

LUDOVIKA UNIVERSITY OF PUBLIC SERVICES

Doctoral School of Military Sciences

Thesis booklet

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**Analysis of Ground Operations in the Russia-Ukraine War, Lessons
Learned, and Recommendations for the Development of Hungarian
Defence Forces Infantry Units**

Doctoral thesis (PhD)

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Budapest, 2025

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1. RATIONALE FOR TOPIC SELECTION AND THE SCIENTIFIC PROBLEM

As a professional infantry officer of the Hungarian Defence Forces (HDF), it was my sworn duty to lead my subordinates to the best of my ability. When I was commissioned as an officer in 2014, the Russian occupation of Crimea was a recent event, and armed clashes were ongoing in Luhansk and Donetsk regions between Ukrainian and Russian forces, as well as pro-Russian insurgents. After my commissioning, I immediately entered an intensive training process as an infantry platoon leader, which, in response to the new conflict, shifted focus from asymmetric warfare to conventional warfare and national defence tasks. As a professional officer, I kept following the events, as many of the military equipment used in the conflict were also in service with the HDF. This piqued my interest in understanding what tools were used, how they were applied, and what results they yielded. In the summer of 2020, I obtained master's degree in International Security and Defence Policy at the National University of Public Service (NUPS), where I also analysed the land operations of what was still known as the "Eastern Ukrainian War" at the time. After obtaining my master's degree, at the encouragement of my superior, later my thesis supervisor, I continued my academic work, and at the Doctoral School of Military Science, my research topic became the analysis of the Russia-Ukraine conflict to explore development opportunities for the HDF infantry units.

As a researcher continuing in the profession and a civilian worker in the defence industry, I find it essential to complete this dissertation due to the importance of the anticipated results. Even if Russia had not escalated the conflict in February 2022, it would still have been worthwhile to examine the events from 2014 onward. However, after February 24, not only did the security environment change, but numerous phenomena must also be reassessed from a military science perspective. Even a superficial reading of the news reveals that infantry and tank forces bear the brunt of the fighting, and their actions determine the success of operations while also suffering the greatest losses.

The comprehensive modernization of the HDF, which began in 2018, was undoubtedly necessary and timely. Thanks to military technology acquisitions, world-class military equipment is now in service. However, it is a well-worn but eternal truth that the best military technology is dead material in the hands of untrained soldiers. If a tool is used improperly, it can, somewhat ironically, pose a greater danger to friendly forces than to the enemy. My research aims to analyse the ground operations of the war at the tactical level to uncover the phenomena and lessons that can be used to ensure the success of the HDF infantry units in completing their tasks with new military technology.

Since World War II, Europe has not experienced such a large-scale conventional war. While

the civil war following the breakup of Yugoslavia had conventional warfare characteristics, with the spread of peacekeeping operations and the "unipolar moment" of the 1990s, it seemed for a time that inter-state conventional wars were not likely to occur in Europe and its immediate surroundings. The questions and unclear successes of peacekeeping operations led military thinkers to devote less energy to the topic of conventional warfare. Of the little energy spent, even less was devoted to analysing the combat tactics of infantry units during conventional warfare. However, in early 2014, Russia occupied (later annexed) Crimea and, in the spring, intervened militarily on the side of the Eastern Ukrainian separatists. With this, an inter-state armed conflict erupted in Europe, specifically the most traditional form of warfare: two states fighting for the possession of certain territories—either to seize or retain them. After the fierce early battles of the war, from the spring of 2015, the topic largely disappeared from military science discussions until the end of 2021 when the likelihood of the conflict reigniting increased.

The events after February 24, 2022, will be analysed for decades, especially as the war is still ongoing at the time of writing. Many lessons have been drawn from these events, depending on one's political stance and expertise. From the perspective of my research, the primary lesson is that infantry units still bear the brunt of conventional warfare, suffering the most casualties. However, even though there is little research on their tactics abroad and none in Hungary, the impact of new military technology and the 4th industrial revolution on their tactics has been largely neglected. Based on this observation, I formulated the following scientific problems that I aimed to solve through my research.

Scientific Problems

1. Since the start of the full-scale invasion (February 24, 2022), there has been no comprehensive scientific research in Hungary, in the Hungarian language, covering the military operations at the ground tactical-operational level, matching the scale of a doctoral thesis.
2. It is evident that since the start of the full-scale invasion, a large number and variety of new military and dual-use technologies have been deployed by the warring parties, radically changing the geometry of the battlefield.
3. The radically changed battlefield geometry has reduced the manoeuvring possibilities and increased the possibilities for fire control and observation, forcing infantry units to fight under fundamentally new conditions.
4. The changed battlefield geometry has made conflicts between near-peer forces even more balanced, leading to a more material-centric military culture, which means that such a war

would result in unacceptable losses for both the HDF and other European armed forces.

5. Due to the drastic changes since the start of the full-scale invasion, the doctrines and regulations governing the tactics of infantry units in the HDF do not meet the latest challenges, requiring their urgent revision.

2. HYPOTHESES AND RESEARCH OBJECTIVES

During the study of the topic and the course of my research, I encountered several issues, leading to the formulation of the following hypotheses:

1. By examining the military events of the war to date, it is possible to determine the specific causes behind individual military actions. Based on this, the requirements of current and near-future warfare can be identified to develop a more modern system of training, preparation, and organizational regulations.
2. Military victory on the battlefield remains attainable; however, the previously valid success factors for each type of combat activity must be applied in a manner suited to the radically changed battlefield geometry.
3. Despite increased observation and fire control capabilities and reduced manoeuvrability, decisive manoeuvres are still feasible—provided the enemy's observation and fire control capabilities can be diminished through the application of new technologies, and TTPs (techniques, tactics and procedures) are adapted to the new battlefield geometry.
4. In a near-peer conflict, beyond the quality of applied TTPs, the preparedness and situational awareness of commanders and staffs, as well as soldier morale, may be the most decisive factors.
5. Through the in-depth analysis of land-based tactical and operational-level military operations and their impact on infantry units, it is possible to determine the desirable direction for the development of infantry sub-units.

Based on the identification of the scientific problem and the formulation of the hypotheses, the following **research objectives** were defined:

1. To professionally present the land operations of the war from the perspective of infantry units at the tactical level.
2. To examine and analyse the factors ensuring success, assess how they have changed, and determine what is now required to achieve them.
3. To analyse tactical and operational-level military operations and evaluate how the new battlefield conditions influence the application and success of tanks and other armoured

vehicles.

4. To examine and evaluate the role of commanders and their influence on tactical and operational-level land operations.
5. To compare the observed effects and newly identified TTPs with the capabilities of the HDF and develop specific proposals for organizational and procedural adjustments for its infantry sub-units.
6. On a personal level, my goal is to replace the currently inconsistent training principles — shaped by the preferences of the leadership at any given time — with a standardized, scientifically grounded system of TTPs, where the latest field experiences play a central role.

3. RESEARCH METHODS

To achieve the research objectives, I employed both general and specific research methods. Among the general methods, I applied observation, analysis, and critical application, while among the military science-specific methods, I utilized, organized, and evaluated the experiences I had gained on shooting ranges, training areas, and during international peace-keeping and combat deployments.

Specifically:

- Content analysis of printed materials, scientific publications, regulations, journal articles, and studies related to the topic.
- Analysis of information from internet-based and other electronic databases related to the subject.
- Systematization and scientific processing of my own professional experience.
- Examination of specific military events, taking into account the warring parties' objectives, deployed forces, and physical conditions, then comparing these with the relevant regulations.
- Analysis of military organizations, decision-making processes, and TTPs.
- Comparative evaluation of the battlefield performance of military equipment.

Tasks performed to achieve the research objectives:

- I analysed and assessed the events of the war in the scope of my thesis, evaluated the land operations, and identified key turning points and phase boundaries.
- I examined which type of military equipment and decision-making or TTPs were used and with what results by the infantry forces of the belligerents.

- I reviewed current regulations to determine the effectiveness of TTPs based on pre-war principles.
- I analysed how new military technology changed the effectiveness of existing equipment and TTPs.
- I assessed the alignment between HDF regulations and successfully applied procedures.
- I reviewed how incoming new military technologies from the HDF's development program could be regulated and what new lessons the war has revealed.

To clarify key concepts and definitions, I used written sources. However, due to the rapid development of military technologies and the fast-paced development of combat events, frequent use of internet sources was essential for describing events. Based on my findings, I drew conclusions that provide a foundation for further research and are practically applicable, grounded in both domestic and international experience.

During the analytical work, I first focused on tactical-level force structure, specifically the Battalion Tactical Group (BTG) as the basic unit. Then I evaluated the effectiveness of the TTPs used in the initial operations. I presented the ideal scenario and then, referencing the operations, demonstrated what actually happened. The main scientific sub-result was identifying the causes behind the deviation between ideal and actual outcomes.

Terrain has always fundamentally influenced the character of operations and the expected results of certain procedures. As I did not conduct a comprehensive military-geographical analysis of the invasion, I evaluated the terrain for each analysed battle individually. Given the variety of operations and procedures, even the same terrain element could have different effects depending on the time period and the composition and combat style of the units involved. Therefore, I refrained from making overly general claims.

4. SUMMARY OF CONDUCTED RESEARCH

- To achieve the research objectives, I performed the following tasks:
- I reviewed and evaluated the events of the war to date, examined land operations, and identified key turning points and important operational phase boundaries.
- I analysed how infantry forces on both sides applied different types of military equipment and decision-making or TTPs, and assessed the effectiveness of their application.
- I reviewed the current military regulations governing such operations to determine the extent to which TTPs based on pre-war principles were effective.

- I evaluated how new military technologies have altered the effectiveness of previously used equipment and procedures.
- I assessed how current Hungarian Defence Forces (HDF) regulations align with those procedures that were successfully applied during the war.
- I investigated what existing regulations could be used for the application of new military technologies being acquired through the force development program and identified new lessons learned from the war.

5. SUMMARY CONCLUSIONS

Examination of the Scientific Problems

Problem 1: This represents the most substantial portion of the dissertation. Using open-source materials, I reconstructed the events, created map sketches for major operations, and processed infantry unit activities in sufficient detail between February 24, 2022 and February 24, 2024 to address the research problems and test the hypotheses. I presented the tactical-operational level ground operations of the full-scale invasion's first two years in Hungarian, with scientific rigor and within the scope of a doctoral dissertation.

Problem 2: Solved. I introduced the newly emerged military and dual-use technologies during the studied period and analysed their effects on the operational and tactical activities of infantry units.

Problem 3: Solved. I demonstrated how the technologies and effects identified in Problem 2—particularly concerning fire control and manoeuvre—impacted infantry operations in various types of engagements.

Problem 4: Partially solved. Building on Problem 3, I examined the key factors that enable the HDF and other European armed forces to continue manoeuvring effectively in a sensor-saturated, altered battlefield geometry, thus avoiding entrapment in a war of attrition.

Problem 5: Partially solved. A dissertation cannot fully resolve this issue, as revising military regulations requires a fixed procedural process. However, I offered detailed recommendations in Chapter 6 for updating the organizational structures and core offensive and defensive tactics of mechanized infantry squads, platoons, and companies—especially concerning regulations Ált./59, Ált./55, and Ált./54, which provide a solid foundation for such updates.

Testing the Hypotheses

Hypothesis 1: Proven. By analysing open-source materials, I was able to identify the underlying causes of specific military events. This allowed me to reveal the current and near-

future requirements of warfare and formulate the basis for a modern training, preparation, and organizational framework.

Hypothesis 2: Proven. Analysis of battles and engagements revealed the causes of victories and how each side adapted its actions to the changed conditions of the battlefield to achieve success.

Hypothesis 3: Partially proven. In a sensor-saturated battlefield, only those operations proved successful where the attacker could establish force and asset superiority over the defender. Unit spacing must be increased due to enhanced observation and fire control capabilities, as battalion-sized formations are highly vulnerable to effective fire strikes. To concentrate forces, it is essential to protect them from the enemy's superior surveillance and fire control. Without achieving this, forces must disperse into smaller sub-units with increased spacing. Achieving surprise and neutralizing sensors is essential to creating superiority — yet this is becoming increasingly difficult and requires further research.

Hypothesis 4: Proven. By evaluating the operations and the quality of command activities and military decision-making processes, I clearly demonstrated that in the absence of decisive qualitative or quantitative superiority, the key success factors are the quality of applied tactics, commanders' and staffs' preparedness and situational awareness, and soldier morale.

Hypothesis 5: Proven. The examination of operations allowed me to present concrete development proposals for infantry units throughout Chapter 8 of the dissertation, as well as identify future research directions.

Assessment of Research Objectives

Objective 1: Achieved. I professionally analysed and presented land operations from the perspective of infantry sub-units for the studied period.

Objective 2: Achieved. In summary sections concluding each invasion phase and in Chapter 8, I identified the key factors behind the success or failure of operations.

Objective 3: Achieved. Through evaluation of operations conducted in sensor-dense environments, I demonstrated new application methods for tanks and armoured vehicles and the conditions for their effective use.

Objective 4: Achieved. The role of commanders and their influence on tactical and operational-level land operations was successfully examined and evaluated.

Objective 5: Partially achieved. The volume of changes and new effects uncovered during the analysis of operations revealed such profound and far-reaching transformations that their full evaluation requires additional research.

6. NEW SCIENTIFIC RESULTS

During my time as a doctoral candidate at the Doctoral School of Military Science and while preparing this dissertation, I arrived at the following research findings:

1. I was the first in Hungary to comprehensively and systematically analyse the first two years of ground military operations of the full-scale Russian invasion. In my research, I not only assessed the events but also applied a methodical and scientifically grounded approach to analyse the temporally and geographically expansive operations. As a result, I identified the war's characteristic periods and developed a new segmentation model based on objective criteria and the specific features of land operations.
2. By examining the defining characteristics of each operational phase, I uncovered the decisive factors and causal relationships behind them. My research demonstrated that the failure of the initial Russian invasion, the success of Ukraine in the autumn of 2022, and the current attritional phase of the war are all shaped by identifiable strategic, operational, and tactical factors. Through their systematic analysis, I revealed new interdependencies and insights into the dynamics of modern land warfare.
3. Through detailed analysis, I identified which battlefield variables triggered a fundamental transformation in the tactics of infantry units and which factors remained unchanged. My research brought a new perspective to changes in battlefield geometry and demonstrated how these changes influence the deployment and employment of infantry sub-units.
4. I developed a new categorization of the tactical procedures of infantry sub-units, which enables the modernization of tactical regulations and training procedures. Based on my research, I determined which offensive, defensive, and supplementary activities of infantry sub-units were effective, which need to be adapted due to changing battlefield variables, and which failed due to non-compliance with pre-existing regulations. Based on my findings, I classified offensive, defensive, and supplementary combat activities into three main categories. (1) Procedures to be retained without any changes. (2) Procedures to be adapted to changed battlefield conditions. (3) Procedures requiring entirely new tactical solutions. This new system can clearly support the modernization of operational and tactical doctrines and the training systems of both Hungarian and allied forces.
5. By examining the battlefield impact of military command systems, I identified the role of command structures and decision-making mechanisms in the success of land operations. Through detailed case studies, I demonstrated how the organizational structure, workflows, and command practices of military staffs affected tactical and operational outcomes.
6. I formulated concrete recommendations for the development of modern military leadership

models and the transformation of the HDF staff system as it pertains to the infantry arm. Based on the facts uncovered in my research, I proposed specific and clear recommendations for the restructuring of HDF infantry sub-unit organization and equipment. I made concrete proposals for restructuring infantry section squads to ensure real combat capability. I also proposed the integration of drones into the organizational structure and outlined principles for their use at platoon, company, and battalion levels. Furthermore, I made concrete recommendations for reorganizing infantry battalions (including BTGs), brigades and their headquarters to account for the newly identified battlefield effects discovered during my research.

7. PRACTICAL APPLICABILITY OF RESEARCH RESULTS AND RECOMMENDATIONS

In line with the original goals of the dissertation, I have formulated several concrete recommendations that serve both the advancement of scientific discourse and practical applicability.

From a theoretical perspective, the dissertation provides a solid foundation for the comprehensive examination of the war. Although my research focuses on ground operations during the first two years of the Russia-Ukraine war from the perspective of infantry sub-units, the characteristics of conventional warfare make these findings indispensable for the strategic and operational interpretation of the entire conflict. The analyses conducted enable the launch of broader research covering the entire war, including long-term operational trends and the continuous evolution of warfare.

One of the most important scientific outcomes of the dissertation is the clear identification of the distinct phases of the full-scale Russian invasion. Through detailed analysis of the dynamics of warfare, employed tactical procedures, and decisive influencing factors, I identified four distinctly separate periods. Within these periods, I uncovered the fundamental conditions that determined the success or failure of military operations. Precisely delineating these periods not only provides essential background knowledge for further study of the war but also offers valuable insights for other academic fields—such as security policy analysis, military history, and strategic planning.

The practical applicability of the research is especially relevant to the land components of armed forces, particularly mechanized infantry and armoured sub-units. The conclusions presented in the interim summaries and especially in Chapter 7 can be directly applied to the evaluation and necessary revision of tactical procedures. The phenomena explored in Chapters

7 and 8, along with the proposed responses to them, contain practical advice that can be incorporated into the HDF infantry sub-units' training system. The proposed organizational and procedural changes outlined in the dissertation can be implemented individually, allowing for the gradual modernization of training and tactical processes, thereby contributing to the development of operational and tactical capabilities.

Recommendations for the Theoretical and Practical Use of the Dissertation

In accordance with the original goals of the dissertation, I propose the following:

Comprehensive examination of the war: Although this dissertation examines only a limited time frame (the first two years) and a specific subject (ground operations from the infantry sub-units' perspective), it provides a strong basis for a much broader study covering the entire war. As this is a conventional conflict, understanding the war's objectives, their evolution, and the overall course of the conflict fundamentally requires the analysis carried out in this dissertation.

Theoretical Utility: I have successfully identified the periods of the full-scale Russian invasion by examining the dynamics of operations, characteristic TTPs, and the defining circumstances. These four periods, along with their underlying military conditions, provide indispensable knowledge for future investigations—both chronologically and across other related research areas.

Practical Utility: The findings in the partial summaries and the entirety of Chapter 7 are suitable for use by the land forces—especially mechanized infantry and armoured sub-units—for evaluating and adjusting their own tactical procedures.

Tactical Adaptation: The phenomena described in Chapters 7 and 8 and the proposed solutions to them offer practical guidance. The recommendations regarding the tactics and organizational structure of HDF infantry sub-units can be incorporated into training individually, enhancing adaptability and practical relevance.

A highly recommended research direction is the examination of the ideal organizational structure of the armoured infantry sub-unit equipped with the recently fielded Lynx IFV. As part of a new study, I propose evaluating its combat effectiveness via VR-based tactical training simulators, followed by live training exercises and finally, combat simulations including live-firing exercises. If the sub-unit performs inadequately in a sensor-saturated battlefield, I recommend adapting its structure based on the impacts identified in my research and retesting it. Naturally, this process must be conducted at all levels of sub-units.

Another essential future research direction involves testing the drone-related findings from my dissertation. As with the armoured infantry sub-units, this research should follow a stepped methodology — beginning with simulators, followed by tactical exercises, and culminating in

live-fire training — with feedback loops used to integrate the results continuously.

Due to the limits of the dissertation and my own expertise, I strongly recommend that another researcher — preferably with an artillery background — conduct research and testing on my proposed changes to the organization, equipment, and employment of company- and battalion-level artillery units, particularly mortar sub-units.

RELEVANT PUBLICATIONS OF THE AUTHOR

- Kocsi János Gyula – Takács Márk: The impact of the war in eastern Ukraine on Russian-Chinese relations In: A hadtudományok időszerű kérdései, tudományos kutatási eredményei 2021.: Ludovika Egyetemi Kiadó, (2021)
- Takács Márk: A kelet-ukrajnai háború szárazföldi katonai műveleteinek bemutatása. In: Pohl Árpád: Biztonság és honvédelem: Fenntartható biztonság és társadalmi környezet tanulmányok 2. Budapest: Ludovika Egyetemi Kiadó, pp 1443-1463 (2020)
- Kovács Levente – Takács Márk: Clausewitz's Small War in the 21st Century. REVISTA ACADEMIEI FORTELOR TERESTRE / LAND FORCES ACADEMY REVIEW, vol. 27, no. 2, pp. 1–9, 2022.
- Marlok Tamás – Takács Márk: VR Training Opportunities in Hungarian Defense Forces. AARMS Vol.23, No 2 (2024) 19-37.
- Marlok Tamás – Takács Márk: Preparations for VR Tactical Training Simulator Efficiency Measurements AARMS Vol.23, No 2 (2024) 5-17.
- Takács Márk: The Kharkiv Offensive : The View from the Commander's Sight – A Case Study. DEFENCE REVIEW: THE CENTRAL JOURNAL OF THE HUNGARIAN DEFENCE FORCES 151 1-2 pp 34-69 (2023)
- Takács Márk: The Neo-Methodist Warfare : Dawn of a New Age? AARMS Vol. 22, No. 2 (2023) 67–81.
- Takács Márk: Short Study: describing the major features of the Russian Battalion Tactical Group. AARMS Vol. 20, No. 2 (2021) 49–65.
- Takács Márk: Short Study: Describing the Major Features of the Russian Battalion Tactical Group Based on their Performance on the Battlefield. HADTUDOMÁNY: A MAGYAR HADTUDOMÁNYI TÁRSASÁG FOLYÓIRATA XXXIII. ÉVFOLYAM, 2023/3. pp 47-63.
- Takács Márk: Az orosz–ukrán háború hadműveleti és harcászati műveletei. In: Jójárt Krisztián – Takács Márk – Nagy Artúr: Az orosz-ukrán háború tapasztalatai I. Védelmi Tanulmányok 2024/1. NKE

CV OF THE AUTHOR

Márk György Takács was born on 15 February 1992 in Nyíregyháza, Hungary. He is married.

He began his higher education studies in 2010 at the Miklós Zrínyi National Defence University, Faculty of Military Technology (Bolyai János Faculty), BSc in Military and Security Technology Engineering. After the first semester, he transferred to the Faculty of Military Sciences (Kossuth Lajos Faculty) and continued his studies in the Military Leadership BSc. He graduated in 2014 with a specialization in Mechanized Infantry.

After his commissioning, he served in Debrecen as a platoon and company commander. In 2019, he was assigned to the Joint Operations Department at the Faculty of Military Science and Officer Training of the National University of Public Service as a practical instructor. From 2022, he worked as an assistant lecturer at the university. Meanwhile, between 2018 and 2020, he obtained the Master's Degree in International Security and Defence Policy at the same institution in a correspondence format.

He gained operational experience in two international deployments: in Iraq as a platoon commander, and in Kosovo as a deputy company commander.

In 2020, he was admitted to the Doctoral School of Military Science at the National University of Public Service. The topic of his dissertation developed during his command assignments and master's studies, with the related scientific research beginning during his university years. His first scientific results were recorded in his master's thesis, and since then, he has published one scientific paper in Hungarian as a sole author, four as a sole author in foreign languages, two as a co-author in Hungarian, and four as a co-author in foreign languages, amounting to a total of 26.20 publication points.

He passed his comprehensive doctoral examination on 15 June 2022 and completed his absolutory on 31 August 2024. He holds advanced-level (C1) certification in English and intermediate-level (B2) in French.