

# THE GATE TO AFRICA EXERCISE PROGRAMME:

## MOROCCO–SPAIN JOINT TABLETOP AND FIELD EXERCISES ON MARITIME SECURITY OF RADIOACTIVE MATERIAL IN TRANSPORT



**IAEA**

International Atomic Energy Agency

THE GATE TO AFRICA EXERCISE  
PROGRAMME: MOROCCO-SPAIN  
JOINT TABLETOP AND FIELD  
EXERCISES ON MARITIME  
SECURITY OF RADIOACTIVE  
MATERIAL IN TRANSPORT

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INTERNATIONAL ATOMIC ENERGY AGENCY  
VIENNA, 2020

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## FOREWORD

States have responded to the risk that nuclear or other radioactive material could be used for malicious purposes by engaging in a collective commitment to reinforce the protection and control of such material and to respond effectively to nuclear security events. They have agreed to strengthen existing international legal instruments, and have established new ones, to enhance nuclear security around the world. Nuclear security management is fundamental to the use of nuclear technologies and to applications where nuclear or other radioactive material is used or transported in ways that are consistent with these commitments.

In May 2012, Morocco, Spain and the IAEA jointly organized a technical seminar on the risk of nuclear terrorism. This led to the adoption of a joint action plan that provided an adequate framework for conducting exercises to test arrangements for nuclear security events and radiological emergencies. The Gate to Africa exercise programme on transport security is an implementation of the Joint Action Plan between Morocco and Spain in cooperation with the IAEA.

This publication details the planning, conduct and evaluation of the Gate to Africa exercise programme of joint tabletop and field exercises held in 2015 and covering the maritime transport security of radioactive materials. It details the methodology used and lessons to be learned. Several findings are presented to assist in the planning and conduct of future exercises. Member States interested in implementing their own exercise programmes may benefit from the material included in this publication. The IAEA officers responsible for this publication were M. Shannon and D. Ladsous of the Division of Nuclear Security.

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# CONTENTS

1.	INTRODUCTION.....	1
1.1.	Background .....	1
1.2.	Objectives.....	10
1.3.	Scope .....	10
1.4.	Structure .....	10
2.	EXERCISE PROGRAMME METHODOLOGY AND DESCRIPTION.....	11
2.1.	Threat description (assumption).....	12
2.2.	Scenario .....	13
2.3.	Tabletop exercise .....	17
2.4.	Field exercise .....	31
2.5.	International panel .....	34
3.	LESSONS LEARNED AND FINDINGS.....	35
3.1.	Lessons learned .....	35
3.2.	Findings .....	38
4.	CONCLUSION .....	39
	REFERENCES.....	41
	ABBREVIATIONS .....	43
	CONTRIBUTORS TO DRAFTING AND REVIEW.....	45



# 1. INTRODUCTION

## 1.1. BACKGROUND

With the assistance of the Global Initiative to Combat Nuclear Terrorism (GICNT), Radiological Emergency Management Exercise 2013 (REMEX-2013) was held 25–26 April 2013 at the National Civil Protection Academy in Madrid, Spain. The IAEA provided financial and technical support for the joint tabletop exercise (TTX); arranged transport security training courses in Spain and Morocco; and coordinated several consultancy meetings to plan the exercise. The exercise consisted of two phases. The first phase mapped out the urgent response that would be needed in the aftermath of a hypothetical detonation of two radiological dispersion devices (RDDs) in two cities involved in the transport operation, with serious transregional and transnational consequences. The second phase tested the response capabilities of both countries under this complex scenario in crime scene preservation and nuclear forensic investigation. The exercise reinforced the links between institutions and identified new issues for future cooperation at the national, bilateral and international level. The experience and lessons learned were valuable.

An international exercise prepared in the frameworks of the Early Notification and the Assistance Conventions, ConvEx-3 (2013), also known as Bab Al Maghrib, was held 20–21 November 2013 by Morocco and the IAEA. This exercise allowed Morocco to evaluate and enhance its:

- Capabilities to face multiple nuclear events in different locations;
- Interagency coordination and information exchange mechanisms;
- Command and control systems at the technical, site and national level;
- Notification and assistance request mechanisms with the IAEA.

This effort also contributed to the enhancement of the international emergency preparedness and response system. Similarly, Spain participated in testing: (i) the effectiveness of IAEA communications, (ii) the response of personnel using the IAEA's emergency web site and the provision of advice to States and companies potentially affected (Level A), and (iii) the Spanish emergency response system, including the provision of assistance upon request (Level B).

With bilateral cooperation between Morocco and Spain and with the cooperation of the IAEA, the three parties agreed to organize a maritime transport

security exercise involving radioactive material by the end of 2015. The context of the exercise programme was driven by the following elements:

- The political instability in the Sahel–Saharan region that required a mutualization of efforts at the bilateral and regional level in response to a marked terrorism threat;
- Recent intelligence information reporting the risk posed by terrorist groups’ interest in acquiring and using radioactive material for malicious acts;
- The commitment by Morocco and Spain to strengthen their national capabilities in nuclear security according to international standards and to contribute actively to upholding nuclear security worldwide together with the IAEA and to other voluntary international initiatives such as the Nuclear Security Summit and the GICNT.

After the IAEA Director General’s visit to Morocco in June 2014, preparations for these exercises were begun during a meeting held 4–5 September 2014 at the IAEA in Vienna. During the meeting, Morocco, Spain and the IAEA agreed to organize a series of exercises entitled Gate to Africa, which would simulate various responses to securing a maritime shipment of radioactive sources in the territorial waters of Morocco and Spain. The following exercises were developed:

- Two national-level TTXs in preparation for a joint TTX and field exercise (FEX):
  - Security in the transport of radioactive sources held in Rabat, Morocco, on 28 May 2015;
  - Security in the transport of nuclear material and spent nuclear fuel in Madrid, Spain, on 1 June 2015.
- A joint TTX on the security of the maritime transport of radioactive sources in Madrid, Spain, on 27 October 2015.
- A joint FEX in Spain on the security of the maritime transport of radioactive sources in Moroccan and Spanish territorial waters on 29 October 2015.

### **1.1.1. Exercise scope**

The Gate to Africa joint exercises addressed nuclear security as it relates to the security of radioactive material during transport. The exercises included two distinct phases: a TTX phase and an FEX phase that evaluated national preparations and implementation for the security of the transport operation.

The exercises addressed the security of the maritime transport of radioactive sources from the port of Algeciras, Spain, to the port of Tanger-Med, Morocco.

The joint TTX examined the normal and abnormal conditions applicable to this type of transport. It also explored potential responses from the competent authorities and security forces to a hypothetical malicious event. The exercises addressed the exchange of information and the coordination between the Moroccan and Spanish authorities.

The joint FEX simulated the potential response of Morocco and Spain if a malicious event were to occur in their respective territorial waters, and the information exchange between the two countries that would be needed during such an event.

The maritime transport of radioactive material requires preparedness, planning and coordination on the part of many different appropriate entities and authorities. During the joint exercises, several considerations affecting radiation protection were also included that would require action on the part of the response forces to ensure safe intervention.

### **1.1.2. Exercise objectives**

The main goal of the Gate to Africa exercises was to discuss and evaluate preparedness and response to a potential nuclear security event involving the transport of radioactive material. The aims were to identify lessons learned, areas for improvement and good practices related to these arrangements.

The applicable Moroccan and Spanish institutions were identified, trained and tested at the national and international level. The exercises provided a mechanism through which to examine transport situations that permitted discussions on the roles and responsibilities of the appropriate authorities and entities with direct responsibility for the transport of radioactive material. The exercises aimed to improve cooperation and information exchange among Morocco, Spain and the IAEA.

The general objectives of the Gate to Africa exercises differed at the national and international level. At the national level, the TTX tested and verified the coordination and actions of the appropriate authorities and other relevant stakeholders with transport security responsibilities. At the international level, the TTX resulted in a better understanding of the issues, challenges and requirements pertaining to the secure transport of radioactive material in the face of attempted theft, sabotage, unauthorized removal or other malicious acts.

The exercises also tested the use and application of nuclear security recommendations and guidance relevant to transport security, in particular:

- IAEA Nuclear Security Series No. 20, Objective and Essential Elements of a State's Nuclear Security Regime [1];

- IAEA Nuclear Security Series No. 13, Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities [2];
- IAEA Nuclear Security Series No. 14, Nuclear Security Recommendations on Radioactive Material and Associated Facilities [3];
- IAEA Nuclear Security Series No. 9, Security in the Transport of Radioactive Material [4].

The exercises aimed to achieve the following specific objectives:

- Examination of national nuclear security arrangements and capabilities in terms of event prevention, detection, protection and response during the sea transport of radioactive materials;
- Discussion of roles and responsibilities, regulatory and technical aspects, operational protocols, information exchange mechanisms, and cooperation and coordination between stakeholders and Morocco and Spain at a national level;
- Exercise of command and control systems;
- Discussion and conduct of response to terrorist events;
- Identification of improvements to enhance security measures and national systems;
- Improvement of cooperation between Morocco and Spain;
- Contribution to strengthening the international regime with regard to the security of the maritime transport of radioactive sources.

The following areas of interest relate to these objectives:

- Decision making at operational and strategic levels;
- Coordination and communication at a national level;
- Coordination and communication between Morocco and Spain;
- Capabilities and procedures on radiation protection and detection;
- Capabilities and procedures on response to criminal or terrorist acts;
- Radioactive material detection and identification techniques.

### **1.1.3. Exercise participants**

This exercise involved a large number of actors with responsibility and competence in the field.

Moroccan authorities and entities:

- Ministry of the Interior;
- Ministry of Foreign Affairs and Cooperation;

- Royal Gendarmerie;
- General Staff of the Royal Armed Forces;
- Royal Moroccan Navy;
- Inspectorate of Health Services;
- Inspectorate of Engineering of the Royal Armed Forces;
- General Directorate of National Security;
- General Directorate of Civil Protection;
- Directorate of the Merchant Navy;
- General Directorate of Customs Administration and Indirect Taxes;
- Ministry of Health Radiation Protection Centre;
- National Centre for Nuclear Energy, Science and Technology;
- Tanger-Med Port Authority.

Spanish authorities and entities:

- Secretary of State Security;
- Sub-Delegation of the Government in Cádiz;
- Civil Guard;
- National Police;
- General Directorate of Civil Protection and Emergencies;
- Department of National Security;
- Ministry of Foreign Affairs and Cooperation, Sub-Directorate General for Non-Proliferation and Disarmament;
- Ministry of Industry, Energy and Tourism, Sub-Directorate General of Nuclear Energy;
- Research Centre for Energy, Environment and Technology;
- Ministry of Development, Emergency Unit, Coordination and Crisis Management;
- General Directorate of the Merchant Marine;
- Maritime Captaincy of Algeciras;
- Maritime Rescue and Safety Society;
- Ports of the State;
- Bahia de Algeciras Port Authority;
- State Agency of the Tax Administration, Department of Customs and Special Taxes;
- Algeciras Customs Department;
- National Radioactive Waste Company;
- Empresa Express Truck S.A.U.

#### **1.1.4. Exercise documents**

An exercise manual for the joint exercises on the security of the maritime transport of radioactive sources was developed jointly by Morocco and Spain and reviewed by the IAEA. It communicated the exercise concept and the background information needed to prepare, implement and evaluate the Gate to Africa exercises and is intended for the exercise teams in Morocco, Spain and the IAEA.

In addition to this exercise manual, a facilitator's guide was prepared for the TTX. The facilitator used this guide throughout the exercise to lead discussion and to focus the participants' responses on the basis of a particular scenario. The guide describes the structure, content, exercise data, event sequence, injects and discussion questions of the TTX.

A document was also prepared for the observers explaining the exercise concept, background information and discussion topics.

#### **1.1.5. Exercise overview**

The maritime transport of radioactive material requires preparation, planning and coordination among many different relevant organizations and authorities. This programme comprised both national-level and joint exercises.

The following exercises were developed with a two-phase approach:

- Phase 1: Two national-level workshops and two TTXs in preparation for joint TTX and FEX:
  - Security in the transport of radioactive sources held in Rabat, Morocco, on 28 May 2015;
  - Security in the transport of nuclear material and spent nuclear fuel held in Madrid, Spain, on 1 June 2015.
- Phase 2: Conducting the joint TTX and FEX:
  - A joint TTX on the security of the maritime transport of radioactive sources held in Madrid, Spain, on 27 October 2015;
  - An international discussion panel held in Madrid, Spain, on 28 October 2015;
  - A joint FEX on the security of the maritime transport of radioactive sources held in Moroccan and Spanish territorial waters on 29 October 2015.

The joint exercise event of the Gate to Africa programme was opened on 26 October 2015 in Madrid, Spain, by the Secretary of State of Foreign Affairs of Spain and the Secretary General of the Ministry of Foreign Affairs of Morocco, in the presence of the Director General of the IAEA.

### 1.1.6. Tabletop exercise

During the TTX, the discussions focused on the national security arrangements and capabilities of each State with respect to the detection and prevention of a malicious act, protection during the transport of radioactive material and response to a malicious event. The discussions addressed various aspects of the preparation for and conduct of transport, specifically the transport security plans; the threat assessment; the roles and responsibilities; the regulatory and technical aspects; the operational protocols; and the information exchange, cooperation and coordination mechanisms between national stakeholders in Morocco and Spain, as well as between the two countries.

The joint TTX was organized in five conceptual modules:

**Module 1: Transport preparation.** Identification of the roles of the competent authorities and other stakeholders, their responsibilities and the security requirements for preparing a radioactive material shipment, including authorizing and preparing packages for transport.

**Module 2: Threat and security plans.** Examination of how each State considers what constitutes a threat when establishing security requirements and transport security plan requirements for the transport of radioactive material.

**Module 3: Maritime transportation.** Assessment of the roles, responsibilities and security requirements for the maritime transport of radioactive material (both at the port and during shipment).

**Module 4: Incidents and security events.** Demonstration of how Morocco and Spain would respond to incidents and security events during the maritime transport of radioactive material. This included assessing unusual situations for threats, possible insider threats to the shipment, operational situations and bilateral communications.

**Module 5: Crisis management, contingency and response plans.** Demonstration of crisis management in a nuclear or radiological security event involving radioactive material transport with potential radiological consequences.

Throughout these TTXs, there was a focus on the following areas:

- Preparation and coordination of the transport of Class 7 dangerous goods and associated radioactive detection and identification along State borders;
- Decision making at operational and strategic levels;

- Coordination and communication at the national level;
- Coordination and communication between Morocco and Spain;
- Capabilities and response procedures in the face of criminal or terrorist acts.

#### **1.1.7. Field exercise**

The overall goal of the joint FEX was to examine and evaluate the security response of Morocco and Spain in the event of a malicious act against a radioactive material transport occurring within their respective territorial waters. The information exchange and coordination between the two countries during the event were also assessed. One important aim was to strengthen national capabilities and reinforce cooperation between the two States. Throughout the exercise, high level coordination was conducted by interior ministers from the national emergency centres of each country through live video conferencing.

The FEX had the following structure:

- Simulation of a hijacking of a RO-RO (roll-on/roll-off) ship by a notional terrorist group;
- Interdiction of the terrorists with the radioactive material on board a small craft by Moroccan security forces as they entered Moroccan territorial waters;
- Neutralization of the terrorist group with the radioactive material on board the RO-RO ship by Spanish security forces;
- Assessment of any radiological contamination and necessary personnel decontamination processes.

Approximately 60 international observers followed the FEX through the use of live audio and video feeds transmitted from both Moroccan and Spanish forces to Civil Guard (national police force) headquarters.

#### **1.1.8. Lessons learned and findings**

The exercises successfully demonstrated the national capabilities, interaction and coordination required to handle a malicious act against a transport of radioactive material. The capabilities of Morocco and Spain to successfully resolve a potential malicious radiological event were greatly enhanced.

The Gate to Africa evaluation exercise included a critical analysis of the results which led to the identification of the following lessons learned and

findings by Spain and Morocco. The main lessons learned from this exercise included the following:

- (a) The Gate to Africa exercise programme enhanced the national capabilities of both Morocco and Spain, as well as bilateral cooperation between them, which is necessary for the secure transport of radioactive material.
- (b) The joint exercises highlighted the need for improved international support and coordination in order to enhance the security regime for international shipments.
- (c) The exercises allowed for the practical application of security tactics and radiological response procedures of the security and other response forces that participated in the exercise.
- (d) The exercises provided for a better understanding of the complex nature of these types of shipment, as well as of the necessary planning and coordination needed for a secure radioactive material shipment.
- (e) The exercises highlighted additional areas of concern, such as radiological consequence management or radioactive material outside of regulatory control that might be studied and addressed in future joint activities.

The following findings resulted from the exercise:

- (a) Developing specific international technical requirements for the security of radioactive material during transport that will support the development of technical guidance at the national level.
- (b) Addressing the link between the national threat assessment and the threat basis used to protect the transported material, as well as the mechanisms to enhance, should the threat change and, where necessary, the physical protection of the transported material by all relevant parties.
- (c) Training and exercising on a continuous basis are critical elements in enhancing preparedness for radioactive material transport. This ensures that the key individuals involved in these types of transport fully understand their roles and responsibilities and allows them access to the knowledge of their respective counterparts in the other country. This includes law enforcement, security and other response organizations.
- (d) Integrating security and safety actions in response to a security event involving radioactive material is critical.
- (e) Establishing formal information exchange mechanisms for communication among the various entities (shipper, receiver, carrier, regulatory body, port authorities, security services, etc.) involved in the transport of radioactive material.

- (f) Protecting sensitive transport information and communications is key to ensuring the security of the shipment.
- (g) Continuing to exercise joint capabilities and interoperability to effectively prepare the State and enhance its ability to manage and mitigate threats to radioactive and nuclear material. This is especially important for regulatory agencies, law enforcement agencies, border security and other response organizations in neighbouring countries.

### **1.1.9. Conclusion**

In the process of sharing feedback on the experiences of the Gate to Africa exercises, both Morocco and Spain are ready to continue collaborating with the IAEA to implement the lessons learned and findings for future IAEA activities on nuclear security.

## **1.2. OBJECTIVES**

This publication provides the lessons learned and findings from Morocco and Spain resulting from their planning, conduct and evaluation of the Gate to Africa exercise programme in 2015. It outlines the methodology used to develop the exercises, including scenarios and injects, and intends to be helpful to other Member States interested in implementing their own transport security exercises.

## **1.3. SCOPE**

This publication summarizes the Gate to Africa exercise programme and describes the scenarios and injects utilized during the exercise in 2015. It also lists the lessons learned and findings from the exercises. It does not provide sufficient information to reproduce the exercises in detail. While Member States interested in implementing their own exercise programmes may benefit from the material included in this publication, it is not intended to be used as a detailed guide on how to do so.

## **1.4. STRUCTURE**

Section 1 describes the introduction, background, exercise description, lessons learned and findings, and conclusion. Section 2 describes the exercise methodology, threat assumption, and technical scenario, and outlines the scenario

modules and exercise observations. Section 3 lists the lessons learned and findings. Section 4 provides the conclusion.

## **2. EXERCISE PROGRAMME METHODOLOGY AND DESCRIPTION**

The Gate to Africa exercises consisted of:

- Two national-level IAEA sponsored workshops on the secure transport of radioactive material;
- Two national-level TTXs on the land transport security of high activity Category 1 radioactive sources, organized respectively by Morocco (Rabat, 28 May 2015) and Spain (Madrid, 1 June 2015);
- A joint TTX (Madrid, 27 October 2015) on the maritime transport security of high activity Category 2 radioactive sources organized by Morocco and Spain;
- An international discussion panel (Madrid, 28 October 2015);
- A joint FEX (Madrid, 29 October 2015) on the maritime transport security of high activity Category 2 radioactive sources, organized by Morocco and Spain in their respective territorial waters.

During the TTX, the discussion focused on national security arrangements and capabilities in prevention, detection, protection and response during the transport of radioactive material. The discussions also addressed transport preparation and conduct, specifically transport security plans, threat assessment, roles and responsibilities, regulatory and technical aspects, operational protocols, information exchange, tactical and non-tactical intervention measures in the case of an incident occurring during the transport, and cooperation and coordination mechanisms among national stakeholders in Morocco and in Spain, as well as between the two countries.

Exercise documents were developed jointly for the joint TTX and FEX.

The scenarios in these exercises tested security plans and contingency response plans for radioactive material transport between Spain and Morocco. Analysing the radiological emergency response was not an objective of the TTX.

The scenarios involved the maritime transport of Category 2 radioactive sources transported from the port of Algeciras, Spain, to the port of Tanger-Med, Morocco. During the TTX, various injects were introduced that assessed the abilities of the competent authorities and other stakeholders to plan for and

react to differing circumstances. The final step of the TTX was to assess the contingency response to a malicious event during radioactive material transport.

The FEX focused on a scenario in which security forces would have to retake control of a maritime transport of radioactive sources. The response of the security forces of Morocco and Spain in their respective territorial waters, including safety and security actions, information exchange and coordination mechanisms at the national and bilateral level, and the reinforcement of cooperation between the two countries, were the main aspects evaluated in the FEX.

The Gate to Africa exercise programme was opened on 26 October 2015 in Madrid, Spain, by the Secretary of State for Foreign Affairs of Spain and the Secretary General of the Ministry of Foreign Affairs of Morocco, in the presence of the Director General of the IAEA.

## 2.1. THREAT DESCRIPTION (ASSUMPTION)

The following description of the nature of the threat and potential consequences of a malicious attack on a maritime transport vessel was developed by Morocco and Spain, assumed during the Gate to Africa exercises, and used to establish the exercise scenarios.

“The proliferation of international terrorism attacks has increased the awareness of the international community. The attacks on high value targets highlight the vulnerabilities and exposure to this kind of threat in different parts of the world. The Mediterranean countries are no different. Terrorist groups have long pursued radioactive material for manufacture of RDDs.

“Instability in the Sahel–Saharan region and the collapse of State authority in certain countries in the region may lead to the proliferation of terrorist groups and result in the need for increased security in these regions. International intelligence services may suggest an increased likelihood of terrorist attack on high value targets on either side of the Mediterranean coast using radioactive material in the Mediterranean countries. Possible avenues of attack may include RDDs, radiological exposure devices, denial-of-use of water supplies and other methods.

“Recent intelligence information has reported that terrorist groups are interested in acquiring radioactive material. The widespread use of nuclear and radiological materials for civil purposes (e.g. industry, medicine, research) provides many potential avenues through which to obtain these materials. The use of RDDs involves potential impact on the political

and economic stability of a region and poses national security concerns. Violent, extremist organizations thrive in conditions of conflict and political instability. Largely due to instability in various parts of the world, extremist groups have successfully gained support and may operate beyond the areas where they are ordinarily based, posing serious security threats to the transregional scene. As a result, a malicious attack on a maritime transport vessel cannot be ruled out where the insider threat remains plausible.”

## 2.2. SCENARIO

These exercises involved a radioactive material transport from the port of Algeciras, Spain, to the port of Tanger-Med, Morocco, across the Strait of Gibraltar. In this scenario, a RO-RO ship, transporting two packages intended for medical application from Algeciras to Tanger-Med, was subject to a hijacking attempt. The scenario assumed that terrorists were already on board the vessel, posing as truck drivers. Radioactive sources of  $^{192}\text{Ir}$  and  $^{137}\text{Cs}$  were being carried on this ship.

Each container had a volume of  $40\text{ dm}^3$  and each package contained multiple radioactive sources. This type of ship has a maximum capacity to transport 12 commercial vehicles (i.e. trucks and cars) along with their drivers. One of the commercial trucks was carrying two packages containing Category 2 radioactive sources of  $^{192}\text{Ir}$  and  $^{137}\text{Cs}$ , respectively. The activity of each source was approximately 500 GBq.

### 2.2.1. Source information

Brachytherapy is a radiotherapy technique in which the sealed radioactive source is placed inside or in the immediate vicinity of the area of tissue requiring treatment. Brachytherapy is commonly used as an effective treatment for certain types of cancer, such as cervical, prostate, breast or skin cancers. The radiation sources used for brachytherapy are always enclosed in a non-radioactive protective capsule. The sources may be delivered manually but are almost invariably delivered through a process known as ‘remote afterloading’. The three radionuclides most commonly used in brachytherapy are  $^{137}\text{Cs}$ ,  $^{192}\text{Ir}$  and  $^{60}\text{Co}$ .

#### 2.2.1.1. Ir-192 source

Iridium-192 is the most commonly used isotope for high dose brachytherapy applications. It is produced by neutron bombardment of  $^{191}\text{Ir}$  (a stable isotope)

and manufactured as an alloy wire. The wire is coated in platinum to filter the electrons produced in the iridium decay process.

The  $^{192}\text{Ir}$  source is a miniature source fixed on a cable. This model is a cylindrical, single encapsulation made of stainless steel and is tungsten, laser or plasma seal welded. Approximate outer dimensions of the encapsulations are 1.1 mm in diameter and either 3.96 mm or 4.96 mm in length. Minimum wall thickness is 0.17 mm. A stainless steel connector and cable are welded to one end of the encapsulation. The overall length of the encapsulation is 2.1 mm.

The  $^{192}\text{Ir}$  source is in the form of flexible and frangible wires surrounded by a plastic sheath. Pin diameters range from 0.3 to 0.6 mm or as a single or double pin whose outer diameter is 0.5 mm. The arms of the pin have a length of between 30 and 50 mm.

Information about the package used to transport the source is summarized in Table 1.

TABLE 1. TRANSPORT PACKAGE INFORMATION

Name	GammaMed high dose rate system
Isotope	Iridium-192
Half-life	73.83 d
Emission	310, 470 and 600 keV gamma
Weight	24 kg
Category	2
Individual source activity	444 GBq (12 Ci)
Total activity in transport	444 GBq (12 Ci)
Capsule dimensions	0.9 mm × 4.57 mm (diameter × height) 0.6 mm × 3.5 mm (diameter × height)

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TABLE 1. TRANSPORT PACKAGE INFORMATION (cont.)

Encapsulation	Single
Dose rate at 1 m distance package	0.1 mSv/h
Dose rate on contact	2 mSv/h
Contamination test	< 4 Bq/cm <sup>2</sup> for beta, gamma and low toxicity alpha emitters and 0.4 Bq/cm <sup>2</sup> for other alpha emitters
Physical form	Solid
Chemical form	Metal
Danger	External irradiation
Package	Type A, non-fissile

2.2.1.2. Cs-137 source

The <sup>137</sup>Cs source is a brachytherapy commercial system (i.e. a Curietrom low/medium dose rate (LDR/MDR)) transported on the same ship. On the basis of current international regulations, the type of package selected for the TTX would depend on the total activity and the type of radioactive source considered.

It is important to note that in this exercise the radioactive sources considered are shielded. However, for a <sup>137</sup>Cs source, the amount of radionuclide transported, A<sub>T</sub>(<sup>137</sup>Cs), would define the type of package used for transport. Where A<sub>T</sub>(<sup>137</sup>Cs) is < 2 TBq, the radionuclide sources could only be transported in a Type A package with a United Nations number (UN number) UN 3332 (radioactive material, Type A package, non-special form, non-fissile or fissile excepted).

### 2.2.2. Transport details

The radionuclide sources are transported in a Type A package with UN number UN 3332. The transport details are provided in Table 2.

From a radiological protection point of view, both packages are Type A, Label II — Yellow (i.e. the maximum radiation level at any point on the external surface is in the range 0.005–0.5 mSv/h). During the exercise, the maritime transport remains in Spanish territorial waters. This is in accordance with the requirements for special forms of radioactive material specified in the following regulations for transportation by road and sea:

- Regulations for the Safe Transport of Radioactive Material, 2018 Edition, IAEA Safety Standards Series No. SSR-6 (Rev. 1), IAEA, Vienna (2018).
- The European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR) dated 30 September 1957 (BGBI, 1969 II, p. 1489), last amended by 22nd ADR amending regulation dated 3 June 2013 (BGBI, 2013 II, p. 648).
- International Maritime Dangerous Goods (IMDG) Code, Amendment 36–12.

TABLE 2. TRANSPORT SOURCE DETAILS

	Ir-192 source	Cs-137 source
UN number	UN 3332	UN 3332
Transport index	0.8–0.9	0.8–0.9
Label	II — Yellow	II — Yellow
Activity (GBq)	444	400
Weight (kg)	24	11

## 2.3. TABLETOP EXERCISE

### 2.3.1. Overview

TTXs are a powerful and cost effective tool for assessing the capabilities of competent authorities and other relevant stakeholders with regard to the transport security of radioactive material. These exercises are ideal for developing training programmes and international coordination and cooperation with all regulatory bodies and stakeholders concerned with potential radiological theft or sabotage. TTX methodology is widely accepted by the international community to effectively identify weak points, explore response plans, develop new concepts and/or improve mutual knowledge and understanding among competent authorities and stakeholders.

A TTX consists of a round table discussion phase organized by the facilitator(s). It is important that all participants take an active role in this discussion. The participants must feel free to answer the questions, based on their knowledge, experience and perception of the situation. This tool allows the facilitator(s) to control the timeline of the scenario using injects to control the flow from one issue to the next while striving to provide each participant with enough time to understand, question and/or answer. The tabletop portions of the exercises establish an action phase followed by a quick response to varying abnormal circumstances. These situations comprise a scenario which is simulated on a tabletop. The tabletop scenario follows the initial discussion phase and is initiated at the precise time the incident occurs.

At the beginning of the TTX, the chairperson gives a general overview of the exercise, comprising structure, scenario, objectives and purpose, and presents the facilitator(s) for each session.

### 2.3.2. Facilitators

The role of the facilitator(s) is to manage the session, controlling the timeline, directing discussions and ensuring adherence to the rules. The facilitator(s) introduce exercise modules, brief participants, introduce scenarios to be discussed, provide situation updates and moderate the discussions. The facilitator(s) also provide additional information to actors, resolve questions that are raised and, if necessary, interrupt discussions that are outside the scope of the TTX. Ideally, each session of the TTX would have at least two facilitators (one for each of the participant countries). In this way, each facilitator can help stimulate debate within his or her own delegation.

### 2.3.3. Observers

This TTX was attended by both national and international observers representing a wide range of transport security stakeholders. The purpose of inviting observers was to share information and experience about transport security arrangements to prevent, protect against and respond to malicious acts during the transport of radioactive material. Observers were drawn not only from regulatory authorities and law enforcement agencies but also from shippers, receivers, carriers and others with roles and responsibilities in transport security. In addition to the exercise actors, individuals who were second in command at the primary participating agencies and organizations had an opportunity to observe the exercise.

### 2.3.4. Structure

The TTX structure was developed considering the exercise's objectives, scope and three main scenarios. The scenarios involved different circumstances (normal and abnormal) that highlighted necessary actions to resolve security issues related to detection, characterization, operative response and pretrial investigation. Likewise, each scenario needed to encompass those security topics, including aspects related to legal regulation, rules, procedures or other competence areas in a way that assessed the response of authorities and other stakeholders under normal or abnormal circumstances (even in circumstances beyond the unlawful seizure of radioactive material).

The TTX was compartmentalized into five conceptual modules. This made it easier to focus the discussion of the delegations and achieve the objectives. The structure of the TTX sessions and their main guidelines are shown in Fig. 1.

### 2.3.5. Key elements

#### 2.3.5.1. Module 1: Transport preparation

**OBJECTIVE:** Identify roles, responsibilities and security requirements for preparation of a radioactive material shipment, including authorization and preparation of packages for transport.

Module 1 focused on discussing the roles and actions of the competent authorities and other stakeholders when any radioactive material is transported in or through the country. The following issues were considered:

- Regulations applicable to preparation, licensing or authorization of a transport;

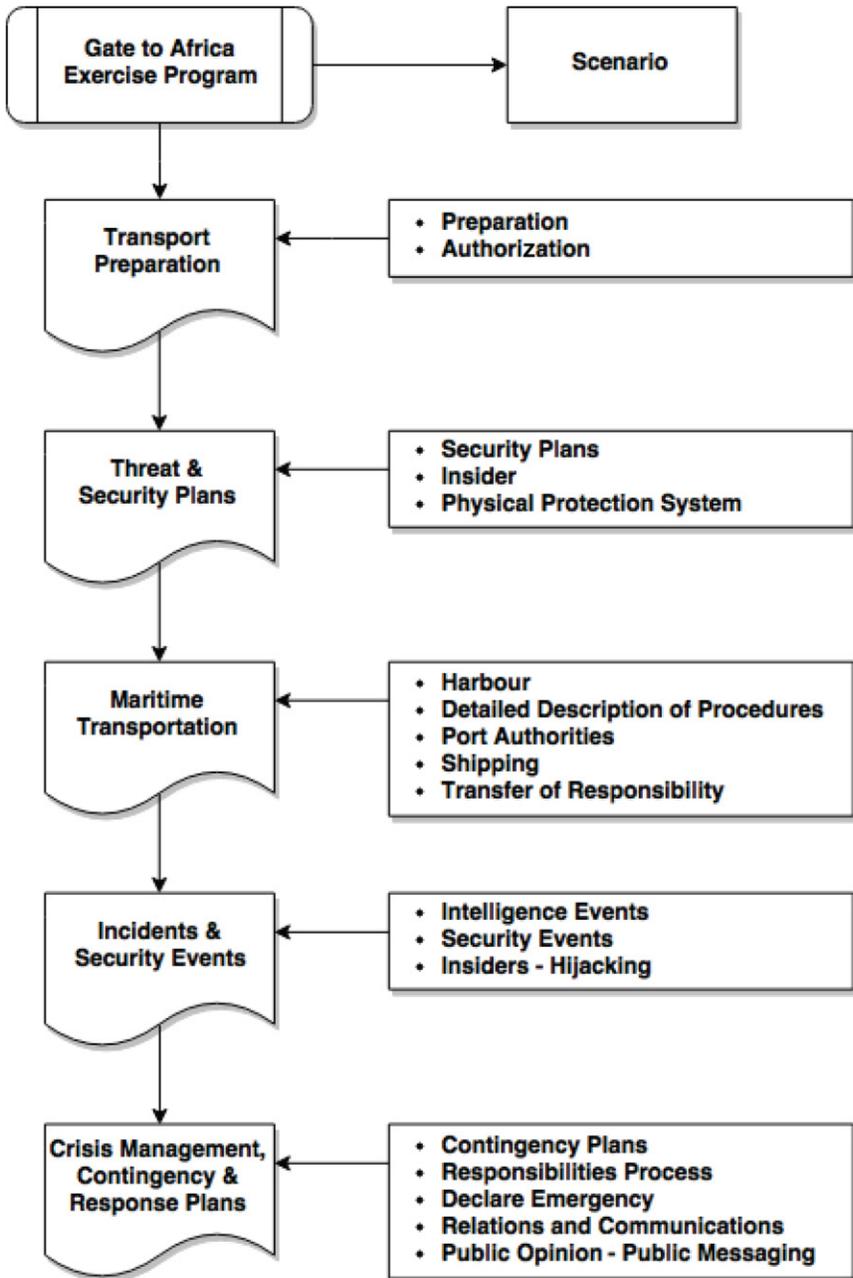


FIG. 1. Five modules of the TTX.

- Roles, responsibilities, authorities and actions of the competent authorities and other stakeholders (e.g. cargo company, regulatory body, customs, port authority, security organizations);
- Capabilities and arrangements under normal circumstances;
- Communication and coordination between competent authorities and stakeholders, and between Morocco and Spain.

**INJECT:** *The shipping company, Express Truck S.A.U. (European Isotope Transport Association), gave a presentation about the responsibilities and security requirements involved in preparing a radioactive material shipment, including authorization and preparation of packages for transport.*

The following topics were discussed:

- (1) What transport regulations/requirements are in force (not just in the country of origin but also in the country of destination):
  - (a) For a high activity radioactive source transport?
  - (b) Interfaces with safety?
  - (c) Regarding transport security?
- (2) Which specific authorities in Morocco and Spain are responsible for, and involved in, the authorization of the transport? Provide details of:
  - (a) Who authorizes the transport from the security perspective?
  - (b) Who submits the request? Who is authorized, the shipper or the carrier?
  - (c) Is there a separate authorization process for safety and for security? In this process, are trustworthiness checks envisaged?
  - (d) Is there any national-level coordination? What are the measures taken in order to coordinate the organization of the transport with the authorities in charge of security (e.g. law enforcement authorities)?
  - (e) Are trustworthiness checks to be undertaken?
- (3) Are the transport security plans/measures required to acquire authorization? Provide details of:
  - (a) Who develops the plans/measures, who evaluates them and, if applicable, who approves them?
  - (b) What are the security plans/measures and who has responsibility at the national level?
  - (c) What are the security plans/measures and who has responsibility at the carrier level?
  - (d) What are the means of control of implementation or reporting?
- (4) How are information exchange and security accomplished?
- (5) For an international shipment, how are the different phases of the shipment planned and coordinated to ensure consistent security?

### 2.3.5.2. Module 2: Threat and security plans

**OBJECTIVE:** Demonstrate how the State considers threats in establishing its security requirements and transport security plan requirements for the transport of radioactive material.

Module 2 evaluated the role, security plans and actions of the State's security forces and security corps prior to and during the transport of radioactive material under normal circumstances. The issues considered were:

- Roles and responsibilities of competent authorities;
- Procedures for threat analysis and risk assessment;
- Transport security measures, security plans, special security arrangements and protection of sensitive information;
- Bilateral information exchange and coordination.

**INJECT:** *The Civil Guard gave a presentation on how the assessment of the threat affects the transport of radioactive material.*

The following topics were discussed:

- (1) Threat assessment:
  - (a) Is there a national threat assessment? If yes, by whom? Is it made on a regular basis?
  - (b) How is this threat assessment taken into account when defining the protection measures of the transport?
- (2) What are the main arrangements contained in the transport security plan? Questions include:
  - (a) What are the protection measures taken by the authorities? Are they affected by the level of the security threat?
  - (b) Who decides what protection measures the authorities will take? Who implements those measures?
  - (c) Does this plan suggest an itinerary? Is this submitted to the concerned authorities for approval?
- (3) How is the threat assessment or other threat information or security related information communicated to the shipping company and any other stakeholders (such as the authority granting transport authorization or the response forces)? Are there threat information exchange mechanisms between Morocco and Spain?
- (4) How does it impact the transport security measures required by the authorities and implemented by the shipping company/carrier? In addition:
  - (a) How is this reflected in the transport security plan?

- (b) What are the security measures taken by the transporter (detection, delay, response, deterrence)?
- (c) Is there any coordination between the shipper and potential response organizations?
- (5) Is there any training associated with radioactive material for ‘security responders’?
- (6) For an international shipment, how are the different phases of the shipment planned and coordinated to ensure consistent security?

### 2.3.5.3. Module 3: Maritime transportation

**OBJECTIVE:** Demonstrate roles, responsibilities and security requirements for maritime transport of radioactive material (both at the port and during shipment).

Module 3 focused on the role and actions of the port and maritime authorities for radioactive material transport under normal circumstances. The following issues were considered:

- Roles, responsibilities and actions of competent authorities (e.g. port authority, maritime authority);
- Capabilities and available resources of competent authorities;
- Procedures for transferring responsibility of radioactive material (time and place);
- Special security arrangements;
- Bilateral information exchange and coordination (e.g. maritime authority).

**INJECT:** *The General Directorate of the Merchant Marine gave a presentation of the actions undertaken by the maritime and port authorities.*

The following topics were discussed:

- (1) How is the transfer of responsibility for the security of package(s) defined and agreed? Where and how is it executed (shipper, carrier, receiver, etc.)?
- (2) What are the formalities to be carried out by the transporter with the port authority, between the unloading of the source and its exit from the port? During an international shipment, who is responsible for coordination (consignee, consignor, shipping companies, etc.)?
- (3) Who are the main stakeholders/actors during this phase? What are their security roles and missions?
- (4) What are the security verifications that need to be completed before the package of radioactive material leaves the port?
- (5) How is the transport monitored (location, status, communications, etc.)? What means of communication are used with the RO-RO ship, transport

- control centre, etc.? Are there any systems to track a package with the objective of issuing an alert in the case of a malicious act?
- (6) Does the shipper have contingency plans to address abnormal situations or malicious acts?
  - (7) How are documents, such as bills of lading containing sensitive information regarding the radioactive material consignment, handled?

#### *2.3.5.4. Module 4: Incidents and security events*

**OBJECTIVE:** Demonstrate how Morocco and Spain would respond to incidents and security events during the maritime transport of radioactive material.

Module 4 considered different possible incidences that could involve the following issues:

- Roles and responsibilities of competent authorities and stakeholders;
- Capabilities and available resources of competent authorities and stakeholders;
- Coordination between competent authorities and stakeholders;
- Types of arrangement;
- Special security arrangements under abnormal circumstances;
- Operational command under abnormal circumstances;
- Decision making processes under abnormal circumstances;
- Tactical response under abnormal circumstances;
- Bilateral information exchange and coordination.

**EVENT 1:** Owing to technical problems, a merchant ship carrying radioactive material sustains damage in its propulsion plant and is only able to operate at minimum cruising speed (no tow needed) or dead ship condition (tow needed).

Once experts designated by the port of Algeciras/maritime authority have evaluated the situation the ship is ordered to return to port.

Once the ship is stopped, a fire on the truck parking deck is observed. This fire involves those trucks transporting radioactive sources. The fire is extinguished before it reaches other trucks inside the ship.

This double event focuses the discussion on:

- Port and maritime authorities' actions;
- Bilateral information exchange;
- Procedures for ensuring radioactive material security.

**INJECT 1:** *Owing to technical problems, a merchant ship carrying radioactive material sustains damage in its propulsion plant and is only able to operate at minimum cruising speed (no tow needed) or dead ship condition (tow needed).*

The following topics were discussed:

- (1) What are the actions to be carried out in such a situation?
- (2) How is it determined whether this is due to a normal accident or to a malicious act?
- (3) Which communications would be made from the General Directorate of the Merchant Marine to other authorities and relevant entities in this field?
- (4) Who should take the decision to tow the ship to a port or to evacuate the radioactive source to another ship?
- (5) What types of communication would be made to the other country's maritime authority?

**INJECT 2:** *In the event that the ship is towed to the harbour for repair.*

- (1) What actions should the port authority undertake in relation to the security of the radioactive sources?
- (2) What actions should the security corps undertake for the duration that the radioactive source remains in the harbour?

**INJECT 3:** *A fire involving trucks carrying radioactive sources breaks out in the vehicle cargo area.*

- (1) What kinds of communication should be made from the maritime authority of the harbour?
- (2) What types of action should be taken to ensure that there is no radiological emergency?
- (3) What types of action should be taken to ensure the physical security of radioactive sources until their transfer to the port?
- (4) What communications should be made to the other country's authorities?

**EVENT 2:** This event focuses on a scenario that considers the influence of international intelligence information on the behaviour of competent authorities and other stakeholders during the transport of a radioactive source. In this scenario, State security forces and security corps submit intelligence information suggesting terrorist activity in the area. The issues to be considered are:

- State security forces and security corps actions;
- Government actions;

- Port and maritime authorities' actions;
- Coordination procedures between stakeholders in the harbour environment;
- Bilateral information exchange;
- Bilateral coordination mechanisms;
- Procedures existing between Morocco and Spain for transferring the responsibility for radioactive material security;
- Special security arrangements.

**INJECT:** *Specific intelligence information is received in the form of a credible communication having been intercepted that indicates an attempt will be made to steal radioactive material.*

The following topics were discussed:

- (1) What actions would the national security authorities and port and maritime authorities carry out before this phase of transport? What coordination actions would the port zone departments take before this phase of transport?
- (2) What types of communication would be made with the other country's authorities? How would this be accomplished?
- (3) What actions would the Moroccan and Spanish security authorities take before the shipment and during its transit through their national territorial waters?
- (4) What types of coordination between the Moroccan and Spanish security authorities would be established to ensure the security of the transport?

**EVENT 3:** The RO-RO ship resumes navigation in Spanish territorial waters, where a terrorist group hijacks the ship. The attack aims to take control of the RO-RO ship with the support of possible insiders (i.e. truck drivers). They threaten to use the radioactive sources on board in RDDs in both Morocco and in Spain.

After several hours, a rigid-hulled inflatable boat (RHIB) leaves the ship and heads towards the Moroccan coast. Two terrorists are on board the RHIB with a package capable of transporting one of the two radioactive sources.

This event considers the following issues:

- State security forces and security corps actions;
- Port and maritime authorities' actions;
- Protocols and procedures for bilateral communication and information exchange;
- Operative coordination mechanisms between both countries.

**INJECT 1:** *A terrorist cell comprising three people disguised as truck drivers tries to gain control of the boat.*

General considerations regarding the response to an attack include:

- (1) What is the national framework (policy, legal basis, international commitments) that would form the basis of the response to a nuclear security event (attack against nuclear/ radioactive material)?
- (2) What ministries and agencies are involved? What capabilities are required?
- (3) In the particular case of an attack during the maritime transport of radioactive material, who are the main actors? To whom will the boat crew communicate the alert?
- (4) What coordination mechanism will be initiated? Will it be at the national level? Will it be at the international level?
- (5) How would the unlawful seizure of radioactive material by a terrorist cell be verified?
- (6) What protocols would be activated by the security forces after the loss of Category 2 radioactive sources?
- (7) What actions and what kinds of communication would be carried out by the security authorities and Directorate of the Merchant Marine?
  - (a) Who assumes command of the operation?
  - (b) Who assumes interdepartmental coordination?
- (8) What communications would be made to the other country's authorities?
- (9) If communication were lost, how would the ship be located?
- (10) What actions should the other country's authorities take in anticipation of the ship entering their territorial waters?
- (11) What types of action would prompt the security corps to try to recover the radioactive sources?
- (12) What coordination mechanisms would link the security corps with the Moroccan authorities?
- (13) After the situation has been managed in terms of security, what would be the remaining safety measures, if any, to be taken?
- (14) What would happen if an insider were implicated in the attack? What measures are in place to limit the ability of insiders to affect the radioactive material shipment?

**INJECT 2:** *Information on the attack has been spread widely on social media.*

- (1) Is there a need for any official communication?
- (2) Who would manage this communication?

**INJECT 3:** *Once reviewed, the list of passengers (i.e. truck drivers) identifies the terrorists and checks are made to determine whether they come from*

*the Sahel–Saharan region and whether they have links to Moroccan and/or Spanish citizens.*

- (1) What police coordination mechanisms would be activated to retrieve all possible information about the terrorists?

**INJECT 4:** *After half an hour, a RHIB that has departed from the Spanish coast shadows the RO-RO and comes alongside it. A terrorist carrying a radioactive source then transfers it to the terrorists on board the RHIB, which immediately heads towards Morocco.*

- (1) What actions would the security corps carry out?
- (2) If the RHIB entered Moroccan territorial waters, what actions would the Moroccan authorities take?

**INJECT 5:** *The boat leaves again destined for Moroccan territorial waters.*

- (1) What actions would the Civil Guard take?
- (2) What actions would the Moroccan authorities carry out?
- (3) What communications would be carried out by the police authorities and by the Moroccan maritime authority?

**INJECT 6:** *The radioactive sources are recovered.*

- (1) What actions would be carried out to verify that there has been no deterioration in the packaging of the radioactive sources?

**INJECT 7:** *After a few hours, the media pressure has increased significantly since information on the attack and the likely reason for the terrorists attacking the port has been leaked.*

- (1) Who would define the communication policy for each government?

#### *2.3.5.5. Module 5: Crisis management, contingency and response plans*

**OBJECTIVE:** Demonstrate crisis management in a nuclear or radiological security event involving radioactive material transport with potential radiological consequences.

While this module was not intended to address radiological emergencies, it provided a framework for discussion between Morocco and Spain on the following issues:

- Contingency plans against radiological risk;
- Coordination between Morocco and Spain;
- Mass media communication procedures.

This approach addressed the civil protection actions of Morocco and Spain (assuming the various incidents incur any type of radiological risk).

**INJECT 1:** *Moroccan experience in building its crisis management capabilities related to radioactive material was discussed.*

**INJECT 2:** *The General Directorate of Civil Protection presented the national crisis management system in this field.*

- (1) How do the authorities respond to these events?
- (2) What is the national crisis management system?
- (3) Is there a need to communicate the situation to the media and to the civilian population? If so, then:
  - (a) By whom?
  - (b) Which message?
  - (c) Who has the authority to speak for the incident commander? If it represents an international situation, how is the messaging coordinated or managed between the different countries?
- (4) What notifications would be made to international organizations (e.g. the IAEA) and neighbouring States?

### **2.3.6. Exercise observations**

#### *2.3.6.1. Module 1: Transport preparation*

This module explored existing Spanish legal requirements for nuclear and radioactive material transport. The European Isotope Transport Association gave a presentation on how its transport system is configured and discussed the question of what information should be shared with which logistics and transport providers.

Five subjects regarding the transport of radioactive material were discussed: (i) type of material transported and the relative ‘attractiveness’ of the shipment, (ii) legal requirements regarding the shipment, (iii) resources

involved and/or required, (iv) procedures before and during the transport and (v) documents needed when planning and conducting a shipment.

Moroccan and Spanish participants gave presentations on existing regulations for exporting and importing dangerous goods (e.g. radioactive sources). Participants discussed existing international requirements from the International Maritime Organization (IMO), IMDG Code and International Ship and Port Facility Security (ISPS) Code, and international recommendations from the IAEA. Participants also discussed who authorizes or licenses transport activities in Morocco and Spain, which authority or authorities is/are responsible at certain stages of transport and how trustworthiness checks are implemented within the countries. From the origin facility in Spain to the port of Algeciras, existing European Union (EU) regulations are in effect, as well as two royal decrees. Notification of initial transport is made and the transport is written into official records. Requirements were discussed that would allow the port authority to accept or deny the shipment through the port of Algeciras based on safety and security. Trustworthiness checks of all staff involved were discussed.

Both countries agreed that an exchange of documentation with port authorities was warranted and had occurred. Security information was also exchanged. A transport security plan was written for this shipment. The transfer of liability along the route was discussed. It was also discussed whether or not appropriate and effective rules and regulations exist for maritime transport.

#### *2.3.6.2. Module 2: Threat and security plans*

This module elaborated on the assessment of a potential threat to the transport of radioactive material. The delegations explained that the threat assessment was performed in three phases. The first phase studied previous situations or incidents, and the second phase analysed the current threat situation. In the third phase, a vulnerability assessment was performed.

Once the participants had established how the threat assessment was to be performed, the group discussed whether a national threat assessment existed and, if so, how it was implemented when protection measures were defined. They elaborated on the communication of increased threat levels and discussed which authority would notify the involved parties that there would be a need for an increased threat level. The notification of an increased threat level was extensively discussed, especially with regard to who would assume responsibility for notifying which parties. The delegations noted that any threat between the neighbouring States could be communicated swiftly and correctly, without delay.

Moroccan and Spanish representatives further discussed how and whether a design basis threat could or should be applied to maritime transport.

### *2.3.6.3. Module 3: Maritime transport*

This module elaborated on the differing roles and responsibilities of the involved parties when maritime transport is conducted. The main stakeholders were defined and challenged as to how responsibility is transferred as the transport moves across responsible boundaries.

The shifts in responsibility between several entities depending on the location of the radioactive material during a transport operation were discussed.

Stakeholders presented details of how the actual transport is monitored. The shipper's authorized contingency plan was briefly discussed. The captain of the ship was determined as the sole entity who could initiate an alarm. This alarm is sent to the relevant authorities signalling notification of an on-board threat.

### *2.3.6.4. Module 4: Incidents and security events*

This module addressed the actual scenarios. In the first scenario (Event 1), the transport vessel suffered from a mechanical or technical problem. The issue of a possible insider was briefly discussed, as well as the existing procedures for handling a mechanical breakdown. Spanish participants presented their procedures on how to handle a vessel transporting dangerous goods, such as radioactive sources, that suffered a mechanical breakdown. They discussed whether the vessel needed to be towed back to the port of Algeciras and what communications would need to occur for this to be possible. The Spanish port authorities described their procedures. Further into the discussion and scenario, it was explained that a fire had started on the vessel in the cargo hold, where the trucks were stored. The participating authorities affirmed that the security and safety of the radioactive sources were maintained.

In the second and third scenarios (Events 2 and 3), the vessel was subject to hijacking by terrorists. The actions of Morocco and Spain during these events were elaborated. The participants agreed on the need to quickly notify the neighbouring country upon receipt of this information. The participants affirmed their swift and prompt bilateral communication, and the fact that established communication procedures existed between the two countries.

The difficulty in sharing information with other countries during a radiological accident was discussed versus the need to restrict information in the interests of national security. It was noted that existing conventions require each country to make records of such incidents, but the participants agreed that their national security may require other courses of action.

Moroccan and Spanish participants described actions and procedures after receiving the alarm from the vessel's security alert system. The Spanish authorities discussed who authorizes the response of the intervention force. They

discussed the considerations made prior to the decision to intervene and recapture the hijacked vessel. Participants elaborated on actions taken to regain the vessel. Tactical communications would be established concurrently from ministerial, to regional, to individual and technical coordination levels. It was affirmed that an event in either country's territorial waters would result in the notification of the other country's embassy. Actions to regain control of the vessel were discussed.

Both countries gave detailed presentations on their actions to secure the radioactive source and on decontamination procedures for the terrorists and members of the special intervention units. The chemical, biological, radiological and nuclear teams from both countries displayed capability to handle the situation. They affirmed their abilities to skilfully secure the sources and protect the public from contamination.

The need to handle the media was also elaborated. Both countries agreed that official communication through a single channel, representing all authorities in each country, would be beneficial. Spain described the structure of its crisis management organization and in which phase of operations it would be established.

#### *2.3.6.5. Module 5: Crisis management, contingency and response plans*

The final module elaborated on the contingency and response plans of both Morocco and Spain. Special attention was given to how public information and crisis management would be handled in both countries. Blocking and detouring of maritime traffic would begin after the event. Communication with the media via a single point of contact and single channel would be maintained. International crisis management notifications would be initiated with the IAEA, neighbouring countries and other involved parties.

## 2.4. FIELD EXERCISE

### **2.4.1. Content and structure of the joint field exercise**

The FEX focused on a case in which security forces would have to retake control of a maritime transport and its radioactive material cargo. The FEX had the following structure:

- (1) RO-RO ship hijacked by notional terrorist group;
- (2) Interdiction of the terrorists with the radioactive material on board a small craft by Moroccan security forces as they enter Moroccan territorial waters;

- (3) Neutralization of the terrorist group with the radioactive material on board the RO-RO ship by the Spanish security forces;
- (4) Assessment of any radiological contamination and necessary personnel decontamination processes.

#### **2.4.2. Summary**

A RO-RO ship leaves Algeciras, Spain, in transit to Tanger-Med, Morocco, carrying two radioactive sources on board. A terrorist group, on board and disguised as truck drivers, tries to obtain control of the ship. The master mariner/captain discovers the hijacking attempt and uses the ship's security alert system to alert the authorities. The Spanish maritime authority receives that signal and as the ship is sailing under the Spanish flag in Spanish territorial waters the maritime civil authority sends this information to the Civil Guard. The Civil Guard shares this information with its Moroccan counterpart, the Royal Gendarmerie, using established channels.

The information exchange provides intelligence service information suggesting that a terrorist group is threatening the interests of Morocco and Spain. The objectives of the terrorist group are to: (i) garner international media attention by hijacking the ship, and (ii) obtain radioactive sources to use in RDDs in Morocco and in Spain. The Civil Guard sends a patrol boat to the area to confirm this intelligence information. In parallel, the Civil Guard alerts the Royal Gendarmerie and sends notices to the Moroccan intelligence service.

Meanwhile, the RO-RO ship changes its route and sails westbound along the Spanish coastline. Once the intelligence information is confirmed, the Moroccan and Spanish special anti-terrorism units are alerted and sent to the area. A Civil Guard helicopter is deployed and hovers above the ship.

When the RO-RO ship reaches a predetermined area, a RHIB sailing from the Spanish coast draws alongside it. After the theft of one of the radiological packages, the RHIB heads towards Morocco. The Civil Guard helicopter follows the RHIB to the limit of Spanish territorial waters. When the RHIB enters Moroccan territorial waters, the Moroccan authorities assume control of the incident.

The Moroccan authorities take control of the RHIB. The terrorists on board are interdicted and the Moroccan authorities recover the radioactive package. Checking and security control of the crew, package and RHIB are undertaken in Tanger-Med. Members of the response team and the terrorists are decontaminated. The Spanish intervention team boards the RO-RO ship and the terrorists on board are apprehended. The chemical, biological, radiological and nuclear team boards the ship, locates and secures the radioactive sources and decontaminates the

intervention team and terrorists. The exercise ends when the radioactive source is located and the terrorists are apprehended.

### **2.4.3. Command and control**

The Civil Guard directed the portion of the exercise in Spanish territorial waters, and the Royal Moroccan Navy, with the support of the Royal Gendarmerie, led the portion of the exercise in Moroccan territorial waters.

There are two command and control centres (CoCs) in Spain: the main CoC is located in Madrid at Civil Guard headquarters and another CoC is located in Algeciras. The CoC in Madrid hosts international observers. Likewise, there are also two CoCs in Morocco: the main CoC is located in the National Emergency Centre in Rabat and a second operational CoC is located in the Royal Moroccan Navy's North Maritime Region Command in Ksar Sghir. Both main national CoCs are in charge of receiving information from their national forces and have a permanent link with the counterpart CoC in the other country. Both main centres receive information in real time, all shared using secured channels.

The Algeciras CoC has combined tactical and operational responsibilities and was responsible for coordinating the exercise. This centre had officers from both countries and directed participating units during the exercise. The centre has all the capabilities of the operational CoCs in Madrid and Ksar Sghir, as well as radio communication with the participating units of both countries.

Throughout the exercise, high level coordination was conducted by the interior ministers from the national emergency centres of each country through live video conferencing.

### **2.4.4. Exercise observations**

The overall goal of the joint FEX was to examine and evaluate the response of Morocco and Spain to a malicious act against a radioactive material transport. Coordination and information exchange were also assessed. Further, the lessons learned from the exercises were determined in order to improve the capability to respond to a similar incident. Another important goal was to strengthen national capabilities and reinforce cooperation between Morocco and Spain.

The FEX was planned by a group of experts from both countries. The FEX scenario displayed each country's national capabilities and joint cooperation in handling a malicious act against a radioactive material transport.

## 2.5. INTERNATIONAL PANEL

At the behest of the Moroccan and Spanish authorities, international observers were invited to participate in the final joint TTX and FEX. Approximately 60 international participants were present at the National Civil Protection Academy during the conduct of the TTX. At the conclusion of the exercise, they were afforded the opportunity to ask questions.

On 29 October 2015, selected representatives provided presentations on transport security. The presenters discussed a number of topics, as follows:

- The 1540 Committee (<https://www.un.org/en/sc/1540/>) stressed that the preparations for an exercise are important not only for the successful conduct of the exercise, but also as a learning process for all involved organizations and to strengthen the network with colleagues.
- The GICNT was in attendance as an observer and gave a presentation.
- The EU Commission highlighted the important interface between safety and security and also the security of radioactive material in use and in storage.
- The EU Institute for Environmental Protection and Research discussed the interface with export and border controls, including customs authorities' use of risk profiles to identify consignments for secondary inspection.
- The Vienna Centre for Disarmament and Non-Proliferation highlighted the importance of fostering a nuclear security culture to help ensure effective nuclear security.
- The International Source Suppliers and Producers Association described how transports of <sup>60</sup>Co are planned and conducted, including package design and practical experiences.
- The Civil Guard presented the new model for security at nuclear power plants.
- The National Centre for Nuclear Energy, Science and Technology (Morocco) discussed the establishment of a new regulatory authority responsible for the safety, security and safeguarding of nuclear and radioactive material.

Finally, these international participants were also able to observe the FEX through the use of live audio and video feeds transmitted from both Moroccan and Spanish forces to Civil Guard headquarters.

### 3. LESSONS LEARNED AND FINDINGS

The exercises successfully demonstrated the national capabilities, interaction and coordination needed to handle a malicious act against a transport of radioactive material. International observers were afforded the opportunity to ask questions during the exercises and presenters from the responding authorities responded in regard to each phase of the operation. The capabilities of Morocco and Spain to successfully resolve incidents similar to those in the exercises were greatly increased as a result.

The available techniques to transmit live audio and video to the audience at Civil Guard headquarters were impressive and much appreciated by the observers.

#### 3.1. LESSONS LEARNED

The exercises successfully demonstrated the national capabilities, interaction and coordination needed to handle a malicious act against a transport of radioactive material. The capabilities of Morocco and Spain to successfully resolve a future malicious radiological event were greatly increased.

The evaluation of the Gate to Africa exercises included a detailed analysis of their results. This analysis led to the identification of the following lessons learned and findings by Spain and Morocco.

##### 3.1.1. Main lessons learned

- The Gate to Africa exercise programme enhanced the national capabilities, as well as bilateral cooperation, of Morocco and Spain as necessary for the secure transport of radioactive material.
- These joint exercises highlighted the need for improved international support and coordination in order to enhance the security regime for international shipments.
- The exercises allowed for the practical application of security tactics and radiological response procedures of the security and other response forces that participated in the exercise.
- The exercises provided for a better understanding of the complex nature of these types of shipment, as well as for the necessary planning and coordination needed for an effective and secure radioactive material shipment.

- The exercises highlighted additional areas of concern, such as radiological consequence management or nuclear material outside of regulatory control, that might be studied and addressed in future joint activities.

### 3.1.2. Detailed lessons learned

**General exercise.** The approach for comprehensively addressing the transport security of radioactive material was useful and beneficial. This required holding numerous discussions and coordination meetings, at both the national and bilateral level, to prepare and conduct the main components of the exercise: a national TTX in the first phase and a joint TTX and an FEX in the second phase.

This approach proved to be a powerful tool for increasing the awareness, common understanding and preparedness of teams at the national and bilateral level, and for identifying gaps and areas for improvement.

The main lesson learned was to allow, whenever possible, more time for TTX discussions and for discussion of the observers' comments.

**Module 1.** There is a need to develop international specific technical requirements for the transport security of radioactive material, which would help in developing technical guidance at the national level.<sup>1</sup> Despite this, the Gate to Africa exercises were successful. The lessons learned from them could be used to help develop such technical requirements and guidance.

The following are worthy of further consideration:

- The transfer of responsibility during an international transport of radioactive sources between involved entities needs further investigation.
- The transport preparation involves various entities (shipper, receiver, carrier, regulatory body, port authorities, security services, etc.) that need to exchange information. The information exchange, interaction and coordination among these institutions and organizations, in particular among technical and security organizations during the transport preparation or its conduct, have been identified as critical, especially regarding physical protection and threat assessment. Formalized and agreed mechanisms need to be established. However, managing and preserving the security and confidentiality of sensitive information throughout this process is a key consideration.

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<sup>1</sup> This material was published in 2018 as Preparation, Conduct and Evaluation of Exercises for Security of Nuclear and Other Radioactive Material in Transport, IAEA-TDL-007, IAEA, Vienna, 2018.

- There is a need to establish and maintain a link between the threat assessment and the protection of the radioactive material transport. Access, in real time, to information regarding the transport of highly radioactive sources being carried out at the national level might help to enhance the security of radioactive material transport, should a change in the threat occur. For this purpose, the development of an information system at the national level that ‘centralizes’ this type of information and that allows access to relevant parties might be considered.

**Module 2.** Threat assessment at the national level was discussed. Well established and exercised mechanisms are in place in each country, as well as between the two countries. This is a very positive point. The transport company utilized a threat assessment in establishing security for the radioactive material shipment. How this threat assessment links to a national threat assessment is unclear. This link needs to be clearly addressed and formalized between the different actors. Additionally, when a change in threat occurs, the mechanisms to reinforce, if necessary, the physical protection of the transport of a radioactive source by all relevant parties needs further consideration and approvals.

**Module 3.** The maritime transport is an important phase. Algeciras and Tanger-Med are following international and well established rules and procedures. In addition, there is good cooperation between port authorities (Tarifa Traffic and the Centre de Surveillance du Trafic Maritime à Tanger (CSTM Tanger)). However, when the transport leaves the port, it is important to highlight the importance of the role of port authorities and maritime authorities in ensuring maritime transport security.

The main mechanisms to ensure security, transport monitoring and alert transmission are in place, in accordance with international standards.

**Module 4.** It is important to note that the response to the security event involving radioactive material involved security and safety actions in an integrated manner and that it is not possible to separate the security response from the safety response. The exercise highlighted the importance of ensuring that law enforcement agencies are well prepared to manage chemical, biological, radiological and nuclear events. The experience of Morocco and Spain could be considered as an international reference.

During the FEX, the law enforcement agencies demonstrated a high level of capability and performance (state of the art tactics, protocols, cooperation and coordination). The interventions, from the security perspective, of both

Morocco and Spain were very similar. The exercise highlighted the importance of communication and coordination between the law enforcement agencies from the two countries. This was even more crucial because of the short distance spanning the Gibraltar strait and the use of high-speed boats capable of reaching the coast very rapidly. From this perspective, the exercise confirmed that the communication channels are well established and fully operational, and they proved to be successful. This aspect is considered as a good practice model at the international level.

There is an interest in conducting more exercises in order to improve preparedness for radioactive material transport.

The following are worthy of further consideration:

- Notification and communication of safety events to the international community, which will be done by the relevant national authorities in accordance with the appropriate channels and arrangements.
- Management of the event while minimizing the impact of the transport traffic in the area.
- Temporary closure of the port, which might be considered based on the events and the decision of the national authorities.
- Insider threats present significant risks to the security of radioactive material during transport. Training in awareness of this issue, identification of insider threats and mitigation of their effects should be undertaken at all levels in the transport of radioactive material.

**Module 5.** The exercise confirmed the importance of providing timely and appropriate information to the media and the public, taking into account the ongoing security actions. Information management would help minimize any unwanted effects on the social community, which might otherwise be generated and spread in an uncontrolled manner, including through social networks.

### 3.2. FINDINGS

Spain and Morocco presented the following findings to the international community:

- (1) Developing international specific technical requirements for the transport security of radioactive material will support the development of technical guidance at the national level.

- (2) Addressing the link between the national threat assessment and the threat used to protect the transport material and the mechanisms are crucial to reinforce, if necessary, the physical protection of the radioactive source transport, by all relevant parties, should a change in the threat occur.
- (3) Training and exercising on a continuous basis are critical in improving preparedness for radioactive material transport. This allows the key persons involved in these types of transport to know and fully understand their roles and responsibilities, as well as allowing them access to the knowledge of their respective counterparts in the other country. This includes law enforcement, security and other response organizations.
- (4) Integrating security and safety actions in response to a security event involving radioactive material is critical.
- (5) Establishing formal information exchange mechanisms for communication between the various entities (shipper, receiver, transport company, regulatory body, port authorities, security services, etc.) involved in the transport of radioactive material is essential.
- (6) Protecting sensitive transport information and communications is key to ensuring the security of the shipment.
- (7) Continuing to exercise joint capabilities and interoperability is important in effectively preparing the States' capability to manage and mitigate threats to radioactive and nuclear material. This is especially important for the regulatory agencies, law enforcement agencies, border security and other response organizations of neighbouring countries.

## **4. CONCLUSION**

The Gate to Africa exercises illustrate, once again, the benefits of solid cooperation and strategic partnership on such essential and critical topics in the context of a regional environment that requires the mutualization of efforts to prevent malicious acts against radioactive material during transport. The exercises also served as a regional model of cooperation between two neighbouring countries and were supported by the IAEA, working together with the relevant States to address the challenges facing global nuclear security.

The completion of the exercises demonstrated that their objectives were achieved. The joint TTX and FEX were carried out smoothly and successfully. Moreover, the FEX provided a realistic assessment of the Moroccan and Spanish capabilities developed to combat nuclear terrorism.

This exercise programme allowed Morocco and Spain to enhance their national capabilities as well as their joint cooperation in maintaining the security of radioactive material during transport.

Having shared feedback on their experiences of the Gate to Africa exercises, both Morocco and Spain are ready to continue collaborating with the IAEA in applying the lessons learned and findings to future IAEA activities on nuclear security.

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## **ABBREVIATIONS**

CoC	command and control centre
FEX	field exercise
GICNT	Global Initiative to Combat Nuclear Terrorism
IMDG Code	International Maritime Dangerous Goods Code
RDD	radiological dispersion device
RHIB	rigid-hulled inflatable boat
RO-RO	roll-on roll-off
TTX	tabletop exercise



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In May 2012, Morocco, Spain and the IAEA jointly organized a technical seminar addressing the risk of nuclear terrorism with respect to the international maritime transport of radioactive materials. This seminar led to the adoption of a joint action plan that provided an adequate framework for conducting exercises to test the response capabilities of both countries in the event of hypothetical nuclear security events and radiological emergencies. The Gate to Africa exercise programme on transport security was an implementation of the joint action plan between Morocco and Spain in cooperation with the IAEA.

This publication outlines the events and details the planning, conduct and evaluation of The Gate to Africa joint tabletop and field exercises held in 2015. It details the methodology used and lessons learned. Several findings and recommendations are provided to assist in the planning and conduct of future exercises. Member States interested in implementing their own exercise programs may benefit from the material included in this publication.