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ANALYSIS OF THE FEATURES OF THE USE UNMANNED AERIAL VEHICLES BY THE ARMED FORCES OF THE RUSSIAN FEDERATION DURING A FULL-SCALE ARMED INVASION

The use of unmanned aerial vehicles allows the countries that use them to significantly reduce the loss of manpower and equipment during the combat mission and at the same time significantly increase the effectiveness of the use of high-precision and conventional means of destruction. The greatest experience in the use of unmanned aerial vehicles was acquired by countries that are actually advanced in terms of military technology (in particular, the USA, Israel, Turkey, etc.), which took an active part in armed conflicts in the Middle East, the North Caucasus, etc. In addition, in modern conditions, the threat of uncontrolled spread of the use of unmanned aerial vehicles of a light class, which can be used for the purpose of carrying out terrorist acts on important state and military facilities, is growing. Unmanned aerial vehicles have become so important to success on the battlefield that they are sometimes used by the military to destroy enemy drones. In addition, it is with the help of unmanned aerial vehicles that one side receives the coordinates of military targets and command posts of the opposite side, which are subsequently destroyed by accurate artillery strikes. In the article, based on the analysis of modern wars and armed conflicts, combat experience and features of the use of unmanned aerial vehicles of the armed forces of the Russian Federation, an analysis of unmanned aerial vehicles for typical tasks, in particular, conducting reconnaissance, adjusting fire, striking and electronic warfare, was carried out. In particular, the conducted analysis indicates a tendency to increase the scale of use of unmanned aerial vehicles by the armed forces of the Russian Federation in conditions of a full-scale armed conflict (not excluded due to the end of stocks of high-precision missiles), in contrast to the experience of the combat use of individual unmanned aerial vehicles in the East of the country and the expansion of the range of tasks.

Key words: *full-scale armed invasion of Russia into Ukraine; unmanned aerial vehicles; Armed Forces of Ukraine; conducting intelligence; fire adjustment; striking; electronic warfare.*

Introduction. The analysis of the experience of modern wars and armed conflicts shows the rapid growth of the role of unmanned aerial vehicles, the scope of which has expanded significantly since the second half of the 20th century. Modern unmanned aerial vehicles have become an integral element of reconnaissance and reconnaissance-strike systems in the wars of the current generation, one of the characteristic features of which is considered to be the conduct of non-contact combat operations with the receipt of intelligence information about targets in real time and the instant assignment of strikes on them. The use of unmanned aerial vehicles made it possible to significantly reduce the loss of manpower and equipment during the combat mission and at the same time significantly increase the effectiveness of the use of high-precision and conventional means of destruction. The greatest experience in the use of unmanned aerial vehicles was gained by countries that are actually advanced in terms of military technology (in particular, the USA, Israel, Turkey, France, etc.), which took an active part in armed conflicts in the Middle East, Syria, the North Caucasus, etc. In addition, in modern conditions, the threat of uncontrolled spread of the use of unmanned aerial vehicles of a light class, which can be used for the purpose of carrying out terrorist acts on important state and military facilities is growing.

Formulation of the problem. Based on the results of the analysis of the anti-terrorist operation/operation of the United Forces/full-scale armed conflict of the Russian Federation, it was established that the enemy uses unmanned aerial systems of various classes and types (tactical, operational-tactical, battlefield, etc.) not only for conducting aerial reconnaissance and adjusting fire

artillery, but also for detecting and destroying infrastructure facilities of the Armed Forces of Ukraine. At the same time, in the Armed Forces of Ukraine, the specialized systems of complex countermeasures against unmanned aircraft complexes are at the stage of completion and the available forces and means of air defense have limited capabilities to detect and destroy such targets.

Analysis of recent research and publications. The analysis of the results of research and publications [1–4] shows that significant attention is paid to the scientific and practical issues of the analysis of application experience, prospects for the development of unmanned aerial vehicles as an element of modern reconnaissance and attack systems, the search for approaches to the construction of an effective system of countering them in modern armed conflicts considerable attention. In particular, the work [2] considers the modern classification of unmanned aerial vehicles. The issue of analysis of development, combat experience, evolution of tasks and methods of using unmanned aerial vehicles for ground purposes, as well as views on the threat of uncontrolled expansion of their scopes of application (in particular, in the interests of carrying out terrorist acts) are considered in work [3]. The issues of detection of unmanned vehicles and their countermeasures are discussed in the work [4]. At the same time, it can be argued that, theoretically, there is a need to generalize the experience and features of using unmanned aerial vehicles to solve combat tasks, the scope and content of which is constantly expanding. The relevance of the article is due:

to the use of unmanned aerial vehicles by the russian federation for conducting aerial reconnaissance, adjusting artillery fire, launching strikes on military facilities and the civilian population;

the requirements of the governing documents regarding the creation of a system of comprehensive countermeasures against the enemy's unmanned aircraft systems and the limited capabilities of the available forces and means to perform the tasks of this system.

The purpose of the article is to analyze the features of the use of unmanned aerial vehicles of the armed forces of the russian federation, which are used or planned to be used by the enemy for carrying out typical tasks, in particular, conducting reconnaissance, adjusting fire, striking, electronic warfare and other tasks.

Main part. During the study, the main focus was on the analysis of the characteristics and capabilities of unmanned aerial vehicles that are in service with units (sub-units) of the armed forces of the russian federation as well as the experience and features of the combat use of individual unmanned aerial vehicles in a full-scale armed conflict. The results of the analysis of the possibilities of using unmanned aerial vehicles of the armed forces of the russian federation of various classes in the interests of conducting reconnaissance, adjusting fire, striking and radio-electronic warfare.

The article analyzes the characteristics of the possibilities of using unmanned aerial vehicles (unmanned aerial vehicles) of the armed forces of the russian federation of various classes (table 1) as well as the experience of the combat use of individual unmanned aerial vehicles in modern armed conflicts in the East of the our country.

Table 1

Results of the analysis of the possibilities of using unmanned aerial vehicles (unmanned aerial systems) of the armed forces of the russian federation of various classes

Type of unmanned aerial vehicles (unmanned aerial systems)	Typical tasks	The possibility of using unmanned aerial vehicles (unmanned aerial systems) to perform certain typical tasks	Application
Ultra-small unmanned aerial vehicle “ZALA 421-08M”, “ZALA 421-16E2” [5]	Conducting intelligence	Search, detection and identification of ground objects.	The unmanned aerial vehicle was used by the enemy on the territory of Ukraine, in particular in the north (Kharkiv region), Donetsk region.
	Adjustment of fire	-	

Kamikaze drone "Lancet-3"	Delivering blows	Delivering blows with the target load of the shock destination.	The unmanned aerial vehicle was used by the enemy on the territory of Ukraine, in particular, in Mykolaiv, Kirovohrad and Zaporizhzhia regions. It was used in hostilities in Syria.
Drone "Cube UAV"	Delivering blows	Delivering blows with the target load of the shock destination.	The unmanned aerial vehicle was used by russian saboteurs on the territory of Ukraine, in particular the Kherson region.
Unmanned aerial vehicle "Orlan-10"	Conducting intelligence	Observation of extended and local objects in hard-to-reach areas.	The unmanned aerial vehicle was used by the enemy on the territory of Ukraine, in particular in the Kharkiv, Odesa, and Mykolaiv regions, the armed forces of the Donetsk People's Republic, and the armed forces of the Luhansk People's Republic. It was used in hostilities in Syria.
	Adjustment of fire	-	
	Delivering blows	Delivering blows with the target load of the shock destination.	
	Rebroadcast	Use as a repeater	
	Radio electronic warfare	Suppression of cellular communications.	
Unmanned aerial vehicle "Orlan-30"	Conducting intelligence	Observation of extended and local objects in hard-to-reach areas.	The unmanned aerial vehicle was used by the enemy on the territory of Ukraine, in particular the Luhansk region.
	Adjustment of fire	-	
	Delivering blows	Delivering blows with the target load of the shock destination.	
	Rebroadcast	Use as a repeater	
	Radio electronic warfare	Suppression of cellular communications.	
Kamikaze drone "Shahed-129"; "Shahed-131"; "Shahed-136"; "Shahed-191"	Delivering blows	Delivering blows with the target load of the shock destination.	The unmanned aerial vehicle was used by the enemy throughout the territory of Ukraine.
Chinese drones of the company "DJI" [6]	Conducting intelligence	Observation of extended and local objects in hard-to-reach areas.	There are no data

Reconnaissance unmanned aerial system "Forpost-R"	Conducting intelligence	Search, detection and identification of ground objects.	Application in the area of the anti-terrorist operation and the operation of the Joint Forces since 2014. It was used in hostilities in Syria.
	Adjustment of fire	Transmission of data for target indication to shock (fire) means, control over the results of strikes on targets.	
	Delivering blows	Delivering blows with the target load of the shock destination.	
	Rebroadcast	Theoretically possible	
	Other tasks	Mapping the area	
Unmanned aerial vehicle "Mohajer-6"	Conducting intelligence	Search, detection and identification of ground objects.	The unmanned aerial vehicle was used by the enemy on the territory of Ukraine, in particular in the Odesa region.
	Delivering blows	Delivering blows with the target load of the shock destination.	
	Other tasks	Mapping the area	
Unmanned aerial vehicle "Orion" (export name "Inokhodets")	Conducting intelligence	Search, detection and identification of ground objects.	The unmanned aerial vehicle was used by the enemy on the territory of Ukraine, in particular in the Kherson region and Donbas. It was used in hostilities in Syria.
	Other tasks	Mapping the area	
Unmanned aerial vehicle "Zastava" [7]	Conducting intelligence	Search, detection and identification of ground objects.	Application in the area of the anti-terrorist operation and the operation of the United Forces. Destroyed by the Ukrainian military on the territory of Donbass in 2020. The Ukrainian military "landed" in Donbas even before the start of the full-scale burning of russia.
	Adjustment of fire	Transmission of data for target indication to shock (fire) means, control over the results of strikes on targets.	
Unmanned aerial vehicle "Eleron-3" [7]	Conducting intelligence	Search, detection and identification of ground objects. Observation of extended and local objects in hard-to-reach areas.	The unmanned aerial vehicle was used by the enemy on the territory of Ukraine, in particular in the Chernihiv and Mykolaiv regions and in Donetsk region. The Ukrainian military "landed" in Donbas even before the start of the full-scale burning of russia. It was used in hostilities in Syria.

Unmanned aerial vehicle "Tachyon" [8]	Conducting intelligence	Search, detection and identification of ground objects. Observation of extended and local objects in hard-to-reach areas.	Use by the enemy in the area of the anti-terrorist operation and the operation of the United Forces. The unmanned aerial vehicle was used by the enemy on the territory of Ukraine, in particular in the Northern and Eastern directions. It was used in hostilities in Ossetia.
	Adjustment of fire	Transmission of data for targeting shock (fire) means.	
	Conducting intelligence	Search, detection and identification of ground objects. Observation of extended and local objects in hard-to-reach areas.	
Unmanned aerial vehicle "Supercam S350" [9]	Conducting intelligence	Search, detection and identification of ground objects. Observation of extended and local objects in hard-to-reach areas.	The unmanned aerial vehicle was used by the enemy on the territory of Ukraine, in particular in the Sumy region.

Analysis of data from the table of unmanned aerial vehicles of the armed forces of the Russian Federation allows us to conclude that the main tasks of unmanned aerial vehicles are:

conducting real-time reconnaissance (gathering intelligence information about enemy ground objects during preliminary reconnaissance and preliminary reconnaissance);

detection and identification of intelligence objects, determination of their exact location; adjustment of fire (directing of artillery fire and rocket salvo systems at ground objects, control of striking);

radio-electronic warfare (suppression of anti-aircraft defenses; establishment of false targets; suppression of cellular communications).

Considering the small residues of high-precision missiles, their high cost, sanctions for the purchase of imported electronics for their manufacture, low accuracy of "Soviet" missiles, inefficiency of anti-aircraft missiles, and in order to achieve at least some advantage in the war of the Russian Federation against Ukraine and continue the terror of the population far from the front line, Russia began to negotiate with Iran on the purchase and supply of shock unmanned aerial vehicles, so-called dronov-kamikadze and according to satellite images, on June 8 and July 15, Tehran displayed Kashan with a Russian delegation on the airfield of the Shahd line [10], and then sent drones of kamikadzi "Shahed-129", "Shahed-131", "Shahed-136", "Shahed-191" through the Caspian Sea. However, officially Iran denies the supply of the Russian Federation of drones, which the aggressor country has begun to actively use since the beginning of September in the war against Ukraine and subsequently, unmanned aerial vehicles have already begun to collect in the territory of the Russian Federation, applying the labeling "M215 Gerani-2" from the components that provides Iran.

For the first time dron-kamikadze "Shahed-136" (a barrade or rolling ammunition) was shot on September 12 in the Kharkiv region, at which there was a label "M215 Geran-2" [11]. This unmanned aerial vehicle is a type of weapon, the main difference of which is that it is not a weapon carrier, it is a weapon itself, that is, a deadly unmanned aerial vehicle of a unilateral attack. Its sole and main purpose is the lesion of terrestrial stationary targets at a long distance by giving the given coordinates and the contact blasting of the battle part of the drone. Iranian dron kamikadze is today the most precision weapon of the Russian Federation thanks to the management system that provides data from four satellite navigation systems, namely: Glodass (Russia), Beidou (China), Galileo (EU), GPS (USA). This unmanned aerial vehicle does not have a video surveillance channel, it is brought to a specific target only by satellite coordinates, and the motion route adjustments are adjusted through the use of navigation systems.

Unmanned aerial vehicles "Shahed-129", "Shahed-131", "Shahed-136", "Shahed-191" are most often used on the territory of Ukraine [12], the main tactical and technical characteristics of which are given in table. 2.

Table 2

The main tactical and technical characteristics of UAVs, which most often use the armed forces of the Russian Federation in the territory of Ukraine

Indicator	"Shahed-129"	"Shahed-131"	"Shahed-136"	"Shahed-191"
Weight, kg: run load	600 100	135 15	200 40	500 100
Height, km: maximum minimum	3,1	4 60 m	4 60 m	7,62 60 m
Action radius, km	1 700	900	2 500	1 500
Speed, km/h: maximum cruising	200 150	200 150	185 170	350 300
The duration of flight, h	to 24	to 24	to 24	to 4,5

More than 100 cases of use of this type of drones for attacks on the rear positions, artillery units and other important stationary objects were recorded and only about 70 % of this type of unmanned aerial vehicles was destroyed by the units of the Armed Forces Ukraine. This is due to the fact that the enemy tries to ensure maximum steady for radars by laying new routes, the use of small drone flight heights, and when approaching the lesion – reducing to maximum small heights.

The peculiarity of the drone-kamikadze "Geran-2" is the ability to be in the air for up to 24 hours, for a long time to hang over the target for damage and attack it only after the relevant team is received.

Thus, the main advantages of unmanned aerial vehicles "Geran-2" are [13]:

the possibility of defeat of stationary objects at long distances;

small size and low speed;

little effective scattering surface;

low cost;

the most simple production;

masked and mobile launch;

the ability to stay in the air for up to 24 hours and adjust the flight route;

invisibility for air defense systems;

possibility of using a massive attack.

The main disadvantages of unmanned aerial vehicles "Geran-2" are:

the presence of loud sound of the engine;

inability to damage moving goals;

inability to find or attack goals on their own;

dependence on the effects of weather conditions when the target is affected at a long distance, for example, the presence of an error when wearing unmanned aerial vehicles with wind flows.

Analysis of the main tactical and technical characteristics of drones-kamikadze as an object of radar detection showed that this means of air attack corresponds to the main trends in the development

of modern air assaults to reduce their radar noticeability. This leads to deterioration of the efficiency of detection in inspection radar stations.

Taking into account all the above benefits of drone-kamikadze “Geran-2” and the possibility of making them in the territory of the Russian Federation in large quantities for applying massive blows on important objects, they can completely substitute missile shelling and, unfortunately, do significant damage in the territory of Ukraine.

Conclusions and prospects for further investigations. The analysis carried out shows the tendency to increase the scale of the use of unmanned aerial vehicles by the armed forces of the Russian Federation during a full-scale armed conflict, in contrast to the experience of the combat use of individual unmanned aerial vehicles on the East of the country, and the expansion of the range of tasks, in particular, conducting reconnaissance, adjusting fire, striking, radio-electronic fighting, etc.

The results of the analysis are not exhaustive, which is a perspective for further research.

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АНАЛІЗ ОСОБЛИВОСТЕЙ ЗАСТОСУВАННЯ БЕЗПЛОТНИХ ЛІТАЛЬНИХ АПАРАТІВ ЗБРОЙНИХ СИЛ РОСІЙСЬКОЇ ФЕДЕРАЦІЇ ПРИ ПОВНОМАСШТАБНОМУ ЗБРОЙНОМУ ВТОРГНЕННІ

Використання безпілотних літальних апаратів дозволяє країнам, які їх використовують суттєво знизити втрати живої сили і техніки під час вирішення бойового завдання і одночасно суттєво підвищити ефективність застосування високоточних та звичайних засобів ураження. Найбільшого досвіду застосування безпілотних літальних апаратів набули країни, які фактично є передовими у військово-технічному відношенні (зокрема, США, Ізраїль, Туреччина тощо), які брали активну участь у збройних конфліктах на Близькому Сході, Сирії, Північному Кавказі тощо. Крім того, в сучасних умовах зростає загроза безконтрольного поширення застосування безпілотних літальних апаратів легкого класу, які можуть використовуватись з метою здійснення терористичних актів на важливих державних та військових об'єктах. Безпілотні літальні апарати стали настільки важливими для успіху на полі бою, що іноді застосовуються військовими і для знищення ворожих безпілотників. Крім того, саме за допомогою безпілотних літальних апаратів одна сторона отримує координати військових цілей і командних пунктів протилежної сторони, які згодом знищуються точними ударами артилерії.

У статті, на основі аналізу сучасних війн і збройних конфліктів, бойового досвіду та особливостей застосування безпілотних літальних апаратів збройних сил російської федерації, проведено аналіз безпілотних літальних апаратів із типових завдань, зокрема, з ведення розвідки, коригування вогню, нанесення ударів та радіоелектронної боротьби. Зокрема проведений аналіз свідчить про тенденцію до збільшення масштабів застосування безпілотних літальних апаратів збройними силами російської федерації в умовах повномасштабного збройного конфлікту (не виключення через закінчення запасів високоточних ракет), на відміну від досвіду бойового застосування індивідуальних безпілотних літальних апаратів на Сході країни та розширення кола завдань.

Ключові слова: повномасштабне збройне вторгнення росії в Україну; безпілотні літальні апарати; Збройні Сили України; ведення розвідки; коригування вогню; нанесення ударів; радіоелектронна боротьба.