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6th INTERNATIONAL SCIENTIFIC - PROFESSIONAL CONFERENCE

SECURITY AND CRISIS MANAGEMENT -THEORY AND PRACTICE

SAFETY FOR THE FUTURE 2020

PROCEEDINGS

BELGRADE 2020

FOREWORD

*A forum **Safety for the Future** arose out from the idea and the need to see security problems as a whole, and yet separately, through a prism of scientists and experts in order to bring science, company practice and economy together. The forum contains several important events: the International Scientific Conference "Security and Crisis Management-Theory and Practice", an exhibition of tools and equipment, demonstration exercises and a round table with various topics.*

This year, for the sixth time, we are realizing a conference, with new elements of researching security phenomena in the field of crisis management, but also in all related areas. The fact is that the environment in which individuals and legal entities exist is increasingly complex, and the range of phenomena that affect the security of an entity is becoming wider. It is consist of familiar and unfamiliar circumstances. Managing those circumstances is possible to a certain extent, if there is an optimal and necessary quantum of knowledge. Hence, the knowledge is foundation on which is necessary to build capabilities of individuals and legal entities in order to be able to recognize, prevent and react on threats.

Crisis management has become everyday need, essential for survival of an individual, companies or society as a whole. It is more and more difficult to assess the risk of events with negative effects at the very beginning of their occurrence, and coping with negative consequences leaves harder effects on society. Scientific research of security phenomena has become priority of society sustainable development. Scientific knowledge is necessary for systematic knowledge of phenomena in the environment, and practice for checking their usability.

Scientific findings do not always come to those who perform security tasks, such as individuals or legal entities. Therefore, there is a need for scientists and experts to meet and exchange ideas, opinions and knowledge. Materialization of knowledge is carried out daily in the process of modern business. Exposed to the impacts of a turbulent environment, and focused on sustainability, modern business requires permanent monitoring of changes and adaptation to these changes.

Comprehension of the environment in which the modern society exist, is possible if there is the necessary knowledge of the phenomena that characterize it. That knowledge provides an opportunity of preventive action through an efficient risk assessment system. Only knowledge, formed as a symbiosis of science and profession, has quality and strength, which guarantees the possibility of preventive action and an optimal level of readiness to react to negative events. The resistance of contemporary society to negative events depends on the degree of knowledge development.

*This year's conference is organized in specific conditions, without physical gathering. Having in mind the risk of infection due to the existence of the **COVID19** virus, the real danger of spreading the virus in the presence of a large number of people in the area, the organizers' assessment that the gathering is risky and in the application of all protection measures and the crisis team decided that the Forum is realized through the publication of a collection of papers and posting presentations of the author on the site www.bekmen.rs (presentations are posted at the request of the author).*

Proceedings from the 6th International Conference - Security and Crisis Management - Theory and Practice, presents a new value in the observation of a portfolio of security phenomena at the strategic, company, and individual level. The papers published in the proceedings are new findings and views of the author. A wide range of issues, confirms the assumption of the necessity of such a conference. The papers presented at the last five conferences have unambiguously demonstrated the need for regional cooperation and the harmonization of joint capacities.

The proceedings represent a review of existing knowledge, a source of new knowledge, assistance to researchers and practitioners in solving security problems, a support for those who practically deal with security and a source of initiative to improve existing knowledge in the field of security, management and engineering.

We hereby invite all interested scientists and professionals to improve the quality of future publications with their work.

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CBRN CRIME SCENE MANAGEMENT and INVESTIGATION

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Abstract: *Investigation of a CBRN incident has to be conducted in a systematic, objective, and timely manner in order to collect, preserve and analyse physical evidence from the associated site to be admissible in a criminal or civil proceeding, as well as in prosecution of acts of terrorism and war crimes. The inherently hazardous character of a crime scene involving CBRN agents adds complexity to investigative actions and requires additional expertise, equipment and conditions. The specific investigation strategies are necessary, together with the adapted CBRN detection equipment and forensics methods and procedures. This paper deals with the management of a CBRN crime scene and the specifics of investigation process, including interfaces between CBRN safety and security, and emergency response. The necessary framework, the conduct of operations, and an integrated command structure are outlined. The role of the technical support organisations with adequate CBRN expertises is emphasised.*

Keywords: *CBRN, investigation, management, crime scene, forensics.*

1. INTRODUCTION

The potential misuse of chemical, biological, radiological and nuclear (CBRN) material has been a major concern in the recent decades when homeland & international security was confronted by radicalisation and increasing sophistication of terrorism. The letter "e" is often added (CBRN-e) to indicate the potential presence of explosives in scenarios where these agents are dispersed by detonation. Although generally considered as low probability events they might however have a big impact on the citizens and the society. The scope and magnitude of detrimental consequences varies from one type of CBRN threat to another, and also depend on the particular scenario of release and/or dispersal [1].

A vast variety of CBRN security incidents is feasible, and might be deliberately committed by criminals, non-State armed groups, non-state actors who are state proxies, or States. They range from the intentional, unauthorized use and various criminal acts, to terrorist attack and armed conflict involving these materials, The aim of perpetrators is to inflict the direct physical damage (on humans, infrastructure, environment), create chaos and disruption, costs and economic losses, and deterioration of the social and governmental stability. Furthermore,

technological accidents and unintentional man-made errors at a location or facility where the materials are produced, used or stored, or natural disasters leading to damage of an industrial plant/ storage can also cause release of CBRN agents pending severe consequences that might have transnational impact.

Confirmation, or even suspicion of use of CBRN materials adds complexity to any international or domestic security incident /conflict. Existing international treaties and conventions prohibit use of chemical and biological agents that are weaponised and recognised as different categories of weapons of mass destruction (WMD). Under the *Biological & Toxin Weapons Convention* (1972) the use of biological agents and toxins as weapons is absolutely prohibited, while *Chemical Weapons Convention* prohibits the use of toxic chemicals as weapons. The Treaty on the *Non-proliferation of Nuclear Weapons* - NPT (1970) obliges State Parties not to manufacture or otherwise acquire nuclear weapons or other nuclear explosive devices, although their use is not explicitly forbidden so far. However, the *Geneva Protocol* (1925) and other international human rights laws are absolutely incompatible with the potential use of nuclear or radiological weapons, as well as any other WMDs. Many Member States of the UN have adopted laws which criminalize even intentional unauthorized acts involving nuclear or other radioactive material out of regulatory control, including illicit trafficking [2-4]. Moreover, there are international non-binding agreements for the multilateral export control of materials, components and equipment used in WMD programs. These items are detailed in specialised control lists for chemical, biological and nuclear control regimes that are developed and used by customs and other national agencies that are associated with enforcing or implementing export controls [5].

In the case of an event that might have involved CBRN the main concern is to protect the health of people potentially exposed and to assess possible violations of law, including international humanitarian law. In armed conflict allegations are often made that one or more of the conflict parties has used CBRN weapons. Such situations are extremely sensitive, since a reaction or even an absence of reaction may be interpreted as upholding or rejecting the allegations. Eventual confirmation of CBRN warfare acts might be used as justification to attack or engage in war on another country. Therefore it is very important to conduct a systematic, objective, professional and timely investigation with the aim to classify the nature of the incident, to determine how it happened, who did it and what the consequences are. This paper deals with the management of a CBRN crime scene and the process of investigation concerning security related actions at scene requisite for collecting and preserving evidence, while consequence management is beyond its scope.

2. INVESTIGATION of a CBRN INCIDENT

The adequate response to CBRN incidents requires integral, multidisciplinary approach and well-ordered interagency cooperation. The national CBRN response system is activated upon discovery of the incident or with recognition of the threat. Whether it is an instrument alarm or information on elevated or credible threat, an initial assessment has to be performed to identify credibility and severity of the problem, including the type & nature of a CBRN agent involved. Rapid detection and identification of a CBRN agent are of vital importance to enable timely and properly hazard assessment, improved decision making, better protection of public and first responders, and to enhance overall mitigation of the consequences. This was demonstrated in the Aum Shinrikyo attack in the Tokyo subway system, when the agent was misidentified initially, and about a 4 hour delay in the accurate identification of sarin resulted in a failure to protect medical and emergency response personnel, and to treat properly casualties in the hospitals [6]. In the scenario without any criminal intent, such was

the Goiania incident, the delay in radioactive material identification also caused the enormous radioactive contamination and the severe impact on health & the environment. Therefore, the safe approach in identifying a CBRN agent is to assume that initial information is not correct and has to be verified. When assessing the nature of the threat, technical feasibility & practicality of the device and dispersion method has to be considered, as well as behavioural resolve/ determination/ endurance of the perpetrator. Simultaneously with recognition of the threat, a criminal investigation commences, and appropriate procedures should be initiated if necessary to interrupt the potential illegitimated or criminal act that has CBRN security implications.

A site associated with each of the possible CBRN release scenarios, or alleged intentional unauthorized use (production, handling, concealing and storing) may contain trace physical evidence that need to be investigated, in an attempt to clarify the type of agent and the circumstances of its use. It is also necessary to determine, with certainty, the credibility of the allegation that a criminal or the intentional unauthorized act is committed. In the case of terrorist attack or armed conflict, possible violations of international law, including humanitarian law have to be uncovered. Reconstruction of the events that lead to technological accident is necessary to understand how it occurred or/and to reveal who is eventually responsible due to unintentional error. Therefore, it is very important to conduct investigation in a systematic, objective, professional and timely manner in order to develop investigative leads to prevent potential additional crimes, & to identify & prosecute those involved or suspected. The goal is to analyse and correctly interpret the evidence so that it is admissible in a criminal or civil proceeding, as well as in prosecution of acts of terrorism and war crimes.

The site associated with the CBRN event can be considered as a crime scene regardless the type of a scenario which happened and whether CBRN materials are confirmed, or only suspected, to be present. Accordingly, once the CBRN event is declared, scene control procedures should immediately be established by law enforcement and first responders. The management of a CBRN crime scene must be carried out carefully to ensure safe, secure, successful & well-organized operations, and to enable that relevant criminal investigative procedures are applied. Evidence recovery must be conducted under the authority/agency having jurisdiction, and actions carried out by the person responsible must be based on the scope of his/her position. Material collected must be properly, safely, and legally seized by applying approved procedures and techniques.

Routine investigative activities of a CBRN event are carried out by law enforcement agencies and extend beyond the CBRN crime scene itself. These activities include collecting/ gathering evidence (e.g. digital devices, such as computers, data storage devices, cell-phones, cameras…) that might help to identify the perpetrators, vehicles, tools and places they used during preparation for the act. Also, potential witnesses who may have seen happenings before, during or immediately after a CBRN incident are interviewed. Generally this type of investigation should be conducted close to, but outside, the CBRN crime scene.

The actions requisite at scene in order to collect and preserve evidence are challenging due to the fact that both evidence and the area/environment might be contaminated by hazardous substances. Additional challenge is to preserve physical integrity and potential evidentiary value of trace evidences because of their transient and fragile character. Therefore, the specific investigation strategies, the scientific knowledge and technical resources are needed in various phases of investigation of a CBRN event: to initially detect and characterize a CBRN agent, to ensure safe operations and evidence collection at the scene, and to enable forensic investigation of the evidence. The expertise might help investigators to formulate

questions for potential witnesses and understand the relevance of the responses that are obtained. The interrogation could be facilitated by showing images of the warning symbols for CBRN hazards, typical detectors, or transport & storage containers that were previously prepared. The example of good practice in developing professional guidance for integrated approach in responding and investigating a CBRN incident is the case of the nuclear/radiological incident [4,7-9].

2.1. Forensic examination

Analysis and interpretation of physical evidence collected from the incident site has to determine relevance to methods, tools, people and intentions linked to the CBRN incident. Forensic examination and science have become a central part of the criminal investigation process & in securing court convictions. There are problems specific to conducting forensic analysis in a CBRN incident: evidence has to be analysed either at a crime scene contaminated with CBRN agents, sent to laboratory equipped to handle contaminated evidence, or decontaminated and sent to a conventional forensic laboratory. Decontamination of evidence may diminish its forensic value, but on the other side, very few laboratories are equipped to handle CBRN materials. Moreover information from the CBRN agent may, itself, represent the crucial element of the investigation. The procedures and processes used in handling CBRN contaminated evidence need to be cautiously developed and implemented. Therefore, the specific investigation strategies for this type of incidents are necessary, together with the deployable CBRN detection equipment and adapted forensics methods and procedures.

3. FRAMEWORK for a CBRN INVESTIGATION and CRIME SCENE MANAGEMENT

The most appropriate approach for responding to a CBRN incident is the "All Hazards Response" that integrates diverse types and modes of response, at the different levels. In order to effectively manage a CBRN incident a complex national response system has to be in place, and should be documented in an integrated CBRN national action plan (iCBRN NAP). A national framework for managing CBRN incidents should allow for, and be coordinated with the national emergency system for natural and technological disasters.

Management of a CBRN crime scene is multifaceted, requires multidisciplinary capabilities and involves multiple competent authorities at different jurisdiction levels. An international element may also be included if the consequences of the incident are trans-boundary, and/or State has obligations under relevant international treaties and agreements. All the participants in the response have to be adequately organized into a comprehensive hierarchy and coordinated within a framework which enables that the effective management of the CBRN incident is implemented at each level. This poses a challenge for command, control, coordination and communications that have to ensure appropriate and timely decision-making: operational, tactical, and strategic. Enabling structures are commonly created through centralised configuration, where command, control, coordination and information management are integrated in the Incident Command System (ICS). The ICS is usually organized on 3 levels: (1) National, (2) Local and (3) Operational command level. This framework can have an additional level in states with the federal governmental system, when the federal agency may take the lead.

The configuration of the Incident Command system, roles and responsibilities assigned to each level of command and decision making process should be established in the iCBRN NAP. Definition of roles and responsibilities has to be clear and understood by all participants, as well as decision making process. The secured communication lines have to

ensure internal exchange of information and update on developments for all collaborators in response, while public communication provide information and notifications for the general population. Information management is vital for the timely and effective management, coordination, and dissemination of all pertinent /relevant data and information between all the players. It is also crucial for resource coordination and confirmation of emergency orders.

3.1 Strategic level of the ICS

Strategic decision making is responsibility of the national command (NC) where senior officials from governmental departments, agencies and services related to emergency response are usually appointed, as well as representatives of support organizations. The national command provides strategy and the incident priorities, as well as political and regulatory guidance for management of a CBRN event in line with the **iCBRN NAP**. Accordingly, the NC gives course to the local command level (LC).

The NC ensures implementation of best available strategic goals and tactical objectives, and also acquires logistics, human, technical and financial resources needed to implement them. When magnitude and type of incident excides anticipated level of resource involvement and LC declares a need for back up of operations, the NC may request and coordinate international cooperation and assistance, as well as the military support. The NC also establishes a mode of regular communications with lower command levels, and updates the government on the situation at the CBRN incident site and the related effects on the public and infrastructure.

3.2 Tactical level of the ICS

The Emergency Operations Centre (EOC) represents the local command level which is in charge for tactical decision making. The EOC implements strategic objectives for a CBRN incident crime scene management selected by the national command, and prepare tactical instructions for operational level. Prior to acting on them, the local incident commander should ensure that both personnel and technical resources are in place, and if not, additional support from the national command should be required. Rapidly changing incident conditions may require using multiple tactics simultaneously. The EOC sustains its situational awareness relaying on a flow of information from the incident site and the collective awareness of the local command staff is only as sound as the reliability and proficiency of information & data inputs they receive. Further, the EOC sets up a protocol for informing the NC on the regular basis about the developments regarding the CBRN incident and the impact it made on the population and local infrastructure. The EOC also manages information released to general public on the basis of information obtained from on-scene level and public communication directions received from the national command.

3.3 Operational level of the ICS

The operational command (OC) has to be robust, direct and visible to manage actions on-scene safely and effectively, and in compliance with orders received from EOC. Following these directions the operational command has to establish a framework that clearly outlines the objectives & functions of the operations. The OC has to ensure that during operations at a CBRN crime scene all responding personnel are protected from hazardous materials in line with health and safety measures prescribed for a particular CBRN material. In that regard the safety of the public on the scene has to be ensured as well. The OC assesses availability of resources that are necessary for operations, and reports to local command if additional support is needed. That includes the availability of staff which is remote from the CBRN scene itself but supports on-site activities. Developments and/or uncontrolled occurrences at a CBRN incident scene may also demand for specialized equipment such as mobile

laboratory or decontamination unit. The operational command informs the EOC on the regular basis about the developments at the CBRN incident site and alerts if new findings are relevant for the law enforcement investigation emerge. Since multiple agencies would operate at a CBRN crime scene, flexibility in commanding can be exercised in order to enhance interoperability. The practice in which command is established by the agency doing the most work at the time has proved to be efficient, as well as the command transfer as work tasks change.

3.4 Technical and scientific support organizations

Response to, and investigation of a CBRN incident is complicated by the intrinsic differences between chemical, biological, radiological and nuclear materials, and it is unrealistic to expect that any field responder, member of the EOC staff or incident commander could be an expert in all elements of CBRN response. Assembling diverse expertise and skills, selecting and deploying equipment, and developing procedures sufficiently general to be practicable are extremely challenging tasks. Therefore, external assistance could be necessary in various problematical /challenging circumstances that may occur at an incident scene, such as:

- Interpretation and understanding of unclear, perplexing uncertain readings obtained by field detection & identification techniques;
- Necessity for additional laboratory analysis to confirm presence of a particular CBRN agent;
- Complex or confusing situation on-scene that requires analysis and clarification;
- Explanation of data (e.g. chemical or isotope composition) and symbols from packages, containers or shipping documents;
- Diagnosis of casualties with unusual symptoms that may indicate the presence of a particular CBRN agent.

Additionally, certified laboratories are needed to carry out:

- Forensic analysis of recovered CBRN material (e.g. nuclear forensic analysis) that must be scientifically and legally defensible in criminal prosecution or other national security response,
- Forensic analysis of conventional evidence that is contaminated by hazardous substances,
- Testifying in court about laboratory findings and defending procedures against cross-examination.

Hence, technical, scientific, and/or operational knowledge and expertise are indispensable in order to improve basis for decision making and problem solving on all levels of the Incident Command system, to enhance investigations and to support on-scene operations. The so-called "reach-back" schemes /capabilities can be provided to emergency responders by assembling a pool of multidisciplinary expertise and technical resources and making them available during a CBRN incident. It is also necessary to identify laboratories which are adequately equipped with instrumentation and trained personnel, and licensed to perform analysis of materials containing CBRN agents. Technical and scientific support organizations (TSO) capable to provide described assistance are gaining increased importance in response [1]. TSOs can be government agencies, universities, scientific organizations, industries or private companies (e.g. equipment manufacturers).

4. CBRN CRIME SCENE MANAGEMENT

The scope (size of the area) and the complexity of a CBRN crime scene can vary significantly (depending on the type, size and magnitude of an incident), including the

possibility that multiple crime scenes might be linked to the event. Additional complication could be a combination of two CBRN agents that are present at the same scene, although the probability for such a scenario is considered to be very low.

The management of operations at a CBRN crime scene can generally be treated as an extension of operations management at a conventional crime scene. That includes security related actions such as collecting and analysing physical evidence and witness accounts, recovering material, disabling an explosive device, or pursuing perpetrators. However, the inherently hazardous character of a crime scene involving CBRN agents adds complexity to investigative actions and requires additional expertise, equipment and conditions. Interfaces between safety and security associated with the presence of a CBRN agent on one side, and emergency response on the other should be carefully considered, and related actions applied simultaneously and in a synchronized manner at a crime scene. The aim is to conduct operations in a mode that sustains integrity of the criminal investigation, but sets the protection of the safety and security of responders, and the general public, to be the ultimate priority.

The main difference between the conduct of operations at a CBRN and a conventional crime scene is in issues associated with the contaminated environment and evidence. At a CBRN scene it is necessary to deal with the following concerns:

- **Contamination control** and **minimisation**

Measures to control spread of contamination and to minimize the dispersal (or further dispersal) of a CBRN material at the scene have to be applied. Such measures include:

- Establishing the hazard control zones (usually called Hot, Warm & Cold zones) to manage access into, within and out of a CBRN crime scene;
- Establishing access control with contamination control spots where;
- Monitoring of personnel, equipment, evidence and other items entering and exiting hazard control zones is carried out ;
- Air monitoring as an essential tool for risk identification.

- **Decontamination**

Decontamination of **personnel, equipment** and other items exiting hazard control zones is performed at decontamination stations. Evidence might be decontaminated as well providing that evidentiary value will not be diminished. Decontamination methods and requirements depend on the type of a CBRN material present, so the extent to which decontamination is applied and the manner in which it is administer vary for toxic chemicals, radioactive material, pathogens or/and bio-toxins.

- **Control of individual exposure of personnel**

Since the health and safety of the operational personnel are of primary concern, individual exposure to radiation or/and chemical toxicity has to be monitored and reduced to the extent reasonably achievable. That can be accomplished by controlling the time which operational personal spend in the hazard control zones and limiting it. Consequently, the risk from overexposure (to radiation or/and the chemical toxicity) or accidental exposure (to pathogens or toxic chemicals) is reduced. Additionally, at crime scenes where nuclear or other radioactive material is present a distance has to be ensured, and/or shielding set up if required, between the evidence contaminated with a CBRN agent and the individual collecting it.

- **Robust** and **rapid analytical methods** and **instrumentation**

A range of advanced **methods** and instrumentation is necessary to support investigation, starting from detection and identification of CBRN agents at the crime scene, methods for traditional forensic analysis modified for dealing with contaminated evidence, to complex laboratory methods for profiling CBRN agents such are methods used in nuclear forensics.

- The **scientific knowledge** and technical resources are needed to support thorough investigation of a CBRN event.

Operations at a CBRN crime scene start the same as at other crime scenes - with the establishment of scene control and performing risk assessment of common hazards. At a CBRN scene, rapid detection and identification of a CBRN agent are essential as well as revealing mode/pathways of its dispersion. After assessing the hazards present and evaluating the level of risk, hazard control zones have to be established and the Safety plan and an Incident Action Plan (IAP) developed to meet the tactical objectives. Handling of evidence should be defined in an Evidence management plan. Personal protective equipment (PPE) is selected based on the anticipated or known hazards, using a risk based graded approach. Operations at a CBRN scene must be based upon a structured and standardized system of protocols and procedures.

5. CONCLUSION

The objective of a CBRN incident investigation is to collect and correctly interpret the evidence from the associated site providing a high-degree of assurance that the evidence is scientifically and legally defensible in the court of law. The management of a CBRN crime scene must be carried out carefully to ensure safe, secure, successful and well-organized operations, and to enable that relevant criminal investigative procedures are applied. Collecting and preserving evidence at a CBRN scene are challenging due to the fact that both evidence and the area/environment might be contaminated by hazardous substances. Additional challenge is to preserve physical integrity and potential evidentiary value of trace evidences because of their transient and fragile character. Forensic examination is complicated by the facts that decontamination of evidence may diminish its forensic value, and that very few laboratories are equipped to handle CBRN materials. Moreover, information from the CBRN agent itself may represent the crucial element of the investigation. The specific investigation strategies for this type of incidents are necessary, together with the deployable and rapid CBRN detection equipment, and adapted forensics methods and procedures.

Operations at a CBRN scene have to be conducted in a mode that sustains integrity of the criminal investigation, but sets the protection of the safety and security of responders, and the general public, to be the ultimate priority. Measures for contamination control and minimisation of the dispersal (or further dispersal) of a CBRN material have to be implemented at a scene. Decontamination stations need to be established for decontamination of personnel, equipment and other items exiting hazard control zones. Individual exposure of personnel to radiation or/and chemical toxicity has to be monitored and reduced to the extent reasonably achievable.

Management of a CBRN crime scene is multifaceted, requires multidisciplinary capabilities and involves multiple competent authorities at different jurisdiction levels, possibly including an international element, if the consequences of the incident are transboundary. This poses a challenge for ensuring appropriate and timely decision-making: operational, tactical, and strategic. Enabling structures are commonly established through the centralised configuration, where command, control, coordination & information management are

integrated in the Incident Command System (ICS), usually organized on national, local and operational command levels. Since expertise and technical resources needed for thorough investigation of a CBRN event are extensive and multidisciplinary, and beyond that possessed by most law enforcement agencies, an external assistance to ICS has to be provided by technical and scientific support organizations.

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