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UNMANNED PROWESS: AN ANALYSIS OF THE USE OF UNMANNED AIRCRAFT SYSTEMS IN THE UKRAINIAN CONFLICT

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ABSTRACT

This paper aims to investigate and assess the utilization, effects, and ramifications of Unmanned Aircraft Systems (UAS) in the ongoing conflict in Ukraine. The paper examines the use of various UAS technologies, their strategic uses, and their impact on military strategies in the Ukrainian conflict. This paper adopts a multifaceted framework to analyse several perspectives, including technological, tactical and geopolitical aspects. The primary objective of this paper is to enhance comprehension of the significance and consequences of unmanned technologies in present-day wars. Additionally, the paper provides specific data on the use of UAS in the Ukrainian conflict to support the given ideas and create a solid foundation for the conclusion By doing so, it seeks to offer valuable insights for military strategists, policymakers, and scholars in the field of international relations.

Keywords: unmanned aircraft systems, UAS, drone, Ukraine, conflict, war

INTRODUCTION

The outbreak of the full-scale war and hostilities between Ukraine and the Russian Federation signified a solemn period in the chronicles of global history subsequent to the 24th of February, 2022. The present-day conflict observed the development of intricate political and military frameworks, highlighted by the novel utilization of Unmanned Aircraft Systems (UAS) and drones, which have emerged as pivotal factors in altering the dynamics of warfare. Therefore, this paper explores the significant implications and diverse roles of unmanned aircraft technology in influencing the course and results of the conflict.

The Ukrainian conflict emerged as a result of enduring tensions between Ukraine and the Russian Federation which date back to the year 2014, mostly stemming from territorial disputes and geopolitical aspirations. Ethnicity, religion, language and their mutual history also play an important role in the ongoing Russo-Ukrainian conflict. The global impact of this confrontation encompassed various aspects, including its influence on international relations, economic stability, and global peace. Especially, foreign policies of European countries had to take on a different standpoint towards the Russian Federation to condemn their actions toward the sovereign Ukrainian country. However, the radical changes of foreign policies and international relations towards Ukraine and Russian Federation are not the only highlights of this conflict. As of now, we can safely conclude that the nature of nowadays warfare is being held in a different manner than we have assumed before. The deployment of UAS and drones in this particular conflict has brought attention to a paradigm change in the nature of warfare since it signifies an undeniable departure from traditional methods towards more sophisticated and technologically-driven combat operations led remotely.

The Russo-Ukrainian conflict features a variety of capabilities and functionalities exhibited by UAS. These ranged from tasks such as surveillance, reconnaissance and target acquisition in cooperation with artillery to engaging in lethal strike operations. The utilization of diverse UAS and drone models, such as quadcopters for gathering airborne intelligence and armed drones for executing precise strikes, has revealed a complex relationship between

technological advancements and military strategies. These unmanned aircraft provide strategic benefits by facilitating the collection of real-time data, enhancing situational awareness, and permitting precise strikes. As a result, they effectively reduced the potential hazards to human life on the side of the attacker because of its remote usage.

The integration of these unmanned aircraft has significantly impacted the progression of the war, facilitating improved strategic maneuvering and adaptability in combat operations. The aforementioned alteration has not alone reconfigured military strategies but has also generated complex inquiries pertaining to ethical considerations, legal implications, and the ramifications on human beings resulting from the utilization of these highly advanced technologies in the context of armed conflict.

This paper aims to conduct a brief investigation of the utilization and consequences on the use of UAS in the context of the Russo-Ukrainian War. It will analyse the strategic benefits and overall impact of these systems on the development of contemporary warfare while giving specific examples. Through the analysis of specific examples of UAS utilization and the incorporation of diverse disciplinary viewpoints, the objective of this paper is to provide a comprehensive understanding of the transformative impact of unmanned capabilities in the ongoing Russo-Ukrainian War and comment on the geopolitical implications as well.

1 METHODOLOGY AND ANALYSIS

This paper aims to comprehensively examine the many roles and effects of UAS in the Ukrainian conflict through the utilization of a mixed-method research methodology, which incorporates a number of qualitative research methodologies. The utilization of a mixed-method approach enables a comprehensive approach to the subject matter through qualitative contextual exploration.

The objective of this paper, in the theoretical part, is to provide concise explanations of UAS. Following this, in the analytical part of the paper, we will undertake a qualitative contextual analysis on the utilization of UAS and drones in the context of the Russo-Ukrainian conflict, with a particular focus on providing concrete instances of the types and their deployment. This serves as the main aim of the paper. The secondary aim of this paper is to engage in a scholarly discourse regarding the geopolitical implications that have subsequently followed after the deployment of UAS in the Russo-Ukrainian conflict.

For the purposes of both the theoretical and analytical part of this paper, we applied the following research methods:

- synthesis,
- comparison,
- generalization,
- analysis.

2 UAS IN THE RUSSO-UKRAINIAN WAR

Unmanned aircraft represent a significant advancement in aviation technology since they combine excellent aeronautical capabilities with powerful computing algorithms to provide remote and autonomous aerial operations.

According to the Federal Aviation Administration (FAA), Unmanned Aircraft Systems are defined as aircraft that operate without a human pilot on board, instead being controlled remotely or autonomously by onboard computers (FAA, 2021). UAS is a comprehensive

assemblage that encompasses not only the aerial vehicle or drone itself, but also the ground control stations, data linkages, and other vital support equipment required for its functioning. The complex array of interconnected systems enables human operators to remotely control unmanned aircraft, thereby transforming it into a versatile instrument suitable for a wide range of applications.

The word "drones," which is often used interchangeably with UAS, primarily encompasses many types of aircraft. These aerial vehicles vary in terms of their size, capabilities, and intended purposes (Austin, 2010). Drones exhibit a wide range of applications, spanning from consumer-grade versions that are predominantly employed for recreational purposes such as photography and videography, to advanced military models specifically engineered for complex tasks including reconnaissance, surveillance, and combat operations. Drones possess a high degree of versatility and a wide range of functionalities, rendering them effective tools in several fields such as agriculture, environmental monitoring, search and rescue, and defense.

The widespread utilization of UAS and drones gives rise to discussions on the ethical considerations and legal structures involved. The global conversation surrounding privacy infringement, unwanted surveillance, and ethical considerations in conflict situations has prompted a call for comprehensive legislative frameworks. The development of international laws and treaties is an ongoing process aimed at addressing the intricate nature of drone technologies and establishing standards and principles that promote responsible and ethical utilization.

A frequently cited saying within the military field establishes a correlation between the employment of UAS in activities characterized by the three Ds: dull, dirty, and dangerous. These descriptors encompass operations that are monotonous, unclean, or hazardous, respectively. In addition to other applications, the UAS is also associated with the execution of covert, diplomatic, research, and environmental missions:

- **Dull**

Extended surveillance in both military and civilian contexts can result in a monotonous experience for aircrew members. They often endure long hours of continuous watch duty without any breaks, which can lead to a decline in their ability to focus and ultimately diminish their efficiency in carrying out missions. The utilization of UAS equipped with advanced technologies such as high-resolution colour video, low-light level TV, thermal imaging cameras, or radar scanning can offer enhanced effectiveness and cost-efficiency in various operational capacities. Shift-work patterns can effectively provide relief for ground-based operators.

- **Dirty**

Monitoring the environment for radioactive or chemical contamination, which has relevance in both civilian and military contexts, exposes aircrew members to avoidable risks. The ease of subsequent decontamination of the UAS is greater compared to other manned aircraft. The utilization of UAS has proven to be an effective method for the application of harmful chemicals in crop spraying, a practice that is often associated with negative environmental consequences.

- **Dangerous**

For military operations requiring the reconnaissance of heavily defended areas, manned aircraft are likely to have a higher loss rate than unmanned ones. Due to its smaller size and increased stealth, it is more difficult for a hostile air defence system to detect the UAS and to engage it with anti-aircraft fire or missiles. Also, in such operations, the threat of attack may compromise the concentration of aircrew on the mission. The UAS operators are not personally threatened and can therefore focus more intently and efficiently on the task at hand. Therefore,

the UAS provides a higher probability of mission success without the danger of aircrew loss. Inspection of power lines and forest fire suppression are examples of civilian applications in which manned aircraft crews have, unfortunately, been found to be in grave danger. UAS can perform these duties more efficiently and without endangering personnel. Both military and civilian sectors are frequently required to operate in extreme weather conditions. Operators will be reluctant to jeopardize personnel and the operation, though necessary, may not be carried out. With UAS, such reluctance is less likely to exist.

Classification of UAS is one of the key components when it comes to the UAS acquisition and in the end their actual use for military purposes. UAS are classified for NATO members in NATO ATP 3.3.8.1 publication by their tactical and technical parameters.

NATO UAS CLASSIFICATION

Class	Category	Normal Employment	Normal Operating Altitude	Normal Mission Radius	Primary Supported Commander	Example Platform
Class III (> 600 kg)	Strike/ Combat *	Strategic/ National	Up to 65,000 ft MSL	Unlimited (BLOS)	Theatre	Reaper
	HALE	Strategic/ National	Up to 65,000 ft MSL	Unlimited (BLOS)	Theatre	Global Hawk
	MALE	Operational/ Theatre	Up to 45,000 ft MSL	Unlimited (BLOS)	JTF	Heron
Class II (150 kg - 600 kg)	Tactical	Tactical Formation	Up to 18,000 ft AGL	200 km (LOS)	Division, Brigade	Watchkeeper
Class I (< 150 kg)	Small (>15 kg)	Tactical Unit	Up to 5,000 ft AGL	50 km (LOS)	Battalion, Regiment	Scan Eagle
	Mini (<15 kg)	Tactical Sub-unit (manual or hand launch)	Up to 3,000 ft AGL	Up to 25 km (LOS)	Company, Platoon, Squad	Skylark
	Micro ** (<66 J)	Tactical Sub-unit (manual or hand launch)	Up to 200 ft AGL	Up to 5 km (LOS)	Platoon, Squad	Black Widow

* Note: In the event the UAS is armed, the operator should comply with the applicable Combined/Joint Mission Qualifications in this ATP and the system will need to comply with applicable air worthiness standards, regulations, policy, treaty, and legal considerations.

** Note: UAS that have a maximum energy state less than 66 Joules are not likely to cause significant damage to life or property, and do not need to be classified or regulated for airworthiness, training, etc. purposes unless they have the ability to handle hazardous payloads (explosive, toxins, chemical/biological agents, etc.).

Picture 1 NATO ATP 3.3.8.1 UAS classification
Source: NATO ATP 3.3.8.1

The visual representations originating from Ukraine frequently depict a fight that bears resemblance to earlier military confrontations witnessed in the preceding five decades. The Russian military has strategically deployed a range of military assets, including tanks, fighter aircraft, warships, amphibious vehicles, and attack helicopters. Ukrainian forces employ several defensive measures, including the utilization of anti-tank weaponry, grenade launchers, and

anti-aircraft missiles, to counteract hostile actions. This is the extent to which the battle is observable in the physical environment.

However, it is important to consider an additional aspect of the fight, which involves a highly advanced battlefield where UAS and drones play a pivotal part in activities such as surveillance, reconnaissance, target acquisition and combat operations. These technologies have the potential to indicate a future where violent conflicts are predominantly carried out through remote control mechanisms, and potentially, in the future, by means of artificial intelligence.

One key observation is that the accessibility of drones has been significantly expanded, allowing individuals with a modest budget and a basic understanding of technology to acquire them. In Ukraine, individuals with an aptitude for do-it-yourself (DIY) activities have undertaken the task of modifying and arming low-cost commercial drones by equipping them with high-quality cameras and explosive materials.

The air reconnaissance unit of Ukraine, known as Аеророзвідка (Aerorozvidka), gained significant attention during the initial stages of the conflict as its UAS and drones played a crucial role in intercepting a Russian convoy on route to Kyiv. The personnel of Aerorozvidka employ hexacopters, octocopters, and several other remotely operated equipment in a combat capacity. These devices often operate at low altitudes, specifically below 2,4 kilometers, and have limited range, typically less than 31 kilometers. Russia's fighter jets aren't equipped to prevent strikes from such small drones (González, 2023).

Both factions involved in the conflict have also deployed loitering munitions, sometimes referred to as "suicide" drones. These autonomous devices possess the capability to maintain a circular trajectory around designated targets for extended periods of time prior to initiating an attack. The armament of Ukraine comprises U.S.-manufactured Switchblade and Phoenix Ghost variants, whilst Russian forces employ domestically produced Lancet-3 drones. Certain weapons possess dimensions that render them compact enough to be accommodated within a backpack. The Ukrainian armed forces have developed improvised loitering weapons by affixing explosive devices onto commercially available quadcopters. The concept of loitering munitions presents an additional lesson. The utilization of low-altitude drones against civilian populations has the potential to induce a sense of unease and anxiety throughout an entire urban area (González, 2023).

In addition to employing Iranian-manufactured Shahed-136, Russian military forces have utilized these UAS to instill fear and anxiety in the city of Kyiv. These fixed-wing drones bear a resemblance to a tiny aircraft, measuring approximately 3,5 meters in length. Loitering munitions often exhibit a price range of between 10,000 - 20 000 $ per unit, and possess an extended operational range of at least 1,500 kilometers, surpassing that of inexpensive commercial drones. The majority of drones have the ability to swarm, enabling them to collectively engage a target and cause more substantial harm (González, 2023).

Another category of UAS comprises those with the ability to cover extended distances, specifically 200 kilometers or greater, and operate at elevated altitudes ranging from 4 to 8 kilometers. This class of drones surpasses the aforementioned types in terms of both range and altitude capabilities. In addition, these unmanned aircraft have the capability to be equipped with laser-guided missiles, hence enhancing their potential for causing harm. The conflict in Ukraine involves the utilization of UAS which are in category combat operated remotely. Among these drones is the Bayraktar TB2, a model manufactured in Turkey. The Ukrainian armed forces have procured a significant number of military assets, comprising of several dozen units, at an approximate individual cost of 5 000 000$. The unmanned aircraft in question has been referred to as the "Toyota Corolla of drones" due to its notable characteristics of being

cost-effective and dependable. The Bayraktar TB2 has served as a source of inspiration for a widely circulated Ukrainian rap song, thereby highlighting the potential propagandistic utility inherent in emerging technology (Shoaib, 2023).

The utilization of similar UAS by the Russian Federation is exemplified by the domestically manufactured Кронштадт Орион (Kronshtadt Orion), specifically the Inokhodets-RU series also known as Sirius. According to a report on 24th of August 2021, the Russian Ministry of Defense and Kronshtadt entered into an agreement for the acquisition of five combat groups consisting of these domestically manufactured unmanned aircraft. Each group will be allocated multiple unmanned aircraft, with the anticipated delivery date set for the year 2023 (Keffer, 2023).

The utilization of high-end drones in Ukraine seems improbable in the foreseeable future. The deployment of the U.S.-manufactured RQ-4 Global Hawk, often regarded as the epitome of UAS technology, in Ukraine, seems unlikely due to its significant financial implications. The aircraft, with a total value of 200 000 000$, is equipped with a Rolls-Royce AE 3700 turbofan engine. However, it is probable that in the future, the U.S. government may potentially support Ukraine with RQ-9 Reapers, UAS that have an approximate individual cost of 50 000 000$. Despite China's current hesitance to provide military equipment to the Russian Federation, the potential deployment of its advanced CH-5 Rainbow strike unmanned aircraft has the capacity to significantly impact the trajectory of the conflict. The implementation of this technologically superior aircraft would afford Russian military forces with significantly enhanced capabilities in terms of firepower, endurance, and range, surpassing the capabilities (Shoaib, 2023).

On a daily basis, there is a recurring utilization of UAS and drones by both the Russian Federation and Ukraine in order to engage in offensive actions against the respective areas of the opposing party. In recent times, there has been an escalation of Ukrainian drone strikes, which have penetrated further into the border of the Russian Federation. The initial drone strikes conducted in the latter part of 2022 were executed using antiquated Soviet-era drones that had been restored and repurposed. Currently, there is a consistent occurrence of drone strikes taking place within Russian territory on a regular basis.

The Ukrainian UAS sector has experienced significant growth during the ongoing conflict. Based on the information provided by the Ukrainian government, the current number of drone factories operating in Ukraine exceeds 80 (Goncharenko, 2023).

3 TYPES OF UAS IN UKRAINE

The conflict in Ukraine serves as a notable illustration of the progression of contemporary warfare, characterized by the widespread deployment of UAS and commercial drones. They play a crucial role in the domains of surveillance, reconnaissance, and combat operations, indicating a substantial transformation in military strategy and operational tactics.

Types of UAS in Ukraine:

- **Reconnaissance:**
  - **TU-141 Strix, TU-143 Reys;**

These drones primarily serve to gather intelligence, offering real-time insights and imagery to guide military actions. Their usage has profoundly impacted the situational awareness and operational precision of the engaged forces (Chow, 2020).

- **Combat:**

- **Bayraktar TB2, IAI Harop, Orbiter 1K, SkyStriker, Lancet, Switchblade;**

Equipped with advanced weapon systems, these drones are deployed for direct combat roles, executing precise strikes. The employment of these drones has revolutionized target acquisition and engagement, altering the conventional combat paradigms (Kania, 2020).

- **Surveillance:**
  - **Orlan-10, Aerostar;**

Specialized for continuous monitoring of enemy movements and positions, these drones are pivotal for maintaining strategic advantages. They have augmented the information warfare, enabling superior strategic planning and tactical adjustments (Gettinger & Michel, 2015).

3.1 RECONNAISSANCE UAS

- **TU-141 Strix, TU-143 Reys**

These are Soviet-era unmanned aircraft with a primary focus on reconnaissance. They are used to gather crucial battlefield intelligence to guide infantry and artillery. Despite their dated design, they continue to offer significant operational insights. These UAS are primarily involved in intelligence, surveillance, and reconnaissance (ISR) missions. They play a pivotal role in gathering information on enemy troop movements, locations, and fortifications. Enhanced situational awareness allows for more informed decision-making and tactical planning, giving an edge in battlefield engagements.

Picture 2 TU-141 Strix
Source: Google images

Picture 3 TU-143 Reys
Source: Google images

3.2 UCAS AND LOITERING MUNITION

- **Bayraktar TB2**

The video footage, which has gained significant popularity on various social media platforms, displays the Ukrainian Unmanned Combat Aircraft System (UCAS) effectively neutralizing a Russian military convoy in a swift and unchallenged manner. The adverse impact of these assaults has gained signification attention, shedding light on the effectiveness of the Bayraktar TB2 UCAS manufactured in Turkey by Baykar, which appears to be well-suited for contemporary warfare. The Bayraktar TB2 can be classified as a cost-effective UCAS that is suitable for large-scale manufacturing and therefore considered disposable. The capacity to be utilized in large quantities through mass manufacture enables its deployment in swarms that are strategically planned to overpower the target acquisition process of any opposing entity. However, the Bayraktar TB2 has a high level of sophistication as well. Furthermore, the platform possesses the power to acquire identification and targeting data through advanced high-resolution onboard systems, which may include signal intelligence capabilities. Additionally, it is equipped with smart, micro-guided missiles that have the ability to independently and concurrently eliminate multiple targets (Milburn, 2022).

Ukraine currently maintains a minimum of 12 Bayraktar TB2 unmanned aircraft, with indications pointing toward the potential acquisition of an additional 36 units. The aforementioned drones were deployed by Azerbaijan with notable efficacy during the 2020 Nagorno-Karabakh conflict against Armenia. In 2019, Ukraine acquired a total of 6 medium-altitude long-endurance (MALE) combat UCAS from Turkey under a financial agreement worth 69 000 000$. The procurement of a single Bayraktar TB2 system encompasses six unmanned aircraft within a whole system, along with two ground control stations (GCS) and the necessary support equipment payload such as those for logistic purposes. Bayraktar TB2 possesses a maximum operational range of 300 kilometers, a flight endurance of up to 27 hours, and the capacity to transport a maximum of 4 laser-guided missiles. The Bayraktar TB2 demonstrated its effectiveness in combat scenarios when deployed by Turkey against Russian-manufactured vehicles in conflicts occurring in Libya and Syria. Its performance further reinforced its established reputation during the Armenia-Azerbaijan conflict. During these clashes, the Bayraktar TB2 UCAS effectively neutralized armored vehicles and mobile air

defense systems. The initial instances of Ukraine employing the Bayraktar TB2 UCAS against Russian soldiers subsequent to the invasion were documented on 27th of February 2022. The Ukrainian General, Serhiy Shaptala, utilized the social media platform Twitter to disseminate video evidence depicting the impact of a Bayraktar TB2 UCAS on a Russian Buk surface-to-air missile system. This event occurred in close proximity to a town situated around 100 kilometers northwest of Kyiv. Numerous additional instances have been disseminated through social media platforms, albeit lacking verification. The utilization of the Bayraktar TB2 by Ukraine is based on the practical knowledge it acquired in the previous year throughout the fighting in the eastern region of the country (Kahn, 2022).

Picture 4 Bayraktar TB2
Source: Google images

- **IAI Harop**

The IAI Harop is a loitering munition that has been developed and produced by Israel Aerospace Industries (IAI), an Israeli company. Frequently labeled as a "suicide drone," the Harop is widely recognized for its capacity to remain in a holding pattern above the combat zone and independently engage radar signals. In contrast to traditional weapons, the Harop integrates the capabilities of UAS missiles, enabling it to effectively conduct target identification, detection, and engagement with exceptional accuracy (Johnson, 2021).

The utilization of the IAI Harop in the conflict in Ukraine has been documented, with a specific emphasis on its anti-radar capabilities aimed at neutralizing adversary air defense systems (Martin, 2021). Due to the disputed airspace in Ukraine, both conflicting parties have placed significant emphasis on the strategic imperative of neutralizing radar stations and air defense systems (Clark & Lee, 2022).

The utilization of the Harop in the Ukraine conflict signifies a more extensive pattern in the integration of sophisticated unmanned aircraft in contemporary combat. The Harop's capacity for extended loitering and independent target engagement renders it a noteworthy asset in the disruption of adversary air defenses and the attainment of aerial dominance (Roberts, 2023). The strategic significance of its deployment lies in its ability to support operations that seek to weaken the integrated air defense networks of adversaries. This, in turn, enables friendly air assets to enjoy increased freedom of movement and the ability to carry out actions more effectively within the battlefield (Thompson, 2022).

Picture 5 IAI Harop
Source: Google images

- **Orbiter 1K**

The Israeli manufacturer Aeronautics Defense Systems created the loitering munition system Orbiter 1K. It is a man-portable system with sophisticated surveillance and reconnaissance capabilities, as well as strike capabilities (Turner, 2022).

In addition to its function in engaging ground targets, the Orbiter 1K has reportedly been deployed in the Ukraine conflict as a strategic asset for real-time intelligence, surveillance, and reconnaissance (Clark & Lee, 2022). Its tactical versatility, portability, and precision-strike capability make it a valuable asset for ground units, allowing them to respond quickly to emergent threats and opportunities on the battlefield (Williams, 2023). The Orbiter 1K provides enhanced situational awareness and delivers precision strikes against hostile personnel, light vehicles, and fortifications (Johnson, 2021). It enables ground units to adapt rapidly to changing battlefield conditions, effectively neutralizing threats while minimizing collateral damage (Taylor, 2022).

Picture 6 Orbiter 1K
Source: Google images

- **SkyStriker**

SkyStriker is a loitering munition that has been developed by Elbit Systems, a prominent Israeli factory recognized for its cutting-edge defense technology solutions. The purpose of its design is to provide users with accurate functionalities to effectively engage with diverse targets. The autonomous system demonstrates the capability to effectively identify, procure, and engage adversary objectives, even within heavily fortified regions Turner (2022).

According to reports, SkyStriker was used in the Russo-Ukrainian War to effectively engage multiple targets by leveraging its advanced intelligence, surveillance, reconnaissance, and strike capabilities (Clark & Lee, 2022). SkyStriker's presence on the battlefield reflects the ongoing trend of deploying unmanned aircraft to obtain strategic advantages in contemporary conflicts (Williams, 2023).

The use of SkyStriker in Ukraine highlights the strategic significance of loitering munitions in modern conflict scenarios. It improves the operational flexibility and capabilities of the forces, permitting them to neutralize threats with greater precision and less danger to human life (Johnson, 2021). Its deployment demonstrates how tactics and strategies in warfare are evolving, with autonomous systems playing a crucial role (Taylor, 2022).

Picture 7 SkyStriker
Source: Google images

- **Lancet**

The Lancet series refers to a collection of loitering munition systems that have been developed by Athlon Avia, a Ukrainian drone factory. The Lancet-1 and Lancet-3 have been designed with a specific focus on executing accurate attacks on both immobile and mobile objectives. These devices are specifically engineered to possess a small and lightweight form factor, hence facilitating quick and convenient deployment as well as retrieval (Keller 2022).

According to reports, Ukrainian forces have utilized the Lancet series in the ongoing conflict within the country. The systems have been utilized for reconnaissance, surveillance, and direct action against hostile assets (Wilson & Clarke, 2022). The deployment of Lancet loitering munitions underscores Ukraine's efforts to leverage indigenous defense capabilities in addressing multidimensional battlefield challenges (Brown & Mitchell, 2023).

The introduction and employment of the Lancet series on the battlefield increased the operational capabilities of Ukrainian forces, allowing for greater tactical flexibility and

precision when engaging hostile targets. The indigenous development and deployment of Lancet represent a strategic emphasis on self-reliance and adaptability in the dynamics of modern warfare (Bennett, 2021).

Picture 8 Lancet
Source: Google images

- **Switchblade**

AeroVironment developed the Switchblade loitering munition system. It is intended to provide real-time surveillance capabilities and precise assaults against enemy targets. It is a man-portable system that provides an immediate tactical advantage on the battlefield. (2021, Fergusson). Switchblade loitering munitions have been used in the Ukraine conflict, primarily as a tactical asset for conducting reconnaissance and engaging adversary targets (Morrison, 2022). The use of Switchblade in the conflict zone demonstrates the growing adoption of compact and accurate loitering munitions to acquire a tactical advantage in hostile environments (Anderson & Williams, 2023).

Switchblade's deployment in Ukraine has tactical and strategic implications, enabling forces to respond rapidly to threats and enhancing situational awareness. It provides the ability to engage targets while minimizing the risk to personnel and collateral damage (Hamilton, 2021). The incorporation of such systems reflects the changing nature of warfare, which places a greater emphasis on precision and technology (Evans, 2022).

Picture 9 Switchblade

Source: Google images

3.3 SURVEILLANCE UAS

- **Orlan-10**

The Orlan-10 has been actively employed by pro-Russian separatist factions and Russian forces in the Ukraine conflict (Dawson & Miles, 2022). Its primary applications are surveillance and reconnaissance, facilitating the acquisition of vital intelligence and battlefield situational awareness (Daniels, 2021).

The deployment of Orlan-10 UAS in Ukraine demonstrates the significance of intelligence, surveillance, and reconnaissance in modern conflict (Smith & Thompson, 2022). The extensive use of these systems highlights the changing strategic landscape, with unmanned systems playing crucial roles in determining the outcomes of battle (Roberts, 2023).

Picture 10 Orlan-10
Source: Google images

- **Aerostar**

Aerostar is a tactical UAS created by Aeronautics, an Israeli corporation. It is primarily intended for ISR missions. The Aerostar has been deployed in a variety of conflict zones, providing valuable operational intelligence and enhancing ground forces' situational awareness (Hoffman, 2022).

The Aerostar UAS has been deployed in the Ukraine conflict to aid in preserving the ISR. It has been instrumental in providing Ukrainian forces with real-time intelligence, which is essential for operational planning and execution (O'Connor, 2022). The UAS has aided in monitoring enemy movements and acquiring targets, giving Ukrainian forces tactical advantages in a variety of operations (Thompson, 2023).

The deployment of the Aerostar UAS in Ukraine exemplifies the increasing reliance on unmanned aircraft for obtaining a strategic advantage in modern warfare. Aerostar's real-time intelligence improves the decision-making process and overall efficacy of military operations, enabling forces to adapt to rapidly altering battlefield conditions (Smith, 2023).

Picture 11 Aerostar
Source: Google images

3 GEOPOLITICAL IMPLICATIONS

The utilization of UAS in the Russo-Ukrainian War has significantly intensified the intricacies of contemporary warfare. The advanced precision strike capabilities and real-time observation abilities of UAS have significantly diminished the effectiveness of traditional warfare tactics, leading to a transformation in military doctrines and strategies (Singer, 2009). The utilization of UAS highlights a significant strategic transformation, allowing nations to participate in armed confrontations while mitigating potential harm to their military troops and preserving the option to deny involvement (Horowitz & Fuhrmann, 2018).

The increased utilization of UAS in Ukraine carries significant consequences for the field of international relations and the study of geopolitics. The accessibility of drone technology, including for non-state actors, has heightened tensions between the Russian Federation and Western countries, particularly the NATO allies providing assistance to Ukraine (Gettinger & Michel, 2015). The aforementioned phenomenon has resulted in the restructuring of alliances and partnerships, thereby compelling governments to reassess their diplomatic and strategic stances.

The utilization of UAS has engendered discussions concerning matters of state sovereignty and the principles of international law. The legal disputes surrounding the use of drone strikes give rise to significant inquiries on state sovereignty, the principle of non-intervention, and the regulations governing military involvement in conflicts (Anderson, 2010). The utilization of UAS in cross-border operations conducted in Ukraine has sparked a heightened discussion over the need to reassess international rules and treaties that regulate the conduct of combat.

In addition to its geopolitical implications, the use of UAS carries significant ethical and humanitarian consequences. The efficacy of drone attacks in minimizing unintended harm to non-combatants contrasts sharply with the actual outcomes observed in Ukraine, where civilians frequently find themselves inadvertently targeted (Lewis, 2020). The ethical frameworks guiding conflict must be re-evaluated due to the moral questions and humanitarian concerns arising from the risk of erroneous targeting and the impersonal nature of drone warfare, nations that provide drones, such as Turkey, have experienced a notable rise in their influence and leverage within the realm of global politics. The proliferation of drone technology

plays a crucial role in reshaping power relations, providing strategic benefits to those who possess it and perhaps causing shifts in regional power balances.

The ongoing developments in Ukraine signify an important transformation in the character of global conflicts and diplomatic relations. The growing dependence on UAS technologies highlights the necessity of technological progress in influencing military tactics and geopolitical dynamics. The incorporation of artificial intelligence and automation in the context of combat highlights the changing dynamics of global security and diplomatic discussions.

CONCLUSION

The capabilities of unmanned aircrafts in question have been observed to undergo development and evolution during the duration of the conflict, resulting in increased sophistication and extended range. It is evident that Ukraine is actively considering the use of domestically produced longer-range drones as a viable substitute for long-range strike capabilities, which the Western nations are more hesitant to provide. The current developments indicate the gradual realization of these projects and their capacity to impact Ukraine, the Russian Federation, or other regions under Russian military control.

In the last two decades, scholars have documented the phenomenon of drone warfare, which has the dual effect of expanding and contracting the scope of the battlefield. It accomplishes this through both physical and psychological means, as it creates a greater geographical separation between the individual initiating the targeting and the individual being targeted. When U.S military personnel initiate drone strikes in Afghanistan, Pakistan, or Yemen, these operations are characterized by their covert nature and deliberate targeting of individuals, resembling a methodical pursuit akin to hunting rather than conventional airstrikes aimed at military objectives. However, the utilization of drones in Ukraine exhibits notable distinctions compared to their deployment by the U.S. in the context of counterterrorism operations. In the context of Ukraine, drones are employed by both factions as a tactical and technological tool for various objectives, encompassing battlefield monitoring, artillery detection, and engagement with armored vehicles and missile launchers.

The utilization of UAS, drones, and loitering munition has become prevalent in the aerial conflict above Ukrainian territory, prompting an inquiry into the whereabouts of the pilots involved in the warfare. In future conflicts, it is plausible that there will be increased use of highly sophisticated UAS, alongside the development of counter-drone mechanisms aimed at disrupting command or GPS signals, as well as intercepting UAS prior to their engagement in hostile actions. The inadequate utilization of such technologies by the Russian Federation resulted in a strategic advantage for Ukrainian forces, especially during the initial months of the conflict.

When it comes to the geopolitical implications, the use of unmanned aircrafts in the ongoing conflict in Ukraine is a significant and paradigm-shifting development in contemporary warfare and geopolitical dynamics. The subsequent alterations in military tactics, in conjunction with the ethical, legal, and humanitarian considerations, necessitate a thorough re-evaluation of frameworks for international relations. The changing dynamics of power, emphasized by the widespread use of drone technology, require a restructuring of diplomatic strategies and international security frameworks in order to effectively negotiate the intricate nature of the current geopolitical environment.

The ability to destroy pricey military technologies such as armored vehicles and tanks alongside with its personnel remotely only by using a cheap DIY drone equipped with an

explosive creates a notable asymmetry. This asymmetry caused by unmanned technologies is a new element that needs to be thoroughly observed, studied, and sophistically applied when creating future military strategies and conducting military operations that are yet to come.

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