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# Application of Artificial Intelligence in Military Operations Planning[1]

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*The military operations planning is one of the major functions of military staffs. The increasing complexity of the contemporary operating environment requires new approach to the understanding of the situation and realisation of a viable plan. The aim of this paper is to scrutinise the potential usage of future Artificial Intelligence tools in the process of military operations planning. The main question is whether Artificial Intelligence in its current state can be applied in military operations planning. To answer this question the paper provides a short overview of military operations planning, a summary of military-related Artificial Intelligence research and existing solutions, then identify criteria and field of application for future Artificial Intelligence-driven tools. Analysing the topic gives some insight into this possible way of increasing the effectiveness of the planning groups, thus contributes to finding more effective solutions for emerging complex and comprehensive problems.*

**Keywords:** *operations planning, artificial intelligence, planning tools*

## Introduction

A major theme of the contemporary scientific literature is the application of Artificial Intelligence (AI) in various fields of our daily activities. AI must be viewed in the context of human intelligence, as originally it was the role model the researchers tried to copy. The human intelligence can be divided into three levels, such as the computational, perceptual and cognitive intelligence.[3] In the computational and perceptual area of intelligence computers tend to be faster and more thorough due to their speed and the applied algorithms. To excel in the cognitive area is a greater challenge.

The military will not be spared from the long-standing effects of AI. Some of the very first research were funded by the military in the hope of getting the upper hand of the potential enemy. The most trivial usage of AI in the military is in the autonomous

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[3] Imre Négyesi – Péter Török: The Relationship between Human Intelligence and Artificial Intelligence I. *American Journal of Research, Education and Development,* no. 2 (2020). 7–10.

weapon systems that can detect and destroy the enemy all on their own, without human supervision. Semi-autonomous weapon systems need a human in the loop for giving orders and/or authorisations, providing supervision. One widely known example of the semi-autonomous weapon system is the Block II version of the Tomahawk cruise missile from the 1980s that used a rudimentary AI called Digital Scene Matching Area Correlator to navigate.[4] Various kinds of robots, self-driving equipment, intelligent ammunitions are only a few examples where the defence industry research and development budget goes throughout the world. Besides these, the AI has great potential to provide aid in the planning and execution phases of military operations.

From the 1960s on, the United States and the Soviet Union tirelessly worked on automation of the battlefield systems. They fielded huge computer systems to aid command and control of forces on the field. These early systems struggled and failed mostly because the expectation of the military could not be fulfilled by the actual state of technology at the time.[5] With the technological boom since the 1980s the situation has changed. The battlefield command and control systems are flourishing and the acquired know-how provides a solid basis for the introduction of new technologies.

Contemporary military operations planning is becoming more and more complex, it must take enormous amount of factors into consideration. Advanced command and control systems are providing unprecedented levels of data for the commanders and staffs. Given its ability to get the most out of the available data in a short time, AI may be the solution to lay out sound plans amidst this complexity. But can Artificial Intelligence be applied in military operations planning in its current state? The aim of this paper is to examine the impact AI has and will have on military operations planning.

In this first section of this paper I will summarise the long process of the evolution of AI research. The contemporary hype for "thinking machines" turned out to be early optimism, and research continued to reach more realistic ends. As AI algorithms and methods evolved so did the military planning methods, on which I will elaborate in the second section. In the last decades of the 20th century the holistic approach changed the operations planning processes, requiring new analyses and new ways of thinking to develop plans. As the amount of work required to make a reasonable plan increased, using sophisticated computer applications in the planning was considered. Several early AI-driven computer programs were developed to facilitate operations planning, which I will present in the third section. In the last section I will highlight the trends and possible future applications of AI in the military operations planning. As this research field is continuously progressing and the military applications are mainly considered secret, this article provides only a snapshot of the current open-source data available via document analysis method.

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[4] Geoffrey B. Irani – James P. Chirst: Image Processing for Tomahawk Scene Matching. *Johns Hopkins APL Technical Digest*, 15, no. 3 (1994). 250–264.

[5] For more information see Elizabeth A. Stanley: *Evolutionary Technology in the Current Revolution in Military Affairs: The Army Tactical Command and Control System.* Carlisle, Strategic Studies Institute, 1998; Imre Négyesi: A csapatvezetési rendszerek automatizálásának első eredményei az USA fegyveres erőinél I. *Hadtudomány*, E-szám (2015). 139–151.

## The overview of military operations planning

Planning is an indispensable task of every organisation. Before conducting any activity, thorough preparation is required which is governed by planning. Operations planning is an activity conducted by military organisations at all three levels of war.[6] Its content and tasks vary at each level, a strategic-level operations planning differs from the tactical-level operations planning mainly in the focus of the planning. At tactical level, the planning focus is on the utilisation of available troops and assets to achieve the assigned mission, while at the strategic level the primary focus is to identify military ways to achieve the political ends. The link between the strategic and tactical level is provided by the operational level, which translates the comprehensive strategic-level objectives to operational-level objectives and identifies executable tasks for the assigned tactical units. Therefore, in a planning process the strategic and operational levels, and the operational and tactical levels work closely together to devise a plan. The planning method can be sequential, parallel or collaborative depending on the time available and on the staffs executing it.[7] Besides, there are two main philosophies along which the planning processes and leadership methods developed. One is the Western-style approach, the other is the Russian-style.

In the Western-style method the commander is a central figure, but he has a staff to assist in decision-making. This method empowers the staff with the responsibility of making assessments, recommendations and developing different courses of action from which the commander will choose the most appropriate one. NATO offers a framework that provides the foundation for the operations planning. This commonly agreed and scientifically proven approach of planning is called the Operations Planning Process. It consists of seven key activities, these in sequence are: the planning initiation, the mission analysis, the course of action development, the course of action analysis, the course of action validation and comparison, the commander's decision and last, but not least the plan development. These planning activities have a lot of subordinate activities, which must be accomplished to achieve the aim of the planning activity.[8]

Planning methods on different levels of war or of different nations may vary in the actual execution, but the logic of the planning and the outcome is set by the Operations Planning Process framework. For example, the NATO Tactical Planning for Land Forces process is a ready-to-use process designed for NATO tactical headquarters. It follows the scheme of the Operations Planning Process as it has seven main steps, too: the receipt of mission, the mission analysis, the course of action development, the course of action analysis, the course of action comparison, the commander's decision and the order production, dissemination and transition. There are some differences in the names of the steps, but the governing idea behind them is the same.[9] The Military Decision-Making Process in use by the United States Army has the same number of steps with slightly different names, but the essence is the same. The NATO's operational level planning – detailed in the

6 NATO Standardization Office: *AJP-5 Allied Joint Doctrine for the Planning of Operations, Edition A, Version 2.* 2019a.

7 For more information see NATO Standardization Office (2019a): op. cit. Chapter 2.

8 NATO Standardization Office (2019a): op. cit. 4-1.

9 NATO Standardization Office: *APP-28 Tactical Planning for Land Forces, Edition A, Version 1.* 2019b. 1–7.

Comprehensive Operations Planning Directive – has different phasing and naming than the Operations Planning Process, but the main ideas are unchanged: the mission must be analysed, courses of actions must be developed and after the decision a plan must be made.

This Operational Planning Process and its implementations have several shortfalls nonetheless. First, the understanding of the superior command's task, the mission analysis is a time-consuming process in which all the staff functional experts are engaged. Failure to grasp the problem and the mission correctly may lead to wrong solutions or some time-wasting reanalysis of the situation. If the commander disapproves all courses of action, the staff has to work on new ones, which is also time-consuming and probably goes under time pressure. If any of the functional experts on the staff has deficit in their knowledge of their nominated fields, then hidden flaws may spoil the planning from very early stages on. While the teamwork approach that the Western-style planning uses tries to capitalise on the common knowledge of the planning team, the result is not always acceptable. The sum of the team members' knowledge is more than the knowledge of the commander's alone, but frictions, misunderstandings among the team and misconceptions about the mission can easily go wrong and jeopardise the effort.

We do not know the current Russian decision-making process in detail, but there are some hints about how it looks like. In the Russian-style approach the commander is the one who decides how he wants to accomplish the mission, figures out the broad course of action while the staff only helps to develop it in detail. It is a kind of commander's estimate, in which the commander devises the plan after analysing the situation, and later conducts terrain reconnaissance to verify the plan's viability. Parallel with this leader's recon, the staff begins the process to verify the plan and adjust it if possible. Once finished, the order is issued to the subordinates. Prior execution intensive preparations and reorganisations may occur. This process is pretty straightforward, concise and requires less time than the Western one.[10]

Realising the relatively short time required for the Russian-style decision-making and building on the lessons learned from the continuous engagements of the previous decades, U.S. and NATO thinkers came up with methods to shorten their planning processes. The NATO Tactical Planning for Land Forces process suggests that under time pressure the details of the courses of action should be reduced to make the analysis and comparison faster.[11] The United States Army Military Decision-Making Process proposes several solutions in time-constrained environment, one being the method when only one course of action is developed by a small team led by the commander. Conducted this way, the process unintentionally becomes very similar to the Russian one.[12]

With detailed knowledge of these planning processes one may find that there are three steps which require significant amount of time: the analysis of mission, the course of action development and the course of action analysis. These steps include several other processes that have to be conducted in order to get a sound and executable plan. The

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[10] Roger N. McDermott – Charles K. Bartles: *The Russian Military Decision-Making Process and Automated Command and Control.* Hamburg, German Institute for Defence and Strategic Studies, 2020. 29–32.

[11] NATO Standardization Office (2019b): op. cit. F-1–F-3.

[12] Department of the Army: *FM 6-0 Commander and Staff Organization and Operations.* 2014. 9-44–9-46.

inherent part of mission analysis is the analysis of the operating environment. During this task the factors of the enemy, the terrain and the surrounding environment must be taken into consideration which requires thorough and time-consuming analyses. The course of action analysis step usually features some kind of wargaming, meaning that all the actions that must be taken during the execution should be modelled to identify possible shortfalls or collisions.

## Existing AI tools in operations planning

It is well beyond the scope of this work to define what AI is. There are several approaches to grasp the very essence of AI from different points of view, such as reasoning or behaviour.[13] In terms of this work, AI is considered a branch of computer science, which deals with automation of activities such as data processing, problem-solving and decision-making. As such, AI can only be conceived in a digital environment.

The very origins of AI can be bound to military activities. In the early stages, military funding fuelled the research in the hope of achieving cutting-edge technology to maintain superiority over the enemy. As already mentioned, semi-autonomous and autonomous systems are high-visibility areas of AI research, their results can be dazzlingly demonstrated. The algorithms which support operations planning may be very similar to those of the autonomous systems, but they are less spectacular and receive less publicity. Most of the AI research fields can be connected to some military applicability.

The initial research of AI research projects ran in research labs and universities, partially funded by different governmental institutions, with the military providing a significant fraction of the sum. Funding was mostly available to projects which promised real-life applications in a reasonably short term. Expert systems emerged, which were specific applications designed to solve one specific problem, thus its AI component was limited to a well-defined problem set, and in cases even the hardware component was designed specifically for that problem. Market players joined the enthusiasm and started to fund AI driven expert systems in the hope of potential financial benefits in the long run. As the hardware requirements of a would-be universal AI became evident, efforts were made to build a new generation of computers that are able to work parallel on different problems. These new multi-processor workstation systems were built specifically for applying AI, and contributed a lot to the research. This, and breakthroughs in computer technology seemed to bring the achievement of true AI closer. The ultimate goal of AI research is a computer that could act and think at least as well as a human does. It is almost consensual that this goal is not achievable with the current possibilities.[14]

As the new era of great power competition emerges in present days, the United States, China, and the European Union invest billions of dollars in AI research.[15] While this

[13] Stuart Russel – Peter Norvig: *Artificial Intelligence.* Englewood Cliffs, Prentice Hall, 1995. 4–5.
[14] Nils J. Nilsson: *The Quest for Artificial Intelligence.* New York, Cambridge University Press, 2010.
[15] Neil Savage: The Race to the Top among the World's Leaders in Artificial Intelligence. *Nature,* 10 December 2020. S102–S104.

research contributes mainly to the industrial and economic fields, military also has a part in it. It is often a beneficiary of technologies developed for civilian usage, and AI can also be a good example for this.

The military operations planning is feeding on information which is required to make a bold and executable plan. Therefore, the main areas for utilisation of AI are the information gathering activities, the so-called Intelligence, Surveillance and Reconnaissance (ISR) and the Target Acquisition (TA). Expert systems have great use in logistic planning. When considering the actions required for the desired effects one must take into consideration the use of AI supported system in the fields of Cyberspace Operations and Information Operations. When the execution of the plan or the preparation for the execution starts, AI supported Command and Control systems may provide an invaluable contribution to the successful operation.[16]

The strengthening private sector was the new impulse AI needed. In the United States and the Western world influential players from the industry achieved new levels in research and progress that the military tried to leverage. Ethical concerns aside, some private companies cooperated with the United States military, notably Google, whose expertise was paramount in setting up the so-called Algorithmic Warfare Cross-Function Team of the Department of Defense, or shortly Project Maven in 2017. The aim of Project Maven was to develop an AI driven system that can help with the military intelligence efforts against terrorist and insurgent groups. The focal point was processing, exploiting and disseminating tactical footage and full-motion videos made by Unmanned Aerial Systems. It is able to detect and classify objects, and provide alerts for specific cases.[17]

Project Maven was a success as it helped identifying potential insurgents and terrorists during the Defeat-ISIS campaign in Iraq and Syria. Google soon abandoned the project due to the concerns of its employees regarding the ethics of AI's military use. Several major United States private companies followed suit and stated that they restrain themselves from the promoting of AI's military application. Companies in the rival powers of the United States, for example in China, are not known to have been making such vows. It is likely that the country which cares less of the ethic of AI application will gain more, at least in the military field. Face recognition algorithms engaged by China to control the population is somewhat questionable on an ethical level. Face recognition to identify potential enemy fighters on the other hand has invaluable benefits.[18]

As the new wave of AI researched started in the 1980s with the introduction of the workstation concept, the decade-long Strategic Computing Program project of the United States made a lot of contribution to the AI research. As a side project Natural Language Processing was evolved, resulting in a usable speech-recognition software.[19] The Natural Language Processing evolved via neural networks and achieved some great feats. In 2015 a Chinese, a year later a United States based private company achieved efficient speech-

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16 Daniel S. Hoadley – Kelley M. Sayler: *Artificial Intelligence and National Security.* Washington, Congressional Research Service, 2020. 9–16.

17 Pentagon: *DoD Memorandum.* 2017.

18 Forrest E. Morgan et al.: *Military Applications of Artificial Intelligence.* Santa Monica, RAND Corporation, 2020. 25–26.

19 Nilsson (2010): op. cit. 370–371.

recognition. By now reasonably good machine translations have become available for various languages and even smartphones can be directed by voice commands. Analysing large amount of enemy radio communication and phone call recordings to get important operational information or to identify important persons is not a dream anymore. All of these applications can be exploited by the military intelligence cell of any staff that can afford them.

As for logistic planning there are already systems in the militaries that can aid in planning the maintenance periods and need of individual equipment. The United States Army and the Air Force use these kinds of expert systems to optimise the maintenance costs and times. Speaking of troop movements and operations, in the 1980s the Strategic Computing Program was the origin of the Dynamic Analysis and Replanning Tool (DART), which was a decision-support application for logistic planning using AI algorithms at its core. It was applied in the planning phase of Operation Desert Storm in 1990, and was capable of identifying the logistic requirements of moving military equipment from different locations into the theatre of operations. This application was a success and saved a large amount of money and time. Based on this success a new application was developed called Joint Assistant for Development and Execution (JADE). Its aim was to conduct make force deployment plan for conventional conflicts, including timings for deployments. Its counterpart, the Survivable Adaptive Planning Expert (SAPE) was an application designed for planning nuclear war, although the system's development was stopped after the fall of the Soviet Union.[20]

Parallel with these efforts a new project had been running in order to create a decision assistant system for operational level planners. This was called Project ARES and had several optimistic goals, such as automated terrain analysis, situational analysis and course of action generation. Due to the limits of the computers of the 1980s, this project could not fulfil the expectations and was cancelled shortly.[21] This resembled the fate of early planning algorithms. In the course of the 1970s, several algorithms were developed that could be able to devise plans for achieving objectives with the help of predefined actions. Though they were only applicable to well-defined problems, increasing complexity diminished their feasibility. Since then it became obvious that the current level of AI is incapable of generating options which can cope with the complexity of the real world.

In cyberspace operations human cognition is too slow, AI support is needed. In 2016, a so-called "Cyber Grand Challenge" was funded by the United States military to test the possibilities of AI-enabled cyber tools. The demonstration showed that AI algorithms can autonomously detect, evaluate and patch vulnerabilities before they could be exploited by an adversary with incredible speed. Besides the speed, the demonstration proved that the same tool can be a defensive or an offensive asset at the same time. AI is not only capable of processing video, photo and audio but it can also manipulate them, producing

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[20] Theo Farrell et al.: *Transforming Military Power since the Cold War.* New York, Cambridge University Press, 2013. 51–52; Nilsson (2010): op. cit. 373.

[21] William A. Branch: *Artificial Intelligence and Operational-Level Planning: An Emergent Convergence.* Fort Leavenworth, U.S. Army Command and General Staff College, 2018. 28; Gerald M. Powell et al.: Artificial Intelligence and Operational Planning. *Army Research, Development and Acquisition Magazine,* 28, no. 1 (1987). 27–29.

fake reports, which can be a powerful asset in the informational operations. Detecting and countering these deep fakes is getting harder as the algorithms improve, thus AI must be engaged to check the validity of any source.[22]

The Russian and Chinese militaries also improve their capabilities, especially in the command and control. Speeding up the process from target identification to commence firing is a priority task for the Russian army, as demonstrated in the conflict with Ukraine during 2014. When applying even primitive AI to the targeting process, the effectiveness of indirect fires can be multiplied and sped up on a previously unconceivable scale. This kind of expert systems are confirmedly being fielded for the Russian army.[23] The Chinese military is also actively developing its AI capabilities. The Chinese concept of the future's "intelligentised warfare" requires swift decisions and precise actions, both to be achieved by applying AI assets. Several projects are ongoing in China to improve the command and control of military forces, but details are mainly kept in secret. One publicly known example is upgrading the system of nuclear submarines with AI, thus improving the decision-making ability of the commander and decreasing the cognitive load of the crew.[24]

## Potential effect of AI on future operations planning

The future of operations planning is being decided today as works progress in different countries to apply AI in different sections of the planning process. In present days, the United States military is working on potential command and control support systems, such as the Joint All-Domain Command and Control (JADC2), which aims to centralise planning and execution of operations across all domains, i.e. land, air, sea, space and cyberspace. It is clear that all major military powers, i.e. the United States, China, Russia realised that the potential of AI in decision-making must be leveraged. Contemporary research, development and field testing in progress are paving the way for the near future's intelligent and upgraded decision-making.

Although the requirements of enabling AI systems may vary depending on the field of application and the country and military arm applying it, some common criteria can be identified. First, planning or planning support AI must be able to do its task in almost real-time, let it be analysing data, or even generating a course of action. Second, output information must be interchangeable with other AI systems as well as human planners, so the output must be clear, concise and understandable for planners without special knowledge in information technologies. Third, the process the AI applies must be transparent to make human planners understand the way it reached the decisions. This last criterion is arguably the most important one: the machine should be able to explain its way of thinking.

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22 Hoadley–Sayler (2020): op. cit. 11–12.

23 Peter Layton: *Fighting Artificial Intelligence Battles.* Canberra, Australian Defence College, 2021. 55.

24 Elsa B. Kania: Chinese Military Innovation in the AI Revolution. *The RUSI Journal,* 164, no. 5–6 (2019). 26–34.

The operating environment is a complex entity by its very nature, and new challenges make it successively more complex. The AI in its present state works similarly to human cognition: splits complex problems to solvable subproblems. Although the chaotic nature of the operating environment full of complex adaptive systems makes it almost impossible to predict what will happen next, but at least there are attempts. Taking the operations planning into consideration the mission analysis, course of action development and the course of action analysis are the most time-consuming steps which can be sped up and enhanced by applying AI.

During the mission analysis, no matter what level of war we are talking about, the most important step is the understanding of the operating environment. As for NATO on the operational level this process is called the joint intelligence preparation of the operating environment, on the tactical level it is the intelligence preparation of the operating environment. (For the United States these are joint intelligence preparation of the operational environment and intelligence preparation of the battlefield respectively.) This analysis provides information about the adversary and the terrain that must be taken into consideration when forming the plan. There are two factors that constrain the analysis: the information available and the time available. The amount of data retrieved in a contemporary operating environment is so large that human analysts are not able to cope with it in time. AI based expert systems will be more and more competent in translating the relevant data into information, this way facilitating timely decision-making.

Devising courses of action is a process that builds up on the information retrieved during the analysis of mission. The AI already showed its ability to process data fast and reliably, so applying an AI-driven course of action generator is a possibility. These systems will be more ready to provide different points of view based on their perception of the situation depending on the experience they gained from previous assignments. Sophisticated expert systems must select the information to avoid overloading the human planners, whose cognitive capacity must be focused elsewhere. Detailed real-life terrain information can be used to create 3D models and with AI tools they could be used to plan courses of action, providing aid in determining fields of fire and lines of sight. Applying a database of previous engagements, manoeuvers, and exercises could empower a decision-support tool to suggest courses of action depending on previous successful examples.

The analysis of courses of action consists of several tests, in which the different own and enemy courses of actions are played against each other. An accepted method for the analysis is the military wargame, a regulated process that is "a simulation of a military operation in which participants seek to achieve a specified objective, given pre-established resources and constraints".[25] Depending on the size and scope of the operation, these simulations are time-consuming. Similarly to the AI that potentially can be applied to create courses of action, the analysis, i.e. the wargaming process can be sped up by using purposefully designed AI systems.

As already highlighted, time is indisputably an important factor in planning. In the highly technologised operating environment every moment is precious, the speed of

[25] NATO Standardization Office: *AAP-06 NATO Glossary of Terms and Definitions (English and French) Edition 2021*. 137.

decisions can be the key to the success. This is the main topic of the envisaged decision-centric warfare.[26] When the information is available, the time for processing it and producing orders for subordinates is precious. Whoever can reduce the time between the steps of the Observe–Orient–Decide–Act decision loop will have advantage over the adversary. AI can help in highlighting available assets in short time, devising solutions for troop movements, fire missions, can speed up combat power calculations and can make recommendations for tasking troops. Development of branches and sequels to plans could be easier with the help of such systems mentioned before.

The United States armed forces are currently contemplating the idea of multi-domain operations. The key of the concept is multiple effects from different domains concentrated in time and space to disrupt and overload adversary command and control systems. Planning these effects and finding that very point in time when these effects must be massed against the adversary is such a delicate process that it requires assistance from decision support systems powered by AI.

Tasking troops, requesting information and processing voice reports could be achieved by the reliable speech recognition and Natural Language Processing AI. These measures can speed up the command and control of any operation on any level. Command and control of ongoing operations and the assessment function attached to it could be made quicker. If the continuous assessment function during the execution identifies decision points then automatic pre-programmed decisions could be made, identified and executed by autonomous or semi-autonomous AI. The same 3D model engaged for visualising the terrain could be used for tracking the flow of events and highlighting potential hazards.

Installing and incorporating AI decision-support systems not only helps in speeding up the decision loop, but some also see it as a way to reduce the number of personnel in the headquarters. While using AI speeds up things, specialists for maintaining and handling it are still required, which may mean a slight increase in the personnel, since a staff must be prepared to fulfil its mission without the AI, so existing specialists should not be dropped from the roster. Another requirement for the various kinds of AI is electricity. Computers running these calculation-heavy applications require large amount of electric power that is not likely to be permanently available in the field. If it is to be done, then it could increase the electromagnetic footprint of a field headquarters to an extent which may make it impracticable. In the near future operational level and higher headquarters are more likely to use AI tools than the tactical level ones due to this constraint. Further improvements in miniaturisation, accumulators and quantum technology may have the potential to remove this caveat. Another solution can be the outsourcing of data process and using AI tools deployed in a remote location, but this requires constant and reliable protected communications. Achieving this is a tough challenge.

Albeit AI has several potential uses and promises high returns in relatively low costs, there are setbacks implied. By allowing the AI to sort out data and produce relevant information no one can be sure whether important data is left out. One solution could be the explainable AI, which means that while it uses its obscure machine learning neural

[26] Bryan Clark et al.: *Mosaic Warfare: Exploiting Artificial Intelligence and Autonomous Systems to Implement Decision-Centric Operations.* Washington, Center for Strategic and Budgetary Assessments, 2020. 17–25.

networks to produce results, the operators could follow what logical reasoning led to the decisions. AI of this kind is still under development.[27] The electromagnetic output, the required space and the increased communication could give away the location of the field HQ making it an easy target.

On the other hand, there is the human factor. It is questionable whether a human staff officer or commander would willingly accept recommendations or facts from an AI if they cannot understand via which methods that recommendation was found and on what facts it was based. Current research suggests a relatively high confidence in algorithms to crowd advice when a task becomes difficult.[28] This may mean that the internal work of the Western military staff that is currently based on cooperative work may be biased when AI comes into play. Also trust in AI will most likely depend on personal experiences during trainings and operations. If there is no trust between man and AI, then it will jeopardise the mission and the lives of people.

The development and engagement of AI raises several other questions. There is currently no international legal regulation to set the limits of the AI. Without constraints imposed by regulations ethical concerns may rise, such as it happened with the Google employees already mentioned, and adherence to universal ethical values cannot be forced. Enforcing globally accepted regulations can also be a challenge in case of an AI, whose working methods and motives behind decisions are not quite clear.[29]

## Conclusion

The past experiences show that there always were great expectations regarding the potential impact of the technological improvements, but the actual technology usually fell behind in meeting these expectations. Commercial players tend to hype their products and since the AI development became a profitable enterprise, hyping is overflowing the media. There is a potential risk in overestimating the capabilities of available AI assets. Current AI technologies do not involve high-level reasoning. They do not think. They are not capable of the same kind of semantic representations and inferences that humans are capable of. They are not able to reason abstractly about real-life situations. But they excel in finding patterns and processing data.[30] Leveraging their existing and proven capabilities and restraining from expecting the impossible are the key for the successful application of AI in operations planning. Operations planning has to be sped up, has to be made more

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27 Sherrill Lingel et al.: *Joint All-Domain Command and Control for Modern Warfare*. Santa Monica, RAND Corporation, 2020. 44–45.

28 Eric Bogert et al.: Humans Rely more on Algorithms than Social Influence as a Task Becomes more Difficult. *Nature Scientific Reports*, 11, no. 8028 (2021).

29 For more on legal and ethical issues see Imre Négyesi: A mesterséges intelligencia katonai felhasználásának társadalmi kérdései. *Honvédségi Szemle*, 149, no. 1 (2021). 133–144; James Butcher – Irakli Beridze: What is the State of Artificial Intelligence Governance Globally? *The RUSI Journal*, 164, no. 5–6 (2019). 88–96.

30 Kathy Pretz: Stop Calling Everything AI, Machine-Learning Pioneer Says. *IEEE Spectrum*, 31 March 2021; Yasmin Afina: Rage Against the Algorithm: The Risks of Overestimating Military Artificial Intelligence. *Chatham House*, 27 August 2020.

thorough, and this will be able to be achieved by engaging future state-of-the-art Artificial Intelligence solutions.

As demonstrated, the AI as research field made great improvements throughout the past 70 years. These improvements are highly correlated to the improvements in computer technology. Military has always been a driver and beneficiary of AI research, and still is among the main proponents of it all over the world. Ignoring AI means giving the upper hand to the adversary whoever it may be. The leading militaries in the world, namely the United States, Russia and China are investing heavily on military AI research. One must also take into consideration the potential impact of emerging new warfighting concepts, such as the Multi-Domain Operations of the United States or the Chinese attempts to achieve a kind of "intelligentised" warfare: both of which are building heavily on the application of different Artificial Intelligence tools in terms of command and control.

The main question is whether Artificial Intelligence in its current state can be applied in military operations planning. In my point of view despite the recent advances in technology, AI is not yet capable of formulating military plans. Although it is extremely useful in speeding up various sub-processes. The operations planning applied by the NATO relies heavily on different analyses that require enormous time when planning large-scale operations. During crisis response planning even months and weeks may pass until a plan is formulated on the strategic and operational level. The steps of the operations planning processes contain several tasks that can be facilitated by the help of Artificial Intelligence based decision-support tools. Some of these tools are already in use or under tests, some are in conceptual format or under development, but their impact cannot be neglected.

In this paper I set up three criteria that are required for an AI system engaged in planning. It has to accomplish its task in almost real-time, has to use interchangeable output data and it has to be explainable regarding the way it comes to decisions. Even if these criteria are met, there will be points of friction still. Potential benefits come with concerns and possible setbacks, several factors must be taken into consideration regarding the widespread use of AI. On the material and technological side of the wide scale introduction of AI to the planning process more advanced computers, reliable and safe cloud technology and high-speed long-distance connection methods are required. The staffs must be thoroughly trained to adopt the mindset required for working with AI in the future's potential human-computer hybrid organisations.

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