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SMALL AERIAL DRONES – MODELERS OF LAND FORCES TACTICS IN CONTEMPORARY AND FUTURE WARFARE

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ABSTRACT
In light of the swift advancement of drone technology and the growing deployment of small Unmanned Aerial Systems (sUAS), land forces are faced with fundamental challenges and opportunities that significantly transform the mode of action and tactics used on the battlefield of contemporary and future warfare. In our paper, we explore the transformative effects of sUAS on the actions of combat forces, combat support forces and military logistics of land forces. We consider both the role of sUAS in enhancing operational capabilities – through advanced reconnaissance, continuous surveillance, precision strikes, force protection, rapid mobility, and the safeguarding of routes and supply depots – and the risks associated with their potential exploitation by enemy forces. Thus, we address essential tactical scenarios in which we analyze how sUAS can decisively influence the actions of all types of forces within the land forces. The study also underlines the imperative of updating doctrines and operational frameworks of land force structures for the effective integration of emerging technologies and the development of adequate protective measures, essential for ensuring a sustainable tactical advantage in future conflicts.

KEYWORDS: sUAS, tactics, land forces, doctrinal transformation, contemporary warfare

1. Introduction

In recent decades, autonomous technologies have evolved rapidly, and drones have become an essential element in modern military conflicts. In particular, small unmanned aerial systems (sUAS) have revolutionized the way armed combat is conducted in modern warfare. They allow for faster and more precise tactical actions, without the risks associated with the use of traditional resources. Thus, they provide the possibility of obtaining significant tactical advantages for land forces, providing the ability to react quickly and effectively to rapidly changing battlefield situations. At the same time, the use of sUAS by the enemy can generate considerable difficulties, including vulnerabilities in the defense of its own forces, risks in securing logistical routes, and challenges in the protection of equipment and warehouses, which requires the development of appropriate protective measures and effective countermeasures.

The use of drones in armed conflicts has evolved from an auxiliary role of intelligence gathering and surveillance, to a multifunctional tool that influences tactical decisions in real time and allows forces to react promptly to changing situations on the ground. sUAS, in particular, are capable of carrying out a wide range of missions, from reconnaissance and protection of alignments, positions and areas of deployment, areas of action, supply routes, etc., to striking enemy targets or providing rapid logistical support.

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Contemporary and future warfare is characterized by increased complexity and speed. In this context, special emphasis is placed on the integration of advanced technologies, and military conflicts are increasingly influenced by developments in the field of artificial intelligence, cyber warfare, autonomous technologies and, within these, specifically, drone technology. Modern warfare no longer means only direct confrontations between combatant forces, but also a complex game of information, adaptability and speed, in a hybrid and often unpredictable environment. In this landscape, sUAS become not only a support tool, but also an essential element in the recalibration of the tactics of land forces, a category of forces of the army, composed of various types of forces, each having specific roles in the context of military operations. These include: combat forces, combat support forces, service support forces, special operations forces, and command support elements (U.S. Department of the Army, FM 3-0: Operations, 2022).

In this context, sUAS find their applicability in all segments of land forces, influencing each component, from tactical actions to logistical support.

The purpose of this paper is to analyze the role of sUAS in shaping the tactics of land forces, both in contemporary warfare and in future conflicts. To this end, we will explore the impact of these technologies on various types of forces within land forces and discuss how they can modify the dynamics of tactics, including in the context of a hybrid, nonlinear or variable intensity war.

Thus, the paper falls into the category of applied, qualitative and descriptive studies, aiming to analyze how sUAS shape, influence and transform the tactics of land forces in contemporary and future military conflicts. The general purpose of the research is to identify emerging trends in the use of tactical drones, to assess their impact on military doctrine and to anticipate possible directions of evolution of land combat. The main purpose of the paper is to analyze the operational and tactical role of sUAS in recent military conflicts, in order to identify the structural and functional transformations produced on land forces.

The specific objectives are: to investigate the main aspects and trends regarding the use of sUAS in recent conflicts; to assess the impact of drones on observation, patrol, strike and maneuver tactics; to identify vulnerabilities and continuously adapting capabilities of land forces; to formulate conclusions and recommendations regarding the integration of sUAS into the doctrine and training of land forces.

The central question of the research is: "*How do sUAS influence the tactics and organization of land forces in contemporary and future warfare?*", and the working hypothesis formulated is: "*sUAS represent a major transforming factor in land force tactics, by increasing observation capacity, precision and lethality, generating the need for rapid adaptation of doctrines, procedures and combat structure*".

The research method used is qualitative, with an emphasis on documentary analysis and comparative analysis, as we considered that this approach allows the investigation of the phenomenon in a broad contextual framework, through critical examination of primary and secondary sources. Data analysis was carried out through an inductive approach, aiming to extract trends and operational lessons from concrete cases. Recurring patterns in the use of tactical drones were identified, as were the changes generated in the decision-making chain and the conduct of actions at the tactical level. The data used come from open, academic and doctrinal sources.

We would like to point out that we did not consider it necessary to expressly define the term "small aerial drones (sUAS)", as the issue of drones has already become a familiar social paradigm for both the general public and specialists, being intensively addressed in numerous studies, articles and doctrinal reports. In this context, we opted to deepen the tactical and doctrinal impact of these systems, assuming a minimum level of familiarity with the term.

Considering all these aspects, we believe that our work will contribute to a deeper understanding of how sUAS shape the future of land force tactics and how they can be effectively integrated into operational structures to provide a significant advantage in future conflicts.

2. sUAS – Vectors of Doctrinal and Tactical Transformation of the Land Forces

In recent decades, accelerated technological progress has led to a profound transformation of the combat environment. Of all the new capabilities introduced, aerial drones – especially small ones – have emerged as a factor in radically changing tactics, doctrine and operational architecture. The constant, almost continuous presence of these means on the modern battlefield, except during periods when weather conditions are unfavorable or when the enemy is executing effective electronic warfare (EW) actions, makes them a permanent threat to all elements of the combat device, regardless of the nature or level of force – from the engagement group (starting with individuals and teams in direct contact with the enemy) and the command system, to the operational reserve and the logistics system.

Thus, drone technology has become one of the most disruptive innovations of contemporary warfare. From peripheral surveillance tools, drones have come to play a central role in the conduct of military operations, affecting all levels of organization and action – from command systems to combat teams, from combat forces to logistics. The war in Ukraine has provided and provides the most eloquent framework for observing this phenomenon, not only confirming but validating the doctrinal and tactical transformation caused by the proliferation of these systems.

In order to analyze the extent to which sUAS constitute vectors of transformation of doctrines and tactics of weapons and military specialties of land forces, we will start from the operational and tactical functions of these aerial drones, we will address their impact on tactical organization and maneuver, aspects regarding the accessibility of these systems, their tactical advantages – their precision, adaptability and effectiveness in combat, the implications for military leadership and, last but not least, their limits and vulnerabilities.

sUAS have become multifunctional platforms capable of performing a wide variety of missions on the contemporary battlefield, including: reconnaissance and surveillance of the battle space, fire control and correction, direct attack on identified targets (precision strikes against vehicles, personnel, combat positions and logistical infrastructure), engineering support (mining/ demining and obstacle placement/ removal missions), Chemical, Biological, Radiological, and Nuclear support (CBRN detection missions), missions across the entire spectrum of logistical support (logistical transport – supply/resupply; transport of medicines, blood, serum, medical supplies; punctual evacuation, etc.) and electronic warfare actions (Borsari & Gordon, 2023, pp. 4, 7).

Some modern models are equipped with frequency hopping jamming avoidance technologies, and semi-autonomous drones can change their trajectory in real time or return to the operator in the event of a mission failure (Yang et al., 2025, p. 3). This makes electronic countermeasures and conventional air defense systems insufficient to completely neutralize this threat.

A direct effect of the ubiquity of drones is the reduction of the effectiveness of classic concentrations of troops and military equipment. Currently, the massive use of heavy equipment – such as armored vehicles or self-propelled artillery – in the front line becomes a major factor of vulnerability, as these elements are easily detectable and quickly engaged by attack drones.

While large military structures have dedicated anti-aircraft systems, small subunits – sections, teams, groups – remain extremely vulnerable to attacks carried out by drones. The constant presence of UAVs in the tactical space dramatically limits the freedom of maneuver of troops, constrains the concentration of forces and favors dispersion, and this fact leads to: avoiding classic combat formations and devices (battle vanguards, etc.); decreasing the mass of armored vehicles in the 1st echelon; using small, dispersed and highly mobile groups, accompanied by reconnaissance and attack drones.

Recent evolutions in the Russo-Ukrainian conflict reveal a trend toward dispersion at the tactical and operational levels, where small formations, often 10-15 soldiers (generally, between 8 soldiers for small attacks and 30 soldiers for larger attacks supported by one or two infantry fighting vehicles and surveillance and attack drones), operate over extended fronts, continuously supported by reconnaissance and strike drones – a shift from 20th-century mass maneuvers that reduces casualties but also constrains the tempo of operations (Watling & Reynolds, 2025, pp. 8-10). But this tactical adaptation is a reactive one and does not completely eliminate the threat of drones, but only temporarily mitigates it.

A special case in the issue of sUAS is represented by First Person View drones (FPV). Especially in the context of the war in Ukraine, these drones have stood out as lethal attack tools, used by both Ukrainian and Russian forces. Being easy to produce or adapt (many coming from commercial drones), they can carry various explosive charges – from hand grenades, anti-tank grenades, mines and mortar bombs to improvised warheads – and are employed both as kamikaze loitering munitions and in reusable strike roles (Carlstedt & Lyth, 2025, p.3).

The ability of these drones to use standard ammunition, including those captured from the enemy, gives them an important logistical value. Their efficiency is also proven by the emergence of subunits and units specialized exclusively in the operation of attack UAVs (but not only), transforming FPVs from simple improvisations into organized and doctrinal capabilities.

sUAS, especially FPV drones, can track moving targets at high speeds and adjust their trajectory in real time, in many cases providing superior accuracy to artillery and heavy platforms. This capability reflects the principles described by Scharre regarding autonomous interception systems and advanced technology – generally, capable of reacting faster than the human operator in the process of searching, identifying and engaging the target with high precision, agility and speed. (Scharre, 2018, pp. 29-30, 49-50, 134, 228). In the conflict in Ukraine, FPV drones have been observed performing agile movements and sudden accelerations, patrolling areas and engaging a variety of targets immediately upon identification, including UAVs in flight (Carlstedt & Lyth, 2025, pp. 1, 3-4). Also, even in the case of a partial strike, the destructive effect of the first drone can be completed with a second strike and, if necessary, a third and fourth strike or with traditional fire support.

Thanks to visual and electronic guidance, attack drones can identify and engage moving targets with precisions that are far superior to conventional artillery. Compared to traditional weapon systems, they offer clear advantages in reaction time, decision-making flexibility – including the ability to retarget mid-mission – and first-strike accuracy. This capability enables the operator – or, in the case of autonomous drones, the algorithm – to redirect the strike based on real-time developments on the battlefield. These capabilities are fully effective only under optimal conditions of communication and sensor reliability, while actual performance may vary depending on environmental factors, electronic warfare interference, operator proficiency, and datalink integrity. Consequently, targets can be prioritized according to criteria such as threat level or operational value, without requiring hierarchical approval at the tactical level (Scharre, 2018; Carlstedt & Lyth, 2025).

So, considering all these aspects, we believe that sUAS, especially FPV ones, have experienced explosive development due to: low cost; agility and maneuverability; adaptability to commercial platforms (agricultural, logistical, etc.); the possibility of using conventional or captured ammunition (grenades, IEDs, mines).

Also, military structures have begun to include subunits dedicated to operating these drones, capable of carrying several medium-caliber ammunition elements, which gives them significant tactical value (Milasauskas & Jaskunas, 2024).

In many cases, these drones operate as single-strike systems, destroying themselves with the target – an economically acceptable fact, in relation to the efficiency obtained (the cost of such a drone is often up to 1,000 USD, and the value of the target – from several hundred thousand USD to several million).

The use of drones profoundly influences the military decision-making process. The commander benefits from real-time information, but also from the possibility of delegating initiative to the drone operator. Access to high-resolution aerial imagery of the battlefield in real time allows not only observation of the front, but also rapid, decentralized decision-making (Sauser, 2025, pp. 57-59). This leads to a tendency to "delegate tactical authority" to the drone operator, especially in contexts where reaction time is reduced and direct interaction with military leadership is ineffective.

As the autonomy of weapons develops, there is a risk that autonomous systems will decide on the selection and engagement of targets in a context where the rapid reaction time poses difficulties for human intervention (Boulanin & Verbruggen, 2017, pp. 25-27). Thus, in the case of autonomous drones equipped with artificial intelligence, the decision to attack can be taken by the technical system itself – clearly raising ethical and legal issues. This decentralization, combined with the development of autonomous drones, becomes a real challenge in terms of legal responsibility and control over the decision to attack the target. Therefore, the use of lethal autonomous drones in the absence of permanent human control continues to remain a controversial subject at the international level, with calls for regulation and limitation from some bodies such as the UN Human Rights Council (Heyns, 2013, p.17, para. 94). In this regard, the Group of Governmental Experts on Lethal Autonomous Weapons (GGE-LAWS) adopted a set of guiding principles in 2019 stating that international humanitarian law applies in all circumstances and that human responsibility for decisions to attack cannot be transferred to the technical system (UN CCW GGE, 2019, p.10). In December 2024, the UN General Assembly adopted a resolution that provides for both the prohibition of certain fully autonomous systems and the regulation of those with partial autonomy through a dual model. (UNGA, 2024, pp. 1-2). However, the norm-setting process is affected by divergences between states and procedural mechanisms, such as the consensus requirement in the GGE, which block the progress of binding norms (Opinio Juris, 2024). In parallel, non-governmental organizations such as Human Rights Watch and the Stop Killer Robots coalition continue to exert pressure for the adoption of an international treaty, highlighting the ethical and human rights risks that these systems entail (HRW, 2025; Stop Killer Robots, 2023). It is important to emphasize that the Heyns report (2013) and the SIPRI study by Boulanin & Verbruggen (2017) do not directly analyze the conflicts in Ukraine, Syria and Nagorno-Karabakh, but deal with the legal and ethical implications of the use of autonomous drones. In the context of the present, these sources are articles as general conceptual and normative references, which substantiate the analysis of recent cases.

At the same time, these systems can substitute an important part of armed combat, namely close combat, a type of confrontation that modern militaries are increasingly less willing to engage in. This allows military leadership to make decisions to minimize the risk to which it exposes its subordinates, by entrusting some of these missions to drone operators and teams, so as to preserve the life, integrity and health of subordinate personnel.

Although they have considerable action potential, drones are not invulnerable, as they can be affected by electronic warfare systems, which block communication and guidance, are vulnerable to air defense, especially the rapid reaction (SHORAD) one, and, not least, require doctrinal integration and joint-arms support to be truly effective. In conclusion, we emphasize that sUAS radically change the structure of modern combat. They increase lethality, reduce the relevance of armored masses and force the adoption of a fragmented, decentralized, visible combat style, with an emphasis on mobility and precision. At the same time, these capabilities face limits imposed by air defense, electronic warfare and logistical capabilities. However, it remains obvious that the one who controls the tactical air with drones – dominates it on the ground as well.

3. Tactics of Integrated Use of Drones in Modern Combat Actions

In the current operational architecture, drones are no longer a simple support, but essential actors in the decision-making and executive cycle in combat. Their integration into the operational architecture of land forces can be analyzed pertinently by referring to the four fundamental functions of combat: discovering the adversary, fixing it, striking it and exploiting success.

The tactic of using sUAS is based on a well-structured sequence, in which reconnaissance means identifying the target, and attack drones engage it directly or in cooperation with other high-power fire systems, such as artillery, aviation or missiles. Subsequently, land forces – infantry, armored vehicles – act to occupy or maintain the terrain.

This tactical formula is applicable in all types of operations: specific to armed combat (offensive, defensive), intermediate, stability and support operations, with minor differences related to the pace and intensity of the action.

Depending on the situation and the purpose of the operation, the tactics of using sUAS in combat are based on the principle of sequencing: detection – hit, detection – hit – exploitation or detection – fixation – hit – exploitation. Therefore, the tactics of using drones are based on an operational sequence in two, three or four phases, as we have explained above.

In the situation where the initial drones do not destroy the target or do not achieve the desired effect on the target (immobilization, etc.), others prepared in advance are launched in a short time, on trajectories corrected in real time, to resume the engagement and complete the fire mission (Bronk & Watling, 2024, p. 26).

In terms of enemy detection, small aerial drones are used with remarkable efficiency to gather information from the near tactical field. Due to their mobility, small silhouette and the ability to transmit images and geospatial data in real time, these systems allow for the conduct of immediate aerial reconnaissance missions, acting in a complementary or even substitutive manner to classic patrols. In urban or forested combat theaters, quadcopter drones are launched from the platoon or company level to identify combat positions, obstacles, traps or hidden enemy dispositions. Through optical, infrared or thermal detection capabilities, these devices provide special decision-making support to commanders at the tactical level, allowing rapid adaptation of maneuvers and avoidance of surprise (Watling & Reynolds, 2025, pp. 14-15; Cantin, 2024, p. 2).

Pinning the enemy is a tactical function in which drones contribute by maintaining pressure on the enemy device, preventing it from regrouping, maneuvering or withdrawing. This effect is achieved both through direct harassment with FPV attack drones and through continuous surveillance of the tactical space, which forces the enemy to adopt a defensive position. Kamikaze drones launched repeatedly in the same sector force the enemy to remain in fixed positions, consume resources to protect sensitive points and reveal their disposition. Also, the visible or audible presence of observation drones has a psychological effect of demoralization and attrition, indirectly contributing to pinning the enemy in vulnerable positions (Borsari & Gordon, 2023, pp. 7, 13, 25-26).

The function of striking the enemy is perhaps the most spectacular expression of the tactical use of sUAS. They are used both as direct attack vectors (via kamikaze or FPV drones) and as means of adjusting and correcting indirect fire (artillery, mortars, multiple launchers). Drones allow for high-precision strikes on valuable targets – armored vehicles, command posts, logistical elements or operational teams –, reducing the need for massive ammunition consumption and minimizing collateral risks. At the same time, they facilitate the neutralization of fortified points without exposing one's own troops to direct contact. Thus, drones become a force multiplier, especially in conditions of parity or numerical inferiority.

The exploitation of success, as the final function of tactical action, is supported by the ability of drones to track the opponent's retreat in real time, to detect escape routes, to indicate breaches in the enemy's device, and to guide their troops in penetration or encirclement maneuvers (Edmonds & Bendett, 2023, pp. 12-16). At the same time, by continuously monitoring the tactical space after a successful strike, drones help to consolidate the gain obtained, to avoid ambushes or counterattacks and to detect abandoned logistical points or enemy reserve forces. Overall, the effective exploitation of success becomes much more agile and controlled when supported by a persistent aerial reconnaissance system, as sUAS can provide.

Thus, sUAS not only complement, but transform the way in which the fundamental functions of combat are applied. They allow for the rapid and reliable discovery of enemy positions, contribute to their fixation through harassment and information pressure, increase lethality through precision strikes, and facilitate the exploitation of tactical gains through tracking and control of the battlefield. Their integrated use in all phases of a military operation ensures faster adaptation to the dynamics of the modern battlefield and increases the overall effectiveness of combat forces.

We also want to emphasize that the effective use of sUAS in combat involves their integration with the fire of classical weapons: ground and reactive artillery, bomb launchers, and anti-tank and anti-aircraft missiles. This combination of means produces a synergistic effect superior to any single type of weaponry, increasing tactical efficiency and reducing the time required to neutralize targets (Watling & Reynolds, 2025, p. 11). In the absence of a sufficient number of attack drones, it is preferred that target identification be done by reconnaissance sUAVs, and their engagement be achieved by conventional fire.

In modern combat theaters such as Ukraine, the integration of reconnaissance assets with fire systems has generated sensor-to-shooter practices, in which UAV detection feeds artillery strikes with minimal delay – so, detection assets are directly linked to fire systems, significantly reducing the time between identification and strike (Edmonds & Bendett, 2023, p. 6; Watling & Reynolds, 2025, pp. 11, 14-15).

As we can see from the above, from a doctrinal point of view, the tactic of using drones in combat is relatively simple in concept – "detect and strike" – but is complex in execution, as it assumes: a constant presence of reconnaissance drones in the relevant tactical space; rapid reaction in launching attack drones; effective cooperation between UAV operators, commanders and deep-sea firepower; redundancy in planning, to ensure the ability to resume the mission in case of initial failure.

This tactic has been repeatedly observed and documented in the war in Ukraine, where drones, especially FPV drones, are used in successive waves to achieve the complete destruction of an armored target or a fortified objective (Cantin, 2024, p. 3).

In conclusion, the current tactic of using drones is part of the "strike-first" paradigm, in which taking the initiative through rapid detection and immediate striking becomes fundamental and is based on an accelerated decision-making and executive cycle, which allows for extremely precise actions with reduced casualties. Their integration into the fire and maneuver architecture has led to a revolution in the planning and conduct of modern combat, oriented towards initiative, speed and precision. The simplicity of the logic of action – "discover and strike" – masks a complex network of technological integration and inter-arms coordination, essential for success in modern combat.

Thus, it is recommended to develop specialized "drone-combined teams" structures, in which reconnaissance and attack UAVs and artillery/guided fire operators act in sync, under the same chain of command, to maximize the tactical-operative effect.

4. The Impact of sUAS on the Tactics of Combat, Combat Support and Service Support Forces

The integration of sUAS into the contemporary battlefield has produced a profound doctrinal transformation, directly affecting the tactics of combat forces, combat support forces, and logistical support forces. In this chapter, we analyze the impact of sUAS on each type of force in the targeted land forces, highlighting the changes generated by new technological capabilities.

4.1. The Influence of sUAS on the Tactics of Combat Forces

The integration of sUAS into the structure of the armed forces has produced a significant transformation in the tactics of the combat forces. This change was not limited to operational changes on the ground, but required profound doctrinal revisions, the adoption of new TTPs (tactics, techniques, procedures), as well as the acquisition and implementation of complex systems to ensure interoperability, protection and operational efficiency of sUAS within the chain of command and synergy with conventional weapons. Although they do not have a firepower comparable to artillery, the precision of the strikes and the ability to act deep in the enemy device give them a clear operational advantage. They allow for pinpoint attacks, considerably reducing ammunition consumption and losses of own personnel (Borsari & Gordon, 2023, pp. 4-5, 7, 13), proving operational efficiency and achieving direct tactical effects.

Considering these aspects, sUAS have become an integral part of tactical operations carried out by infantry, armored troops, mountain hunters or paratroopers. They offer the possibility of continuous observation of the tactical field, identifying targets in real time and engaging them with precision, reducing own losses.

On the offensive, drones can replace artillery fire training by delivering pinpoint strikes on tactical objectives, allowing combat forces – infantry, mountain fighters, paratroopers/airborne, tanks and engineering elements – to execute maneuvers in more favorable conditions, attacking an already weakened and disorganized enemy with a favorable balance of forces.

On the defensive, they increase surveillance and reaction capacity, providing early warning of enemy movements and allowing for prompt counterstrikes.

The use of attack drones allows engaging enemy armor without directly exposing their own armor. Combat forces can also maneuver more aggressively, permanently supported from the air by drones that provide them with data, strike targets or jam enemy communications. Furthermore, the use of drones allows for the execution of "deterrent strikes" on enemy troops, who, under the pressure of continuous observation and imminent threat, may enter into psychological disorganization (Borsari & Gordon, 2023, pp. 25-26).

Also, as can be easily seen, sUAS, especially attack drones, have begun to take over traditional missions of military branches and specialties in combat forces: infantry – by neutralizing ground targets and supporting assault actions; mountain hunters/paratroopers – by quickly accessing hard-to-reach areas; armored – by employing vehicles with kamikaze drones or smart munitions launchers; reconnaissance – through drones capable of operating longer distances and extended periods, equipped with AI, multispectral sensors and encrypted communications.

The use of AI in aerial reconnaissance missions increases the probability of automatic target detection and reduces the cognitive load of the human operator.

4.2. The Influence of sUAS on Combat Support Forces Tactics

Combat support structures – artillery, reconnaissance, engineering, air defense, electronic warfare and CBRN defence – are deeply influenced by the introduction of sUAS.

Artillery feels a major tactical pressure, as sUAS can take over missions to strike surface targets, partially replacing destruction or neutralization shots, due to their superior accuracy and short reaction time. At the same time, reconnaissance drones support fire correction, and the presence of enemy drones requires the dispersal of pieces and increased mobility, which generates a considerable logistical and operational effort (Cranny-Evans, 2023; Watling & Reynolds, 2025, pp. 9-10, 12, 14-15, 17).

Drones are increasingly used as portable delivery platforms for munitions, contributing to ammunition economy through high precision and the ability to pursue moving targets. Despite the risks of drone interception or operator exposure, their overall effectiveness remains superior to conventional artillery in dispersed or highly mobile engagements. As recent analyses of the war in Ukraine indicate, small unmanned systems have in many instances replaced traditional fire support as the primary means of precision strike, offering faster engagement cycles and lower expenditure of materiel (Slusher, 2025, pp. 2-4, 9; Zafra, Hunder, Rao & Kiyada, 2024). So, in certain situations, using drones instead of artillery brings a series of advantages: reduced ammunition consumption; low risk for the crew; shorter reaction time; reduced logistical costs.

Some states are already developing concepts of "drone artillery battalions", units that take over tactical roles of artillery batteries, especially in urban or mountainous terrain.

However, we consider that it is necessary to make a comparative approach to the limitations of sUAS and, respectively, artillery, at least from the following perspectives: weather, EW, barrage of fire, heavily fortified positions/ shelters and vulnerability (Watling & Reynolds, 2025, pp. 10-11; Bronk & Watling, 2024, p. 27). Thus, despite the advantages, we consider that sUAS cannot completely substitute artillery for the following reasons: they are dependent on weather conditions (wind, rain, snow); they cannot execute extended barrage fire; they cannot penetrate and destroy heavily fortified shelters in the field (bunkers, underground depots, etc.); they are vulnerable to jamming and AA fire. However, they can neutralize the entrances/exits of these objectives, thus forcing the enemy to remain isolated or blocked in defensive positions.

Reconnaissance benefits massively from UAVs equipped with multispectral sensors, long flight capacity and artificial intelligence for real-time analysis. These drones can partially replace traditional reconnaissance teams, reducing human risk and allowing for the coverage of large areas in a short time (Watling & Reynolds, 2025, pp. 14-15).

So, we assume that it is recommended to permanently integrate at least one team of UAV operators within each artillery or research subunit, to optimize joint actions.

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Military engineers use sUAS for engineering research, minefield verification, mining, demining (creating color in minefields), placing obstacles or controlled destruction, including in contaminated environments and/or under enemy fire. At the same time, we prompt that small aerial drones with LIDAR sensors are currently being tested for rapid mapping of mined areas, drastically reducing losses among sappers (Hutsul et al., 2024; Baur, 2024).

Anti-aircraft defense is assisted by drones that detect and track enemy UAVs, can act as decoys or can be armed with specialized ammunition to shoot down FPV drones or helicopters flying at low altitudes. So, fast drones are used to harass helicopters or other UAVs.

Electronic warfare is becoming decentralized: jamming stations are mounted at the platoon or even vehicle level. Own drones can act as jamming platforms or can locate enemy electromagnetic sources. In support of communications and informatics, sUAS and not only these serve as radio signal repeaters, extending the operating range of other drones or their own networks (Watling & Sylvia, 2025, pp. 14-16, 24-25). Some drones are already equipped with "spoofing" (GPS signal replacement) and "decoying" (target simulation) capabilities, increasing electronic efficiency in support of ground forces.

CBRN defence integrates drones equipped with sensors to identify chemical, biological or radiological contamination, reducing personnel exposure and accelerating the process of analyzing contaminated terrain.

Essentially, sUAS optimize most combat support functions and impose major tactical adaptations, but remain complementary to classical means, without being able to fully substitute them.

4.3. The Influence of sUAS on Service Support Force Tactics

Drones also offer essential benefits in the logistics field. First, UAVs reduce ammunition consumption, fuel consumption and wear and tear on heavy equipment, reducing pressure on the logistics chain.

Supply and transportation benefit from transport drones used to deliver ammunition, water, food, medical supplies and spare parts. They can penetrate areas that are difficult to access or under fire, where the risk to logistics personnel is high. Maintenance is facilitated by drones capable of inspecting damaged vehicles in the field, transporting essential components or evacuating light equipment to collection points.

Medical support uses drones to deliver medical supplies and, in some cases, to evacuate the wounded. Campaign services can be complemented by UAVs for courier, resource distribution and even reconnaissance or disinfection of affected areas.

Thus, we believe that it is feasible to create logistical subunits dedicated exclusively to the operation and maintenance of support drones. By centralizing piloting, maintenance, and dispatching competencies, these subunits can allocate sUAS capabilities to multiple frontline elements, significantly increasing the efficiency of the logistics chain

(Watling & Reynolds, 2025, p. 17; Slusher, 2025, p. 4). As sUAS become common tools for tactical delivery of ammunition and light supplies, the establishment of dedicated logistical subunits becomes justified. These structures would concentrate technical expertise (piloting, maintenance, power supply chain management) and optimize the routing and dispatch of flights to multiple frontline units, reducing the risks associated with rotations and conventional resupply.

Therefore, we can say that sUAS bring unprecedented logistical efficiency by: reducing ammunition and fuel consumption; lower maintenance costs (compared to tanks or self-propelled artillery); reduced logistical risk in the 1st echelon; precise and rapid transport of ammunition, CL, water, equipment, including in encirclement conditions. Also, drones can be equipped for: medical transport and evacuation of the wounded; maintenance of military equipment, recovery and evacuation of damaged military equipment; support in campaign services (food delivery, water, postal services, decontamination, etc.).

5. Conclusions

Small aerial drones have redefined the traditional ratios between weapons and specialties, providing a significant force multiplier. They allow for reduced personnel losses, reduced resource use, dispersion and mobility of tactical structures, and increased reaction speed.

The impact of sUAS on the tactics of ground forces is manifested in numerous directions and plans, including the following: reducing the viability of mass attacks with armored vehicles; preventing the concentration of troops due to continuous aerial reconnaissance; carrying out the offensive in difficult weather conditions, in order to avoid UAV surveillance; the need for electronic warfare down to the platoon level, with the installation of jammers on armored vehicles.

On the Ukrainian front, the effects of the use of sUAS on the tactics of ground forces are profound and visible in all forms of military engagement. Combat troops have become extremely cautious about their movements during the day, due to constant aerial surveillance by enemy drones. This reality has led to a significant shift in the pace of tactical action, favoring operations at night, when the probability of detection is lower. At the same time, traditional fortifications, often visible from the air, have been replaced by underground or covered positions, designed to reduce the visual and thermal signature of troops and equipment. This structural adaptation of defensive positions reflects the constant pressure exerted by the aerial eye of drones.

Counter-offensives conducted without technological or numerical superiority in drones have proven extremely costly. In the absence of their own surveillance and air interdiction network, armored vehicles are quickly identified, tracked, and neutralized with the help of FPV drones, becoming easy targets on the battlefield. In addition, a completely new dimension of the conflict has emerged: aerial combat between drones. Attack (FPV) and reconnaissance drones hunt each other, developing an autonomous micro-theater of confrontation. Some drones are equipped with improvised devices, such as nets or objects designed to hit or destabilize the propellers of the enemy drone during flight. This type of confrontation adds additional tactical complexity and highlights how profoundly the dynamics of modern warfare have been transformed under the influence of these sUAS.

So these realities require an adaptation of tactics towards smaller, dispersed forces, equipped with drones, supported by artillery and protected by air and electronic defense systems.

Our paper demonstrates that sUAS represent a fundamental transformative factor in the tactics, organization and functioning of land forces in contemporary and future warfare. Starting from the hypothesis that these systems confer a decisive advantage by increasing the observation capacity, precision and lethality, qualitative research and comparative documentary analysis have confirmed not only the validity of this hypothesis, but also the extent of the transformations induced across the entire operational spectrum.

Using applied and inductive analysis methods, based on doctrinal sources and recent case studies (Ukraine, Syria, Nagorno-Karabakh), we have identified and argued numerous essential aspects, which we will reiterate in the form of conclusions below.

sUAS have become deeply integrated into all tactical combat functions – discovery, fixation, strike and exploitation –, contributing to reducing reaction time, increasing the accuracy of the strike and decentralizing the decision in the tactical field. This has led to the emergence of new engagement models, based on rapid sequences of the "detection – strike – exploitation" type.

The tactics of combat forces have been fundamentally reshaped, with drones offering continuous reconnaissance capabilities, precise fire support and indirect action against valuable targets. They allow maneuvers to be carried out in low-risk conditions and, in some cases, replace classic infantry, armored troops or reconnaissance functions.

Combat support forces (artillery, reconnaissance, engineering, electronic warfare) have been forced to adapt to a new tactical ecosystem dominated by the presence of drones. Artillery, in particular, is influenced by the concept of "flying artillery", and reconnaissance benefits from extended coverage and reduced operational risk through the use of multisensory UAVs.

Logistics and support services have seen significant efficiency gains: drones allow for the rapid and precise transport of resources, the evacuation of equipment, and the provision of medical support or maintenance in hazardous conditions. In some cases, logistics subunits specialized in operating UAVs can partially replace exposed human resources.

FPV drones have become not just improvised tools, but doctrinal capabilities – capable of hitting moving targets, executing precision strikes and permanently disrupting the enemy's tactical organization.

The psychological impact of the constant presence of drones is major: troops are forced to operate under the threat of constant surveillance and strikes, which requires a different pace of action, greater dispersion of forces and adaptation of fortifications for the purpose of camouflage.

The research hypothesis is fully confirmed: sUAS act as vectors of the transformation of ground forces' tactics, requiring urgent and profound doctrinal adaptations. Forces that control tactical airspace through drones are likely to gain a decisive advantage in dominating the terrain and shaping actions on the ground.

As a result, we believe that, naturally, it is necessary to develop specialized integrated drone units, develop standardized tactical procedures for the use of UAVs at all levels (from squad to battalion and, why not, above), train personnel in the operation, maintenance and counteraction of drones and, last but not least, rethink the defensive architecture in the face of this omnipresent and evolving threat. In conclusion, sUAS are not just a support element, but active pillars of the new tactical and doctrinal architecture of contemporary warfare. They generate a paradigm shift in the organization, equipment and operation of land forces and require not only appropriate endowment, but also a profound reformulation of doctrine, training and operational planning.

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