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The challenges of military decisionmaking in the context of multidomain operations and Artificial Intelligence

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Contents

1. THE JUSTIFICATION OF THE TOPIC AND THE OUTLINE OF THE SCIENTIFIC PROBLEM

One important component of the effective employment of military forces is their equipment and level of training, but a suitable decision-making system is equally important for the success. Historical examples show that in some cases effective decision-making can even compensate for numerical disadvantage. However, there is no ultimate, perfect decision-making method: their effectiveness depends on a number of factors, including force structure and design, organizational culture, technology, and location. Given the complexity and ever-changing nature of the world, our current procedures cannot be regarded as permanently good, even if there is no apparent evidence of any factor that might justify the need for change. Even if a decision-making procedure is perfectly appropriate for a given organisation, a given situation, at a given time, it is by no means certain that it will be equally appropriate in other circumstances: effective decision-making methods that have been tried and tested in the past may fail even when there are only minor changes in the circumstances, and therefore they need to be continually improved and revised. However, the resulting modified or newly developed methods are not necessarily better: they are created by people who may make mistakes or work according to the wrong logic.

Two potential drivers of change can be identified that may afferct the current Hungarian military decision-making system laid down in our regulations: the development of Artificial Intelligence and the concept of multidomain operations. The one cannot be separated from the other: both are based on the competition for data and information, making AI a key player in the command and control of multidomain operations. We are living in the era of the fourth industrial revolution, which is different from the previous ones in that changes are occurring at an ever faster pace. New technologies are changing so rapidly that it is almost impossible to keep up with them and to adopt them more widely, because by the time a technology is fully introduced in a field, it may have become obsolete. The main focus of the fourth industrial revolution is data and access to it, and this has a decisive impact on the art of war. New technologies will inevitably induce changes in the structure and methods of military organisations, so it can be argued that the successful application of new technology can only be expected from reformed structural elements. Although we talk of an industrial revolution, the changes brought about by technology in the military are not so sudden and radical: they have been going on for a longer period of time at an ever higher technological level, as I will try to argue in my thesis.

The basic reason behind my choice of topic was my professional experience of 16 years spent at the units and headquarters of the Hungarian Defence Forces: the systemt and methods of command and control did not always follow the organisational changes, nor were they greatly affected by the changes in the equipment or the military application of the advanced technological tools already commercially available. During my service at the Joint Forces Command of the Hungarian Defence Forces, I had the opportunity to familiarize with the NATO operational planning process, and to participated in operational planning courses, training and international exercises abroad. I was able to gain a closer insight into the implementation of operational planning of the Bundeswehr and the Hungarian Defence Forces and, I was involved in the development of the NATO's Graduated Response Plan for Hungary. During this time I gained a lot of experience in the field of operational planning, but as it is a very complex and complex system of processes, I am by no means an expert. I have, however, realised that operations planning and management is an area that must have a priority in development, keeping them at the highest possible technological level, and training their methods, as it is the only way to ensure that the existing force can be used effectively.

The operational environment is ever-changing. To develop its concept of operations for the future, the United States Army has identified the expected trends and key "disruptive technologies" that could induce radical changes in our daily activities. Of these technologies, quantum technology and Artificial Intelligence have the greatest potential to influence military planning and leadership. Given the level of technology development, it is currently the Artificial Intelligence that I consider more important and will be investigating. Artificial Intelligence is present in various forms in all smartphones, in many other electronic devices, on many websites, i.e. it is inescapable, and people use it unconsciously in their everyday lives. The thesis and the research behind it are not of a technical nature, I do not focus on the technological aspects of Artificial Intelligence, but on its possible targeted application, primarily from the perspective of the operations planner / potential user, I present what an ordinary operations planner knows and thinks about artificial intelligence at present, what he expects from it, all this based on literature that can be digested by 'technological outsiders'. The primary aim of the research is not to develop AI applications, but simply to assess what the field is capable of and where it is heading. As the technology develops, it is certain that planning and the command and control systems will be increasingly permeated by AI, but the extent of this cannot be known at the present.

However, the changing technology is only one of the new challenges, the changing world is constantly shaping conflicts and can create situations where traditional, well-established approaches are not effective enough, they cannot model reality adequately. In our modern world, continuous improvement of our procedures is also essential, one direction is the concept of multidomain operations, which has become an important element of NATO's Joint Force Doctrine. NATO's search for a new way forward at the end of the Cold War, its involvement in peace support and then counter-insurgency operations, have all gradually influenced the way the Alliance views warfare, the operational environment and the role of military forces. The novelty of multidomain operations lies not primarily in the creation and introduction of new elements, but in rethinking the relationships between existing elements, making extensive use of new technologies.

Through my experiences in previous assignments, my reading of literature and professional discussions held with fellow operations planners from various nations, I have come to realize that the current perception and approach to operations planning is not uniform neither within NATO nor in the various military organizations and commands of the Hungarian Defence Forces. The reasons for this are, on the one hand, the different organisational culture, level of training and experience of each nation, armed forces and even units, and on the other hand, the fact that the available national regulations are sometimes considered outdated, partly due to organisational changes and partly due to the update of NATO procedures and concepts that occurs from time to time. In the absence of a uniform interpretative framework, operational planners who have already finished various national and international courses and served in various posts are trying to use their own knowledge and experience to interpret the ambiguities found in the Hungarian national regulations and fill in the gaps they have identified. These attempts are usually local and specific to a single department. Such attempts to find solutions without reviewing and revising the regulations only deepen existing problems. Operations planners, having acquired procedures from different nations or different commands, may interpret certain steps of operations planning in radically different ways and build up different sets of procedures from the same doctrinal basis. I feel that an important criterion for the effective application of the Hungarian Defence Forces is that our operational planning procedures should be as uniform and as up-to-date as possible, that their processes should meet the challenges generated by the changing security challenges of the 21st century and, of course, that they should be linked as closely as possible to NATO's operational planning procedures at the appropriate level. In my thesis, I cannot address operations planning at all three levels of operations, primarily due to space constraints and secondarily due to lack of competence and experience at the military strategic level, and will therefore I will focus on joint/operational level and tactical level operations planning.

As a research problem, I identified that the military decision-making processes are lagging behind the changes in the technical environment and approach to operations. We had to review the currently used adaptations of operations planning procedures originated in the Anglo-Saxon countries that are defined in our regulations, especially in the perspective of that we currently use, as defined in the regulations, need to be reviewed from the perspective whether there is any room for improvement in the application and exploitation of technical achievements in their application. The basic focus of the research is the current state of Hungarian operations planning and its current long-term unsustainability. The subject of my research is whether there is a need for change in the current Hungarian military decision-making methods, whether and how artificial intelligence can be integrated into the operations planning of the Hungarian Defence Forces, and what changes the concept of multidomain operations can bring to the Hungarian Defence Forces.

2. HYPOTHESES AND RESEARCH OBJECTIVES

In the first subchapter, I identified as a research problem that military decision-making is lagging behind the changes in the technical environment and in the approach to operations, and therefore the current state of Hungarian operations planning system cannot be sustained in the longer term, if the effects of Artificial Intelligence and the concept of multidomain operations are taken into consideration.

During the analysis of the research problem, I have formulated the following hypotheses:

1. Military decision-making processes are being shaped by professionals, taking into account the military necessities and the recent research findings from other disciplines, in particular decision theory.
2. In the complex system of military operations planning, which permeates all levels of war, the structural, procedural or technological changes at one level of operation must necessarily generate changes at other levels.
3. At its current level of maturity, Artificial Intelligence can be reliably integrated already into the decision-making processes and operational planning of military organisations.
4. The multidomain operations is an innovative approach that requires a completely new outlook and organisational structure at all levels of implementation.

Based on the above, I will answer the following research questions:

1. Is the design of military decision-making processes in line with the basic principles of decision theory and management science?
2. Are the operations planning procedures applied at the different levels of war align to each other, and does organisational change or the emergence of new technology trigger a change in procedure?
3. What is the state of development of the Artificial Intelligence and are there any obstacles to its use in operations planning?
4. What does the concept of multidomain operations mean and what concrete changes does it bring to the planning of future military operations?

By proving the hypotheses and answering the research questions, I will fulfil the following research objectives:

1. I will examine the extent to which military decision-making conforms to the general principles of decision theory and identify the unique characteristics of military decision-making.
2. I will analyse the operations planning procedures used in NATO and the Hungarian Defence Forces and examine the circumstances of their development.
3. I will assess the potential of using AI-based tools in operations planning and determine whether AI can be reliably and effectively applied in operations planning.
4. I will examine the circumstances of the emergence of multidomain operations, their theoretical foundations and identify the aspects of multidomain operations relevant to the Hungarian Defence Forces.

By achieving the above objectives and answering the research questions, the research aims to contribute to the modernisation of the operations planning culture and procedures of the Hungarian Defence Forces, and to the development of educational materials for Hungarian professional military education.

3. RESEARCH METHODS

I had to narrow down my research at a very early stage: the decision-making processes at the military level are so complex and could involve legal aspects to such an extent that their study would take away the focus of the research. My professional experience comes fromt the tactical and operational levels, and it was therefore logical to examine these levels only. I have adopted a joint force approach in examining military decision-making and operations planning methods, while

focused on the specifics of the land force as presented. The main reason for this, apart from my professional background, is primarily that the multidomain operations root in the land forces.

The research methodology used in the thesis was drawn from two sources, one is Earl Babbie's The Basics of Social Research, and the other is István Gőcze's work on the conduct of scientific research. Data collection was carried out using document analysis and literature review methods, examining original primary and secondary sources. The data obtained was then analysed using non-intrusive research methods: content analysis and historical/comparative analysis. At various stages of my work, I have used my personal observations in the field of operations planning, which I gained during my former assignments and various studies. My research is essentially an applied research: it focuses on the possibilities of using the results of Artificial Intelligence and multidomain operations in operations planning. In the thesis, I have processed a relatively large number of Hungarian and foreign doctrines and policies, but the ongoing, significant developments and research are classified. Consequently, I have not had access to the most recent data, nor have I been able to use the data that I have had access to previously. For this reason, it is possible that information may come to light after the thesis has been finalised that may cast doubt on my findings or, in the worst case, invalidate them. This is not a problem for the completion of the thesis as the research objectives can still be achieved despite these factors.

During the presentation of operations planning, multidomain operations and partly also the Artificial Intelligence, I strived to use deduction to map and present causal mechanisms, as an explanation of the outcome. To examine why current processes are the way they are and how they are interrelated, I consider it essential to analyse the notions in depth and to identify trends. In order to do this, throughout the thesis I place great emphasis on clarifying the different concepts, analysing their meanings, what each concept means in common usage and what in the context of the thesis. Our present reality, whether we consider it technologically or doctrinally, is the current stage in a process, and therefore, in order to show its trends and expected evolution it is not possible, nor is it appropriate, to avoid an examination of the historical context. In the book of essays written in memory of Miklós M. Szabó, retired Lieutenant General and Academician, Professor László Kovács asks the question: "is it possible to research the future without knowing the past"? His answer is that research into the past and study of the future must be linked. In writing my thesis, I have taken the same position, and I have found in several places that the processes of the recent past have a major impact not only on the present, but also on future events.

In the context of the applicability of artificial intelligence and multidomain operations, I will examine whether the Hungarian Defence Forces currently – theoretically – have the necessary conditions for successful application. For this purpose, I will use the DOTMLPF-I framework used by NATO, which can help to identify the necessary systemic changes that need to be implemented within the Hungarian Defence Forces.

The original DOTMLPF is a framework for military capability development that has been in general use for the last decades and, like many other theoretical tools in the military domain, its use can be traced back to the United States of America. When the Joint Capability Integration and Development System (JCIDS) was created, the resources required to create joint capabilities were labelled as doctrinal, organisational, training, material, leadership, personnel and infrastructure resources, and they were abbreviated to DOTMLPF. This analytical framework was later adopted and extended by NATO, but in the meantime it was also further developed by the United States armed forces. Both solutions extended the DOTMLPF framework, but in different ways.

At the time of writing, the latest abbreviation for the version of the US force that has been further developed is DOTmLPF-P. The "m" in this abbreviation, which indicates material factors, is lower-cased in comparison to the others because it is intended to emphasise that the focus of development should not be on the creation and introduction of new equipment, but on maximising the capabilities of existing equipment and developing it. The letter 'P' at the end of the acronym stands for 'policy', as this component looks at the national and international policy regulatory requirements for the effective deployment of the capability.

In contrast to this approach, NATO, after adapting the DOTMLPF, has extended it to its own needs and uses the DOTMLPF-I format. The "I" stands for "interoperability". Interoperability is of paramount importance for NATO, since the Alliance's military force is made up of the military forces of its member states, and their uninterrupted cooperation is a prerequisite for effective joint action. Although the two frameworks are largely identical and marginal differences do not fundamentally affect the overall result, I will use the NATO DOTMLPF-I framework for the analysis because of our country's NATO membership. Accordingly, I will analyse the doctrinal, organisational, training, material and equipment, leadership, personnel, facilities and infrastructure, and interoperability capability areas.

4. RESULTS OF THE RESEARCH

At the beginning of my research I identified the relative static nature of military decision-making procedures as a problem, and I intended to focus on Hungarian operations planning procedures. In order to provide the necessary context, I aspired to present the theoretical foundations of the procedures as well as their actual practical development and evolution. One of the basic research questions was whether there is a need for change in the current Hungarian military decision-making methods, or are the ones currently in use sustainable and acceptable? In case of required change, I wanted to investigate whether and how Artificial Intelligence can be integrated into the operations planning of the Hungarian Defence Forces, and how the concept of multidomain operations could bring about change.

In the first half of the first chapter, I introduced the general principles of human decision-making to provide a general knowledge base for military decision-making and operational planning. I have clarified the concept of a problem and presented a derivable problem-solving model. I have pointed out that a problem is a subjective category, the same objective reality can be perceived by observers as either a normal state of affairs or a problem to be solved, in the light of their own interpretations and perceptions. I have described a general decision-making process which, in its main steps, mimics typical military decision-making processes. I have pointed out that there is no such thing as an absolutely good decision, because in every real decision situation there are a number of incalculable, unknown elements that limit the rationality of decisions. I have outlined the differences between individual and group decision-making and the main advantages and disadvantages of group decision making. I have pointed out that the accumulated knowledge of groups, which is in all cases more than the knowledge of the individual, can multiply the group's performance under appropriate group dynamics, while under the influence of inappropriate, or misapplied group mechanisms (e.g. peer pressure) the group's performance is below the performance of its members as individuals. I have drawn attention to the phenomenon of group norms, which are internal regulators that define the functioning of the group and regulate the behaviour of group members. I have emphasised the importance of group size, which has a direct impact on group effectiveness, and I have presented the characteristics of an effective group. The nature of decisions is largely determined by the preparation, skills and experience of the decision-maker, in addition to the circumstances of the decision space. The timeliness of decisions to a large extent is aided by the simplification processes in the brain, the so-called heuristics, whose importance must not be underestimated.

I have separated the role of the commander and the staff in military decision-making. I have found that although the commander, as a single leader, is responsible for making decisions, more complex problems in higher echelons are best solved by their staff. I have described the process of the development of the currently known military staff system and its application at different operational levels. In relation to the activities of the commander, I briefly described the origins of mission command and its adaptations to Hungarian regulations so far. I described the basic principles of mission command as a leadership philosophy and some of the pitfalls of its application. I analysed the emergence and development of the comprehensive approach. I pointed out that the comprehensive approach was originally a political construct that later took on military content and suggested a possible definition: the comprehensive approach is a philosophy that promotes the effective use of available military, political and civilian capabilities to achieve political objectives by coordinating the activities of national, international and non-governmental actors in the operational environment, both in the planning and execution phases.

I scrutinized the decision-making cycle in Hungarian ground operations doctrine and in select NATO doctrines, clarified its origins and traced it back to the so-called "OODA loop" created by John Boyd. I drew attention to the dangers of the speed of decision-making, which can be counterproductive: a decision based on more information and taken just in time can be preferable to a series of decisions taken quickly but without sufficient justification.

I have described the frameworks currently used to implement operations planning at different levels. I have examined how the methodology of operations planning has evolved historically and found that it is based on the old process of the commander's assessment of the situation. I described the operational and combat level decision/operational planning processes used in the Hungarian Defence Forces and their origins. I have pointed out that these processes were not selected and adopted on the basis of a systemic approach. The processes adopted by the Hungarian Defence Forces were developed in the early 2010s and as such are quite old, and at the time of their development the main focus of NATO and US forces was counterinsurgency operations. Overall, I found that the Hungarian operations planning procedures were based on and designed with NATO and US land forces processes in mind but have remained unchanged in the years since their domestic introduction: they have neither been updated nor modernised, and they do not always interface seamlessly with the procedures of NATO allied commands. The experience gained in various courses abroad or in various international operations has influenced the operations planning procedures of individual formations and even of individual sub-units. In order to achieve meaningful progress and to move to a higher level, a common and uniform set of procedures without questioning

is needed. Once this is done, the key to effectiveness remains the readiness and capabilities of the executive staff, which can be developed through exercises and training

In the second chapter I presented some important aspects of Artificial Intelligence are in connection with the military decision-making. I started with the problem of conceptualising Artificial Intelligence, the classification of it in different aspects, and a brief historical overview. I presented these from the perspective of operations planning and command and control. I pointed out that a connection exists between the development of Artificial Intelligence and its military application from its very beginning. I have discussed the potential impact of the application of Artificial Intelligence on military decision making. I have described the concepts of "hyperwar" and mosaic warfare, which anticipate that the decision cycles currently in use will have to be shortened as a result of the application of Artificial Intelligence. With or without applying these concepts, the use of Artificial Intelligence can have a fundamental impact on military decision-making. This will result in a competition in decision-making, which we can call decision-centric warfare. In this, both sides want to make decisions faster than the opponent in order to seize and retain the initiative. The quality and "goodness" of decisions may also depend on the Artificial Intelligence engaged, so it will be important for all parties to continuously improve the quality of their technology and integrate the latest developments as soon as possible. This competition may lead to the use of untested technologies and tools to achieve the hoped-for advantage, or even to the expense of ethical guidelines in the face of a convulsive development imperative.

I have identified the main processes that are part of the decision-making process at the command post and that will be affected by the application of Artificial Intelligence. I have concluded that command posts relying only on human resources or traditional computer-based solutions will not be competitive compared to those using Artificial Intelligence. At the same time, I have shown that the use of Artificial Intelligence does not necessarily imply a reduction in the size of the command post but may even lead to an increase in staff numbers due to the technical requirements and the need of specific training.

I have drawn up a set of requirements, the elements of which I believe are essential for the effective integration of Artificial Intelligence into the command and control system of military organisations. These requirements are:

- the continued availability of the necessary hardware, including the possibilities of replacements;
- the availability of stable, redundant communication channels;
- the availability of appropriate expertise, including reinforcements;
- maintaining conditions for safe operation.

During my research, I have identified some of the points where Artificial Intelligence has the potential to change military decision-making: the efficient, timely processing of massive amounts of data; the ability to provide timely, rapid analysis and recommendations; the facilitation of automated decision-making; the transformation of unit tasking; and the emergence of new command structures. These potential changes will have a profound impact on the way soldiers perform their tasks, either in planning and command in the staffs or in execution in the area of operations. This unanticipated or uninvited interaction also raises ethical issues. I have presented the current internationally developed ethical guidelines and governing legal standards for Artificial Intelligence, which have so far only been developed as recommendations by relevant international organisations, recognising the inherent dangers of the technology. As these guidelines and standards are recommendations, there is currently no organisation to enforce or monitor compliance with them, nor is there any possibility of real retaliation. In the case of AI for military use, ethical and legal standards are also fluid, with no clear boundaries as to when and in which situations the protection of human life is paramount.

I have found that the reliability of Artificial Intelligence is based on both its underlying algorithms – its programming – and the reliability of the data it is loaded with. The decisions and recommendations made by machines will only be as correct and accurate as their underlying programming allows: if the algorithm designed to solve the problem is flawed, then so will the problem-solving. Avid proponents of AI technology may argue that AI can find new algorithms, new solutions, and this is true. But the initial algorithm that creates the new algorithms is a human creation, it is not independent of its creator's thoughts, knowledge, heuristics, and therefore carries the potential for all human error. Therefor what is programmed by a human being will have the potential of human-bound error in it for good, and consequently a machine programmed by a human-programmed machine has this potential risk.

I have pointed out that the responsibility of applying Artificial Intelligence, the use of the results obtained by Artificial Intelligence, in turn, entails a moral and ethical responsibility that cannot be placed on a machine or the creator of that machine. The use of decision support or even decision support systems based on Artificial Intelligence is a useful and important aid and complement for some of the tasks of operational planning or management, but it cannot replace human supervision, control and final decision. Relying on machine decision/recommendation without human supervision is unsafe. In an accelerating operational environment, in the emerging era of decision-centric warfare, the speed of reaching a decision may be offset or even negated by the inherent fallibility of the decision. I have pointed out that a decision/proposal made by Artificial Intelligence tends to be accepted as a good solution by a higher percentage of human operators/decision makers in complex decision situations regardless its real value. However, this

tendency may, in the long run, jeopardise professionalism and the traditional order of acquiring military experience, with consequent serious sacrifices.

Perspective decision systems based on artificial intelligence, which are already partially implemented, can assess the situation by analysing information in near real time, assign tasks to available forces/equipment and provide the commander with a real-time augmented reality-based situational awareness. Individually, these capabilities are disruptive to that command and control system, in particular to the principles of mission command. The more accurate and complete the common operational picture is available to the superior commander, the better it is modelled or even supported by augmented reality, the greater is the temptation for the superior commander and his staff to micromanage the subordinates, since they have a better view of things beyond the task at hand than the one who is fighting. On the one hand, this goes against the principles of mission command, but on the other hand, it is a logical use of the information available. I pointed out that this dilemma could generate serious ethical and professional debates, and that the Hungarian Defence Forces must be prepared for this new situation. I have pointed out that Artificial Intelligence-based command and control and mission command can coexist for a while at the current rudimentary level of technology, but the envisaged future Artificial Intelligence-based command and control systems will not allow the implementation of mission command philosophy, at least not in the way and form it is currently applied.

I have analysed the areas that need to be improved in order to effectively apply AI in planning and leading military operations. These areas, requirements, are time and resource intensive issues that need to be addressed as soon as possible so that when the time is right – i.e. when available and effective systems are available – the application of AI can begin as soon as possible.

In the fourth chapter, I described the concept of multidomain operations, which is an upgraded version of the joint operations based on the requirements of the 21st century. I considered it essential to clarify the related concepts, the evolution in the meaning of the different phrases over the years, since the same concepts and terms can have different meanings from concept to concept. I found that the translation of the concepts into Hungarian, as in the case of the operations planning, was not entirely successful. I have proposed a change in the translation of operational environment in the Hungarian terminology database.

I scrutinized the concept of domains. I have found that the use of the phrase has been inconsistent over the past decades, but with the publication of NATO's Allied Joint Doctrine in 2022 this situation seems to normalize. Analysing the Hungarian translations of the various terms, I found that they do not fully correspond to the originally intended meaning, and therefore I proposed a change in terminology. I proposed proper translation for the English word “domain” and the phrases

“multidomain”, “cross-domain” and “all-domain”. However, in military use I do not recommend translating “multidomain” to Hungarian, partly because of the existing terminological confusion and inconsistencies, and partly because of maintaining interoperability and emphasizing the real meaning of the term.

I have pointed out that multidomain operations are innovations primarily in the areas of command and control and operations planning, and do not fundamentally change the actual combat or operational activities. The five operational domains that we use today are the complement of the traditional domains of land, sea and airspace with the two newly available domains that became available through the advances in technology: space and cyberspace. After clarifying the related concepts, I have followed the historical evolution that has led to the emergence of multidomain operations, including the initial version of the concept that was incorporated into NATO doctrine in December 2022. I described some aspects of modern joint operations. I found that the US concept of multidomain operations does not differ markedly from the NATO accepted concept of multidomain operations. In each case, the essence of conducting the operations is the same: to seek synergy of effects resulting from the activities of capabilities located in different domains, or to challenge the enemy's command and control system with multiple challenges at the same time, thereby overwhelming and paralysing it. I have pointed out that the concept of multinational operations is based on the principle of multinational cooperation and assumes that the different nations will be able to link their forces and assets into a common network, which at the same time imposes heavy requirements.

I have analysed the joint all-domain command and control system envisioned in the concepts of multidomain operations, and the recent results of available relevant research. These suggest that command and control methodologies and system of command posts require major changes to meet the requirement of multidomain operations, including the integration of Artificial Intelligence-based decision support and decision systems to the command posts. This will require the development of a real-time communication system that allows the data collected by various sensors to be collected, interpreted and forwarded to the relevant users. I have pointed out that the central element in a multidomain operation conducted by NATO standards is the data, and also the interoperability, connectivity and integration of assets belonging to different services. I have defined the tasks and the main objectives of the processes that are necessary for the development of the capabilities required by NATO. I described the challenges facing the Alliance, that can be obstacles to the realization of full multidomain compatibility. I pointed out that the Hungarian Defence Forces, as a part of NATO's military force, have to do everything in its power to ensure that our technological level, and particularly in command and control technology, does not diverge far from the level of NATO

headquarters. In the last part of the chapter, I analysed the areas in which the Hungarian Defence Forces need to make improvements in order to get closer to the conduct of multidomain operations.

5. SUMMARIZED CONCLUSIONS

At the beginning of my research, I set out four hypotheses. In the light of the above results of the thesis, three of these were partially confirmed and one was clearly refuted.

My first hypothesis is that military decision-making processes are constantly being shaped by professionals taking into account recent research findings from other disciplines, in particular decision theory, in addition to military imperatives. In the chapter on the general principles of decision making, I have explored the general theoretical principles of decision-making and decision models, and thus demonstrated that the decision-making processes used by NATO and the Hungarian Defence Forces are consistent with them. However, I also revealed that the procedures used by the Hungarian Defence Forces on different operational levels were not introduced on the basis of their compliance with the scientific requirements of decision theory. In terms of the processes currently used, they are simply a transposition of the processes used by our Allies without any source-critic, so that their decision-theoretical validity depends on the work of the designers of the original processes. I have demonstrated that changes in procedures are primarily indicated by military doctrinal or organizational changes. In my research, I found no evidence or indication that any changes in the processes were made purposefully to incorporate the results of another disciplines. I consider my hypothesis to be partially justified, because while general practice shows that NATO and US military decision-making procedures were developed using and in accordance with the results of decision theory, no such intention can be clearly identified in the case of the procedures outlined independently by the Hungarian Army or subsequently adopted from others.

The second hypothesis assumed that in the complex system of military operational planning that permeates all levels of warfare, structural, procedural or technological changes at one level of operation must necessarily generate changes at other levels. In this dissertation, I have analysed the circumstances of the development and evolution of the NATO and Hungarian operations planning processes currently in use, as well as the system of operational planning and the processes related to the different operational levels. In the light of what has been discussed, it can be stated that organisational, procedural and technological changes do not automatically result in changes in the processes, and in a significant number of cases even the justified changes fail to take place, or happen only after a long delay. Depending on these findings my hypothesis is not proven to be correct.

According to my third hypothesis, at its current level of development, Artificial Intelligence can already be reliably integrated into the decision-making processes and operational planning of military organisations. In the chapter on Artificial Intelligence, I have described in detail the current areas of application in which various militaries are already using Artificial Intelligence-based applications and tools. At the same time, I have made it clear that these systems can only be used to perform certain subtasks under human supervision so far. I therefore consider this hypothesis to be partially justified.

My fourth hypothesis was on multidomain operations and stated that multidomain operations is an innovative approach that requires a completely new approach and organizational structure at all levels of execution. Demonstrating multidomain operations I made it clear that although the concept of multidomain operations is new, it is not a revolutionary approach as an evolution of overall Army operations. During my research I found that the current organisational structure of the Hungarian Defence Forces is suitable for conducting multidomain operations with minor changes only. Regarding the multidomain approach, I found that multidomain tasks can be interpreted and executed by expanding the approach of joint operations, but currently the joint approach is not integral part of the force culture, especially at the tactical level. Considering these I believe that my hypothesis is only partially justified: a new approach is needed, but a drastic change in the organisational structure can be avoided.

6. NEW SCIENTIFIC RESULTS

1. I have demonstrated that the operations planning procedures currently in use in the Hungarian Defence Forces, as laid down in existing regulations and standing procedures, are not fully coherent and harmonised with each other. I have formulated proposals to eliminate the incoherence.
2. I have demonstrated that the importance of mission command will change due to Artificial Intelligence-based command and control tools and the concepts of multidomain command and control. In conjunction with this, I conducted a DOTMLPF-I analysis, which resulted in determining how Artificial Intelligence can effectively be integrated into the command and control and operations planning of military organisations.
3. I have created Hungarian translations of the terms related to the concept of multidomain operations, and proposed revisions of existing definitions and clarifications of existing terms accordingly.

4. I have demonstrated that the introduction and application of multidomain operations to the Hungarian Defence Forces requires not structural, but conceptual and attitudinal changes primarily.

7. PRACTICAL APPLICABILITY OF RESEARCH AND SCIENTIFIC RESULTS, RECOMMENDATIONS

The different results shown in this thesis can be used in several areas. The most important area of application is in professional military education. The development, interrelationship, theoretical considerations and the events that induced the development of operations planning have not been presented in such detail and context in any other Hungarian-language material to which I have had access to. The chapters of the thesis could serve as a good starting point for the development of new educational materials and lecture notes, thus modernising the teaching of this important element of military science.

In this thesis I have demonstrated that although the operational planning procedures used by the Hungarian Defence Forces form a system, they need to be revised in the light of new NATO principles and procedures, and the emergence of new technologies and theories. This review should optimally be part of a complex doctrinal reform, which is justified not only by changes in Allied doctrines but also by changes induced and predicted by the current force development and modernisation programme of the Hungarian Defence Forces. During a doctrinal review, in addition to incorporating the principles of multidomain operations, it is advisable to take the changes in NATO's operational planning processes into account, to move the current operations planning system from its current hybrid composition towards NATO doctrines, and, where appropriate, to develop national procedures – here I refer to company and platoon-level decision-making. The procedures at the military strategic level and operational-level headquarters should be brought into line with NATO principles, and national specificities should not justify to change the processes, only complement them. From the current MDMP based decision-making at the tactical level, I propose a transition to the NATO TPLF, which would not result in major methodological differences, but would bring the workflows closer to NATO standards instead. At the same time, the procedures of countries with considerable operational experience should be taken into account and used to develop abbreviated operations planning procedures that will help time-pressured staffs and commanders to avoid being at a decision-making disadvantage vis-à-vis the enemy.

Communicating the new principles and procedures to a wide professional audience requires up-to-date knowledge in professional courses at different levels, in specialised further education

courses and in master's courses. To this end, it is proposed to ensure the continuous professional training of the educational staff, who are part of professional military education. This professional training could take the form of participation in regular capability development conferences organised by NATO ACT, participation in courses and further training at various NATO and NATO-accredited training institutions and, of course, regular participation in the professional training and exercises of the Hungarian Defence Forces.

In the thesis I proposed a clarification of terms in the Hungarian military terminology database. In connection with this, I consider it advisable to review the entire terminology and to revise it if necessary. The Hungarian terms, that are traditional or considered traditional do not always correspond perfectly to the meanings that their English equivalents have. At present, this is particularly true in the case of Hungarian light infantry tactics based on the American model, but the terminology of operations planning can be reasonably revised. Obviously, the translation of German terminology into Hungarian will be a similar problem in the near future, especially if adherence to tradition continues to take precedence over the creation of an effective and clear conceptual system.

Regarding the use of Artificial Intelligence, I propose a more centralised and focused use of resources. It is trivial that the Hungarian Defence Forces will never be able to compete with the armies of economically stronger states, and the various fields of professional military education will not achieve breakthroughs any faster than research teams in American or Chinese universities. As a layman, instead of fragmenting resources by standalone projects I believe it is advisable to run a research and development programme grounded on a well thought-out, comprehensive plan based on the real needs of the Hungarian Defence Forces, and considering their feasibility. I have proposed the establishment of a central training centre for Artificial Intelligence, which could provide effective assistance to the staffs of the various military organisations in learning about the possibilities of new technology and existing systems, and contributing to their development.

The heuristic DOTMPLF-I analyses I carried out in this thesis cannot be taken as tasks to accomplish. Their professional content is obviously questionable, since they are only made through the lens of a common operations planner, each specialised area should be reviewed by a separate group of experts to get a true picture. Nevertheless, the analysis itself may provide methodological guidance or its findings may be worthy of consideration by a professional team actually carrying out the analysis.

In the development of the command and control system, and possibly in the development of new national procedures, particular attention should be paid to the possibility of speeding up the decision cycle. However, the benefits of speeding up the decision cycle can only be felt for a limited period of time. When this turns into a disadvantage is a matter for further empirical research.

If we are adopting the command and control procedures of NATO or another ally, the process of adaptation must pay particular attention to the common starting point. The starting point must not be the things that should exist and work, but what we have and how they work. If new concepts are developed without the necessary foundations and conditions, based on projected future changes or on an assumed false reality, they will almost certainly not stand the test of time.

8. THE AUTHOR'S RELATED PUBLICATIONS

1. Fazekas Ferenc, "AI and Military Operations' Planning," in Artificial Intelligence and Its Contexts, 2021, pp. 79–91.
2. Fazekas Ferenc, "Az átfogó műveletтervezés kialakulása és fő jellemzői," in Biztonság és honvédelem, 2020, pp. 1345–1384.
3. Fazekas Ferenc, "Mesterséges intelligencia az átfogó műveletтervezésben," in A hadtudomány aktuális kérdései 2021, 2023, pp. 57–70.
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9. BIOGRAPHY OF THE AUTHOR

Lieutenant Colonel Ferenc Fazekas was born on 11 September 1980 in Püspökladány, Hungary. Married, father to two sons.

He began his higher education in 1999 at the Miklós Zrínyi National Defence University Faculty of Military Science, on military leader specialisation. He graduated in 2003 as a mechanized infantry lieutenant. After graduation he began his service in Hódmezővásárhely as platoon leader and company commander. In 2011 switched his position to brigade operations officer. In 2016 he became operations planning senior officer at the Hungarian Defence Forces Joint Force Command. He graduated from the U.S. Army Infantry Officer Basic Course in 2006, and attended the U.S. Army Scout Leader Course. In 2018 he completed the Comprehensive Operations Planning Course at NATO School Oberammergau. He graduated as senior military leader in 2023. He has expanded his professional experience five times in peace support operations, as platoon leader in Bosnia, company commander in Afghanistan, deputy chief of operations section in Afghanistan, liaison officer to KFOR JOC in Kosovo, and the Hungarian Contingent's chief of operations Iraq.

He obtained his masters degree in military sciences in 2019, and following this he was assigned to be an auxiliary instructor at the National University of Public Service Faculty of Military Sciences and Officer Training Department of Joint Operations. On 01 August 2020 he became full-time instructor and in September he was assigned to the Department of Military Strategy as assistant lecturer. He began his doctoral studies in 2020 at the Doctoral School of Military Sciences. He formulated his thesis based on his previous experiences of his assignments, and started his research while continuing his university studies. His first scientific results were recorded in his master's thesis, and consequently he authored 12 Hungarian and 4 English standalone articles, and co-authored 2 others, with a total sum of 61.70 publication points. He was awarded with ÚNKP scolarship in 2020, 2022 and 2023. He took his complex exam on 15th June, 2022. He recieved his leaving certificate on 09th July 2024. He has advanced level exam in English and intermediate level exam in Latin.