LUDOVIKA UNIVERSITY OF PUBLIC SERVICE

Doctoral School of Military Sciences

THESIS BOOKLET

for the Doctoral (PhD) dissertation of

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Development possibilities of the national CBRN defence system in the context of the security challenges of the 21st century

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FORMULATING THE RESEARCH PROBLEM

What kind of CBRN threats the world would face in the first half of the 21st century? In the first half of the 21st century, the unlimited use of CBRN weapons is not expected, but the likelihood of their use for limited purposes will increase. Armed conflicts reduce industrial security; missiles can hit industrial plants and nuclear power plants, even if they are not primary military targets. Technological progress is unstoppable, and the establishment of new hazardous industrial facilities and factories increases the likelihood of peacetime CBRN incidents. Overall, the risk of proliferation of WMD will increase, while the regulatory mechanisms that could prevent the escalation of certain crises will be weakening.

Recently, the allied CBRN defence-related standards have changed. The new NATO Comprehensive CBRN Defence Doctrine describes an expansion of certain tasks, and the national military strategy guidelines indirectly emphasize the chemical defence capabilities of the Hungarian armed forces. The use of WMD for limited purposes on the territory of a sovereign state in peacetime is a new task for CBRN defence. Do the CBRN defence capabilities and organisational levels fully meet these needs?

What CBRN defence tasks does the Voluntary Territorial Reservist units/sub-units have? The CBRN defence tasks of the Voluntary Territorial Reservist sub-units during of a CBRN event or a natural or civilizational disaster are unquestionable. Their training for these CBRN protection tasks is not currently in place. Due to the specific role and tasks of the Voluntary Territorial Reservist Service, its training procedures for CBRN defence may have specific characteristics, which require carrying out scientific studies.

What national systems are available to support CBRN knowledge management? Computer-based CBRN evaluation programs are playing an increasing role in discussing CBRN defence issues and supporting the commander’s decision-making process. Of the computer programs currently used by the Hungarian Defence Forces for modelling, some have not been supported for many years, and it is worth investigating what in-country options are available to maintain this capability.

HYPOTHESES

The following research hypotheses were formulated:

1. The growing threat posed by weapons of mass destruction implies the need for organizational and technological improvements in CBRN defence, and I assume that CBRN defence can respond to this changing security environment by meeting this need.
2. I assume that the changing CBRN defence tasks and the increasing CBRN threat will induce organisational change in the field of ABV protection.
3. I assume that a training guide for CBRN defence based on scientific methodology can be developed in order to support the CBRN defence training of Voluntary Territorial Reservist units.
4. I assume that it is possible to develop a new CBRN assessment software that can be more effectively adapted to the national operational environment.

RESEARCH OBJECTIVES

I set the following research objectives:

Reassessing the CBRN security threats of the 21st century. To summarize the CBRN defence challenges, which the Hungarian Defence Forces is facing with in the coming changes of the security environment.

Developing a proposal for a CBRN defence organizational structure that responds to the changing doctrinal challenges and growing CBRN challenges.

Develop CBRN decontamination training procedures based on the existing doctrinal background in order to improve the CBRN defence training system of the Voluntary Territorial Reservist units.

Development of the technical requirements for the demo version of a new Hungarian developed computer evaluation program to support the CBRN defence.

RESEARCH METHODS

In this thesis the following research methods were used:

For almost twenty years I served as a chemical officer in the chemical defence corps of the Hungarian Defence Forces. Relying on the national and international experience I gained during my work, I have deepened my knowledge of the subject in Hungarian and international publications. I participated numerous times in training events abroad as a member of the NATO Response Force (NRF), which gave me a detailed insight into the complexity of NATO's CBRN defence tasks, with special emphasis on CBRN warning and reporting, and the analysis of the operational impact of weapons of mass destruction. I have incorporated my observations from my assignments into my dissertation, most notably in the development of the concept of the CBRN assessment software.

I have analyzed the security implications of the Russia-Ukraine war and the challenges from CBRN defence perspective. Through case study analysis, I have explored the threat posed by WMD and its operational implications for armed conflict. I used logical procedures to compare and contrast reports from international organizations and data on WMD, resulting in conclusions. I have specifically addressed the current state of proliferation of these type of weapons. I have identified the existing international CBRN defence regulations and NATO guidelines as source works and explored the coherences laid down in them. I compared the combat-level CBRN capabilities of the countries in the region to develop an appropriate organisational concept. Among the research methods, I generally used observation, comparison and analysis. Following deductive logical methods I analysed the CBRN defence capabilities and organisations of the Hungarian Defence Forces.

Based on the documents on the training of reserve forces and a comprehensive analysis of the relevant source works, I have established the basic theses for the training of the Voluntary Territorial Reservist Forces for the specialized task of CBRN decontamination. I developed the concept for the training program for the training of these forces, incorporating my personal professional experience. Using a trial version of the new Hungarian CBRN assessment software, I modelled atomic strikes in order to compare the resulting evaluations with other CBRN software.

STRUCTURE OF THE THESIS AND APPLIED RESEARCH METHODS

Based on the analysis of the national and international security policy changes, I summarize the CBRN defence challenges the Hungarian Defence Forces are facing with, and I identify the adaptation possibilities of modern CBRN defence capabilities. In the introduction, I outline the recent technological and social changes and formulate the current questions concerning the topic of CBRN defence. I outline the research objectives and describe the research methods used during my whole research process. I formulate my research hypotheses and present the relevant bibliography.

The thesis consist of 5 chapters:

In the 1st chapter (Reassessing the current CBRN threats), I show through case studies that international security policy changes bring new risks and threats with them and that have a direct impact not only on the security of our national environment, but also on the security of the international community, including the integration organisations - NATO and EU countries. To strengthen the CBRN defence, I develop proposals for organisational and structural changes.

In the 2nd chapter (The role and tasks of CBRn defence) I describe the current role and responsibilities of CBRN defence. Building on doctrinal foundations, I describe the process of identifying CBRN hazards during operations. I identify the emergency response actors in a potential peacetime CBRN incident. I develop organisational proposals to strengthen CBRN defence.

In the 3rd chapter (Development of the CBRN decontamination capability of the Voluntary Territorial Reservist Forces) I introduce the different types of voluntary reserve service and their tasks. Based on the legislativeal background and taking into consideration of the CBRN expertise aspects, I recommend a CBRN decontamination training procedure based on the existing doctrinal background in order to improve the CBRN protection training system of the Voluntary Territorial Reservist Forces.

In the 4th chapter (The importance of civil-military interaction during managing a major CBRN incident) I reveal the importance of civil-military interaction in the management of serious ABV incidents. After identifying and exploring the shortcomings of effective civil-military

interaction and the conditions of cooperation, I make proposals to increase the effectiveness of the interoperability.

In the 5th chapter (Computer programs supporting situational awareness and decision making process in case of CBRN events) I compare the CBRN knowledge management software applications used by the Hungarian Defence Forces. I present an evaluation software based on my concept, which was developed by a Hungarian national company. I will run simulations on all of the software to determine the advantages and disadvantages of the programs and compare their capabilities. I propose the use of the software developed based on my idea and experience.

In the next part of the thesis, I will summarize my theories, present the scientific results and make recommendations. Finally yet importantly, I list the bibliography studied and cited by me, the list of figures and tables can be found in the thesis, the list of authors' publications, and acknowledge those who supported me during my work.

OVERALL CONCLUSIONS

The possible future use of CBRN materials as weapons in the next five to fifteen years depends as much on technological as geopolitical changes. The production and proliferation of toxic, infectious and radiological materials is expected to continue to develop, potentially leading to lower thresholds to entry for actors wishing to possess CBRN weapons. While this will undoubtedly have an impact on the diversity of state and non-state actors possessing CBRN weapons, it is unclear whether this will automatically increase the prevalence of WMD use. Overall, however, it seems to open up the possibility using CBRN materials and deploying them as weapons in new innovative ways in the 21st century. We have to be prepared to meet them both on the battlefield and in the civilian sphere, during of war or peace.

In response to Russia's illegal, unprecedented, full-scale invasion of Ukraine in February 2022, NATO has taken steps to significantly strengthen its deterrence and defence posture and will continue to develop the full range of capabilities, including CBRN defence capabilities, needed to maintain credible deterrence and protection. Our country also needs to increase the resilience of our society and infrastructure to counter Russian and other external malign influence attempts, and enhance our preparedness and response against CBRN threats. Climate change considerations must also be integrated to enhance our CBRN defence

capabilities and resilience.[1] Consideration should be given to the potential impacts of climate change on CBRN protection, including the potential for extreme and unusual conditions to exacerbate the consequences of CBRN threats and the potential acceleration or spread of emerging and infectious diseases.

The global CBRN security environment has changed dramatically over the past decade. Russia represents NATO's most pressing CBRN security challenge. Russia's war against Ukraine illustrates the Putin regime's contempt for international law and norms. Russia's ability to produce chemical and biological weapons, its large, diverse and expanding nuclear capabilities dating back to Soviet times, and its continued attacks on international non-proliferation instruments only heighten the concerns. Russia has made efforts to undermine international norms against the proliferation and use of weapons of mass destruction, including trying to shield the Syrian government from accountability for the use of chemical weapons. The Russian Confederation, together with China, has deliberately attacked the legitimacy and authority of the OPCW and its verification mechanisms. Putin's state has dangerously increased the spread of disinformation about biological and chemical weapons, including during the war in Ukraine. It has consistently refused to answer legitimate questions about the so-called Novichok family's nerve agent attacks on allied territory against Sergei and Yulia Skripal in 2018, which cost the life of a British citizen, and on Alexei Navalny in 2020. There are also serious concerns that Russia is considering the use of chemical or biological weapons in the future. The international treaty regime limiting the proliferation of WMD delivery systems has also been eroded, notably through violations of the Intermediate-Range Nuclear Forces Treaty (IMF), although the US also contributed to the processes leading to the Treaty's termination. Russia has refused to comply with almost all of its proliferation and WMD obligations. These problems, coupled with Russia's irresponsible and escalatory rhetoric on WMD, have dramatically increased international concerns about their possible use, particularly in Ukraine.

Hostile non-state actors, including terrorist organizations, continue to seek to acquire weapons of mass destruction, CBRN materials and delivery systems and about to use them against NATO populations, territories and forces. Terrorists aim to use WMD weapons or deliberately release various dangerous materials to, inter alia, create panic and strain national disaster management capabilities. Non-state actors have already used chemical weapons in

[1] Földi László: A klímaváltozás jelentette kihívások az ABV védelemben, Hadtudomány XXIII. évfolyam (2013), elektronikus különszám, o. 101-116

Syria and Iraq, and are known to seek access to more sophisticated CBRN materials and WMD, as well as to attempt to weaponize dangerous industrial materials and other toxic compounds that may be easier to obtain. In addition, scientific and technological innovation continues to reduce the barriers to the acquisition or development of advanced and diverse CBRN materials and delivery devices. Therefore, the risk of use or proliferation of toxic, infectious, radiological materials by non-state actors is likely to continue to increase.

In addition to Russia and terrorist organizations, it must continue to address the security challenges posed by other actors. The Syrian government has repeatedly demonstrated its willingness to use chemical weapons to save its own existence. Aside that it continues to fall short of its international obligations on weapons of mass destruction, according to the Organisation for the Prohibition of Chemical Weapons (OPCW). Syria, having refused to fulfil its disarmament commitments and demonstrably eliminate its entire stockpile of chemical weapons, remains a serious risk of use or proliferation of chemical weapons and their means of delivery. The Democratic People's Republic of Korea (DPRK) continues recklessly expand its nuclear weapons and missile arsenal in violation of relevant UN Security Council resolutions. The assassination of Kim Jong Nam with nerve agent in Malaysia in 2017 shows that the DPRK is willing and able to use prohibited weapons outside its borders. Iran's uncontrolled nuclear program is a constant challenge to regional security. Moreover, Iran's active missile development requires NATO's continued vigilance.[2]

Finally, China's stated ambitions and assertive behavior pose systemic challenges to the current international order and to areas relevant to the security of the Western world. China is rapidly expanding its nuclear arsenal with new warheads and a number of advanced ballistic missile systems. China's rapid and ambitious military modernization is particularly worrying given the Far East's lack of transparency and its limited engagement in international arms control, disarmament and non-proliferation, including WMD. There have been many instances where China has repeated and amplified Russian misinformation on chemical and biological weapons.[3]

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[2] Czajkowski, M. (2012). Iran's ballistic missile arsenal and its place in security and foreign policy of Tehran. Ad Americam, 13, o. 7-21

[3] McCarthy, Simone China’s promotion of Russian disinformation indicates where its loyalties lie https://edition.cnn.com/2022/03/10/china/china-russia-disinformation-campaign-ukraine-intl-dst-hnk/index.html (A letöltés ideje: 2023. 01. 15.)

Our region is facing an ever-widening spectrum of chemical threats, from well-known traditional warfare agents to so-called Novichok neurotoxins and pharmaceutical-based agents (PBA's), which pose challenges for detection, response and protection measures. Doubts remain about the research of possible dual-use agents that could be used to produce chemical weapons.

The risk of naturally occurring or accidental biological threats can also further complicate the security environment. The COVID-19 pandemic demonstrated the extreme potential of biological threats, regardless of their origin, to disrupt our societies and strain our ability to respond in different areas. Biological agents, including both existing and modified pathogens, pose unique and enduring challenges to future military operations as deployed forces face the possibility that adversaries may deliberately employ microorganisms or accidentally release such pathogens and thus unleashes various diseases. Climate change and related trends are also expected to accelerate the emergence of zoonotic diseases, including potential pandemic threats. These risks are intertwined with the proliferation of weapons of mass destruction, as malicious actors may employ new naturally occurring pathogens and toxins. Taken together, these trends make clear the need to strengthen protection capabilities, including medical diagnostics, research and countermeasures, and biological detection and analysis. Planning and collaboration will contribute to the development of CBRN defence and public health responses to biological threats, whether natural or synthetic.

New technologies, including nanotechnology, synthetic biology also threaten to make the development of more deadly microorganisms a reality, capable of overcoming protective measures, more difficult to detect, more resistant to decontamination materials and making medical treatments less effective against them. They can also simplify the availability of dual-use tools for the production of biological or chemical weapons. At the same time, innovation offers promising new and improved capabilities that can support our CBRN defences, including improved approaches to detection, identification, decontamination, medical treatment, consequence management and damage assessment, and knowledge management.

What do today's challenges demand? An integrated, mission-oriented approach to CBRN defence. Successfully addressing such complex, multi-dimensional threats requires a single, mission-focused framework for CBRN defence. The elements of this framework are:

- Procedures that clarify coordinate and optimize the roles, relationships and responsibilities of partners involved in prevention, protection and recovery.

- Exercising operations with integrated strategies, methods, doctrines and tools, as well as coordinate and building links necessary to integrate joint, inter-ministerial and multinational activities.

- People with clearly defined roles and functions, empowered by a CBRN defence culture based on high quality leadership, recruitment, training, education and expertise.

- Cyber defence: CBRN defence must also address cyber threats. The Internet is a key channel for the spread of technical knowledge and expertise on WMD. Malicious cyber actors may attempt to undermine the nation's ability to prevent and effectively defend against CBRN incidents by targeting NATO or allied communications and information systems. Cyberattacks against critical infrastructure highlight the risk that cyber capabilities could be used to compromise industrial facilities or hazardous industrial installations with the intent of causing a release of toxic industrial materials or other CBRN event. A number of such incidents have occurred recently, including attempts to hack the OPCW and destabilising and malicious cyber activities against health services and medical research facilities during the COVID-19 pandemic.

- Hybrid threat: Potential adversaries may use substances that are harmful to health with the intention of creating uncertainty and chaos, impeding decision-making, which is a characteristic of hybrid threats. The Russian disinformation campaigns following the Salisbury assassination attempt and the full-scale invasion of Ukraine in 2022, and the influence activities in virtual domain aimed to disrupt a coherent allied response, illustrated the relationship between hybrid warfare and CBRN defence. The potential for creating new CBRN agents that are more difficult to detect, and dealt with and alternative means of targeting and delivery could create new opportunities for inducing hostile CBRN events in support of hybrid methods.

In summary, we face a security environment in which CBRN hazards are increasingly diverse and numerous, in which state and non-state actors pose a greater risk of WMD use and proliferation, and in which technological trends are rapidly amplifying these risks. Addressing such complex problems requires close and effective cooperation among the Hungarian Defence Force, and their counterparts in the armed forces and civil authorities and organizations.

Reserve forces can be involved in specialized CBRN defence tasks at local level, but special training is recommended to ensure that they are able to perform their tasks on the required level. The modelling and evaluation of this type of event is also essential, using advanced computer programs to support decision making by the higher command.

NEW SCIENTIFIC RESULTS

1. I have proved the increase of the CBRN threat both internationally and in the region of our country, the challenges of CBRN defence and the need for professional development of CBRN defence.
2. Taking into account the current CBRN threat and the guidelines of the existing concepts and startegy documents, as well as the requirements of cooperation with international and national bodies, I developed a new CBRN organisational structure.
3. I developed a CBRN decontamination training procedure based on the existing doctrinal background in order to improve the CBRN defence training system of the Voluntary Territorial Reservist Forces.
4. In cooperation with a national digital technology company, I developed the concept of a new CBRN evaluation software nuclear strike evaluation module, during this process I determined the military-technical requirements.

RECOMMENDATIONS, PRACTICAL APPLICABILITY OF SCIENTIFIC RESULTS

1. The material of the thesis can be used both in the basic and auxiliary training of military higher education, in special CBRN courses at different levels, and in further education courses.
2. Based on my organisational development proposal, a modern CBRN defence organisational structure can be developed, which offers an adequate response to the security challenges of the 21st century and it is accordance with NATO guidelines.
3. The results can be used in CBRN defence training and for the preparation of CBRN tasks of Voluntary Territorial Reservist Forces.
4. The full version of the new CBRN knowledge management software can make a major contribution to support the commanders' decisions.

The results of this dissertation can form the basis for further research. As digitalization and automation will become more important in the future, computer-based CBRN situation assessment will also play a more prominent role, and I recommend developing the CBRN knowledge management software developed by me into a full version.

PUBLICATION LIST

1. The nuclear threat nowadays. (Hungarian)
   Haditechnika, Volume 57. Issue 1. , 2023. Budapest, o. 22–27, ISSN 0230-6891

2. Reassessing the CBRN threats nowadays. (Hungarian)
   A hadtudomány aktuális kérdései napjainkban: Volume II. , Ludovika Egyetemi Kiadó, 2022. Budapest, o. 67–84, .ISBN 978-963-531-615-1

3. The Nuclear Threat Nowadays. (English)
   A Haza Szolgálatában Konferencia Kötet, 2021. Budapest, o. 105–112. ISBN 978-615-82054-9-8, Online: https://ludevent.uni-nke.hu/event/1346/attachments/330/724/A%20Haza%20Szolg%C3%A1lat%C3%A1ban_Konferenciak%C3%B6tet_2021_final.pdf#page=105 Downloaded: 2022.01.02.

4. Weapons of mass destruction and the secret services (Hungarian)
   Szakmai Szemle. Volume 19. (2021) Issue 3. , 2021. Budapest, o. 28–40., ISSN 1785-1181

5. The Establishment of Voluntary Territorial Defence Reservists' CBRN Decontamination Capabilities. (Hungarian)
   Hadmérnök, Volume 16. Issue 2. , 2021. Budapest, o. 127–139. ISSN 1788-1919, DOI: 10.32567/hm.2021.2.9 Online: https://folyoirat.ludovika.hu/index.php/hadmernok/article/view/4827/4563
   Downloaded: 2022.01.02.

6. Weapons of Mass Destruction and the Secret Services. (English)
Hadmérnök, Volume 16. Issue 4. , 2021. Budapest, o. 55–66. ISSN 1788-1919, DOI: 10.32567/hm.2021.4.5 Online: http://real.mtak.hu/137841/1/05_oze_55-66_HM2021_4.pdf Downloaded: 2022. 10. 05.

7. The Significance of Civil-military Interaction in the management of Severe CBRn incidents.
Hadtudományi Szemle, Volume 14. Issue 2. , 2021. Budapest, o. 55–67. ISSN: 2060-0437 DOI: 10.32563/hsz.2021.2.5 Online: https://folyoirat.ludovika.hu/index.php/hsz/article/view/5236/4548 Downloaded: 2022.01.02.

8. The birth of a new specialist corps in World War I.: the Chemical Defence Corps.
Haditechnika, Volume 15. Issue 2. , 2021. Budapest, o. 70–75. ISSN 0230-6891, DOI: 10.23713/HT55.3.12 Online: http://real.mtak.hu/127256/1/HT_2021-3_cikk_12.pdf Downloaded: 2023. 01. 23.

9. Chemical weapons and Just war.
Hadmérnök, Volume 15. Issue 2. szám, 2020. Budapest, o. 199–204. ISSN 1788-1919, DOI: 10.32567/hm.2020.2.13 Online: https://folyoirat.ludovika.hu/index.php/hadmernok/article/view/718/3923 Downloaded: 2022. 10. 05.

10. Special Features of The Russian–Ukranian Armed Conflict (English)
Hadmérnök, Volume 15. Issue 1. , 2020. Budapest, o. 207–220. ISSN 1788-1919, DOI: 10.32567/hm.2020.1.14 Online: https://folyoirat.ludovika.hu/index.php/hadmernok/article/view/615/2902 Downloaded: 2021. 03. 12.

11. Lessons Learned from the Russian – Ukrainian war.
Seregszemle, Volume 14. Issue 3–4. , 2016. Budapest, o. 7–19. HU ISSN 2060-3924

12. Nuclear Threat Nowadays. (English)
A Haza Szolgálatában 2021 Konferencia Absztraktkötet, 2021. Budapest, o. 39. ISBN: 9786158199124

CURRICULUM VITAE

Lieutenant-colonel Zoltán Őze was born in Kiskunfélegyháza. He attended 4 years to the János Damjanich Military Secondary Grammar School located in Szeged. After graduation from high school, he continued his studies in the János Bolyai Military Technical College on chemical defense major in Budapest. In 1998, he won 2nd place at the National Scientific Student Conference with his research document.

After graduating from the Military technical College from 1999 till 2019 he served in various CBRN specialist positions in Kiskőrös, Székesfehérvár, Nagytarcsa and Budapest. In 2003, he successfully completed the Chemical Captain Carrier Course in the United States of America, Fort Leonard Wood. In 2006, he earned a master's degree in disaster management major in the Miklós Zrínyi National Defence University

From 2019, he serves as senior officer at the Institute for Military Course Management, Department of Static Courses at the National University of Public Service. Married, father of two daughters.