**[Good practices in the joint drills on nuclear security at border ports between China Customs and neighbouring countries](https://conferences.iaea.org/indico/event/181/contributions/15432/)**

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**Abstract:**

As the first defend line of the country, Customs play a very important role to the security of the country. China Customs attaches great importance to radiation safety. In recent years, China Customs has continuously strengthened international cooperation on border port radiation safety with other neighboring countries. China Customs has invited cooperative countries to participate in border ports nuclear security joint drill and has sent personnel to participate seminars and training courses held in cooperative countries. China Customs and one particular country’s Customs Administration have established a long-term cooperation mechanism. Each year, China Customs and the X country Customs holding annual meetings of the Customs Joint Working Group on radiation emergency. Since 2015, China Customs and the X country Customs Administration have organized one joint drill about nuclear security every year. China Customs has accumulated rich experience in nuclear security joint drill at border ports. At present, China Customs is planning to cooperate with another country’s Customs in organizing a joint drill about nuclear security.

The paper discusses the specific practice of formulating and implementing nuclear security joint drill between two countries. It introduces the purpose of bilateral cooperation between two countries, the planning and preparations of nuclear security joint drill, and the best practices of nuclear security joint drill at border ports between two countries. The innovativeness of the paper is that it provides other countries with the best practices that can be used for reference in bilateral cooperation on nuclear security at border ports between the two countries.

## INTRODUCTION

Customs is the administrative department that exercises the power of supervision and administration of Entries and exits at ports.[1] It is the first line of defense to guard the security of national doors. Customs plays a very important role in safeguarding national security. Chinese Customs attaches great importance to nuclear security, seriously implements the main responsibilities of the state, fulfills the functions and powers conferred by law, and continuously strengthens the monitoring of nuclear radiation at ports. In recent years, Chinese Customs has continuously strengthened international cooperation in ports’ nuclear security with neighboring countries, invited cooperating countries to participate in the work of radiation detection at Chinese Customs ports [2], and has sent personnel to participate in seminars, training courses and bilateral cooperation projects related to port radiation detection work in cooperating countries. As for holding border ports nuclear security joint drill, China Customs has been continuously promoting the cooperation with periphery countries to carry out bordering ports nuclear security joint drill bilaterally, which not only promotes the ability for China Customs to handle radioactive cargos and the cooperation between Customs and other related departments, but also established platforms and build communications to enhance trust and understanding with neighboring countries. Such act had positive influence on avoiding trade frictions on ports’ commerce.

## Purpose and significance of nuclear security joint drill

**2.1 Domestic level**

Nuclear security joint drill can enhance the ability of China Customs to radiation detection work. Customs supervises the cargo, carry-on items and vehicles according to law, which is the first line of defense to guard the security of the national gates. China Customs carries out radiation detection work at the ports to ensure that nuclear and other radioactive materials are intercepted outside the national gates, meanwhile preventing the flow of nuclear and other radioactive materials from China to the international market [3]. Nuclear security is the focus of international attention. Once nuclear materials fall into the hands of terrorists and become weapons of terrorists, they will consequently cause catastrophic effects. This is the result we do not want to see. Nuclear security joint drill at ports are conducted to train the ability of Customs to dispose of radioactive cargo in a practical way so as to achieve the effect of practicing. This is an effective means to improve the ability of Customs officers to radiation detection work.

Nuclear security joint drill can enhance the coordination between different functional departments in dealing radiation emergency. The disposal of radiation emergencies requires the coordination of multiple functional departments. At entry and exit ports, Customs and the State Immigration Administration (formerly Chinese frontier inspection) are the main port management departments. According to the principle of territorial management for emergencies, local governments are responsible for coordinating territorial resources and dealing with emergencies; ecological and environment departments, public security departments and emergency management departments (formerly fire departments) etc. are responsible for the management of radiation emergencies. To some extent, the effectiveness of dealing with radiation emergencies depends on the synergistic effect of various departments [4]. For China Customs, how to strengthen the cooperation with other port management departments, how to strengthen the contact with local government, how to deal with the division of labor with other functional departments, what roles to play in the nuclear security joint drill, where the boundaries of authority are and how to link up the operational needs to be explored and studied continuously by organizing joint drill.

**2.2 International level**

Nuclear security joint drill can build a platform for bilateral cooperation and enhance understanding and mutual trust. Normally, when radioactive cargos are found at ports, there are usually two kinds of disposal measures taken by Customs after confirming that the radioactivity of the cargo exceeds the standard. The two kinds disposal methods detention and return. After taken detention measures, China Customs immediately enters the domestic treatment procedures and contacts relevant departments for further identification. After determining the property of the incident, the cargo will be then transferred from the Customs to the ecological environment department or public security department for further treatment. If return measures are taken cargos shall be returned to the place of departure, and Customs officers shall record them. For the bilateral neighboring countries at ports, the cargo disposed by the measures of return often cause unnecessary troubles due to the lack of effective communication during the process of return. Both sides refuse to accept radioactive cargo. Radioactive cargos are in detention in the border passages, and the situation is further escalated, even causing bilateral trade frictions. Nuclear security joint drill between bilateral neighboring countries are conducted at ports. Each Department of the two sides participates in the exercises, jointly handles radiation emergency incidents, and establishes a platform for cooperation to understand each other's disposal process, enhance understanding and mutual trust in the exercises, so as to avoid misunderstanding and friction.

Nuclear security joint drill can create a bilateral consultative environment and unify law enforcement standards. The nuclear security joint drills are carried out by the bilateral neighboring countries and a final exercise report will be written for recording the whole process of the exercise. Signatures of two sides are taken to confirm that the two countries agree with each other on the procedures taken for dealing radiation emergency. Therefore, nuclear security joint drill can create a bilateral negotiation environment. Through negotiating and compiling exercise scripts, bilateral neighboring countries of the port could determine the procedures of disposing radioactive cargos and standardize the supervision on radioactive cargo, thus achieving a mutual recognition on regularities and unify enforcement standards.

## Preparations for nuclear security joint drill

The preparation for nuclear security joint drills involves materials, personnel, cooperation between departments and script making, etc. [5] Only by making adequate preparations can the established objectives of the drill be achieved.

**3.1 Material preparation**

Material preparation usually includes drill cargos, drill equipment, drill venues, drill vehicles and other auxiliary materials.

Drill cargos: Drill cargos should be selected considering local circumstances, most possibly the resources found in the region around the port. In addition to the common natural radioactive cargos, special nuclear materials and other radioactive sources should be included according to the complexity of the drill (shown as Table 1). Special nuclear materials, i.e. highly enriched uranium and highly enriched plutonium for the manufacture of nuclear weapons, belong to the national strategic materials, which are strictly controlled in all aspects of production, transportation and application. Customs should report and apply for acquisition step by step. Radioactive sources are made by radioactive materials [6]. At present, a large number of enterprises and institutions in China use radioactive sources for production and operation activities. Chinese government manages the radioactive sources through application and transportation. The local ecology and environment department are responsible for the supervision of the application of radioactive sources, and the local public security departments at the place of departure and destination are responsible for the transportation and transfer of radioactive sources. If China Customs need to use radioactive sources in the drill, they can use radioactive sources as props by contacting enterprises and institutions for rent, the public security department for record transportation, and the ecology and environment department for supervising the application of radioactive sources [6][7].

Table 1. Selectable cargo in drill

|  |  |
| --- | --- |
| **Category** | **Typical cargo** |
| Special nuclear materials | Highly enriched uranium | Highly enriched pluton |  |
| Radioactive source | Industrial sources | Medical sources |  |
| Natural radioactive cargo | Ore raw materials | Chemical raw materials | Industrial products |

Drill equipment: Radiation physical phenomena needs to be detected by special equipment. China Customs carry out radiation detection work at ports. China Customs quipped with a large number of fixed and portable radiation detection equipment [8] (shown as Table 2). It can use specialized equipment issued by China Customs to carry out nuclear security joint drill. It can also deploy radiation detection equipment to support the drill through the General Administration of Customs.

Table 2. Radiation detection equipment distributed by China Customs

|  |  |
| --- | --- |
| **Category** | **Equipment** |
| Fixed | Radiation detection device |  |  |
| Portable | Personnel protection device | Radiation detection device | Radioisotope identification device |

Drill venues: China Customs supervise place include passenger concourse, postal checkpoint, bulk examination place, container freight station [9], (shown as Table 3). According to the specific planning of the drill, Customs workplaces are usually used as drill venues, which is convenient to use existing China Customs supervision facilities and equipment to arrange drill scenes, and more realistic.

Table 3. China Customs supervise place

|  |
| --- |
| **China Customs supervise place** |
| Passenger concourse | Postal checkpoint | Bulk examination place | Container freight station |

Drill Vehicles: Port transport vehicles can be rented, and China Customs supervision vehicles can be deployed to participate in the drill.

Auxiliary materials: including site environment layout, broadcasting commentary system, multimedia audio and video equipment, audience and seating equipment, etc.

**3.2 Personnel Preparation**

According to the division of labor, the participants are divided into four categories: drill operators, drill commanders, narrators and logistical support personnel.

Drill operator: Drill operator is the specific executor of the drill, and all the required actions of the drill are performed by the drill operator. Usually, drill operators are selected among Customs officers engaged in radiation detection work. China Customs carry out radiation detection work at ports, mainly relying on Customs officers at port supervisory posts, using radiation detection equipment to monitor the cargo (shown as Fig. 1). When the cargo is found to have radioactive, the cargo is processed according to the workflow of radiation detection work. During the drill, Customs officers in the port supervision post, as drill operators, carry out standard operations according to the drill script and the requirements of the Customs radiation detection working procedures.



*Fig. 1. Drill operators are following the process*

Drill Commander: Drill Commander is responsible for the whole drill, and ensure the whole drill procedure is completed. Usually, the drill commander is led by the Customs supervision department leader officer.

Narrator: Narrator's job is to inform audiences, media and other audiences of the drill by narrating the background, progress and working status of each functional department. Due to the scale, funding and time limitation of the drill, China Customs often have difficulty to provide comprehensive information, to show detailed operation procedures such as sampling and inspection, which show the real scene of multi-department cooperation, and to wait for the long experimental analysis results. These contents are usually not the focus of the drill, but they are the exercise flow. In the middle of the process, narrators are required to explain and supplement these contents.

Logistics support personnel: Logistics support personnel as an important drill support force, complete the drill material allocation, drill scene layout, drill vehicle scheduling, attendance service and so on.

**3.3 Departmental Cooperation**

Radiation emergency incident can be divided into four categories according to the degree of hazards [10]. The disposal of radiation emergency incident requires multi-department cooperation. According to the order of escalation, the number of departments involved in the disposal of radiation emergency incident. Correspondingly, according to the complexity of the scale of the drill, the number of functional organizations participating in the drill shall increase. Generally, it can be divided into three levels: port level, local level and national level (shown as Fig. 2).

**National level：**

National anti-terrorism; National public security;

National ecology and environment;

National emergency management; Army

**Local level：**

Local government; Local anti-terrorism;

Local public security; Local ecology and environment;

Local emergency management; Local medical and health;

Local media

**Port level:**

China Customs;

National Immigration Administration

*Fig. 2. Three levels of joint drill and functional departments involved*

*3.3.1 Port Level*

At the port level, the radiation emergency incident is the least harmful and the scale of the drill is the smallest. The departments participating in the drill are limited to the port management departments, including Customs, the National Immigration Administration (formerly China Frontier Inspection), the port management units (ports company, airports company, etc.). In case of radiation emergency incident, China Customs has responsibility for detecting the cargo, disposal the cargo, sample and inspect the cargo, and handle with the articles carried by personnel and transport vehicles; the National Immigration Administration has responsibility for controlling the scene, maintaining order and evacuating personnel; and the port administration unit has responsibility for stabilizing the normal production order in the port area and enforce management. Therefore, in the drill of port level, China Customs, National Immigration Administration and port management units cooperate with each other, perform their respective duties, and play a responsive role in the drill, and jointly deal with port radiation emergency incident.

*3.3.2 Local Level*

At the local level, the hazards of radiation emergency incident are moderate. The scale of drills has expanded, and the number of departments participating in drills has increased. When the radiation emergency incident escalates, the port management department can’t control the development of the situation and needs to be handled by the local government, the local government emergency management office coordinates local management resources and reinforce the disposal efforts [11]. In addition to the port management departments, the units participating in the drill should also include local governments and local anti-terrorism, public security, ecology and environment, emergency management (original fire control), medical and health, media and other departments coordinated by local governments.

*3.3.3 National level*

At the national level, the radiation emergency incident has the highest degree of hazards, which involves the largest scale of drills and the largest number of departments participating in drills. In addition to the port manage departments, local governments and their coordinating units mentioned above, they should also include the National Anti-terrorism Office, the Ministry of Public Security, the Ministry of Ecology and Environment, the Ministry of Emergency Management, the army and other national forces, as well as scientific research institutions related to nuclear material accounting, nuclear forensic, radiation protection and other fields. (shown as Table 4)

Table 4. Three levels of joint drill and functional departments involved

|  |  |  |
| --- | --- | --- |
| **Port level** | **Local level** | **National level** |
| China Customs | Local government | National anti-terrorism |
| National Immigration Administration | Local anti-terrorism | National public security |
|  | Local public security | National ecology and environment |
|  | Local ecology and environment | National emergency management |
|  | Local emergency management | Army |
|  | Local medical and health |  |
|  | Local media |  |

**3.4 Script writing for nuclear security joint drill**

First of all, it needs to be clear that the nuclear security joint drill organized by China Customs is the refinement of the National General Emergency Response Plan at the port [12]. And the nuclear security joint drill is a series of response plans arranged by China Customs according to its specific workplaces. The National General Emergency Response Plan is an important strategic compiled by Chinese government to prevent and reduce public emergencies and their damage, ensure the safety of public life and property, maintain national security and social stability, and promote comprehensive, coordinated and sustainable economic and social development. Port emergency management is one of the nodes in the National General Emergency Response Plan. China Customs is an important part of this node. China Customs should improve the port disposal capability in the National General Nuclear Emergency Response Plan and try to be comprehensive and detailed within the scope of its functions and powers. Therefore, China Customs should formulate different drill scripts according to the different workplaces and radioactive cargo [13] (shown as Table 5).

Table 5. Drill scripts for China Customs supervise place and cargos.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Supervise Places****Cargo** | Passenger concourse | Postal checkpoint | Bulk Examination place | Container freight station |
| Special nuclear materials | Script 1 | Script 2 | Script 3 | Script 4 |
| Radioactive source | Script 5 | Script 6 | Script 7 | Script 8 |
| Natural radioactive cargo | Script 9 | Script 10 | Script 11 | Script 12 |

In the preparation of the drill script, it is necessary to take into account the division of duties and responsibilities of various Customs posts, take the actual work of the Customs as the basis, keep close to the actual work, and not play arbitrarily in order to pursue the effect of the drill [14]. At the same time, we should consider the boundaries of responsibilities with other functional agencies. China Customs jurisdiction is limited at ports. In the exercise, the role of China Customs is to discover the radiation emergency incident. In the event disposal, the mainly work of China Customs is finding clues, assessing the situation, quickly collecting information, controlling scene, evacuating personnel and handing over the sites. For criminal investigation, security, disease control, fire control, nuclear forensic, public protection and other fields, professional work is done by professional forces. China Customs should pay attention to the boundaries of its duties, and should not exceed its authority [15].

## Implementation nuclear security joint drill

After preliminary preparation and script formulation of the nuclear security joint drill, it will be implemented by stages, steps and plans [16]. Pay attention to the following points:

**4.1 Control of Radioactive Cargo**

During the whole process of the joint drill, it is necessary to arrange special person to take strict care of the radioactive cargo, ensure that the radioactive cargo is not lost, omitted and polluted the environment [17]. After the drill completed, the radioactive cargo should be recovered in time, especially when special nuclear materials and radioactive sources are used in drill. Special attention should be paid to the application and management of the radioactive cargo, and the sealing device of the radioactive sources should not be opened when it is unnecessary.

**4.2 Safety of drill operators**

Drill operators should pay attention to personal radiation safety and avoid long-term exposure to radioactive cargo by wearing necessary protective equipment. Wear personal radiation, dose monitoring equipment, record personal radiation doses, and operate strictly in accordance with operating procedures.

**4.3 Cleaning after the drill complete**

After sufficient preparations, the nuclear security joint drill is carried out in an orderly and planned way. After the drill commander announces the completion of the drill, cleaning work needs to be completed. If the radioactive cargo is sampled during the drill, the sample should be recovered and treated in the same way as the radioactive cargo. The sampling tools, equipment and all drill materials which touch the radioactive cargo need to be tested for radioactivity. Once radioactive contamination occurs, it should be handled properly by the ecology and environment department immediately, and the contaminants must not be discarded.[5]

## Report for nuclear security joint drill

The report is one of the important achievements for the nuclear security joint drill. It is the acceptance of the drill procedure by the participating departments of the bilateral port countries. It is also the reference basis for Customs of the neighboring countries to carry out the work of radiation detection work at the port. It has a certain demonstration effect. It is suggested that Customs who carry out the joint drill should consult and exchange comments and suggestions with relevant department, study drill scripts, sign drill summaries and reports, formulate an official document, and further standardize the work of Customs radiation detection work at ports.

## Brief introduction nuclear security joint drill held by China Customs and X country Customs

After consultation between the two governments, China Customs and X country Customs have established a long-term cooperation mechanism, holding annual joint working group meetings on Customs radiation detection work.[6] The memorial of the meeting has been signed by the two sides for the implementation of annual cooperation projects and the planning of cooperation plans for the next year [18]. Since 2015, China Customs and X country Customs have organized nuclear security joint drill every year, inviting each other's Customs to participate in nuclear security joint drill at their respective ports (shown as Fig. 3). China Customs has accumulated rich experience in joint drill of radiation emergency at ports. At present, besides cooperating with X country Customs, China Customs is planning to cooperate with another country Customs on the nuclear security joint drill.



*Fig. 3. Nuclear safety joint drill between China Customs and X Customs*

## Conclusion

This paper shares about the purpose, significance, preparation, implementation, summary and experience of the nuclear security joint drill. As a best practice of radiation emergency planning and preparedness, this paper provides the best practices for other countries to develop bilateral cooperation on nuclear security at border ports between the two countries. The summary is as follows:

1. Nuclear security joint drill will help to strengthen the radiation detection ability of China Customs, further enhance mutual trust and understanding between port and bilateral neighboring countries, and promote the unification of nuclear safety law enforcement standards between the two sides.

2. Nuclear security joint drill must be carefully prepared, fully consider the elements of materials, personnel, department cooperation and drill script, and cleaning up after the drill, so as to ensure the orderliness, safety and efficiency of the drill.

3. By means of nuclear security joint drill, we must actively promote mutual recognition of the joint drill reports. And through regularly carry out the nuclear security joint drill, promote the unification of the standards of nuclear safety law enforcement between the two sides, and implement the results of the joint drill.

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