

FUTURE ARMED CONFLICTS: THE ROLE OF ADVANCED MILITARY TECHNOLOGIES IN SHAPING WARFARE STRATEGY

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Abstract. This article explores the transformative impact of advanced technologies on the development of military and specialized equipment, shaping the nature of future armed conflicts. Key focus areas include hypersonic weapons, artificial intelligence, and robotic systems, highlighting their role in redefining warfare strategies and operations. The study outlines the strategic implications of technological innovation in military systems and their influence on future conflict dynamics. Purpose of the research work: Analyze the influence of technological advancements in weaponry and military equipment on the evolving character of warfare and to forecast the potential features of future conflicts. Objectives of the research work: Identify the main trends in the development of military and specialized equipment; examine the strategic implications of emerging technologies such as hypersonic weapons, robotics, and artificial intelligence; hypothesize the potential nature of future wars based on current technological developments; provide recommendations for the preparation and restructuring of armed forces to address future warfare challenges. Methods of the research work: The research work employs a qualitative approach, combining a historical analysis of military strategies with a review of technological advancements in weaponry. Additionally, it incorporates scenario-building and hypothesis generation to predict the features of future armed conflicts. Conclusions: Advancements in military and specialized equipment are reshaping the dynamics of warfare, moving towards strategies emphasizing non-contact operations and rapid, high-precision engagements. Future conflicts are expected to be influenced by hypersonic weapons, artificial intelligence, and robotic systems, with operations expanding into new domains such as cyberspace and outer space. These developments necessitate proactive measures in the restructuring and technological modernization of armed forces to ensure preparedness for emerging conflict scenarios.

Keywords: weapons, military hardware, specialized equipment, hypersonic weapons, artificial intelligence

Introduction

The early 21st century has been defined by rapid advancements in weapons, military, and specialized equipment (WMSE), largely driven by innovative technologies aimed at enhancing the qualitative capabilities of combat systems. This trend is evident in the adoption of cutting-edge military technologies by leading nations, resulting in the deployment of advanced WMSE models [1].

Historical evidence from wars and armed conflicts underscores the significant influence of WMSE on both the conduct and strategy of warfare. Traditionally, two fundamental military strategies - annihilation and attrition - have formed the cornerstone of armed conflicts. The first aims for a decisive victory through overwhelming force, while the second seeks to exhaust the enemy incrementally through successive operations. These strategies have always reflected the capabilities of contemporary military technologies.

The advent of atomic weaponry marked a turning point in warfare. The development of these

weapons by the United States and the Soviet Union facilitated the possibility of global conflicts being determined by their mere possession and the looming threat of their use. This realization gave rise to the doctrine of nuclear deterrence, where the prospect of catastrophic outcomes influenced the dynamics of military and political conflicts [2].

In response to efforts to neutralize nuclear advantages, new military technologies and methods emerged, enabling preemptive global strikes targeting nuclear arsenals, as well as key economic, military, and administrative assets.

Main part

The rapid pace of technological advancement in military and specialized equipment underscores the critical need to understand its implications for future conflicts. As nations continue to innovate in areas such as hypersonic weapons, artificial intelligence, and robotics, the nature of warfare is evolving beyond traditional strategies, requiring a shift in military doctrine and operational planning (Figure 1).



Figure 1. Hypersonic missile

This work is highly relevant in providing insights into these technological trends and their potential to redefine the global security landscape.

Moreover, the growing emphasis on precision, speed, and non-contact methods of warfare aligns with modern strategic imperatives, including minimizing collateral damage and enhancing operational efficiency. By anticipating the characteristics of future wars and offering guidance for the development of armed forces, this study contributes to the formulation of effective defense policies, ensuring preparedness in an era of rapid military-technological transformation [3].

The advancement of WMSE suggests that forthcoming models will likely surpass current systems in performance, introducing novel methods and strategies that alter the combined effectiveness of previous approaches.

Currently, the progress in WMSE technology enables the deployment of high-precision weaponry and systems based on new physical principles to execute selective impact strategies, such as "surgical strikes" on critical enemy assets with minimal expenditure of resources [4].

Furthermore, the significance of non-military measures has grown in contemporary conflicts, involving both state and non-state entities employing unique methods to achieve warfare objectives.

Consequently, as scientific and technological advancements continue, future armed conflicts are expected to differ substantially from current ones, adopting distinct features shaped by the integration of military and non-military measures alongside advanced WMSE systems. This necessitates the forecasting of future warfare scenarios to outline the strategic directions for the development and organization of the Armed Forces.

The concept of war is defined as a combination of key attributes and characteristics distinguishing

it as a specific historical phenomenon. It is typically divided into socio-political and military-strategic dimensions. The socio-political aspects include factors such as objectives, ideological content, and the relative strength of opposing parties. The military-strategic dimension is defined by elements such as the forces and means employed, the scale and scope of operations, their duration, and the methods and forms of combat [5].

This article focuses on the military-strategic aspects of future warfare.

While it is challenging to precisely predict the distinctive features of future conflicts, hypothesizing their potential characteristics is a critical objective of military science.

A key methodological approach to addressing this issue is the analysis of trends in the evolution of military-industrial complexes and their subsequent impact on the nature of warfare in the future. At present, the following can be attributed to the main directions of development of the WMSE:

- development of hypersonic weapons;
- development of weapons based on new physical principles;
- improvement of long-range precision weapons;
- development of military robotic complexes;
- development of unmanned aerial vehicles (UAVs) with the expansion of the range of functions they perform;
- development of artificial intelligence (AI) elements in the development of advanced WMSE designs.

Let us consider the directions of the development of military-industrial equipment and build a hypothesis of the nature of future warfare. With the use of hypersonic technology, it became possible to develop cruise missiles capable of guaranteed overcoming modern air defence systems and hitting key facilities in the strategic depth of the probable enemy's territory in the shortest possible time. Countries such as the United States and China are trying to develop air and sea-launched cruise missiles using hypersonic technology. But the Russian Federation has already developed and has samples of hypersonic weapons in service with its troops (forces) ahead of schedule [6].

With the adoption of hypersonic weapons, it is safe to assume that future warfare will be global in nature. The main targets for defeat will be selected in the operational-strategic and strategic depth of the enemy. For strikes will be used cruise missiles of various basing, the duration of the impact from the moment of decision-making to strike will be measured in hours. Given the range of the hypersonic weapons, the scope of combat operations will cover several theatres of war (theatre of operations). The next weapon influencing the global nature of future warfare is weapons based on new physical principles. The world's leading states are developing such weapons, for example, directed energy weapons – laser, radio frequency, beam, kinetic and other unconventional types of weapons (Figure 2).

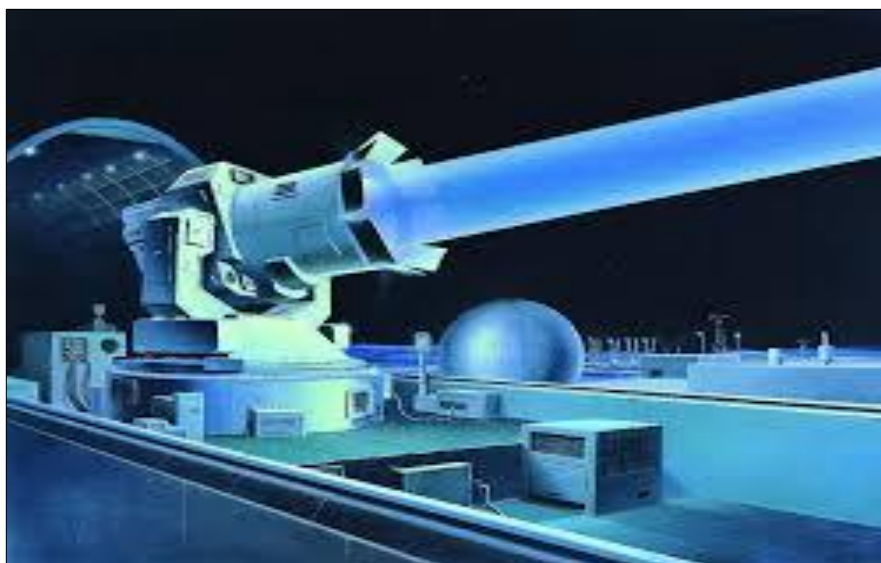


Figure 2. Laser weapons

The idea of instantaneous defeat of an enemy at a great distance through the transfer of directed energy lies at the heart of the weapons based on new physical principles:

- laser weapons – delivery of electromagnetic radiation energy of gamma, X-ray, ultraviolet, visible or infrared wavelength ranges to the target;
- radio-frequency weapons – delivery of electromagnetic radiation energy of radio frequency wavelength range to the target (ultrahigh-frequency weapons, infrasound weapons, etc.);
- beam (accelerating) weapons – delivery of directed beams of high-energy charged or neutral particles accelerated to near-light speed to the target.

All these types of weapons provide almost instant delivery of destructive energy to the target, and the range of destruction can be measured in many hundreds of kilometers.

Realization of such principle of defeat of objects by potential enemy can radically change the character of future war. Its use of such weapons will make it possible to hit objects without physically destroying them, limit the use of conventional means of armed struggle, and reduce the time of an operation to a few minutes.

It can be assumed that this direction of the development of WMSE will make it possible to wage future wars with the use of weapons based on new physical principles by providing critical impact on the enemy's facilities.

The next direction in the development of WMSE is the improvement of precision-guided weapons (PGW) on the basis of new technologies, including the use of global positioning systems and nanotechnology. The use of new technologies makes it possible to achieve even greater accuracy in hitting targets by reducing the mass dimensions and increasing the cruise missile's flight speed. The strike time of modern precision-guided weapons will be significantly reduced in the future due to the increased speed of hypersonic missiles [1; 3].

The increase in the spatial scope of military operations and the accuracy of hitting targets, the change in priorities and objects of impact with the active use of PGW have led to changes in the forms of application and methods of action of troops (forces). Their influence has led to the emergence of a new form of armed struggle – precision combat. In this connection, the PGW will be used in combination with other means of armed struggle, creating, for example, the contours of “reconnaissance-impact defeat”, “defence-impact” and others [4; 6].

The main feature of future wars will be the integrated use of PGW in all spheres of armed struggle. Traditional military actions, strictly distributed across physical spheres, will be replaced by voluminous, multispherical operations conducted simultaneously in all spheres of confrontation.

Taking into account the flight range of PGW strike assets and the experience of its use, it can be predicted that in future armed conflicts PGW strikes against enemy facilities will be carried out within one or several theatre of war, with the participation of all branches of the Armed Forces. At the same time, the duration and number of strikes will depend on the location of military forces and the military-political objectives of the future war.

The next direction in the development of WMSE is the development of robotic complexes for military use. The experience of combat operations on urbanized territory (in urban conditions) by military forces of many countries, in particular the USA, gained in military conflicts of the late XX – early XXI century, activated the development of a new type of armament - combat robotic complexes (CRC).

The main tasks assigned to the CRCs are: fire support of the advancing unit, PGW guidance, reconnaissance of the terrain and control of the results of hitting enemy objects, reconnaissance and surveillance, transportation of ammunition, fuel and lubricants to the combat zone and others.

Many foreign countries, in particular the USA and China, have focused their main efforts in the development of CRCs on the creation of unmanned underwater vehicles (UUVs) as a ‘non-alternative’ combat and support means in future wars (Figure 3). At the same time, the expansion of the range of tasks performed by UUVs makes them an integral component of the armament of surface ships, submarines and special subdivisions of the Navy [2].



Figure 3. China's military "Robot wolf"

According to American specialists, the use of CRCs significantly increases the efficiency of intelligence and information tasks, fire-fighting, electronic countermeasures and other tasks, which, in turn, increases the effectiveness of the use of groups of troops (forces) operating in the theatre of operations.

It should be noted that CRC is being used to actively explore near-Earth space, which is planned by many states as a new theatre of military operations. At the same time, the United States is trying to ensure full legal freedom of manoeuvre in this area of space exploration. A vivid confirmation of this is the creation in the USA of the reusable space unmanned aerial vehicle X-37B, which in 2017 completed almost two years of experimental flight.

The US armed forces plans to deploy an orbiting satellite constellation in near space by 2029 in order to 'protect against strikes from hypersonic missiles of a probable enemy'. The spacecraft will be dispersed in medium-Earth orbit (i.e. below the geostationary orbit), which will allow for reconnaissance of cruise, ballistic and hypersonic missile launches.

With the development of space-based warfare assets, space-based strike assets will appear, i.e. in the future there will be a transition from the supporting functions of space assets to combat operations in space. Given this fact, it can be assumed that future wars will take place in near-Earth outer space with the use of space-based combat CRCs.

Already today, military formations of the CRC are being created. These include unmanned aviation squadrons, ground units of transport robots and others. The defining dynamics of CRC development and their mass production suggest that a characteristic feature of future warfare will be the mass application of autonomous ground, air, sea and space CRCs.

The types of combat robots will range from nanorobots to robotic vehicles that will be able to transport cargo and groups of military personnel. Most of robots will perform reconnaissance, surveillance and reconnaissance functions, equipped with sensors that will provide near-continuous coverage of the battlefield to collect, process and transmit information, as well as shape the disinformation space.

Other robots will fulfil the role of universal combat vehicles, delivery and evacuation vehicles, smart munitions, operating, for example, in 'swarms' - groups of missiles with homing systems or crawling on the ground, jumping 'smart' mines.

CRCs will be used in all spheres of armed struggle. The duration of CRCs use will not be limited in time, depending on the combat missions. The group application of CRCs will take the form of strikes, protection of facilities, and blocking of naval bases.

CRC units will gradually replace conventional military formations, for example, UAV squadrons will replace manned aviation, etc.

One of the priority areas of CRC development is the development of strike unmanned aerial vehicles. The relevance of this direction is explained by the maximum use of airspace in the armed struggle, as well as by the possibility of creating inexpensive strike UAVs, allowing to significantly reduce the losses of aviation complexes and flight personnel (Figure 4).

Unmanned aerial vehicles are considered as effective means of delivering various precision weapons, including homing munitions, to the target.

Work is currently under way in the United States, China and the Russian Federation to develop UAVs with a flight speed of about 1,000 km/h, a range of at least 2,000 km and a payload weight of up to two tone. Their armament will include advanced guided weapons, as well as autonomous decoys and electronic warfare equipment.

The use of unmanned aerial vehicles (UAVs) in the 2020 Patriotic War between Armenia and Azerbaijan was a game-changer. Azerbaijan effectively employed drones for reconnaissance and precision strikes, allowing for real-time intelligence and minimizing human casualties. This technological edge disrupted traditional defense systems, neutralizing Armenian military assets with high efficiency. UAVs significantly enhanced battlefield awareness and contributed to Azerbaijan's operational success, demonstrating the transformative role of modern drone warfare [7; 8; 9; 10].

The use of unmanned aerial vehicles will remain a feature of future wars.



Figure 4. Swarm of combat drones and command systems-3d illustration

Due to the widespread use of UAVs, it is planned to expand the combat capabilities of ground forces and reconnaissance and sabotage units. In future wars, UAVs will be used both as individual systems and as formations of unmanned aviation. Depending on the flight range, combat load and tasks, the scale of UAV application will vary from tactical to strategic level. The flight duration, as experimental flights of UAVs in the United States show, can be measured in years. The form of application of unmanned aviation can be in the form of reconnaissance and strike actions, airspace control, etc. [11].

A new direction in the development of the WMSE is the creation of combat robots, including UAVs, with elements of artificial intelligence.

The application of artificial intelligence technologies in the development of new weapon control systems will make it possible to realise a breakthrough in combat operations.

Such systems will make it possible to speed up decision-making, taking into account the maximum number of factors, and significantly shorten the management cycle of troops (forces), as well as increase their combat capabilities.

At present, American specialists have achieved the greatest results in the area of ‘deep machine learning’. This has become possible thanks to rapid progress in the development of multi-level artificial neural networks.

Pattern recognition technologies and machine learning, which are currently characteristic of artificial intelligence, can provide a high degree of automation of managerial decision-making when analysing and processing information from various sources.

Robotic complexes with artificial intelligence elements will be able not only to conduct reconnaissance and surveillance, but also to carry out precision strikes against enemy targets, refuel in the air and refuel other unmanned and manned aircraft.

It seems highly probable to use advanced CRCs in a single information and communication space on the basis of a unified data transmission network. Elements of artificial intelligence will form information and relevant ‘knowledge’ about the situation, which suggests a new characteristic feature - the application of artificial intelligence [12; 13].

It is not an easy task to build a hypothesis for the use of AI in future wars, as research in this area is still underway. However, it can already be predicted that a part of combat tasks will be redistributed to WMSE with AI elements. At first, these will be support tasks related to reconnaissance both in traditional spheres of armed struggle and in cyberspace. Evolutionarily, the tasks will become more complex and combat-oriented. It can be assumed that special units or civilian agencies will develop the direction of AI application [14].

Thus, the use of global strikes with hypersonic weapons, PGW, application of CRCs and unmanned aviation with artificial intelligence elements will make it possible to reduce the time of combat operations to a minimum, implementing the principle of non-contact armed struggle. On this basis, it is very likely to assume that wars of the future will acquire a fleeting character [15].

A special operation in cyberspace or a global precision strike would be sufficient to achieve the goals of a future war. In this case, deployment of groups of troops (forces) and large-scale combat operations will not be required.

In conclusion, when considering the impact of the development of WMSE on the nature of future warfare, we would like to draw the following conclusions.

The emergence of new models of WMSE can change the self-concept of warfare. The war will no longer have the character of combat operations in our usual perception.

The image of future warfare may have the following characteristic features:

- non-contact impact on the enemy;
- information defeat of the enemy's critical control elements;
- application of hypersonic weapons, PGW and weapons based on new physical principles on the enemy's critical facilities;
- use of UAVs to break through air defence systems;
- mass application of unmanned aviation for various purposes (reconnaissance, strike and ect.);
- coverage of combat operations from one to several theatre of operations;
- duration of combat operations from several hours to several days, depending on the level of achievement of the war objective;
- mass application of combat and support robotic complexes by all branches of the Armed Forces;
- application of artificial intelligence elements in the overall decision support system for troop and weapon control;
- the integrated application of both military and non-military measures of armed struggle in achieving the goals of war.

Preparations for a future war must begin now by specifying measures for the construction and development of the Armed Forces.

One such area of construction and development of the Armed Forces is the creation of military formations with means of defence against information and cyber-attacks. Their main task will be to timely recognize the onset of attacks and take appropriate measures.

The priority area of construction and development of the Armed Forces also includes the creation and development of a defence system against hypersonic and high-precision weapons - space-based reconnaissance and command and control systems, and the formation of a unified information and command and control space using space-based means to control launches of PGW.

An equally important direction in the construction and development of the Armed Forces is the creation of military formations of robotic complexes for various purposes, expanding the combat capabilities of troops (forces) in the performance of tasks, moving from the principle of ‘robot control’ to the principle of ‘tasking a robot’, as well as the introduction of technologies for the group application of robots.

At the same time, while retaining the same type structure, the Armed Forces may have several new branches of the armed forces, which carry out their activities both independently and in co-operation with each other, based on their technical equipment. Against this background, reconnaissance and support military formations will be of predominant importance in relation to fire-attack units.

Thus, the presented characteristics of future warfare will require the development of the composition and structure of the Armed Forces, which is the subject of further research.

Conclusion

The study reveals that the continuous evolution of military and specialized equipment (WMSE) is fundamentally altering the nature of warfare, transitioning from traditional combat strategies to technologically driven operations. The integration of hypersonic weapons, precision-guided munitions, robotics, and artificial intelligence into military systems has introduced unprecedented levels of speed, accuracy, and automation in modern warfare. These advancements enable non-contact engagements and reduce the time and human cost associated with conventional operations.

The findings indicate that future conflicts will likely be characterized by the simultaneous use of military and non-military measures, expanding into domains such as cyberspace and outer space. The application of hypersonic and directed-energy weapons, unmanned systems, and robotic complexes will redefine operational scales and intensify multispectral engagement. Such innovations necessitate a paradigm shift in strategic planning and force composition to address emerging threats effectively.

Moreover, the growing importance of artificial intelligence highlights its potential to revolutionize decision-making processes, enabling real-time analysis and coordination across diverse operational theatres. The convergence of AI with advanced WMSE systems suggests a future where autonomous platforms play a central role in reconnaissance, offensive operations, and support tasks.

To prepare for these changes, armed forces must prioritize the development of defense mechanisms against hypersonic and precision-guided weaponry, enhance cyber resilience, and foster innovation in robotics and AI technologies. This preparation involves both restructuring traditional force compositions and fostering interdisciplinary collaborations to ensure technological dominance in future conflict scenarios.

In conclusion, the ongoing transformation in military technology demands a forward-looking approach to research and development, as well as strategic adaptability to address the multifaceted challenges of future warfare. The anticipated shift towards non-contact, high-precision engagements emphasizes the need for a proactive and comprehensive modernization of defense systems.

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Xülasə

Gələcək silahlı münaqişələr: müharibə strategiyasının formalaşmasında qabaqcıl hərbi texnologiyanın rolu Ramil Axundov, Elnur Məmmədov

Məqalədə gələcək silahlı münaqişələrin xarakterini formalaşdıran hərbi və xüsusi texnikanın inkişafına qabaqcıl texnologiyaların transformativ təsiri araşdırılır. Həmçinin hipersəs silahları, süni intellekt və robot sistemləri, onların müharibə strategiyaları və əməliyyatlarının yenidən müəyyən edilməsində rolu vurğulanır. Tədqiqat işində texnoloji yeniliyin hərbi sistemlər üçün strateji təsirləri ilə yanaşı, gələcək münaqişələrin dinamikasına təsiri də analiz edilir. Silah və hərbi texnika sahəsindəki texnoloji nailiyyətlərin döyüş əməliyyatlarına təsirinin təhlili, gələcək münaqişələrin potensial xüsusiyyətlərinin proqnozlaşdırılması, hərbi və ixtisaslaşdırılmış texnikanın inkişafında əsas tendensiyaların müəyyənəndirilməsi, eləcə də hipersəs silahlar, robototexnika və süni intellekt kimi yeni texnologiyaların strateji əhəmiyyətinin öyrənilməsi tədqiqatın əsas məqsədini təşkil edir. Tədqiqat işində hərbi strategiyanın tarixi təhlilini silah sahəsindəki texnoloji inkişafın icmalı ilə birləşdirən yeni bir yanaşma təklif edilir.

Qeyd etmək lazımdır ki, hipersəsli silahların, süni intellekt və robot sistemlərinin gələcək münaqişələrə təsiri nəticəsində əməliyyatlar kiberməkan və kosmik məkan kimi yeni sahələri əhatə

edəcəkdir. Bu inkişaf mümkün münaqişə ssenarilərinə hazırlığın təmin edilməsi, silahlı qüvvələrin yenidən qurulması və texnoloji modernləşdirilmə məqsədilə proaktiv tədbirlərin görülməsini zəruri edir.

Açar sözlər: silahlanma, hərbi texnika, ixtisaslaşdırılmış texnika, hiperses silahlar, süni intellekt

Аннотация

Будущие вооруженные конфликты: роль передовых военных технологий в формировании военной стратегии

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В данной научно-исследовательской работе рассматривается преобразующее влияние передовых технологий на развитие военной и специальной техники, формирующих характер будущих вооруженных конфликтов. Основное внимание уделяется гиперзвуковому оружию, искусственному интеллекту и роботизированным системам, подчеркивая их роль в переопределении военных стратегий и операций. В статье исследуются стратегические последствия технологических инноваций для военных систем и их влияние на динамику будущих конфликтов. Цель исследовательской работы: проанализировать влияние технологических достижений в области вооружения и военной техники на изменяющийся характер боевых действий и спрогнозировать потенциальные особенности будущих конфликтов. Задачи исследовательской работы: выявить основные тенденции в развитии военной и специализированной техники; изучить стратегическое значение новых технологий, таких как гиперзвуковое оружие, робототехника и искусственный интеллект; выдвинуть гипотезы о потенциальном характере будущих войн на основе современных технологических достижений; дать рекомендации по подготовке и реорганизации Вооруженных сил для решения будущих военных задач. В качестве метода в исследовательской работе был использован качественный подход, сочетающий исторический анализ военных стратегий с обзором технологических достижений в области вооружений, более того, метод также включает разработку сценариев и предположений для прогнозирования характеристик будущих вооруженных конфликтов. Выводы: достижения в области военной и специализированной техники меняют динамику боевых действий, переходя к стратегиям, которые делают упор на бесконтактные операции и быстрые, высокоточные бои. Ожидается, что в результате воздействия гиперзвукового оружия, искусственного интеллекта и роботизированных систем на будущие конфликты операции будут распространяться на новые области, такие как киберпространство и космос. Эти разработки требуют принятия активных мер по реструктуризации и технологической модернизации вооруженных сил для обеспечения готовности к возможным сценариям конфликта.

Ключевые слова: вооружение, военная техника, специализированная техника, гиперзвуковое оружие, искусственный интеллект

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