

**MINISTRY OF DEFENCE OF THE RUSSIAN FEDERATION MAIN DEPARTMENT
OF COMBAT TRAINING**

REMINDER
for protection and counteraction
Enemy UAVs

Moscow
2023

One of the major problems faced by units at the level
battalion, company, platoon during a special military operation, was the mass use of
UAVs by the enemy, primarily commercial small-sized quadcopters (drones). This
memo provides practical recommendations
to commanders (servicemen) of combined arms units solving combat tasks
(tasks) during a special military operation, on protecting and countering enemy UAVs.



REMINDER

for the protection and counteraction of small-sized enemy UAVs

Threats of small UAVs (copters)

Small UAVs are characterized by small geometric dimensions, low thermal contrast and flight speed, as well as a small effective scattering area, which does not allow for sufficient effectiveness of their destruction by air defense missile systems (MANPADS). These factors are decisive in

organizing protection and counteraction in units equipped with small arms, using standard, improvised means and promising developments and combating UAVs.



BpLA A1-C «Fury»

FPV Kamikaze Drone with RPG-7-
Based Warhead

Fig. 1. Typical examples of small-sized UAVs and drones of Ukrainian production

With the help of small-sized UAVs, the enemy solves the following problems:

1. Reconnaissance. Drones with infrared night vision cameras or so-called forward-looking IR systems pose a particular threat. They can see a person not only at night, but also through tree crowns, camouflage nets, etc.

2. Guidance and fire adjustments. When promising targets are detected, drones transmit a video signal to the operator's smartphone or tablet, and artillery (tanks) are guided by the coordinates.

3. Fire damage to personnel and military equipment, including using kamikaze drones such as FPV drones.

In addition to kamikaze UAVs, a relatively new, widely used method of destroying military equipment is the dropping of modified or specially made unguided munitions from hovering quadcopter (octacopter/hexacopter) type UAVs. The most common commercial drones are the **DJI Mavic 3**

capable of carrying a load weighing no more than 400-500 grams.



Fig. 2. Typical samples of ammunition and IEDs used for dropping from UAVs.

Ammunition and IED base used for drone drops: RGD-5 (RGN) hand grenades; home-made VOG-17 (30 mm), VOG-25 (40 mm); NATO rounds for 40x53 mm grenade launchers;

homemade devices based on TNT blocks.

F-1 grenades are also used, either on the Mavic 3 in windless conditions weather, or on larger UAVs capable of lifting their weight.

The most popular modification in the special operation zone is the VOG-17M ammunition, in which the fuse is equipped with a self-destruction device with a 25-second delay. These are the shots that are installed on UAVs by both Russian fighters and the enemy.

Protection against small UAVs

The organization and implementation of measures to ensure the protection of personnel of units and military equipment from the danger that arises during the use of small-sized UAVs and kamikaze drones by the enemy involves the following main measures: notification and dispersal of personnel and equipment;

camouflage and shelter of personnel and equipment.

"To remain unnoticed"

The best way to avoid problems with enemy drones is to remain undetected. That is, to be able to deceive the drone operator. The main thing in this matter **is dispersal,**

camouflage, hiding personal composition and military equipment.

What does dispersal mean ? It is the choice of distances between objects (areas of deployment of units) that exclude their joint destruction during the action of small-sized unmanned weapons. During dispersal, it is necessary to adhere to the following requirements: it should not negatively affect the performance of assigned tasks and complicate control and interaction. Taking these requirements into account, as a rule,

the optimal distance between objects and divisions is selected,

depending on the expected radius of destruction of an enemy UAV carrying a maximum-power munition.

Hence the conclusion: do not park equipment in open spaces and close to each other! In addition to clusters of equipment, this also applies to personnel - do not crowd together. Especially in open spaces where you can be detected by UAVs.

Camouflage and cover from UAVs

What does camouflage and concealment mean? It is a set of measures aimed at reducing the visibility of personnel and equipment, as well as protecting them from enemy impact, including small-sized unmanned weapons. The main methods of performing tactical camouflage tasks to counter enemy UAVs are **concealment, imitation and demonstrative actions.**

If the positions are located in a populated area, it is necessary to hide more in houses, garages, on verandas, under awnings. Move less in open spaces without urgent need. At night, do not turn on hand-held and tactical flashlights or car headlights that can be easily seen by UAV equipment.

Remember that in hot weather with an air temperature of about 40°C, the infrared camera of a UAV practically does not detect a person, and in bad weather, UAVs cannot operate in strong winds, smoke or during a thunderstorm.

Use improvised means and auxiliary materials. Thus, pieces of glass or other mirror materials placed on the roofs of buildings and equipment will create obstacles for the UAV camera. **If the positions are obvious (large fortified area, trench lines, etc.)**

(lack of tree cover):

do not let the enemy understand how many people are defending, where exactly the people, equipment, firing and observation points, dugouts, and ammunition depots are located;

do not light fires, do not dry things in open areas; do not scatter garbage (boxes from army dry rations and other waste) around your positions, move less unless absolutely necessary.

If you use potbelly stoves in dugouts, create a branched system of chimneys to the outside. So that the smoke does not billow out in a column, revealing the fortifications, but spreads along 4-7 thin channels;

if possible, dig "fox holes" at observation posts so that they at least partially hide you from observation from above; arrange canopies over yourself from camouflage nets, heat-insulating mats. Additionally, camouflage points with branches, and when vehicles approach, also cover them with camouflage nets;

the simplest option for camouflaging the fighters in their positions: make thick flooring of branches over some sections of the trenches. Under these places, dig fox holes or small dugouts in the walls of the trenches, under the parapet;

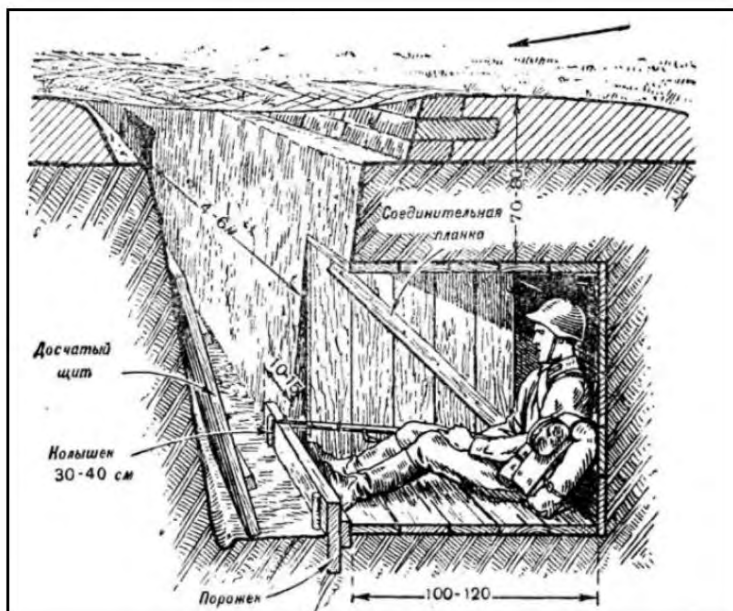


Fig. 3. Equipment of the "Fox Hole" type shelter

with the same flooring from above, cover the observation posts from where they look towards the enemy and to the flanks;



Fig. 4. Vehicle in position under camouflage net.

trample, drive false paths past your positions. Suddenly a broken road is a sure sign of a fortified area or observation post; periodically fly over your positions with a drone to assess the quality camouflage;

try to make less noise, do not get carried away by loud chatter with your comrades. Some drones are equipped with powerful microphones. They can hover and listen to sounds. Keeping quiet (within reasonable limits) will allow you not only not to get caught, but also to hear the enemy drone yourself. When the "bird" descends to 100-150 meters or less, it is quite audible. Each commander (chief) is obliged to constantly monitor compliance by subordinates with the requirements of camouflage discipline.

Imitation consists of reproducing the telltale signs of units (subdivisions), weapons and military equipment, engineering equipment of the area and other objects. During the imitation, false objects (positions, areas, sections, lines, routes, bridges and others) are equipped, and a demonstration of life in them is organized using models and simulators of physical fields of weapons and military equipment. **Your task is to "blur" the number of real targets!**

Depending on the terrain conditions, the number of vehicles shown should also be different. Thus, in wooded areas, about a third should be shown, and in open areas, up to half of the standard number of combat vehicles. In open areas in false areas, up to 80% of combat and transport vehicles should be shown.

To form the unmasking features of simulated objects in the radar wavelength range, standard radar reflectors can be used: metal corner reflector OMU, "Pyramid", "Angle", "Sphere-PR", radar simulator of moving equipment IDT; in the infrared range - catalytic wick furnace KFP-1-180.

Radar simulators of physical fields

Designation	Purpose	Mass, kg	Assembly time, min.	Calculation installations, man
Radar metal corner reflector "Ugol"	Simulation of ground targets and radar reference points or individual industrial facilities	272	6	3
Radar metal corner reflector OMU	Radar imitation of military equipment and creation of a radar interference field	3,25	6	2
Radar metal corner reflector "Pyramid"	Radar simulation of land and surface objects	262		3
Radar reflector "Sfera-PR"	Radar simulation floating bridges	76		2

To demonstrate the activity in the false area, the movement of units and individual vehicles is reproduced, the mutual arrangement of the models is partially changed, the number of shelters and vehicle tracks is increased, radio stations are operated (for transmission), fires are lit and light signs visible from the air are installed.

Thermal simulators of physical fields

Designation	Purpose	Working range of lengths waves, microns	Temperature of the radiating surfaces
Catalytic wick stove KFP-1-180	Creation of thermal unmasking signs	3-5 8-14	250-300

"How to defend yourself against enemy airdrops and artillery."

If the drone operator has examined you, your position, and your equipment, then further options are possible:

If it is just a reconnaissance aircraft (a "wing" or a quadcopter), it will direct artillery, a mortar, another (attack) drone, or will adjust the actions of assault groups if a direct attack is planned.

If the quadcopter is equipped with a drop system, then after detecting your position or equipment, the operator will drop grenades, homemade "bombs" from VOGs or other explosive devices. In this case, they will fly from above, vertically.

If it is a kamikaze drone: FPV, or a "flying wing" (like the "Lancet"), then the strike will be delivered at some angle, not vertically, but even closer to a horizontal trajectory at the end.

Based on this, you need to do everything in advance to minimize the risks. First, this is the depth of burying. Knee-deep trenches and "jacuzzi" style

trenches are not serious. You need to dig, dig and dig deeper. Build dugouts and other engineering structures with labyrinthine entrances. If the soil is very bright, contrasting (sand, clay, black soil against the background of greenery or foliage), then resort to camouflage of parapets. That is, cover them, throw elements of the surrounding terrain. Then it will be more difficult to detect positions.

It is advisable to place the entrances to dugouts and ammunition depots towards the trees. Then it will be impossible for the operator of a "wing" or FPV drone to approach the entrance from a convenient angle. He will either hit poorly, without hitting anyone, or crash into the trees.

The camouflage net and/or mat used on top, above the position, observation post, are important not only in terms of camouflage, but also as a kind of reflector for dropped grenades and IEDs. The use of anti-grenade nets.

Try to make shelters in places where trenches bend, use fox holes so that ammunition falling on the sides, inside the trenches, does not result in shrapnel hitting a soldier hiding in a niche. **In general, simulate the situation where the discharges can fall, and how to properly protect yourself from them by placing soil masses under the shrapnel.**

In any case, an explosion above the trench, somewhere in the air or behind the parapet – it is much safer than in a trench, right under your feet. From such an improvised "roof" the ammunition can simply ricochet and explode somewhere to the side

If you are being covered and getting dumped tightly and regularly – change positions, create new observation points, away from the old ones.



Fig. 5. Operator with anti-drone gun in position, covered with chain-link mesh and camouflage netting over the trenches

Similarly, it is necessary to organize the protection of individual trenches, observation posts, advanced from the main defensive line. Try to position yourself under spreading trees. Cover from above with some kind of fabric, awning, in dry weather you can simply use a scout's scarf. Camouflage the cape from above with elements of the environment.



Fig. 6. Individual trench with a cover on top, camouflaged with pine branches from the surrounding forest.

Secondly, these are measures for the passive protection of military equipment.

In order to reduce losses and damage to military equipment that can be caused by the use of UAVs by the enemy, the following passive protection elements can be effective:

Protective grilles (screens).

After the start of the special military operation (SVO), when the problem with the Javelin ATGM hitting the upper projection of Russian tanks was revealed, they began to install so-called "visors" on them – lattice

screens above the turret. Such screens are used for passive protection of tanks, armored personnel carriers, self-propelled guns from attacks by kamikaze drones (FPV-drone kamikaze). **Lattice screens welded from a strong steel profile are the simplest solution, often allowing you to save the life of a combat vehicle or at least its crew.**



Fig. 7. Tank with a protective steel visor

Protective nets. A

metal net that poses almost no threat to ATGMs or RPGs can become a serious obstacle for kamikaze UAVs, especially FPV drones.

Anti-drone mesh screen kits can potentially be installed on virtually any ground combat and support equipment that may be subject to FPV drone attacks.



Fig. 8. Protection of armored vehicles from chain-link mesh against drops and simple FPV

kamikaze drones . **Anti-drone screen mesh-lattice (ADS-L).**

Anti-drone mesh screen kits can be installed on virtually any ground combat and support equipment that may be subject to FPV drone attacks.

The PDESР is conventionally divided into its constituent elements:

base part;
camping kit;
combat kit.

The base part is a set of fasteners, brackets, rigidly fixed to the combat vehicle, for example, by welding - this can be simply a section of pipe welded to the body with a hole for an oblique transverse pin or some more complex embedded structure.

A field kit is a set of protective elements that must be used when transporting combat equipment; they can partially limit the operation of combat vehicles. At the same time, the field kit must provide the maximum area of protection against kamikaze UAVs.

Combat kit - a set of protective elements that should not limit the operation of combat vehicles, but the area and effectiveness of protection provided by the combat kit may be worse than that of the field kit.

the kit.

For example, a field kit can prevent the tank turret from turning 360 degrees, but cover its entire upper projection, while a combat kit will not interfere with combat operations, but will cover only the turret and some area next to it.

What other requirements may be imposed on the PDESР?

Quick assembly and disassembly – no more than 5-10 minutes. Safely destructible design – for example, if a tank in a field kit is attacked and forced to enter combat, then the turret turn should safely demolish the interfering PDESР, without damaging the tank elements. PDESР elements should not hinder the evacuation of the crew.



Fig. 9. 122-mm self-propelled gun 2S1 "Gvozdika", covered with mesh screens

Countering small-sized UAVs

in the platoon-company-battalion link

To directly cover the units of a motorized rifle battalion from reconnaissance by small-sized UAVs and prevent them from using ammunition, the following are used in the platoon-company-battalion link:

to conduct surveillance, tracking and guidance of UAVs: in a motorized rifle squad (platoon) – an observer;

in a motorized rifle company (at the motorized rifle battalion command post) – an aerial observation post;

for fire destruction of UAVs: in a motorized rifle squad - a duty machine gunner (machine gunner);

in a motorized rifle platoon - a BMP duty crew;

in a motorized rifle battalion - a motorized rifle platoon trained for firing at the NLC (UAV), as well as means (jamming transmitters).

The composition of forces and means involved in combating UAVs in a motorized rifle battalion on the defensive is given in the table.

Composition of forces and means involved in combating UAVs in a motorized rifle battalion (in defense)

Forces and resources	quantity		
	msv	msr 9	msb
Observer Air	3	1	27
observation post Machine gunner	-	-	4
Operator - anti-drone gun BMP	3	9	27
crew	1	3	9
	1	3	12
Sapper (for defusing downed and landed copters, as well as defusing unexploded IEDs)	-	-	1

For direct cover from small UAVs

For the most important objects, such as the command post of a combined arms unit, a divisional artillery group, RAV and logistics depots at the regiment-brigade-division level, **it is necessary to form combined groups from combined arms units of the second echelon, combined arms and anti-landing reserves.** It is also advisable to allocate air defense and electronic countermeasure forces and equipment to them.

Air surveillance, enemy UAV detection

In order to detect enemy UAVs in a timely manner, notify the command of units and duty services about them, and engage enemy UAVs in fire (electronic suppression), a system of air surveillance posts (ASP) must be created, as well as forces and means of direct coverage of the deployment area or combat mission.

connections (units).

Airspace observation posts, like regular observation posts, should be set up in hidden locations and should also have the ability to observe the airspace all around.

Based on combat experience, posts are set up at a distance of up to 400 m from the forward edge of defense, as well as in close proximity to important infrastructure facilities, and are in interaction with the forces and means of their immediate cover (personnel of fire groups, small arms, electronic countermeasures, anti-aircraft fire weapons).

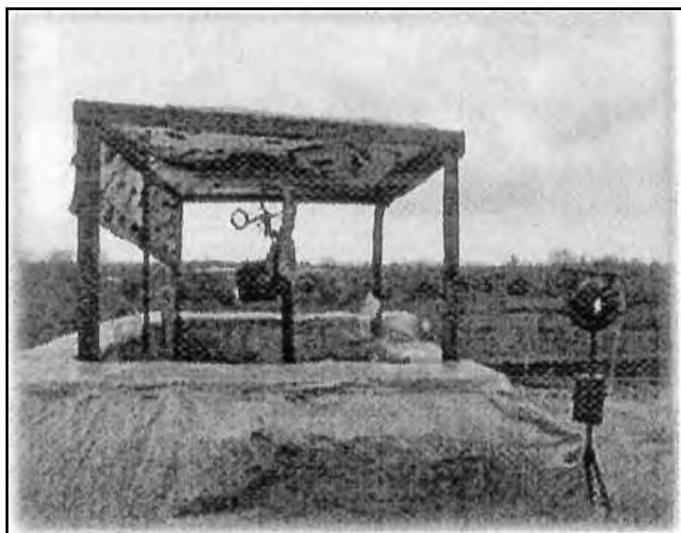


Fig. 10 General view of the air observation post "on the ground"

For their equipment, as a rule, observation towers are built, on which both electronic warfare equipment for suppressing control signals and anti-aircraft and small arms for destroying UAVs can be installed. They must have spare safe escape routes in case of detection by the enemy.

The post is staffed by two or three scouts, one of whom is the senior. The observation post personnel must have personal weapons, night and day observation equipment (optical, optoelectronic devices, thermal imagers), communications and warning equipment, food supplies, water, and other equipment necessary for long-term covert surveillance of the airspace. In addition, posts can be equipped with searchlights and powerful laser pointers.

One of the most trained military personnel is appointed as the senior airspace observation post. The senior post is responsible for organizing visual round-the-clock surveillance of the airspace in the assigned sector.

Algorithm of actions of a personal observation post:

1. Having detected an aerial target, the observer determines its affiliation, position in space (by azimuth, landmarks, cardinal directions) and direction of flight, and immediately reports to the commander of the covered object (commander of the joint fire group), to the nearest

CP (PU) of air defense, to the platoon or battery command post, to which the anti-aircraft section is subordinated. Gives the established signal, while notification of flights of friendly aircraft is carried out in the existing warning networks or via other communication channels.

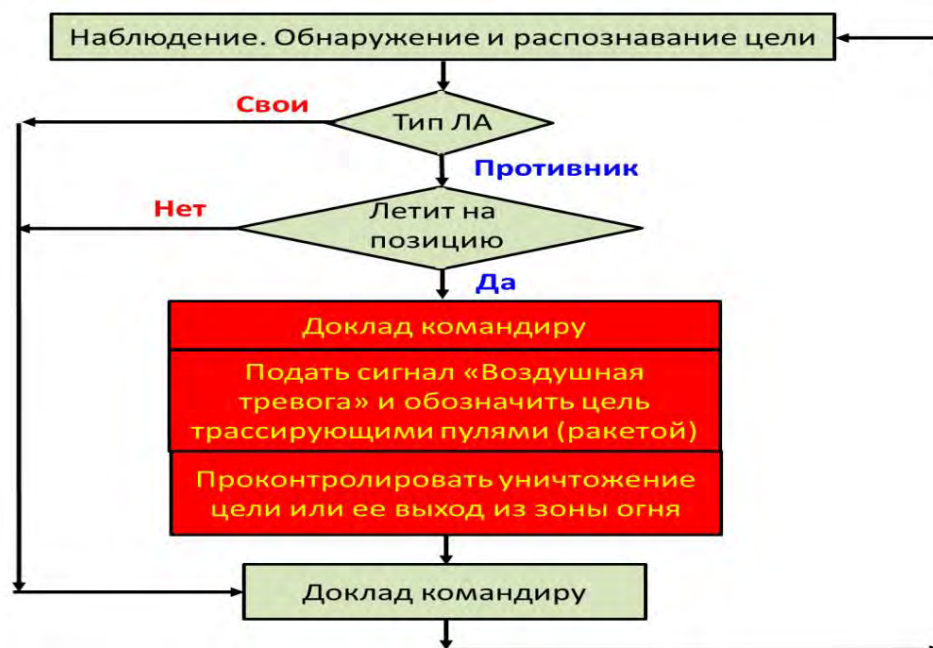


Fig. 11. The order (algorithm) of actions of the PN observer upon detection of an air target

Typical reports from the post could be: "At 12:30 – clear";

"Unmanned aerial vehicle.

Above 3 (landmark number or azimuth in divisions of the protractor). Towards us"; "UAV, at 10 o'clock (direction on the clock

face), past us, towards

"enemy".

2. To select the option to counter the UAV, it is necessary to identify the aircraft. In this case, commands are given in the format: "DRONE/direction/vertical angle of the object in degrees/approximate distance to the object in meters", for example: "DRONE/ 12/45/70", which means at 12 o'clock, at an angle of 45° to the observer, a distance of approximately 70 m. Or, depending on the direction of flight of the attack UAV, give

the command "DRONE-ZENITH" or "DRONE-UP" in case of a drone attack from above.

3. If an observer detects a UAV, based on the current warning signal, he independently makes a decision to open fire, if there are fire weapons, and notifies a specially designated fire group, as well as electronic warfare and anti-aircraft fire weapons crews.

Airspace surveillance is also organized during the movement of troops (forces) in a motor column or by rail. During the movement of a column, observers are placed at the head and tail of the column in open vehicles.

In his instructions for control during movement, the commander battalion (company) also defines:

the location of an observation post for airspace in marching order; the order of protection and cover of the column from an enemy UAV strike;

organization of communications and operating modes of radio equipment, the procedure for communicating signals and commands in the event of an air raid by small-sized UAVs.

Suppression of UAVs by electronic warfare (jamming) and fire damage by fire weapons

The basis of technical measures for suppressing UAVs is jamming the control and navigation systems, intercepting intelligence information, and counteracting surveillance and recognition equipment installed on the aircraft.

Suppression of UAVs by electronic warfare means (jammers).

The electronic warfare company of the combined arms unit is armed with the following jamming stations: R-330Zh "Zhitel" - 1 unit, R-934BMV or "Palantin-U" - 2 units, RP-377UVM1L "Lesochok" (transportable version) - 15 units.

Option 1. The composition of the electronic countermeasure forces and means operating in the interests of the covered unit: 1–2 sets of RP-377UVM1L "Lesochok" are

assigned to the combined anti-UAV groups covering the division (brigade, regiment) command post from reconnaissance and engagement by the enemy using UAVs;

1–2 sets of **RP-377UVM1L Lesochok** are assigned to combined anti-UAV groups covering artillery position areas (artillery directly subordinate to the brigade commander), divisional artillery group and army (when operating in the subordination commander shelf artillery group division zone);

a reconnaissance, direction finding and electronic suppression group for enemy UAV control and data transmission channels, consisting of the command post of the division (brigade) **R-330KPK electronic warfare company and two R-934BMV Palantin-U jamming stations and an R-330Zh UAV SRNS channel jamming station.**

Features of the use of the specified electronic warfare systems.

The RP-377UVM1L "Lesochok" jamming stations assigned to combined tactical groups to combat UAVs are placed on a vehicle (infantry fighting vehicle, armored personnel carrier) of a MANPADS squad and/or a motorized rifle platoon. The stations operate in automatic mode, powered by a battery or an on-board network of the vehicle. Before starting work, in order to ensure EMC between the jamming stations and the RES of the covered unit, the jamming station imposes

restrictions on radiation in the frequency ranges of our RES.



Fig. 12. Placement of the "Lesochok" jamming station on the hood of a car

The range of electronic suppression using small-sized jamming stations **RP-377UVM1L "Lesochok"** is **about 500 m, therefore, to protect extended objects from enemy UAVs, it is necessary to use several jamming transmitters.** When covering area objects, to increase the effectiveness of countering UAVs, jamming transmitters must be placed on elevations (buildings, structures), and several RP-377UVM1L "Lesochok" transmitters must be used simultaneously.

Taking into account the range to the UAV, as well as the capabilities of the jamming station and the effective range of small arms fire, the commander of the joint group determines the order of application of methods for combating UAVs.

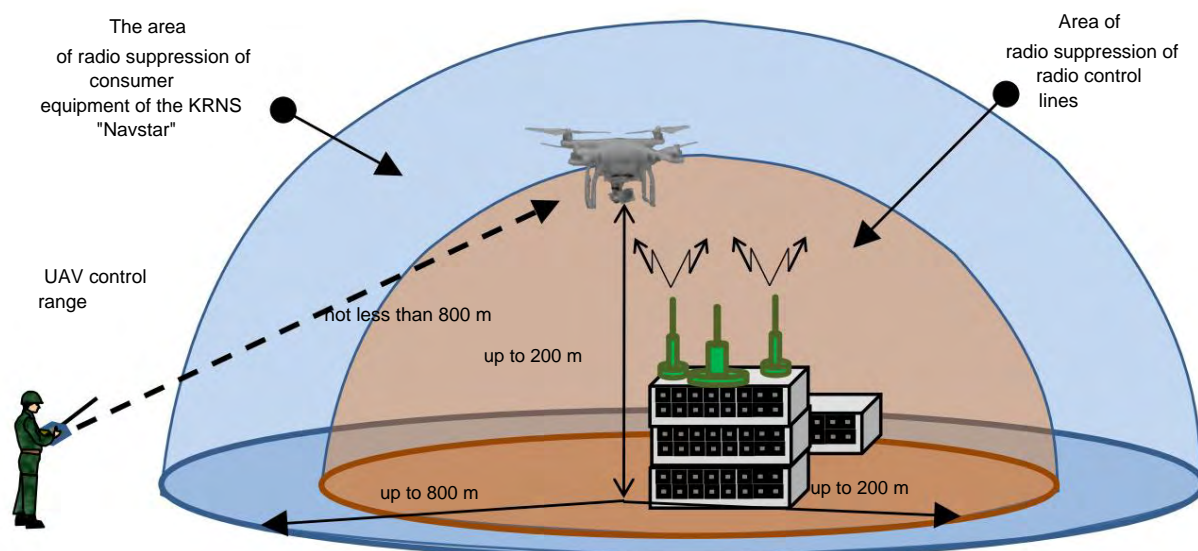


Fig. 13. Option for using the RP-377UVM1L "Lesochok" jamming station, when REP of radio control lines and consumer equipment of the UAV KRNS

The R-934BMV ("Palantin-U") jamming stations perform radio suppression of control and data transmission channels from UAVs by setting up frequency-targeted and direction-deflecting (**in a 90–120 degree sector**) jamming on the main and side lobes of the antenna patterns of UAVs and ground control posts, as well as ground terminals of information consumers of the ROVER (SIR) type. The main

The station's main focus is radio suppression of the reverse data transmission channel and telemetry from UAVs.

The distance from the front edge should be 3-5 km, the distance along the front between stations - up to 10 km, and the greater the distance between stations, the further and more accurate the bearing is. When conducting SAR, information is exchanged between stations via a radio relay channel. The coordinates of the UAV control center are determined based on the bearings determined by calculations. Upon receipt of a signal for suppression from the control center or in automatic mode, jamming is performed in frequency and barrage

jamming in direction (in a sector of up to 120 degrees), while the control channel is broken, thereby eliminating the possibility of manual control of the UAV and obtaining objective data on its condition and position in space.

The duration of jamming is determined by the UAV flight time in the area of the protected object. During jamming, periodic monitoring and additional reconnaissance of new sources of radio emission are carried out.

When creating interference, the UAV may lose control, return along the return route, or begin to patrol over the area of use.

waiting for the connection to be restored.



Rice. 14. R-934BMV EW complex ("Palantin-U")

Option 2. Composition of forces and means of electronic suppression operating in the interests of the covered unit:

2–6 jamming modules **of the Pole-21 complex (Pole-21 M)**, placed to cover the most important objects: artillery and tank position areas, ammunition depots, etc.;

1 set of RUAM **"Silok-01" (Silok-02)**, placed to cover the most important objects - the command post (opposition field) of the formation.

Features of the use of the specified electronic warfare systems.

The Pole-21 complex is built on a modular principle, simplifying its production and deployment. The unified module of the Pole-21 is the R-340RP radio station, which includes the instrumentation and antenna modules. Each post of the complex includes one container with equipment and up to three antenna modules.



Fig. 15. Facilities of the Pole-21 complex: rack with equipment (left), antenna modules (top right) and control panel

Each jamming antenna module is capable of suppressing radio signals from satellite radio navigation systems and control channels in various ranges at distances of at least 25 km. The standard method of deploying and using the Pole-21 complex involves installing a large number of modules over a large area, taking into account the shape and size of the working sectors. With optimal placement, **one complex with 100 antenna posts can cover an area of 150 x 150 km**. A reliable “dome” of interference is created over such an area, eliminating the use of satellite

navigation.

The procedure for covering objects with the Pole-21 jamming modules from UAVs:

1. Use at least two jamming modules: one for the open code GPS suppression mode; The second one is for closed code GPS suppression mode.
2. The jamming modules must be installed behind the object at a distance of 3-4 km with the following orientation:
 - horizontal (azimuthal) – in the direction of the probable attack;
 - vertical (angular) – 20, 45 and 70 degrees.
3. Work on suppression (radiation) – continuous.

In addition to UAVs, the complex is capable of combating cruise missiles and aerial bombs, including the HIMARS MLRS.

The **Silok-01 system** is designed to automatically detect drones and determine their coordinates. The Silok-02 system is capable of automatically tracking drone coordinates using a wide range of frequencies. After detecting an enemy drone, the system switches to target suppression mode.



Fig. 16. Deployment of the Silok-01 complex.

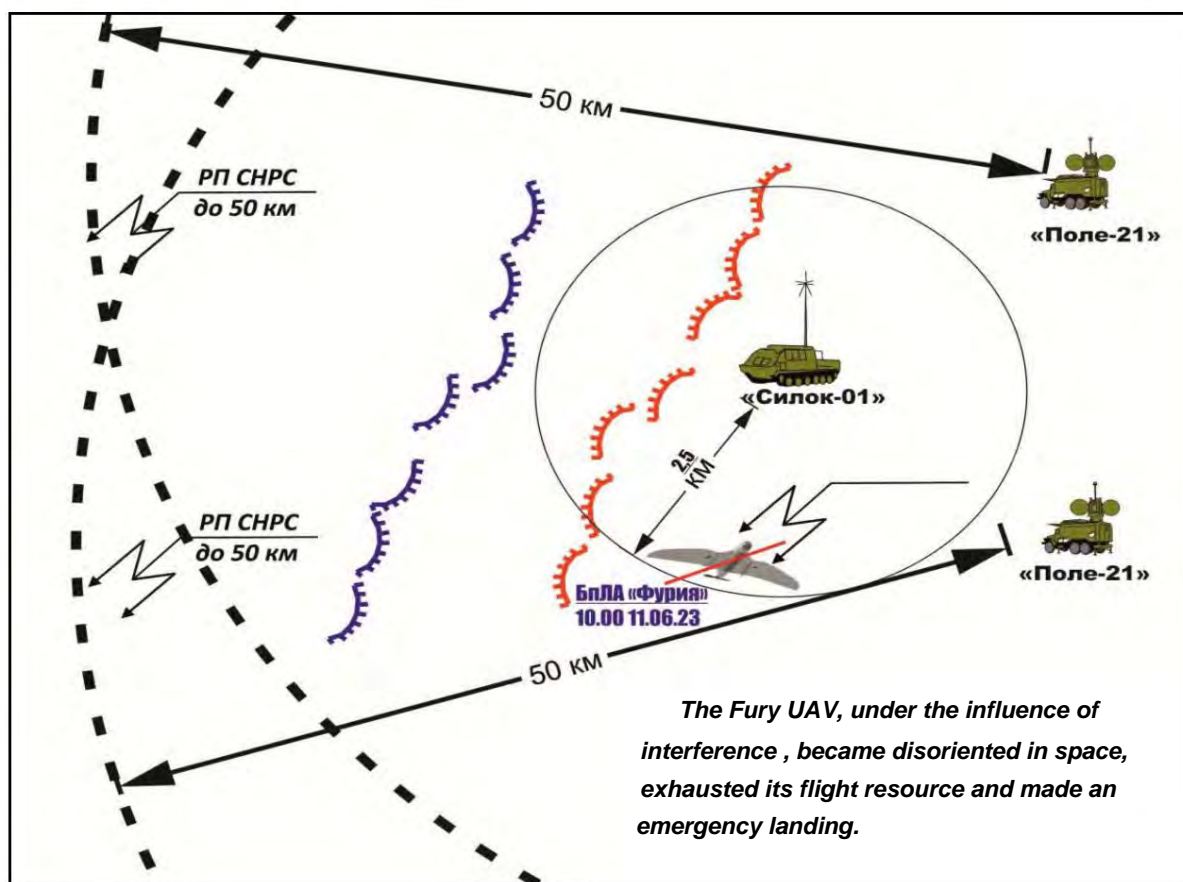


Fig. 17. Scheme of actions of the electronic warfare units of the RF Armed Forces in the area of the Northern Military District on 11.06.2023 to suppress the Fury UAV, using the Silok-01 complex and interference modules "Pole-21"

After affecting the enemy, the EW systems must quickly change their position to avoid being hit by the enemy. Even if the station itself is not detected, the enemy may attempt to carry out area strikes with artillery weapons (including using shells with radio fuses) in the supposed square of its location.

Anti-drone guns.

During the SVO, the development and active use of anti-drone guns for suppressing small-sized UAVs by creating noise interference began. The most successful ones during tests on the front lines

The LPD-801 anti-drone gun, developed domestically, can be used.

The complex is made in the form of a machine gun with a silencer. The length of the product is no more than 970 mm, weight without battery is 3.5 kg. For ease of use, the battery is given the appearance of a magazine from a machine gun. **On one charge, the complex can operate for up to 60 minutes. LPD-801 is capable of jamming control channels and navigation signals of drones at a distance of up to 1500 meters.**

The LPD-801 has begun to be replaced by a new modification of the anti-drone gun – the LPD-802.



Fig. 18. Anti-drone gun LPD-802

Fire damage to small-sized UAVs.

To protect personnel and military equipment from being hit by small-sized enemy unmanned aerial vehicles, commanders of military units (subdivisions) must assign fire teams. The team typically includes a sniper (team commander), 1-2 shooters to support his actions, a shooter-observer with observation equipment (binoculars) and communications equipment. The counter-UAV unit is deployed in pre-determined locations, in probable flight directions, so as to ensure round-the-clock surveillance of the airspace, timely detection and destruction of UAVs

with available firepower. **Algorithm of actions of the fire team upon detection of UAVs.**

The commander of the fire group, based on the current warning signal, in the absence of his UAVs in the air, gives the command to use the available forces and means with the task of destroying the air target. The unit fires concentrated escort (barrage) fire at the enemy UAV, leading the target course and adjusting the fire along the routes.

The rules for shooting from small arms provide for firing from automatic weapons (machine guns) at small-sized air targets at a distance of up to 500 m with the installation of a 4 or "P" sight.

In this case, one of the methods of target designation about the direction of flight and location of the detected UAV will be target designation with tracer bullets (firing with tracer bullets in the direction of flight or location of the detected UAV). At a small UAV flying towards a motorized rifle unit, continuous fire is conducted in the direction of its movement. In this case, fire is opened from a distance of 700-900 m. At a UAV flying to the side or above a motorized rifle unit, fire is conducted in a barrage or accompanying manner.

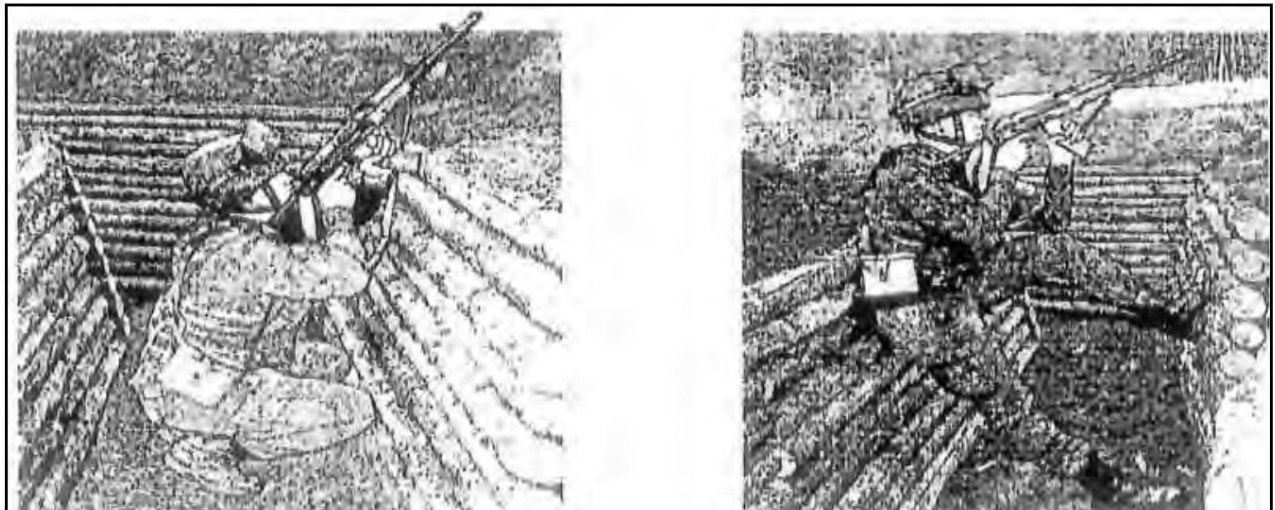


Fig. 19 - Shooting from a trench (communication passage) at air targets (with the left forearm and magazine resting on the front steepness of the trench, with the back and left leg supported on the steepness of the trench)

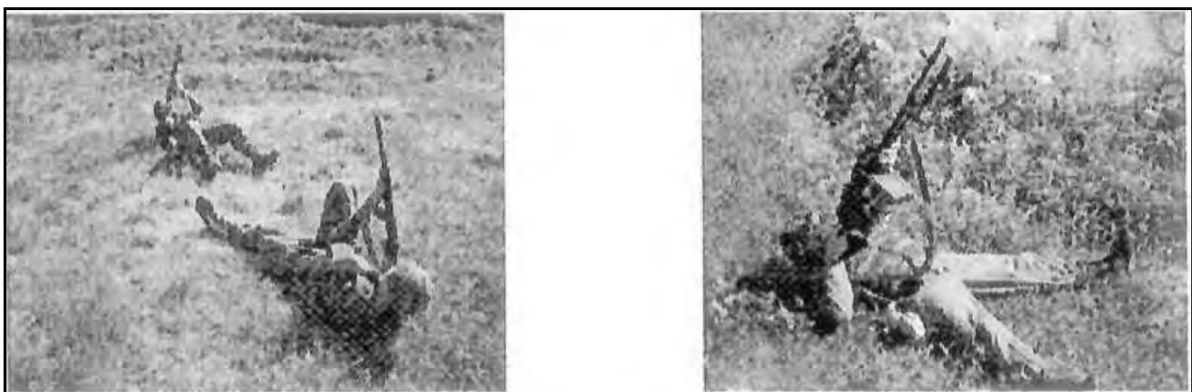


Fig. 20. Firing of a fire group at air targets
from a lying position

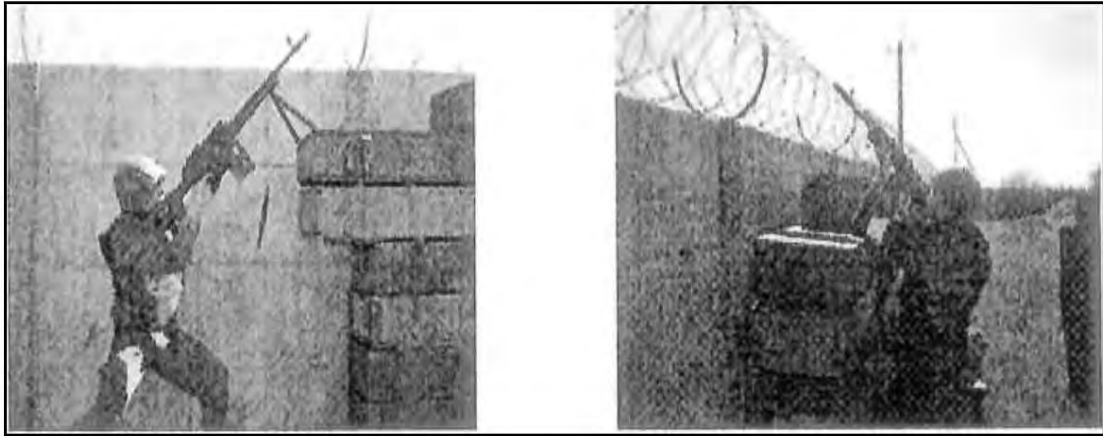


Fig. 21. Shooting at air targets using local objects

To increase the probability of hitting enemy UAVs with fire it is advisable to use tripods for small arms.



Fig. 22. Frame for small arms

Basic rules for shooting at UAVs:

1. Fire is conducted in an accompanying manner against a UAV flying at a speed of up to 45 m/s to the side or above a firing position (above its own unit).

When firing in an accompanying manner at a UAV flying at a speed of 15-30 m/s at a distance of 100, 300, 500, 700 and 900 m, **the lead is taken to be equal to 1, 3, 5, 8 and 12 target bodies, respectively.**

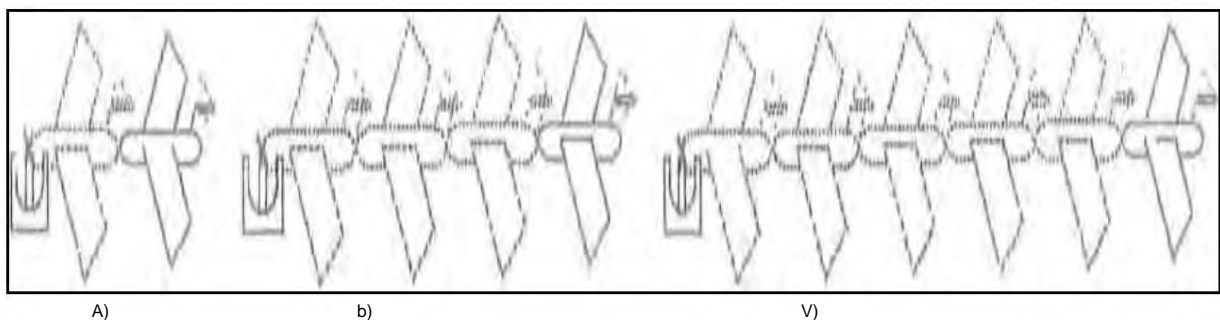


Fig. 23. Scheme of aiming at an air target flying at a speed of 15-30 m/s at distances of a) 100 m, b) 300 m, c) 500 m

The **"Fire"** command is given when the UAV is at a distance of 500 m from the firing vehicle and is carried out for 20-25 seconds in short bursts with fire adjustment.

To adjust fire along the tracks, it is necessary to shoot with cartridges with regular and tracer bullets (in a ratio of one cartridge with a tracer bullet to three regular ones). Shooting with cartridges only with tracer bullets leads to increased wear of the barrel bore.

In all cases of shooting at UAVs, it is necessary to remember that it takes 3-4 seconds to give the command and get ready to shoot. During this time, the UAV flies about 150-200 m.

2. Barrage fire is conducted by setting up a fixed fire concentration zone ahead of the UAV in such a way as to ensure that the beam of fire lines intersects the target's trajectory. The choice of direction for setting up the fire concentration zone is determined by the target's course and speed. During the time it takes to set up the barrage fire zone, the fire group can fire 200-250 bullets. This provides a bullet density that allows one to realistically expect to hit the target.

Ground reference points should be used to ensure timely setting of the task and determination of the direction and moment of opening fire. Having detected the target, it is necessary to determine the direction for setting the fire concentration zone. To do this, mentally plot the target's course on the terrain and determine the reference point closest to the course parameter, or indicate the direction of fire with a long burst of tracer bullets. **To fire, a command is given (for example):** *"Fire over the bridge, barrier"*. The *"Fire"* command is given when the UAV is approximately 150-200 m away from the specified reference point. Upon this command, the machine

gunners and submachine gunners prepare to fire, give the weapon the necessary elevation angle if the target is flying in the direction of the unit's position, and upon the *"Fire"* command, fire for 2-3 seconds, holding the weapon in the specified direction.

In general, the effectiveness of fire against UAVs by the accompanying method is higher than by the barrage method. Therefore, when possible, fire by the accompanying method is preferable to fire by the barrage method.

When firing from a 23 mm anti-aircraft mount (ZU-2E), firing at UAVs on a horizontal course is carried out with the input data set on the anti-aircraft artillery sight (ZAP-23). The range to the air target is set visually (tied to the range to landmarks on the ground) by eye. The degree value of the dive and pitch up is set to 0. The speed is set according to the type of UAV (20-40 m/s).

To engage small-sized enemy UAVs with fire from the 30-mm BMP-2 (BMP-3) AP and the 12.7-mm ZP mounted on tanks, it is advisable to use concentrated fire at the effective fire range, which is up to 2000 m and up to 1000 m, respectively.

Recommendations for countering certain types of attack UAVs enemy.

Positive experience in combating R-18 octocopters was obtained by units during the SVO. Compared to "quadcopters", devices with six (hexacopter) and eight (octocopter) propellers have a higher load-bearing capacity. These include R18 octocopters, made in Ukraine, whose standard load is two RKG-1600 anti-tank cumulative bombs, created by reworking RKG-3EM hand anti-tank grenades. This cumulative ammunition is capable of penetrating the relatively thin upper armor of a modern tank.



Fig. 24. Octocopter R-18

It is recommended:

in order to illuminate the camera of the R-18 octocopter, high-power flashlights with the ability to focus the light beam must be installed at air surveillance posts. To obscure the image of weapons and military equipment or the location of personnel when the drone approaches, it is necessary to use smoke bombs (RDG, DM-11, UDSH);

To engage a drone with fire, it is advisable to prepare magazines loaded with tracer ammunition in advance, and assign up to 8 of the most trained servicemen for fire. At night, it is advisable to assign sniper pairs to each company, additionally armed with thermal imagers. The personnel involved in the above-mentioned activities should be combined into anti-UAV groups.

The group's order of actions during the destruction of the R-18 octocopter.

When an R18 octocopter is detected by an air surveillance post, a signal is sent to the anti-UAV group. When the drone enters the group's area of operation, the camera is illuminated with flashlights, and nearby areas with weapons, military equipment and personnel are destroyed with smoke bombs, creating a continuous smoke screen. When the octocopter is illuminated, the group opens fire on it with tracer ammunition, and a pair of snipers hit the central control elements of the octocopter.

It is advisable to fire from small arms from different positions, possibly on the move, to avoid revealing the group's position. The peculiarity of this method of struggle is the complexity of the application of various types of impact.

Experience shows that before dropping ammunition, the drone must stop in the air in one place to perform targeting. During the complex impact of anti-UAV groups, the R-18 will not be able to stay in one place and the operator will be forced to take the device out of the affected area. Experience in such combat shows that it is enough to hit 2 drones for the enemy to stop flying in this area.

To combat small class UAVs of the quadcopter type, it is also recommended to use your own UAVs. If there are proactive and experienced UAV operators in the unit, it is suggested that when detecting the approach of an enemy UAV, the operator raises his UAV with a piece of camouflage net (fishing net) measuring 50 by 50 cm previously attached to the dropping device, then the main task of the operator is to rise above the enemy device and drop the camouflage net on its blades, as a result of which the propellers will become entangled and the UAV will fall.

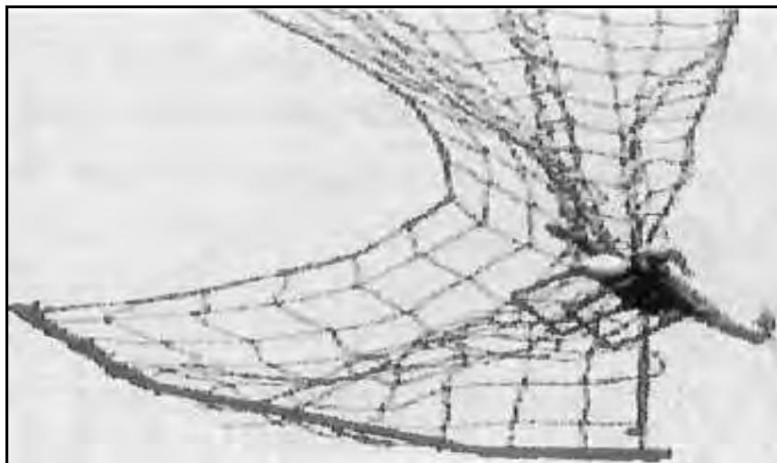


Fig. 25. Network application option

The practice of training shooters to fire at small-class UAVs, which previously took place in the VVO units, where a throwing machine for stand shooting was used during practical training, can also be very instructive.

REMEMBER: countering enemy UAVs is one of the most important tasks to be solved in order to ensure the security of military facilities and troop (force) groups, requiring creativity and initiative from commanders (chiefs). This task must be solved through the implementation of the entire set of measures and, first of all, the creation of an effective system to counter their use, based on UAVs and fire groups interacting with them.

For notes

