sciendo

Land Forces Academy Review
Vol. XXIX, No. 2(114), 2024

CHARACTERISTIC ELEMENTS OF COMBAT DRONES IN MILITARY ACTIONS. UNMANNED AERIAL VEHICLES PROCURED BY ROMANIAN ARMED FORCES

Gheorghe MINCULETE
"Nicolae Bălcescu" Land Forces Academy, Sibiu, Romania
minculetegh@yahoo.com

Veronica PĂSTAE
"Carol I" National Defense University, Bucharest, Romania
pastae.veronica@myunap.net

ABSTRACT

Developments in the war of the future have brought to the fore unmanned aircraft or drones used in national and/or multinational military actions, as particularly important means to achieve operational success. The parameters related to this modern, flexible and particularly maneuverable combat system allow the conjugation of capabilities necessary to fulfill the missions received by the operational structures during preparation and conduct of operations.

The present study first provides a general approach to drone use in military actions, taking into account aspects from previous armed conflicts, as well as from the ongoing war in Ukraine. The objective of the study points to a series of important drone purchases that will be made by our country, to increase the combat potential of the Romanian joint and tactical forces, which will act on national territory and within the North Atlantic Alliance, against any aggressive forces of an unfriendly state.

KEYWORDS: armed conflict, operations, operational risks, drones, combat drones, kamikaze drones, maritime drones

1. Introduction

The future security environment will be increasingly complex, given the continuous challenges to internationally regulated order and the long-term strategic competition among main world actors. Therefore, the future operational environment will be characterized by modernized infrastructure, complex and dynamic ways of operating, which integrate technologies, equipment, automated, robotic systems, artificial intelligence, as well as advanced planning and action procedures.

The increasingly rapid advances in military technology have made drones used in military actions an essential means for achieving real success in future conflicts, offering significant advantages at tactical and joint levels, regarding transparency in decision-making. Finally, we claim that while combat drones may provide strategic benefits, a balanced approach is essential to

DOI: 10.2478/raft-2024-0030

manage the potential risks and human-related consequences of this ever-evolving technology. Becoming an essential component of military potential, combat drones have brought important doctrinal and operational changes, in accordance with the new requirements of planning and conducting military operations by NATO member states.

The crucial role of drones in warfare is undeniable and has evolved. These combat means have been used in various conflicts, such as the Vietnam War, military actions in Iraq and Afghanistan, and were highly efficient in the armed confrontation between Armenia and Azerbaijan, from September 27 to November 10, 2020, regarding the enclave of Nagorno Karabakh (Montalti, 2023). This episode revealed the capacity of drones to tear down camouflage measures and counter the reconnaissance and actions of adversary forces on the battlefield. Currently, the extensive use of drones is evident in the armed conflict in Ukraine, which indicates a true drone war (Lică, 2024).

In 2016, French Special Forces deployed in Syria were among the first to encounter small commercial drones cleverly turned into war tools, when they were attacked by Islamic State fighters. Nicole Thomas, division chief for strategy and policy in the Pentagon's Joint Counter-Small Unmanned Aircraft Systems Office, points out that less funded countries, now have access to airpower in places they would not have in the past, changing the balance in the battle (Sherman, 2023).

The increased use of drones in the confrontation between the Ukrainian liberation forces and the Russian invaders has reconfigured the operational landscape of combatant forces, bringing to the fore new destructive risks, especially in terms of their integrated operational logistics. An eloquent example of effective planning and action by Ukrainian forces is the counter-offensive launched on June 4, 2023 against the Russian occupation army. Using affordable drones, Ukrainian combat structures managed to destroy equipment worth tens and hundreds of millions of dollars belonging to Russian forces (Minculete & Păstae, 2023).

A few years before the outbreak of the armed conflict in Ukraine, considering the impact of military drone usage, a series of significant reflections on ethical, humanitarian, human rights, and laws and principles of war (Leslie, 2021) were affirmed and published. Thus, given the severity, increased lethality, and horrors of war in Ukraine, we believe that at the international level there should be legislation: limiting or banning the use of combat drones with significant destructive effects not only in conflicts between states and between rival armed groups within the same state, with obvious implications for personnel losses first and then for equipment and materials; nationally, European and globally restrained and constructive public conduct towards the intensive and extensive use of combat drones (of any type) in warfare, which in the Russo-Ukrainian confrontation has become downright alarming due to the incredible number of military and civilian casualties, which already generates and will cause significant adverse consequences at regional and global levels; holding states (military groups) accountable for the intention or abusive use of armed drones to protect the rights and safety of soldiers and civilians (considering also the differentiation between combatants and non-combatants); using advanced technology and artificial intelligence in the manufacturing of modernized drones necessary to be precisely used against enemy combatants, so that compared to the use of other advanced combat systems, they allow for effective reduction of risks of collateral damage (Lushenko, 2022, 2-23).

In order to obtain, analyze, evaluate and interpret the information and data necessary for the construction of this novel material, we used several scientific

investigation methods and tools which allowed us to make comparative analyses, evaluations, interpretations, inductions, and deductions to create the content sequences.

2. General Aspects of Drone Use in Military Actions

Today, in the sky above Ukraine, where opposing drones face off, aerial duels often do not require the use of bullets, missiles or bombs. Here, the drones are used: • to spy on the enemy positions (adequately equipped), and if they meet, they hit and destroy each other in flight; • to place precision fire with destructive effect on enemy drones – having a particularly sophisticated configuration that incorporates advanced radars supported by artificial intelligence and the latest aerospace engineering technology. The U.S. Air Force experts say that future armed air conflicts will use sophisticated combat drones able to confront manned aircraft. Currently, the USA are working to develop a high-performance fleet of drones (unmanned aircraft) compatible with their most technologically advanced aircraft (Sherman, 2023).

In the current armed conflict, the Ukrainian defense forces first used the Turkish Bayraktar TB2 drones, as well as drones of own-production (including maritime ones), causing significant losses to the invading Russian army and not only (by: destroying numerous tank columns; hitting some airfields in The Crimean Peninsula; surprise attacks on air bases in the Russian Federation; hitting and sinking warships of great importance for the prestige of the Russian Navy; hitting the Kerch Bridge; attacks on Moscow; hitting refineries and other critical infrastructure, etc.) (Lică, 2024).

Under these conditions (both for tactical use and for hitting the above-mentioned targets) it was estimated that the Ukrainian forces lost approx. 10,000 drones per month around the middle of 2023, according to The Royal United Services Institute (Snodgrass 2023). According to Ukrainian government officials, it is expected that in 2024, the invaded (Ukrainian) state will produce through its domestic defense industry (and with external support in approx. 6-7 facilities) a significant number of combat UAVs (drones) (with medium and long range) (Lică, 2024).

If at first the Russian forces did not use drones as means of attack, but rather as UAV systems suitable for ISR (such as: Orlan-10, Takhion and Zastava, etc.), they later introduced them into battle (starting in the fall of 2022, with a delay due to Western sanctions), in addition to its own attack model – Landcet, the Shahed 131 and 136 types, manufactured in Iran, the Geran 2 model (a domestic copy of the Iranian ones), as well as FPV drones (purchased in large quantities at low prices from China) (Lică, 2024).

Therefore, by implementing tactics and procedures previously used by Ukrainian combatant structures, the Russian forces carried out intensive attacks with a combination of drones organized in swarms, causing major destruction of artillery equipment, various types of armored vehicles, attack aircraft and helicopters, critical and territorial infrastructure, etc. Considering the operational effects, as well as the destruction produced by the adversary, Russian officials have proposed a significant increase in the production of attack drones (other than FPV) to cc. 32000 units/year in the remaining period until 2030 (Lică, 2024; Redacția Adevărul, 10.02.2024).

The major role of drone use in preparing and conducting combat actions has become evident from the lessons learned in the armed conflict in Ukraine. They facilitate observation of invading forces on the move, significantly reducing the number of reconnaissance soldiers who would have to stealthily reach behind enemy lines, aiming to gather the necessary intelligence. This also help artillery units to

launch more accurate strikes, based on the coordinates received. The use of drones also contributes to avoiding civilian casualties as much as possible, and to optimizing military strategies (Minculete & Păstae, 2023).

In 2023, the US Air Force (USAF) conducted tests for an advanced satellite communication system to operate the MQ-9 Reaper multi-role drone. This system allows the drone to transmit real-time data from anywhere on the planet, using advanced SATCOM (Satellite Communications) technology. Improved communication capability is essential, given the fact that the MQ-9 Reaper can fly at high altitudes for long periods, and its sensors provide real-time data on enemy positions, movements, and activities. The MQ-9 can conduct both combat (ground and air attack) and surveillance missions. There are two main versions: the MQ-9A Reaper, with a payload of 1,700 kg and carrying capabilities for various weapons and observation systems, and the MQ-9B Sky guardian, which can carry a payload of up to 2,520 kg, having a higher autonomy, being able to fly up to 40 hours and travel longer distances (Orjanu, 2023) (Figure no. 1).

Figure no. 1: *MQ-9 Reaper drone with Hellfire missiles and JDAM bombs*
(Source: Sherman, 2023)

To protect strategic (secret) locations, and to counter drones of various sizes (smaller or larger), the USA uses the "Fortem DroneHunter F700" system, which includes: "*six rotors; a radar backed by autonomous technology; two 'net heads' designed to precisely launch nets towards enemy drones*". After catching smaller or larger drones, they will be dragged by Drone Hunter. If larger drones are caught, they will be prevented from flying and released, then they will glide smoothly to the ground (assisted by parachutes attached to the nets) (Sherman, 2023).

Ever since last year, Ukraine received the DroneHunter model, used to track the drones (of Group 1 and 2) with which the Russian military spied on Ukrainian first-echelon forces. In this way, Russian forces were prevented from using the drones suitable for collecting the necessary data for the artillery to strike the positions of the Ukrainian troops, as well as the kamikaze drones intended to strike the critical infrastructure of the invaded state. Later, after the Russians began using Shahed drones imported from Iran, Fortem modified the

DroneHunter model to intercept them (Sherman, 2023).

Similar to a century ago, warfare remains a breeding ground for significant advances in weapons technology. In confrontation with Russian occupation, Ukraine is no exception, and drones have become effective technological emblems of this conflict, for both reconnaissance and attack.

In particular, FPV (First Person View) drones have played a highly important part, gradually replacing artillery systems, when the availability of projectiles is increasingly limited. Inexpensive and effective kamikaze drones with attached ammunition have remarkable potential and are rapidly gaining ground among other military equipment. However, evolution is an ongoing process and the use of FPV drones has sparked an intense arms competition between belligerent states, engaged in a continuous race for innovation (Defense Romania Team, 02.02.2024) (Figure no. 2).

Figure no. 2*: Image of an FPV drone in action*
(Source: Defense Romania Team, 2024)

According to the Ukrainian Military Center, the "Come Back Alive" Foundation in Ukraine started the "Eye for Eye 3" campaign with the aim of raising 500 million hryvnias to support their Armed Forces. As a result of this initiative, 10 units of the Ukrainian Air Assault Forces are to receive unmanned aerial systems specialized in reconnaissance and attack. Thus, the "Eye for Eye 3" program aims to provide equipment worth half a billion hryvnias (Jipa, 2024).

In conflict escalation, with the Russian military firing more than 10,000 projectiles a day, as compared to Ukrainian forces who respond with about 2,000, the defense has come up with a lifesaving solution by adapting drones to carry defensive grenades, 82 mm grenade launchers or AG-7 strikes. These compact, easy-to-build, and maneuverable combat systems are an affordable and effective alternative for conducting attacks into the enemy's deep area (Jipa, 2024).

This initiative is related to the withdrawal of American support and the impossibility of the European Union and Great Britain to effectively cover the deficits. Even though ammunition production has been doubled, the huge demand from Ukraine to replenish its stockpiles, cannot be met. Ukrainian Armed Forces have

prepared in advance for this situation, through the "Drone Army" program, training 60,000 servicemen in small drone operations. These devices wreaked havoc on the battlefield, as Russia had problems developing the necessary jamming systems. In addition to small drones, Ukraine has advanced to the third generation of maritime surface drones (Jipa, 2024) (Figure no. 3).

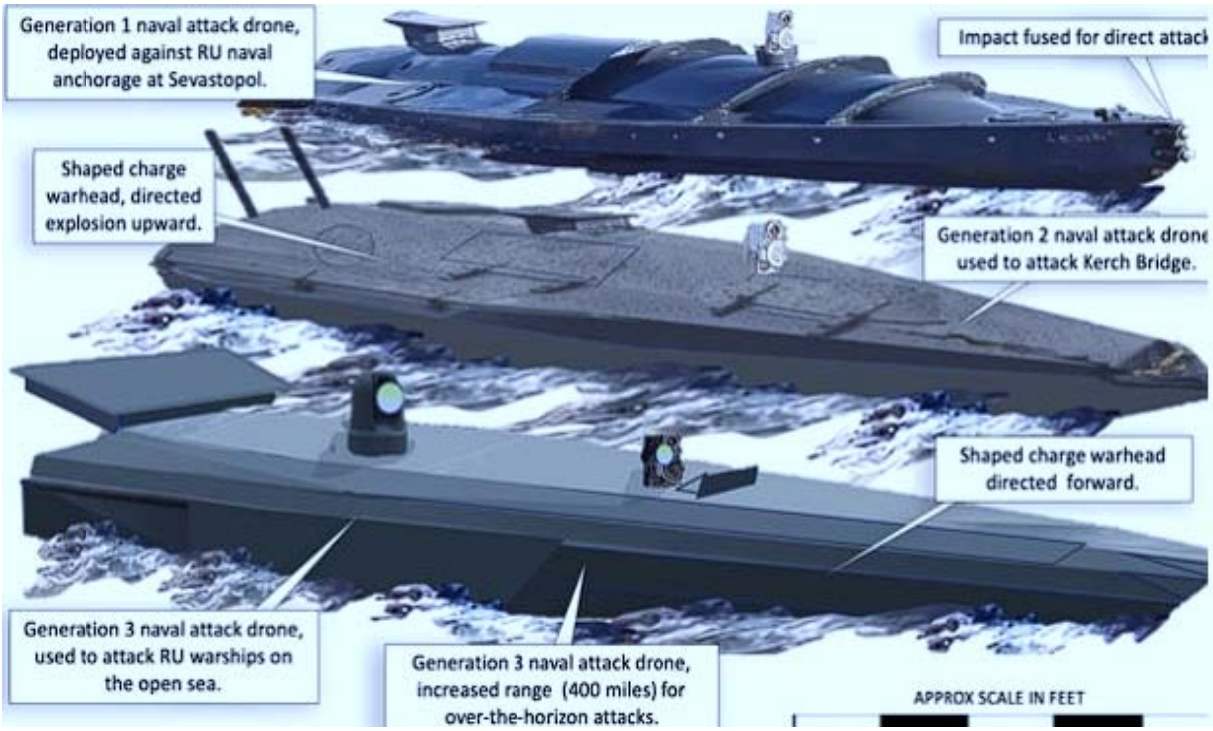


Figure no. 3: *Image of the third generation of Ukrainian surface maritime drones*
(Source: Jipa, 2024)

The increased role of drones in military actions has highlighted several important effects of their use, as presented below. Given their capability to provide real-time data and execute missions with surgical precision, these systems have proved to be highly efficient in theaters of operations. Controlled from a distance, they prevent direct exposure of the military to battlefield dangers, thus contributing to the safety of personnel; advanced sensor and camera technologies enable them to provide detailed information on terrain, enemy position, and suspicious activity, enhancing surveillance capability. Equipped with lethal weapons, they can carry out attacks and destruction missions without requiring the direct presence of human operators in the conflict zone. However, their use has raised significant ethical and legal questions, especially with reference to civil collateral losses, to observance of human rights and abuse prevention. Related technologies are rapidly evolving, impacting their increasingly advanced capabilities, leading to higher autonomy, by incorporating artificial intelligence, thus extending their operability in various environments. Drones have become an important tool in asymmetric conflicts, being efficient and low-cost, as compared to traditional means. Nonetheless, drones are also vulnerable, because the opponent can intercept their control signal, they can be hijacked or damaged by the enemy anti-drone technologies; their impact and implications are complex, depending on the

ways states and military organizations use them (Walsh & Schulzke, 2018).

The United Kingdom will allocate an additional £4.5 billion (USD 5.7 billion) over the next decade for the development of new combat drones, committing to rapidly equip all branches of its armed forces with advanced unmanned combat systems. In order to swiftly equip all branches of the armed forces with combat drones, the UK Ministry of Defence has proposed an additional allocation of £5 billion (USD 5.7 billion) over the next decade for technological modernization, including the integration of artificial intelligence (AI), into these advanced unmanned systems (UAS). The primary aim of this investment in technologically developed UASs is focused on essential objectives resulting from the armed conflict in Ukraine, such as: the need to eliminate maritime mines; conducting one-way attacks; facilitating logistical transports; ensuring proper ISR (Information/Surveillance/Reconnaissance) deployment; addressing logistical support interruptions; and systematically identifying and destroying these systems due to unprecedented electronic warfare (EW) actions (Costea, 2024).

In the future, Romanian competent bodies must purchase advanced equipment to counter drones and/or swarms of drones, as they are necessary for the combatant and logistic support forces in areas/theatres of operations (internal or external). The mentioned requirements also have as an argument the provisions of law no. 283 of December 6, 2021, which stipulates the situations and conditions of intervention with military means by our military personnel, to neutralize drones, as well as the radio-electronic equipment for drone remote control (Minculete, 2023).

3. Features of Drones Purchased by Romanian Armed Forces

On December 20, 2022, Romtehnica SA Bucharest (belonging to the Ministry of Defense) concluded the contract with "Elbit Systems Ltd" company for the production of the "*UAS Watchkeeper X*", *a system mainly designed for conducting reconnaissance missions and intelligence gathering about enemy forces*. A number of 7 functional sets will be bought (3 drones for each system, so a total of 21 drones) through defense industry operators **(**Cozmei, 2022).

Therefore, in the next five years, at national level, the Elbit company will provide at least 21 drones, as follows: 6 "UAS Watchkeeper X" systems for the air force and 1 "UAS Watchkeeper X" system for navy, the total costs of which will amount to 380 million Euros (without VAT), respectively 1,891 billion lei (Cozmei, 2022).

The objective will be attained after building and consolidating (within companies such as *Aerostar, Romaero, AE-Electronics, Elmet,* and *Simultec*) all the facilities needed for the production, integration, testing, and maintenance of the UAS systems shown, which will be produced for the military operational field, to be used in crisis and war situations (Figure no. 4).

Based on the mentioned contract, the drones will be armed with two missiles installed under each wing. It is known that, at *Aerostar Bacău*, Elbit already manufactures parts necessary for the assembly of its "Hermes 450 (Watchkeeper)" drone model. The performance of these UAVs, procured by the British Armed Forces (from the Elbit Systems subsidiary, here), has been tested in the operations carried out by their combat forces in the theater of operations in Afghanistan (Păvălașc, 2022).

Figure no. 4: *Image of the "UAS Watchkeeper X" system, on the ground and in flight*
(Source: Elbit Systems Awarded Romanian Contract, 2022)

Note

According to Elbit, the "Watchkeeper X" model has the following characteristics: max. weight (can carry equipment or weapons) = 550 kg (it belongs to class II of UAVs with limits of 150-600 kg); standard load capacity (MTCR CAT 2) = 180 kg (in emergencies it can carry double the load of equipment or weapons); ceiling (flight) = 4876 m; full speed = max. 150 km/h; operating autonomy (flight) = max. 16 hours; automatic take-off and landing mode (it is equipped with an electro-optical / infrared sensor and a two-mode synthetic aperture radar and a moving target indication system on the ground, regardless of weather conditions; it has sensor fusion algorithms, including an inertial navigation system, allowing automatic navigation and landing even in the case of losing global positioning signals); range (operational) = max. 200 km; length = 6.5 m; wingspan = 10.9 m; it has four support points (two under each wing) for firearms (with: rockets; bombs; grenades, etc.) (Awarded Romanian Contract for Watchkeeper X ..., 2022).

"*The UAV has two sensors under the drone and two inside the fuselage. There are no class II drones that have such a system, only those belonging to higher classes, which are larger, but also more expensive*", said British Colonel (ret.) Nick McRobb (Curtifan, 2020).

To carry out tactical and/or joint operations, complementary to using the specified drones (*to implement, as for the*

previous drone model, the Capability Targets assigned to Romania within the NATO defense planning process), Romtehnica SA concluded in October 2022 with the Turkish company "Bayraktar" a contract worth 300 million Euros to purchase for Romanian land forces 18 drones, respectively, "*3 Bayraktar TB2 UAS systems and 6 air platforms each capable to strike targets, a transaction that will also provide logistical support (including training equipment)*". These systems will be used in specific missions of surveillance, directing artillery fire, or for bombing and ground attacks against enemy forces (Defense Romania Team, 2024) (Figure no. 5).

Figure no. 5: *Image of the "UAS Bayraktar TB2" system on the ground and in flight*
(Source: Minculete, 2023)

Note

The characteristics of a "Bayraktar TB2" system are the following: max. weight = 150 kg (it belongs to class II of UAVs with limits of 150-600 kg); standard load capacity (MTCR CAT 2) = max. 150 kg; ceiling (flight) = max. 5500 m; full speed = max. 220 km/h; operating autonomy (flight) = max. 27 hours; automatic take-off and landing mode (through sensor fusion algorithms, including an inertial navigation system, allowing automatic navigation and landing even in the case of losing global positioning signals; range (operational) = max. 150 km; length = 6.5 m; wingspan = 12 m; it has four support points (two under each wing) for firearms (with missiles, bombs, grenades, etc.) (Păvălașc, 2023).

Considering the importance of drones in future tactical and/or joint operations, several NATO countries have equipped their armies with small drones or "*nano drones*" (*the United States, Norway, France, the United Kingdom, Germany, the Netherlands, Poland, Turkey*) for individual use by military personnel in surveillance, reconnaissance, data and intelligence gathering. These "*pocket drones*" have (for each two-drone system) several particularly important features, as shown below.

They have the shape of tiny helicopters up to 20 cm, are highly efficient and silent;

(max.) three cameras can be installed on a drone, forward, downward, as well as at a 45 degrees angle (the last), to allow the military operating the (above mentioned) system to get full images (with a single drone) in the tactical area of interest. Charging time is max. 25 minutes; the operating period is max. 25 minutes until the discharge of the accumulator, simultaneously charging and using one or the other drone in the system. The systems used at night can also have infrared devices installed, as well as the necessary sensors to transmit video images through digital data connections, within a radius of 1.6 km. The system is designed to carry out reconnaissance in the field, at distances of max. 20-25 km; the training of a military operator for manual piloting of the system will not exceed 30 minutes; they will have to digitally enter the coordinates for the device flight before take-off (Bolocan, 2023) (Figure no. 6).

Figure no. 6: *Generic image of a pocket drone*
(Source: Bolocan, 2023)

According to experts in the field (Lieutenant General Teodor Incicaș, head of the General Directorate for Armaments), battalions and brigades will be equipped with this mini drone system, and the purchase will be made. Next, the *Research Agency for Military Technique and Technologies* will develop and approve "*a tactical-level unmanned aerial system with a flight range of 100 km, with vertical landing and takeoff*", which (following legal acquisition) will be part of the equipment for operational structures of Romanian Armed Forces (Minculete, 2023). Subsequently, the development of the second product of this type of drone, featuring vertical takeoff and landing capability, was initiated (Lazăr, 2024).

Considering the increasingly complex operational requirements resulting from the Russo-Ukrainian conflict, OVES Enterprise, a company specializing in software development and drone production (developing ten models of different sizes), has decided to invest approximately 100,000 Euros in Romania in a new manufacturing line. The Ajeet drone model will be produced, representing a cheaper and highly efficient solution for conducting complex warfare missions. As for its features, this type of small-sized drone will exhibit: compliance with all applicable standards, such as the BMS (Battery Management System – mandatory since 2024); individual possession of a transponder necessary for precise

localization, regardless of the situation and moment; an advanced hardware solution ensuring integrated specific software including AI, facilitating: drone connection, information transmission between drones, and functioning as a whole; information interpretation; autonomous decision-making during flights; adaptation of flight modes. For example, if, during missions, a swarm of drones identifies threats, they can accordingly decide for a low-altitude flight, within the grouped formation, providing an appropriate response to the perceived real threats (Wall Street, February 22, 2022).

As a result of the lessons learned from the armed conflict in Ukraine, in the future, drones will be increasingly used in tactical and/or joint military operations. However, the intensive use of drones in deep reconnaissance, espionage, and destruction actions has led military specialists and skilled research bodies to investigate, create, and implement advanced technical systems to block their operations or destroy them. Thus, the range of anti-drone systems is briefly presented below.

1. Portable anti-drone systems, such as the *"DJI Air 2S System"* designed for detecting and intercepting enemy drones, regardless of their size and speed; the *"SkyWall 100"* system, usable through a specific portable device (actuated by a "laser guidance" and a "compressed air firing system"), for identifying and intercepting drones to protect sensitive sites (including military areas, such as: logistics subunits; warehouses, residential objectives, etc.), but also critical infrastructure, like airports, government buildings, nuclear power plants, etc.; *portable anti-drone laser systems* designed for disrupting or destroying dangerous drones (programmed for any kind of attack) by using focused laser beams (to heat the delicate drone components). Such models are: *"DroneGun MKII"* and *"DroneDefender"* (Figure no. 7a);

2. *Fire control systems for targeting kinetic attack weapons* are used for defense against drones with destructive (kinetic) weapons, directed to act upon military bases, operational logistics structures and formations, territorial and/or critical infrastructure, governmental facilities, etc. For instance, the "*DroneDefender*" system also uses radio frequency (RF) technology to block the control of a drone by sending false signals (Figure no. 7a);

3. *Anti-drone jamming systems* have the role of interfering with the control signal of drones (identifying and locating the operators), to prevent their activity, intended for espionage, terrorist acts, etc. Examples of such anti-drone jamming systems are: "*DJI AeroScope*", "*DeDrone"*, "*DroneShield*" and "*DroneDefender*" (Dima, 2023) (Figure no. 7a).

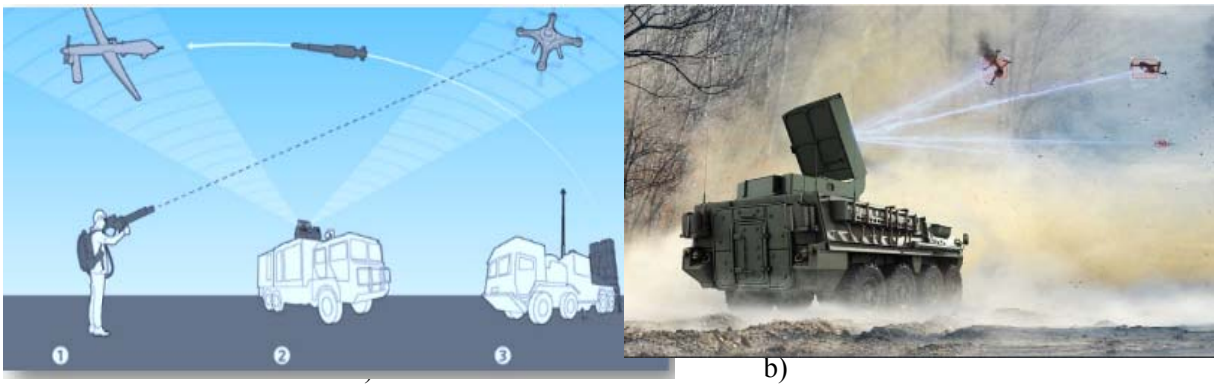
If, individually, drones have been used for decades, in 2021, the Israel Defense Forces (IDF) have implemented the *AI swarm of drones* as a novelty, to geolocate, identify and strike Hamas terrorists in the Gaza Strip, without using GPS assistance (Giannakis et al., 2021). Today, swarms of drones are used quite often in Ukraine, by both opponents, to strike combatant forces, military warehouses, air bases, ports, territorial civil infrastructure, etc. In 2020, the USA launched "Project Convergence" to coordinate with multinational partners, and 14 million dollars were allocated to the *BlueHalo* company, which developed a new prototype that has "capabilities of swarming offensive unmanned aircraft systems" (Judson, 2022).

Meanwhile, in the United States, the Joint Counter-Unmanned Aircraft Systems Office (JCO) was established, under military leadership, to design a UAS interceptor for "*decreasing side effects*", available as a prototype in the third trimester of 2023.

It is designed to work in association with a ground system, generating powerful

microwaves, capable of neutralizing swarms of drones to protect certain positions and/or locations (including logistical support), but also for the protection of operational forces and their logistics structures, against attacks with rockets, artillery, mortars, as well as cruise missiles (Montalti 2023). Figures no. 7 a) & b) show images of mobile neutralization systems against attack drones.

The intensity of drone attacks by the Russian invading forces, led Israel (otherwise very advanced in this field) to help increase protection against Russian kamikaze drone attacks (procured from Iran) by approving export licenses (granted to Elbit and Rafael companies), to sell anti-drone systems to Ukraine (The Times of Israel, 2023).



b)

Figure no. 7: *Mobile systems for neutralizing enemy drones by: a) laser; radio frequency; jamming; b) microwaves*
(Source: Dima, 2023; Monalti, 2023; Minculete, 2023)

Recently in Romania, the Ministry of Defence, to put the project into practice, "*approved the first Romanian jamming system for drones, developed by the Blue Space Technology Company. This product, which has undergone tests and positive evaluations, has several essential characteristics: it is non-kinetic, portable, and independent defensive equipment, intended to neutralize unmanned aerial vehicles (UAV), by jamming the main signals used; has a range of 2 kilometers; does not interfere with communication networks outside the operating ranges*" (Botea, 2023).

Moreover, the Romanian combatant structures involved will soon have a modern anti-drone technological system (the most efficient in Europe), to be activated against the unintentional launches of Russian drones on our national territory, near the border with Ukraine (during attacks on their Danube ports). In this sense, considering the multinational origin of the drones to be purchased by our country, shortly, "*G2G agreements between the Governments of several countries will be concluded, with NATO consent*" (Vasilache, 2023). In Figure no. 8, there are places where Russian drones fell, near the border with Ukraine.

Figure no. 8: *Places where Russian drones fell on Romanian territory*
(Source: Vasilache, 2023)

Considering the hostile actions of the Russian Federation in attacking Ukrainian ports on the Danube with drones, with repercussions also affecting the border limits of Romanian territory, the issue of developing regulations that would allow operational forces to have "*full freedom to use weapons in peacetime, outside military objectives or training grounds*" was raised at the CSAT meeting on 21.02.2024. This will also entail modifications to other laws, such as those concerning national defense, the regime of weapons and ammunition, and the preparation of the population for defense (Manolache, 2024).

4. Conclusion

The efficiency and effectiveness proven in the wars in Iraq, Afghanistan, and Ukraine indicate an expansion of drone role in the future, becoming a priority for NATO member states and the Alliance, in general. With all the resources and capabilities available in this domain, it is imperative to develop and implement allied interoperable standards and adequate capabilities for the production and use of advanced combat drones, as well as means of countering enemy ones, in high-intensity multinational joint and tactical operations against an opponent with similar potential.

In the Russian-Ukrainian war, developing methods for intersystem integration of drones in operations of combat forces, at joint and tactical levels, had and still has a significant impact on the evolution of military actions. Technological advance facilitated the achievement of rapid success in several operations, affecting the dynamics of actions performed by the two armies involved. Russian forces benefited from using a considerable number of drones, which for a while, led to slowing down and even stopping the Ukrainian counteroffensive. This situation points out the importance of effectively integrating drones into military strategies, highlighting their significant influence on the balance of power in contemporary conflicts.

As a result of concentrated actions, including extensive use of drones and swarms of drones to destroy crucial combat equipment (tanks, complex artillery systems, and air defense missiles, aircraft and battleships, drones, etc.), as well as ammunition and fuel depots of the enemy, there are promising prospects for the complete liberation of Ukrainian territory from Russian occupation.

Therefore, due to the increased use of drones in theaters of operations, commanders and logistics managers (logistics management officers) must act proactively, anticipatively and collaboratively in the process of operational planning – including logistics support. So, when preparing operation plans and orders (OPLANs and OPORDs), the following are to be taken into account: the situations and own possibilities of using drones at tactical and joint levels; research, analysis and evaluation of the enemy's potential to attack (national and/or allied) combatant forces – (especially) including the logistic structures, with such means (plus swarms of drones); the availability and immediate use of specific equipment for countering and neutralizing enemy drones or swarms of drones (other than the weapon systems of operational structures).

Lessons learned from the armed conflict in Ukraine highlight the major importance of drones in the process of preparing and conducting combat actions. They make it easier to observe the movements of invading forces, helping to reduce the number of reconnaissance troops needed to scout behind enemy lines. They also aid artillery units to launch more accurate attacks, thus reducing the risk of civilian casualties.

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