

섹션 7.

MILITARY SCIENCES, NATIONAL SECURITY AND SECURITY OF THE STATE BORDER

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THE IMPACT OF TACTICAL AND STRATEGIC TRANSFORMATION OF UAV TECHNOLOGY ON MODERN WARFARE

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1. Introduction

The nature of modern warfare is increasingly dependent on technology. One of the most striking examples of these developments is the widespread use of unmanned aerial vehicles (UAVs). UAVs are employed in military operations, particularly in strikes conducted without direct confrontation, changing the nature of combat. Initially used for reconnaissance purposes, this technology has gradually become one of the most critical elements of warfare. Today, drones serve not only reconnaissance and surveillance roles but also direct attacks, precision strikes, and minimizing civilian casualties.

The purpose of this article is to explore the role of UAVs in modern warfare. This technology is of exceptional importance, especially in areas such as information warfare, strategic planning, and tactical preparation. UAVs allow for more agile and less risky interventions in military operations while also minimizing civilian casualties. However, the moral and legal aspects of this development also give rise to significant debates.

This article aims to analyze in detail how UAVs have advanced in the modern military environment, how they have transformed battle strategies, and the ethical and legal issues created by this technology. The use of drones affects not only battle tactics but also military ethics and international law. The article delves deeper into how this technology has changed the concept of warfare and how these changes will affect future conflicts.

2. The impact of UAVs on modern warfare

The application of UAVs in modern military operations has led to a fundamental change in combat tactics. In the past, battles were primarily managed through soldiers fighting on the ground and engaging in direct fire. However, with

the use of UAVs, the concepts and strategies of how battles are conducted have drastically changed. Now, drones are not only used for reconnaissance and surveillance but have also become weapon systems capable of performing precision strikes with high accuracy.

The use of UAVs, in contrast to traditional combat methods, allows for remote-controlled strikes without the need for a large number of soldiers to be involved. This technology also enables high-precision targeting with minimal risk, making the outcomes of operations more accurate. This is especially important in operations conducted in urban combat or near civilian structures, as drones can minimize civilian casualties.

For example, during the 2020 Nagorno-Karabakh conflict, the extensive use of drones by Azerbaijan demonstrated how this technology provided a significant advantage in battle. In this war, the Azerbaijani army achieved major successes by carrying out precise strikes on Armenia's defense positions via UAVs. Furthermore, the continuous surveillance of the region by UAVs and real-time data collection helped commanders make quick decisions.

Table 1

The impact of UAVs in various conflicts

Conflict	Country	UAV Types Used	Purpose	Impact
Nagorno-Karabakh (2020)	Azerbaijan vs Armenia	MQ-9 Reaper, Bayraktar TB2, Harop	Targeted strikes, surveillance, intelligence gathering	Significant impact on ground forces, decisive aerial superiority
Syria (2015-present)	Russia vs Syrian opposition	Predator MQ-1, Orlan-10, Reaper MQ-9	Reconnaissance, strike missions, close air support	Enhanced surveillance and targeting of opposition forces
Ukraine (2022-present)	Ukraine vs Russia	Bayraktar TB2, Switchblade 300, Puma 3AE	Precision strikes, surveillance, intelligence gathering, reconnaissance	Enhanced battlefield awareness, support for ground forces, strategic strikes

UAVs not only provide tactical advantages but also create significant strategic impacts. In the past, battles were primarily based on close combat, ground fighting, and physical presence. However, with the use of UAVs, battles have shifted to operations that are more remotely controlled and require fewer human resources. This could especially alter the strategic balance of power between nations, as even smaller states can use this technology to effectively combat larger and more powerful armies.

섹션 7.

MILITARY SCIENCES, NATIONAL SECURITY AND SECURITY OF THE STATE BORDER

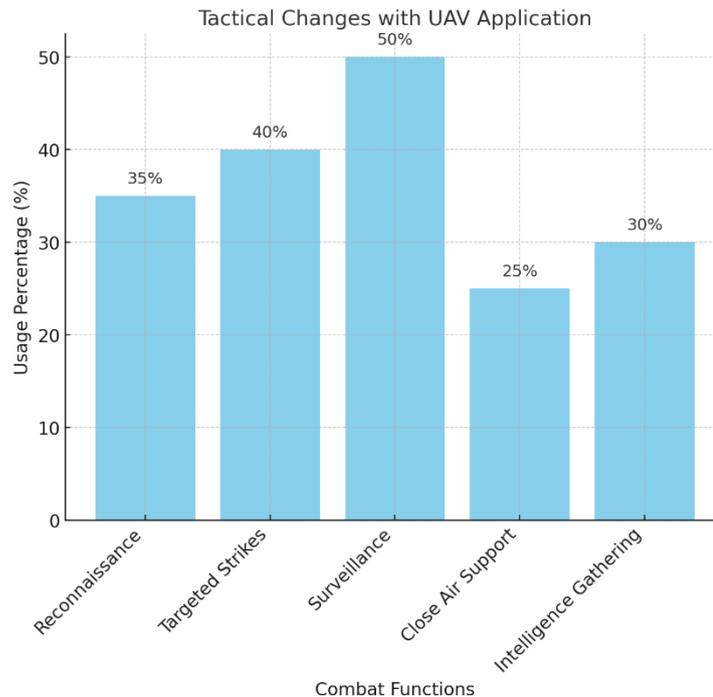


Fig. 1. **Tactical changes with the application of UAVs**

To further clarify the impact of UAVs on strategy, let's explain the use of this technology in several areas with examples:

- **intelligence and surveillance.** UAVs provide the capability to gather essential intelligence before or during combat. They can stay in the air for extended periods, tracking enemy movements and precisely identifying the location of targets. This helps in predicting the enemy's strategies and enables better planning for each phase of the operation.

- **surgical strikes.** Drones are highly precise in target selection and striking. With accuracy up to a few meters, they can completely eliminate a target. These surgical strikes, unlike traditional air strikes, result in fewer civilian casualties. These features make UAVs superior in combat planning and execution compared to traditional combat methods. In modern military operations, UAVs increase the speed of combat and allow decisions to be made more rapidly and accurately.

The tactical advantage of UAVs is not limited to target selection. Reducing civilian casualties is also one of the major advantages of this technology. For instance, during traditional air attacks, the bombs' impact on vast areas can result in civilian deaths. However, drones can target with such precision that they ensure civilian safety. This characteristic is of crucial importance to avoid violations of international humanitarian law during military operations.

Moreover, the use of UAVs raises debates in the international community regarding humanitarian law and the protection of civilians. Armies using drones try to conduct their operations in a “sensitive” manner to minimize civilian casualties. However, as this technology advances, the reduction of civilian harm remains a contentious issue.

3. The Future and Development of UAV Technology

Artificial intelligence and automated decision-making. The application of Artificial intelligence (AI) in UAVs has the potential to fundamentally change the structure and dynamics of modern warfare. UAVs, which were initially used solely for reconnaissance, surveillance, and strike operations, have evolved with the advancement of AI, enhancing their functionality to a new level. The implementation of AI increases the decision-making ability of UAVs, transforming them into independent and automatic systems that no longer rely on human operators. This development broadens the role of UAVs in combat, enabling them to make high-speed decisions. In the future, AI-equipped UAVs could analyze the movements of the opposing force in real time and execute necessary operations.

The use of AI in UAVs is not limited to reconnaissance and strike missions. This technology gives UAVs high levels of independence and agility on the battlefield. With AI assistance, UAVs can make faster and more precise decisions. For instance, AI-equipped UAVs can instantly analyze enemy targets on the battlefield and make optimal decisions during a strike. This capability is critical for quickly adapting to changing conditions and fighting in rapidly evolving scenarios.

AI in UAVs is also associated with high levels of autonomy and maneuverability. UAVs can track and monitor enemy movements and make decisions independently, without human intervention. For example, as a UAV approaches an enemy position, AI can select the target and deliver an optimal strike without causing harm to civilian populations.

Moreover, the real-time decision-making ability of UAVs makes them more agile and effective on the battlefield. AI allows UAVs to collect and analyze data instantaneously. Thus, UAVs can immediately adapt to changing conditions on the battlefield. This feature is invaluable, especially in modern warfare, where conditions change rapidly, and time is of the essence.

The use of AI in UAVs will open up broader opportunities on the battlefield in the future. UAVs, with AI assistance, will not be limited to target strikes but will begin to manage the cognitive aspects of warfare. In the future, UAVs will not only track and analyze enemy movements but also have the ability to make strategic decisions during combat. Such developments will allow military operations to be executed more rapidly and efficiently.

Furthermore, the implementation of AI in UAVs will introduce new methods for operational speed and battlefield analysis. AI-equipped UAVs will achieve more

섹션 7.

MILITARY SCIENCES, NATIONAL SECURITY AND SECURITY OF THE STATE BORDER

precise results in less time and enhance decision-making speed. This will also help increase the efficiency of combat operations and ensure the timely completion of missions.

Swarm drones and their potential in warfare. Drone swarms, a new technology enabling coordinated operation of multiple UAVs, could play a crucial role in the evolution of modern warfare. The essence of this technology is that multiple UAVs communicate and operate together to achieve their objectives. UAVs, working in a swarm, each perform a distinct function. For example, one UAV may identify a target, another will execute the strike, while others ensure control over the area. This cooperation and coordination allow for more precise and faster target selection in the battlefield.

Swarm drones, using the synchronized deployment of multiple UAVs, offer several tactical advantages in warfare. On one hand, this technology could exert significant pressure on the enemy; on the other hand, operations conducted by a swarm can strike multiple targets simultaneously. For example, striking several key enemy targets at once can create a significant impact. This characteristic can severely weaken the enemy's fighting capability and increase the speed factor.

The use of drone swarms presents a new approach that increases the agility and flexibility of military operations. In traditional warfare, battles were primarily focused on ground combat and direct intervention; however, swarm attacks change this approach, requiring more agile and strategic planning. The coordination of UAV swarms further simplifies the management of operations on the battlefield, reducing risks for soldiers.

Additionally, the use of UAV swarms enhances reconnaissance and surveillance operations on the battlefield. One UAV can communicate with another to automatically select targets, while other UAVs carry out strikes. This ensures that large amounts of information are collected and processed more quickly, potentially marking the beginning of a new phase in military strategies.

While the development of drone swarms may provide strategic advantages in modern warfare, the potential threats posed by this technology also need consideration. Swarms of UAVs can become a significant threat when combined, with the potential to eliminate enemy targets in one fell swoop. However, this technology also raises the need for appropriate defense methods and countermeasures.

The opposing side may develop new technologies to counter and neutralize the impact of drone swarms. These technologies can take various forms. On one hand, electronic warfare (EW) technologies can be used to weaken the command systems of UAVs. Through electronic warfare, the communication network of UAVs can be hacked, and the coordination of the swarm can be disrupted.

Kinetic defense systems are another approach to neutralizing this technology. As UAV swarms approach a target, kinetic defense systems can destroy them. Such technologies would allow for effective neutralization of enemy swarm attacks, although they would also lead to the development of new military defense systems.

In the future, the use of drone swarms may play a critical role in gaining an advantage, especially in large-scale conflicts. This technology will enable more automation and faster operations on the battlefield. However, it will also require a reconstruction of military strategies and the development of appropriate defense systems. What effective traditional warfare tactics will be against these new technologies remains to be seen.

The future of drone swarms may mark the beginning of a new era in warfare. This technology can radically change strategic decision-making and defense technologies on the battlefield. However, the regulation of these advancements must consider relevant ethical, legal, and operational issues. As a result, while UAV swarms will play a critical role in the future of warfare, their application will also lead to new threats and defense approaches.

In the future, UAVs will play a major role not only on the battlefield but also in shaping military strategies. New technologies will allow for greater automation of combat and systematic management of operations. For example, more advanced drones with high-altitude flight technology will be able to enter any region and carry out operations there within a short time. This will require less involvement of traditional military forces and may minimize the role of ground troops in combat.

Furthermore, with the development of UAVs, the rapid collection and processing of intelligence data will become possible. Military forces will be able to change the course of battles based on the information provided by UAVs. This will allow for rapid adaptation and more effective decision-making during warfare.

4. Conclusion

The role of UAVs in modern warfare not only increases the speed and precision of military operations but also transforms battle strategies. With the development of this technology, the battlefield is changing, and modern military forces can carry out operations that were previously impossible, thanks to the precision offered by drones. UAVs, especially by enhancing the accuracy of reconnaissance and target strikes, minimize the impact on civilian populations.

While the development of this technology has led to advancements in protecting civilians, making target selection more precise, and reducing risks, the use of UAVs on the battlefield will expand even further in the future. UAVs will play an even larger role in future conflicts, and this technology will have a significant impact not only on military operations but also on strategic decision-making.

Furthermore, with the development of artificial intelligence and drone swarms, the battlefield will become more complex, creating new opportunities for

섹션 7.

MILITARY SCIENCES, NATIONAL SECURITY AND SECURITY OF THE STATE BORDER

the application of new combat strategies. This will also lead to a broader application of this technology in the future.

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섹션 7.

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