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THE ROLE AND IMPORTANCE OF AN AUTOMATED CONTROL SYSTEM IN MILITARY AFFAIRS IN MODERN CONDITIONS

The article examines the role and importance of automated control systems in military affairs in the context of modern challenges. Automated control systems provide integration of information technologies into the processes of troop management, which increases the efficiency and speed of decision-making. In the context of the growing complexity of combat operations and the need for a rapid response to changes in the situation, automation of management processes is becoming critical. The article considers current trends in the development of automated control systems, their impact on the operational readiness of troops, and analyzes existing scientific publications on the topic. The advantages and challenges associated with the implementation of automated control systems in military practice, as well as the main directions for further research in this area are highlighted.

Keywords: *automated control system, military management, control system, decision-making, information technology, information.*

Statement of the problem. Modern military conflicts are characterized by high dynamism and complexity, which requires military commands to quickly adapt to changing conditions. Traditional management methods are often ineffective in the context of information warfare and rapid technological development. Therefore, there is a need to introduce automated control systems that can provide timely collection, processing and analysis of information, as well as support for decision-making at all levels of management. The problem lies in the insufficient study of the impact of automated control systems (ACS) on the operational effectiveness of military formations and the need to adapt them to the specifics of modern warfare.

Analysis of existing research and publications. The study of automated control systems in military affairs has become the subject of active research both in Ukraine and abroad. In [1], the importance of integration of the latest technologies into management processes to improve the operational effectiveness of the Ukrainian Armed Forces is highlighted. The author notes that the introduction of the ACS reduces the time for decision-making and increases the accuracy of combat missions.

An important work is [2], which considers the impact of the peculiarities of modern wars on the development of the automated control system for

aviation and air defense of the Armed Forces of Ukraine. The main factors influencing the process of improving the ACS of aviation and air defense of the Armed Forces of Ukraine are identified and the main directions of its development are determined.

At the international level, no less significant are the studies conducted in [3], in which the author analyzes the impact of automatic control systems on strategic decisions in military conflicts. It is noted that automated control systems not only increase the operational readiness of troops, but also allow for better coordination between different units, which is critical in modern conditions.

The authors of the article [4] consider and analyze all the positive and negative aspects of the use of autonomous weapons systems in terms of the possibility of achieving a more ethical use of them in combat operations. Particular attention is paid to ACS, which are automated artificial intelligence systems in which decisions are made on the basis of program code.

Article [5] examines Ukraine's adoption of a modified Western transformational model of military reform, which is aimed at massing and building military forces capable of interacting with NATO and trained to Western standards. The author argues that Ukraine's military reform, namely the emphasis on command and control, the development

of special forces, etc., has created favorable conditions for the development of military forces capable of limiting Russia's successes on the battlefield and transferring the battle to the enemy's territory.

In [6], autonomous weapons technologies based on artificial intelligence are studied. The author argues that such deadly technologies are crucial in any war and therefore should be closely monitored.

The authors of the article [7] analyze the ethical aspects of the Geneva Convention and argue that the international community should ensure that drones used in the course of hostilities at sea can be used to search for sailors during search and rescue operations.

Thus, the analysis of existing sources shows that the introduction of automated control systems in military affairs is an important direction for improving the efficiency of management processes. However, there is a need for further study of the specifics of their application in the conditions of our country, as well as the development of adapted solutions to ensure the integration of ACS in the Armed Forces of Ukraine.

The purpose of the article is to study the role and significance of automatic control systems in military affairs in modern conditions.

Summary of the main material. This article discusses the key aspects of automatic control systems in military affairs, their role in modern combat conditions, advantages and challenges, as well as practical examples of the implementation of automatic control systems in different countries.

Automated control systems are a set of technologies, software, and algorithms that automate the processes of collecting, processing, and analyzing information to support decision-making. They include a variety of elements, such as battle management systems, logistics systems, monitoring and situation assessment systems.

As for the role of the ACS in military affairs, there are several main areas.

Automated control systems allow military units to respond more quickly to changes in the combat situation, which is critical in modern conflicts where the speed and accuracy of decisions can determine the outcome of an operation.

Quick access to information. Automated control systems provide rapid access to up-to-date data on the situation on the battlefield, allowing commanders to make decisions based on reliable information. For example, monitoring systems can provide real-time data on enemy movements and the status of their own forces and resources.

Analytics and forecasting. Modern ACS use analytical tools that allow not only to analyze the current situation but also to predict possible scenarios. This allows commanders to plan their actions in advance, reducing the likelihood of unforeseen situations.

Operational integration. Automated control systems also provide integration of information from various sources (surveillance, intelligence, information from allies), which allows for a holistic picture of the fighting. This is especially important in multinational operations, where coordination with other military formations is required.

The introduction of the ACS not only increases operational readiness, but also creates conditions for more efficient use of resources, which requires a high level of training and adaptation to new technologies.

Automated control systems play an important role in improving coordination between different military units and organizations. This is especially true in today's multinational operations, where interaction between different military formations is critical to achieving common goals.

Information exchange systems. Automated control systems integrate data from various sources, allowing military units to share information in real time. This includes not only data on the status of their own forces, but also intelligence information about the enemy, which significantly increases the effectiveness of coordination.

Joint operational platforms. The use of common platforms to manage combat operations allows different units to plan and execute operations in a more coordinated manner. For example, the Joint Tactical Radio System in the United States allows different military formations to communicate with each other without delay, which contributes to the timely completion of tasks.

Coordination with civilian agencies. Automated control systems also help to improve the interaction between military and civilian entities, such as emergency services or local governments. This is especially important in humanitarian missions or in cases of natural disasters, where rapid response is required.

Resource management. Automated control systems reduce costs and optimize resource utilization by automating planning and control processes. This ensures more effective coordination between different departments, which in turn increases the overall efficiency of operations.

Thus, improved coordination through the ACS not only increases the effectiveness of military operations, but also provides a higher degree of

security for military personnel, as it reduces the likelihood of errors and inconsistencies in operational plans.

Automated control systems significantly improve the accuracy and efficiency of decision-making in a rapidly changing combat environment. This is achieved through the use of modern technologies that allow analyzing large amounts of data and processing information quickly.

Data analysis. Automated control systems collect and process information from a variety of sources, including intelligence, force status, and resources. Analysis systems can detect trends, patterns, and anomalies, allowing commanders to make more informed decisions.

Decision support systems. These systems suggest courses of action based on analysis of data, scenarios, and previous results. For example, the system can evaluate the risks and benefits of different tactical approaches, helping commanders make more informed decisions in stressful situations.

Simulation and modeling. Automated control systems allow for combat simulations to evaluate the effectiveness of various strategies. This allows commanders to anticipate the possible consequences of their actions and, if necessary, adjust plans.

Speed of decision-making. Time is of the essence in combat operations. Automated control systems can reduce decision-making time by automating the processes of collecting and analyzing information. This allows military units to respond more quickly to threats and changes in the situation.

Reducing the human factor. Process automation reduces the risk of errors that can occur due to human error, such as fatigue, stress, or lack of training. Automated processes provide a more stable and reliable decision-making process.

Increasing the accuracy and efficiency of decision-making through the use of automated control systems significantly affects the effectiveness of military operations, as it maximizes the use of available resources and reduces risks during the execution of tasks.

The introduction of automated control systems in military affairs has a number of advantages that significantly increase the efficiency and effectiveness of military operations.

One of the key advantages of ACS is their ability to provide quick access to information. This, in turn, allows military formations to:

– *respond quickly to changes:* ACS provide commanders with real-time monitoring of the

situation on the battlefield, which allows them to quickly adjust action plans to new circumstances;

– *improved decision-making processes:* thanks to rapid data analysis, teams can make decisions in critical situations without delay, which is important in today's combat environment;

Automated control systems allow optimizing the use of military resources, which is important in the context of limited budgets and logistical capabilities:

– *automation of planning:* the systems can automatically calculate resource requirements (ammunition, fuel, equipment, etc.) based on the analysis of current and projected combat missions, reducing the risk of shortages or overspending;

– *logistics management:* ACS help to coordinate the supply and distribution of resources, which reduces losses and increases the efficiency of logistics processes.

The introduction of the ACS also contributes to improving the security of military formations:

– *risk control:* thanks to accurate monitoring of the situation, ACS allow you to identify potential threats and risks, which allows you to take measures to minimize them;

– *reducing human errors:* automation of control processes reduces the likelihood of errors that can be caused by human factors such as fatigue or stress, which is especially important in combat situations.

Automatic control systems facilitate the integration of the latest technologies into military affairs, which, in turn, helps to ensure that the military is equipped with the latest technologies:

– *promotes innovation:* the use of the latest technologies, such as artificial intelligence, big data, and cyber systems, opens up new opportunities for data analysis and decision-making;

– *increases adaptability:* the system allows for rapid adaptation to changing battlefield conditions, which is critical in modern conflicts where the situation can change very quickly.

The introduction of the ACS also has a positive impact on the training and education of military personnel:

– *training systems:* ACS can be used to create training simulations that allow military units to practice tactical scenarios and improve their training;

– *analysis of training results:* automated systems can collect data on training outcomes, which helps in evaluating the effectiveness of training programs and identifying weaknesses in training.

Thus, the benefits of implementing ACS are multifaceted and significantly increase the efficiency, security, and adaptability of military formations.

Although the benefits of automated control systems are undeniable, their implementation also faces a number of challenges that need to be taken into account.

One of the main challenges is the significant financial costs associated with the development, implementation, and maintenance of an automated control system:

- *capital expenditures*: the cost of purchasing hardware, software, and infrastructure can be very high, requiring significant budgetary resources;

- *long-term costs*: in addition to the initial investment, you need to consider the costs of maintenance, software updates, and staff training.

Successful implementation of the ACS requires qualified personnel, which can be problematic:

- *lack of specialists*: many countries have a shortage of information technology and cybersecurity professionals, which can complicate the process of implementing an ACS;

- *the need for training*: military personnel must be trained to effectively use the new systems, which requires time and resources.

Implementation of the ACS increases the risks associated with cyber threats:

- *cyber-attacks*: ACSs can be targeted by cyber-attacks, which can lead to the loss of confidential information or disruption of systems;

- *the need to protect data*: ensuring the security of information systems requires the development and implementation of comprehensive security measures, including data encryption, monitoring, and responding to threats.

The introduction of an automated control system may lead to an increased dependence on technology, which also has its risks:

- *unpredictable failures*: technical failures or system failures can have serious consequences during combat missions;

- *psychological aspect*: military personnel can become dependent on automated systems, which can affect their decision-making skills in non-standard situations.

The implementation of an ACS may face challenges in integrating new technologies with existing systems:

- *compatibility*: ensuring interoperability of new ACS with traditional military systems can be a challenging task that requires additional effort and resources;

- *transition period*: during the transition to new systems, difficulties may arise due to the need to train staff and adapt to new processes.

Thus, the introduction of automated control systems in the military has its advantages, but also challenges that need to be considered and addressed to ensure the successful implementation of these technologies.

In light of rapid technological advances and changes in the nature of military conflicts, automatic control systems have great potential for further development.

One of the most promising areas of ACS development is the integration of artificial intelligence:

- 1) AI can help process and analyze large amounts of data, identifying patterns and trends that may not be obvious to a human analyst;

2. AI-enabled automated control systems can offer real-time options based on the analysis of the situation and previous results, which can increase the efficiency of decision-making;

- 3). the development of AI-based expert systems can provide military specialists with additional tools for assessing risks and possible scenarios.

Big Data technologies are opening up new opportunities for military automated control systems:

- a) the ability to process and analyze large amounts of data in real time will allow military units to receive up-to-date information about the situation on the battlefield and respond more quickly to changes;

- b) the use of big data analytics can improve the prediction of enemy behavior and help develop more effective strategies;

- c) Big data can be used to adapt training programs to the specific needs of military personnel, which will increase the effectiveness of their training.

As the use of automated control systems grows, so does the importance of cybersecurity:

- the development of new information security technologies and control systems will be critical to ensuring the security of military operations;

- automated control systems can be integrated into cyber operations strategies, allowing military formations not only to defend themselves but also to actively counter cyber threats from the enemy.

In the context of globalization, military conflicts often become multinational, which requires the integration of ACS at the international level:

- cooperation between countries can lead to the creation of common standards for automated control

systems, which will facilitate their integration in multinational operations;

– international cooperation will allow countries to share intelligence and analytical information, which will increase the overall effectiveness of military operations.

The prospects for the development of automated control systems are also linked to the introduction of new technologies.

1. Drones equipped with automated control systems are capable of performing a variety of tasks, from reconnaissance to strike missions. They can operate in dangerous areas without risking the lives of military personnel, which makes them an important element of modern military operations. A study conducted by the US Department of Defense showed that the use of drones in combat operations increases efficiency by 25 % [7].

2. Augmented Reality and Virtual Reality technologies can be used to enhance military training by providing the ability to practice scenarios in a safe and controlled environment. Augmented Reality and Virtual Reality can also help to visualize data in real time during combat operations, which increases situational awareness.

3. Internet of Things (IoT) technologies enable data exchange between various elements of military infrastructure, which allows for the creation of integrated solutions for resource management, monitoring the condition of equipment and assessing the situation on the battlefield. For example, the integration of IoT into logistics systems allows for automatic inventory tracking and supply planning.

4. The use of artificial intelligence technologies in ACS allows automating data analysis and forecasting processes. For example, systems that use machine learning algorithms can analyze large amounts of information from the battlefield, helping commanders make more informed decisions. Military studies show that integrating AI into ACS can reduce the time for information processing by 30–40 % [4].

The implementation of automated control systems in the military in Ukraine and other countries differs in many respects, including technological level, funding, organizational structures, and results. Let's consider the main aspects of comparing the implementation of ACS in Ukraine and abroad.

1. Technological level. Abroad:

– many developed countries, such as the United States, the United Kingdom, and NATO countries, have access to advanced technologies and innovations that allow them to develop and implement highly efficient ACS;

– the use of artificial intelligence, big data analytics, and cybersecurity is widespread, giving military formations significant advantages in combat.

In Ukraine:

– the technological level of ACS implementation often lags behind Western standards due to limited funding and insufficient infrastructure;

– however, Ukraine is actively developing internal technologies, such as the DIA system for the digitalization of public services, as well as cybersecurity initiatives.

2. Financing. Abroad:

– countries with developed economies have much larger budgets allocated to defense and technological innovation;

– such countries often invest in research and development [8], which allows them to remain at the forefront of military technology.

In Ukraine:

– funding for military projects and automated control systems depends on the state budget, which is limited, especially in times of military conflict;

– however, with the outbreak of war in eastern Ukraine and the deterioration of the security situation, there has been an increase in investment in defense, including in the ACS.

3. Organizational structure and strategy. Abroad:

– in developed countries, there are clear organizational structures responsible for the development and implementation of the ACS, which ensures a systematic approach to the modernization of military management; military and civilian experts cooperate to ensure effective integration of new technologies.

In Ukraine:

– the organizational structure for implementing the ACS may be less clear, with frequent changes in management and insufficient coordination between different agencies;

– however, there is a growing trend in Ukraine to involve the private sector and startups in the defense sector, which could improve the situation.

4. Results of implementation. Abroad:

– the introduction of ACS in NATO and other developed countries has led to a significant increase in the efficiency of military operations, reduced losses and increased responsiveness;

– effective integration of the latest technologies allows these countries to respond more quickly to threats and adapt to changing conditions.

In Ukraine:

– although the implementation of the ACS in Ukraine is still in its infancy, efforts to modernize the army are already yielding first results;

– military formations are actively using new technologies to improve command, control, communication and coordination, which has become especially noticeable in the context of the

war in eastern Ukraine.

5. Challenges and obstacles. Abroad:

– although advanced economies have access to advanced technologies, they also face challenges, such as rapid changes in the technological environment, which require constant investment and adaptation;

– cybersecurity and data protection issues are relevant, as the growth of cyber threats jeopardizes not only military systems but also national security.

In Ukraine:

– the main challenges remain limited funding, insufficient infrastructure, and the need for staff training;

– military personnel may face difficulties in adapting to new technologies due to a lack of appropriate training, which may reduce the effectiveness of ACS implementation;

– another important problem is the dependence on imported technologies, which can pose risks in times of political and economic crises.

A comparison of the implementation of ACS in Ukraine and abroad shows that although Ukraine is actively working to modernize its military structures, it still has a number of challenges to overcome.

Developed countries, such as the United States and NATO countries, have a significant advantage due to access to the latest technologies, stable funding, and clear organizational structures. At the same time, Ukraine has demonstrated positive results in implementing new technologies despite limited resources.

Prospects for the implementation of the ACS in Ukraine depend on further funding, infrastructure development, personnel training, and integration of the latest technologies. The country has the opportunity not only to catch up but also to become an innovative leader in certain aspects of military technology if it can overcome the existing challenges.

Conclusions

As a result of the study, several key conclusions can be drawn about the role and importance of the automated control systems in military affairs in modern conditions.

Automated command and control systems play a critical role in improving the operational readiness of troops. They provide quick access to information that allows the command to respond quickly to changes in the combat situation, which in turn increases the efficiency of the tasks.

The integration of the latest technologies, such as artificial intelligence and unmanned systems, opens up new opportunities for automating management processes. These technologies not only increase the speed and accuracy of decision-making, but also reduce the risks to the lives of military personnel.

Despite its many benefits, the implementation of an automated control systems is accompanied by

certain challenges, such as cyber threats, high technology development costs, and the need for staff training. These risks require careful analysis and development of measures to minimize them.

The experience of other countries that are actively implementing automatic control systems can be useful for Ukraine. In particular, the latest technologies and practices developed in the United States, NATO, and other countries can be adapted to Ukrainian conditions, which will help increase the effectiveness of the Armed Forces.

In the future, the role of automated systems in military affairs is expected to grow further, which will require the development of new strategies and approaches to their implementation. Joint initiatives with international partners can be an important factor in ensuring the security and modernization of the Ukrainian Armed Forces.

It is important to continue research in the field of automated control systems, in particular in the context of their adaptation to the specifics of Ukrainian military formations. This will help not only improve management processes but also ensure the efficient use of resources in the face of current challenges.

Thus, automated command and control systems are an integral part of modern military affairs, and their development is critical to improving the efficiency and readiness of the Armed Forces of Ukraine to respond to modern threats.

Further research could be focused on studying specific cases of using automated systems in combat, as well as assessing their impact on strategic and tactical decisions. This will make it possible to develop recommendations for optimizing the use of automated systems in the army, as well as help develop new methods of training military personnel to work with such technologies.

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РОЛЬ ТА ЗНАЧЕННЯ АВТОМАТИЗОВАНОЇ СИСТЕМИ УПРАВЛІННЯ У ВІЙСЬКОВІЙ СПРАВІ В СУЧАСНИХ УМОВАХ

Висвітлено роль та значення автоматизованих систем управління у військовій справі у контексті сучасних викликів. Автоматизовані системи управління забезпечують інтеграцію інформаційних технологій у процеси військового управління, що підвищує ефективність і швидкість прийняття рішень. В умовах зростаючої складності бойових операцій і необхідності швидко реагувати на зміни в оточенні автоматизація управлінських процесів стає критично важливою. Розглянуто сучасні тенденції розвитку автоматизованих систем управління, їх вплив на оперативну готовність військ, а також проаналізовано наявні наукові публікації, пов'язані з цією темою. Визначено переваги та виклики, пов'язані з впровадженням автоматизованих систем управління у військовій практиці, а також основні напрями подальших досліджень у цій сфері.

Сучасні військові конфлікти характеризуються високою динамічністю і складністю, що вимагає від військового командування швидкої адаптації до змінених умов. Традиційні методи управління часто виявляються неефективними в умовах інформаційної війни та швидкого технологічного розвитку. Через те виникає потреба у впровадженні автоматизованих систем управління, здатних забезпечити своєчасний збір, оброблення та аналіз інформації, а також підтримку прийняття рішень на всіх рівнях управління. Проблема полягає у недостатньому дослідженні впливу автоматизованих систем управління на оперативну ефективність військових формувань і необхідності адаптувати їх до специфіки сучасної війни.

Актуальність теми зумовлена потребою в удосконаленні військових управлінських процесів через впровадження новітніх технологій, що здатні реагувати на виклики, які ставлять сучасні бойові дії. Ефективна інтеграція автоматизованих систем управління може суттєво поліпшити координацію, знижувати час реагування на загрози та забезпечувати більш точну і своєчасну інформацію для командирів.

Отже, у статті підкреслено, що дослідження автоматизованих систем управління не лише сприятиме підвищенню оперативної готовності військ, але й відкриває нові перспективи для поліпшення командних структур і методів ведення бойових дій. Впровадження автоматизованих систем управління вимагає комплексного підходу, що містить навчання особового складу, вдосконалення технологічних інфраструктур та аналіз потенційних ризиків, пов'язаних з автоматизацією.

Ключові слова: автоматизована система управління, військове управління, система управління, прийняття рішення, інформаційні технології, інформація.

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