AIR POWER IN THE ERA OF DRONES AND ARTIFICIAL INTELLIGENCE

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Abstract: *The last two decades have been extremely intense and challenging due to paradigm and technological changes, caused by significant geopolitical and military tensions, in a world where instability and lack of a sense of security demonstrate once again the critical need for access to state-of-the-art technology and for the most efficient management of information and data packages.*

The current situation brings before the world's decision-makers, unprecedented situations, dangerous competitions and melts latent conflicts, confirming that the gray area between peace and war is becoming increasingly blurred, and the new era, the information age, requires urgent and decisive responses to maintain the state of security and stability.

Given this context, at the national and regional level, Romania's air power participates with all its capacities and capabilities in supporting security objectives, offers coherent and decisive support in combating threats, anchored in the realities of the current geopolitical environment, with the challenges generated by the use of unmanned aerial platforms and the increasingly frequent use of artificial intelligence in generating courses of action.

Key words: *air power, strategy, unmanned aircraft, drones, artificial intelligence.*

1. INTRODUCTION

One of the most renowned theorists of the doctrine of air power, the Italian general Giulio Douhet, considered the father of air power, supports in his work "The Command of the Air", a basic principle of air power, a principle that represents a fundamental direction in the planning of air missions and refers to the fact that: "to conquer the command of the air means to achieve victory" [4]. Taking this principle into account, the great powers develop several important action coordinates for the "air forces", adapting them specifically for each era, involving them at all levels (strategic, operational and tactical) and, last but not least, permanently allocate substantial resources for their technological development and for accelerating the growth of production.

Douhet believed that air dominance could decide the outcome of conflicts before land or naval forces were decisively engaged. In his view, control of airspace allowed the adversary's vital centers to be struck and his ability to resist to be paralyzed. In other words, air dominance represented not only technological dominance, but also the ability to lead, coordinate, react quickly, and achieve strategic superiority.

Another important strategist and analyst of air power, the English Marshal Hugh Trenchard, adds to what Giulio Douhet said, that: "Air power is the ability to strike quickly and decisively, anywhere." *[7]*.

The statement supported by the British comes and highlights essential characteristics of air power, namely: speed of reaction, precision, mobility and flexibility, defining aspects that distinguish air power from other categories of forces.

In the same line, supporting the importance of air power, American specialist John Warden, known for the "five rings" theory, stated that: “Air superiority provides freedom of action, and without it, the success of operations is limited.” [5]

In Warden's vision, air power must act to systematically strike the enemy's critical points and centers of gravity, thus producing immediate strategic effects.

Today, in addition to all the visions and doctrinal principles of renowned strategists of military theories, a new military doctrine, a contemporary one that is accepted by NATO, defines air power in an integrated conception, as follows: “the alliance can use a variety of military and non-military capabilities to influence the behavior of decision-makers of states and/or non-state organizations, in order to achieve its objectives.” [10] therefore, air power represents, today, the ability to project power from the air and space to influence the behavior of actors or the course of events.

In conclusion, air power is defined as that fundamental component of modern military power that sums up the missions of ensuring control in airspace, of using aviation in offensive and defensive missions and which, through its rapid and strategic actions, decisively influences the fate of the conflict. This approach highlights the fact that air power goes beyond the strictly military dimension and includes political, strategic, economic and psychological effects and actions.

2. THE EVOLUTION OF AIR POWER

By summarizing the evolution of air power and analyzing the components of modern military art, military strategy, operational art and tactics, the role of air power is highlighted, from the beginning, at all levels, with the first missions carried out for reconnaissance purposes, to strategic bombings and contemporary missions using drones and autonomous systems. This evolution has been influenced by technological progress, doctrinal changes and the need to achieve dominance in the airspace area, in order to then gain superiority on the entire battlefield.

The first reconnaissance missions, highlighted during the First World War, were assigned to those types of aircraft that were built on a wood and canvas structure, that evolved at low speeds and had limited autonomy and armament. Later, after the awareness of the role and importance of air power, aircraft are subjected to a spectacular modernization process that will determine their involvement in other types of missions (reconnaissance, observation of enemy structures and forces, obtaining and transmitting information, aerial combat and taking aerial photographs).

During World War II, military aviation reclaimed its role as a decisive factor on the battlefield, an essential, extremely lethal weapon. Aircraft were greatly improved, had piston engines and were equipped with synchronized machine guns, bomber and fighter aviation appeared, and missions such as Blitzkrieg or strategic bombing ensured air superiority and direct support for ground forces. Air power, through its systems considered modern, ensured close support for its own ground troops, carried out bombing missions at a tactical and strategic level, and participated in the destruction of infrastructure elements that gave the enemy an advantage.

The Cold War period presents a new face of air power, new capabilities and systems appear, aviation develops and introduces supersonic aircraft and ballistic missiles into the airspace, and at the conceptual level the principle of nuclear deterrence is increasingly used.

At this stage, airspace control is indispensable for maintaining global strategic balance, and the contribution to maintaining this objective is made by interceptor and multirole aircraft, strategic and nuclear bombers, stealth aircraft and hypersonic missiles.

Modern conflicts place air power in an extremely important position from the perspective of using capabilities at the level at which, through the use of precision-guided weapons, stealth aircraft, hypersonic missiles and forms of hybrid, asymmetric and electronic warfare, it achieves immediate victories in the theater of military action. For this reason, the rapid evolution of technology has made the troops deployed on the battlefield become much more dispersed and fragmented, one of the reasons being to increase the survivability of combatants. *[3]*

Nowadays, current conflicts expose a new face of air power. The increasingly obvious and significant appearance of military drones on the battlefield and in the airspace has outlined new forms for the image of the current war. The missions that unmanned systems perform today are found in reconnaissance and surveillance operations, in actions to eliminate targets through precision strikes and kamikaze attacks, in intelligence gathering and jamming of communications and radars, and the fact that these systems are present on the battlefield ensures strict control of the airspace along with air support for ground and naval troops.

The present offers us a picture of air power dominated by the close relationship between manned military aviation and unmanned aerial systems, a relationship that can no longer be analyzed exclusively from the perspective of technological progress, but must be understood in the context of the digital transformation of the modern battlefield, where artificial intelligence (AI) is becoming a determining factor of operational superiority. In contemporary conflicts, manned aircraft and autonomous drones operate in an integrated information ecosystem, in which AI algorithms facilitate rapid data processing, platform coordination and support for real-time decision-making.

In modern airspace, military aviation systems increasingly use AI-based applications to analyze the operational environment, identify threats, prioritize targets, and optimize missions, while military drones benefit from increased levels of autonomy, and are capable of performing reconnaissance, surveillance, research, and even attack missions with minimal human intervention. This evolution transforms unmanned platforms from simple means of collecting information into active actors in the operational process.

The full integration of piloted aircraft and autonomous systems, coordinated by AI, in a common airspace also requires the development of a legislative, technical and operational framework capable of ensuring interoperability, cybersecurity and flight safety. As technologies based on artificial intelligence become essential components of modern military architecture, it is necessary to harmonize operating standards and procedures, an objective that represents one of the main challenges of contemporary military aviation and through which the process of integrating UAS systems is part of a strategic direction of development at the international level, with the aim of achieving full cooperation between manned and unmanned platforms.

Therefore, the future of military air operations is not defined by the competition between manned and unmanned aircraft, but by their integration into a collaborative system supported by artificial intelligence. The synergy between human expertise, AI processing power and the autonomy of air platforms generates a new operational model, characterized by speed, flexibility, adaptability and information superiority in the face of threats specific to the 21st century battlefield.

We witness an evolution in airpower that reflects the ongoing transformation of modern warfare.

From the fragile planes of World War I to autonomous drones and contemporary stealth aircraft, airpower has become a decisive factor in achieving military superiority.

Past conflicts have demonstrated that air dominance can decisively influence the outcome of a war, and currently, the increasing emphasis on the use of drones, autonomous technologies, artificial intelligence, hypersonic weapons and invisible aviation, along with the integration of cyber and electromagnetic space into the air, outlines a picture of dynamic, important and decisive air power, an vital component that represents a basic pillar of modern international security.

3. THE ERA OF DRONES AND ARTIFICIAL INTELLIGENCE

With the start of unmanned aerial systems, air power has profoundly changed its operational paradigm. The execution of surveillance, reconnaissance, strike and impact assessment missions with reduced risks for human personnel and lower operational costs marks the transition to a new era of air power. In parallel, artificial intelligence, applied in the air domain, is becoming a major force element by analyzing huge volumes of data and automating the decision-making process, by rapidly identifying threats and optimizing mission planning and, last but not least, by coordinating autonomous systems at an extremely precise level.

Recent conflicts demonstrate that drones, advanced sensors and the rapid ability to obtain and process information, especially data and target parameters, have fundamentally changed the way air operations are conducted, and the integration of artificial intelligence into command-and-control structures accelerates the decision-making cycle and allows for near-real-time reactions in complex operational environments.

We are currently experiencing a total transformation of the airspace of modern conflicts, and a complete picture of it exposes an airspace choked by air systems with hypersonic and invisible capabilities, joined by unmanned platforms and autonomous and semi-autonomous systems. Surgical strikes are now kamikaze drone missions, and the integration of artificial intelligence at the level of planning structures and in the decision-making area exposes multi-domain operations with elements from the sphere of electronic and cyber warfare on the scene of military actions, all of which create an information superiority that easily determines a degree of control of the airspace, difficult to achieve until today, air supremacy.

However, this transformation of airspace also brings with it a series of major risks and challenges. Although it is the peak moment for IT specialists, it also brings with it a series of cyber vulnerabilities, and dependence on technology can create huge gaps in the operational and tactical area when decisions are needed. Ethical risks regarding the use of lethal autonomous systems are imminent, and at the legislative level there are still gray areas that cause difficulties in the international regulation of the use of new technologies.

In this context, powerful states manage to effectively combine technology, information and air projection capacity, thus strengthening their strategic position and deterrence capacity, and air power becomes a fundamental element of security, with an important role in assuming commitments within alliances and at the same time requiring the development of modern and interoperable air capabilities. There is a greater need than ever for the modernization of aircraft, the development of radar systems, the integration of drones and the adaptation of artificial intelligence to the challenges of the current operational environment, simultaneously with the doctrinal evolution, these representing essential directions for the consolidation of modern air power.

Thus, it can be said that air power has evolved from a simple means of military support to a complex strategic instrument, capable of decisively influencing international security and stability.

We live today in the era of drones and artificial intelligence, and air superiority depends not only on the performance of combat platforms, but also on the capacity to process information, the integration of emerging technologies and the speed of the decision-making process. Current challenges confirm that the future of air power will be defined by the interconnection between people, technology and information. Those who invest in innovation, interoperability and strategic adaptability will have the advantage in an increasingly dynamic and unpredictable security environment.

4. COMMAND AND CONTROL (C2) ELEMENTS AND THE IMPORTANCE OF ARTIFICIAL INTELLIGENCE

Command and control (C2) is the nervous system of air power, ensuring planning, resource allocation, execution and evaluation of missions. Modern doctrines assign special importance to airspace command and control, and in order to achieve immediate and decisive results, they combine strategic centralization with tactical decentralization.

The involvement of artificial intelligence revolutionizes C2 by accelerating the OODA (Observe-Orient-Decide-Act) cycle and also allows for rapid fusion of data from multiple sensors (radar, EO/IR, SIGINT), prediction of enemy intentions, route optimization and automatic planning of complex missions. At the same time, in modern confrontation environments such as the electromagnetic one where jamming is extremely intense, AI ensures resilience through distributed decisions and partial autonomy, under human observation. The risks present here include cyber vulnerabilities, decision errors and ethical dilemmas, requiring the maintenance of adequate human control and the implementation of actions in a hybrid regime.

At the tactical level, autonomous systems plan and execute original actions such as swarming attacks, execute dynamic threat avoidance maneuvers, and utilize precision targeting to its fullest potential, reducing human participation and cognitive load. Therefore, artificial intelligence develops the necessary skill at the level of C2 structures, which gives forces in the field the opportunity to gain the advantage necessary to achieve victory.

Both drones and the use of artificial intelligence bring air power to the forefront when it comes to imposing control over airspace. This control is not absolute, it manifests itself in varying degrees, specific to each situation and area, and is essential in establishing the design of the operation and planning actions.

The degrees of airspace control are classified according to the enemy's position and capabilities, thus:

- **Air supremacy** – when the enemy is unable to plan and carry out any significant action in the airspace area.
- **Air superiority** – when actions can be carried out in airspace without threats or hostile actions from the enemy, this degree can be local or temporary.
- **Air parity** – when there is symmetry between forces in the airspace, but neither side holds a decisive advantage, an unlikely situation leading to the possibility of contesting control of the airspace.
- **Air interdiction** - when the enemy imposes actions to severely limit access to the airspace of interest, through accessible means (aviation, drones, surface-to-air missiles), actions that severely limit freedom of action.

- **Air interdiction** - when the enemy imposes actions to completely prohibit access to the airspace of interest, the actions block the air forces and make it impossible for them to plan and carry out any type of action.

Today, in the era of drones and AI, these degrees of control of airspace are becoming fluid and contested, transforming air power from an elitist domain of high-performance but extremely expensive manned platforms into one that is saturated, extremely accessible, and open to any type of force that intends to operate in and from airspace.

5. THE ROLE OF DRONES AND UAVs IN MODERN MILITARY ACTIONS

Drones and UAVs assisted by artificial intelligence have profoundly transformed the way contemporary conflicts are conducted, changing the balance between cost, efficiency and strike power. These systems provide persistent surveillance, real-time intelligence gathering, target identification and designation, and precision strikes at relatively low cost. The emergence of autonomous and semi-autonomous drones has led to a major shift in modern military doctrine, as traditional air defense systems are often overwhelmed by multiple, simultaneous and dispersed attacks.

Drones are no longer just a force multiplier for great powers, but have also become accessible tools for non-state actors, paramilitary groups, insurgent or terrorist organizations. This democratization of air power has significantly reduced the technological barrier required to execute strategic attacks or obtain tactical intelligence. Thus, relatively cheap systems can produce disproportionately large effects on military, economic and civilian infrastructure.

The integration of artificial intelligence into UAV systems has significantly increased their effectiveness. AI algorithms enable automatic target recognition, rapid analysis of collected images and data, autonomous navigation in electromagnetically contested environments, and coordination of drones in “swarm” formations. The concept of “swarming” involves the simultaneous use of a large number of drones capable of communicating and cooperating autonomously to overwhelm the opponent’s defensive systems. In this way, air defense is forced to spend expensive resources to neutralize cheap and easily replaceable platforms.

AI also helps reduce the time between target detection and strike (“sensor-to-shooter loop”), an essential aspect in modern conflicts characterized by high mobility and rapid changes in the tactical situation. AI-assisted systems can automatically prioritize targets, identify behavior patterns and instantly transmit coordinates to other combat platforms, thus achieving integration into a digitalized ecosystem of network-centric warfare.

The Russian-Ukrainian conflict is considered by many analysts to be the first major conflict in which drones became the dominant element of the battlefield, and is often referred to as the "drone war". FPV (First Person View) drones, loitering munitions and maritime drones have caused an estimated 70–80% of casualties on the front. Their massive use has fundamentally changed the tactics of ground operations, reducing the freedom of maneuver of armored vehicles and increasing the vulnerability of troops on the move.

Ukraine has developed an extensive drone manufacturing and innovation ecosystem, integrating commercial technologies quickly adapted to frontline needs. By 2025, annual production is expected to exceed 4–5 million units, up from around 800,000 in 2023. Drones have been used not only for reconnaissance and tactical strikes, but also for deep-sea attacks on Russian strategic infrastructure, including air bases, logistics depots, and refineries.

In parallel, artificial intelligence began to be used for autonomous guidance in conditions of intense electronic jamming, automatic vehicle identification and trajectory correction in the terminal phase of the attack.

In addition, the use of automatic video analysis and satellite imagery, assisted by AI, allowed the rapid identification of troop concentrations and logistical routes.

Similarly, Iran is another relevant example of the strategic use of cheap drones in asymmetric warfare. The Shahed-136 family of drones, designed as long-range, low-cost kamikaze munitions, has been used both by Russia in Ukraine (under the name Geran) and by Tehran-backed proxy groups and the Houthis in Yemen.

Iran's deployment and use of drones demonstrate how they can provide "strategic projection" to actors that lack capable conventional aviation. Houthi attacks on commercial shipping in the Red Sea, or on Saudi oil infrastructure and Israeli targets have highlighted the disproportionate impact that these systems can have on the global economy and international maritime security.

A key element is cost-effectiveness: a Shahed drone can cost tens of thousands of dollars; while intercepting it often requires defensive missiles valued at hundreds of thousands or even millions of dollars. This economic imbalance favors actors using saturation attacks and forces states to develop new defense solutions, including directed energy weapons, AI-based anti-drone systems, and electronic warfare technologies.

The future will certainly see the evolution of AI-assisted drones, with a clear trend towards increasing autonomy and reducing dependence on human operators. Future conflicts will likely include autonomous drone swarms capable of performing complex reconnaissance, electronic jamming, coordinated attack, and logistical support missions, while the development of generative artificial intelligence and machine learning systems will allow for rapid adaptation to adversary tactics and effective operation in contested environments.

Thus, AI-assisted drones and UAVs are no longer just an auxiliary component of air power, but a central element of modern warfare, with a direct impact on military doctrines, strategic balance and the way future military operations are conducted.

6. CONCLUSIONS

The massive use of drones underscores the shift to a hybrid, accessible, and persistently contested air environment. For NATO and European militaries, adaptation is imperative for national, regional, and global security. At least three strategic directions are required:

The development of massive, attractable and swarming drone capabilities with integrated AI: Urgent investment in industrial-scale production (low-cost, high-volume), similar to Ukraine. Projects such as Eurodrone or EU collaborative initiatives with Ukraine must be accelerated to generate numerical superiority and saturation of adversary defenses. AI will enable autonomous intelligent swarms.

The improvement of distributed, resilient, and AI-augmented C2: Creating multi-domain networks resistant to jamming and cyberattacks, with AI for rapid planning, data fusion, and accelerated decision-making. This ensures agility in near-peer scenarios (e.g. Baltic, Black Sea).

The development of multi-layered, AI-ready and integrated counter-UAS: Cost-effective detection, identification and neutralization systems (electronic warfare, kinetic low-cost, directed energy), tested through NATO initiatives such as Innovation Range in Latvia. Collaboration with Ukraine and partners is essential for interoperability and practical lessons.

In conclusion, air power in the era of drones and AI no longer depends solely on sophisticated platforms, but on intelligent integration, scalability, adaptability and continuous innovation.

NATO and Europe must act decisively, transforming technological challenges into sustainable strategic advantages for a stable security environment.

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