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PROBLEM ISSUES OF THE ORGANIZATION OF THE USAGE OF UNMANNED COMPLEXES IN THE SECURITY AND DEFENSE FORCES OF UKRAINE AT THE CURRENT STAGE OF THE WAR

The results of the analysis of a number of publications on the experience of creating and functioning of units using unmanned systems in the security and defense forces of Ukraine are briefly considered.

A brief analysis of the modern history of the creation and development of units for the use of unmanned, primarily aviation, systems (complexes) is given. Unwavering trends regarding the further expansion of the practice of using unmanned systems (complexes) of land, air and sea (river) use in modern armed conflicts during the conduct of battles both at the tactical level and operations (special operations) at the operational and strategic levels are emphasized.

The modern experience of using unmanned systems is analyzed and possible further changes in the tactics of tactical-level units on the battlefield are predicted, taking into account the constant development of the latest technological capabilities in the field of reconnaissance, detection, destruction of targets and radio-electronic warfare.

Generalized problematic issues and challenges that have to be solved by tactical-level military commanders and individual specialists in the process of their deployment and application are highlighted.

Conclusions have been drawn regarding the expediency of taking into account the experience gained in the creation, deployment and functioning of units using unmanned systems in the process of developing similar units in the military formations of the National Guard of Ukraine.

The problem of the need to improve the process of selection (transfer) of training and preparation of candidates for service in units for the use of unmanned systems is emphasized. The problem of organizing their appropriate support and developing doctrinal documents on their application on the battlefield, taking into account the need to establish interaction and carry out coordination measures with units and formations in whose interests these units operate, is also emphasized.

Proposals have been submitted regarding the mandatory implementation of the process of studying the tactics of units and military formations of various branches of the military with the support of their actions by units using unmanned systems in military educational institutions.

Keywords: *unmanned systems, unmanned complexes, combat experience, tactics, application, security and defense forces, National Guard of Ukraine, war, state security.*

Statement of the problem. Since the beginning of the criminal military aggression of the russian federation against Ukraine, the challenges facing the security and defence forces on the battlefield have been constantly growing. They are related to both the insufficient level of comprehensive provision of troops and the dynamic development of forms and methods of armed struggle. No lesser challenges exist in the command-and-control system, in the practice of using units of various types of forces and branches of the armed forces.

Given the rapid development of the use of unmanned systems (USS) on the battlefield, operating on land, water and in the air, in order to increase the capabilities of the Armed Forces of Ukraine (AFU) to use unmanned and robotic air, sea and ground systems, the Presidential Decree No. 51 of 6 February 2024 established the Unmanned Systems Forces as a separate branch of the AFU [1].

The process of creating both units and separate military formations using UAVs and various types of complexes has accelerated rapidly. Therefore, it is advisable to consider the problematic issues that constantly arise in the course of formation, deployment and use of the BSU in the security and defence forces of Ukraine, taking into account the

experience gained during the ongoing russian-ukrainian war and which undoubtedly require attention.

Analysis of recent research and publications. Modern forms and methods of warfare (combat operations) with the use of air defence systems are reflected in numerous domestic and foreign publications in both professional journals and the media. Many of these publications relate to the russian-ukrainian war.

The study of these materials makes it possible to identify problematic issues of the practice of formation, training, support, deployment and performance of tasks by units of the security and defence forces of Ukraine with the use of unmanned aerial vehicles. Therefore, researchers from different countries are constantly paying attention to the study of the experience gained.

For example, in a scientific publication [2], the author examines the specifics of the use of military-use UAVs and outlines the prospects for their use. According to the author, the prospects for further use of UAVs include not only reconnaissance or fire damage to enemy forces, but also evacuation of wounded soldiers, demining, delivery of ammunition, medicines, food, etc. However, it should be noted that such tasks are already partially performed by a number of units on the battlefield using both airborne and ground-based unmanned systems. In addition, relatively recently, we have gained new experience in using FPV strike drones as a means of combating enemy unmanned aerial vehicles (UAVs) [3].

A scientific publication [4] offers a forecast of the development of UAVs in the Armed Forces in the most important areas, taking into account existing trends and the capabilities of Ukraine and its partners.

The concept of using unmanned aerial vehicles, as well as the ways our adversary can combat UAVs in certain combat situations during the russian-ukrainian war, are discussed in a scientific publication [5]. The study hypothesises that the success of the use of robotic combat systems depends on the experience of fighting UAVs. As the practice of conducting combat operations with the use of UAVs shows, this hypothesis is confirmed.

In a number of scientific publications, the authors draw attention to the training of UAV operators. For example, publication [6] discusses such an area of the professional training of UAV operators as their psychological readiness.

Already at the end of the first year of the russian-ukrainian war, foreign publications appeared that predicted rapid changes in the very philosophy of modern warfare. In particular, the author of [7] argues that the most intriguing effects of the integration of the BPS into military operations are the impact on the decision-making process, on the balance between the human factor and artificial intelligence, on the structure of the forces and means involved in the operation and the construction of their combat orders, etc.

In his programme publication [8], the former Commander-in-Chief of the Armed Forces of Ukraine, General V. Zaluzhnyi, among a number of important theses, also outlined the prospects for changes in the design of operations based on existing technological capabilities.

Thus, a number of scientific studies have focused on the impact of modern technologies, including the use of UAVs, on the course of war. A brief analysis of these studies confirms the relevance of such research. It should be borne in mind that as modern technologies and systems are introduced into the armed forces, new experience is gained in the formation, deployment and use of the BSF units in the security and defence forces of Ukraine. This organisational and combat experience is, without exaggeration, unique.

Given that the military units of the National Guard of Ukraine (NGU) are actively involved in combat missions to repel armed aggression, it is advisable to summarise the interim results of the review of the results of the use of the BPS and their combat work at the current stage of the russian-ukrainian war.

The purpose of the article is to highlight the results of the study of the characteristic challenges faced by the units of the use of the BPS in the security and defence forces of Ukraine at the present stage, based on the analysis of combat experience, with a view to taking them into account in the further development of units of this type in the National Guard of Ukraine.

Summary of the main material. Even before the large-scale invasion of the russian federation, active hostilities in eastern Ukraine demonstrated the need to use drones on the battlefield not only to adjust artillery and collect intelligence, but also to strike at armoured and hard-to-reach enemy targets. In 2018, the Ukrainian army received the first Turkish-made Bayraktar TB2 strike drones, which at the time successfully performed the task of engaging enemy targets. Later, with the outbreak of hostilities in 2022, the effectiveness of the Bayraktar TB2 was proven in practice.

At the same time, the urgent need for UAVs since the beginning of the full-scale invasion has forced the search for alternative ways to supply troops with aerial reconnaissance and fire control capabilities. The practice of using civilian UAVs for combat missions has confirmed the effectiveness of their use. First of all, volunteer movements and organisations responded to the problem of providing UAVs to units. Later, the state joined the process. The result of the above was the creation of a separate branch of the armed forces.

Today, without exaggeration, Ukraine is among the leading countries in the use and creation of its own UAVs for various purposes. And if at first the emphasis was on airborne UAVs, in a fairly short period of time the rapid development of the creation and use of ground and sea (river) UAVs began.

Currently, both civilian drones are widely used in the air, for example, drones from Skydio (Skydio X2 drone), Autel (Autel Evo II Pro quadcopter), DJI (DJI Mavic 3 drone, Mavic 2 series copters), and military quadcopters (DJI Matrice 300 military drones, Switchblade). Along with these, military UAVs of domestic production and for various purposes are used, such as: Leleka-100, Spectator-M1, Furia, PD-2, Valkiriia, Punisher, Shark, Dovbush, Inquisitor, Elf, Koldun, Baba Yaga, Domakha, eBOSH, KH-S7, Mamont, Qeen Hornets, etc.

According to the type of control, drones are divided into GPS and FPV drones. With the appropriate configuration and calibration, a drone with a GPS module can fly independently to certain points along a specific route.

FPV (First Person View) drones, which are primarily quadcopters, are used for free and usually manoeuvrable and fast flight in the first-person mode.

The current practice of using UAVs shows the possibility of solving the following military tasks: aerial reconnaissance; targeting and controlling fire and manoeuvres of units; striking land and sea targets; mining and demining; radio jamming; relaying (messages and data); detecting enemy air defence systems (as a false target); cargo delivery; delivering other drones to the area of their use; intercepting air targets; creating fire and smoke zones. This list of tasks is constantly being updated.

For example, the practice of shooting down enemy UAVs with FPV drones as a way to combat them is a relatively recent one, as is the use of a "Drakon drone" with a thermite-based incendiary mixture to inflict damage to enemy personnel, weapons and military equipment, as well as to destroy enemy fortifications. There are known cases of FPV drones being used against enemy helicopters and aircraft (in the parking lot). A fairly new type of UAV is the domestically produced missile drone (e.g., the Palianytsia). Thus, the development of UAVs is ongoing, and their scope of application is constantly expanding, as are their capabilities.

At the current stage of the russian-ukrainian war, maritime (river) surface drones have dramatically changed the situation in the Black Sea basin, forcing the enemy to withdraw its warships and auxiliary vessels away from the Ukrainian coastline due to a number of painful losses. The naval combatants perform a number of tasks, such as conducting reconnaissance, launching kamikaze strikes on enemy surface targets and communications, laying mines, and delivering cargo. A fairly new form of application of naval UAVs is the delivery of fire strikes by drones with rocket (flamethrower) systems. The names "Sea Baby", "Mamai", "Magura V5" have become well-known in the circles of military experts around the world. The development of technologies and tactics for the use of Ukrainian-made maritime drones continues.

Ground drones are also actively used by both sides in the russian-ukrainian war. Ground-based unmanned systems (GBUS) perform a wide range of tasks, including reconnaissance, fire support for units, facility protection, patrolling, logistics (delivery of ammunition, food, water and medicine, fuel and lubricants, etc.), evacuation (of the wounded and dead), mining and demining, smoke screens, obstacle destruction or as a kamikaze drone to destroy enemy targets, electronic warfare, and interaction with other unmanned vehicles. Ukrainian companies have developed a number of UAS that have already been successfully used on the battlefield, for example: Tarhan, Phantom, Phantom-2, Scorpion-3, Myrotvorets, Zaliznyi Vovk, Rys, Ratel S and other ground drones.

The use of BPS on the battlefield has had a dramatic impact on both the tactics of the Ukrainian security and defence forces and the tactics of the enemy. The number of contact battles in which infantrymen engage in small arms fire has significantly decreased (assault groups simply do not reach the point of attack), as the parties are trying to make extensive use of various types of UAVs (primarily FPV drones) along with other means of fire.

For example, on the night of 11-12 October 2023, a record was set for the effectiveness of the use of UAVs on the battlefield. During this period, the enemy attempted another offensive near Avdiivka. He attacked with a significant number of armoured vehicles in a strip where one of the special units of the NGU was also holding the line among

the units of the security and defence forces of Ukraine. Over a period of about 10 hours, the drone operators destroyed 107 pieces of enemy armour and artillery. Most of the targets were destroyed. Our forces suffered no losses. The results of this unique combat work were confirmed and documented (target coordinates, video footage and reports) by the command of the 110th Mechanised Brigade of the Armed Forces of Ukraine, which was holding the defence of Avdiivka at the time [9].

Another example of the impact of the use of the BPS is the success of Ukraine's security and defence forces in the Black Sea basin. In fact, for the first time in history, a country that had almost no navy of its own forced the enemy forces, which had a huge naval advantage, to leave its waters. This is undoubtedly a strategic success.

Ukraine's strike UAVs strike enemy targets in their operational and strategic depth. They destroy important facilities of the enemy's defence industry in the occupied territories and deep into the russian federation. Such strikes are carried out against military units, storage bases, warehouses, airfields, communications, oil refineries and chemical plants, etc.

Thus, the experience of the russian-ukrainian war proves the relevance of the thesis that the war will be won by the one who has a significant advantage in the use of the latest technologies and solutions. Changes have already been made to the tactics of warfare and operations of the Armed Forces, and this process is ongoing.

The change in combat tactics with the advent of unmanned and robotic systems logically led to the creation of new special units for the use of unmanned vehicles in the military organisational structures of the Ukrainian defence forces.

The main task of these units is to minimise human involvement on the battlefield, which will help to save the lives of servicemen.

In one of the episodes of this war, the servicemen of the 13th Brigade of the National Guard of Ukraine "Charter" achieved this result to some extent by planning and conducting the first fully robotic operation against the enemy in the Kharkiv sector on 13 December 2024. The purpose of this operation was to create conditions for further advancement of the brigade's units. The operation involved numerous ground-based robotic systems (drones for mining and demining, kamikaze drones, mobile turrets) and UAVs of various types (heavy multi-rotor "bombers", surveillance drones, various FPVs). Colonel M. Holubok, Chief of Staff of the Charter Brigade, said: "Our goal is to save the life of a soldier by replacing him on the battlefield, where possible, with a robotic or unmanned system. This requires detailed planning, a constant search for new engineering solutions and the creation of a culture of innovation in the brigade" [10].

The use of unmanned systems of various types and bases was to some extent made possible by the mobilisation of technical specialists to military units, which gave a powerful impetus to the use and even the "adaptation" of various modifications of unmanned systems. For the most part, servicemen with the appropriate level of technical education (engineers, IT specialists) have extensive experience in flying unmanned aerial vehicles, gained through volunteering at drone pilot training schools (multicopter, wing and FPV). However, they lack knowledge of battle planning, fire control, military topography, engineering, and finally, they lack the appropriate level of military professional education that can be obtained at primary centres and educational institutions.

Due to the variety of types of UAVs and their tactical and technical characteristics, there is a need for a certain number of trained specialists in their maintenance and experienced operators. Unmanned systems replace the soldier on the battlefield, but are still controlled by humans, and therefore it is a priority to train not only operators but also commanders who plan the use of UAS.

An analysis of the enemy's use of robotic systems would also be useful. To ensure the effective use of ground robots, Russian units undergo specialised training. The following are some of its areas.

1. Technical training. Operators must learn to control different types of robots, understand their functionality, and have the technical knowledge to maintain the equipment.

2. Tactical training. It involves training in the interaction of robots with other units and drones, as well as the use of robots in various combat conditions.

3. Engineering training. Units that use robots for demining or mining must have a high level of engineering training to perform specific tasks.

Experience in combat shows that the effective use of unmanned systems is possible through a combination of high-quality planning for the use of unmanned systems, involvement of unit commanders in planning, interaction between mechanised units and unmanned units and a pre-established reserve, and a consistent, planned build-up of unmanned vehicle capabilities. For example, the problem of planning the use of UAVs based on the experience of performing tasks by a special task force is outlined in the "Collection of Generalisation of the

Combat Experience of the SSO Units during the Kursk Operation (3 August – 6 September 2024)" [11].

Another problem that needs to be addressed is the lack of understanding and knowledge of UAV use by unit commanders, as there is a lack of training in the use of UAVs in various types of combat. This has led to the fact that sometimes trained UAV specialists replenish the losses of general units as infantrymen [12], which is unacceptable. Not all commanders fully understand the problems associated with the technical aspects of UAVs. For example, unmanned systems are effective with technical support (availability of communication, access to the Internet – Starlink terminals, availability and stability of the GPS signal, etc.) Synchronisation of actions of manoeuvre and strike UAV units requires coordination at the stage of planning fire damage. Constant confrontation between electronic warfare and UAVs (recently, UAV control systems have been actively implemented using fibre-optic networks to avoid interference from electronic warfare). And that's not all the problems.

It is quite logical that the main efforts are currently focused on training UAV specialists, both individually and as part of UAV units (UAV companies, units for the use of unmanned systems "Kryla Omegy", "Taifun", a unit of strike UAVs of the 27th Pechersk Brigade, etc.), but attention should also be paid to the training of tactical and operational commanders.

The Commander of the National Guard of Ukraine, Brigadier General O. Pivnenko, has clearly stated that the NGU has experience and success in the use of unmanned vehicles, the organisational and staff structure is being adapted, the components of training for unmanned systems crews have been identified, and the Centre for Management and Analysis of Unmanned Systems has been established. The information it collects from various units allows it to analyse the use and effectiveness of these units in performing their tasks.

Brigadier General O. Pivnenko noted: "The enemy has taken into account our best practices in creating the Air Force, while the Russians have a large number of reconnaissance UAVs (such as ZALA, Orlan, Supercam, etc.) with a long range of more than 100 km from the launch site. Therefore, we must respond to this threat in time to prevent the enemy from reconnaissance of our forward and rear positions. That is why another area of our development is the destruction of enemy reconnaissance drones by our FPV drones. In 2024, units of the National Guard of Ukraine destroyed almost 250 enemy reconnaissance and strike UAVs worth about $55 million" [13].

Thus, we must admit that at present, due to the use of drones of various types, it is almost impossible to strictly use the tactics familiar to units set out in the combat manuals of both armies. The requirements for fortification of positions, equipping weapons and military equipment with anti-drone screens, improving the quality of disguising the actions of units and their dispersal, using electronic warfare equipment to ensure the safety of troops, and increasing requirements for their mobility have increased significantly. This also confirms the need for continuous development of the relevant areas of military science, as wars are won by armies that adapt more quickly to new conditions on the battlefield.

Conclusions

Unmanned systems have become an integral part of warfare at various levels, and their use has already led to changes in combat tactics, which requires changes to the doctrinal documents on the use of troops.

Strike drones have become a separate type of weapon used by both the Ukrainian defence forces and the enemy, which requires an effective air defence system that can be reinforced by conducting "anti-drone warfare" with electronic warfare and FPV anti-drones.

Introduced in 2024 by the Ministry of Digital Transformation of Ukraine, the unified defeat rating (which affects the allocation of additional drones by the Ministry of Defence) requires division into two categories: the rating of tactical drone units that defeat the enemy in the area of their brigades and their units; the rating of operational drone units operating in the area of several military units. This will allow for better verification of the targets hit. This task can be quickly solved by clearly defining areas of responsibility (a task for the operational command).

Drone versus drone combat in tactical operations is playing an increasingly important role on the battlefield. The range of missions is likely to include both defensive tasks (protecting priority targets from barraging ammunition and enemy reconnaissance drones and kamikaze drones) and offensive actions, when drones are used to destroy other drones protecting targets so that our attack drones can break through to their targets.

The training of operators of unmanned systems of the National Guard of Ukraine should be carried out according to uniform standards, in accordance with the

needs and tasks of military units (UAV specialists, ground drones, robotic mine and demining systems, electronic warfare drones). The experience of the relevant units of the Security Service of Ukraine and the Special Operations Forces of the Armed Forces of Ukraine should be taken into account.

The priority task in the training of commanders of military units of the National Guard of Ukraine should be to focus on the study of the procedure for the use of UAVs, taking into account the capabilities of unmanned systems, understanding the tactics of use, organisation and maintenance of interaction, and the technical component of the use of unmanned vehicles of various types and purposes. It is considered extremely urgent and necessary to teach these new methods of warfare in higher military educational institutions of the NGU.

Drone warfare will increasingly extend to the maritime and land environments. Therefore, the tactics of using units and military formations of various branches of the armed forces with the support of their actions by units using unmanned systems require further research, accumulation of experience and its implementation in the training of tactical and operational commanders.

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ПРОБЛЕМНІ ПИТАННЯ ОРГАНІЗАЦІЇ ЗАСТОСУВАННЯ БЕЗПІЛОТНИХ КОМПЛЕКСІВ У СИЛАХ БЕЗПЕКИ ТА ОБОРОНИ УКРАЇНИ НА СУЧАСНОМУ ЕТАПІ ВІЙНИ

Стисло розглянуто результати аналізу низки публікацій стосовно досвіду створення і функціонування підрозділів із застосування безпілотних систем у силах безпеки та оборони України.

Наведено короткий аналіз сучасної історії створення і розвитку підрозділів із застосування безпілотних, насамперед авіаційних, систем (комплексів). Підкреслено неухильні тенденції до подальшого розширення практики використання безпілотних систем (комплексів) наземного, повітряного та морського (річкового) застосування у сучасних збройних конфліктах як у ході ведення боїв на тактичному рівні, так і під час проведення операцій (спеціальних операцій) на оперативному та стратегічному рівнях.

Проаналізовано сучасний досвід використання безпілотних систем і спрогнозовано можливі зміни у тактиці застосування підрозділів тактичного рівня на полі бою з огляду на постійний розвиток новітніх технологічних можливостей у сфері розвідки, виявлення, ураження цілей та радіоелектронної боротьби.

Висвітлено узагальнені проблемні питання, які мусять вирішувати військові командири тактичного рівня та окремі фахівці, а також виклики, на які їм доводиться реагувати під час розгортання та застосування безпілотних систем.

Сформовано висновки щодо доцільності врахування набутого досвіду зі створення, розгортання та функціонування підрозділів із застосування безпілотних систем у процесі розвитку подібних підрозділів у військових формуваннях Національної гвардії України.

Акцентовано увагу на проблемі необхідності вдосконалювання процесу відбору (комплектування), навчання та підготовки кандидатів на проходження служби у підрозділах із застосування безпілотних систем, організації їх відповідного забезпечення і розвитку доктринальних документів з їхнього застосування на полі бою з урахуванням необхідності налагодження взаємодії та проведення заходів злагодження з підрозділами та військовими формуваннями, в інтересах яких ці підрозділи діють.

Подано пропозиції щодо обов'язкового впровадження в освітій процес військових навчальних закладів вивчення тактики застосування підрозділів та військових формувань різних родів військ з підтримкою їхніх дій підрозділами із застосування безпілотних систем.

Ключові слова: *безпілотні системи, безпілотні комплекси, бойовий досвід, тактика, застосування, сили безпеки та оборони, Національна гвардія України, війна, державна безпека.*

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