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New Specific Contribution to Capabilities of Chemical, Biological, Radiological and Nuclear Reconnaissance Units Enhancement

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Abstract

Chemical, biological, radiological and nuclear (CBRN) reconnaissance squad is a basic unit designated to performing CBRN observation, meteorological observation in a ground layer of atmosphere and dosimetry and chemical control. It is equipped with devices and vehicles which enable to fulfill operational tasks in all types of military operations. The squad is also a source of information in a system of CBRN warning and reporting system within both the North Atlantic Treaty Organization and Czech Republic Integrated Rescue System. The review deals with summary of tactical and operational demands related to this squad and the particular enhancement of technical and technological equipment of the armament, equipment and material which has been completed in recent time for the purposes to improve CBRN reconnaissance capabilities.

Keywords: Capability; CBRN reconnaissance; Detection; Squad; Unit; Weapons of mass destruction; Toxic industrial materials

Introduction

Chemical, biological, radiological and nuclear defense (thereinafter CBRN defense) and protection against the effects of toxic industrial materials (TIM) released within industrial accidents, natural disasters or potential terrorists´ attacks have a crucial importance from the actual and presumed development of the security situation point of view. This importance must be understood not only in a framework of the Czech Republic within the protection of own territory but also within forces´ deployment in foreign missions.

General understanding of CBRN squad activities

CBRN reconnaissance and sensitive site reconnaissance, surveillance and surveys are together with CBRN monitoring, sampling of CBR substances and CBRN identification the part of CBRN defense component "detection, identification and monitoring". CBRN reconnaissance is a mission undertaken to obtain information by visual observation or other methods to confirm the presence or absence of CBRN hazards. CBRN reconnaissance efforts are designed and initiated to detect CBR contamination. CBRN reconnaissance needs to be supported by combat and service support surveillance and reconnaissance assets, such as sensors on unmanned platforms and airborne locating and detection sensors. Civilian partners, for example local emergency services and host nations first responders, can also contribute to information useful for developing a more comprehensive CBRN operational picture. Biological detection and identification are a part of biological reconnaissance, surveillance and surveys. CBRN surveillance, reconnaissance and survey may also include gathering of information on adversary use of CBRN weapons or devices, associated hazards, or meteorological data useful for CBRN hazards prediction [1].

Considerations for planning and preparing for CBRN reconnaissance are based on the mission as defined by the requesting unit. Missions, tasking, priorities, and command or support relationships are coordinated and established by the appropriate headquarters. Required actions in planning and preparing for CBRN reconnaissance operations are described in standardization operational procedures of each unit or staff.

Most tasks related to operational environment reconnaissance includes capabilities which must be supported with appropriate material and vehicles such as:

- The observation and reporting of local weather and terrain conditions
- Monitoring of potential toxic industrial hazards (TIH) and natural hazard potential
- Detection and monitoring of CBRN hazards and contaminants
- The marking of CBRN contamination, the collection of materiel and environmental samples and remote detection

It is very important to stress that CBRN reconnaissance operations are planned and performed with six fundamentals to complete missions in operations. There are as follows:

- To ensure continuous CBRN reconnaissance: CBRN reconnaissance is conducted before, during, and after all operations. Before an operation, CBRN reconnaissance focuses on filling gaps in information about the enemy, specific hazard considerations, and the terrain where the enemy may employ CBRN weapons and a TIM could be released. During an operation, CBRN reconnaissance focuses on providing the commander with updated CBRN information that verifies the enemy's composition, dispositions, and intentions as the battle progresses. This allows commanders to verify which course of action is being adopted by the enemy and determine if the plan is still valid. After an incident, CBRN reconnaissance focuses on maintaining contact with the source of contamination or hazard if known.

- To orient on the objective: CBRN reconnaissance operations are generally limited to those areas where the adversary is most likely to employ CBRN weapons or devices, or where a CBRN hazard (TIM incident) will most likely occur within the area of operations. It depends on the importance of an area to the conduct of operations.
- To report all information rapidly and accurately: CBRN reconnaissance is performed to permanently obtain information. Commanders need this information to confirm or make decisions. Negative reports tell as much as positive reports. Accurate reporting of locations is essential to avoiding CBRN hazards.
- To operate in a secured/controlled area: While conducting CBRN reconnaissance the CBRN reconnaissance team (so called "Recce Team") is highly vulnerable to activities of a potential adversary. Therefore, CBRN reconnaissance operations must include security measures allowing the CBRN Recce Team to work in a secured/controlled area.
- To develop the situation rapidly: When a CBRN reconnaissance asset encounters an enemy force or hazard, it must quickly determine the threat it faces. For a new hazard, the reconnaissance asset must determine the type of hazard, dispositions, and assess the implications of that information. In most cases, the reconnaissance unit developing the situation uses actions on contact.
- To maximize the capability of CBRN Reconnaissance units: When selecting a unit to conduct a CBRN reconnaissance task, the commander must consider the various capabilities and limitations of the unit. The mobility, survivability, sustainability and detection capabilities of each type of unit should be considered.

CBRN squad main tasks

The purpose of CBRN field reconnaissance is to collect information to allow friendly forces/organizations to avoid contaminated areas. It is performed both in advance of and in parallel with other operations, to provide information to the commander, allowing him to confirm or modify his concept of operations. It can be divided into three types:

- CBRN route reconnaissance
- CBRN zone reconnaissance
- CBRN area reconnaissance

Sensitive site reconnaissance (SSR) is an investigation of specific locations of interest to the commander (for example a suspected insurgent chemical storage facility), or where hazards cannot be detected by normal military capability. The aim of SSR is to gather technical and scientific information concerning the adversary´s offensive CBRN capability as well as intelligence on potential TIH in the Joint operational area and is part of the overall intelligence collection effort [2]. Specialized CBRN Defense units are in a supportive role for site characterization of CBRN substances (TIM sites) and CBRN weapon production, research and storage facilities.

A CBRN survey is the directed effort to determine the nature and degree of CBRN hazards in an area of confirmed or suspected contamination, and to delineate the boundaries of the hazard area. This may include measuring the degree of radiation, the presence of biological or chemical hazards, and the sampling of items suspected of CBRN contamination. It is likely to be carried out by specialist personnel using sensors and equipment designed for the task. In facts we differentiate a few types of survey. Chemical surveys are conducted when the military commander requires detailed information on the size of the contaminated area. The focus of the survey is to determine the extent of contamination within the area of interest or along specific routes. The unit conducting the survey knows the general area of the contamination. It may also know the agent and delivery means. This will help in planning the survey. Time is a major factor in planning and conducting chemical surveys. Detection tests with various types of equipment take from a few seconds up to several minutes. When conducting chemical surveys, there are several possibilities to consider such as: what type of agent is known to be present is there a chance of mixture, and how much time is available to conduct the survey [3]. Biological Survey is a special type of survey which is under responsibility of military health service and due to this there are currently no established procedures. Radiological surveys are conducted when the military commander requires detailed information on the size, extent and level of radiological contamination. There are two types of radiological surveys, aerial and ground:

- Aerial survey: Aerial surveys are conducted rapidly over large areas. Radiation exposure levels for survey teams are considerably lower than during ground surveys. Aerial surveys can be employed in areas where dose rates are unacceptable and terrain is difficult. The disadvantages of aerial surveys are the decreased accuracy of dose rate readings and their dependence on weather.
- Ground survey: Ground radiological surveys can be conducted by automated CBRN reconnaissance systems. These systems reduce dose rates received by personnel and must be used whenever possible. Disadvantages of ground surveys are lack of speed and flexibility, personnel receive higher doses, they require more personnel and equipment, and they place a greater burden on communications. However, ground surveys are normally independent.

Other important tasks are related to CBRN monitoring. CBRN monitoring is the continuous or periodic process of determining whether a CBRN hazard is present or not. CBRN hazards can be significantly affected by a number of factors including weather, terrain, and time of day and agent persistency/decay. Monitoring is conducted on personnel, equipment, or terrain to establish the presence of contaminants and to validate decontamination [4]. CBRN monitoring is performed in activities as follows:

- In areas of assessed risk, assurance that no hazard is present
- Estimation of the endurance of a hazard and hence the period for which protective measures must be sustained
- When quantification can be achieved, periodic relaxation of protective measures
- Validation of the continued effective functioning of collective protection
- In the case of radioactive hazards, calculation of the total dose absorbed by personnel

In the framework of monitoring units have to be able to perform:

- Indirect monitoring: Indirect monitoring is used by a unit to measure radiation levels when dose rates are high enough to be read inside a shielded location. It lowers the risk of exposure to military personnel.
- Exposure monitoring: Risks of long-term health effects from exposure are assumed to be cumulative and are typically based on the total dose received. It is therefore important to maintain dose records of those exposed to hazard materials. Commanders also need to be aware of individual dose histories when planning future

operations where radiation exposure is a possibility. Even after the completion of a military operation, long-term health monitoring may be required by national regulations for those personnel who have been exposed to hazard materials. Post-deployment assessments of internal doses may also be required.

In the framework of reforming of the Czech Armed Forces (CAF) the resort of the Ministry of Defence systematically and independently on actual published information creates in this area needed abilities and specific potential which will in a crucial way contribute to the development of abilities of allied forces. In this connection the Czech Republic is profiled as one of the leading countries in the North Atlantic Treaty Organization (thereinafter "NATO") in development of abilities related to CBRN Defence of NATO and it is actively involved into activities of related allied organs, working groups and programs [5].

Even though in the past it was implemented a significant number of activities related to the definition and detailed specification of intent effective structures and protection capabilities concerning CBRN Defence and particular specification changes to operational and performance capabilities of units and departments of the CAF chemical corps (CCs) attention has not been practically devoted. Available and approved materials that have been reviewed by the scientific community and verified usually focused only on areas that are specific operational (power) the ability touched very briefly. Although author do not dispute the importance of streamlining capabilities in areas related to issues of organizational structures, staffing, material-technical provision and financial provision, so far it has not been performed an analysis of the current state of performance capabilities of units and formations of the CAF CCs.

Assessment of the contribution within reaching capabilities in term to involving new technical means into the CAF CCs

The introduction of new technical means into the CAF CCs structure in most cases allows development and effective achievement of operational capabilities. Final status is yet a balance between declared, real and required capabilities [6].

The Table 1 provides a summarized overview of capabilities that have been achieved or lost by introducing new technical means into the CAF CCs structure. Evaluation is done by using the symbol "+" (positive-increase capability) "0" (no change-the ability to remain at the same level) and "-" (negative-poor skills).

Introduced evaluation is attached to new established means in the CAF CCs. They are as follows:

- CBRN reconnaissance system marked as S-LOV-CBRN
- NBC decontamination vehicle (in the CAF CCs named as MDA)
- Decontamination of military equipment LINKA-08 (thereinafter ''LINKA-08")
- Set for personnel decontamination (thereinafter ''SDO 2014")

The main focus of this paper is to compare recent and potential new capabilities in relation to CBRN reconnaissance platoon equipped with an old type of the vehicle BRDM-2 rch (Russian production) and CBRN reconnaissance system marked as S-LOV-CBRN. Other ones could be mentioned in next papers.

Unit	Vehicles		Assessment of a benefit within capability achievement			
	Current	New	Description of capability	+	0	-
CBRN reconnaissance platoon	BRDM-2 rch	S-LOV-CBRN	Able to carry out reconnaissance, detection, initial identification of CBRN agents (including TIM) and to monitor CRN/TIM.	X		
			Able to conduct a survey of CBRN agents and TIM in an open space with an area of 1500 km^2 in an hour.	X		
			Able to detect CBRN threats and TIM and perform tactical sampling of potential or suspected CBRN materials for subsequent analysis.	X		
			Capable of making a point, and reported (remote) detection of CBRN materials on roads in areas of interest and in static facilities.	X		
			Able to monitor substances CRN on roads in areas of interest and in static facilities.		X	
			Able to provide the necessary level of protection against weapons of mass destruction in accordance with the standards of Allied Command Operations respecting standards of the Allied forces.	X		
			Able to maintain real (real close) situational awareness of their own strengths and resources.	X		
			Capable tactical deployment in cold and extremely hot weather and the operations on different terrain profile and austere conditions.		X	
			Capable of independent relocation and transportation means tactical airlift.	X		
			Able to use for their own material self-sufficiency for 3 days.		X	
			Capable of integration into the warning system and awareness (CBRN-Warning and Reporting).	X		

			Capable of integration into the NATO system of intelligence, surveillance and reconnaissance in order to allow the total allocation, mutual monitoring of skills and dissemination of comprehensive information to users.	X		

Table 1: Assessment of a benefit within capability achievement.

Selected facts for assessment of operational capabilities

On the basis of the specifications can cause the following partial conclusions, which have a major impact on the deployment of chemical techniques and materials not only in operations within NATO, but also in the Czech Republic.

CBRN reconnaissance system S-LOV-CBRN showed a significant contribution to increasing the capabilities of units of radiation, chemical and biological reconnaissance (Figure 1). Its equipment, especially in the detection of the full range of under interest toxic substances, significantly higher than its predecessor, thus Armored Reconnaissance transporter BRDM-2rch and vehicle radiation and chemical reconnaissance LR-130rch. It is essential to the possibility of integration into the NATO system alerts and warnings, total computerization and robotics and the ability to work in an integrated networked information environment. Inappropriate for solutions, however, is limiting the detection of toxic substances only from the vehicle, thus the absence of withdrawal crew to implement control measures, lack of implementation options Infantry survey and the lack of options for manual sampling. These factors significantly influence or even make impossible to implement some of the important tasks of the units of radiation, chemical and biological reconnaissance established military rule Chem-1-6.

Figure 1: Set of the CBRN reconnaissance system S-LOV-CBRN.

Conclusion

The analysis operational capabilities which have been the main focus of this article, pointed to the significant strengths and weaknesses of new technical devices that have recently been introduced into the arms of CAF CCs. Part of the studies performed, from which this article is based, was to analyze the performance capabilities aimed at comparing operating (power) capabilities. Significant conclusions will be the content of following papers.

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