CONSIDERATIONS REGARDING THE USE OF UNMANNED AIRCRAFT IN THE NATIONAL SECURITY STRATEGY PARADIGM

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War has always been the greatest challenge for armed forces and soldiers. The modern warfare, through its forms and new technologies, challenges the training of leaders and military structures at higher levels, able to operate in all conditions and with all forms and super-technological systems encountered in the modern theatre of war. Contemporary dangers, threats and risks force the decision-making structures to identify solutions to combat them, in line with their level of technology and the field in which they propagate.

Modern warfare challenges leaders, commanders, and staff officers of planning, command, and control structures to identify ways to maximize the combined effects of manoeuvre and firepower and to synchronize military actions in the tactical field with the characteristics of modern technologies and with the established strategic objectives.

Keywords: security; strategy; unmanned aircraft; military actions; air operations;

INTRODUCTION

The present-day provides a picture of the security environment dominated by political-economic, military and social uncertainties, threats and tensions. Many of the vital systems that ensure the normal functioning of society are going through a period that is difficult to manage. Political crises alongside with those in the health, energy, economic and environmental protection fields, the degradation of the standard of living in less developed countries, the increase in migration and the exodus of refugees from areas where military actions are carried out, complete the overall picture of the security environment with a touch of generalized instability.

Providing national, regional and global security becomes, thus, a wish for the political classes and a challenge for the structures responsible for monitoring, managing and strengthening the security climate.

In view of the picture in which the image of the security environment is represented, the conflict in Ukraine is superimposed today, with all its particularities and the effects of multi-domain actions that transform the current confrontation into a long-lasting war.

The position of Romania in the current configuration of the security environment is an extremely important one and implies predictability and responsibility on the part of decision-making fora due to the relationship between the current regional security environment and the status that our country has assumed, as a member of political and military organizations of the EU and NATO, as the host of the anti-ballistic defence shield elements and a member of the strategic partnership with the USA.

On the other hand, due to its geographical position, Romania, which has a common border with Ukraine and access to the Black Sea, is NATO's last outpost in Eastern Europe, and all these realities, in turn, emphasize even more the importance of managing the regional security environment.

Thus, Romania has framed its national security objectives and established its main directions of action in line with the global and regional geopolitical context and with the respect and permanent defence of the values, rights and freedoms that the state guarantees to its citizens, according to the Constitution. Following and fulfilling these objectives involves the design and implementation of doctrines, norms, procedures and plans that are reflected at the tactical level in dispositions and action orders that entities and structures at the execution level must carry out.

The battlefield and modern warfare are composed of a series of combat systems that act differently and, together, develop a huge pressure on security systems, and the appearance of new smart technologies, devices that act on the basis of algorithms built by artificial intelligence, of remotely controlled equipment, completely changes the concepts so far and outlines a new image of the national, regional and global security environment.

The *"man versus machine"* war is no longer the prerogative of "*Science Fiction*" films, and strategic approaches and doctrinal constructions must take into account the existence and involvement of artificial intelligence, technologies and modern unmanned systems with their operating capabilities in military actions at all levels of the contemporary battlefield.

The space of military actions or the modern battlefield is today unstable and variable, dynamic and volatile, intelligent and augmented. This is due to its dimensions (land, air, sea, space, cyber, information etc.) that intertwine and they influence each other displaying variants of missions and military actions of an extremely advanced and comprehensive scope that can be countered only by the use of force or systems and types of weaponry that have a common characteristic, the effect of mass destruction.

Part of this conglomerate that today makes up the battlefield, the modern airspace in turn has a new characteristic attributed to it, that of intelligent airspace, a characteristic that implies the introduction into the scene of military actions of strategies and advanced technologies intended to increase the efficiency of operations in the airspace through the use of autonomous systems, unmanned aerial vehicles (UAVs), drones and other equipment that can operate without direct human intervention.

AIR SPACE AND INTELLIGENT AIR SPACE

Airspace has always represented the dimension that man wanted to dominate, to control. It has been the dream of many scientists, engineers and inventors who contributed to the design and construction of the first machines heavier than air, and this only to feel the emotions and thrill of flight.

The possibility of using such platforms opened the way to a new approach to the configuration of the battlefield. The combat aircraft missions significantly tipped the balance in terms of the war outcome. The defeat of the enemy was also due to the way of acting in the area of military operations of this new force structure, aviation, a vector of power characterized by omnipresence, efficiency and precision. Once the victory is achieved, the immediate objectives of the victory, at the level

of the theatre of operations, are oriented towards securing the obtained advantages and consolidating the positions in the land, sea and air space. These objectives present a challenge to the subunits on the ground, and air support provides sustenance for land and/or maritime operations and provides, in addition to reconnaissance and action missions, operations by which still active elements of the enemy's device can be engaged, essential structures can be disabled from the logistics structure and structures designed to ensure command, control, communications and transport capabilities can be also eliminated. Thus, aviation constitutes a power vector, a force that quickly and easily integrates the operations and manoeuvres of combat structures, an instrument that offers advantages and is able to decide the fate of the confrontation on the battlefield through the actions developed in and from the airspace.

In parallel with the military dimension of the airspace, the civil side is also developing. Humanity benefits from the advantages offered by the speed of transport and the ability to reach hard-to-reach areas, and thus more and more different users of airspace appear. There is a need for a legal framework, norms and rules to coordinate the aeronautical activity. Thus, in Paris, in 1919, 42 states signed the first international convention on the use of airspace, the *"Convention on the Regulation of International Airspace Traffic"*, a document that laid the foundations for an international system of regulations of air navigation. In the years that followed, airspace means evolved, the missions and purposes for which air space is used increased exponentially, the use of air dimensions becomes a necessity for the military, political, economic, medical, touristic, communications and transport fields and at the same time an area from which threats to national and international security can be proliferated.

At the national level, the airspace is framed as an integral part of Romania's territory, whose sovereignty and control are ensured in accordance with international law and where international norms, rules and agreements are valid, regulating all aspects related to air navigation, safety, security, protection environment, civil liability and competition in air transport.

Today, airspace is managed with professionalism and responsibility through rules, standards and procedures established at international level by the International Civil Aviation Organization (ICAO), and implemented at national level as well, with Romania's accession to the specialized European system established at the EUROCONTROL International Conference (Official Gazette no. 115 on 5 June 1996). The acceptance and adaptation to international rules is achieved through the Romanian Administration of Air Traffic Services – ROMATSA, an entity that manages,

"administers and exploits the Romanian airways, ensures the management and unitary development of the activities of directing aircraft belonging to Romanian and foreign airlines" (Official Gazette no. 22 on 29 January 1991, art. 1).

The airspace organized in this way allows for the planned and coordinated development of civil air traffic. However, in situations specific to crises and conflicts, when a threat to national safety and security is identified that propagates from this area, the responsibility for managing all actions carried out in the airspace belongs to the Ministry of National Defence that, through the specialized structures, coordinates the necessary actions to eliminate the threat and achieve the level of control over the airspace.

The development of the aerospace technological component, the implementation of procedures coordinated by artificial intelligence in aviation and the increasingly intensive exploitation of airspace represent new challenges for the structures responsible for managing this field, and in an attempt to safely coordinate air traffic and to identify, isolate and exclude the aspects that can provide events, decisions are needed that include the entire spectrum of actions and that must be taken in the shortest possible time. The realization of this need is today based on the consultation and increasingly intensive use of artificial intelligence, which deals with intelligent airspace management.

The framing of intelligent airspace in the configuration of the airspace and especially in the configuration of the national territory is a reality that involves the adaptation of the structures responsible for their management from the point of view of ensuring safety and security, to the identification of solutions to integrate autonomous systems, unmanned aerial vehicles (UAVs) and drones, in advanced operational strategies and plans to improve the safety and effectiveness of planned and organized military actions to ensure national security. This initiative can only be implemented after a responsible and professional review of air assets, autonomous systems using both offensive and defensive intelligent airspace.

UNMANNED AIR VEHICLES

Artificial intelligence (AI) and autonomous systems in the intelligent airspace are forcing a redesign of the modern battlefield. Their use together with a variety of sensors and algorithms needed to navigate and operate in airspace without human intervention, communication languages developed for interaction with other systems in airspace optimizes the performance of the systems versus the costs of their realization and operation.

Nowadays, the most relevant intelligent systems used in modern airspace are unmanned technologies, or more precisely without a human pilot on board. Considered as airborne components, these systems constitute the technological pinnacle identified at the Air Force level, and their importance is reflected in the methods, techniques and strategies of operating UAS in the conditions of hybrid and asymmetric warfare.

Unmanned aerial systems have valid and mature operational characteristics in ISR/ISTAR concepts and neutralization of ground and air, static or kinetic targets (Ştir, 2010, no. 6; Prisacariu, 2013, pp. 169-180; 2017, pp. 181-189). UAS capabilities and attributes offer relevant advantages in conflict zones, and among the most relevant are: persistence and penetrability alongside versatility and autonomy. Specialized studies and analyses support the technological evolution and the place in the UAV classification matrices offers a series of significant fields and projects that have marked development stages of aerial vectors without a human pilot on board (Valavanis, 2007; Prisăcariu, 2017, pp. 181-189; Fahlstrom, Gleason, 2012; Prisacariu, Boşcoianu, Luchian, 2014, pp. 51-50; Prisacariu, 2022, pp. 200-210).

At the same time, the current technological requirements and limitations (prototyping, manufacturing, operation/flight safety and economic) of unmanned aircraft determine sustained research and development concerns for the optimization of UAS functions under the conditions of intelligent airspace, directed functions for obtaining products/data on the conceptual cycle and on all levels of *intelligence* (Prisacariu, Boşcoianu, Luchian, pp. 51-58; Maltego team), see *figure no. 1*.

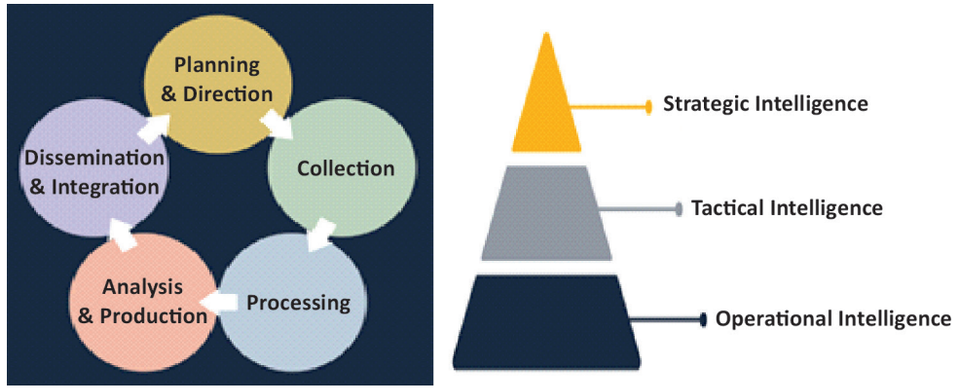

Figure no. 1: Intelligence concept (Maltego team, Understanding the Different Types of Intelligence Collection Disciplines, https://www.maltego.com/blog/understanding-the-different-types-of-intelligence-collection-disciplines/, retrieved on 2 May 2023)

Unmanned aircraft in the system architecture of the same name can provide real-time *intelligence* data in IMINT, COMINT, and SIGINT concepts with the help of multispectral sensors.

Thus, IMINT (Imagery Intelligence) sensors provide information extracted from the sampling and processing of digital data in the form of static or dynamic images, and the current technological level offers the possibility of sampling by UAVs, from high altitudes, images with high resolution levels (4K, 8K). Examples RQ-4 Global Hawk (*figure no. 2*) or MQ-9 Reaper *(figure no. 3)*.

Figure no. 2: RQ-4 Global Hawk
(https://www.northropgrumman.com/what-we-do/air/global-hawk, retrieved on 4 May 2023)

Figure no. 3: MQ-9 Reaper
(https://www.af.mil/About-Us/Fact-Sheets/Display/Article/104470/mq-9-reaper, retrieved on 4 May 2023)

UAS AND NATIONAL STRATEGIES

National Defence Strategy and White Paper on Defence

Inventions and new technologies have a significant impact on the battlefield. The effects of their use are found primarily in surprising the enemy, and then in creating a more realistic picture of the battlefield, in improving information about the situation on the ground, in making precision strikes and in the area of communications through better communication and coordination between the troops. All these effects aim at achieving a stable security environment and, in the case of conflicts, achieving victory and reducing the risk of human life loss. These objectives are set at the national level through strategies and doctrines, and as technology continues to evolve its role is increasingly important in shaping the outcomes of future battles and conflicts.

According to the *National Defence Strategy for 2020-2024* (2020), aspects are revealed regarding *the extensive process of building robust deterrence and defence capabilities, which began in 2015*[1]*,* with unmanned aerial systems constituting

[1] Presidential Administration (2020), *National Defence Strategy for 2020-2024.*

the current technological peak. At the same time, UAS are part of that range of tools that Romania needs to have a fast and strong response capacity to crisis situations.

As a national security interest, securing the eastern border through the use of advanced stationary and mobile aerial sensors from medium and high altitudes, in areas of interest and when the situation requires it, is already a reality that needs responsible and serious decisions.

From an internal perspective, robotic aerial systems are in the attention and equipment of structures intended to ensure the safety and security of citizens and are used to contribute to the prevention of criminal activities with a negative impact on national interests (e.g., cross-border criminality).

From the perspective of foreign policy, we can talk about capitalizing on congruent and possibly complementary partnerships to raise the level of equipment with UAS-type vectors in order to meet national security objectives. Possible partnerships leading to the dynamism of the national defence industry and the horizontal technological empowerment of industrial partners in the civil area, such as technology transfer for the Bayraktar TB-2 (Curtifan) or Watchkeeper X (Defense Romania team).

As an integrative document of the government with a series of measures and actions in the field of defence, the use of unmanned aerial systems targets both the specific missions of the armed forces and the directions for the development of defence capabilities (Prisacariu, 2022, pp. 200-210).

A series of missions specific to the Romanian armed forces can be instrumented with intelligent/robotic/autonomous aerial systems in peacetime through the surveillance and defence of the national territory (land, air, fluvial and maritime) or areas of responsibility of information interest and early warning. More precisely, missions regarding the collection, processing and dissemination of defence information to specialized government institutions. In civil emergency situations, UAS are used for specific support missions for search-rescue or interventions to remove the effects of natural disasters (floods, fires, earthquakes).

EQUIPPING THE NATIONAL DEFENCE SYSTEM WITH UAS

Starting from the historical *VR-3 Reys* from the years 1968-1997 (https://en.wikipedia.org/wiki/Tupolev_Tu-143) and then *RQ-7 Shadow 600* (https://en.wikipedia.org/wiki/AAI_RQ-7_Shadow), now, the recent intentions of the government in Bucharest have focused on the procurements started for the entry into the national defence system of complex tactical-operational unmanned air vector systems: *Bayraktar BT-2* and *Watchkeeper X* (Curtifan; Defense Romania team).

Bayraktar BT-2

It is a MALE (medium altitude long endurance) class UCAV (unmanned combat aerial vehicle) capable of kinetic weapons neutralization missions, produced in Turkey by Baykar Makina, built primarily for the Turkish Air Force. It is powered by a piston engine and has an array of onboard EO-IR/FLIR sensors (https://en.wikipedia.org/wiki/Baykar_Bayraktar_TB2).

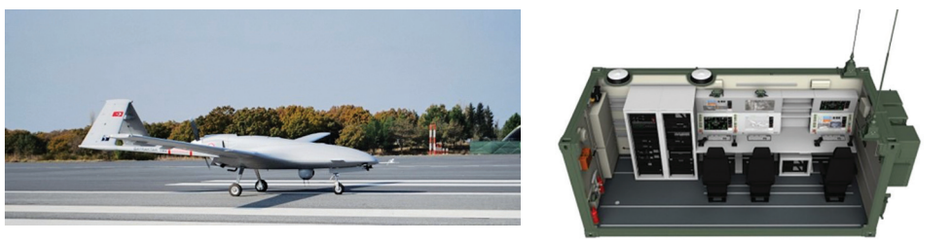

Figure no. 4: Bairaktar BT-2 and ground control station (Ib.)

The most relevant characteristics and performances are displayed in *table no. 1.*

Table no. 1: Characteristics and performances of Bayraktar TB-2

Features	Value	Features	Value
Span	12 m	Ceiling	7620 m
Max. weight / Payload	700 kg / 150 kg	Direct signal C2ISR	300 km
Max. speed	222 km/h	Max. Range	4000 km
Endurance	27 h	Weapons	Bombs, rockets

Bayraktar TB-2 has a high level of reliability, it has three redundant C2 systems and an autonomous flight control level. In addition to EO-IR equipment on a self-stabilized platform, TB-2 is also equipped with laser systems such as laser designator, laser finder and laser pointer and smart ammunition (http://crd.yerphi.am/files/Baykar_catalog_eng.pdf).

Watchkeeper X

It is a robotic aerial system specially designed for ISR missions with COMINT capabilities, developed by Thales and Elbit, equipped with a synthetic aperture radar and EO-IR sensors and can be operated independently or as part of C4I networks. It is equipped with laser designator, laser finder and laser pointer (https://www.thalesgroup.com/en/countries/europe/united-kingdom/markets-we-operate/defence/air-systems-uk/isr-air/watchkeeper).

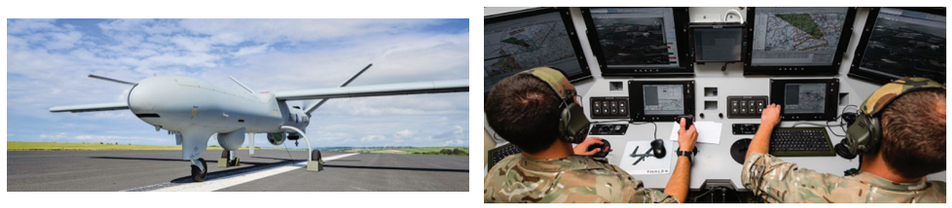

Figure no. 5: Watchkeeper X and ground control station (Ib.)

It has a number of CAA (civil aviation authority) and NATO (STANAG) accredited features and performances recommending it for both civil and military uses (*table no. 2)*.

Table no. 2: Characteristics and performances of Watchkeeper X

Features	Value	Features	Value
Span	10,9 m	Ceiling	4876 m
Max. weight / Payload	550 kg / 180 kg	Max. Range	200 km
Max. speed	150 km/h	Endurance	16 h

CONCLUSIONS

The theatre of military actions represents the tactical area where combatant forces are pitted against each other so that at the end of the confrontation the strongest and best trained one will win. Plans developed at the operational level are implemented in the tactical field, and military actions are coordinated with precision and effectiveness to obtain the advantage that will shape victory. In this general context, the emergence of a new element, technology or system with multiple capabilities and possibilities can represent that advantage that tilts the balance and determines the winner.

In the air space, air systems are modernized from one day to the next, fighter jets pass from one generation to another and reach capabilities that can hardly be fought. The increasing use of artificial intelligence in the airspace and the use of autonomous systems has led to the creation of intelligent airspace, a new dimension that defence strategies must include in future battle plans and concepts.

The world is digitizing, spaces overlap and intersect, intelligent systems take over the duties of human operators and rapidly implement algorithms that can shape decisions on the battlefield. The concept of man vs. man war is already history, and man vs. machine war is slowly becoming a robot vs. robot showdown. The super-technology of the battlefield and the emergence of new autonomous systems in intelligently defined spaces controlled by artificial intelligence determine

a new approach to future strategies. The vision of political and military leaders must be oriented towards decision-making algorithms programmed in binary code, and strategies and doctrines can no longer be developed without taking into account the importance and influence that autonomous systems have today.

Just as more than 120 years ago the airplane and aviation completely changed the face of war and introduced a new dimension to the plans and strategies of those times, today UAVs are redefining the airspace and implicitly the battlefield, applying some courses of action based on logical algorithms and solutions imposed by binary codes. What should not be lost from attention are the principles and norms that strategies and doctrines must introduce and apply, especially in the decision-making area, so that the objectives are fulfilled with the help of technology, but under the command of the human leader, the one who can intervene where the machine does not take into account free will and applies decision matrices that can generate chaos and perhaps even the end of human existence on Earth.

The paper presented general aspects, marked by the conditions of the intelligent airspace, regarding the traceability of robotic air systems on the axis of use/missions, capability and strategic programmatic documents.

Future research efforts will focus on advanced multi-criteria analysis or AHP (Analytic Hierarchy Process) of UAS in the MALE and UCAV classes (separate analyses) to rank, identify and highlight the criteria and technical aerial systems analysed.

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