

SECURITY IMPLICATIONS OF MODERN WEAPONRY DEVELOPMENT

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Abstract: *This paper examines the impact of modern military technology applied in weaponry on societal security. The focus is on contemporary weaponry, including autonomous systems, hypersonic missiles, cyber weapons, and others, as well as their potential consequences on international relations and military doctrines. It analyzes how these technological advancements affect deterrence strategies, increasing the risk of conflict escalation and complicating arms control efforts. Special emphasis is placed on the ethical and legal dilemmas accompanying the use of new technologies in armed conflicts. The paper provides an overview of the most significant risks and offers recommendations to mitigate the negative effects of modern weapon development on societal security.*

Key words: Security, Modern weaponry, Artificial intelligence, New technologies

1. INTRODUCTION

The rapid development of modern military technologies, such as autonomous systems, hypersonic missiles, drones, and cyber weapons, poses a series of challenges to global security and international relations. These technologies not only enhance the operational capabilities of the military but also fundamentally change the nature of modern conflicts, introducing new factors of risk and uncertainty. One of the key issues is that technological advancement often outpaces existing legal and ethical frameworks, making arms control and conflict escalation prevention increasingly complex tasks.

Additionally, the accelerated proliferation of these technologies and their growing accessibility introduce new security risks. As these advanced technologies become part of the arsenals of not only major powers but also smaller states and even non-state actors, maintaining stability

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in the global security order becomes more difficult. Given the rising tensions among major powers and the spread of these technologies, questions arise regarding how new forms of weaponry impact deterrence strategies and military doctrines, as well as the international order as a whole.

The increased autonomy of weapon systems and their rapid action capabilities create additional challenges in conflict prevention, as they significantly reduce the time for making critical decisions and complicate crisis management. This scenario further complicates international diplomacy and mechanisms for preventing armed conflicts, as the accelerated pace and unpredictability of actions enabled by such systems can lead to escalations that could have previously been avoided through diplomatic or military means. Therefore, researching and understanding the security implications of modern weapons development becomes crucial for the future of global security.

2. MODERN WEAPONRY

Modern weaponry represents a significant leap compared to previous generations of arms, both in terms of technological sophistication and the way it transforms modern military conflicts (Jankovic & Komazec, 2023). Technological innovations in the field of weaponry have enabled the development of systems that operate based on advanced technologies such as artificial intelligence, machine learning, hypersonic propulsion, cyber capabilities, and more, making modern combat systems far more capable and faster.

One of the key elements of modern weaponry is its ability to integrate various functions within a single system, thereby reducing reaction time and increasing precision in combat operations. Modern weaponry encompasses a wide range of technologies, from advanced conventional systems to fully digitized and automated weapons, with the potential to redefine military doctrines.

A particularly notable advancement is the development of hypersonic missiles, which, due to their speed and maneuverability, create the need for entirely new defense systems and strategic thinking (Scharee, 2020). Similarly, cyber weapons are used for attacks on information systems and critical infrastructure, highlighting the expansion of warfare into the cyber domain.

Although autonomous weapons often take center stage when discussing modern technologies, it is important to emphasize that they represent just one part of a broader spectrum of advanced systems that are currently in use or under development (Jankovic & Komazec, 2023). The development of modern weaponry, therefore, is not just a technical upgrade but a transformation of the way wars are fought and security is maintained, posing new challenges in international relations, legal frameworks, and ethical norms.

However, one of the key obstacles in the discussion about modern weaponry is the lack of a unified definition and standardized terminology. Different countries, organizations, and experts often use different terms to describe the same systems, complicating international negotiations on arms control and the creation of legal frameworks. For example, autonomous weapons can have different meanings depending on the context in which they are used—some definitions include the presence of a human factor in the decision-making process, while others completely exclude human intervention (Scharee, 2020).

Furthermore, the lack of clear standards complicates the understanding of the risks modern weaponry may pose, particularly in situations where a quick response to the threats posed by these systems is required. Due to its complexity, modern weaponry requires a multidisciplinary

approach to fully grasp its implications, including technical, legal, ethical, and strategic aspects (Jankovic & Komazec, 2024).

For all these reasons, the need to establish unified regulations and clear definitions becomes imperative, especially in the context of international agreements and norms on arms control. Without clear regulations, modern weaponry could become a destabilizing factor, increasing the risk of conflict and escalation on a global scale.

This advancement creates the need for a deeper understanding of the implications modern weaponry brings not only to military but also to social, legal, and political spheres.

3. DEVELOPMENT OF MODERN WEAPONRY

The development of modern weaponry is a consequence of rapid advancements in science and technology, which enable the enhancement of existing systems and the creation of entirely new categories of weapons. Over the past decades, key drivers of this development have included the application of artificial intelligence, robotics, new materials, as well as significant improvements in data processing and communication technologies. This development not only changes the nature of warfare but also introduces new security challenges and dilemmas.

One of the most prominent aspects of modern weapons development is the push toward increasing system autonomy (Scharee, 2020). Traditional weapons models relied on human operators for all critical decision-making, while today's systems are increasingly taking over these tasks. This trend is particularly evident in autonomous systems that can operate without direct human intervention (Mirkovic, 2007). The development of such systems has been made possible by advances in machine learning and data analytics, which allow the weapons to "learn" from their environment and adapt their decisions in real time.

In parallel with the development of autonomous systems, modern weapons are becoming increasingly precise and faster. Hypersonic missiles, capable of reaching speeds several times the speed of sound, provide states with the ability to penetrate enemy defense systems before they can adequately respond. This speed, combined with advanced guidance systems, makes these missile systems extremely difficult to predict, significantly increasing the risk of conflict escalation.

Cyber weapons, although not physical objects like missiles or tanks, hold a central role in modern military operations. Their use ranges from attacks on military and civilian networks to leveraging cyber capabilities to destabilize political systems and economies. Advances in cyber weaponry allow military forces to achieve strategic objectives without the need for traditional military engagement, radically changing the nature of conflict and the concept of warfare.

In addition to technological advancements, the development of modern weapons often involves refining existing technologies, adapting military doctrines, and changing the way armed forces are organized (Jankovic & Komazec, 2024). Classic military platforms, such as tanks and aircraft, continue to play a significant role, but now include advanced communication, automation, and guidance systems, making them more efficient in modern combat conditions (Mirkovic, 2007). For instance, modernized tanks are now equipped with sensors that enable automatic threat detection and precise targeting, reducing the need for constant human oversight.

The development of modern weaponry is also frequently driven by the strategic interests of nations. Some countries invest significant resources in developing weapons that can provide a strategic advantage over others, whether through dominance in cyberspace or the development of advanced missile systems. This arms race raises questions about global security and control

mechanisms, as the lack of international agreements on new types of weapons could lead to the destabilization of the global order.

However, modern weaponry is not limited to military applications alone. Many technologies developed for military purposes are finding their way into the civilian sector. For example, drones, initially developed for military missions, are now used in various industries such as agriculture, logistics, and energy (Scharee, 2020). This synergy between military and civilian development further accelerates the progress of technologies that form the foundation of modern weaponry.

The development of modern weaponry is an ongoing process that requires constant technological advancement and adaptation to new security challenges. As technology progresses, weapon systems become more complex, sophisticated, and potentially dangerous, placing new demands on the international community in terms of regulation and control.

4. REVIEW OF THE SECURITY IMPLICATIONS OF MODERN WEAPONRY DEVELOPMENT

The development of modern weaponry carries with it a range of significant consequences that impact various aspects of global and societal security. Technological advancements have enabled the emergence of sophisticated weapons systems which, although efficient in military operations, raise serious questions about their broader implications. Among these consequences, ethical challenges, legal issues, and changes in military doctrines stand out.

One of the most important aspects of modern weapon development is autonomous weaponry, which has far-reaching impacts (Jankovic & Komazec, 2023). Although these technologies can improve precision, autonomous weapons bring serious ethical challenges. The biggest ethical issue regarding autonomous weapons relates to the question of responsibility. When a machine makes decisions about targets and executes attacks without direct human intervention, the question arises of who is responsible for the consequences, especially when mistakes occur or when there are civilian casualties. This challenge further complicates the establishment of accountability systems within international law, raising the question of whether responsibility can be shared between engineers, programmers, military operators, or governments.

In addition to ethical dilemmas, the development of modern weaponry, especially autonomous weapons, increases the risk of collateral damage and civilian casualties (Joncic, 1996). Although these technologies are promoted as precise and efficient, the reality on the ground can be different. In situations where autonomous weapons fail to correctly identify targets or distinguish civilians from enemy combatants, serious incidents may occur. Such events raise further questions about how to ensure proper control over these technologies and reduce the risk of misuse.

Another important consequence is the shift in decision-making processes in military operations (Mirkovic, 2007). With increasing automation, the role of humans in critical attack decisions is diminishing, raising moral concerns. Delegating responsibility for life-and-death decisions to machines poses a serious challenge to ethical principles, as machines lack the capacity for empathy or moral judgment. This aspect is particularly problematic when it comes to the use of autonomous weapons in unpredictable and chaotic combat conditions, where human judgment is crucial to avoiding unnecessary casualties.

Another significant consequence of modern weapon development relates to international relations and global security. As countries develop increasingly sophisticated weapons systems, there is a risk of destabilizing the international order and increasing tensions among major powers (Jankovic, 2023). For example, hypersonic missiles, due to their speed and

ability to bypass existing air defense systems, can create a sense of insecurity in rival nations, leading to an accelerated arms race.

One of the key consequences of modern weapon development is the shift in arms control dynamics. Traditional arms control agreements often rely on inspections and verification of physical capacities in certain countries. However, modern technologies such as autonomous systems and cyber weapons make it difficult to implement such agreements because they are often intangible and do not involve conventional monitoring methods. For example, autonomous weapons can be developed and tested without physical presence on the battlefield, which significantly complicates their control.

Moreover, cyber weapons present a particular challenge to global security, as they can be used to attack critical infrastructure without the physical component of conflict ever manifesting. This type of weaponry can destabilize entire regions or countries without traditional military engagement, and due to their nature, cyber attacks are often difficult to attribute to a particular state or actor. This further complicates international relations, as countries affected by cyber attacks often cannot clearly identify who is responsible.

Technological advancements in modern weaponry also have a significant impact on humanitarian law and the ways wars are fought. Although international humanitarian law (IHL) mandates the protection of civilians and limits the use of certain types of weapons, modern technologies often surpass existing legal frameworks (Joncic, 2015). For example, autonomous weapons that can independently select targets are not clearly covered by current international conventions (Scharee, 2020). Rules that regulate the use of conventional weapons cannot be fully applied to technologies that operate without human intervention. As a result, the existing legal framework is not adequately prepared to address the challenges posed by modern weaponry (Filipovic, 2023).

Additionally, the use of these technologies can result in significant changes in military doctrines. While traditional warfare relied on large military forces, modern weaponry enables smaller, highly specialized units to achieve greater effects on the battlefield. This change in strategy affects the entire military plan and requires new approaches to training, organization, and force deployment (Thomas & Mittal, 2019). With the rise of autonomous and automated systems, reliance on human resources decreases, while technical and technological superiority becomes the key factor in the success of military operations.

In conclusion, the development of modern weaponry brings numerous consequences that span military, legal, ethical, and societal spheres. These consequences require technical solutions, a thorough revision of international regulations, ethical standards, and military doctrines. In the absence of clear legal and moral guidelines, the risks associated with the use of these technologies could further destabilize global security and increase the likelihood of conflict.

5. CONCLUSION

The development of modern weaponry brings significant technological advantages but also raises numerous security concerns. The introduction of these technologies into military conflicts changes the nature of warfare while presenting new challenges in arms control and the protection of civilians and critical infrastructure. While modern weapons offer many benefits, they also increase the risk of errors and raise questions about accountability for decisions made by machines.

Ethical and legal issues related to autonomous weapons are becoming increasingly important, as current legal frameworks fail to fully regulate these technologies. Despite efforts at the international level to improve regulation, the lack of unified standards and definitions makes

it difficult to reach a consensus. Coordinated international cooperation is essential to ensure proper control and reduce the risk of misuse.

In conclusion, it is clear that the development of modern weaponry has far-reaching consequences for global security. To minimize these risks, legal, ethical, and technical mechanisms must accompany technological progress, with the ultimate goal of preserving stability and protecting fundamental human rights.

REFERENCES

Autonomous Weapon Systems: Technical, Military, Legal and Humanitarian Aspects, International Committee of the Red Cross, Expert Meeting, Geneva, Switzerland, 26–28 March 2014.

Filipovic, A., (2023): Lethal autonomous weapon systems (laws) – towards global regulation or indiscriminate employment?, ПОЛИТИЧКА РЕВИЈА бр. 01/2023, год. (XXXI) XXIII vol. 75

Jankovic, K., (2023), Upotreba bespilotnih letelica u artiljerijskom izviđanju u vojnim operacijama, Zbornik radova DQM-POLYTECH-2023, 26. Međunarodna konferencija "Upravljanje kvalitetom i pouzdanoscu", The DQM Research Center, Prijedor, Serbia, Peter the Great St. Petersburg Polytechnic University, St. Petersburg, Russia

Jankovic, K., Komazec, N., (2023): Osvrt na rizike autonomnog oruzja, Zbornik radova 9. Međunarodna konferencija „Bezbednost i krizni menadzment – teorija i praksa”, Beograd

Jankovic, K., Komazec, N., (2024): Upravljanje rizicima savremenog oruzja, Zbornik radova međunarodni naucni skup „Savremeni izazovi i prijetnje bezbednosti”, Banjaluka,.

Joncic, V. (1996.), „Vojna potreba i međunarodno pravo”, Vojno delo, 6/96, Beograd

Joncic, V. (2015): Međunarodno humanitarno pravo, Pravni fakultet, Beograd

Mirkovic, T. (2007): Naoruzavanje i razvoj, Evropski centar za mir i razvoj (ECPD) Univerziteta za mir Ujedinjenih, Beograd

Scharee, P. (2020): Vojska bez vojnika. Laguna, Beograd, 2020. (originalan naslov Army of none: Autonomous Weapons and the Future of War)

Thomas, R., Mittal, V. (2019): “Potential for Army Integration of Autonomous Systems by Warfighting Function”, Military Review, Army University Press.