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Forensic aspects of crime scene investigation using CBRN agents

Kryminalistyczne aspekty dochodzenia w miejscu zbrodni z wykorzystaniem środków CBRN

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Abstrakt: Liczba przestępstw i aktów terroru popełnianych z użyciem środków CBRN systematycznie wzrasta. Czynności dochodzeniowe, w tym dochodzenie na miejscu zdarzenia, są coraz większym wyzwaniem i wiele krajów musi zoptymalizować swoje procedury. Ważną rolą organów ścigania jest skuteczne identyfikowanie stosowanych środków CBRN i gromadzenie dowodów. Procedura dochodzenia na miejscu zdarzenia musi zatem spełniać wysokie standardy w zakresie zapewnienia bezpieczeństwa organów śledczych oraz gromadzenia i przechowywania dowodów. Taki proces wymaga udziału nie tylko kompetentnych i wykwalifikowanych ekspertów, ale także wykorzystania najnowszych rozwiązań technicznych. W Polsce prowadzenie czynności kryminalistycznych na miejscu zdarzenia, w którym zastosowano środki CBRN, opiera się z jednej strony na klasycznych metodach i technikach kryminalistyki a z drugiej na wykorzystaniu do tych prac specjalnych urządzeń. Są niewątpliwie cennym rozwiązaniem i pozwalają na szybsze i dokładniejsze wykonanie określonych testów. Artykuł zawiera przegląd literatury dotyczącej najważniejszych zagadnień związanych z prowadzeniem działań na miejscu zdarzenia z udziałem czynników chemicznych, radiologicznych i biologicznych, znanych jako CBRN. Opisano podstawowe atrybuty miejsca zdarzenia CBRN, przedstawiono procedury dochodzeniowe oraz omówiono niektóre metody postępowania umożliwiające wykorzystanie nowych technologii. Artykuł został podzielony na cztery części – pierwsza omawia najważniejsze aspekty badania miejsca zdarzenia, druga – czynności prowadzone w miejscu użycia środków CBRN, trzecia – nowoczesne metody badania miejsc zdarzenia z wykorzystaniem tych agentów, a czwarta zawiera podsumowanie.

Słowa kluczowe: CBRN, chemiczne, biologiczne, radiologiczne, jądrowe, kryminalistyka

Abstract: The number of crimes and acts of terror committed with the use of chemical, biological, radiological and nuclear (CBRN) agents is steadily increasing. Investigative activities, including examination of the scene of an incident, is an increasingly serious challenge and many countries need to optimize their procedures. An important role for law enforcement agencies is to effectively identify the CBRN measures used and collect evidence. The on-scene investigation procedure must therefore meet high standards in terms of ensuring safety of the investigative teams, as well as gathering and preservation of evidence. Such a process requires participation of not only competent and qualified experts, but also using the latest technical solutions. In Poland, conducting forensic activities at the scene of an incident, where CBRN means were used, is based – on the one hand – on classical methods and techniques of forensics, and – on the other hand – on applying special devices designed for these works. Undoubtedly, they provide a valuable solution and enable faster and more accurate performance of specific tests. The present work offers a literature review, discussing the most important issues related to conducting activities at the site of an incident, involving chemical, radiological and biological agents. The author describes the basic attributes of a CBRN incident site, outlines investigative procedures, and discusses some of the methods of conduct that enable the use of new technologies. The work is divided into four parts: the first discusses the most important aspects of investigating the scene of an incident, the second – activities carried out at the site of use of CBRN agents, the third – modern methods of investigating the sites of incidents using these agents, and the fourth provides a summary.

Keywords: CBRN, chemical, biological, radiological, nuclear, forensic examination

1. Introduction

Deliberate use of chemical and biological material to harm humans, animals or natural environment is a serious challenge to investigative bodies and other entities involved in the protection of human life, health and safety. In recent decades, mankind has experienced devastating effects of accidental or deliberate releases of toxic chemicals, whether biological or radioactive. This type of humanitarian catastrophe was caused not only by accidental industrial failures or human negligence, but also by premeditated criminal and terrorist activities. In consequence, the release of toxic agents took the lives of millions of people and has manifested itself for many years in incurable diseases resulting from exposure to the toxic effects of CBRN agents. At the same time, they paralyzed the services responsible for health protection, limited trade, transport and tourism, and the entire world economy.

Chemicals and biologicals have often been used methodically and purposefully to harm people and the environment. Perpetrators of this type of crime were natural persons, organized groups and even state entities. The perpetrators of such attacks had various motives, most often political, religious, cultural, social or economic. The knowledge and technology of the perpetrator determine the success of this type of crime. Unfortunately, the dynamic development of

technology, in addition to the measurable amenities it offers, has significantly contributed to building a threat to the local and global population.

As there is still no uniform or binding definition of CBRN crimes and incidents in the context of criminal law, instead of citing them, it is worth giving examples and recalling some of the most spectacular crimes committed with the use of chemical, biological, radiological and nuclear agents. There have been recorded many such events. According to a 2001 study conducted by the National Defense University, there were 180 cases in the 20th century related to the illegal use of biological weapons alone. Of this number, only 21 cases concerned actual use, while the vast majority of incidents consisted only in threats (Carus 2001: 8).

Analyzing only the past 50 years, the first example of an incident involving CBRN was an attempt to deliberately poison the inhabitants of the town of The Dalles in the United States in 1984 by members of the Neo-Sannyas sect. The attack was aimed at taking over local power in consequence of changing the result of the local elections. The perpetrators hoped that the poisoned inhabitants of the region would not take part in the elections. They chose eating places as the target of the attack. As a result, 751 people were poisoned. The disease resulting from the attack was treated as collective food poisoning due to natural causes, and it was only a year later that it was proven to be related to the activities of the Neo-Sannyas sect (Kastner 2011: 69).

Also in the 1980s, an attack was made in Damascus with the use of an agent paralyzing the nervous system. A similar attack took place in Syria in the city of Khan Shaykhun. According to the Syrian Human Rights Observatory, 72 people, including 20 children, were killed in the chemical attack on Khan Shaykhun. About 200 people were injured. The Syrian government denied that its forces had carried out the attack. The West, however, accused Damascus, while Russians allied with the Syrian government claimed that the death toll was the result of an attack by the Syrian air force on the rebels' weapons depot which produced chemical weapons.

In March 1988, the whole world was appalled by the deliberate use of mustard gas on civilians in northern Iraq. It was a chemical attack on the Kurdish city of Halabja carried out by Iraqi troops. The Iraqi air force, by order of Saddam Hussein, dropped chemical bombs on the city. A mixture of sarin, tabun and mustard gas then killed 5,000 people and crippled several thousand defenseless civilians for life.

Another spectacular event was the use of sarin in the Tokyo metro by the Japanese religious sect Aum Shinrikyo in 1995. As a result of the attack, 12 people died and almost 6,000 sustained serious injuries that the victims of the attack felt for many years. In 2013-2017, mankind again experienced deliberate

abuse of chemical weapons in Iraq and Syria, and in 2017 there was recorded a deliberate use of toxic chemicals at Kuala Lumpur Airport.

Another example of a CBRN attack was the intentional distribution of correspondence in the United States containing the anthrax bacterium in 2001. The well-known attempts by the Russian government on the lives of political opponents echoed loudly, as well. It was the use of polonium-210 in the 2006 attack on Litvinenko's life, the use of Novichok in the 2018 attack on Skripal, or the recent attempt on the life of Alexei Navalny. These events attracted the attention of the whole world particularly because of the deadly effectiveness of hazardous substances.

Still other cases that have attracted public attention include attacks by letters sent to public authorities in Slovakia containing americium-241 (2016). Two years later, there was a mustard attack on the Tbilisi airport (2018) and attacks with dimethylmercury and abrin in the Czech Republic (2018). During the same period, there were also several terrorist attacks, such as the one involving hydrogen sulfide in Australia in 2017. At the same time, toxic use of ricin was reported in several European countries. In 2019, there were terrorist conspiracies in Indonesia, involving the use of abrin.

The recent 2019 COVID-19 pandemic is another example of a rapidly spreading biological agent that threatens the health and lives of huge human populations. All these cases constitute a particular challenge not only for medical services, but also for law enforcement agencies and services responsible for security, especially in the field of collecting evidence and perfect cooperation and coordination of activities at the crime scene (Kolencik 2021: 54).

The cases described above confirm the need to increase awareness and skills related to professional investigation of the scene, effective investigation and prosecution of perpetrators responsible for creating a chemical, biological or radioactive hazard. These incidents prove the necessity of developing and implementing effective cooperation of many authorities and entities responsible for public safety (Holie 2020: 504). An example of such cooperation is a specialized unit established by the World Health Organization, which is called the Biorisks and Health Security Protection Unit, responsible for proper interaction between the health sector and services responsible, as part of its statutory activities, for security in the event of a threat or use of CBRN. Coordination and cooperation between individual actors is essential for the effective investigation and prosecution of crimes caused with use of chemical, biological, radiological and nuclear weapons.

One of the main dangers of a deliberate use of chemical and biological agents is the ease of obtaining materials and equipment required to manufacture, transport, store, and distribute CBRN weapons. Many of these substances and

materials can be dual-use and can easily be purchased from legal industries such as chemical manufacturing plants, breweries, drug factories and fertilizer production plants. They are actors linked to thousands of legal supply chains, also with access to a wide range of dual-use equipment. Dual-use equipment and devices are defined as materials and devices used for lawful purposes which may also be used illegally. This spectrum covers a wide variety of devices and technologies designed for civilian use, but with the possibility of their application for military or terrorist purposes related to the production of weapons of mass destruction (Forge 2009: 112). By way of example, the same biological agents and equipment used in the production of antibiotics and vaccines can be used to develop, produce and transmit biological pathogens. Regarding chemicals, the same chemical used in the production of pesticides can be used for criminal and terrorist purposes as a raw material or a precursor to the production of a potential nerve-paralyzing agent.

The difficulty in restricting access to certain equipment and chemicals is that many of them can be easily obtained from legal sources, including pharmacies, fertilizer stores or chemical wholesalers. It should be emphasized here that, in addition to the dual-use industries, there are also research institutes, universities and research centers that conduct research using high-risk chemical and biological agents. Such research provides not only insight into the characteristics and properties of these materials, but also relatively easy access to them.

Fortunately, identification, investigation and prosecution of incidents of deliberate use of CBRN agents are relatively rare compared to other serious crimes. However, it is important to be aware that the increasing ease of acquiring or producing these hazardous materials pose an increasing threat on a massive scale. On the other hand, the lack of knowledge and experience in the discussed area has in many cases led to the loss of key evidence required to successfully identify and prosecute the perpetrator of the crime. It is therefore worth analyzing the forensic aspects of investigating the scene with the use of CBRN and the latest stack solutions used in the field.

2. Basic aspects of investigating the scene of an incident in legal terms

Investigating the scene of an incident plays a most important role in forensics – this place is a specific closed or open space in which a given event took place. From the point of view of forensics, the event having occurred at this site becomes the subject of criminal proceedings together with all the things deployed in this space (Metodyka oględzin…: 18-19) .

It should be added that there may be various types of threats at the site of a given event. When dealing with terrorist activities or catastrophes, there may even be biological, chemical, detonation and even radioactive contamination, known as CBRN threats (Zespół CLKP: 49). It should be borne in mind that if we are dealing with such conditions, then the investigation of the scene and activities related to securing the traces created on the spot will not be possible until the threats are eliminated. This, in turn, significantly reduces the possibility of using material sources of evidence in ongoing proceedings (Zespół CLKP: 49).

Among the most important activities carried out on the scene of a given incident there is the appropriate protection of the place where it occurred. One of the vital tasks is the assessment of its size as only on the basis of these activities is it possible to determine the personnel needs as well as the strength and resources that will be necessary to conduct the inspection of the scene. In the event that the needs are disproportionate to the resources at the disposal of on-site investigative officers, support from other entities must be mobilized. At the same time, the activities related to securing the place of the event are attended by the head of the command point, the coordinator of the teams conducting the inspection, persons responsible for keeping the point of storing human corpses and remains, and for running the point of storing objects and traces (Metodyka… 2019: 18).

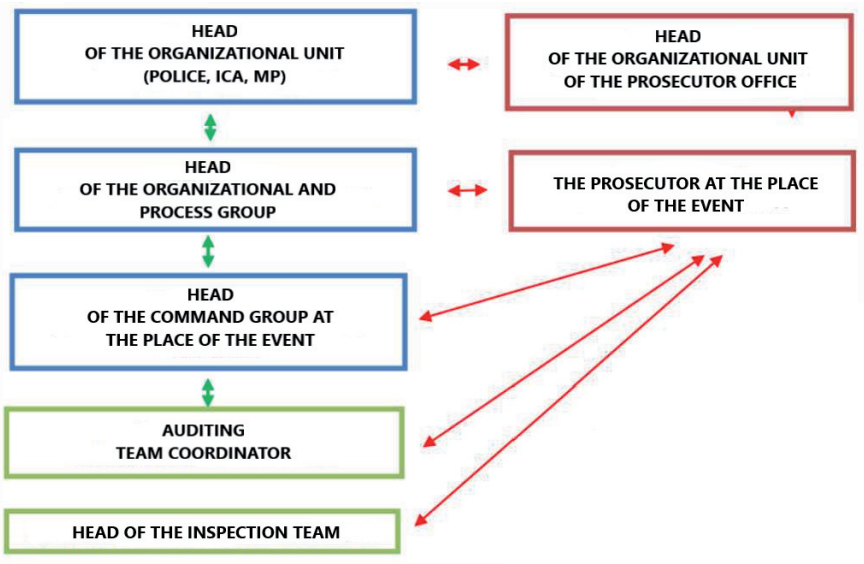

Fig. 1. Exchange of information on the scene
Source: *Metodyka oględzin miejsc przestępstw o charakterze terrorystycznym i katastrof*, Warszawa 2019, p. 15.

During the work on the scene, an important role is played by the efficient flow of information and its exchange between individual officers responsible for carrying out specific tasks (Figure 1). Therefore, it is important to respect the instructions, recommendations and guidelines on how to secure the scene. This translates into efficient performance of activities and determines their quick implementation without the need to repeat activities (Falenta 2020: 47-51).

As part of forensic examinations of the place of a specific event, a whole complex of forensic activities is performed, consisting of:

a) procedural activities;

b) securing the scene of the event;

c) penetrating the surrounding area;

d) conducting an examination of the proper place, people, things and the corpse;

e) conducting a trial experiment;

f) inference;

g) constructing a version of an event based on traces, collected information and data;

h) operational activities, which include:

- observations,
- confidential sources of information,
- questioning;

i) local vision (Falenta 2020: 52).

An on-scene inspection is the performance of forensic and trial activities, which rely on precise, strict, purposeful and planned observation. At the same time, perceptiveness plays a very important role during the inspection, which is closely related to the human sense. On the other hand, the available means and technical methods are used. The actual basis for the inspection is notification of the event pursuant to Art. 304 of the Code of Criminal Procedure. As part of the inspection, tactical and technical-forensic activities are carried out in order to get acquainted with the course of a given event. They are conducted in a planned manner and take into account the characteristics of a given area. It is also important to classify various groups of traces of crime, their carriers, things, their location, properties, condition and individual characteristics (Banakh, Różański, Koval [red.] 2019: 343-347).

3. Activities of investigating the scene of the incident where CBRN agents were used

It should be noted that the term "CBRN event" includes the unauthorized possession, use or any form of handling of chemical, biological or nuclear

material that presents a safety risk as well as an out-of-control release of these substances and materials (Burczaniuk [red.] 2017: 267). Both when planning and conducting operations, it is imperative that the operational commander or the combined force commander conducts a CBRN threat assessment as well as adjusts the scope of security activities to the level of threat at hand. The use of both resources and opportunities is associated with mobility, flexibility and efficient deployment of forces and resources. The most important thing, however, is proper management of CBRN information (Harmata, Witczak 2018: 267). It consists of collecting, processing, storing and disseminating information, which is done in order to:

– prepare a CBRN threat assessment;
– plan the distribution of elements of the Contamination Detection System;
– alert about contamination;
– report on CBRN incidents;
– make risk prediction, warning and notification;
– prepare contamination assessment;
– secure risk management (Harmata, Witczak 2018: 267).

When conducting on-scene investigations with the use of CBRN agents, the principle is that as many traces of materials and samples as possible should be collected. It is also necessary to select an appropriate method of securing the evidence as well as transfer the collected and secured evidence to specific services responsible for procedural activities at the scene of the event. The CBRN expert and the task force play a central role in these activities.

The most important tasks of the expert are:

– preparation of the CBRN incident site for safe sampling;
– determination of the degree of risk;
– selection of personal protective equipment appropriate to the situation;
– selection of a specific decontamination method as well as decontamination;
– gathering of evidence;
– taking part in identifying the CBRN measures used (Zdrojewski, Krzyżanska, Wlizło-Skowronek 2013: 22).

The task force consists of two sample takers, i.e. experts in forensic securing of evidence, a person documenting the scene as well as an expert in CBRN and explosives (Krzyżańska, Zdrojewski, Skowron 2013: 21). The task force team are obliged to:

– guarantee safety at the scene of the accident;
– disclose, collect, preserve and package the evidence;
– conduct the analysis of evidence;

– conduct classic criminal analyses at the scene;
– prepare detailed documentation;
– draw up a sketch of the place of the event;
– secure fingerprint traces, traces and biological material belonging to perpetrators of the crime (Krzyżańska, Zdrojewski, Skowron 2013: 23).

As part of the forensic examinations of the scene of an incident, where CBRN agents have been used, the following activities are undertaken:

– determining the protection of the area around the scene of the incident within a radius of at least twice as large as the furthest revealed trace of the explosion or from the fragments of the explosive device;
– carrying out a secondary risk assessment, taking into account the possible presence of other explosive devices;
– assessment of the risk related to the possibility of using CBRN materials (chemical, biological, radioactive and nuclear) in the explosive device;
– revealing as well as securing as many objects and traces as possible, which will ensure the most complete reconstruction of a given explosive device, determining its location at the scene of the event and the likely method of causing an explosion;
– if high-powered explosive devices were used at the CBRN scene, then the individual characteristics of the means of transport used for their transfer should be established;
– analysis of which changes were caused by the explosion and which were caused by its perpetrators;
– determination of the area in which the specific event began (Metodyka... 2019: 41-42).

When conducting on-scene forensic examinations using CBRN agents, it is imperative to rely on:

– information from police officers, fire brigade officers, paramedics and soldiers, personnel specializing in engineering, mining and pyrotechnics;
– own findings and observations;
– testimony of witnesses and victims;
– inferences adopted on the basis of the overall picture and the location of traces resulting from the event;
– taking into account the fact that the traces of the incident and the casing of the explosive device and its structural elements may also appear in the ground on which the explosion took place as well as in the surrounding area and on the ground surface covered by the projection radius;
– locating objects and traces related to the event and determining its place on the basis of specific features (Metodyka... 2019: 41-42).

At the scene of a CBRN incident, the main category of evidence is from contact with an explosive device in the blasting zone. It should be added that the traces left in this area are exposed to various side effects of the shock wave. The direct impact of detonation products will destroy objects through high pressure and temperature. In this type of situation, we deal with burns, deformations, large fragmentation and tearing of individual fragments (Młynarczyk 2020: 175-180).

The category that requires securing evidence materials as part of forensic examinations at the scene with the use of CBRN measures are activities undertaken in the zone of impact of the explosion. Items from an area slightly away from the epicenter of the event, which were covered by an influential shock wave spreading with the products of the explosion, should be duly secured. At the same time, their lower density affects proportionally the reduction of the pressure and temperature, which later shows less damage to the elements of the environment. It is worth adding here that they are not burnt or significantly torn and chipped, they have black marks and cracks as traces of solid explosion products (Metodyka... 2019: 43).

The traces that can be collected will also come from those sectors in which the objects revealed during the inspection of the site of the incident have cracked and broken, or – in the case of sheets and plastics – bent and various deformations. It should be added that the epicenter of explosion of some material or an explosive device at the scene with the use of CBRN agents is often a post-explosion funnel defined in forensic technology as the so-called place zero, where usually the highest level of damage occurs and the number of traces is the largest. In order to facilitate the concentration of visual inspection activities, the funnel together with the adjacent area should constitute a separate sector of their conduct. Its size depends on the amount of explosive used. You should also measure the diameter and depth of the funnel and protect the samples from its crown, walls and bottom of the funnel against the layers below the observed bottom from a depth of about 5-10 cm and in the walls of the fun-

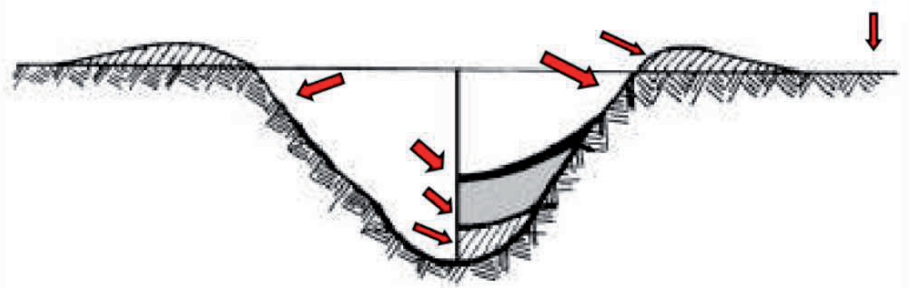

Fig. 2. Sampling from the on-site hopper using CBRN means
Source: *Metodyka oględzin…*, p. 43.

nel with a depth of about 1-20 cm. Usually, 2-3 samples are taken from each place, while the size of one cannot be smaller than 100-200 g. However, these are exemplary values, which in practice depend on the amount of explosives used or the type of soil (Metodyka... 2019: 43).

Control material should be taken during hopper sampling tests. These are ground samples from places beyond the impact range of the explosive charge. In this situation, it is also necessary to prepare a cross-section of the funnel and to search it with a strong magnet. Subsequently, the material is transferred from the funnel, because it is precisely these activities that can largely contribute to finding fragments of the structure, housing, power source or other elements of the explosive device at the scene. Also, screening should be made in all surrounding sectors within the range depending on the amount of explosive used and the type of load (Metodyka... 2019: 44).

4. Modern methods of investigating event sites with the use of CBRN means

Forensic investigation of the scene with the use of CBRN means is not only human work within the framework of dedicated teams. At the same time, in recent years, advanced technologies have been helpful here, thus supporting the work of specialists. Such a demand has been made many times and for many years efforts have been made to create devices supporting human work at the scene of incidents with the use of CBRN means (Harmata, Witczak 2018: 27).

The solutions included building a remotely controlled robot to carry out tasks related to the verification of threats as well as securing the widest possible spectrum of forensic traces in the event of CBRN threats. Such a device was to be adapted to work in various terrain and weather conditions. At the same time, the robot prepared under the projects to be launched was to be capable of conducting visual, chemical, radiological and biological reconnaissance. Its tasks were also to include detection and protection of forensic traces with the appropriate mobile platform used for this, its own control system and drive. It was to enable its autonomous functioning in various terrain conditions. It should be added that its modular structure was to guarantee the use of appropriate tools in the configuration depending on the needs of the investigation of the scene (Harmata, Witczak 2018: 27).

An analog RMI robot was used in forensic investigations at the scene of the incident with the use of CBRN agents. Over twenty years of experience, research, tests and improvement of design solutions have resulted in the creation of the PIAP Patrol device, which replaced it. It is a digital device equipped

Photo 1. Modern Piap Patrol robot used to detect CBRN threats
Source: *Nowy robot mobilny PIAP PATROL®*, https://piap.pl/2020/05/19/nowy-robot-mobilny-piap-patrol/ (accsess: 02.12.2021).

with a manipulator with 6 degrees of freedom with the function of clamping the gripper jaws. This is ensured by its use both for observation, transport and picking up objects weighing up to 22 kg. On the other hand, the manipulator guarantees a 2 m reach as well as a large range of motion in all planes.

The PIAP Patrol robot can be equipped with sensors for radiation, toxic industrial substances, warfare agents and explosives vapors. Thanks to them, it is possible to transmit measurement data to a special operator's console, which is immediately informed when the device is in a poisonous gas cloud or when the tested object is leaky, which in turn causes leakage of a dangerous substance. The use of sensors is optional, which means that they can be mounted in any way and according to the needs of a given action. Such necessary accessories are attached at various points of the device and depending on the type of action to be performed and the intended use of the gripper. If, on the other hand, we are dealing with measurements at close range, then sensors must be mounted on the gripper in the device, and for reconnaissance measurements – on a base or a manipulator.

It should be added that the PIAP Patrol device is controlled by a lightweight panel supporting mobile X-ray systems and CBRN sensors. The panel is integrated with portable X-ray devices. At the same time, tests of remote operation of the robot were carried out in 2020 and showed that with one lightweight console it is possible to control the device and accessories from a distance of up to 800 m from the operator, while in a densely built-up area, the radio range was excellent at a distance of up to 400 m. The robot could take an X-ray image of the object at the same time, without the need to use a separate computer to operate the digital radiography system.

As the robot has a small size and a suitable type of drive system, it can participate in activities carried out inside buildings and in difficult field conditions – its modular and compact design allows transporting it in a small car. In addition to carrying out various forensic investigations at the scene with the use of CBRN means, the robot is also helpful in supporting activities of the fire brigade, police or army. That is why it was adapted to the installation of various equipment, accessories and weapons used to neutralize improvised explosive devices.

Another example of the use of specialized equipment may be the vehicle purchased for the needs of the Małopolska Police Department. It is a modern pickup truck based on a Toyota Hilux 6×6 car, subjected to deep modifications. The vehicle has an assault ramp with two independently raised gangways. These types of ramps have previously been delivered, among others to JW Grom [Military Unit 'Thunder']. At the rear of each gangway, there are raised integrated ballistic shields. During the assault, up to eight operators can be on the ramp. A container for transporting assault equipment is located under the ramp. Two officers can move in the cabin of the vehicle, behind the front seats there is a technical compartment with communication, signaling, etc. devices and a separate space for individual equipment.

Photo 2. Assault platform based on the Toyota Hilum car - front view
Source: https://malopolska.policja.gov.pl/krk/aktualnosci/14035,Malopolscy-policjanci-rozpoczeli-eksploatacje-pojazdu-z-platforma-szturmowa-na-b.html access: 08.07.2022.

Photo 3. Assault Platform based on Toyota Hilux – rear view
Source: https://malopolska.policja.gov.pl/krk/aktualnosci/14035,Malopolscy-policjanci-rozpoczeli-eksploatacje-pojazdu-z-platforma-szturmowa-na-b.html access: 08.07.2022.

The assault platform described here is the first vehicle of this type in the Małopolska Police Department. The purpose of the purchase was to increase the ability to effectively and efficiently respond to terrorist attacks and CBRN threats in order to protect critical infrastructure facilities and public spaces. In the event of an act of terror and a chemical, biological or radiological threat, the vehicle is used at the scene of the incident by units specializing in chemical and ecological rescue (Counter-Terrorism Subdivision of the Police in Krakow and the Rescue and Fire Fighting Unit of the State Fire Service in Krakow). The purchase of Toyota Hilux was the result of cooperation between firefighters and Małopolska Police Anti-Terrorists as part of the project "Effective together – SPKP with PSP against terrorist threats". The vehicle is shown in the Photos 2 and 3.

Modern technology provides completely new possibilities, which is due to the fact that technological solutions are used to investigate the scene with the use of CBRN means. They significantly facilitate the work of both forensic investigators and other services involved in the work. Despite this, classical working methods are still used in the study of CBRN contamination sites. The principles include, for example, removing the causes of the incident prior to any procedural steps taken by CBRN specialists.

5. Summary

In Poland, conducting forensic activities at the scene of an incident, where CBRN means were used, is based – on the one hand – on traditional methods and techniques of forensics, and – on the other hand – on the use of special devices designed for these works. They are undoubtedly a valuable solution and facilitate faster and more accurate performance of specific tests.

In Poland, there is an extensive system of responding to events with the use of CBRN funds, which is supervised by the Ministry of National Defense and is part of the crisis management system. At the same time, individual duties and tasks of entities responsible for responding to CBRN events are regulated by statutory provisions. However, in the context of responding to CBRN events of a terrorist nature, the most important role has been entrusted to the Police. Specific tasks in the area of CBRN belong to the Bureau of Anti-Terrorist Operations, which operates within the General Police Headquarters.

The functioning of the CBRN incident response system requires cooperation of a large number of different entities: the State Fire Service, chemical and ecological rescue units as part of the National Fire and Rescue System, State Sanitary Inspection, Institute of Meteorology and Water Management, the Police Force and other services. Also, once forensic examinations at the scene with the use of CBRN measures are started, the relevant cooperation of various services and entities is often necessary. Therefore, specialists in the field of forensics cooperate with chemists, biologists, pyrotechnicians, laboratory diagnosticians, doctors and radiological protection. When it comes to the situation demanding a broader analysis of the released CBRN factor, then not only national, but also international cooperation is necessary to obtain information from databases. This largely depends on the nature of the threats studied.

For many years, forensics has been grappling with the situation where CBRN incidents sometimes led to cases where prosecutor could not bring charges due to lack of evidence even if the criminal had been apprehended. This was because the site investigation staff could not enter the contaminated site until it had been completely decontaminated, and most decontamination methods and measures had irreversibly damaged the evidence. Therefore, when neutralizing CBRN contamination, it is the substantive knowledge of people with appropriate qualifications, combined with the selection of an appropriate decontamination agent, that would allow the most faithful preservation of the evidence at the scene.

Modern technology offers completely new possibilities, which is due to the fact that technological solutions are used to investigate the scene with the use of CBRN means. This significantly facilitates the work of both forensic investigators and other personnel involved in the work. Despite this, classical

working methods are still used in the study of CBRN contamination sites. The principles include, for example, removing the causes of the incident prior to any procedural steps taken by CBRN specialists.

The military has a great potential in terms of personnel and technical resources to combat CBRN threats, as it has adequate resources at its disposal. These include the Epidemiological Response Center of the Polish Armed Forces, the Military Centers of Preventive Medicine, the Military Institute of Hygiene, Epidemiology and chemical troops. Nevertheless, various security institutions also have specific powers to act on the scene after the use of CBRN measures.

When conducting CBRN on-scene investigations, evidence must be disclosed, secured and collected without endangering human health and life or the environment. Medical assistance is often required for those injured as a result of CBRN contamination.

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