

Periodical Radiological Crime Scene Management Exercises in Germany

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Abstract.

In order to maintain and to improve the ability to investigate a radioactively contaminated crime scene, the competent federal authorities BfS, BKA and BPOL conduct periodical exercises. During this exercise various tasks are performed like radiation detection, processing contaminated evidence etc. This exercise series is used to enhance the capabilities to deal with radiological emergencies. The paper describes the national German strategy and the roles and responsibilities developed for managing a radiological crime scene. Additionally, necessary equipment for work in a highly contaminated environment is presented and lessons learned are discussed.

1. Introduction

The Federal Office for Radiation Protection (BfS) engages in many exercises and training courses on the topic of nuclear security measures for nuclear and other radioactive material out of regulatory control [1]. It also provides assistance at major public events at the request of the security authorities [2]. The Role of BfS in the framework of the Central Federal Support Group in Response to Serious Nuclear Threats (ZUB) in Germany has been described in a previous contribution [3]. On request of a German competent authority (state or federal) the ZUB can be called upon to handle severe cases of criminal use of radioactive material.

In the case of a crime scene with possible involvement of nuclear or other radioactive material out of regulatory control, BfS together with the German Federal Criminal Police (BKA) and the German Federal Police (BPOL) within the ZUB framework will work together to safely investigate the crime scene. After the investigation of the Polonium incident in Hamburg in 2006 [4], regular crime scene management exercises were established. They are conducted at least once a year on a large scale to practice the cooperation and team work between BfS, BKA and BPOL.

2. Strategy

The need for periodical crime scene exercises arises from the fact that thankfully there are hardly any real crime scenes involving radioactive material. The German approach for dealing with such a crime scene therefore is based on a theoretical concept developed after the Hamburg incident, which has been the basis for the first crime scene exercises. The exercises in turn have shown which areas of the concept prove viable and which have to be adapted. The result is a concept that incorporates practical experience from exercises and is open to future changes if the need arises.

Since there are numerous possible scenarios for a radiological crime scene, the periodical crime scene management exercises usually focus on a particular subset in order to have all different

departments involved at regular intervals. An exercise for the complete workflow of a realistic crime scene would take days and involve an extremely large number of personnel. Training scenarios are for example decontamination procedures, buried sources or data recovery from contaminated electronic devices, but will also include certain aspects which are constantly practiced, like inter-office communication, contamination measurements or general safety issues.

Within the framework of the ZUB, BfS is responsible for all aspects of radiation protection, including the radiological safety and dosimetry of all personnel involved in the actual crime scene management. To fulfil these tasks, BfS is training its personnel to take over pre-defined roles and responsibilities, developed together with the police and defined by experience gathered in different exercises, which are similar to those described in the upcoming guide NST 014 by the IAEA [5]. These roles and responsibilities are going to be defined in the following subsections.

2.1. On-scene commander (OSC) for all BfS personnel

An experienced member of BfS is in charge of all BfS personnel at the crime scene and is responsible for the dosimetry of all personnel (including police forces) as well as the radiological safety of everybody involved in the management of the crime scene. Together with a deputy, the OSC is working closely with the police officer in charge of the crime scene, determining who can enter the crime scene and for how long they can stay from a radiological safety point of view. The OSC is assigning BfS teams for all of the roles described in the following subsections.

2.2. Detection / Search teams

Ideally, there will be sufficient BfS personnel to assign at least two detection / search teams. These teams consist of two BfS members each, who are familiar with all of the necessary measurement equipment for determining the radiological situation at the actual crime scene and are accompanying the police teams assigned by the BKA crime scene unit. The teams will first of all determine whether or not there are airborne radionuclides and after that perform a sweep of the crime scene to determine if there are hidden radiological sources present and/or if there is radioactive contamination present. Communication with the police team is very important during these search excursions and remains a big challenge as BfS and BKA use different communication equipment and the teams are wearing full protection suits. In the case of the BfS personnel this includes a respirator mask, which makes conversation particularly difficult. The reason for the different equipment is on the one hand a different style of communication (radiation protection requires and uses a different 'language' as that employed by police) and on the other hand it is much easier to organize radiation protection and conventional crime scene management separately.

If there are sources present at the crime scene which would cause a significant dose for the personnel the teams will regroup in a safe distance and the OSC will organize a suitable shielding container for the source if possible. In such an event the source will have to be recovered before any police work can be done at the crime scene, as the police personnel are considered members of the general public and should not receive a dose in excess of 1 mSv per

year. Once all major radiological sources have been removed the crime scene unit of the BKA will in cooperation with the BfS team start their search for evidence. The BfS team will measure possible evidence for radiological contamination. Contaminated evidence will then be heat sealed and transferred out of the airlock.

2.3. Airlock operators

Any crime scene that may possibly contain radioactively contaminated evidence will be sealed off with an airlock provided by BfS (see section 3). The airlock will be manned by a team of two BfS members, whose job it is to handle any evidence that needs to be heat sealed for transport to the glove box. They are also responsible for contamination measurements of all personnel leaving the crime scene and assist with containing any contamination that they may have found. At least two teams are necessary for continuous operation of the airlock.

2.4. Glove box operators

A team of two BfS members is operating a mobile glove box in which contaminated evidence can be further investigated on site. For this purpose they transfer the heat sealed evidence into the glove box, where they are unpacked and can be handled by BfS and BKA specialists. Especially in the case of contaminated electronics such as laptops or mobile phones the immediate investigation can provide timely evidence. Once the investigation in the glove box is completed, the operators of the glove box can again heat seal the evidence for storage or transfer to a facility equipped for further analysis like ITU in Karlsruhe. As with the airlock, two teams are necessary to provide continuous operation of the glove box.

2.5. Radiological advisors for the decontamination unit of the BPOL

Any personnel that has been contaminated during the investigation of the crime scene will be transferred to a specialized police unit trained in the decontamination processes. The OSC will assign a BfS expert to advise the decontamination unit of the BPOL on how to handle contaminated personnel. The advisor will make sure the measurements from BfS airlock personnel gets transferred to the decontamination unit and will give advice on how to proceed if requested or necessary.

2.6. Documentation officers

Several documentation officers are required to handle a crime scene in a manner that assures the proper documentation for a possible court case. At least three BfS members are assigned to do this job. One is standing by at the airlock to provide documentation for the evidence and as well as the contamination measurements of the crime scene personnel. Another documentation officer is assisting the OSC to make sure all the information from the search teams gets documented. One more is kept in reserve to makes sure that continuous documentation is possible at all necessary positions.

2.7. Radiological advisors on questions of risk assessment, handling and transportation of contaminated evidence

BfS experts on special subjects are available either on site or via telephone in case of arising problems. This includes but is not limited to the questions of dose estimates (including inhalation dose and calculating maximum working hours), necessary shielding requirements for transport, how to best handle certain sources and the possibility to perform propagation calculations for airborne radioactive nuclides based on atmospheric conditions.

3. Examples of Equipment

Apart from the appropriate detectors, a radiological crime scene may require some special equipment. BfS is providing the necessary tools to facilitate work in such a crime scene without spreading contamination. In order to do so, one needs to be able to isolate the rooms in question by means of an airlock. Evidence from the crime scene need to be packaged in a manner that allows to transfer them without spreading contamination. A glove box can be useful for further examination of evidence in close proximity to the crime scene in order to quickly obtain clues in connection with the crime. Should the dose rate at the crime scene be too high for working safely, a manipulator is required to handle radioactive sources. This small set of essential equipment will be described in the following subsections.

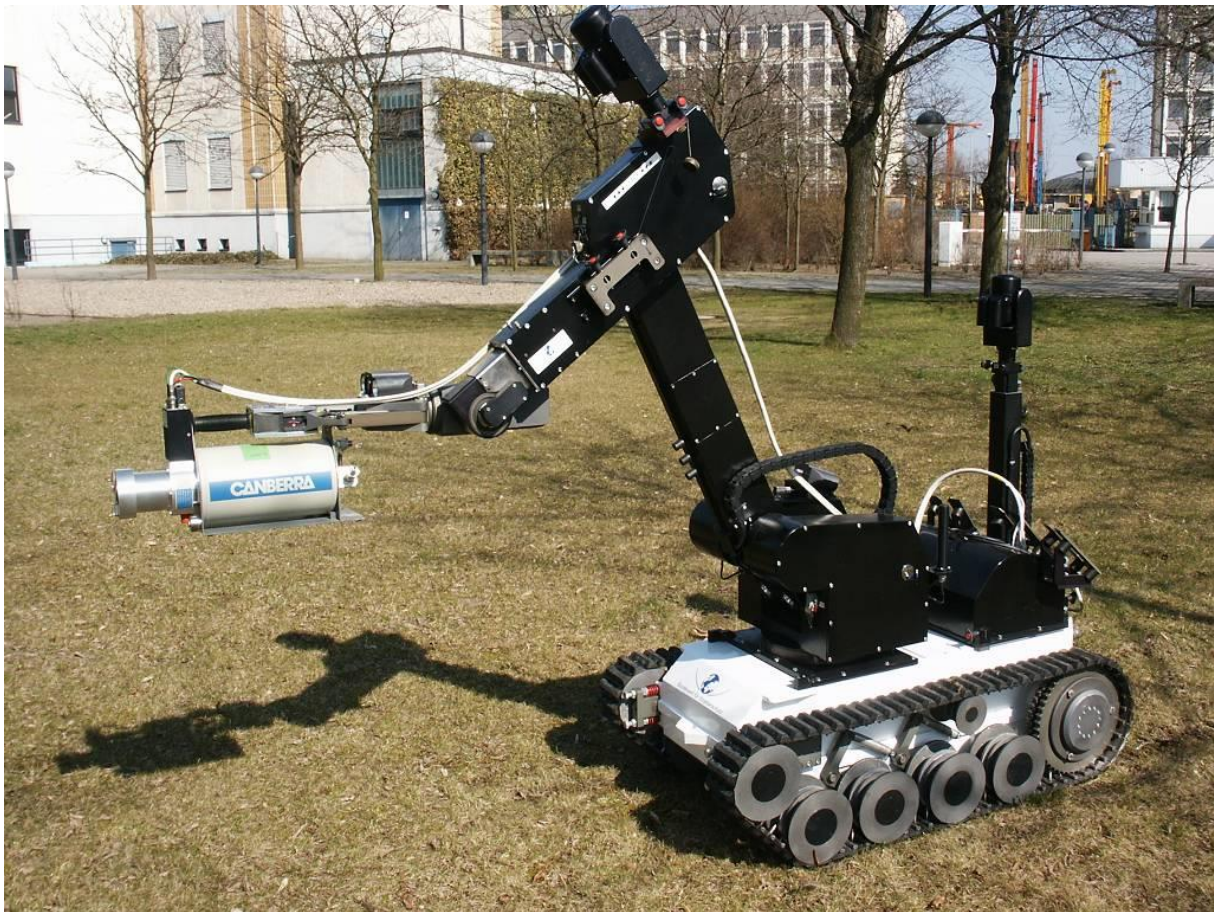


FIG. 1. The explosive ordnance disposal and observation robot (tEODor), adapted for BfS purposes. The arm is carrying a LN₂ cooled germanium detector.

3.1. Manipulator

If the search team determines that the crime scene contains a highly radioactive source which makes prolonged working unsafe, a manipulator can be brought in to salvage the source or sources in question and put them in a container with adequate shielding. For this purpose, BfS can provide the explosive ordnance disposal and observation robot (tEODor) built by telerob Gesellschaft für Fernhantierungstechnik mbH (see FIG. 1). It is remote controlled and can be equipped with different detectors, including liquid nitrogen cooled germanium detectors as well as a Target IDENTifinder, a Rad Eye gamma pager or a KSAR neutron detector. tEODor is able to work in high dose rate environments and has been tried and tested for this purpose.

3.2. Airlock

The airlock works in conjunction with a vacuum pump, which slightly lowers the pressure within the crime scene and thereby creates an airflow which is directed from the outside into the crime scene, making sure that possible airborne contamination stays within the sealed off area. The size of the airlock itself is to some extent adjustable. It is large enough for two people to work in it simultaneously. Of the personnel responsible for the operation of the airlock one is stationed outside the airlock to be able to transfer contaminated evidence via the flexible plastic sleeve attached to a feed through. The procedure is shown in FIG. 2, the plastic bag is then heat sealed by means of the heat sealing machine visible in the picture.



FIG. 2. Airlock with a plastic sleeve in which the contaminated evidence from the crime scene can be heat sealed by means of the heat sealing machine. The heat sealing machine is set up on wheels so it can be transferred to the glove box when necessary.

The second person assigned to the airlock is stationed within the airlock to assist personnel working in the crime scene. This consists of contamination measurements when exiting the crime scene and transferring the contaminated evidence into the flexible plastic sleeve. If contamination is detected the airlock operator will also assist in disposing of the contaminated pieces of protective clothing.

3.3. Glove box



FIG. 3. Glove box for the examination of contaminated evidence from the crime scene. The evidence gets introduced through the round opening visible at the front of the picture. A panel providing multiple connections for electronic equipment can be attached to the other side of the glove box in case a laptop or mobile phone need to be examined and data extracted.

Contaminated evidence that could provide vital clues need to be examined as soon as possible. Instead of transporting them to a laboratory with a hot cell, which could be hundreds of kilometers away, a first examination can be handled on-site with the help of a glove box, which can be seen in FIG. 3. Like the airlock, the glove box works in conjunction with a filter system and a vacuum pump to contain possible airborne radiation in case of damage to the glove box. The height of the actual working compartment is size adjustable to allow for comfortable working. While delicate operations are hampered by three layers of rubber gloves, it is still possible to flick through the pages of a diary for example. Electronic devices can be powered via an electric feed through and data can be extracted with the help of a USB connection.

4. Experience gathered by BfS

The periodical radiological crime scene exercises are of great importance. Only through constant training the responsible competent authorities can maintain the ability to deal with an eventual contaminated crime scene. The exercises provide valuable information, for example

in the area of necessary personnel and resources. Under ideal conditions, BfS alone will need approximately 30 people to be able to deal with all aspects of radiation protection. Should the investigation last longer than a day or two, which is a very likely scenario, then the number will most likely increase to about 50 or 60 people. Necessary equipment in form of protective clothes and masks needs to be stored to have it available at the crime scene. Since the roles and responsibilities are only on a limited basis pre-assigned to specific personnel, it is very important to have written procedures available for all personnel to be able to fall back on in case they need to take over a certain part they do not usually perform.

While the actual operations during a crime scene investigation seem to run smoothly, documentation of the measurement results frequently proves difficult. The reason for this is on the one hand, that there is a problem to communicate the information due to the fact that BfS personnel inside the crime scene uses radio communication to exchange information with the OSC as well as with the documentation officers. The communication often is hampered by wearing respirator masks, which has led to the use of neck microphones. But even then the main practical problem with the communication is that only a limited number of people can work at the same time within the crime scene as a change of personnel requires contamination measurements within the airlock which have to be documented via radio communication, making it difficult to maintain radio contact to another team on the inside. Especially in light of these problems, it is important to develop specialized measurement protocols for contamination measurements, dedicated to either personnel or objects. This makes the task of documenting found contamination much more efficient and reduces communication to a minimum.

Every exercise on such a large scale always provokes interest in the higher ranks. While it is important that we can accommodate visitors and demonstrate the level of competence with which police forces and BfS cooperate for such a large endeavor, one of the most important lessons learned through periodical crime scene management exercises is that visitors need to be kept away from the personnel during the exercise. Otherwise the interaction between visitors and trainees can seriously hamper the timeframe of the exercise as well as the concentration of the personnel. For this reason, BfS is monitoring the exercise with multiple cameras, broadcasting a live feed to a closed off area where visitors can observe the exercise and discuss any questions they might have with a dedicated BfS advisor (see FIG. 4).

Maybe the most important lesson learned from these periodical crime scene management exercises is that they are necessary for developing an appreciation of what ‘the other side’ has to offer. BfS is not a law enforcement agency like BKA and BPOL and tends to operate very differently to them. For example, scientists seem to have a very different approach to certain aspects of the operation due to their work experience – if a police officer says quickly, this usually means as fast as possible (meaning minutes at most), while to a scientist quickly can be a matter of hours or days until a result is satisfactory. Also, BfS personnel do not receive the level of drill that is required for a police operation, which can be frustrating for the police while not being a sign of unprofessionalism on behalf of the scientist. It took a while for the BfS scientists as well as the professional police officers to get to know each other and understand how they work. The exercises have achieved that both sides know what their counterpart is doing and that they can rely on each other. For this reason it is very important to maintain some experienced personnel who have been through this process and can help bridge the gap for new

recruits. This is especially the case on the police side of things, as they tend to change between different roles within the police force more often than BfS personnel.



FIG. 4. Observation area for visitors during a crime scene management exercise. Multiple cameras provide a live feed from the actual crime scene, allowing the trainees to exercise unhampered by visitors or supervisors while at the same time allowing for a detailed discussion afterwards.

5. Conclusion

In conclusion, maintaining an annual radiological crime scene investigation management exercise is the basis for BfS, BKA and BPOL to be well prepared in case of a radiological emergency. The roles and responsibilities have been defined by experience and personnel is being trained specifically for these tasks. The exercises are also the main tool to develop and optimize operational procedures.

References

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