; TranSAS-3) — (Provision for the application of the IAEA safety standards)
STI/PUB/1143
ISBN 92–0–116602–8
Includes bibliographical references.

Radioactive substances — Transportation — United Kingdom.
Radioactive substances — Safety regulations — United Kingdom.
I. International Atomic Energy Agency. II. Series: Safety standards applications ; TranSAS-3. III. Series.

VICL 02-00295

FOREWORD

Within the family of the United Nations the IAEA has the specific statutory function of establishing standards of safety for the protection of health against exposure to ionizing radiation. As a result, in 1959 the United Nations Economic and Social Council requested that the IAEA be entrusted with the drafting of recommendations on the transport of radioactive substances. Within its statutory mandate and pursuant to this request, in 1961 the IAEA issued the Regulations for the Safe Transport of Radioactive Material (the Transport Regulations). The Transport Regulations have been periodically reviewed and, as appropriate, amended or revised. Moreover, several guides and technical documents supporting the Transport Regulations have been issued by the IAEA. The latest version of the Transport Regulations was issued by the IAEA as publication TS-R-1 (ST-1, Revised).

On 25 September 1998 the IAEA General Conference adopted resolution GC(42)/RES/13 on the Safety of Transport of Radioactive Materials. In adopting that resolution the General Conference recognized "*that compliance with regulations which take account of the Transport Regulations is providing a high level of safety during the transport of radioactive materials*".

The IAEA's Statute also authorizes it with the function of providing for the application of its standards at the request of any State. The IAEA discharges this statutory function through a number of mechanisms, including rendering independent peer review appraisal services to determine the status of compliance with its standards. Consistent with this statutory function, resolution GC(42)/RES/13 requested the IAEA to provide for the application of the Transport Regulations by, inter alia, providing a service for carrying out, at the request of any State, an appraisal of the implementation of the Transport Regulations by that State.

In response to this request, on 10 December 1998 the IAEA offered to render such an appraisal service to all Member States. The service was termed the Transport Safety Appraisal Service (TranSAS). Since then the IAEA General Conference, through resolutions GC(43)/RES/11, GC(44)/RES/17 and GC(45)/RES/10, has commended the Secretariat for establishing TranSAS, commended those Member States that have requested an appraisal and encouraged other Member States to avail themselves of the appraisal. In addition, resolution GC(45)/RES/10 also invited Member States availing themselves of TranSAS to consider offering to one or more representatives of concerned States the opportunity to accompany TranSAS as observers, with the consent of the recipient Member State.

On 6 July 2001 the Ambassador and Permanent Representative of the United Kingdom of Great Britain and Northern Ireland (UK) to the IAEA requested the IAEA to organize and conduct a TranSAS in the UK. In response, discussions on this request were held in London during July 2001, and a visit was undertaken in

December 2001 to organize and agree the details of the appraisal. It was agreed that the requested appraisal would address the implementation of the Transport Regulations in all relevant transport activities in the UK, both domestically and internationally, for all modes of transport, but with a special emphasis on maritime transport.

A TranSAS to the UK, which involved the participation of 11 independent experts from the IAEA and Member States of the IAEA, including three observers, and also three experts from the International Maritime Organization and from the International Civil Aviation Organization, took place between 9 and 21 June 2002. This report summarizes its findings.

CONTENTS

SUMMARY AND FINDINGS

BACKGROUND

S01. On 25 September 1998 the General Conference of the IAEA adopted resolution GC(42)/RES/13 on the Safety of Transport of Radioactive Materials. The General Conference recognized in adopting that resolution, inter alia, that compliance with regulations that take account of the IAEA's Regulations for the Safe Transport of Radioactive Material (the Transport Regulations) is providing a high level of safety during the transport of radioactive material. In addition, it requested the IAEA Secretariat to provide for the application of the Transport Regulations by, inter alia, providing a service for carrying out, at the request of any State, an appraisal of the implementation of the Transport Regulations by that State. In response to this direction the IAEA has created and offered to all States the Transport Safety Appraisal Service (TranSAS).

S02. A letter dated 6 July 2001 from the Ambassador and Permanent Representative of the United Kingdom of Great Britain and Northern Ireland (UK)[1] addressed to the Director General of the IAEA requested that the IAEA organize and conduct a TranSAS. In response, discussions on this request were held between the IAEA and the UK Government in London during the week of 16 July 2001, at which time it was agreed that the requested appraisal would address the implementation of the Transport Regulations in all relevant transport activities in the UK, both domestically and internationally, for all modes of transport, but with a special emphasis on maritime transport. The IAEA then undertook a visit in December 2001, at which time details of the forthcoming appraisal were discussed and an informal agreement was reached. Following careful planning, a team of experts was assembled and the appraisal for the UK was carried out between 9 and 21 June 2002.

OBJECTIVES

S03. The appraisal in the UK addressed all modes of transport (i.e. road, rail, maritime and air), but with an emphasis on maritime transport. It considered all

[1] Abbreviations have been used in this report in order to shorten the text. In general, these are defined in the main body of the text. A list of abbreviations is provided in Appendix I.

relevant aspects of the regulation of the transport of radioactive material in the UK with regard to the requirements specified in the IAEA Regulations for the Safe Transport of Radioactive Material [1], the guidance provided in other IAEA documents [2–5] and other relevant transport safety related international regulatory documents. Issues such as physical protection and legal liability were not addressed, however, since they are not covered under the scope of a TranSAS.

THE APPRAISAL TEAM

S04. The team to undertake the TranSAS (the appraisal) was assembled by the IAEA. The team consisted of 11 independent experts from the IAEA and Member States of the IAEA and from two other international regulatory organizations: the International Maritime Organization (IMO) and the International Civil Aviation Organization (ICAO). In addition, the team had three observers from Member States of the IAEA. The members of the team all represented the competent authorities of States, other regulatory bodies of States or staff members of international dangerous goods regulatory bodies. The expertise of the appraisal was very broad and covered experience in package design, package testing, regulatory reviews, compliance assurance, inspections and enforcement, the development of regulations, radiation protection, quality control and quality management, modal and intermodal applications and operations, maritime transport and port management, and air transport.

CONDUCT OF THE APPRAISAL

S05. The appraisal included:

- A training session for the appraising personnel preceding its start.
- Presentations and discussions by UK regulatory and consignor, carrier or consignee transport experts on key topics, both for the combined team and individually for each subteam; interviews with individuals by team members; the inspection of documents; and multiple co-ordination meetings between the appraisal and key UK counterparts.
- Peer review appraisals of the relevant sites and facilities involved in transport operations in the UK.
- An exit meeting with key UK counterparts to summarize and discuss the findings.

To ensure that as broad a range of topics as possible could be covered, the team was divided into three separate subteams during much of the first week and into three

different and separate subteams for one day during the second week. Each of the subteams was accompanied by an observer.

APPROACH

S06. It was agreed between the UK and IAEA prior to the appraisal that the appraisal report would provide for each area considered a background discussion, a basis for any finding (tied to an international regulatory requirement or recommendation) and the finding (or findings). The findings were to be structured as follows:

- Recommendation: an area or regulatory item for which current practice needs specific corrective attention. It can be, but need not necessarily be, an indication of shortcomings either in the national statutory legislative and regulatory regime or in the methods of fulfilling their requirements.
- Suggestion: an area or regulatory item for which changes to a current practice could lead to improvement. It should stimulate the regulatory body's management and staff to consider ways and means of enhancing performance.
- Good practice: an area or regulatory item for which current practice goes well above the norm. It has to be superior enough to be worth bringing to the attention of other nuclear regulatory bodies as a model in the general drive for excellence.

FINAL REMARKS AND SUMMARY OF THE FINDINGS

S07. Each finding, as documented in Section 4 of this report, has a basis in the Transport Regulations, in the modal international standards and/or in other relevant international regulatory documents and standards.

S08. The appraisal did not find any issues that were safety critical. However, the appraisal resulted in three recommendations and 21 suggestions for areas in which the UK transport regulatory practice can be streamlined or improved. The appraisal also identified 15 areas of good practice that can serve as a model for other competent authorities in the radioactive material transport sector. The good practices that were identified in the maritime and air transport operational areas are especially noteworthy.

S09. The recommendations relate to

— The manner in which the UK competent authority documents some of its reviews and assessments;
— The need to establish a more systematic approach to the review of package designs used to transport smaller quantities of radioactive material that are not approved by the competent authority;
— The need to enhance its inspection and enforcement activities for minor consignors and consignors of mobile sources, which have lagged in recent years as a result of reduced available resources.

S10. The findings of the appraisal are summarized below. The summary first presents the recommendations, then the suggestions and finally the identified good practices. The summary is arranged by the topical review areas that are presented and discussed in detail (including the citation of the regulatory basis) in the main text of this report.

Summary of the recommendations

S11. Table S–I summarizes the three recommendations identified during the appraisal.

Summary of the suggestions

S12. Table S–II summarizes the 21 suggestions identified during the appraisal.

Summary of the good practices

S13. Table S–III summarizes the 15 good practices identified during the appraisal.

TABLE S–I. THE THREE RECOMMENDATIONS IDENTIFIED DURING THE APPRAISAL

Topical review area	Recommendation
Review and assessment	It is recommended that a written formal report be issued for each package design certificate and special arrangement certificate, including modifications to certificates, that clearly documents the basis of the approval.
Review and assessment	It is recommended that compliance assurance activities for transport include a systematic review of the non-competent authority approved package designs using an appropriate sampling basis.
Inspection and enforcement	It is recommended that the Department for Transport (DfT) should evaluate the adequacy of its audit and inspection programme and that the necessary resources should be provided for audits and inspections. Specifically, minor consignors and consignors of mobile sources should be more fully integrated into this programme. Priorities should continue to be risk based to maximize the effectiveness of the limited resources.

TABLE S–II. THE 21 SUGGESTIONS IDENTIFIED DURING THE APPRAISAL

Topical review area	Suggestion
Authority, responsibilities and functions of the regulatory body	It is suggested that the DfT considers encouraging the Carriage of Dangerous Goods Committee (CDGC), consistent with its authority to liaise and co-ordinate with other governmental bodies, to re-establish and implement plans for joint agency enforcement liaison exercises, with a view to convening at least one exercise per year.
Authority, responsibilities and functions of the regulatory body	It is suggested that the UK evaluates the adequacy of its staffing and financial resources for the various regulatory bodies to ensure that they are able to fulfil their responsibilities, including those in the areas of authorization (e.g. the approval of package designs), regulatory reviews and assessments, inspections and enforcement, and for establishing safety principles, criteria, regulations and guides.
Authority, responsibilities and functions of the regulatory body	It is suggested that the DfT should continue and enhance its efforts to communicate its concerns regarding the format of the ADR Agreement to the United Nations Economic Commission for Europe (UNECE), and work closely with it to ensure that future editions of the ADR Agreement are more user friendly.

TABLE S–II. (cont.)

Topical review area	Suggestion
Organization of the regulatory body	It is suggested that the UK authorities should continue efforts to harmonize the domestic adoption of the international regulatory requirements for radioactive material using a simpler and common approach for all modes.
Organization of the regulatory body	It is suggested that a common approach for the domestic adoption of regulatory requirements on a modal basis could be facilitated by having all modes (a) adopt by reference rather than some of the modal authorities rewriting regulatory requirements into UK domestic documents and (b) adopt on the same schedule (subject to any constraints imposed by the international modal bodies).
Authorization process	Although the records of approvals (i.e. certificates of approval) kept by the Radioactive Materials Transport Division (RMTD) appeared organized and complete, it is suggested that the following record keeping improvements be implemented: — The development of a programme to archive electronically approval certificates, approval files, correspondence and package design data; — The inclusion of foreign certificates in validation and multilateral approval files; — The inclusion of all modification sheets in corresponding certificate files.
Authorization process	It is suggested that the RMTD reviews and amends as necessary its approval procedures and develops an implementation strategy and schedule that ensures that the applicability of each certificate is clearly specified so that other competent authorities and users of the certificate will be able to determine whether the certificate needs further multilateral approval action.
Authorization process	It is suggested that, although not specifically authorized or prohibited by the Transport Regulations, the RMTD assesses its approval procedures to ensure that it refrains from expanding the applicability of foreign certificates in the execution of its multilateral approval programme (e.g. authorization of additional contents for a foreign package design) and should consider expanding applicability only through an independent UK approval certificate.
Authorization process	It is suggested that the RMTD undertakes an internal review to develop policies and practices that would minimize the number of certificates issued.

TABLE S–II. (cont.)

Topical review area	Suggestion
Authorization process	It is suggested that the RMTD considers issuing validation and multilateral approvals of foreign package design certificates with a single approval valid for all applicants, include multiple models of a package design on a single certificate and expand the use of multiple contents on a single approval.
Authorization process	It is suggested that modification sheets be amended so that certificate holders are made aware that if the associated approval needs validation or multilateral approval the modification sheet will also need validation or multilateral approval.
Review and assessment	It is suggested that the RMTD should complete and implement a technical instruction document (e.g. an assessment manual) that provides guidance for the review of applications for the approval of package designs, special form and low dispersible radioactive material, special arrangements, shipments and radiation protection programmes.
Review and assessment	It is suggested that there be a more structured approach to assuring consistency, possibly considering, inter alia, the following two elements: — Filling the leadership position for the mechanical engineering section, which has been vacant for an extended period of time; — Additional formal technical oversight by the section leaders.
Review and assessment	It is suggested that the RMTD should continue ensuring that its interaction with applicants does not result in a conflict of interest or the perception of a conflict of interest and that the regulator remains clearly independent.
Review and assessment	It is suggested that restricted access to approval documents (both the application and the certificate) should be reconsidered by the RMTD and its legal staff to assure that adequate information regarding its activities is available to the public, consistent with the need to protect commercial information that is customary in the UK.
Inspection and enforcement	It is suggested that the existing DfT memoranda of understanding with the Heath and Safety Executive (HSE) and the Civil Aviation Authority (CAA) should be reviewed to ensure that they reflect how the respective responsibilities are currently being fulfilled.

TABLE S–II. (cont.)

Topical review area	Suggestion
Inspection and enforcement	It is suggested that organizations involved in the transport of mobile sources should be requested to fill out the checklist for inspecting and documenting transport operations; an action that could facilitate the definition and establishment of priorities for required inspections.
Operations — maritime transport	It is suggested that, to prevent the use of outdated and inappropriate documentation and ensure user friendly controlled documents, James Fisher and Sons and Pacific Nuclear Transport Limited (PNTL) and British Nuclear Fuels Limited work together to standardize the formats of and process for changing the controlled documents used on board ships, including the manner in which change controls are communicated in the documents.
Operations — maritime transport	It is suggested that the Maritime and Coastguard Agency (MCA) should consider assessing the need to stage additional exercises for evaluating UK response capabilities in the event of maritime Class 7 emergencies not involving PNTL or other INF Code ships to ensure that adequate emergency response capabilities exist.
Operations — maritime transport	It is suggested that the UK Government should continue bilateral liaison with the Irish Government on counter pollution and response issues, including the provision of an Irish Sea emergency towing vessel (ETV) as identified by the risk based approach in A Review of ETV Provision around the Coast of the UK.
Operations — maritime transport	It is suggested that the UK Government should continue multilateral liaison with neighbouring States. Such liaison agreements could prove beneficial in the event of an emergency in waters surrounding the UK involving ships carrying radioactive material.

TABLE S–III. THE 15 GOOD PRACTICES IDENTIFIED DURING THE APPRAISAL

Topical review area	Good practice
Legislative and governmental responsibilities	It was determined that an excellent memorandum of understanding exists between the CAA and the HSE, which is clear, concise and does an excellent job of assigning responsibilities. This memorandum of understanding is held up as a good model for other States to follow.
Authority, responsibilities and functions of the regulatory body	It was determined that the use of national regulatory co-ordinating committees and groups with charters to co-ordinate the development and implementation of domestic regulatory documents reflecting the requirements of the international modal authorities, that meet regularly to co-ordinate inputs to new international regulations and to co-ordinate the planning and scheduling of periodic enforcement liaison exercises, is viewed as a good model for other States to follow.
Organization of the regulatory body	It was determined that the MCA implements maritime dangerous goods regulations through direct reference to the IMO International Maritime Dangerous Goods (IMDG) Code. This practice reduces the workload on the MCA, speeds up the process of adopting new regulations for that mode, allows the implementation date for that mode to coincide with the implementation date established by the IMO and reduces the likelihood of errors or differences occurring in regulatory requirements.
Authorization process	It was determined that the modification process used by the RMTD provides an adequate regulatory control of modifications but allows a streamlined and efficient process for changes that have limited safety significance. It is understood that the UK has made a proposal to include this scheme within the Transport Regulations during the current biennial revision cycle.
Review and assessment	It was determined that the RMTD has for many years provided prospective applicants with a document that provides guidance on the information necessary for an application for approval.
Review and assessment	It was determined that the RMTD has an established practice of early and active interaction with applicants during the design review process. The RMTD has an established practice of regularly observing the physical testing of package designs, consistent with para. 477 of the guidance safety standard on compliance assurance.

TABLE S–III. (cont.)

Topical review area	Good practice
Review and assessment	It was determined with regard to the administrative aspects of the RMTD functions that the project records management goes beyond the norm by having (a) files that are neat, complete, systematically organized and properly maintained and (b) project information maintained electronically providing search and sort capabilities available to all staff members.
Review and assessment	It was determined that the RMTD's long history of commissioning assessments and receiving reports from the NRPB on radiation exposures resulting from the transport of radioactive material is a very good practice that goes beyond the norm and that is consistent with the radiation protection provisions of the Transport Regulations and with the responsibilities and functions of the regulatory body contained in the recently published legal and governmental infrastructure safety standard.
Inspection and enforcement	It was determined that the RMTD has developed very good, above the norm documentation covering quality and compliance assurance that is extensive and detailed.
Emergency preparedness for transport	It was determined that the UK has comprehensive and effective emergency response plans involving governmental agencies and industry that go beyond the norm incorporating emergency arrangements for all modes of transport.
Operations — maritime transport	It was determined that the UK has gone well beyond what has been and is currently required in the area of the maritime transport of radioactive material covered in the IMO IMDG, INF and International Safety Management codes, implementing recommendations that have since or are later anticipated to become mandatory, and often adopting additional measures beyond those specified in these codes to enhance the actual or perceived level of safety for the maritime transport of these materials.
Operations — rail transport	It was determined that, based on an appraisal at the Dungeness nuclear power station, the UK nuclear power facility operators have established beyond the norm comprehensive quality assurance programmes and procedures related to the storage, handling and transport of fuel flasks on the site and to and from the railhead that can serve as a model for other States.

TABLE S–III. (cont.)

Topical review area	Good practice
Operations — air transport	It was determined, after reviewing Amersham's packaging data, packagings and package test facilities, that the documentary evidence maintained was of a very high calibre and it is recommended that Amersham be consulted if guidance material on Type A package documentation is to be developed for other applications.
Operations — air transport	It was determined, based on the assessment of the air transport mode, that an excellent safety culture consistent with that recommended in the BSS is fostered and maintained by Amersham, Exel and Lufthansa in their multimodal (road–air) operations.
Operations — package operations and packaging maintenance	It was determined that the UK competent authority monitors the trends of large shippers of the more dangerous forms of Class 7 (radioactive) material, identifies when the performance of the consignors, carriers and consignees may trend towards non-compliance, notifies the shippers of the potential area of non-compliance and works with them to facilitate their definition of the root causes and corrective actions to be taken. It then continues to monitor the situation to ensure that the corrective actions are achieving the desired effect.

1. INTRODUCTION

BACKGROUND

1.1. This report documents the results of a Transport Safety Appraisal Service (TranSAS) to the UK in June 2002. The appraisal involved 11 experts from five States (Brazil, Japan, New Zealand, Spain and the United States of America) and three international organizations (the IAEA, International Civil Aviation Organization (ICAO) and International Maritime Organization (IMO)), and three observers, two from Latin America (Argentina and Peru) and one from Europe (Turkey).

1.2. In order to facilitate safety in the transport of radioactive material throughout the world, the IAEA, pursuant to its statutory authority, has established the Regulations for the Safe Transport of Radioactive Material (the Transport Regulations). The latest edition of the Transport Regulations was published in 1996, and revised in 2000 [1]. In addition to providing the Transport Regulations, the IAEA also issues various guidance documents [2–5][2].

1.3. This suite of documents provides a sound basis for competent authorities in States to regulate the transport of radioactive material. Specifically, the Transport Regulations [1], and their preceding editions (e.g. the previous 1985 edition (as amended in 1990) [6]), have provided and continue to provide a model to be followed by relevant international organizations and States in developing binding regulations for the international and domestic transport of radioactive material. The guidance documents [2–5] also are valuable tools for competent authorities, consignors, carriers and consignees for describing how they may apply specific requirements of the regulations. For example, the general advisory document [2] and its predecessor documents [7, 8] provide insight into why various regulatory requirements have been established and defines ‘a way’, or ‘ways’, but not ‘the way’, that specific requirements may be satisfied in practice. Guidance is also provided for specific key areas, inter alia, planning and preparing for emergencies [3][3], compliance assurance [4] and quality assurance [5].

---

[2] Note: Refs [2] and [3] were being printed by the IAEA at the time of the UK appraisal, and were published in July 2002. The draft text of these documents was used in this appraisal and, where cited in this report, the text is that actually published.

[3] The predecessor document to Ref. [3] was Safety Series No. 87.

1.4. Details regarding the manner in which the Transport Regulations are implemented into international regulatory documents are provided in Section 3 of this report. Effective implementation of the Transport Regulations at the State level is essential for ensuring a high level of safety during the transport of radioactive material. Other key documents that should be considered by a State in regulating its transport of radioactive material are discussed in detail in Section 3.

1.5. On 25 September 1998 the IAEA's General Conference, which meets annually, adopted resolution GC(42)/RES/13 on the Safety of Transport of Radioactive Materials. In adopting that resolution the General Conference recognized that compliance with regulations that take account of the Transport Regulations is providing a high level of safety during the transport of radioactive material. In addition, it requested the IAEA's Secretariat to provide for the application of the Transport Regulations by, inter alia, providing a service for carrying out, at the request of any State, an appraisal of the implementation of the Transport Regulations by that State.

1.6. In response to this direction the Director General offered the requested Transport Safety Appraisal Service to all States in letter J1.01.Circ, dated 10 December 1998.

1.7. The first TranSAS was undertaken and completed at the request of Slovenia in 1999. Requests had been received by the IAEA by June 2002 from four additional States for these appraisals (from Brazil, Panama, Turkey and the UK). The appraisal for Brazil was completed and the documentation of the results initiated in April 2002, and the appraisal for the UK, which is documented in this report, was undertaken in June 2002.

1.8. In each of the General Conferences since 1998 resolutions focused on transport safety have commended the Secretariat for establishing the TranSAS, commended those States that have requested that service and encouraged other States to avail themselves of this service (see GC(43)/RES/11, GC(44)/RES/17 and GC(45)/RES/10). In addition, GC(45)/RES/10 also invited Member States availing themselves of TranSAS "*to consider offering to one or more representatives of concerned States the opportunity to accompany TranSAS missions as observers, with the consent of the recipient Member State*".

1.9. On 6 July 2001 the Ambassador and Permanent Representative of the United Kingdom of Great Britain and Northern Ireland to the IAEA requested the IAEA to organize and conduct a transport safety appraisal in the UK. In response, discussions on this request were held in London during July 2001, and a visit was undertaken in

December 2001 to organize and agree the details of the appraisal. It was agreed that the requested appraisal would address the implementation of the Transport Regulations for all relevant transport activities in the UK, both domestically and internationally, for all modes of transport, but with a special emphasis on maritime transport.

1.10. Two IAEA staff members undertook a preliminary visit in December 2001, at which time details of the appraisal were discussed and an informal agreement was reached. Following careful planning, a team of experts was assembled and the appraisal was convened in the UK between 9 and 21 June 2002.

OBJECTIVE OF AN APPRAISAL

1.11. The objective of a TranSAS is to assist the requesting Member State in evaluating and, as necessary, improving its Class 7 transport safety regulatory programme by providing:

— An appraisal of the State's transport safety regulatory practices with respect to the requirements of the Transport Regulations and related international standards and guidelines;
— Recommendations, as appropriate, in areas in which the State's transport safety regulatory programme may be improved.

TERMS OF REFERENCE OF THE TRANSAS TO THE UK

1.12. The terms of reference for the appraisal for the UK were established in advance, through the December 2001 informal agreement (see para. 1.9) between the IAEA and the UK. They are as described in paras 1.13–1.14.

Scope of the appraisal for the UK

1.13. The scope, as established for the appraisal, was that:

> "*The UK TranSAS Mission shall address all modes of transport (road, rail, maritime and air) with an emphasis on maritime transport, and shall consider all relevant aspects of the regulation of the transport of radioactive material in the UK with regard to the requirements specified in the IAEA Regulations for the Safe Transport of Radioactive Material and other relevant international regulatory documents (e.g. the model regulations of the UN Committee of*

Experts and the regulatory documents of the international modal organizations). Neither physical protection nor legal liability, which are not component parts of transport safety, will be addressed in this TranSAS Mission"[4].

Activities for the appraisal for the UK

1.14. The agreed specific activities for the appraisal included the following.

Prior to the appraisal:

— The UK to provide responses to a detailed questionnaire;
— The IAEA to circulate the completed questionnaire responses to all team members[5] for their review;
— The UK to provide a comprehensive set of its top level legal instruments;
— The IAEA to arrange for an independent legal review of the top level legal instruments, with a view to resolving all legal issues prior to the appraisal;
— The IAEA to obtain curricula vitae and the required security access information from potential team members, and to provide the UK with this information for its review and acceptance;
— The IAEA to obtain signed confidentiality statements from designated team members, and provide copies of these statements to the UK.

During the appraisal:

— The appraisal should start with an expert team meeting (to include the experts, observers, rapporteur and UK points of contact, as needed) to train the appraisal members on the approach to be taken and the procedures to be used, and to discuss how the appraisal activities should be scheduled and co-ordinated;
— Receive overview briefings from relevant UK authorities;
— Evaluate pertinent documents;
— Undertake interviews with appropriate personnel, as required;
— Undertake visits to key sites and facilities;

---

[4] For this scope, which was established prior to the appraisal, the experts from the IMO were of the view during the appraisal that, under the prevailing circumstances, it would have been prudent when reviewing the transport aspects of radioactive material to consider other parameters, such as security, responsibility and liability, in parallel.

[5] Team members were designated experts, designated observers and an IAEA funded rapporteur.

— Work closely with UK counterparts throughout the appraisal to ensure adequate and complete communication;
— Prepare a preliminary draft report documenting the findings from the appraisal and make appropriate recommendations and suggestions and identify good practices, as appropriate;
— Review the preliminary draft report with key UK counterparts and make mutually agreed adjustments, as necessary;
— Convene an exit meeting to brief all interested UK parties.

Following the appraisal:

— The IAEA and UK to agree, following the appraisal, upon a final appraisal report;
— The IAEA to obtain written approval from the UK to publish the appraisal report;
— The IAEA to publish the appraisal report.

2. APPROACH AND CONDUCT OF THE APPRAISAL

APPROACH

2.1. One of the first steps in the initiation of the appraisal following the agreement reached in December 2001 was the transmittal by the IAEA to the UK DTLR[6] point of contact a detailed questionnaire that has been developed by the IAEA to support the convening of a TranSAS.

2.2. The questionnaire provided a detailed set of questions on:

— Legislative and governmental responsibilities;
— The authority, responsibilities and function of the regulatory body;
— The organization of the regulatory body;
— The authorization process;
— Review and assessment;
— Inspection and enforcement;
— The development of regulations and guides;
— Emergency preparedness for transport;
— Maritime transport.

2.3. The UK DfT point of contact arranged for the various regulatory authorities in the UK to complete the questionnaire, which was then returned to the IAEA; prior to the appraisal the questionnaire and the answers to its questions was provided to each team member. In addition, in accordance with the informal agreement, the UK DfT point of contact also provided a set of top level legal documents to the IAEA, which were forwarded in advance of the appraisal to staff in the IAEA's Office of Legal Affairs. The staff of the Office of Legal Affairs reviewed and commented upon the documents and these comments were forwarded to the DfT point of contact.

2.4. It was agreed between the IAEA and UK points of contact that the appraisal report would provide the necessary background discussion on each area, a basis for a

[6] Prior to the appraisal the competent authority in the UK was identified as the Radioactive Materials Transport Division (RMTD) of the Department for Transport, Local Government and the Regions (DTLR). Soon before the appraisal was undertaken the DTLR was reorganized and renamed as the Department for Transport (DfT). Henceforth in this report the UK competent authority is identified as the DfT.

comment (tied to a regulatory requirement) and the comment (or comments) pertaining to that area. The comments would be in the form of 'findings' that were to be structured as follows:

— Recommendation: an area or regulatory item for which current practice needs specific corrective attention.
— Suggestion: an area or regulatory item for which changes to a current practice could lead to improvement.
— Good practice: an area or regulatory item for which current practice goes well above the norm.

2.5. Additional details regarding the method for structuring the recommendation, suggestion and good practice findings are provided in Appendix II.

THE APPRAISAL TEAM

2.6. The appraisal team consisted of 14 individuals: 11 experts from five States and three international organizations, and three observers. The appraisal members all represented the competent authorities of States, other regulatory bodies of States or staff members of international dangerous goods regulatory bodies. The expertise represented by this team was very broad and included experience in package design, package testing, regulatory reviews, compliance assurance, inspections and enforcement, the development of regulations, radiation protection, quality control and quality management, modal and intermodal applications and operations, maritime transport and port management, and air transport.

2.7. Biographical particulars of the members of the appraisal team are provided in Appendix III.

CONDUCT OF THE APPRAISAL

2.8. The schedule of the appraisal is summarized in Table I. A detailed, day by day schedule was also developed by DfT staff, which guided the appraisal activities.

2.9. The detailed schedule for the appraisal was adjusted as planning for the appraisal progressed and during the appraisal. As can be seen from Table I, the appraisal team was divided into three separate subteams during the first week and into three different and separate subteams for one day during the second week. This allowed a broad coverage of topics to be covered by the various experts and allowed

TABLE I. SCHEDULE OF THE UK TRANSAS APPRAISAL

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
					Day 1 Team travels to London.	*Day 2* Team training meeting in London.
Day 3 Plenary meeting with the appraisal and UK counterparts; introduction of the team and UK counterparts; overview briefings by the UK authorities. *Subteam A*: review of the MCA (briefings by the MCA, review of documents, individual interviews, emergency procedures). *Subteam B*: reviews compliance assessments of operations at the DfT. *Subteam C*: reviews regulatory design assessment at the DfT.	*Day 4* *Subteam A*: review of the MCA (briefings by the MCA, review of documents, individual interviews, emergency procedures). *Subteam B*: reviews compliance assessments for emergency response at the DfT. *Subteam C*: reviews regulatory design assessment at the DfT. Subteams to depart to Barrow-in-Furness at 1.30 p.m.	*Day 5* *Team*: Morning, inspection tour of ship, review ship certificates and documents. *Subteam A*: assessment of INF ships against the INF Code. *Subteam B*: reviews carrier's emergency response facilities for maritime operations and operational aspects of maritime transport in Barrow-in-Furness. *Subteam C*: reviews road–rail operations.	*Day 6* *Subteams A and B*: reviews maritime–rail intermodal activities, review of rail activities at Barrow-in-Furness. *Subteam C*: reviews maritime radiation protection programmes used in ship operations. *Afternoon*: all, team review, questions and answers with UK points of contact.	*Day 7* Team travels to Sellafield. *Subteams A, B and C*: at Sellafield (briefings on flask activities and experience with contamination; tour of flask receiving, handling, storage and maintenance facilities; review of flask maintenance quality assurance documentation). Team meeting with key counterparts.	*Day 8* Day off.	*Day 9* Team travels to London. Team housed in London. Informal team meeting in London in the evening.
Day 10 Team initiates partial drafting of report, co-ordinates with key counterparts at the DfT.	*Day 11* *Subteam D*: CAA appraisal at Amersham, tours and visits at Amersham, freight forwarder air operator and Heathrow (air–road, intermodal). *Subteam E*: tours nuclear power station (road–rail, intermodal). *Subteam L*: meeting with legal personnel.	*Day 12* Team prepares initial full draft report, co-ordinating with key counterparts from the DfT, MCA, HSE, CAA and DTI.	*Day 13* Team completes full draft report, co-ordinates with key counterparts as needed.	*Day 14* Exit meeting and report by individual team members on their findings in their fields of expertise, response by key counterparts from the UK. Team travels home.	*Day 15* Team travels home, as needed.	

each of the subteams to be accompanied by an observer. In addition, the activities during the two-week period included:

— A training session for the appraisal on the Sunday preceding the start of the appraisal.
— Presentations and discussions by UK regulatory and consignor, carrier or consignee transport experts on key topics, both for the combined team and individually for each subteam; interviews with individuals by team members; and the inspection of documents.
— Appraisal visits to sites and facilities involved in transport regulation and operations.
— Multiple co-ordination meetings with the appraisal and key UK counterparts.
— An exit meeting to summarize and discuss the findings and agree on the draft report.

2.10. The visits to operating sites, which included presentations, appraisal tours and interviews, were to:

— The Pacific Nuclear Transport Limited (PNTL) sea–rail intermodal facility at Barrow-in-Furness, which included:
  • A visit to and appraisal tour of one of the PNTL ships, the *Pacific Sandpiper*, used for transporting INF[7] type material.
  • Witnessing the arrival by the Direct Rail Service Limited (DRS) rail system of four empty light water reactor (LWR) flasks and their transfer to a British Nuclear Fuels Limited (BNFL) ship for transport to mainland Europe.
— The BNFL (BNFL THORP facilities) at Sellafield, which included:
  • A visit to the facilities that are used for the receipt, interim storage and maintenance of LWR irradiated nuclear fuel flasks.
  • A visit to the facilities that are used for transferring loaded flasks from receiving transport vehicles to the unloading areas, and for transferring empty flasks back to transport vehicles.
— The James Fisher and Sons Limited emergency response facilities for all sea transport located at Barrow-in-Furness.
— The Dungeness nuclear power station's INF flask handling facilities and its associated rail–road intermodal transfer facility.

[7] The IMO's terminology used in its INF Code is used here. Although INF is an abbreviation for 'irradiated nuclear fuel', the INF Code covers not only irradiated nuclear fuel but also high level radioactive waste and plutonium.

— An Amersham plc (Amersham) facility, which packages and consigns numerous packages of radiopharmaceuticals by road on a daily basis.
— Heathrow airport and the associated Exel freight forwarder air operating facility, which serves as a major UK forwarding point and road–air intermodal transfer facility for numerous shipments, including those from Amersham, and the Lufthansa cargo handling facility at Heathrow airport.

2.11. Thus, through these site and facility visits, all modes of transport were covered in the appraisal, which offered the appraisal the opportunity to evaluate the application of the regulations from the perspective of various regulated consignors and carriers.

2.12. A transport accident occurred during the early part of the appraisal that involved a train carrying an empty irradiated nuclear fuel flask colliding with a road vehicle at a rail crossing. The collision occurred at a low velocity (approximately 3 miles per hour (5 km/h)). There were no injuries. There was light damage to the front of the train and the cab of the lorry. There was no derailment and no damage to the flask or railway wagon carrying it. The event was rated by UK officials using the International Nuclear Event Scale at level 0, but received considerable media coverage. The Subteam D appraisal and review of the Dungeness nuclear power station provided an opportunity for those experts to review in detail the manner in which the nuclear power plant staff responded to this event.

3. INTERNATIONAL PERSPECTIVE ON TRANSPORT SAFETY REGULATIONS AND STANDARDS

IAEA SAFETY STANDARDS

3.1. Key to the development of a radioactive material (Class 7) domestic transport regulatory regime is the development by the IAEA of its Transport Regulations. This effort was initiated in the late 1950s at the request of the United Nations Economic and Social Council, and has led to the periodic publication of updated requirements. The latest edition of the Transport Regulations was issued in 1996, and revised to accommodate editorial changes in 2000 [1]. The previous edition, upon which some States still base their domestic transport regulations, was issued in 1985 and amended in 1990 [6]. As noted previously, there are additional guidance documents issued by the IAEA to support the application of the Transport Regulations by regulators and users [2–5, 7, 8].

3.2. The Transport Regulations have a foundation, from a radiation protection standpoint, in the IAEA's Safety Fundamentals document on Radiation Protection and the Safety of Radiation Sources [9] and the International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources (the BSS) [10].

3.3. Finally, a key document for the application of transport regulations in a State is the IAEA's Legal and Governmental Infrastructure for Nuclear Radiation, Radioactive Waste and Transport Safety [11], which discusses in detail the legislative and governmental responsibilities of a State and the responsibilities, functions, organization and activities of a regulatory body.

3.4. These IAEA documents all serve as a basis for appraising radioactive material transport regulatory activities. However, it must be recognized that these documents are not backed by the rule of law, that they are generally not mandatory for a State and that they are advisory in nature. For example, the Transport Regulations [1, 6] serve as models for a State's domestic transport regulations.

3.5. In striving to foster a consistent basis for communicating these recommended requirements to its Member States, the IAEA also issues a standard glossary [12].

3.6. The Transport Regulations serve as the model for the radioactive material portions of international dangerous goods regulatory documents, some of which are applied on a mandatory basis by Member States.

3.7. The first step in applying the Transport Regulations is the incorporation of its requirements into the United Nations Committee of Experts on the Transport of Dangerous Goods' Recommendations on the Transport of Dangerous Goods — Model Regulations [13], which provide a detailed set of 'model regulations' for all nine classes of dangerous goods. This set of model regulations then serves as a basis for modal regulations. Those regulations for air [14] and sea [15] are mandatory upon all member States of the ICAO and the IMO, respectively. For States in Europe, the United Nations Economic Commission for Europe's (UNECE) Inland Transport Committee develops dangerous goods regulations (including requirements derived from the Transport Regulations [1]) for road (the ADR requirements) [16] and rail (the RID requirements) [17]. States that are members of the European Union are bound by European Commission (EC) directives to abide by the ADR and RID requirements.

3.8. In addition to these fundamental documents, there are additional regulatory documents that apply to specific modes of transport. Key documents for maritime transport include the IMO INF Code [18], the Guidelines for Developing Shipboard Emergency Plans for Ships Carrying Materials Subject to the INF Code [19], the IMO International Safety Management (ISM) Code [20], the International Convention for the Safety of Life at Sea (SOLAS) [21] and the United Nations Convention on the Law of the Sea (UNCLOS) [22]. The IMO has periodically published a detailed set of emergency management schedules (EmS) on emergency preparedness. It has spent the past few years working to completely upgrade the EmS (in part in co-operation with the IAEA for Class 7 material), and the new EmS will be published shortly.

3.9. The UNECE also issues regulations for inland waterways, but since the UK does not transport radioactive material on its inland waterways these regulations are not considered here. Similarly, the Universal Postal Union also issues requirements for the postal carriage of dangerous goods, but the UK does not allow the carriage by post of radioactive material and these regulations were therefore not considered in this appraisal.

RELEVANCE OF INTERNATIONAL REGULATORY DOCUMENTS AND STANDARDS TO UK TRANSPORT SAFETY

3.10. The appraisal fully understood that the basis for the UK's regulations for the transport of radioactive material are, to a great extent, based upon the modal requirements issued as the ICAO Technical Instructions [14], the IMO International Maritime Dangerous Goods (IMDG) Code [15], and the UNECE ADR [16] and RID [17] regulations for air, sea, road and rail, respectively. The UK also bases its requirements for road and rail regulations on EC directives that incorporate the ADR and RID text. These modal requirements, in turn, are each derived from the Transport Regulations. Thus the suite of documents outlined above, coupled with the appraisal team's expertise, served as a primary basis for appraising the regulatory regime of the UK.

4. APPRAISAL OF THE UK'S APPROACH TO REGULATING THE TRANSPORT OF RADIOACTIVE MATERIAL

INTRODUCTION

4.1. This section is structured to some extent around a detailed questionnaire that was developed by the IAEA beginning in 1999 to facilitate discussions during an appraisal. That questionnaire was originally structured around eight key topical areas:

— Legislative and governmental responsibilities;
— The authority, responsibilities and function of the regulatory body;
— The organization of the regulatory body;
— The authorization process;
— Review and assessment;
— Inspection and enforcement;
— The development of regulations and guides;
— Emergency preparedness for transport.

A ninth topical area, maritime transport, was added for the purposes of this appraisal. It became clear as the appraisal proceeded that the appraisal needed to address operations associated with all modes of transport and those associated with packages and packaging maintenance. Thus Section 4 of this report is structured around the original eight topical areas, and a ninth dealing with operations. The appraisal in the UK addressed each of these topical areas, as the appraisal deemed appropriate. The following provides, for each of these areas, a discussion of the situation in the UK, and then documents any applicable findings. Each finding or group of findings is preceded by a basis (utilizing appropriate international regulatory and guidance documents). The findings are presented in terms of recommendations, suggestions and good practices.

4.2. A number of international documents were utilized for the appraisal in the UK, including, inter alia, those of the IAEA. The text from the Transport Regulations [1], the BSS [10] and the legal and governmental infrastructure safety standard [11] were frequently used as a basis for appraising many of the activities and developing the findings. It is noteworthy that no current formal mechanism exists for making either the BSS [10] or Ref. [11] mandatory at an IAEA Member State level. However, in contrast, because the requirements of the Transport Regulations are implemented through the United Nation's dangerous goods model regulations [13] into the international modal regulatory documents (Refs [14–17]) for air, sea, road and rail, respectively, the mechanism exists for making the Transport Regulations mandatory

for a State such as the UK. Thus findings based upon the Transport Regulations [1], Ref. [13] or Refs [14–17] may be viewed as having a strong basis in international regulatory documentation; however, the significance of the other IAEA safety standards, such as the BSS [10] and the legal and governmental infrastructure safety standard [11], cannot and should not be discounted.

LEGISLATIVE AND GOVERNMENTAL RESPONSIBILITIES

4.3. The appraisal evaluated a number of UK specific regulatory and other supportive documents, including those listed in Table II. The numbers of the documents in the first column of this table were arbitrarily established by the Secretariat to facilitate tracking the documents during the appraisal and referencing in this report. This list has been enhanced from the set of documents initially provided to the IAEA, as the need for additional documents was identified by the appraisal team during the appraisal and provided by the appraisal's UK counterparts, including the document Passing Legislation in the United Kingdom, the document Preparing and Making Statutory Instruments, Department for Transport, memoranda of understanding, etc. These documents are not included in the general references at the end of this report since they are specific to the UK and most of them apply only to the first part of this section.

4.4. It is also noted that, although document 26 in Table II provides terms and conditions (i.e. requirements) for the transport of dangerous goods by inland waterways, this was not considered in the appraisal, nor were any further issues addressed during the appraisal on inland waterways since there are no shipments of radioactive material in the UK by this mode of transport. Similarly, the transport of radioactive material is not allowed by post in the UK, so this mode of transport was also not appraised.

4.5. In evaluating a State's legislative and governmental process it is necessary to become generally familiar with the history and basis for that State's regulatory and legislative regimes. For the purposes of this appraisal the discussion, of necessity, started with the UK's use of the term 'legislation'. To that end, document 1 in Table II explains that:

> "*every primary law in the United Kingdom (UK) must be approved by Parliament before it comes into force. However, Parliament does not nowadays (except occasionally) decide which new laws to introduce. Nor does it administer or enforce the law… Parliament discusses and scrutinizes proposed*

TABLE II. EXAMPLES OF UK DOCUMENTS PERTAINING TO LEGISLATIVE AND GOVERNMENTAL RESPONSIBILITIES

Number of document	Abbreviated identifier of document	Title of document
General or memoranda of understanding		
1	**NA[a]**	**Passing Legislation in the United Kingdom**
2	**Statutory Instrument Preparation Guide**	**Preparing and Making Statutory Instruments, Department for Transport, 2002**
3	**HSC/Sec. of State for Transport Agreement**	**An Agency Agreement Between the Health and Safety Commission and the Secretary of State for Transport, 31 October 1996**
4	**Memorandum of understanding between DfT and HSE**	**Memorandum of Understanding between the Department of Transport and the Health and Safety Executive on Matters of Mutual Concern for and During the Transportation of Radioactive Materials, 6 August 1991**
5	**Understanding between DfT and CAA**	**Transport of Radioactive Materials by Air, An Understanding between Department of Transport and Civil Aviation Authority, 8 December 1986**
6	**Memorandum of understanding between CAA and HSE**	**Memorandum of Understanding between the Civil Aviation Authority Safety Regulation Group and the Health & Safety Executive, including Annex No. 3 — Dangerous Goods in Transit at Aerodromes**
7	**SI 1999 No. 303**	**Statutory Instruments — The Carriage of Dangerous Goods (Amendment) Regulations 1999**
Road		
8	**Radioactive Material (Road Transport) Act 1991c27**	**Radioactive Material (Road Transport) Act (c.27)**
9	**2002 (SI 2002 No. 1093)**	**The Radioactive Material (Road Transport) Regulations 2002**
10	1983 (SR 1983 No. 344)	The Radioactive Substances (Carriage by Road) Regulations (Northern Ireland) 1983 (SR 1983 No. 344)

TABLE II. (cont.)

Number of document	Abbreviated identifier of document	Title of document
11	1986 (SR 1986 No. 61)	The Radioactive Substances (Carriage by Road) (Amendment) Regulations (Northern Ireland)
12	**1992, SI 1992 No. 234 (N.I. 2)**	**Radioactive Material (Road Transport) (Northern Ireland) Order 1992**
Sea		
13	**NA**	**Merchant Shipping Act 1995 (c.21)**
14	**SI 1997 No. 2367**	**The Merchant Shipping (Dangerous Goods and Marine Pollutants) Regulations**
15	**Merchant Shipping Notice No. M 1755(M)**	**The Carriage of Dangerous Goods and Marine Pollutants in Packaged Form — Amendment 30-00 to the International Maritime Dangerous Goods (IMDG) Code**
16	**SI 2000 No. 3216**	**The Merchant Shipping (Carriage of Packaged Irradiated Nuclear Fuel etc.) (INF Code) Regulations 2000**
Air		
17	**Order 2000 SI No. 1562**	**The Air Navigation Order 2000**
18	**1994 SI No. 3187**	**The Air Navigation (Dangerous Goods) Regulations**
19	**Amendment 1996 SI No. 3100**	**Amendment 1996 to the Air Navigation (Dangerous Goods) Regulations**
20	**Amendment 1998 SI No. 2536**	**Amendment 1998 to the Air Navigation (Dangerous Goods) Regulations**
Ports		
21	**SI 1987 No. 37**	**The Dangerous Substances in Harbour Areas Regulations 1987 (SI 1987 No. 37)**
Rail		
22	**1996 (SI 1996 No. 2090)**	**The Packaging, Labelling and Carriage of Radioactive Material by Rail Regulations (RAMRail)**

TABLE II. (cont.)

Number of document	Abbreviated identifier of document	Title of document
23	**1998 (SR 1998 No. 132)**	**The Packaging, Labelling and Carriage of Radioactive Material by Rail Regulations (Northern Ireland) (RAMRailNI)**
24	NA	**A**pproved Requirements for the Packaging, Labelling and Carriage of Radioactive Material by Rail 1996 Edition
25	(CDGCPL) 1996 (SI 1996 No. 2092)	The Carriage of Dangerous Goods (Classification, Packaging and Labelling) and Use of Transportable Pressure Receptacles Regulations
Inland waterways		
26	BWB 1981 (Class 7)	British Waterways Board Terms and Conditions: Dangerous Goods BWB 1981, and Schedule of Dangerous Goods (The Green Book)
Radiation protection		
27	**SI 1999 No. 3232**	**The Ionising Radiations Regulations 1999 and Approved Code of Practice and Guidance**
Driver training		
28	**SI 1996 No. 2094**	**The Carriage of Dangerous Goods by Road (Driver Training) Regulations 1996**
Emergency preparedness		
29	**SI 2001 No. 2975**	**The Radiation (Emergency Preparedness and Public Information) Regulations 2001 (SI 2001 No. 2975)30**
30	NA	**DTLR-RMTD Emergency Arrangements — Plan 2002 (May 2002)**

Note: Those documents in **bold** were provided by the DfT to be available for review by the appraisal, whereas the others were cited by the DfT but were not available or reviewed during the appraisal.

[a] NA: not applicable.

legislation, and by approving a new law legitimizes it in the eyes of the population as a whole".

4.6. The term legislation thus takes on a very broad meaning in the UK. It can be better understood by considering statutory instruments (SIs). An SI, as described in document 2 of Table II, is a type of secondary or subordinate legislation, and can be, inter alia, for example, an order, regulation, rule or scheme. Thus in the UK legislation includes:

— The passing of enabling acts by Parliament, establishing the responsibilities of Secretaries of State in a general or corporate sense such that, if the detailed structure of the government changes, it is not necessary to change the enabling acts;
— The promulgation of regulations that are subordinate legislation by a regulatory body.

4.7. As an example of the acts passed for regulating the transport of radioactive material in the UK, the appraisal considered the 1991 Radioactive Material (Road Transport) Act, document number 8 in Table II. It states, inter alia, that the document is:

"*an act to make new provision with respect to the transport of radioactive material by road; to repeal section 5(2) of the Radioactive Substances Act 1948; and for connected purposes. [27 June 1991]…*
The Secretary of State may make such regulations as appear to him to be necessary or expedient…
Regulations under this section may also – …
(a) impose requirements by reference to the approval of the Secretary of State or of any person or body specified in the regulations;…
The power to make regulations under this section shall be exercisable by statutory instrument which shall be subject to annulment in pursuance of a resolution of either House of Parliament".

4.8. This text establishes the means for Parliament to retain control over subordinate legislation, such as regulations developed by the assigned regulatory bodies. It enables the assigned bodies to develop, under the oversight of the Secretary of State, the needed subordinate documents, while allowing Parliament the opportunity to have the final approval of them.

4.9. Relative to formally establishing the competent authority for the transport of radioactive material in the UK, each regulation for which a competent authority is

required provides the definition of who or what organization is the relevant competent authority. In fact, all of the regulations specify that the Secretary of State for Transport is the competent authority. For example, the recently issued regulations for road transport (document number 9 of Table II) defines in 14(2) that:

> "*…in relation to Great Britain, references in these Regulations to actions or decision of the Secretary of State shall be taken as being the action or decision of a competent authority.*"

The Secretary of State then delegates that responsibility at his or her discretion to the appropriate body. The delegated body for the transport of radioactive material is the RMTD of the DfT. For issuing authorizations the road regulations specify, for example, in 62(1) that:

> "*The Secretary of State may issue the following type of certificate under these Regulations — (a) a special form radioactive material approval certificate;…*"

4.10. There is thus a clear path for the designation of the competent authority within the UK and, through acts such as documents 8 and 13 in Table II, both of which were reviewed during the appraisal, the powers within the UK to (a) define regulatory bodies, (b) designate a competent authority, (c) establish regulations and (d) regulate by the different designated bodies are well established in the office of the Secretary of State and are overseen by the UK Parliament.

4.11. In summary, various regulatory bodies develop regulations in the UK and these regulations are promulgated by Parliament. A common approach to the development of regulations is to use what is known as the 'negative resolution' procedure (see documents numbers 1 and 2 of Table II). This process generally involves preparing a draft regulatory document, followed by a consultation with the public using the government's consultation web site and other means of communication, and finalizing the proposed regulations. The document then is 'made' (i.e. signed by the Minister) and laid before Parliament (Parliament has the opportunity to table a motion against the document up to 40 days after the document is laid before it). The regulations are then placed into force normally 21 days after being laid before Parliament. If a motion against the regulations is tabled, then Parliament can call for a debate and negate the regulation if it chooses. Through this process both houses of Parliament control subordinate legislation.

4.12. The appraisal worked with the UK authorities to gain a better understanding of the regulatory structure in that country since, although the RMTD is designated for the purposes of the Transport Regulations as the UK competent authority, each mode

is regulated by a different legal body, and each issues its own set of regulatory documents. The resulting overall description of the top level legal organizational infrastructure of the UK for regulating the transport of radioactive material, with emphasis on the RMTD as the UK competent authority, is shown in Fig. 1. It must be emphasized that this figure provides a simplified overview of the regulatory structure that exists in the UK; it represents a synthesis of multiple documents by the appraisal with the co-operation of RMTD staff, and does not provide all the interorganizational communication paths.

4.13. As can be seen in Fig. 1, the regulatory responsibility for all four modes of transport falls under the responsibility of the Secretary of State for Transport. However, to ensure the effective functioning of the legislative–regulatory regime and to avoid overlaps and gaps, in some cases it has been deemed necessary to establish working agreements, such as memoranda of understanding, between some organizations (e.g. see documents numbered 4–6 in Table II). A working agreement was determined not to be necessary between the RMTD and MCA, since they are both within the DfT, whereas the CAA is an autonomous body reporting separately to the Secretary of State for Transport.

4.14. The legislative and governmental responsibilities of a State for the transport of radioactive material are defined in Ref. [11]. Specifically, para. 2.2 of Ref. [11] specifies requirements for the legislative and governmental mechanisms a State needs to have in place. The following are quotes relative to transport from this paragraph (shown in italics), with comments prepared during the appraisal (in non-italicized, bulleted text) based on interviews regarding the manner in which the UK satisfies these requirements.

> "*2.2. There are certain prerequisites for the safety of facilities and activities. These give rise to the following requirements for the legislative and governmental mechanisms of States:*
>
> "*(1) A legislative and statutory framework shall be established to regulate the safety of… activities.*"
>
> • The framework is established by acts of Parliament. Two examples of the acts are documents 8 and 13 of Table II.
>
> "*(2) A regulatory body shall be established and maintained which shall be effectively independent of organizations or bodies charged with the promotion of nuclear technologies or responsible for… activities. This is so that regulatory judgements can be made, and enforcement actions taken, without pressure from interests that may conflict with safety.*"
>
> • The DfT and its executive bodies, including the RMTD, are independent of those organizations or bodies charged with the promotion of nuclear technologies (such as the DTI).

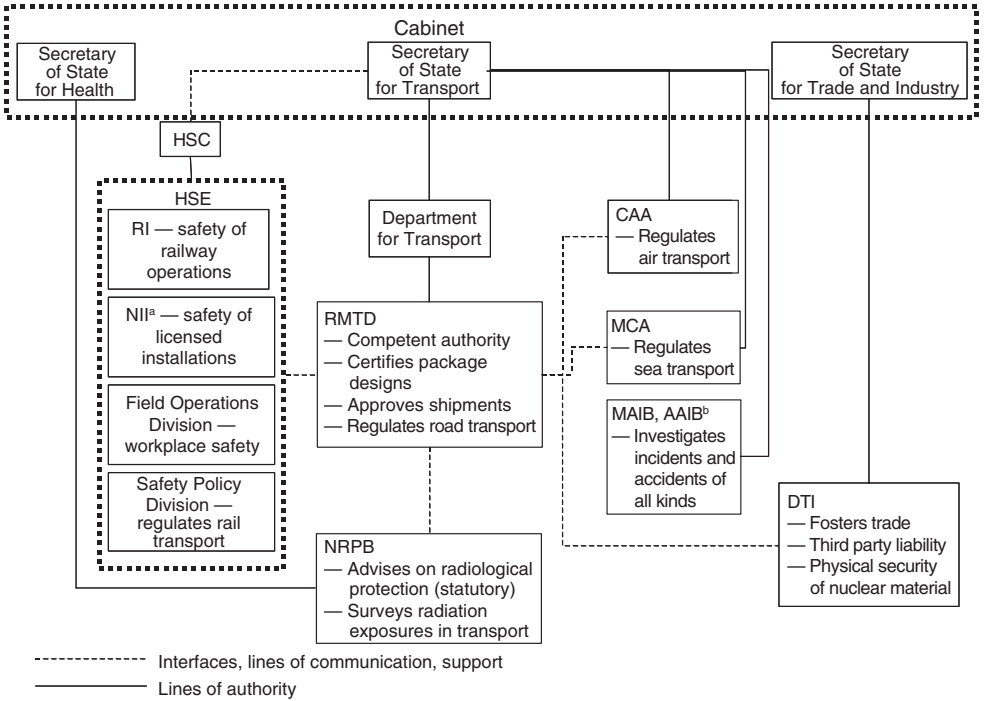

FIG. 1. Top level legal organizational infrastructure of the UK for regulating the transport of radioactive material. AAIB: Air Accident Investigation Branch; CAA: Civil Aviation Authority; DTI: Department of Trade and Industry; HSC: Health and Safety Commission; HSE: Heath and Safety Executive; HSE (RI): Her Majesty's Railway Inspectorate; HSE (NII): Her Majesty's Nuclear Installations Inspectorate; MAIB: Maritime Accident Investigation Branch; MCA: Maritime and Coastguard Agency; NRPB: National Radiological Protection Board.
[a] The NII also reports to the DTI. [b] The MAIB and AAIB are examples of accident investigative bodies (there are others).

"*(3) Responsibility shall be assigned to the regulatory body for authorization, regulatory review and assessment, inspection and enforcement, and for establishing safety principles, criteria, regulations and guides.*"

- The RMTD and the other regulatory bodies (see Fig. 1) have been assigned these responsibilities.

"*(4) The regulatory body shall be provided with adequate authority and power…*"

- The implementing acts of Parliament establish the necessary authorities and power as demonstrated, for example, in documents 7 and 12 of Table II.

"*(5) No other responsibility shall be assigned to the regulatory body which may jeopardize, or conflict with, its responsibility for regulating safety.*"

- The RMTD and other regulatory bodies (i.e. the CAA, MCA and HSE) do not have responsibilities that jeopardize or conflict with their assigned regulatory responsibilities for transport safety.

"*(6) …*"

"*(7) Adequate infrastructural arrangements shall be made for the safe transport of radioactive material.*"

- A detailed set of infrastructural arrangements is provided (e.g. see documents 3–6 of Table II, and the reporting and communicating arrangements illustrated in Fig. 1).

"*(8) An effective system of governmental emergency response and intervention capabilities shall be established and emergency preparedness shall be ensured.*"

- This is dealt with in detail in paras 4.111–4.121.

"*(9) Adequate infrastructural arrangements shall be made for physical protection, where these influence safety.*"

- This is dealt with adequately in the individual UK regulations (see, for example, Part I, Regulation 7, of the recently issued road regulations, document 9 of Table II).

"*(10) …*"

"*(11) The technological infrastructure necessary for ensuring the safety of… activities shall be provided, where this is not provided by other organizations.*"

- The NRPB provides support to the RMTD, as shown in Fig. 1. Other expertise is obtained by the RMTD as and when needed.

Issue: Comprehensive memoranda of understanding

4.15. The appraisal identified a number of working agreements, memoranda of understanding, etc., such as documents 3–6 of Table II, that formalize the

infrastructural arrangements between governmental bodies. It was determined that the Memorandum of Understanding between the Civil Aviation Authority Safety Regulation Group and the Health & Safety Executive, including Annex No. 3 — Dangerous Goods in Transit at Aerodromes, warranted praise. It was judged by experts in air transport to be the best formalized arrangement seen to date. It is very specific and complete, is clearly written and does an excellent job of assigning responsibilities.

4.16. Finding:

Basis: para. 2.2 of Ref. [11] states that "*There are certain prerequisites for the safety of facilities and activities. These give rise to the following requirements for the legislative and governmental mechanisms of States:… (7) Adequate infrastructural arrangements shall be made for the safe transport of radioactive material.*"

Good practice: it was determined that an excellent memorandum of understanding exists between the CAA and the HSE, which is clear, concise and does an excellent job of assigning responsibilities. This memorandum of understanding is held up as a good model for other States to follow.

4.17. If a state has a complex regulatory structure, as the UK does, it is vital to have signed documents clearly specifying responsibilities between the various regulatory bodies.

AUTHORITY, RESPONSIBILITIES AND FUNCTIONS OF THE REGULATORY BODY

4.18. Requirements for authority and responsibilities of the regulatory bodies can be found in both the Transport Regulations and Ref. [11]. For example, in addition to para. 2.2 of Ref. [11], which was cited and to which appraisal activities were performed, paras 2.4 and 2.6 of Ref. [11], relative to transport, state, inter alia:

> "*2.4. Legislation shall be promulgated to provide for the effective control of… transport safety. This legislation:*
>
> *(1) shall set out objectives for protecting individuals, society and the environment from radiation hazards, both for the present and in the future;*
> *(2) shall specify… activities and materials that are included in the scope of the legislation and what is excluded from the requirements of any particular part of the legislation;*

(3) shall establish authorization and other processes (such as notification and exemption), with account taken of the potential magnitude and nature of the hazard associated with the … activity, and shall specify the steps of the processes;
(4) shall establish a regulatory body with the authority outlined in para. 2.6;
(5) ...
(6) shall specify the process for removal of [an]… activity from regulatory control;
(7) shall establish a procedure for review of, and appeal against, regulatory decisions (without compromising safety);
(8) shall provide for continuity of responsibility when activities are carried out by several operators successively and for the recording of the transfers of responsibility;
(9) shall allow for the creation of independent advisory bodies to provide expert opinion to, and for consultation by, the government and regulatory body;
(10) shall set up a means whereby research and development work is undertaken in important areas of safety;
(11) …
(12) …
(13) …
(14) shall define what is an offence and the corresponding penalties;
(15) shall implement any obligations under international treaties, conventions or agreements;
(16) shall define how the public and other bodies are involved in the regulatory process; and
(17) shall specify the nature and extent of the application of newly established requirements to existing facilities and current activities."

"*2.6. The regulatory body shall have the authority:*

(1) to develop safety principles and criteria;
(2) to establish regulations and issue guidance;
(3) to require any operator to conduct a safety assessment;
(4) to require that any operator provide it with any necessary information, including information from its suppliers, even if this information is proprietary;
(5) to issue, amend, suspend or revoke authorizations and to set conditions;
(6) to require an operator to perform a systematic safety reassessment…;
(7) to enter a site or facility at any time to carry out an inspection;
(8) to enforce regulatory requirements;

(9) to communicate directly with governmental authorities at higher levels when such communication is considered to be necessary for exercising effectively the functions of the body;
(10) to obtain such documents and opinions from private or public organizations or persons as may be necessary and appropriate;
(11) to communicate independently its regulatory requirements, decisions and opinions and their basis to the public;
(12) to make available, to other governmental bodies, national and international organizations, and to the public, information on incidents and abnormal occurrences, and other information, as appropriate;
(13) to liaise and co-ordinate with other governmental or non-governmental bodies having competence in such areas as health and safety, environmental protection, security, and transport of dangerous goods; and
(14) to liaise with regulatory bodies of other countries and with international organizations to promote co-operation and the exchange of regulatory information."

4.19. The Transport Regulations [1] specify in para. 103 that:

"*103. In certain parts of these Regulations, a particular action is prescribed, but the responsibility for carrying out the action is not specifically assigned to any particular legal person. Such responsibility may vary according to the laws and customs of different countries and the international conventions into which these countries have entered. For the purpose of these Regulations, it is not necessary to make this assignment, but only to identify the action itself. It remains the prerogative of each government to assign this responsibility.*"

4.20. The appraisal evaluated the authority, responsibilities and functions of the UK transport regulatory bodies through a detailed study of documents and interviews. Regarding the authorities specified in paras 2.4 and 2.6 of the legal and governmental infrastructure safety standard [11], the appraisal found that these requirements are satisfied well. Regarding the allocation of responsibility, pursuant to para. 103 of the Transport Regulations [1], the UK has allocated responsibilities as noted in Fig. 1, and this allocation was determined by the appraisal to be adequate and complete. The functions of the regulatory bodies are set forth in multiple documents, including acts of Parliament, memoranda of understanding and other working agreements between the various government agencies. Once again, it was determined that the allocation of functions is adequate and complete. Areas for improvement are addressed below.

Issue: Intergovernmental co-ordination with appropriate committees and working groups

4.21. The UK has in place and uses quite effectively a Carriage of Dangerous Goods Committee (CDGC) that involves all the domestic dangerous goods regulators. The CDGC regularly brings together representatives of all enforcement agencies in Great Britain that have an interest in dangerous goods, including those in Class 7 (radioactive material in transport).

4.22. The CDGC has been in existence since 1998 and brought together three former liaison committees, all involved in the transport of dangerous goods. One former committee was known as the Enforcement Liaison Committee for the Transport of Radioactive Materials (ELCTRAM), which was constituted in 1986. It came into being as the result of a recommendation from the Advisory Committee to the Secretary of State and the Health and Safety Commission on the Transport of Radioactive Material. The recommendation was for such a committee to be formed so as to improve liaison and contact between involved enforcement agencies.

4.23. ELCTRAM continued in operation until 1998, at which time it joined two other liaison committees to form the CDGC. The committee consists of representatives from the RMTD, CAA, MCA, Vehicle Inspectorate, HSE (Policy, Operations and Technical Support), Association of Chief Police Officers (which covers England and Wales) and Association of Chief Police Officers (Scotland). It is primarily focused on liaison and enforcement matters associated with current and imminent regulations, whereas the Technical Sub-committee of Dangerous Goods Working Party (WP/TDG) is primarily focused on new and developing regulations.

4.24. The CDGC meets approximately twice a year to facilitate effective liaison and communication. Its terms of reference are:

— To promote the consistent and effective enforcement of legislation for the safe transport of dangerous goods;
— To develop effective liaison arrangements between those bodies that have an enforcement role in relation to the transport of dangerous goods;
— To consider proposed legislative changes, potential deficiencies in current legislation, international developments and EC initiatives that impact on the transport of dangerous goods, so as to identify and resolve potential enforcement and/or policy difficulties;
— To resolve operational and/or legal difficulties.

4.25. The CDGC also carried forward from ELCTRAM the practice of conducting periodic enforcement liaison exercises that focus on a selected transport modal interchange point and bring together representatives from the involved enforcement agencies. The last such exercise was carried out in February 1999 and was aimed at road–air interchanges at a major airport (Heathrow). There have been no further such exercises conducted, mainly because of rearranged priorities within some of the participating enforcement agencies.

4.26. In addition to the activities outlined above, the WP/TDG, which is chaired by the Head of the Dangerous Goods Transport Policy Branch, DfT, plays a key role in the consultation process and in the development of various international modal transport regulations. Its output provides essential material for DfT policy makers, international negotiators and makers of the regulations.

4.27. Subordinate to the WP/TDG is a technical subgroup (the Radioactive Material Sub-group). This subgroup meets under the chairmanship of the Transport Radiological Adviser to the Secretary of State, who is also the Head of the RMTD. It is principally concerned with consultation and input to new regulations, both international and national. It meets as and when necessary, according to the demands of prospective new regulations and the two-year IAEA revision cycle. It draws its membership from various government departments and agencies, such as the HSE, MCA, CAA and Environment Agency, as well as representatives from industry, trade associations and some public interest groups.

4.28. Findings:

Basis: para. 2.6 of Ref. [11] states, inter alia, that "*The regulatory body shall have the authority:… to liaise and co-ordinate with other governmental or non-governmental bodies having competence in such areas as health and safety, environmental protection, security, and transport of dangerous goods;*"

Suggestion: it is suggested that the DfT considers encouraging the CDGC, consistent with its authority to liaise and co-ordinate with other governmental bodies, to re-establish and implement plans for joint agency enforcement liaison exercises, with a view to convening at least one exercise per year.

Good practice: it was determined that the use of national regulatory co-ordinating committees and groups with charters to co-ordinate the development and implementation of domestic regulatory documents reflecting the requirements of the international modal authorities, that meet regularly to co-ordinate inputs to new international regulations and to co-ordinate the planning

and scheduling of periodic enforcement liaison exercises, is viewed as a good practice that States should consider emulating.

4.29. With regard to the preceding identified good practice, the joint agency enforcement liaison exercises were judged by the appraisal to be a valuable tool for a State such as the UK in which multiple agencies are involved in regulating transport and many of the Class 7 material transport activities are intermodal, involving more than one of these agencies.

4.30. The use of the CDGC and other committees, working parties, etc., is an excellent way to facilitate planning, communication and co-ordination among the various bodies involved in regulating the packaging and transport of Class 7 material.

Issue: Staffing of transport regulatory bodies

4.31. The UK regulatory structure for the transport of radioactive material is complex, as illustrated in Fig. 1, and consists of the DfT, which serves as the competent authority for the purposes of the application of the Transport Regulations, including the approval of package designs, special form radioactive material, low dispersible material, special arrangements, certain shipments and interfacing with the IAEA, and which regulates the road transport of radioactive material; the CAA, which regulates the air transport of radioactive material; the MCA, which regulates the sea transport of radioactive material; and the HSE (RI), which regulates the rail transport of radioactive material.

4.32. The appraisal indicated that the MCA appears to be well staffed and organized to carry out its necessary functions (e.g. surveying, inspecting and enforcing) of ensuring the safe transport of INF Code material by sea. INF Code material transport is a small fraction of the responsibility of the MCA, but a significant commitment is made to ensure that its responsibilities in this area are properly fulfilled.

4.33. It appears, however, that other UK regulatory elements may not be adequately staffed to fulfil all of their specified functions. Specifically, the DfT and CAA may not be adequately staffed to perform all of the functions for which these organizations have responsibility. Although the DfT has vehicle inspectors or examiners who can carry out various enforcement functions, it was not demonstrated satisfactorily during the appraisal that these functions were sufficient nor that the RMTD itself and the CAA are adequately staffed to perform all of their necessary inspection and enforcement functions.

4.34. Finding:

Basis: para. 2.2 of Ref. [11] states, inter alia, that "*There are certain prerequisites for the safety of facilities and activities. These give rise to the following requirements for the legislative and governmental mechanisms of States:… (3) Responsibility shall be assigned to the regulatory body for authorization, regulatory review and assessment, inspection and enforcement, and for establishing safety principles, criteria, regulations and guides. (4) The regulatory body shall be provided with adequate authority and power, and it shall be ensured that it has adequate staffing and financial resources to discharge its assigned responsibilities*."

Paragraph 4.1 of Ref. [11] states, inter alia, that "*The regulatory body shall be structured so as to ensure that it is capable of discharging its responsibilities and fulfilling its functions effectively and efficiently. The regulatory body shall have an organizational structure and size commensurate with the extent and nature of the facilities and activities it must regulate, and it shall be provided with adequate resources and the necessary authority to discharge its responsibilities.*"

Paragraph 4.6 of Ref. [11] specifies, inter alia, that "*The regulatory body shall employ a sufficient number of personnel with the necessary qualifications, experience and expertise to undertake its functions and responsibilities. It is likely that there will be positions of a specialist nature and positions needing more general skills and expertise. The regulatory body shall acquire and maintain the competence to judge, on an overall basis, the safety of… activities and to make the necessary regulatory decisions.*"

Suggestion: it is suggested that the UK evaluates the adequacy of its staffing and financial resources for the various regulatory bodies to ensure that they are able to fulfil their responsibilities, including those in the areas of authorization (e.g. the approval of package designs), regulatory reviews and assessments, inspections and enforcement, and for establishing safety principles, criteria, regulations and guides.

4.35. Additional resources may be needed for some of the regulatory bodies in the UK to ensure that they are adequately staffed to fulfil their responsibilities, specifically in the inspection and enforcement area (see also the recommendation and suggestions in para. 4.109).

Issue: Need to liaise with the UNECE Inland Transport Committee and other international organizations on the structure of the modal transport regulations

4.36. The DfT found it necessary to redraft the ADR requirements into its own domestic road regulations (see document 9 of Table II). The reported reason for this is that the format of the ADR does not communicate clearly; the text of the Transport Regulations was frequently used as a basis for this document, rather than the text of the ADR regulations, because it appears to DfT lawyers and technical staff to be more accurate and clearly stated.

4.37. Finding:

Basis: para. 2.6 of Ref. [11] states, inter alia, that "*The regulatory body shall have the authority:… (14) to liaise with regulatory bodies of other countries and with international organizations to promote co-operation and the exchange of regulatory information*."

Suggestion: it is suggested that the DfT should continue and enhance its efforts to communicate its concerns regarding the format of the ADR Agreement to the UNECE, and work closely with it to ensure that future editions of the ADR Agreement are more user friendly.

4.38. The need to attain closer consistency between the domestic and international regulatory documents might also be communicated by the UK to the IAEA hosted Interagency Co-ordination Group (which involves the IAEA, ICAO, IMO and UNECE). The UK could provide to the Interagency Co-ordination Group examples of where problems exist between the various international regulatory documents in order to facilitate its deliberations.

ORGANIZATION OF THE REGULATORY BODY

4.39. Paragraph 4.7 of Ref. [11] specifies that "*In order to ensure that the proper skills are acquired and that adequate levels of competence are achieved and maintained, the regulatory body shall ensure that its staff members participate in well defined training programmes. This training should ensure that staff are aware of technological developments and new safety principles and concepts.*"

4.40. It was determined that the DfT has a comprehensive training programme for its staff members directed towards satisfying this requirement.

4.41. Paragraph 4.9 of Ref. [11] specifies that "*The government or the regulatory body may choose to give formal structure to the processes by which expert opinion and advice are provided to the regulatory body; the need or otherwise for such formal advisory bodies is determined by many factors. When the establishment of advisory bodies is considered necessary, on a temporary or permanent basis, such bodies shall give independent advice. The advice given may be technical or non-technical (in advising, for example, on ethical issues in the use of radiation in medicine). Any advice offered shall not relieve the regulatory body of its responsibilities for making decisions and recommendations.*"

4.42. The DfT utilizes the expertise of the NRPB in many areas, including, inter alia, assessing the level of radiation exposures that are incurred as a result of the transport of radioactive material in the UK. The document facilitating this arrangement was reviewed. The work of the NRPB in supporting the DfT in this responsibility is commendable and is addressed in detail later in this report.

Issue: Seeking a simpler and common approach for the development and adoption of transport regulatory requirements

4.43. There are four regulatory bodies focused individually on the four modes of transport — road, rail, sea and air. One of these, the DfT, which is responsible for road regulations, is also designated as the competent authority with the added responsibility to review and approve package designs, requests for special arrangements, etc., and to oversee the State's compliance with the radioactive material transport regulations. These four bodies also interface with bodies such as the HSE (NII) in the areas of inspection and enforcement, where interests overlap.

4.44. Owing to this regulatory infrastructure and also, in part, because of constraints imposed by European law, the UK adopts regulatory requirements on a modal basis. This leads to a complex regulatory structure, which currently results in different regulatory document structures and different adoption dates for the individual modes, although it was recognized that the different adoption dates are not completely within the UK's control.

4.45. The maritime regulations implemented by the MCA are short documents that reference the IMO IMDG Code directly. Other modal regulators rewrite the regulatory requirements and there are inconsistencies in the wording between the different modes (e.g. the definition of 'consignment' is the same in the road and rail regulations and for sea transport by reference to the IMO IMDG Code [15], but is significantly different in the air regulations). These differences offer the potential for confusion on the part of the users of the regulations (although the extent of potential

confusion is not known), especially those users involved in either intermodal transport or international transport. In addition, it adds complexity to the overall regulatory regime.

4.46. Findings:

Basis: the following is the basis for the ensuing good practice and suggestions relating to the organization of the regulatory body.

Paragraph 4.2 of Ref. [11] states that "*If the regulatory body consists of more than one authority, effective arrangements shall be made to ensure that regulatory responsibilities and functions are clearly defined and co-ordinated, in order to avoid any omissions or unnecessary duplication and to prevent conflicting requirements being placed on the operator. The main functions of review and assessment and inspection and enforcement shall be organized in such a way as to achieve consistency…*"

Good practice: it was determined that the MCA implements maritime dangerous goods regulations through direct reference to the IMO IMDG Code. This practice reduces the workload on the MCA, speeds up the process of adopting new regulations for that mode, allows the implementation date for that mode to coincide with the implementation date established by the IMO and reduces the likelihood of errors or differences occurring in regulatory requirements.

4.47. Steps have been initiated among the various regulatory bodies in the UK to evaluate the current regulations with a view to reforming the manner in which transport regulations are implemented at the domestic level via an instrument known as a regulatory reform order.

Suggestion: it is suggested that the UK authorities should continue efforts to harmonize the domestic adoption of the international regulatory requirements for radioactive material using a simpler and common approach for all modes.

4.48. The appraisal noted that the UK regulatory authorities are currently discussing this issue. This effort should be continued and emphasized. Specifically, consideration could be given to evaluating the manner in which the MCA adopts international regulations.

Suggestion: it is suggested that a common approach for the domestic adoption of regulatory requirements on a modal basis could be facilitated by having all

modes (a) adopt by reference rather than some of the modal authorities rewriting regulatory requirements into UK domestic documents and (b) adopt on the same schedule (subject to any constraints imposed by the international modal bodies).

4.49. This co-ordinated approach could be facilitated through a more effective use of an existing co-ordinating committee or the formation of a new committee, ensuring that all affected regulatory bodies are involved.

AUTHORIZATION PROCESS

4.50. When transporting radioactive material the safety of transport personnel, the general public, property and the environment can only be assured if the accepted transport regulations are complied with. Although these regulations authorize several cases in which transport can be made without competent authority involvement or package design approval, a key function of the competent authority is the conduct of a systematic programme responsible for issuing documents that approve the transport of radioactive material. Examples of these approval documents, often referred to as certificates of approval, include special form radioactive material approvals, design approvals for packages containing fissile material, Type B(U) and B(M) package design approvals, shipment approvals and special arrangements approvals.

4.51. This approval programme is conducted in the UK by RMTD staff. Although the Head of the Division issues these approval documents, each member of the engineering, quality and compliance assurance, and criticality sections is involved in the implementation and documentation of this programme. As a whole, the appraisal was impressed by the efficiency and capability of the RMTD approval staff. The following suggestions for improving this complex and resource and time consuming programme are offered.

4.52. The following is provided as a basis for the findings relating to the authorization process (additional bases are discussed for each issue as applicable).

Basis: the principle basis for all findings for the issues relating to the authorization process in this subsection is found in the Transport Regulations [1], which specify in para. 802 that competent authority approval is required for specified package designs, special form radioactive material, low dispersible radioactive material, special arrangements and certain shipments. The form of the approval and specific requirements for approvals are identified in paras 803–806 of the Transport Regulations [1].

Issue: Completeness of records of approval

4.53. Finding:

Suggestion: although the records of approvals (i.e. certificates of approval) kept by the RMTD appeared organized and complete, it is suggested that the following record keeping improvements be implemented:

- **The development of a programme to archive electronically approval certificates, approval files, correspondence and package design data;**
- **The inclusion of foreign certificates in validation and multilateral approval files;**
- **The inclusion of all modification sheets in corresponding certificate files.**

Issue: Multilateral approval and validation programme

4.54. The RMTD staff make a clear distinction between multilateral approval and validation. However, examples were found indicating that the resulting certificates do not always recognize the fact that many of the certificate holders, carriers and fellow competent authorities do not understand these distinctions or do not make the same distinctions.

4.55. Findings: with respect to the multilateral approval and validation programme implemented by the RMTD, two suggestions were identified.

Basis: for the following two suggestions, the following applies:

The Transport Regulations [1] specify in para. 834 that "*Multilateral approval may be by validation of the original certificate issued by the competent authority of the country of origin of the design or shipment. Such validation may take the form of an endorsement on the original certificate or the issuance of a separate endorsement, annex, supplement, etc., by the competent authority of the country through or into which the shipment is made*."

Ref. [4] states in para. 419 that:

> "*419. …It is essential that the competent authority… issues appropriate certificates of approval giving all the required information.*"

Ref. [4], in addressing the issue of validations, further states (in paras 513 and 516) that:

"*513. Under the Regulations, multilateral approval of a design or shipment may be effected*
— *either by independent certification as part of a chain of multilateral competent authority approvals*
— *or by validation of the approval certificate issued by the original competent authority.*"

"*516. Validation eliminates the possibility of confusion of certificates issued by different competent authorities that cover the same case. Validation may apply to the original certificate in its entirety, or to the appropriate part(s) of it if there are other parts which constitute a multilateral approval or which are otherwise inappropriate for multilateral approval.*"

Thus validation is a method that can be used to effect a multilateral approval. Such a validation is constrained to the contents or parts of the contents of the original certificate. A validation should not expand beyond the contents of the original certificate. If expansion is needed (e.g. in terms of different specified contents) then the approval should be accomplished using a separate certificate.

Suggestion: it is suggested that the RMTD reviews and amends as necessary its approval procedures and develops an implementation strategy and schedule that ensures that the applicability of each certificate is clearly specified so that other competent authorities and users of the certificate will be able to determine whether the certificate needs further multilateral approval action.

Suggestion: it is suggested that, although not specifically authorized or prohibited by the Transport Regulations, the RMTD assesses its approval procedures to ensure that it refrains from expanding the applicability of foreign certificates in the execution of its multilateral approval programme (e.g. authorization of additional contents for a foreign package design) and should consider expanding applicability only through an independent UK approval certificate.

4.56. Applicants who request an expansion of a certificate's contents could be directed by the RMTD to make that request to the competent authority that approved the original design, or the RMTD could undertake issuing a separate unilateral or multilateral approval certificate, as appropriate. At the very least, the RMTD should remove all references to the original design approval when it issues approvals that expand on the scope of an original design approval.

4.57. As the industry transporting radioactive material continues to mature and becomes more international, more approvals are likely to be necessary in order that the RMTD can meet the needs of its applicants.

4.58. Findings: the appraisal resulted in three suggestions on the issuing of multilateral approval and validation certificates.

Suggestion: it is suggested that the RMTD undertakes an internal review to develop policies and practices that would minimize the number of certificates issued.

Suggestion: it is suggested that the RMTD considers issuing validation and multilateral approvals of foreign package design certificates with a single approval valid for all applicants, include multiple models of a package design on a single certificate and expand the use of multiple contents on a single approval.

Suggestion: it is suggested that modification sheets be amended so that certificate holders are made aware that if the associated approval needs validation or multilateral approval the modification sheet will also need validation or multilateral approval.

4.59. It is important that the certificate holder understands that the modification sheet becomes a part of the certificate and should be attached to the certificate when the certificate is presented to package users and to other competent authorities for validation.

4.60. The need for making both minor and major changes to approvals was recognized during the appraisal. The modification process employed by the RMTD was acknowledged.

4.61. Finding: with respect to regulatory control, the appraisal identified one good practice:

Good practice: it was determined that the modification process used by the RMTD provides an adequate regulatory control of modifications but allows a streamlined and efficient process for changes that have limited safety significance. It is understood that the UK has made a proposal to include this scheme within the Transport Regulations during the current biennial revision cycle.

REVIEW AND ASSESSMENT

4.62. The preceding discussion and findings on the authorization process addressed the approval programme from a global perspective, whereas this area of discussion and findings specifically addresses the details of the package design review and assessment activities associated with the approval of package designs, materials, transport and special arrangements.

4.63. The RMTD, as the competent authority, issues approvals, including package design approvals, as described in para. 802 of the Transport Regulations [1] (see paras 4.50–4.61). In addition, the RMTD is responsible for the overall safety of non-competent authority approved radioactive material transport packages such as Type A and industrial packages.

4.64. The RMTD technical staff is directly responsible for review and assessment activities. The RMTD staff is experienced and knowledgeable in its respective areas of responsibility.

4.65. The RMTD has developed a complete process for the oversight of the design approval process that includes the following:

— *Pre-application activities*. The staff interacts informally with prospective applicants on new package designs, starting very early in the design process. The staff interaction includes meetings and telephone calls to discuss potential new package designs.
— *Package testing*. The staff reviews proposed package testing programmes. The discussions include the potential use of scale models or prototype packages, attributes of the test facilities and test details such as drop orientations. The staff regularly observes relevant portions of package testing.
— *Application guidance*. The RMTD has issued an Applicant's Guide that is current and comprehensive in its scope. The Applicant's Guide is publicly available and includes the relevant administrative as well as technical aspects concerning the submittal of an application for approval.
— *Technical review of the application*. The RMTD review and assessment is thorough, and the members of the RMTD staff are experienced and knowledgeable in their respective areas of responsibility. The technical staff is divided into three sections that share responsibility for design review. The review process is initiated administratively upon receipt of an application. Applications include requests for the approval of new package designs, shipments, special form radioactive material or special arrangements. Applications may also be requests for modifications of previous approvals or

requests for the validation or multilateral approval of a foreign approved package. A project officer, typically from the mechanical engineering section, is assigned the overall responsibility for the co-ordination of the review. The project officer may be a criticality assessor for the modification of approvals if the approval involves fissile material. Mechanical engineering, criticality and quality assurance assessors are assigned, as appropriate. A job control sheet is used to co-ordinate the review among the three groups.

— *Administrative programme management*. The RMTD performs a large number of technical reviews and maintains a large number of current transport approvals. Computer databases are used to assist in the administrative management of the programme. An administrative group maintains the databases as well as the hardcopy files associated with the review and assessment programme.

4.66. In general the competence, experience and knowledge of the RMTD staff was recognized as being impressive. Staff members appeared to approach their work in a dedicated and conscientious manner. The various sections seem to function well together as a team and there appears to be a great deal of interaction between staff members. The quantity of work performed by the RMTD staff was also recognized as being substantive. Approximately 200 technical assessments (including package design and special form approvals, foreign certificate validations and modifications to approvals) were performed in the past year. Overall the staff seems highly motivated and skilled. Some areas of potential improvements were identified during the appraisal, as well as some good practices that are deserving of recognition.

4.67. Finding: the following is provided for a basis for the findings for the review and assessment issues (additional bases are discussed for each issue, as applicable):

Basis: the provisions in Ref. [11] that directly relate to the review and assessment programme for transport activities are listed below.

"*2.2. There are certain prerequisites for the safety of facilities and activities. These give rise to the following requirements for the legislative and governmental mechanisms of States:… (2) A regulatory body shall be established and maintained which shall be effectively independent of organizations or bodies charged with the promotion of nuclear technologies or responsible for… activities. This is so that regulatory judgements can be made, and enforcement actions taken, without pressure from interests that may conflict with safety.*"

"*4.3. If the regulatory body is not entirely self-sufficient in all the technical or functional areas necessary to discharge its responsibilities for review and assessment*

or inspection, it shall seek advice or assistance, as appropriate, from consultants. Whoever may provide such advice or assistance (such as a dedicated support organization, universities or private consultants), arrangements shall be made to ensure that the consultants are effectively independent of the operator."

"*4.7. In order to ensure that the proper skills are acquired and that adequate levels of competence are achieved and maintained, the regulatory body shall ensure that its staff members participate in well defined training programmes. This training should ensure that staff are aware of technological developments and new safety principles and concepts.*"

"*5.5. …"The regulatory body shall formally record the basis for these decisions.*"

"*5.9. A primary basis for review and assessment is the information submitted by the operator. A thorough review and assessment of the operator's technical submission shall be performed by the regulatory body in order to determine whether the… activity complies with the relevant safety objectives, principles and criteria. In doing this, the regulatory body shall acquire an understanding of the design of the facility or equipment, the safety concepts on which the design is based and the operating principles proposed by the operator, to satisfy itself that:*

(1) the available information demonstrates the safety of the facility or proposed activity;
(2) the information contained in the operator's submissions is accurate and sufficient to enable confirmation of compliance with regulatory requirements; and
(3) the technical solutions, and in particular any novel ones, have been proven or qualified by experience or testing or both, and are capable of achieving the required level of safety."

"*5.11. Any modification to safety related aspects of a facility or activity (or having an indirect but significant influence on safety related aspects) shall be subject to review and assessment, with the potential magnitude and nature of the associated hazard being taken into account."*

Paragraph 801 of the Transport Regulations [1] states that "*For package designs where it is not required that a competent authority issue an approval certificate the consignor shall, on request, make available for inspection by the relevant competent authority, documentary evidence of the compliance of the package design with all the applicable requirements.*"

Guidance regarding review and assessment programmes is given in the provisions of Ref. [4], as shown below.

Paragraph 207 of Ref. [4] provides for the optional use of advisory bodies and for the use of outside assistance for technical support.

Paragraph 501 of Ref. [4] states that "*It is one of the responsibilities of the competent authority to issue approvals. The decision to give an approval is based upon the competent authority's evaluation of the applicant's demonstration of compliance with the relevant regulations. As described in Section IV, the competent authority should complete and record these safety evaluations.*"

Paragraph 502 of Ref. [4] states that "*The first contact of applicants with the competent authority is often when they apply for an approval, but they should also be encouraged to contact the competent authority during the preliminary design stages in order to discuss the implementation of the relevant design principles and to establish both the approval procedure and the actions incumbent on them.*"

Paragraph 477 of Ref. [4] states that "*It is the responsibility of the competent authority to determine that the designs of packages are assessed against all the relevant parts of the Regulations. Therefore, the competent authority or its agent should not only conduct assessments of 'designs', if appropriate, but it should also ensure that similar assessments of package designs which do not require competent authority approval (such as Type A packages or industrial packages) are carried out by the appropriate organizations and that the necessary evidence of such assessments is available to the competent authority, if requested.*"

Issue: Full documentation of the basis for approval

4.68. The RMTD does not prepare a formal document or report for package approvals or special arrangements that describes the basis for the approval. The records of the assessment include memoranda to the file, correspondence with the applicant regarding the technical details of the assessment and the job control sheet that shows individual assessor sign-offs. The criticality review section typically provides a written description of the assessment it performs.

4.69. Finding:

Recommendation: it is recommended that a written formal report be issued for each package design certificate and special arrangement certificate, including modifications to certificates, that clearly documents the basis of the approval.

4.70. The report should include all technical disciplines important for the safe performance of the package or shipment, including structural, thermal, radiation shielding, operations, maintenance and criticality. The report should also include any package drawings or drawing lists that are included as part of the certificate. The report should clearly identify the basis for the approval for all technical disciplines to meet the requirements of para. 5.5 of Ref. [11] and be consistent with paras 419 and 501 of Ref. [4]. Consideration should be given to making this report readily available upon request to other competent authorities and, as appropriate, to members of the public.

Issue: Programme to monitor the design of Type A and industrial packages

4.71. The RMTD is responsible for the oversight of the transport of radioactive material in packages that are not approved by the competent authority. Some oversight of Type A and industrial package designs is performed on an ad hoc basis. Currently resources do not exist to develop and implement a consistent or structured programme to monitor the design of Type A and industrial packages.

4.72. Finding:

Recommendation: it is recommended that compliance assurance activities for transport include a systematic review of the non-competent authority approved package designs using an appropriate sampling basis.

Issue: Administrative guide for assessors

4.73. The RMTD has developed a procedure, which has not yet been implemented, for providing administrative guidance to assessors. The procedure would be more useful if it included additional technical detail for enhancing the review process and assuring complete, thorough and consistent technical reviews, and if it provided guidance regarding the final report of the review, as described above for all elements requiring competent authority approval, as specified in para. 802 of the Transport Regulations [1]. The assessment manual should also provide guidance for the transitional arrangements on package designs (e.g. paras 815–818 of the Transport Regulations [1]), on the restrictions on modifications that may be authorized and for the manufacture of new packagings, including major components.

4.74. Finding:

Suggestion: it is suggested that the RMTD should complete and implement a technical instruction document (e.g. an assessment manual) that provides

guidance for the review of applications for the approval of package designs, special form and low dispersible radioactive material, special arrangements, shipments and radiation protection programmes.

Issue: Consistency in technical reviews

4.75. Currently the consistency of all the technical reviews performed by the RMTD is achieved by informal staff interaction.

4.76. Finding:

Suggestion: it is suggested that there be a more structured approach to assuring consistency, possibly considering, inter alia, the following two elements:

- **Filling the leadership position for the mechanical engineering section, which has been vacant for an extended period of time;**
- **Additional formal technical oversight by the section leaders.**

Issue: Guidance to applicants

4.77. The RMTD has for many years provided prospective applicants with a document that provides guidance on the information necessary for an application for approval. The current edition of this document is Document No. DETR/RMTD/0003, dated January 2001, Guide to an Application for UK Competent Authority Approval of Radioactive Material in Transport (IAEA 1996 Regulations), known as the Applicant's Guide. The current issue of the Applicant's Guide is comprehensive and timely, being based on the Transport Regulations. This is a practical and useful tool that is responsive to the guidance provided in para. 412 of Ref. [4].

4.78. Finding:

Good practice: it was determined that the RMTD has for many years provided prospective applicants with a document that provides guidance on the information necessary for an application for approval.

Issue: Interaction with applicants

4.79. Interaction between the competent authority and applicants is beneficial in both assuring a quality application and in facilitating the final review process by addressing problems early in the design phase, consistent with the guidance in para. 479 of Ref. [4].

4.80. Findings:

Good practice: it was determined that the RMTD has an established practice of early and active interaction with applicants during the design review process. The RMTD has an established practice of regularly observing the physical testing of package designs, consistent with para. 477 of the guidance safety standard on compliance assurance.

Suggestion: it is suggested that the RMTD should continue ensuring that its interaction with applicants does not result in a conflict of interest or the perception of a conflict of interest and that the regulator remains clearly independent.

Issue: Administrative files of the competent authority

4.81. The RMTD maintains databases that include descriptive information on each application received. The database information is comprehensive, and includes all requests received by the RMTD; it is well organized and can be sorted and manipulated using standard database techniques. Database information is entered for each application received by the RMTD, including the date of the application, certificate number, assigned staff members and completion dates. The database includes information for all types of approvals, including the validation of foreign certificates. An administrative support group maintains hardcopy files for each application, and a file of all approval certificates is also maintained in both hardcopy and electronic forms.

4.82. Finding:

Good practice: it was determined with regard to the administrative aspects of the RMTD functions that the project records management goes beyond the norm by having (a) files that are neat, complete, systematically organized and properly maintained and (b) project information maintained electronically providing search and sort capabilities available to all staff members.

Issue: Public participation and information

4.83. All information supplied to the RMTD as part of an application for a package or shipment approval is treated as commercial-in-confidence and will not be disclosed by the RMTD, with certain exceptions. The certificate of approval that is issued by the RMTD is sent directly to the applicant and is not distributed to users or the public by the RMTD. The certificate holder is responsible for the distribution of the

certificate to users or other parties. The participation of the public in rule making activities is allowed for through an Internet based system used to record comments.

4.84. Finding:

Basis: the requirements in Ref. [11] include provisions for public information and interaction. For example:

"*2.6. The regulatory body shall have the authority:… (11) to communicate independently its regulatory requirements, decisions and opinions and their basis to the public;…*"

"*3.3. In order to discharge its main responsibilities… the regulatory body:… (6) shall communicate with, and provide information to, other competent governmental bodies, international organizations and the public;…*"

Suggestion: it is suggested that restricted access to approval documents (both the application and the certificate) should be reconsidered by the RMTD and its legal staff to assure that adequate information regarding its activities is available to the public, consistent with the need to protect commercial information that is customary in the UK.

4.85. Greater access of the public to the work of the division is suggested, as described in paras 205 and 420 of Ref. [4]. It is noted that the restricted availability of the information contained in package applications may cause difficulties for other competent authorities under some circumstances.

Issue: Radiation exposure assessment

4.86. Reports on the normal and potential doses in transport were reviewed in detail. These studies and reports were performed by the NRPB for several periods (the reports reviewed covered a time period from 1964 to 1996). The appraisal noted that additional studies have been made since and more are currently underway. These studies are undertaken in support of the NRPB's statutory responsibility to provide advice to the RMTD (see the discussion in paras 4.3–4.14 and Fig. 1). The NRPB produces an annual analysis of exposures from accidents, and mode or case specific analyses of the normal exposures involving transport.

4.87. In accordance with these reports the maximum individual radiation doses to the public have been determined to be of the order of a few μSv per year. Workers involved in the transport of technetium generators were determined to receive the

highest doses (approximately 15 mSv/a). In all cases the doses have been determined to be lower than the applicable limits.

4.88. The resulting doses in reported accidents are of the order of a few hundred μSv. In a sequence of reports for the period 1989 to 1996 it was determined that all but one of 129 reported events were 'radiologically insignificant'. The one event of significance, which occurred in 1996, involved the inappropriate transport of a contaminated flask lid spacer and resulted in an exposure to a driver of about 6.5 μSv to the body and a 52 μSv skin dose. A second worker received a hand dose of 70 μSv.

4.89. The efforts in assessing and documenting radiation exposures from the transport of radioactive material by the NRPB on behalf of the RMTD appear to more than satisfy the requirements in para. 304 of the Transport Regulations [1] and para. 3.3(10) of Ref. [11].

4.90. Finding:

Basis: para. 304 of the Transport Regulations [1] states that "*The relevant competent authority shall arrange for periodic assessments of the radiation doses to persons due to the transport of radioactive material, to ensure that the system of protection and safety complies with the Basic Safety Standards…*"

Paragraph 3.3 of Ref. [11] states, inter alia, that "*In order to discharge its main responsibilities, as outlined in para. 3.2, the regulatory body:… (11) shall advise the government on matters related to the safety of… activities;…*"

Good practice: it was determined that the RMTD's long history of commissioning assessments and receiving reports from the NRPB on radiation exposures resulting from the transport of radioactive material is a very good practice that goes beyond the norm and that is consistent with the radiation protection provisions of the Transport Regulations and with the responsibilities and functions of the regulatory body contained in the recently published legal and governmental infrastructure safety standard.

4.91. The NRPB assessments are made annually for accidents that have been reported, and periodically for mode or practice specific activities. Each assessment is reported formally to the competent authority.

INSPECTION AND ENFORCEMENT

4.92. The competent authority should perform audits and inspections as part of its compliance assurance programme in order to confirm that the users are meeting all the applicable requirements of the Transport Regulations and are applying their quality assurance programmes. Inspections are also necessary to identify instances of non-compliance that may necessitate either corrective action by the user or enforcement action by the competent authority.

4.93. In determining the national programme for compliance assurance, the competent authority should take into account not only the numbers and types of packages being transported but also the size and complexity of the industry, as well as its own resources. Under all circumstances, compliance assurance should include, as a minimum, the three following fundamental activities:

— Review and assessment activities, including the issue of approval certificates;
— Inspection and enforcement;
— Emergency response.

4.94. For the purposes of the Transport Regulations, the Secretary of State for Transport is the UK competent authority for movements by all modes of transport. The RMTD carries out the executive function on behalf of the Secretary of State. These responsibilities are reflected in a memorandum of understanding between the DfT and the CAA (December 1986), a memorandum of understanding between the DfT and the HSE (August 1991) and an agency agreement between the HSC and the Secretary of State for Transport (October 1996).

4.95. The requirements in the UK related to quality and compliance assurance programmes are identified in The Radioactive Material (Road Transport) Regulations 2002 (document 9 of Table II), specifically in Regulation 18. The specific requirements in the 'road' regulations are used as a basis for the findings with regard to DfT practices related to inspection and enforcement requirements.

4.96. With regard to inspection Regulation 18(2) states that "*the user must establish and maintain a quality assurance programme to ensure that the requirements of these Regulations are complied with and provide evidence of the efficacy of such a programme to an inspector upon request*."

4.97. Specific details of what the user must be able to provide or demonstrate are in Regulation 18(4). A user is defined in Regulation 18(5) to include "*a consignor, consignee, carrier, owner, freight forwarder, design authority, and any person*

associated with manufacture, testing, maintenance and inspection of packages, packagings, special form material and low dispersible radioactive material."

4.98. The powers and procedures related to compliance assurance apply to (Regulation 18(6a)) the design, manufacture, testing, inspection and maintenance of packagings, special form radioactive material, low dispersible material and (Regulation 18(6b)) to the "transport of a consignment", which in Regulation 4(5) is defined in detail and includes:

- The design, manufacture, maintenance and repair of packagings;
- The preparation, consigning, loading, carriage (including in-transit storage), unloading and receipt at the final destination of loads of radioactive material and packages;
- The routine, normal and accident conditions of transport by road encountered in carriage and in storage during transit;
- The transport by road that is incidental to the use of the radioactive material.

4.99. According to Regulation 18(7), if it appears to an inspector that any person engaged in any of the operations set out in paragraph 6a or in the "transport of a consignment" is not or is not likely to comply with any of the requirements of these regulations and that as a result there is risk of injury to health or damage to property or to the environment, he or she may as respects that person either impose a prohibition or serve a notice in accordance with the provisions of Regulation 18. In accordance with Regulation 18(11) "*Any person upon whom either a prohibition is imposed or a notice is served under paragraph (7) must comply with that prohibition or notice*."

4.100. Since the regulations include requirements for emergency provisions for the transport of radioactive material (Regulations 27 and 66/71), a compliance assurance programme should include activities pertaining to emergency planning and preparedness and to emergency response, when needed. These activities should be incorporated into the appropriate national emergency plans. The appropriate competent authority should also ensure that consignors and carriers have adequate emergency plans.

4.101. The powers of inspectors and the Secretary of State in relation to emergency arrangements are further described in Regulation 71.

4.102. A compliance assurance programme can only be implemented if its scope and objectives are conveyed to all parties involved in the transport of radioactive material (i.e. designers, manufacturers, consignors and carriers). Compliance

assurance programmes should therefore include provisions for the dissemination of information, which should inform users about the way the competent authority expects them to comply with the regulations and about new developments in the regulatory field.

4.103. The UK has detailed procedures to be followed in the preparation and making of statutory instruments, which are a type of secondary or subordinate legislation normally consisting of an order, regulation, rule or scheme (document 2 of Table II).

Issue: Quality and compliance assurance documentation

4.104. The DfT has extensive quality and compliance assurance documentation for its programme, including:

— Specific regulations (the above mentioned Regulation 18) for quality and/or compliance assurance in accordance with and expanding on the related requirements of the Transport Regulations [1] (paras 310 and 311).
— A detailed standard procedure (RMT2-001, October 2001) for quality and/or compliance programme auditing.
— Several memoranda of understanding to ensure effective co-ordination with other departments. A December 1986 memorandum of understanding between the Department of Transport and the CAA records their agreements about the transport of radioactive material and their respective roles and responsibilities in this context. An August 1991 memorandum of understanding between the Department of Transport and the HSE was prepared to ensure the effective co-ordination on quality assurance and compliance assurance matters affecting the transport of radioactive material off licensed sites. An October 1996 agreement between the HSC and the Secretary of State for Transport provides details on matters of mutual concern on the packaging, preparation and carriage of radioactive material by rail. These last two documents identify specific areas of interface, the agreed primary and secondary responsibilities and the working arrangements. An example of the clear delineation of the responsibilities for the departments involved (with regard to dangerous goods) is the April 1998 memorandum of understanding between the HSE and CAA (as amended January 2000).
— A Checklist for Inspecting Transport Operations and Documentation for Mobile Sources.
— Standard enforcement and prohibition notices.

4.105. Finding:

Basis: the Transport Regulations [1], para. 310, concerning quality assurance, and para. 311, concerning compliance assurance, apply to this issue.

Good practice: it was determined that the RMTD has developed very good, above the norm documentation covering quality and compliance assurance that is extensive and detailed.

Issue: Adequacy of the current audit and inspection programme

4.106. Since about 1996 the RMTD programme of planned audits and inspections in its areas of responsibility has been suspended due to staff reductions. As a result, audits and inspections were reduced and became mainly reactive. An enhanced audit and inspection programme was restarted this year following a recent restoration to the previous (1997) staffing levels. There are about 40 major consignors moving radioactive material (including to and from nuclear power stations) by road and many other minor consignors are involved in road movements of radioactive material. Previously, major consignors were audited or inspected by the RMTD once every three to five years, but they have not been fully audited in recent years. Major consignors seem to have extensive quality assurance programmes, as required by the regulations, and the planned audits should confirm that these programmes remain up to date and effective. Neither an audit nor an inspection were witnessed during the appraisal. In 2002, prior to the time of the appraisal, there were 13 audits or inspections. The appraisal noted that the RMTD may still not have adequate resources to satisfy the current requirements for planned audits and inspections. For example, significant additional requirements for audits and inspections have been recently identified with regard to mobile sources.

4.107. The following is noted for the inspection of the other modes of transport (the rail, air and sea modes). The responsibilities of the DfT for inspections of the rail and air modes are covered in the memoranda of understanding between the DfT and HSE and CAA, respectively. Rail transport is subject to considerable inspection by the HSE, which includes the scrutiny of the arrangements in the safety case required by the Railway (Safety Case) Regulations 2000, as amended. Although the transport of dangerous goods, including radioactive material, is not identified as a key priority in the strategy document Strategy for Improving Health and Safety on the Railways[8], the inspection resources applied reflect the comparative simplicity of operational

[8] See http://www.hse.gov.uk/hsc/strail.pdf.

arrangements in the industry. One operator carries one type of package and accounts for the majority of rail transport movements. The arrangements also reflect the HSE (RI) approach of working through a single lead inspector for that operator. Of the approximately 60 HSE (RI) inspectors, less than one person-year is devoted to dangerous goods inspections, although in all cases, as needed, the skills of these inspectors will be supplemented by personnel with experience in radioactive material transport and radiation protection matters, as determined necessary. For air transport there are only three CAA inspectors covering all aspects of dangerous goods transport, not just inspections. For the inspection of sea transport it was noted that there is no memorandum of understanding with the MCA, which, like the RMTD, is also in the DfT (and thus a memorandum of understanding is not necessary). For all modes other than the road mode the RMTD will assist when requested, but it is not clear that such requests, combined with any DfT planned audits or inspections, would be sufficient to confirm the adequacy of the joint inspection programmes.

4.108. For multimodal transport it should be clear where the prime responsibility changes from one organization to another. An example could be the April 1998 memorandum of understanding (as amended January 2000) between the HSE and CAA, specifically where it addresses dangerous goods.

4.109. Findings:

Basis: para. 402 of Ref. [4] states, inter alia, that "*In determining the national programme for compliance assurance, the competent authority should take into account not only the number and type of packages being transported but also the size and complexity of its industry, as well as its own resources.*"

Paragraph 405 of Ref. [4] states that "*...the competent authority should have adequate resources to carry out its functions, which include the operation of its own compliance assurance programme*." Paragraph 407 of Ref. [4] states that "*A more complex compliance assurance programme will be needed for a State whose radioactive material industry involves all types of radioactive material movements. Such a programme would need to take additional account of:*

— *Package design, manufacture and maintenance;*
— *A high volume of movements.*"

Recommendation: it is recommended that the DfT should evaluate the adequacy of its audit and inspection programme and that the necessary resources should be provided for audits and inspections. Specifically, minor consignors and consignors of mobile sources should be more fully integrated into this

programme. Priorities should continue to be risk based to maximize the effectiveness of the limited resources.

Suggestion: it is suggested that the existing DfT memoranda of understanding with the HSE and the CAA should be reviewed to ensure that they reflect how the respective responsibilities are currently being fulfilled.

Suggestion: it is suggested that organizations involved in the transport of mobile sources should be requested to fill out the checklist for inspecting and documenting transport operations; an action that could facilitate the definition and establishment of priorities for required inspections.

DEVELOPMENT OF REGULATIONS AND GUIDES

4.110. Relevant aspects of the development of regulations and guides are discussed in paras 4.3–4.11, 4.18–4.20, 4.43–4.49, 4.73 and 4.77.

EMERGENCY PREPAREDNESS FOR TRANSPORT

4.111. The Transport Regulations concerning emergency response (paras 308 and 309 of the Transport Regulations [1]) provide some very general requirements. The appraisal determined that requirements are much more elaborate and specific in the UK's regulations. Thus practices in the UK go well beyond those requirements.

4.112. The Radioactive Material (Road Transport) Regulations 2002 (document 9 of Table II) are applicable for road transport. Regulations 27 and 66–71 deal with emergency response, radiological emergencies and intervention arrangements.

4.113. Consignors of radioactive material are required to specify emergency provisions. For example, para. 555 of the Transport Regulations [1] requires a consignor to provide a statement regarding the actions, if any, that are required to be taken by the carrier. In the UK competent authority approval of package designs, special arrangements and shipments is conditional upon the existence of suitable emergency arrangements by the consignor and carrier. The major consignors of radioactive material, in a co-operative effort, have established common arrangements for dealing with emergencies. These arrangements are known as RADSAFE. Under RADSAFE the emergency arrangements of each member organization are made available to provide a nationwide response capability. RADSAFE covers road and rail

operations and also covers points of entry and exit for import and export operations. RADSAFE is co-ordinated by the United Kingdom Atomic Energy Authority.

4.114. The national obligation to provide emergency provisions as specified, inter alia, in para. 308 of the Transport Regulations [1] is fulfilled by the National Arrangements for Incidents Involving Radioactivity (NAIR). NAIR was set up to ensure that radiological expertise is always available in any incident involving radioactivity and thus provides necessary protection to the general public. NAIR is administered by the NRPB.

4.115. In addition to RADSAFE, some major consignors have produced their own emergency response plans for the limited routes that are served by their own establishments. An example of such a plan is the Sellafield Transport Emergency Plan (STEP), which provides a response to any radioactive material transport incident in Cumbria and a transport incident elsewhere if BNFL is responsible for that movement.

4.116. NAIR exists as a backup resource in the event that the consignor's provisions fail or cannot be implemented.

4.117. The contingency arrangements for maritime based incidents involving the transport of irradiated nuclear fuel are covered by the Shipboard Marine Emergency Plan prepared by PNTL and BNFL and approved by the MCA in accordance with IMO guidelines. The MCA National Contingency Plan also lays down contingency arrangements.

4.118. The DfT is the lead agency for providing information on government emergencies relating to the transport of radioactive material by road. For other modes of transport the DfT liaises with the appropriate lead department. The RMTD is not required to be permanently on call for this service. However, the duty office, staffed outside normal working hours, has contact details for personnel designated to provide this service.

4.119. It is noteworthy that, during the appraisal on 11 June 2002, an incident occurred in which a train carrying an empty fuel flask to Dungeness struck at low speed a lorry on a level crossing near the village of Brenzett. Members of the appraisal team were able to investigate the national response to this incident. The response was demonstrably very effective, in particular the frontline RADSAFE response from Dungeness A.

Issue: Adequacy of emergency planning and preparedness

4.120. During the appraisal a comprehensive evaluation showed that the UK has an excellent emergency planning and preparedness programme. Examples include:

- The RADSAFE plan provides a rapid and effective national response for road and rail incidents involving radioactive material consigned by all the major users in the UK, who are signatories of the RADSAFE contract.
- Emergency exercises and drills are performed frequently to test the arrangements. The regulators (the DfT and HSE) play a role in these exercises and the DfT takes part in planning and witnessing at least one exercise per year for the road and rail modes.
- The RADSAFE and NAIR schemes share a common emergency contact number to initiate the arrangements. This helps ensure a rapid response.
- There are some 10 to 15 reported transport incidents per year. The incident reports are documented in detail, and even relatively minor incidents are reported and communicated thoroughly. The NRPB prepares an annual report of incidents (see paras 4.66–4.91).

4.121. Finding:

Basis: para. 308 of the Transport Regulations [1] states that "*In the event of accidents or incidents during the transport of radioactive material, emergency provisions, as established by relevant national and/or international organizations, shall be observed to protect persons, property and the environment. Appropriate guidelines for such provisions are contained in [Emergency Response Planning and Preparedness for Transport Accidents Involving Radioactive Material[9]].*"

Paragraph 2.7 of Ref. [3] states that "*The goal of a programme for planning and preparedness for an emergency involving radioactive material should be to assist in building competence and confidence that an emergency arising from a transport accident would be managed effectively; that is, that the objectives and requirements elaborated in the Safety Fundamentals and Safety Requirements publications can be met. Any response should be capable of being undertaken in a timely, effective, appropriate and coordinated manner wherever the accident may occur.*"

---

[9] INTERNATIONAL ATOMIC ENERGY AGENCY, Emergency Response Planning and Preparedness for Transport Accidents Involving Radioactive Material, Safety Series No. 87, IAEA, Vienna (1988). This document has recently been superceded by TS-G-1.2 [3].

Good practice: it was determined that the UK has comprehensive and effective emergency response plans involving governmental agencies and industry that go beyond the norm incorporating emergency arrangements for all modes of transport.

OPERATIONS

4.122. The appraisal in the UK involved evaluations and observations at facilities involving all modes of transport (i.e. air, road, rail and sea) and at three types of intermodal facility (i.e. rail–sea, road–rail and road–air).

Maritime transport

4.123. As can be seen by inspection of the schedule followed during the two-week appraisal (Table I), a significant effort was made to understand and evaluate the UK activities associated with the transport of radioactive material by sea. This included one subteam focusing on maritime issues beginning late Monday morning of the first week and continuing through to Thursday of that week and the other two subteams addressing some maritime issues during that week, concluding with the entire team inspecting one of the PNTL ships at its rail–sea intermodal facility located at Barrow-in-Furness and observing the arrival of a DRS rail shipment of empty INF flasks and their transfer to the BNFL ship *European Shearwater* for onward shipment to mainland Europe the following weekend.

4.124. Example photographs taken during the technical visit and observation at Barrow-in-Furness are provided in Appendix IV.

4.125. After the detailed inspection of the maritime operations associated with the transport of INF[10] Code material at the PNTL facilities, the appraisal concluded that the UK maritime activities involving these materials are handled in a very commendable fashion.

Issue: Satisfying and going beyond regulatory requirements in the maritime transport of INF Code material

4.126. It was determined that there are many good and exemplary features relative to the manner in which the UK implements international maritime regulatory

[10] INF is used here consistent with its use in the IMO INF Code [18] to mean irradiated nuclear fuel, high level radioactive waste and plutonium.

standards and guidance and also the manner in which PNTL implements and in many cases goes beyond the required international standards in the controls implemented on the ships used for the transport of INF Code material by sea. Examples include the following:

— Although the IMO IMDG Code will not become internationally mandatory under the International Convention for the Safety of Life at Sea until 1 January 2004, since 1991 the UK has made the IMDG Code mandatory for its flagged ships, including those UK flagged ships involved in the carriage of radioactive material. It also imposes this requirement on any non-UK flagged ship operating in UK waters.
— Although the IMO INF Code was initially introduced on a voluntary basis and only came into force on a mandatory basis on 1 January 2001, PNTL ships carrying INF (as defined in the Code) have been required to comply with the INF Code since its inception in 1993 pursuant to a UK Maritime Shipping Notice.
— The ISM Code has not been mandatory internationally for cargo ships, including INF certified ships. It becomes mandatory on 1 July 2002. However, some UK ship operators have voluntarily asked the MCA to conduct the necessary audits and surveys and to provide certification against this voluntary code. The operator of ships carrying INF Code material began applying the requirements of this code during 1995–1996.
— The UK operator of ships carrying INF Code material has frequently gone beyond the existing regulatory requirements and the requirements of the IMDG, INF and ISM codes in both the design and operation of its ships (e.g. in the provision of a satellite navigation system that transmits its position and vector every two hours and onboard equipment that would transmit relevant information from a sunken ship for seven to ten years, should one be sunk).

4.127. Finding:

Basis: the Transport Regulations [1] specify in para. 103 that "*In certain parts of these Regulations, a particular action is prescribed, but the responsibility for carrying out the action is not specifically assigned to any particular legal person. Such responsibility may vary according to the laws and customs of different countries and the international conventions into which these countries have entered. For the purpose of these Regulations, it is not necessary to make this assignment, but only to identify the action itself. It remains the prerogative of each government to assign this responsibility*."

In addition, para. 2.3 of Ref. [11] states, inter alia, that "*Compliance with the requirements imposed by the regulatory body shall not relieve the operator of its prime responsibility for safety. The operator shall demonstrate to the satisfaction of the regulatory body that this responsibility has been and will continue to be discharged*."

Good practice: it was determined that the UK has gone well beyond what has been and is currently required in the area of the maritime transport of radioactive material covered in the IMO IMDG, INF and ISM codes, implementing recommendations that have since or are later anticipated to become mandatory, and often adopting additional measures beyond those specified in these codes to enhance the actual or perceived level of safety for the maritime transport of these materials.

4.128. Introducing safety requirements and operations into a practice involving radioactive material such as the maritime transport of INF Code material that are not yet in force, or that go beyond the current or anticipated regulatory requirements, is deemed to be a good practice that enhances safety and the public acceptance of these activities.

Issue: Need for consistency in PNTL and BNFL documents controlling shipboard operations

4.129. There are significant efforts being made to upgrade and update the necessary shipboard documents for PNTL ships. However, this involves two entities: James Fisher and Sons as ship managers and PNTL and BNFL. Comparison of some of the documents showed that although they probably individually have proper change control procedures in place, they are not consistent between documents. In order to avoid conflicts and potential misunderstandings, it is suggested that the two entities work to a consistent method for providing change control on their documents.

4.130. Finding:

Basis: paras 434–438 of Ref. [5], on document control, state that, inter alia "*…there should be a procedure or procedures for controlling all relevant documents… Document control measures should include the unique identification of each document, an indication of the document revision or issue status, and… Control of the release and distribution of documents should be in accordance with the appropriate procedure, using up to date distribution lists. The procedure used should ensure that persons needing the documents are made aware of, and use, the appropriate and correct documents… Information on document revision and status should be given to*

all persons affected by the change. Arrangements should be made to prevent the use of outdated and inappropriate documents".

Suggestion: it is suggested that, to prevent the use of outdated and inappropriate documentation and ensure user friendly controlled documents, James Fisher and Sons and PNTL and BNFL work together to standardize the formats of and process for changing the controlled documents used on board ships, including the manner in which change controls are communicated in the documents.

Issue: Potential need for evaluating emergency response capability for maritime accidents involving non-INF Code radioactive material

4.131. The MCA's response to a maritime incident will follow the procedures set down in the National Contingency Plan for Marine Pollution from Shipping and Offshore Installations (NCP), which was published in January 2000. Depending on the size, scale and threat of an incident, the MCA would set up a series of command and control centres to deal with the different aspects of the response, including, inter alia:

— A salvage control unit: to control the salvage aspects of the response in conjunction with the owners, insurers and salvors of the vessel concerned. This is led by the Secretary of State's Representative for Maritime Salvage and Intervention.
— A marine response centre: to control and co-ordinate the response to pollution at sea. This is led by the MCA.
— A shoreline response centre: to control and co-ordinate the multiagency response to pollution on the shoreline. This is led by the local authority.
— An environment group: to provide environmental and public health advice to all levels of the response.

4.132. In addition to these response centres, search and rescue will be co-ordinated by the local Maritime Rescue Co-ordination Centre or Maritime Rescue Sub Centre, which are operated by Her Majesty's Coastguard .

4.133. Further details on any of these command and control procedures can be found on the MCA web site (http://www.mcga.gov.uk).

4.134. When responding to chemical incidents the MCA needs to have specific information on the risk and threat to public health, responder health and the environment, and a chemical response capability. This is achieved by:

— An in-house chemist.
— A chemical spill modelling capability (CHEMSIS) and a chemical hazards database (CHEMDATA).
— A chemical strike team co-ordinated by V Ships: this response team is created from a bank of trained personnel who regularly work on chemical tankers and have technical experience and knowledge of working with chemicals.
— A chemical hazards advisory group: made up of key organizations and companies that can provide the information and advice that the MCA needs during a chemical incident. This group is made up of the National Chemical Emergency Centre, the environmental regulators in the UK, the National Focus for Chemical Incidents (which provides a link to the local health authorities through regional service provider units), industry representatives from the chemical and shipping industries, MCA contractors and individual companies with shipping, chemical and response interests. The MCA is currently revising the information it needs during a chemical incident, which will have a bearing on the membership of this group.
— Specific equipment stockpiles for salvage and ship to ship transfer operations during chemical incidents.

4.135. During a significant maritime incident involving non-INF radioactive material, the MCA would activate the NCP and look to the sources listed above for specific information on the risks and chemicals involved. As BNFL and PNTL are technically competent with respect to responding to INF incidents, the MCA would contact these organizations for advice and bring them into the multiagency response that the MCA sets up in the UK to respond to such an incident, along with the RMTD. A good working relationship has been developed between the staff of the MCA and both BNFL and PNTL, which will facilitate this process. In addition, the MCA and the Secretary of State's Representative for Maritime Salvage and Intervention also have regular and extensive liaison with all major salvage companies on all aspects of salvage and counter pollution measures.

4.136. Because of the lack of events involving radioactive material in maritime transport, there has only been one governmental regional exercise (within the Irish Sea, working with PNTL and BNFL) to evaluate emergency response capabilities for accidents involving INF Code radioactive material transported by sea.

4.137. The appraisal determined that PNTL and BNFL have a strong commitment to having the capability of responding to emergencies involving INF Code [18] material shipments aboard its ships and periodically undertakes scheduled exercises to evaluate its emergency plans. For example, the PNTL Shipboard Marine Emergency Plan (SMEP) deals with how to respond to an emergency, irrespective of

where it occurs. The index guides the user as to where to go in the manual and what to do. The method for reporting such emergencies to local port States is specified in the SMEP. This procedure is approved by the administration of the flag State; that is, the UK (as mandated in the INF Code).

4.138. It was reported that it will take PNTL arranged resources less than 24 hours to get a qualified response team to an emergency site involving one of its ships within the open sea, anywhere in the world. This was judged to more than satisfy the requirements of The Guidelines for Developing Shipboard Emergency Plans for Ships Carrying Materials Subject to the INF Code (applied in November 1997 by IMO Resolution A.854(20), paras 2.27–2.28), which state:

> "*2.27 Quick, efficient co-ordination between the ship and coastal State or other involved parties becomes vital in mitigating the effects of an incident involving INF Code materials. The Plan should address the need, where appropriate, to contact the coastal State for consultation and/or authorization regarding mitigating action. See also 1.15 above. 2.28 The identities and roles of various national and local authorities involved vary widely from State to State and from port to port. Approaches to responsibility for release response also vary. Some coastal States have agencies that take charge of response immediately and subsequently bill the owner for the cost. In other coastal States, responsibility for initiating response is placed on the shipowner.*"

4.139. The preceding referred to para. 1.15 of the guidelines, which states, inter alia:

> "*Generally, the consignor should be prepared to assist in an emergency response to an incident involving any INF Code materials by providing timely and detailed information about shipments and to send immediately emergency response/support assets to an incident site, if required. The planning for such assistance should be complementary to the Plan.*"

4.140. However, it was noted that the MCA has not undertaken any exercises involving emergency response personnel who could be involved in a maritime radioactive material accident not involving a PNTL ship or INF Code material. The carriage of radioactive material in ships not covered by the INF Code, such as ore concentrates and uranium hexafluoride, poses a lower risk than INF Code material, but can still be of concern in the event of an incident or accident.

4.141. Finding:

Basis: Ref. [3] recommends that "*Drills and exercises simulate actual emergencies. They are the best means of accomplishing, at a minimum, the following goals and objectives:*

— *Revealing weaknesses in plans and procedures,*
— *Identifying deficiencies in resources (both in human resources and equipment),*
— *Improving co-ordination among various response personnel and agencies,*
— *Clarifying individual roles and areas of responsibility,*
— *Enhancing overall emergency response capabilities,*
— *Improving the speed of response,*
— *Monitoring the benefits over time of improvements made to a response system.*

The type of drill or exercise should be such that over a given period of time all of the aspects of the response plan can be tested. Participants in drills and exercises should be rotated to ensure that all personnel experience the response plan in action."

Suggestion: it is suggested that the MCA should consider assessing the need to stage additional exercises for evaluating UK response capabilities in the event of maritime Class 7 emergencies not involving PNTL or other INF Code ships to ensure that adequate emergency response capabilities exist.

Issue: Potential need to arrange for government provided emergency towing vessels in high density traffic areas

4.142. The lack of a government provided emergency towing vessel (ETV) capability in the Irish Sea was initially of concern during the appraisal, since that is the route used by PNTL to reach the Barrow-in-Furness facility. However, it was noted that the MCA has already evaluated ETV provision around the UK through A Review of ETV Provision around the Coast of the UK, which was published in 2001. Additionally, the MCA has a clear liaison and operational arrangement with PNTL for emergency action in the event of a maritime transport incident in the Irish Sea should the incident involve a PNTL ship. It was also determined that PNTL had independently talked to the Irish Government.

4.143. It was not initially clear during the appraisal whether ETV and/or salvage arrangements are available for any other shipments of radioactive material through the Irish Sea. The need for, and options related to, an ETV for the Irish Sea were addressed in the 2001 ETV review. The need for an ETV in the Irish Sea was identified through a risk based approach. Such an ETV would provide a contingency

for all vessels using these waters. This report has been accepted by the UK Government and negotiations have begun with the Irish authorities over the provision of an Irish Sea ETV. It is hoped that such an arrangement will work in a similar manner to the joint provision of an ETV by the UK and France in the Dover Straits. A proposal document for a joint MCA and Irish Coastguard ETV is being developed and the Irish Government is considering its funding options.

4.144. Government provided ETV capabilities for waters local to the UK have been provided based on the risk based approach of the 2001 ETV review. Figure 2 shows the areas of ETV coverage. Those areas in which the UK Government provides ETV

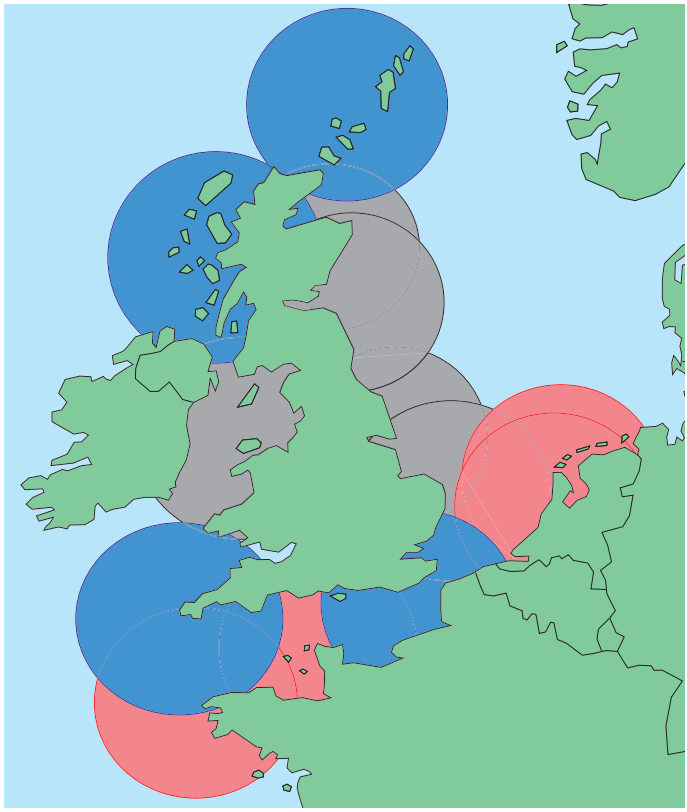

FIG. 2. Coverage of sea lanes close to the UK by government provided emergency towing vessels. Blue: areas in which ETV capability is provided by the UK Government, the one based in the English Channel is provided through a joint agreement between the UK and French governments. Red: areas in which ETV capability is provided by other governments. Black: areas in which tugs are only available through the Coastguard Agreement for Salvage and Towage with local port commercial salvors.

capability are shown in blue, the one based in the English Channel is provided through a joint agreement between the UK and French governments. Those areas in which ETV capability is provided by other governments are shown in red. The areas in which tugs are only available through the Coastguard Agreement for Salvage and Towage (which applies throughout the UK) with local port commercial salvors are shown in black.

4.145. The appraisal showed that the MCA has been involved in extensive liaison with the Irish authorities regarding general counter pollution measures in neighbouring waters. There has been extensive and ongoing bilateral discussions between the British and Irish governments with respect to cross-border contingency planning and emergency management procedures. This liaison has resulted in an operational agreement between the MCA and the Irish Marine Emergency Service on maritime search and rescue and maritime counter pollution, which is in a final draft form.

4.146. Ireland attended the last Anglo French Accident Technical Group, held in Jersey in May 2002, to participate in discussions on joint counter pollution and contingency planning issues in the English Channel. Currently progress is ongoing for the accession of Ireland to the Bonn Agreement. The decision has been made to amend the agreement to allow the accession of Ireland. Ratification is still awaited from the Netherlands, Denmark and Norway. Once this accession has been finalized it will provide additional coverage and an enhanced response capability through the Bonn Agreement to the whole of the UK Counter Pollution Control Zone and Irish waters.

4.147. Thus, although significant progress has been and continues to be made, there was no clear evidence provided during the appraisal of formalized trilateral liaison between the UK, the Republic of Ireland and PNTL. Such liaison agreement could prove beneficial in the event of an emergency in the Irish Sea involving ships carrying radioactive material.

4.148. Findings:

Basis: The Guidelines for Developing Shipboard Emergency Plans for Ships Carrying Materials Subject to the INF Code (Applied in November 1997 by IMO Resolution A.854(20), paras 2.27–2.28) state:

"*2.27 Quick, efficient co-ordination between the ship and coastal State or other involved parties becomes vital in mitigating the effects of an incident involving INF Code materials. The Plan should address the need, where appropriate, to contact the*

coastal State for consultation and/or authorization regarding mitigating action. See also 1.15 above."

"*2.28 The identities and roles of various national and local authorities involved vary widely from State to State and from port to port. Approaches to responsibility for release response also vary. Some coastal States have agencies that take charge of response immediately and subsequently bill the owner for the cost. In other coastal States, responsibility for initiating response is placed on the shipowner.*"

The preceding referred to para. 1.15 of the guidelines, which states, inter alia, that "*Generally, the consignor should be prepared to assist in an emergency response to an incident involving any INF Code materials by providing timely and detailed information about shipments and to send immediately emergency response/support assets to an incident site, if required. The planning for such assistance should be complimentary to the Plan.*"

Suggestion: it is suggested that the UK Government should continue bilateral liaison with the Irish Government on counter pollution and response issues, including the provision of an Irish Sea ETV as identified by the risk based approach in A Review of ETV Provision around the Coast of the UK.

Suggestion: it is suggested that the UK Government should continue multilateral liaison with neighbouring States. Such liaison agreements could prove beneficial in the event of an emergency in waters surrounding the UK involving ships carrying radioactive material.

Rail transport

4.149. In addition to the detailed appraisals and observations relating to the maritime transport of INF Code material at Barrow-in-Furness, briefings were provided during the appraisal while at the BNFL facility by DRS personnel that illustrated the manner in which they transport INF Code material from nuclear power plants in the UK to the BNFL fuel processing facility at Sellafield, and to and from the BNFL facility at Barrow-in-Furness to Sellafield.

4.150. Figure 3 shows the routes followed by DRS in these shipments. It also shows two additional routes used by DRS not related to the rail transport of radioactive material (i.e. non-radioactive material shipments are made to or from Grangemouth and Daventry). The intermodal facilities used for rail shipments of radioactive material are:

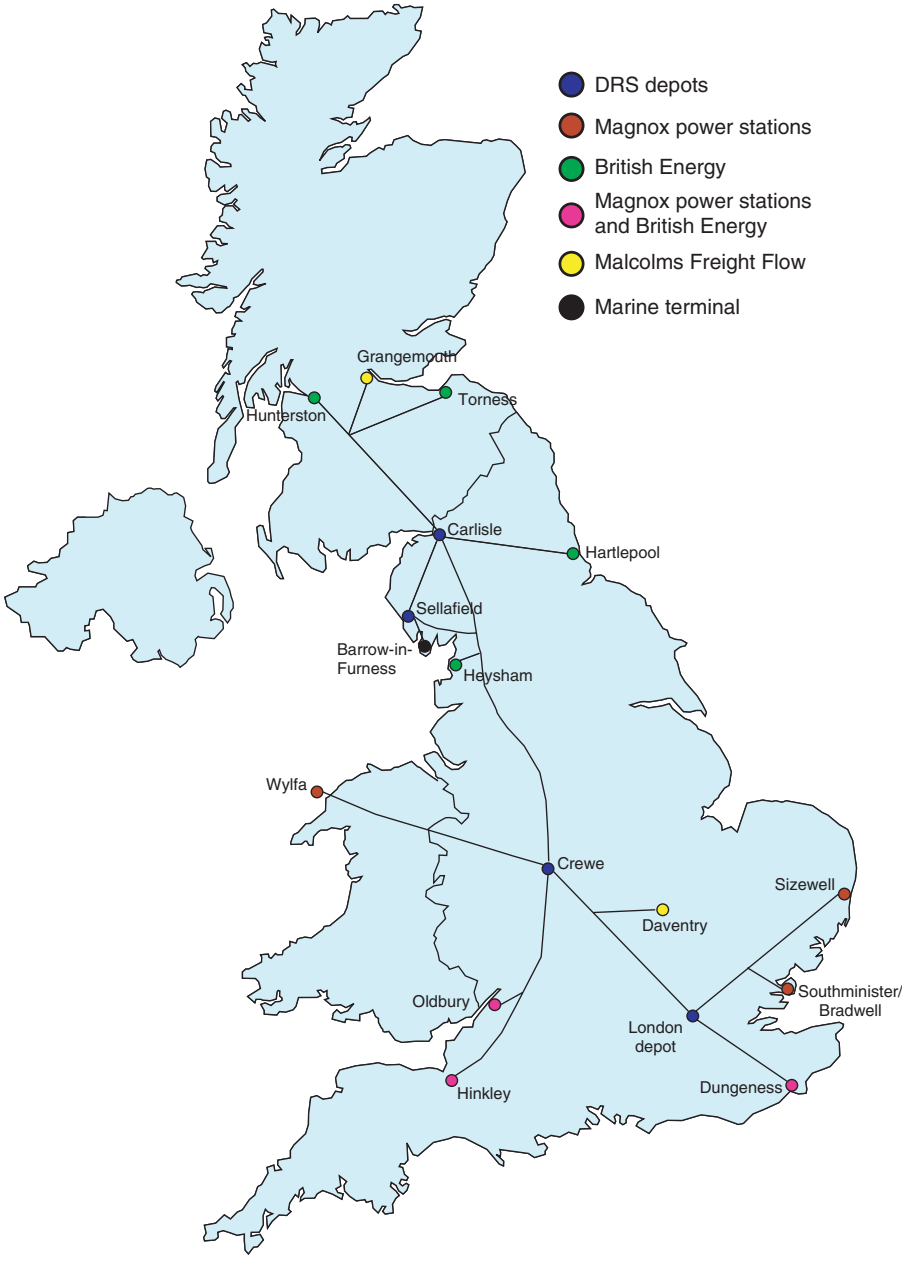

FIG. 3. Routes followed by DRS in transporting INF Code material by rail in the UK (excluding those with terminal points marked in yellow; that is, Grangemouth and Daventry).

— Rail–sea: Barrow-in-Furness;
— Rail–road: Bradwell, Dungeness, Hinkley, Hunterston, Oldbury, Sizewell, Torness, Wylfa.

4.151. A large number of shipments of INF have occurred by rail in the UK, including road–rail intermodal shipments from some UK nuclear power plants and sea–rail intermodal shipments from Barrow-in-Furness. DRS has since 1995 undertaken all of these shipments.

4.152. DRS has its headquarters in Carlisle, has a staff of approximately 160 people and undergoes periodic inspections by the HSE (RI). During the briefings and discussion in Barrow-in-Furness, the HSE (RI) was represented and verified that when radioactive material expertise is needed it is available within the HSE or, if necessary, can be obtained from the RMTD.

4.153. The training of rail crews for the rail shipments of radioactive material undertaken by DRS was evaluated. The crews are trained both in the normal areas for rail operations and in areas relating to their responsibilities in carrying Class 7 (i.e. radioactive material) dangerous goods. This training is subject to audit by the HSE (RI). DRS has since 1996 experienced approximately 30 external audits (by the HSE (RI) and other bodies) and 50 internal audits.

4.154. Before being qualified to drive a locomotive pulling INF cargo, a train driver must have his or her competence certified by DRS and by Railtrack. This process is subject to audit by HSE (RI), which includes in-cab observations of performance.

Issue: Rail transport operations

4.155. It was the appraisal's judgement that the operations of DRS are accomplished in a commendable manner, in compliance with the rail regulations. A specific finding related to the road–rail interface at Dungeness nuclear power station is outlined below.

4.156. Finding:

Basis: paras 218 and 219 of Ref. [5] state, inter alia, that "*…an organization may be involved in more than one basic transport activity, e.g. design and manufacture, use and carriage, or even all phases from design through to carriage. The QA programme for any particular organization must be specially designed/developed to suit its needs and total activities … Irrespective of the type of organization involved or the kind of activity it engages upon, there will be a need for the interfaces between that*

organization and others to be identified and controlled. Such interface identification and control should be achieved during the application of QA and the development of the relevant QA programmes by the organizations involved."

Good practice: it was determined that, based on an appraisal at the Dungeness nuclear power station, the UK nuclear power facility operators have established beyond the norm comprehensive quality assurance programmes and procedures related to the storage, handling and transport of fuel flasks on the site and to and from the railhead.

4.157. Examples of these good practices include, inter alia:

— The responsibilities for various activities are clearly defined.
— Key steps in the arrangements are verified by authorized persons who are suitably qualified and experienced.
— Comprehensive radiation and contamination surveys are carried out at various stages during the preparation and receipt of fuel flasks. Action levels are clearly defined.
— All records relating to individual flask movements are kept together and are complete.
— Non-compliances associated with the flask condition detected by operators during the process are recorded on a central database. Flask maintenance engineers at Sellafield can access the database. This helps ensure that defects that may have an impact on flask integrity are prioritized.

Air transport

4.158. The appraisal team decided to focus attention on the shipment of radiopharmaceuticals to properly assess the air transport of radioactive material in the UK. This afforded the appraisal several benefits: due to the high volume of shipments (over one thousand per day), the appraisal could assess over 95% of the air shipments made in the UK; since shipments are made in smaller quantities, the appraisal could assess a Type A and excepted package programme; due to the time critical nature of both material (i.e. a short half-life of the material) and transport (i.e. the material must arrive to support the schedule of medical procedures), the appraisal could assess transport safety in a high volume, time sensitive environment.

4.159. To achieve this objective one subteam toured Amersham, one of the largest producers of radiopharmaceuticals in the world. During this visit the subteam reviewed the corporation's structure, core business and safety programmes. The subteam evaluated Amersham's packaging data and packagings and toured its

packaging and transport facilities. To complete its appraisal the subteam followed a routine pharmaceutical shipment to a freight forwarder, Exel, and an air carrier, Lufthansa. At these locations the subteam witnessed the shipment's consolidation and preparation for transfer to the air carrier and the air carrier's acceptance check and preparation for its loading on board an aircraft.

Issue: Packaging requirements and documentation

4.160. Finding:

Basis: section VI of the Transport Regulations [1] defines general requirements for all packagings and packages, packaging performance requirements for excepted packages and Type A packages, and sets additional requirements for packages that will be transported by air. Paragraph 801 of the Transport Regulations [1] requires users of package designs that do not require competent authority approval to maintain documentary evidence of the compliance of the package design with all the applicable requirements.

Good practice: it was determined, after reviewing Amersham's packaging data, packagings and package test facilities, that the documentary evidence maintained was of a very high calibre and it is recommended that Amersham be consulted if guidance material on Type A package documentation is to be developed for other applications.

Issue: Safety culture

4.161. Finding:

Basis: para. 2.28 of the BSS [10] recommends a safety culture be fostered and maintained to encourage a questioning and learning attitude to protection and safety and to discourage complacency.

Good practice: it was determined, based on the assessment of the air transport mode, that an excellent safety culture consistent with that recommended in the BSS is fostered and maintained by Amersham, Exel and Lufthansa in their multimodal (road–air) operations.

4.162. The appraisal was particularly impressed with the redundancy built into the system, which minimized the possibility for non-compliance, and the programmes established to identify and address deviations from the normal shipping process that could result in transport delays or regulatory non-compliance.

Road transport

4.163. The appraisal observed the arrangements for the transport of nuclear fuel flasks by road between the Dungeness nuclear power station and the railhead. The appraisal also observed the road transport of Excepted and Type A packages between Amersham and Heathrow airport. The appraisal's findings for road transport are covered by discussions in paras 4.149–4.162.

Package operations and packaging maintenance

4.164. Package operations and packaging maintenance were inspected and observed at the Sellafield facility and the Amersham facility.

4.165. At the Sellafield facility the LWR flask maintenance facilities and the associated quality assurance activities appeared to the appraisal to be operated in a commendable manner. No specific findings resulted from these appraisals, except for those relating to areas previously covered in this report.

4.166. However, during discussions on flask surface contamination management and experience an issue relative to Magnox flask operation and maintenance was raised. The appraisal learned the following. The DfT monitors the performance of consignors and carriers in areas of compliance with the requirements of the Transport Regulations and, as necessary, takes appropriate corrective actions to reverse unacceptable trends. For example, the DfT receives quarterly reports from those consignors, carriers and consignees involved in the carriage of INF flasks, including the carriage of Magnox fuel within the UK. In August 2000 an unacceptable trend with regard to flask and rail wagon contamination was identified with these shipments. Although the contamination levels at receipt generally did not exceed the regulatory limits, the trend was upwards, approaching these limits. The phenomenon of 'sweating', whereby contamination levels may increase during transport, is acknowledged and addressed in Ref. [2].

4.167. As a result of the identification of this trend, the DfT sent letters to senior managers in each of the organizations involved, informing them of this trend, requesting them to investigate the situation and inviting them to a meeting to report on their findings. In response to these letters, the companies involved formed an industry working group to look at the possible sources of contamination. The working group had the task to (a) determine the root causes, (b) define appropriate corrective actions and (c) direct those involved in these shipments not to unilaterally undertake alternative corrective actions. From December 2000 to March 2001 the working group undertook a detailed assessment, arranged for expert site visits and evaluations,

defined and shared good practices, shared findings and developed a list of root causes and proposed corrective actions. The working group focused through subgroups on three areas: operations, design and statistics. The latter area was intended to assist in identifying trends. Concurrently, reports were made to the DfT. An industry forum was established and convened meetings regularly with advocates (flask champions) from each site to further facilitate the work of the working group.

4.168. The industry developed from these efforts a good practice guide for their flasks, addressing 33 recommended actions and areas for improvement. As this guide was applied the DfT noted a stabilization and, more recently, a decline in the numbers of contamination events that were approaching or marginally exceeded the regulatory limit. During the second quarter of 2002 there were no flasks or conveyances that were approaching or exceeding these limits. As the work proceeded, the DfT met with the industry's management to encourage continued emphasis on applying the necessary corrective actions. The DfT continues to monitor the trend, with a goal of ensuring zero variances for at least one year.

4.169. During the period August 2000 to June 2002 the DfT met at least five times with representatives from the operating sites to ensure that they understood the regulator's concerns and continued with their positive efforts.

Issue: Tracking trends for deficiencies and competent authority corrective actions

4.170. Finding:

Basis: paras 5.12 and 5.13 of Ref. [11] state, inter alia, that "*Regulatory inspection and enforcement activities shall cover all areas of regulatory responsibility. The regulatory body shall conduct inspections to satisfy itself that the operator is in compliance with the conditions set out, for example, in the authorization or regulations. In addition, the regulatory body shall take into account, as necessary, the activities of suppliers of services and products to the operator. Enforcement actions shall be applied as necessary by the regulatory body in the event of deviations from, or non-compliance with, conditions and requirements.*"

"*The main purposes of regulatory inspection and enforcement are to ensure that:*

(1) facilities, equipment and work performance meet all necessary requirements;
(2) relevant documents and instructions are valid and are being complied with;
(3) persons employed by the operator (including contractors) possess the necessary competence for the effective performance of their functions;

(4) deficiencies and deviations are identified and are corrected or justified without undue delay;
(5) any lessons learned are identified and propagated to other operators and suppliers and to the regulatory body as appropriate; and
(6) the operator is managing safety in a proper manner."

In addition, para. 402 of Ref. [4] states, inter alia, that "*The competent authority should have a compliance assurance programme for examining and reviewing all aspects of the transport of radioactive material, within its jurisdiction or area of influence, with regard to safety and the provisions of the Regulations. In determining the national programme for compliance assurance, the competent authority should take into account not only the numbers and types of packages being transported but also the size and complexity of its industry, as well as its own resources. Under all circumstances, compliance assurance should include, as a minimum… Review and assessment activities…*"

These requirements can be satisfied by a competent authority through an aggressive application of a compliance monitoring programme, coupled with actions taken to identify the root causes and encourage appropriate corrective actions.

Good practice: it was determined that the UK competent authority monitors the trends of large shippers of the more dangerous forms of Class 7 (radioactive) material, identifies when the performance of the consignors, carriers and consignees may trend towards non-compliance, notifies the shippers of the potential area of non-compliance and works with them to facilitate their definition of the root causes and corrective actions to be taken. It then continues to monitor the situation to ensure that the corrective actions are achieving the desired effect.

4.171. The monitoring of trends by a competent authority and acting to reverse those with potential impacts is a noteworthy and commendable practice.

5. FINAL REMARKS

5.1. The appraisal of the safety of the transport of radioactive material in the UK considered multiple aspects of transport, including transport by all modes (i.e. road, rail, sea and air); the intermodal exchange of packages (i.e. road–rail, road–air and rail–sea); the design approval, manufacture, operation and maintenance of packages; inspection and enforcement activities; and planning and responding to emergencies. The appraisal team appreciates the many efforts undertaken by the UK authorities in preparing for and hosting the appraisal. The appraisal team's counterparts were co-operative and responsive. The multiple visits to operating sites, which covered all modes of transport and the maintenance and operations associated with various types of packages and radioactive material, were well organized and provided the appraisal the opportunity to witness at first-hand these functions and to interview those who regulate and those who are regulated. The staff of the IAEA Transport Safety Unit wish to thank the team members from Member States and international organizations for their efforts during this appraisal.

5.2. By commissioning this international appraisal of its radioactive material transport regulatory programme the UK has demonstrated a commendable openness with regard to this vital regulatory activity. As has been noted, the findings of the appraisal, which are documented in detail in Section 4 of this report, each has a basis in international standards and/or regulatory documents.

5.3. The appraisal showed that the regulatory framework in the UK for the transport of radioactive material is well developed; that the UK is committed to a sound safety culture in its transport regulations; that, in general, the regulation of this transport is handled well; and that the competent authority and the other involved regulatory bodies should be commended for their efforts. In all of these areas, and in other associated areas, the appraisal found much to praise.

5.4. Specifically, the appraisal did not find any issues that were safety critical. However, there were a number of areas identified in which improvements could be made. The appraisal resulted in three recommendations and 21 suggestions; it also identified 15 areas of good practice that can serve as a model for other transport competent authorities to emulate. The good practices identified in the maritime and air transport operational areas are especially noteworthy.

5.5. The appraisal team takes note that the appraisal was intended to provide independent constructive criticism as an aid to guiding the UK's future developments in regulating its domestic and international radioactive material transport activities. The appraisal acknowledges that the UK competent authority and the other UK

regulatory bodies associated with the transport of radioactive material are best positioned to determine, within their national context and specific regulatory priorities, the value of and priority to be placed on the findings of the appraisal as documented in this report. Thus the decisions on whether and how to implement changes, and on the priority of implementing any changes, rest with the UK authorities.

Appendix I

ABBREVIATIONS

These abbreviations are for the purposes of this report only.

AAIB	Air Accidents Investigation Branch
ADR	European Agreement Concerning the International Carriage of Dangerous Goods by Road
Amersham	Amersham plc
BNFL	British Nuclear Fuels Limited plc
CAA	Civil Aviation Authority
CDGC	Carriage of Dangerous Goods Committee
DfT	Department for Transport (see also DTLR)
DRS	Direct Rail Services Ltd
DTI	Department of Trade and Industry
DTLR	Department of Transport, Local Government and the Regions (this has been renamed the Department for Transport (DfT))
EC	European Commission
ELCTRAM	Enforcement Liaison Committee for the Transport of Radioactive Materials
ETV	emergency towing vessel
HSC	Health and Safety Commission
HSE	Health and Safety Executive
ICAO	International Civil Air Organization
IMDG Code	International Maritime Dangerous Goods Code
IMO	International Maritime Organization
INF Code	International Code for the Carriage of Irradiated Nuclear Fuel, Plutonium and High-Level Radioactive Wastes in Flasks on Board Ships

INF	irradiated nuclear fuel
ISM Code	International Safety Management Code
LWR	light water reactor
MAIB	Marine Accident Investigation Branch
MCA	Maritime and Coastguard Agency
NAIR	National Arrangements for Incidents Involving Radioactivity
NCP	National Contingency Plan for Marine Pollution from Shipping and Offshore Installations
NII	Nuclear Installations Inspectorate
NRPB	National Radiological Protection Board
PNTL	Pacific Nuclear Transport Limited plc
RADSAFE	industry's transport emergency arrangements for the transport of radioactive material
RI	Railway Inspectorate
RID	Regulations Concerning the International Carriage of Dangerous Goods by Rail
RMTD	Radioactive Materials Transport Division (part of the DfT)
SI	statutory instrument
SMEP	shipboard marine emergency plan
THORP	Thermal Oxide Reprocessing Plant
TranSAS	IAEA Transport Safety Appraisal Service
UK	United Kingdom of Great Britain and Northern Ireland
UNECE	United Nations Economic Commission for Europe
WP/TDG	Technical Sub-committee of Dangerous Goods Working Party

Appendix II

METHOD FOR DOCUMENTING THE FINDINGS

The agreement reached in December 2001 between the IAEA and UK points of contact for documenting the findings of the appraisal was that the findings could result in recommendations or suggestions for the improvement or identification of good practices. These findings were to be developed in accordance with the following definitions.

Recommendation: a recommendation is advice on improvements that can be made in the national regulatory arrangements in the areas that have been reviewed and discussed. Such advice is based on proven international practices and should deal with the root causes rather than the symptoms of the concerns raised. It can be, but need not necessarily be, an indication of shortcomings either in the national statutory legislative and regulatory regime or in the methods of fulfilling their requirements. Recommendations should be specific, realistic and designed to result in tangible improvements.

Suggestion: a suggestion either is an additional proposal in conjunction with a recommendation or may stand on its own following a discussion of the associated background. It may indirectly contribute to improvements in national regulatory arrangements but it is primarily intended to make the regulatory body's performance more effective, to indicate useful expansions of existing programmes and to point out possibly superior alternatives to current work. In general it should stimulate the regulatory body's management and staff to consider ways and means of enhancing performance.

Good practice: a good practice is an indication of an outstanding organization, arrangement, programme or performance, superior to those observed elsewhere, and more than just the fulfilment of current requirements or expectations. It has to be superior enough to be worth bringing to the attention of other nuclear regulatory bodies as a model in the general drive for excellence.

It was agreed that the basis for every recommendation, suggestion or good practice should be clearly identified, and tied directly to appropriate paragraph(s) of the Transport Regulations and/or other applicable international documents, standards and codes.

Appendix III

THE UK TRANSPORT SAFETY APPRAISAL SERVICE (TRANSAS) TEAM

The UK TranSAS team consisted of 14 experts from eight States and three international organizations. Figure 4 is a photograph taken at the beginning of the appraisal.

C. ARDOUIN — Team member

Mr. Ardouin is a Senior Adviser (Science) at the National Radiation Laboratory, Christchurch, New Zealand. He has a Master of Science degree in radiation biology, a Bachelor of Science (Hons) degree in biochemistry from the University of London and a Graduate Diploma of Teaching from the Christchurch College of Education.

FIG. 4. The UK TranSAS team. Front row, seated (left to right): R. Pope, IAEA; G. Dicke, IAEA; Y. Yasogawa, Japan; K. Rooney, ICAO. Back row, standing (left to right): L. Grainger, IMO; C. Ardouin, New Zealand; R. Boyle, USA; I. Rahim, IMO; E. Köksal, Turkey; N. Osgood, USA; F. Zamora, Spain; J. Lopez-Vietri, Argentina; N. Bruno, Brazil; R. Ramirez-Quijada, Peru.

Mr. Ardouin is responsible for the licensing and compliance monitoring of the non-medical users of radiation throughout New Zealand. He also co-ordinates the national radiation incident response plan. In addition he has 12 years of experience working as a health physicist in the UK nuclear power industry.

R.W. BOYLE — Team member

Mr. Boyle is the Chief of the Radioactive Materials Transport Branch in the United States Department of Transportation's Office of Hazardous Materials Safety. In this position he is responsible for the regulation of radioactive material transported into, out of and through the USA and representing the USA at all transport meetings sponsored by the IAEA. He has two degrees in engineering: a Bachelor of Science degree in mechanical engineering from Virginia Polytechnic Institute and State University and a Master of Science degree in civil engineering from the Catholic University of America. He has worked in various engineering fields for 17 years, including 10 years in areas associated with the safe transport of radioactive material.

N. de C. BRUNO — Team member

Mr. Bruno is a member of the senior staff of the Waste Management Division, which is part of the Directorate for Nuclear Safety, of the Brazilian Nuclear Energy Commission. Mr. Bruno was educated at Santa Ursula University in Rio de Janeiro, where he studied electrical engineering.

Mr. Bruno spent three years at Angra 1 nuclear power plant working for Odebrecht Constructors Inc., where he gained experience in the field of quality control in electrical and instrumentation assembly. He joined the Brazilian Regulatory Body in 1983. From 1984 to 1993 he worked in the Electrical and Instrumentation Branch and attended the IAEA/KFK training course on the Instrumentation and Control of Nuclear Power Plants at Karlsruhe in the Federal Republic of Germany. For the past eight years he has worked in the transport area. In 1995 he completed the post-graduate course in total quality management at Estácio de Sá University in Rio de Janeiro. Mr. Bruno also attended the IAEA training course on the Safe Transport of Radioactive Material at Argonne National Laboratory in Illinois and the United States Department of Energy/Sandia training course on the Physical Protection of Nuclear Material During Transport, held in Rio de Janeiro in Brazil.

He has participated in technical committee meetings at the IAEA and since 2000 has been the Brazilian delegate for the IAEA Transport Safety Standards Committee (TRANSSC). Mr. Bruno was the Liaison Officer for the TranSAS to Brazil.

G.J. DICKE — Alternate team co-ordinator

Mr. Dicke is a Transport Safety Specialist in the Transport Safety Unit in the Division of Radiation and Waste Safety at the IAEA. He is the Scientific Secretary for the annual IAEA meetings for the review and revision of the IAEA Transport Regulations. He represents the IAEA at meetings of the United Nations Committee of Experts on the Transport of Dangerous Goods and the Dangerous Goods Panel meetings of the ICAO for the incorporation of the IAEA Transport Regulations into the United Nations model regulations and the ICAO Technical Instructions. He chairs the annual interagency meeting with the ICAO, United Nations and IMO in support of the harmonized and integrated implementation of the IAEA Transport Regulations into the United Nations model regulations and the international modal transport regulations. He has had the lead role in the development of the working procedures and the questionnaire for the IAEA TranSAS and he was the appraisal leader for the first two transport safety appraisal services that have been carried out to date.

Prior to joining the IAEA in May 1997 Mr. Dicke worked for 26 years for Nuclear Operations of Ontario Hydro in Canada. For about 20 years he was responsible, initially as Unit Head and later as Section Head, for the operational and regulatory aspects of Ontario Hydro's transport of radioactive material. He completed his doctoral examinations in chemical engineering at the Delft University in the Netherlands. He is a Professional Engineer in Ontario, a member of the Chemical Institute of Canada and he is a member of the editorial board of the International Journal of Transport of Radioactive Material.

L. GRAINGER — Team member

Mr. Grainger is an independent transport consultant and specialist writer. He has been Cargo Safety Adviser to the Bahamas Maritime Authority in London since 1996. He has represented the Bahamas at all levels within the committee process at the IMO in London. He has acted for the IMO since 2001 as a special envoy to Panama, lectured at the Academy in Trieste, assisted in preparing official amendments to the mandatory IMDG Code and taken part in technical co-operation missions to Thailand and Indonesia.

Mr. Grainger served in the UK Department of Transport for 40 years. He was promoted to Senior Principal Officer in 1993, awarded an OBE in 1995 and took early retirement from government in 1996. As a Principal Officer he was head of the department's Dangerous Goods Transport Policy Branch for 17 years. He led the UK delegations to the United Nations Economic and Social Council Committee of Experts on the Transport of Dangerous Goods from 1979 to 1996 and became Chairman of that committee in 1988. He represented that committee in many related international forums. He was responsible for most aspects of the land transport of dangerous goods within the UK and in mainland Europe, and for the co-ordination of UK policy globally and multimodally, including the integration in legislation of radioactive material with other classes of dangerous goods. From 1997 to 1998, as an IAEA consultant, he assisted in the exercise to incorporate the IAEA Transport Regulations in the United Nations Recommendations on the Transport of Dangerous Goods — Model Regulations. Mr. Grainger was nominated by the IMO to serve as a team member on the UK appraisal.

E.M. KÖKSAL — Team member/observer

Mr. Köksal is a Senior Health Physicist at the Turkish Atomic Energy Authority Çekmece Nuclear Research and Training Center (ÇNAEM) in Istanbul, Turkey. He is also Acting Deputy Director of the Center.

He has a Bachelor of Science degree from Ankara University in physics and a Master of Science degree from the University of Surrey in the UK in radiation studies. He has been working in the radiation protection field associated with the safe transport of radioactive material for more than 35 years. He is a member of the IAEA TRANSSC.

J.R. LOPEZ-VIETRI — Team member/observer

Mr. Lopez-Vietri is Head of the Transport of Radioactive Material Section of the Autoridad Regulatoria Nuclear, Gerencia de Seguridad Radiologica y Nuclear, Buenos Aires, Argentina. He has a degree in industrial engineering from Buenos Aires University and has been working professionally in the Argentine National Atomic Energy Commission and the Nuclear Regulatory Authority (the competent authority of Argentina) since 1978.

Since 1990, as a senior expert in the transport of radioactive material, he has taken part in several IAEA and IMO meetings. He is involved as Regional Co-ordinator in the IAEA Co-operation Agreement for the Promotion of Nuclear Science and

Technology in Latin America and the Caribbean (ARCAL) project Regulatory Harmonization and Quality Assurance Programmes for the Safe Transport of Radioactive Material. He has collaborated in developing the IAEA Transport Regulations and related documents, both the English and Spanish versions. Since 1995 he has served as Argentina's representative on the IAEA TRANSSC. He has served as an analyst in radiation and nuclear safety, and specialized in the safe transport of radioactive material. He is involved in performing the analysis, assessment and compliance assurance of national and international regulations for the safe transport of radioactive material. He has been a lecturer in national and international training courses on the transport of radioactive material, inter alia, in the framework of the IAEA Latin America programme ARCAL and in model projects in Peru, Costa Rica, Chile, Guatemala, Brazil, Panama and Bolivia, and in the IAEA regional training course (in Latin America and the Caribbean). He is involved in preparing training material in Spanish. From 1979 to 1982 he collaborated in quality assurance audit teams in Argentine nuclear power plants, and since 1982 he has collaborated in developing national and international standards in relation to the safe transport of radioactive material. He has prepared and presented about 50 technical publications in domestic and international events and journals.

N. OSGOOD — Team member/rapporteur

Ms. Osgood is Senior Project Manager for the Spent Fuel Project Office in the United States Nuclear Regulatory Commission. She has over 25 years of experience in the field of radiation protection and has worked in the transport field since 1988. Her work at the Nuclear Regulatory Commission includes project management for the review of designs for spent fuel storage casks and transport containers for Type B quantities of radioactive material and fissile material.

Ms. Osgood received a Bachelor of Science degree in biology and mathematics from the University of Richmond and pursued post-graduate study in nuclear engineering at the University of Maryland. She is certified in the field of health physics by the American Board of Health Physics. She serves as the Nuclear Regulatory Commission representative to the American National Standards Institute N14 Committee for standards for the packaging and transportation of radioactive material.

R.B. POPE — Team co-ordinator

Mr. Pope is Head of the IAEA Transport Safety Unit in the Division of Radiation and Waste Safety, Vienna, Austria. He is also the Scientific Secretary for the IAEA

TRANSSC. He has two degrees in mechanical engineering: a Bachelor of Science degree from the University of Utah and a Master of Science degree from Stanford University, and has performed additional graduate studies at the University of New Mexico and the University of Tennessee. He has been working professionally in various engineering fields for 40 years, including 27 years in areas associated with safety in the transport of radioactive material.

In addition to working in the area of transport safety at the IAEA, Mr. Pope has worked in the same area at Sandia National Laboratories and Oak Ridge National Laboratory in the USA, and in aerospace and other energy related activities at the United States National Aeronautics and Space Administration, Sandia National Laboratories and Garrett AiResearch. He is the author, co-author or editor of more than 120 technical documents, and has served as general chairman, programme chairman, international chairman and in other roles with the International Packaging and Transportation of Radioactive Materials Symposium Series since 1978. He is also on the editorial board of the International Journal of Transport of Radioactive Material and is a member of the American Nuclear Society and the Institute of Nuclear Materials Management.

I. RAHIM — Team member

Mr. Rahim is a Technical Officer in the Maritime Safety Division of the IMO. He entered the sea-going profession more than 25 years ago as a cadet and moved up to the rank of captain. He holds a Master Mariner's certificate of competency and an honours degree in transport technology. He has lectured at the branch campus of the World Maritime University in Malaysia on ports, shipping and maritime related matters, and developed new shipping courses before moving on to join a major company involved in ports and shipping projects, having their Asia and Pacific regional office in Kuala Lumpur.

Mr. Rahim undertook numerous studies involving port privatizations, port management, and efficiency and productivity enhancements. He left as Project Director. Before joining the IMO Secretariat in London he undertook a number of consultancy assignments for the IMO and the United Nations Economic and Social Commission for Asia and the Pacific relating to the facilitation of maritime traffic and multimodal transport. At the IMO, in addition to being the Technical Officer responsible for matters relating to the IMDG Code, he is secretary to the Editorial and Technical Group and co-secretary to the Sub-committee for Dangerous Goods, Solid Cargoes and Containers.

R. RAMIREZ-QUIJADA — Team member/observer

Mr. R. Ramirez is Head of the Department of Installation Control and Safeguards in the Technical Office for National Authority at the Peruvian Institute for Nuclear Energy in Lima in Peru. He has a degree in chemical engineering and also has a post-graduate degree in nuclear safety and radiation protection. He has been working in radiation protection for 20 years in the fields of inspection and assessment on the radiological safety of radioactive and nuclear facilities, including the transport of radioactive material. He has also served as an expert on radiological safety and radiological emergencies in the Latin American region.

K.M. ROONEY — Team member

Ms. Rooney is the Dangerous Goods Programme Manager for the ICAO in Montreal, Canada. She is the Secretary for the ICAO Dangerous Goods Panel and represents the ICAO at the IAEA, the United Nations Sub-committee on the Transport of Dangerous Goods, the Universal Postal Union and the International Air Transport Organization. She has two degrees in chemistry from the National University of Ireland: a Bachelor of Science and a PhD, specializing in catalysis.

Additionally, Ms. Rooney worked on the airline dangerous goods acceptance check system for the Societe Internationale de Telecommunication Aeronautique and International Air Transport Organization and on a freight forwarder acceptance check system and various expert systems for intermodal dangerous goods transport for EXIS.

Y. YASOGAWA — Team member

Mr. Yasagowa is Technical Counsellor for Transport of Dangerous Goods, Nippon Kaiji Kentei Kyokai, Japan, which is a survey and inspection association for the safe transport of dangerous goods by ships authorized by the Japanese Government.

He obtained a First Grade Deck Certificate from the Ministry of Transportation of Japan and has a Bachelor of Laws degree from the Chuo University of Japan. He was at sea as a ship's deck officer for four years, and has been working professionally in the area of the safe transport of dangerous goods, including radioactive material, for 35 years. He has been an Expert Member of the Nuclear Safety Commission of Japan since 1994.

He has participated in IAEA technical committees for the safe transport of radioactive material as a member of Japanese delegations for 25 years. He is also Japanese representative to the United Nations Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized Systems of the classification and labelling of chemicals since 1985. He has been awarded recognition as a man of merit for nuclear safety by the Minister of the Science and Technology Agency of Japan.

F.M. ZAMORA — Team member

Mr. Zamora is the Head of the Transport and Manufacturing of Nuclear Fuel Unit in the Consejo de Seguridad Nuclear in Spain, which is the competent authority for nuclear safety and radiological protection. He has a degree in chemistry from the Universidad Complutense of Madrid. He initially worked for CIEMAT (Madrid) on researching the biological processes of vegetables using radioactive labels compounds.

He has been working for the Consejo de Seguridad Nuclear for 20 years in areas associated with the licensing, inspection, enforcement and regulation of industrial radiation facilities and suppliers of radioactive material and with the assessment of exemptions of radioactive material and radioactive consumer products. At present he is in charge of approvals, inspection and regulation in the transport of radioactive material area. He is also member of the Spanish Commission for the Co-ordination of the Transport of Dangerous Goods and of the IAEA TRANSSC.

Appendix IV

PHOTOGRAPHS TAKEN DURING THE APPRAISAL'S INSPECTION AND OBSERVATION AT THE BNFL AND PNTL FACILITIES IN BARROW-IN-FURNESS

Figures 5 to 12 illustrate the inspection and observation that occurred in the appraisal at the PNTL rail–sea intermodal transfer facility at Barrow-in-Furness. This included an inspection of the PNTL ship *Pacific Sandpiper*, the arrival of a DRS train carrying four empty LWR flasks, the transfer of these flasks to the ship *European Shearwater* for outbound shipment to mainland Europe and meetings in the *Pacific Sandpiper* and PNTL office facilities to evaluate its activities and inspect key documentation.

FIG. 5. The entrance to the PNTL Barrow-in-Furness facility.

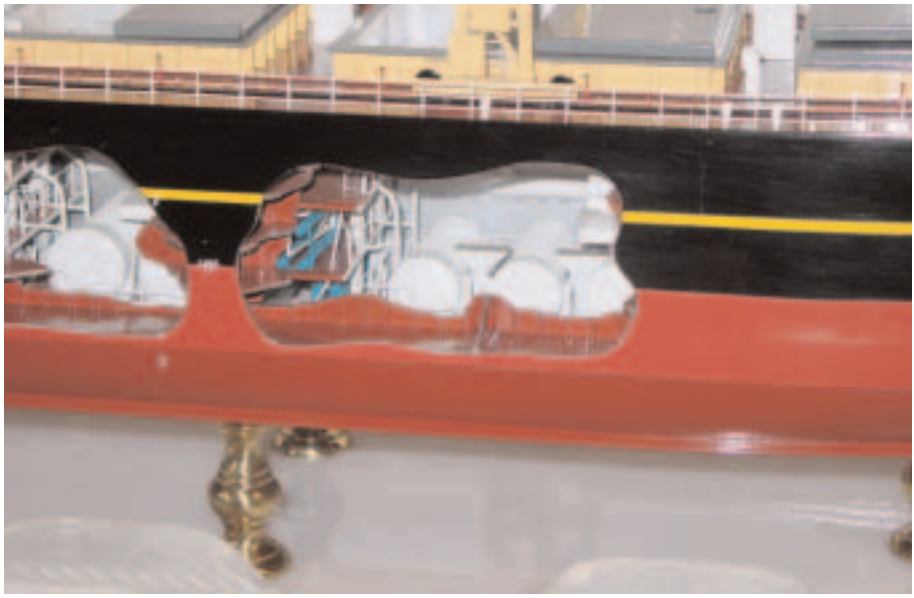

FIG. 6. PNTL ship model showing the location of the holds and double hull.

FIG. 7. Inspecting one of the flask holds in the ship.

FIG. 8. Arrival of a rail shipment of empty flasks at Barrow-in-Furness.

FIG. 9. Flask bearing rail wagons being shunted into location under a crane by DRS locomotives.

FIG. 10. Flask on a rail wagon.

FIG. 11. Crane at the PNTL facility used for moving flasks.

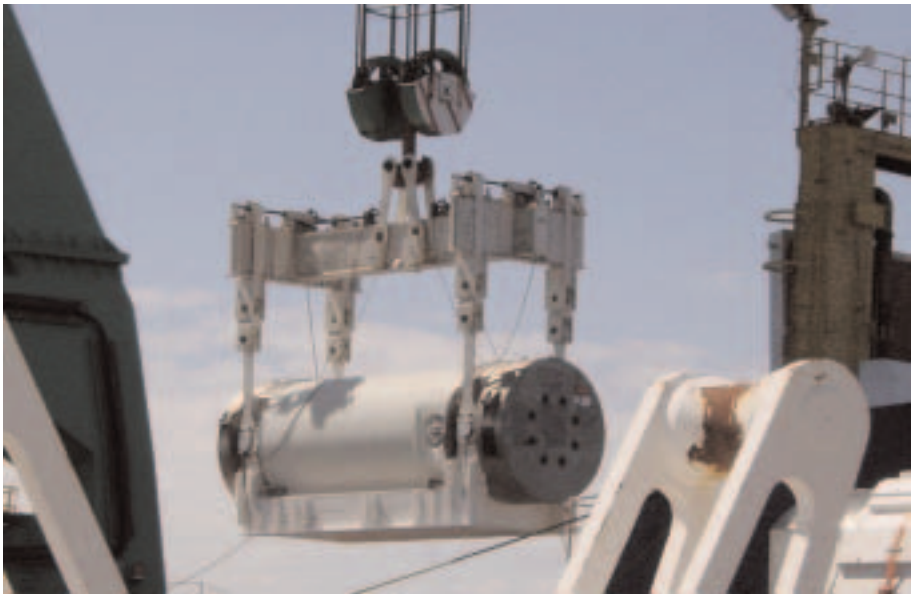

FIG. 12. Flask being transferred by crane from a rail wagon to the ship's hold.

REFERENCES

[1] INTERNATIONAL ATOMIC ENERGY AGENCY, Regulations for the Safe Transport of Radioactive Material, 1996 Edition (Revised), Safety Standards Series No. TS-R-1 (ST-1, Rev.), IAEA, Vienna (2000).

[2] INTERNATIONAL ATOMIC ENERGY AGENCY, Advisory Material for the Regulations for the Safe Transport of Radioactive Material, Safety Standards Series No. TS-G-1.1 (ST-2), IAEA, Vienna (2002).

[3] INTERNATIONAL ATOMIC ENERGY AGENCY, Planning and Preparing for Emergency Response to Transport Accidents Involving Radioactive Material, Safety Standards Series No. TS-G-1.2 (ST-3), IAEA, Vienna (2002).

[4] INTERNATIONAL ATOMIC ENERGY AGENCY, Compliance Assurance for the Safe Transport of Radioactive Material, Safety Series No. 112, IAEA, Vienna (1994).

[5] INTERNATIONAL ATOMIC ENERGY AGENCY, Quality Assurance for the Safe Transport of Radioactive Material, Safety Series No. 113, IAEA, Vienna (1994).

[6] INTERNATIONAL ATOMIC ENERGY AGENCY, Regulations for the Safe Transport of Radioactive Material, 1985 Edition (As Amended 1990), Safety Series No. 6, IAEA, Vienna (1990).

[7] INTERNATIONAL ATOMIC ENERGY AGENCY, Explanatory Material for the IAEA Regulations for the Safe Transport of Radioactive Material, 1985 Edition (As Amended 1990), Safety Series No. 7, IAEA, Vienna (1990).

[8] INTERNATIONAL ATOMIC ENERGY AGENCY, Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material, 1985 Edition (As Amended 1990), Safety Series No. 37, IAEA, Vienna (1990).

[9] INTERNATIONAL ATOMIC ENERGY AGENCY, Radiation Protection and the Safety of Radiation Sources, Safety Series No. 120, IAEA, Vienna (1996).

[10] FOOD AND AGRICULTURE OGANIZATION OF THE UNITED NATIONS, INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL LABOUR ORGANIZATION, OECD NUCLEAR ENERGY AGENCY, PAN AMERICAN HEALTH ORGANIZATION, WORLD HEALTH ORGANIZATION, International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources, Safety Series No. 115, IAEA, Vienna (1996).

[11] INTERNATIONAL ATOMIC ENERGY AGENCY, Legal and Governmental Infrastructure for Nuclear Radiation, Radioactive Waste and Transport Safety, Safety Standards Series No. GS-R-1, IAEA, Vienna (2000).

[12] INTERNATIONAL ATOMIC ENERGY AGENCY, IAEA Safety Glossary — Terminology use in Nuclear, Radiation, Radioactive Waste and Transport Safety, Version 1.0, April 2000, IAEA, Vienna (2000).

[13] UNITED NATIONS COMMITTEE OF EXPERTS ON THE TRANSPORT OF DANGEROUS GOODS, Recommendations on the Transport of Dangerous Goods — Model Regulations, Rep. ST/SG/AC.10/1/Rev.12, United Nations, New York (2001).

[14] INTERNATIONAL CIVIL AVIATION ORGANIZATION, Technical Instructions for the Safe Transport of Dangerous Goods by Air, Doc. 9284-AN/905, 2001–2002 edition, ICAO, Montreal (2001).

[15] INTERNATIONAL MARITIME ORGANIZATION, International Maritime Dangerous Goods Code, including Amendment 30-00 — 2000 Edition, IMO, London (2000).
[16] UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE, European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR), ECE/TRANS/140, UNECE, New York and Geneva (2001).
[17] UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE, Regulations Concerning the International Carriage of Dangerous Goods by Rail (RID) — 2001 Edition, UNECE, London (2001).
[18] INTERNATIONAL MARITIME ORGANIZATION, International Code for the Safe Carriage of Packaged Irradiated Nuclear Fuel, Plutonium and High-Level Radioactive Wastes on Board Ships (INF Code), IMO, London (2000).
[19] INTERNATIONAL MARITIME ORGANIZATION, Guidelines for Developing Shipboard Emergency Plans for Ships Carrying Materials Subject to the INF Code, IMO, London (2000).
[20] INTERNATIONAL MARITIME ORGANIZATION, ISM Code — International Safety Management Code and Revised Guidelines on Implementation of the ISM Code, 2002 Edition, IMO, London (2002).
[21] INTERNATIONAL MARITIME ORGANIZATION, International Convention for the Safety of Life at Sea, consolidated edition, 1992, IMO, London (1992).
[22] UNITED NATIONS, The Law of the Sea, Official Text of the United Nations Convention on the Law of the Sea with Annexes and Index, UN, New York (1983).