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THE USE OF DRONES IN TACTICAL MILITARY OPERATIONS IN THE INTEGRATED AND CYBERNETIC BATTLEFIELD

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ABSTRACT

Drones have become an essential component of modern military arsenals, representing unmanned aerial vehicles capable of performing a variety of tasks, from surveillance and reconnaissance to precision strikes and assistance in military operations. This paper examines the classification and use of drones in the integrated and cybernetic battlefield, analyzing the existing types of drones and the advantages and disadvantages of their use. Various types of drones, their characteristics, capabilities, advantages, and limitations depending on the type and purpose of the operation are examined. The high flight autonomy, surveillance and reconnaissance capabilities, striking potential, precision, and reduced manufacturing and operating costs make drones a highly topical subject in military scientific research. The vulnerabilities and specific limitations of these new weapons, such as vulnerability to radar interference, adverse weather conditions, technological novelty, and doctrinal action limitations, create problems, restrict use, and decrease target effectiveness.

Additionally, the paper analyzes the role and impact of Kamikaze drones in military operations in the current integrated and cybernetic battlefield, highlighting their ability to precisely target and surprise the enemy.

KEYWORDS: cybernetic, drone, integration, kamikaze, precision transformation, transformation

1. Introduction

In the context of technological evolution in general and military technology in particular, in current and possible future wars, the drone has become a crucial component in the arsenal of armed forces worldwide.

Our analysis starts with the Vietnam War, a conflict through which Americans identified the issue of utilizing high-tech means of that time (fighter planes, helicopters, armored vehicles, technological equipment and systems available at that time, automatic weapons, guided anti-tank missiles, sensors, computers, and even unmanned aerial vehicles) through which they ensured victory in tactical-level military actions (Bojor & Cîrdei, 2021).

Drones, broadly speaking, are unmanned aerial vehicles remotely piloted

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by a human or, in the case of autonomous drones, by artificial intelligence software. They can perform a multitude of tasks efficiently and with minimal maintenance and operating costs. The notion of a drone refers to an aerial vehicle piloted remotely by a person or autonomously by AI software. Ground or naval vehicles piloted in the same way as aerial vehicles are not considered drones but rather remotely operated vehicles or robots.

The first drones appeared in the military and aerospace fields for research, reconnaissance, and strike missions in support of military structures in peacetime, crises, and war. In this article, we analyze the aspects related to the classification, use, and types of drones in the military domain, as well as their advantages and disadvantages in action on the integrated and cybernetic battlefield.

The importance of integrating these drones into strike or command and control systems, as well as their potential to transform the way contemporary and future military operations are conducted, is emphasized.

In conclusion, the paper underscores the continued importance of research and development in the field of military drones, as well as the need for a balanced approach to their use in military operations, considering both the advantages and disadvantages associated with them.

2. Classification and Types of Military Drones

Military drones can be based on various criteria, such as:

a. *Range classification*: Very short range drones – up to 5 km; short range drones – up to 150 km; medium range drones – up to 700 km; long range drones – over 700 km.

b. *Destination criteria classification*: spy and/or intelligence-gathering drones; meteorological drones; drones for scientific studies; drones for electronic warfare actions; attack and bombardment drones; surveillance, guidance, and control drones for combat vehicles; kamikaze drones; trap drones; multi-role drones.

Analyzing drones, produced to date or in development, from a structural point of view, we conclude that they can be: single-rotor helicopters, multi-rotor helicopters, hybrids, or fixed-wing aircraft.

Single-rotor helicopters are miniature helicopters powered by thermal or electric motors, without a pilot on board, and remotely controlled. Those with gas engines can fly long distances, are stable, can hover in a fixed position, and can carry heavy loads. They are used for aerial reconnaissance, including in enemy territory, terrain study, mapping, meteorology, logistics transport, and ground attack. This type of drone requires high costs for pilot training and presents some difficulties in operation, especially during landing and takeoff, moments when the danger of injuring the operating personnel or destroying the aircraft is high.

Multi-rotor drones are easy-to-control and pilot aircraft, stable, reliable, and capable of performing multiple tasks over short distances. They are typically lightweight and fly at low altitudes and relatively short distances. In the military field, they are used for photography, mapping, battlefield reconnaissance at platoon or company level, striking the enemy with military grenades, and transporting written correspondence between battalion echelons. Although easy to pilot, they become unstable and difficult to fly in adverse weather conditions.

Fixed-wing drones are unmanned aircraft equipped with thermal engines and, more rarely, electric or hybrid engines. These characteristics allow fixed-wing drones to have high altitudes and long flight distances. Due to their size, these types of drones require larger takeoff and landing areas, sometimes even paved runways. They can remain in flight for long periods and can operate at very long distances, making them highly effective in strategic warfare.

They can also be used to strike the enemy across the depth of the battlefield or to transport large quantities of equipment, ammunition, or even wounded soldiers.

Unlike other types of drones, they withstand adverse weather conditions very well, are stable, fast, and maneuverable. However, they cannot remain stationary, and if tasked with surveilling a target, they must fly on a predetermined path, which can lead to the target being struck and taken out of combat.

In terms of acquisition cost, the fixed-wing drones are the most expensive unmanned aerial vehicles (Daley, 2023).

3. Advantages of Using Drones in the Military Domain

A brief look at the structural characteristics of unmanned aerial vehicles leads us to a series of advantages of their use in military actions and stability and support operations on the cybernetic battlefield, such as:

– High flight autonomy due to optimal energy consumption;

– Very difficult to detect due to reduced radar footprint, relatively small size, and electric propulsion;

– Enhanced or even unlimited capabilities for battlefield research, observation, and surveillance through the integration of advanced electro-optical means under reduced radar and visual footprint conditions;

– The ability to guide high-precision strike vectors with very low material and human costs and high masking probabilities;

– Some drones can remain stationary in flight for a long time and can act at the opportune moment or return to base on a different route than the initial one if the mission is canceled or the enemy is not detected;

– Long-term recovery and reuse of these devices, allowing for the achievement of objectives with relatively low costs;

– Ensuring the physical security of the operator through remote operation;

– Multi-rotor drones can take off and land vertically and can remain in a fixed surveillance position for extended periods;

– Allows for rapid changes to the initial target or mission cancellation if the enemy behaves differently from the predicted action mode;

– Ability to engage fixed or mobile targets and engage targets in various conditions.

4. Disadvantages of Using Drones in the Military Domain

The use of drones in military actions, while offering many advantages, also generates some disadvantages that can have negative effects on the successful conduct of operations in certain situations. Therefore, it should be emphasized that certain information about military drones is confidential, both from the manufacturer's trade secret perspective and from the perspective of the military user's secret, which they attempt to surprise the adversary.

In this regard, we have attempted to deduce a series of disadvantages that we may encounter during military operations or stability and support operations:

– Radio-wave guidance can be jammed or intercepted in electronic warfare conditions, and the drone can be shot down or redirected against its own troops;

– Weather conditions can limit action in time and space and can deprive our troops of vital information for decision-making or fire correction;

– Although the autonomy of drones is greater than that of manned aerial vehicles, in the case of those powered by electric energy, when the external temperature drops below a certain limit, flight performance can be drastically reduced, thus generating problems in fulfilling the mission;

– Operator training requires a large consumption of material, financial, and time resources;

– The production of military drones in the era of globalization is made from components manufactured in several

countries, which generates risks regarding their production in the event of small or medium-intensity military conflicts;

– The use of drones is closely linked to global spatial positioning systems (GPS, Galileo, Glasnost, etc.);

– The integration of drones with other high-precision research and strike systems is at an early stage, and action in the integrated battlefield is still a major goal to be achieved (Cohen et al., 2020).

5. Use of Kamikaze Drones

These weapons systems, Kamikaze drones, are both unmanned aerial vehicles and intelligent munitions and have proven their effectiveness in current wars. From our point of view, these drones are useful for striking targets of operational and strategic importance. However, they can also be successfully used against tactical objectives such as light vehicles and armored vehicles, fortified defense positions, elements of aerial and anti-aircraft systems, personnel, and fire means in movement or stationary.

At the tactical level, Kamikaze drones have a range of up to 50 kilometers, an autonomy of several hours, and can carry striking loads of up to 5 kg. Considering these aspects, it follows that Kamikaze drones are, in fact, firearm systems that can strike, at the tactical level, targets arranged throughout the depth of the combat deployment of large tactical units such as brigades. Also, their integration into swarms together with other types of drones (research, electronic warfare, surveillance, cyber-attacks, etc.) can strike targets composed of multiple elements such as command points, ammunition depots, communication centers, elements of precision strike research systems, communication (relay) points, etc.

The advantages of using these types of drones are:

– Easy and rapid relocation of the launch and control position allows for concealing the striking action;

– Observation, surveillance, target acquisition, and coordinate determination capabilities make these drones surgical precision weapons;

– Control through the human factor or automatically, combined with low-altitude flight, allows Kamikaze drones to strike targets with precision and surprise (Goldstein & Waechter, 2023).

6. Conclusion

In conclusion, the drone represents the latest and most profound revolution in military affairs, offering enormous possibilities for monitoring, reconnaissance, and striking the enemy in military actions. Thinking and action in the military domain currently undergo profound transformations with major effects on planning, organization, and conduct of armed combat. At the same time, it is essential to recognize the enormous potential of drones to enhance the efficiency and effectiveness of military operations, reduce the risk to military personnel, and save lives. By continuing research and development in this field and promoting responsible technology use, drones can become an essential tool in maintaining global security and stability in the 21st century. Currently, through the use of drones, the Russo-Ukrainian war, military knowledge, and practice are at a significant impasse. The harmonious combination of information technology, artificial intelligence, and all types of drones allows the creation of the perfect cybernetic battlefield. Thus, the reaction to the adversary's action facilitates simultaneous or even preemptive striking, and, like in the First World War, when machine gun dominance blocked offensive operations, the use of drones makes everything we knew about conducting armed combat obsolete.

However, we need to have a balanced and responsible approach to the use of drones in a military context. It is crucial to consider the risks and challenges associated with their use, as well as the need to respect

international law regarding the rights of civilian populations and combatants in war.

In conclusion, the era of drones has only just begun, and this reality obliges us to examine the effects of their use on the conduct of war and to apply the resulting corrections.

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