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Countering FPV Drones: Insights from Ukraine's Combat Experience

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Abstract:

First-person view (FPV) drones, a type of strike unmanned aerial vehicle (UAV), have become a serious threat on the battlefield. Owing to their maneuverability, speed and remote-control capabilities, they are widely employed by the enemy to destroy moving and armored vehicles, engage detected targets, and conduct surveillance and reconnaissance. Control is often carried out via fiber-optic communication lines (FOCL). The purpose of this article is to analyze the enemy's use of FPV drones and to identify effective, non-traditional ways of countering them. The article also presents measures developed to neutralize enemy UAVs and provides an overview of experimental testing.

Keywords: *drones, counteraction, fiber optic communication line, defense, war*

1 Introduction

The systematic use of this type of weapon has largely levelled the security on the front line, significantly worsening the logistics and command and control of military units. However, at the same time, the reduced effectiveness of electronic warfare on the operation of FPV drones, which use a fiber – optic communication channel for control, makes it necessary to search for innovative technical solutions and develop recommendations for the personnel of units to counter the existing threat.

The main feature of the FPV UAV with FOCL is the use of a fiber-optic cable to control the latter, which completely ignores the influence of electronic warfare devices (EW devices).

Due to this feature:

- Stable communication with the drone is maintained without risk of signal blockage.

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- The drone cannot be detected by current electronic intelligence systems or drone detectors.
- Control and video signals cannot be suppressed or intercepted.
- High-quality imaging is ensured, significantly increasing the probability of target engagement.
- Reliable communication is maintained even without direct line of sight between operator and drone.
- A high data transmission rate is supported.
- Drone operation is possible without the use of repeaters.
- Multiple drones can be employed simultaneously in the same direction without requiring frequency separation.
- The operator's location (take-off point) is difficult to determine.

But despite the existing advantages of FPV drones with FOCL, they have a range of limitations, such as:

- A lower flight speed.
- A low maneuverability and dependence of the drone on the cable (although the fiber optic cable is quite strong, it becomes brittle and can break when broken at a 45-degree angle, which significantly limits maneuverability).
- The reduction of payload weight (a 10 km cable reel weighs about 1.2 kg, which in turn reduces the weight of the munition).
- A lack of a backup communication channel (in the event of a cable break, communication is lost, and it is impossible to control the drone).
- High requirements for operator qualifications.
- The cost of fiber optic cable (the cable is quite expensive to manufacture, which increases the overall cost).

2 Ways the Enemy Uses FPV Drones with FOCL

Next, let us look at some of the ways in which FPV drones can be used with the use of FOCLs, as shown in Tab. 1. For example, the "Free Hunt" method involves the FPV drone operator flying independently from the take-off point to the area where the target was previously identified, searching for it on the ground and destroying it.

The method of "Ambush" using FPV drones with FOCL involves landing an FPV drone near the area of a future strike, conducting further surveillance and suddenly striking the target if it is detected. For example, the FPV drone was in standby mode on the road and when an off-road vehicle of one of the military units appeared, it launched a strike to kill (Fig. 1).

Fig. 1 FPV drone with FOCL in standby mode and a vehicle hit by it

Tab. 1 Ways the enemy uses FPV drones with the use of FOCLs

N.	Method of application	Short description	Purposes of application
1	High-precision guided attacks. Support of offensive operations. Repelling attacks.	The drone is controlled via FOCL for precise guidance even in the absence of radio communication.	Damage to equipment, air defense system and fortifications.
2	Organizing an ambush.	The drone controlled via FOCL monitors the enemy. If it appears in a suitable place (on the routes of advance), it destroys enemy soldiers and their equipment.	Infantry and vehicle damage.
3	Covert surveillance	Use of FPV drones on fiber optics for continuous reconnaissance without signal detection.	Identification of enemy positions, data collection
4	Massive swarm attacks (> 5 FPV drones)	Simultaneous use of multiple drones via FOCL	Defense breakthrough, airspace saturation.
5	Undermining of engineering structures	The drones carry explosive charges for targeted detonation of bridges, fortifications, etc.	Disruption of logistics and fortification infrastructure.
6	Use in urban areas	Fiber-optic connectivity avoids communication loss in difficult urban environments.	Attack operations, sweeping of territories.

The method of “Supporting the attack” of an assault group with FPV drones with FOCL consists in successive strikes by the enemy using FPV drones with FOCL on the positions of units as their storm groups move out of their defense.

As for such a method as “Counter-battery warfare”, it means that along with conventional firepower for counter-battery warfare, such as firepower systems, the enemy is increasingly using FPV drones with FOCL.

The strikes are carried out in the depths of the defense of the Ukrainian Defense Forces (UDF) units in order to destroy artillery systems and mortar crews in firing positions or in areas of concentration. The general procedure for conducting counter-battery combat by the enemy is as follows:

- They conduct aerial reconnaissance of the area using reconnaissance UAVs “Zala 421”, “Supercam S350”, “Orlan-10”.
- To identify firing positions of Ukrainian artillery units, the enemy also uses radar systems for reconnaissance and fire control 1L219 “Zoo-1”, artillery sound reconnaissance 1B75 “Penicillin”, etc.
- After identifying potential targets, the enemy uses FPV drones with FOCLs, mostly on a “carousel” basis, i.e. within 10–60 minutes. The enemy’s FPV drones enter the target in turn, in the amount of three to ten pieces, in order to guarantee the defeat of the detected object.

3 Countering FPV Drone Threats

3.1 Issues

A selective analysis of professional publications in the area of innovation in anti-drone technologies has shown that experts pay attention to the following components of the countermeasures system when studying certain issues:

- drone detection system (detection methods based on radar data; acoustic detection methods; optical and infrared detection systems; approaches to combining multiple sensors to improve detection accuracy),
- drone recognition and classification (machine learning and artificial intelligence for drone identification; image and video processing methods for drone recognition; signal analysis for classifying drone types; comparative studies of different recognition methods),
- counter-drone measures (jamming and spoofing technologies; physical and cyber interception strategies) [1-8].

Based on the focus of our article, we concentrate on the issue of countering drones, including by unconventional means that are not combined with the use of specific military equipment.

For example, our observation that enemy FPV kami-kaze drones hit vehicles and armored vehicles of the UDF raises the issue of protecting equipment and positions from these types of drones. A significant increase in the number of enemy uses of such drones at the front from 2022 to 2025 requires corrective actions that will help to increase the effectiveness of countering them.

Given the widespread use of FPV drones by the enemy and the growing threat to the defense forces, measures have recently been taken to build an effective system to counter this type of weapon. The increase in the use of FPV drones is especially noticeable in 2025 with the onset of spring and the intensification of offensive operations on certain sections of the contact line. It is not possible to fully analyze information on the frequency or scale of the use of FPV drones, due to the constantly changing intensity of combat clashes. Some scientists have analyzed the statistics of the use of FPV drones by the Ukrainian and Russian military on the battlefield for a certain period of 2023-2024, which shows a significant increase in their use [9]. But these data do not reflect the full situation in the combat zone. From our own experience, we can add that, depending on the situation in certain sections of the front, the enemy can use from 50 to 100 FPV drones during the day or week to attack a separate position of the Ukrainian Defense Forces.

Since the beginning of 2025, Kvertus, a Ukrainian manufacturer of EW devices and EI devices (part of NAUDI), has been implementing the ambitious Atlas project, which aims to create a large-scale UAV defense system for the military in the front line and in the area close to the front line, stretching over 1 300 kilometers [10]. In addition, since June 2024, the Armed Forces of Ukraine have begun forming the Unmanned Systems Forces as a separate branch, tasked with addressing specific operational needs in this domain [11]. As a result, under current wartime conditions, nearly every brigade of the Defense Forces now includes reconnaissance and strike unmanned aerial vehicle (RSUAV) units, which play a key role in countering FPV drones.

It should be noted that counteraction is organized at the tactical level within units on their own, which does not allow for the rapid implementation of the most effective methods of counteraction and the accumulation of experience.

However, the absence of separate structural units within a brigade, regiment, battalion, or company to counter UAVs makes it difficult to allocate personnel and equipment to perform these tasks, to identify responsible persons, and to establish interaction and a system to counter FPV drones.

A possible solution is to continue scaling up UAV countermeasures units in brigades, following the example of creating battalion and company-level RSUAV units. These units will be capable of organizing countermeasures both in specific sectors of the frontline and by assigning their assets to support tactical-level formations. This issue needs to be further studied to determine the optimal form of organization and use of these units. Countering FPV drones is complicated by their technical and maneuvering features – specifically, their ability to bypass electronic warfare signal jamming and the high degree of operator control that allows them to navigate around physical obstacles and strike vulnerable parts of military equipment or positions. The cost of manufacturing or purchasing off-the-shelf FPV drones is low enough ($300–600) to allow them to be used on a massive scale by both our military and the enemy. An FPV drone is capable of carrying various types of ammunition: cumulative ammunition to destroy vehicles, including armored ones, high-explosive fragmentation ammunition to destroy manpower and weapons, and thermobaric ammunition. A 1.0–1.5 kg munition on standard 7-inch drones can cause devastating damage to all types of armored and unarmored vehicles, manpower and weapons.

The range of the most common FPV drones with ammunition is up to 10 km. In some cases, experienced pilots with the right equipment and well-chosen positions can cover a distance of up to 20 km. Accordingly, at such a distance from the front line, there is a risk of being attacked by this type of drone.

The high maneuverability, controllability and speed of the FPV drone makes it a highly accurate guided weapon that poses a significant threat to the UDF.

The development and scaling up of the use of FPV kamikaze drones by the enemy leads to an increase in the threat from this type of weapon. There is a significant increase in the production and use of FPV drones by the enemy. Therefore, the issue of protecting personnel, equipment and weapons from FPV kamikaze drones is extremely relevant. The available types of protection do not guarantee 100% effectiveness. Different types of protection can be used depending on the conditions and require mandatory testing in conditions as close as possible to combat use. It should be noted that range tests may differ substantially from actual combat conditions [12]. For example, EW devices that will protect vehicles should be tested while the vehicle is in motion and take into account the possibility of drone attacks at different control frequencies (the most common frequencies are 900 MHz, 1.2 GHz, 2.4 GHz and 5.8 GHz).

At the same time, given the widespread use of FPV drones and the complexity of countering them, there is another challenge in organizing effective countermeasures against these types of drones. Currently, the defense forces do not structurally provide for separate units to counter FPV drones, which would take on the main function of organizing and providing cover for defense areas or friendly units under attack by the enemy.

The creation of such units will allow for systematic organization of countering UAVs, including FPV drones, allocation of necessary means, building interaction with friendly UAV units to avoid shooting down friendly drones, and will contribute to more effective accumulation of knowledge and experience in countering UAVs.

There are various ways to counter enemy FPV drones. None of these methods provides complete protection against defeat, and their effectiveness may vary depending on the conditions and situation.

A prerequisite for proper protection against hostile FPV drones is their timely detection. There are four main types of drone detection/monitoring equipment: radio frequency analyzers, acoustic sensors (microphones), optical sensors (cameras), and radars.

An effective method of detecting drones is the use of radio frequency spectrum analyzers [13]. The use of a spectrum analyzer can help detect drones approaching positions and allow you to prepare to repel an attack or move personnel to cover.

FPV drones, which currently mostly use analogue signals, can be detected by video interception. Since the analogue signal is not protected, video interception systems can receive live video of enemy drones. This will enable timely detection of enemy drones and, in cooperation with other units, increase the effectiveness of defense against attacks by these drones.

The most common methods to protect equipment, personnel and positions from enemy FPV drones are as follows:

- electronic warfare protection (jamming the control receiver on the drone itself or jamming the video signal receiver),
- physical protection,
- smoke screen,
- shooting down with small arms,
- use of the radio horizon,

Types of electronic warfare equipment to counter drones:

- anti-drone guns. They are of limited effectiveness, as FPV drones are fast and maneuverable, which makes it difficult to keep them in the suppression zone,
- portable tactical or so-called “trench” electronic warfare,
- mobile electronic warfare for installation on vehicles,
- stationary electronic warfare systems (e.g. Bukovel). They are usually located at a considerable distance from the front line and may not cover the area of the impact of FPV drones,
- electronic warfare protection has both advantages and disadvantages.

Advantages:

- the ability to protect vehicles on the move,
- possibility to use portable compact electronic warfare equipment for infantry units, in particular to cover assault groups.

Disadvantages:

- limitations related to power and the required power source,
- interference with friendly UAV units (in the case of mobile assets, it is unlikely that all neighboring units will be able to warn of the use of electronic warfare).

A sufficient level of personnel training is required to operate electronic warfare equipment and drone detection equipment. In the production of FPV drones, the frequency of transmitters may change. Even if an EW system is currently able to cover all the frequencies used by FPV drones, the enemy may start using new frequencies in a short time, and the effectiveness of EW systems will be levelled. The difference in polarization of the antennas on the drone and the EW system significantly reduces the effectiveness of drone signal jamming. The entire spectrum of each frequency is very difficult to completely jam, especially with cheap Chinese modules. At high power levels, EW devices have the potential to cause health hazards to nearby personnel. For mobile electronic warfare devices, shaking while moving can cause damage and malfunction.

Many domestic manufacturers, military specialists and volunteers are working on the development of EW devices from FPV drones, including mobile ones. Not all existing solutions provide the required level of protection. In order to select an effective anti-FPV electronic warfare product for specific conditions of use, it is necessary to look for the best solutions in cooperation with manufacturers, EW experts, volunteers, and the military. This area is constantly evolving and changing dynamically. There is a struggle between technologies. Therefore, in order to know about the most effective means of EW device, you need to be in contact with experts and developers all the time. This work should be systematic.

Potential development of automatic target acquisition technology for FPV drones can make it much more difficult to suppress EW device. All means must be tested. It should be noted that range testing may differ significantly from use in combat conditions.

3.2 Physical Protection

Types of possible physical protection to prevent FPV drone strikes:

- A protective frame on the equipment, an example is shown in Fig. 2 [14]. The enemy document "UAV Countermeasures Memo" at the end of this section describes in detail the methods and options for the construction of protective structures. An important aspect is the ability to quickly change or remove the structure depending on the conditions of use of the equipment.

Fig. 2 An example of a protective frame on a machine

- Protecting positions with nets (chain-link, camouflage netting, possibly other types of nets). The nets should be placed at a certain distance to protect personnel from direct hit by the FPV drone, explosive force and debris. It is recommended to place protective nets in several lines, at an angle, to increase the effectiveness of protection and reduce the likelihood of triggering and hitting the drone.
- Given the low image quality of analogue video communication systems installed on most FPV drones, it may be effective to place low-visibility barriers made of knitting wire or strong fishing line over the positions. This can increase the hit rate of drones entering the target.
- Protecting dugouts and premises from drone entry: a blanket at the entrance or closed doors, nets on windows, etc.

3.3 Shooting Down a Drone with Small Arms

Cases of drones being shot down by firearms have been recorded on numerous occasions, both by our forces and the enemy. This is confirmed by information from military units and videos on the Internet. This primarily concerns civilian drones such as Mavic and Matrice, whose trajectory is smoother and more predictable.

Shooting down an FPV drone is complicated by the high speed and maneuverability of the drone, which reduces the effectiveness of the shooter’s reaction and aiming. The FPV drone has the ability to quickly approach and engage the target, which does not leave enough time for the use of firearms to shoot down. Nevertheless, there are cases of shooting down this type of drone with small arms.

Timely detection of the drone’s approach is important. A potentially more effective approach is to disable a weapon using buckshot ammunition, as its wider spread increases the likelihood of hitting the target. This method is more effective for protection of stationary targets. It is ineffective against moving targets with a high probability of being used due to the difficulty of aiming and timely detection. Additional testing of this method is required to confirm the effectiveness of shooting down an FPV drone with firearms, in particular buckshot.

3.4 Use of UAVs with Netting Devices

This anti-UAV technology involves the use of a net to stop the drone by blocking the rotor blades. There are three main delivery methods:

Net guns fired from the ground can be hand-held, shoulder-launched or turret-mounted. Efficiency ranges from 20 m to 300 m. They can be used with or without a parachute for a controlled descent of a captured drone.

Mesh gun fired from another drone overcomes the limited range of the mesh gun on the ground. It can be difficult to capture another moving drone. Usually, it is used with a parachute for a controlled descent of the captured drone.

A suspended net deployed from a net drone when a friendly drone carries and maneuvers the net toward the offending drone. The netting drone is usually able to either bring the offending drone to safety or, if it is too heavy, release the captured drone with or without a parachute for a controlled descent.

The disadvantages of this countermeasure are that drone-deployed nets can be inaccurate and have long reload times; nets launched from the ground have a short range; and drone-mounted net guns often have difficulty intercepting and neutralizing enemy drones that fly aggressively or maneuver quickly.

3.5 Smoke Screen Protection

To be effective, this method requires detecting an approaching drone and setting up a smoke screen to prevent it from hitting.

An FPV drone is able to approach and engage a target quickly. There may not be time to set up an effective smoke screen. Smoke screening significantly disguises positions or vehicles, which can lead to an increase in the number of “hunters” with other weapons.

3.6 Use of Interceptor Drones

The FPV drone can be destroyed by an interceptor drone, which is a conventional multi-rotor UAV with smooth-bore cone-shaped tubes attached to it, connected by a nut and clutch, which are loaded with special 12-gauge cartridges with shot and an electric match (Fig. 3).

Fig. 3 General view of the interceptor drone

3.7 Using Nets for Camouflage

Overlapping trenches, crevices and ditches and approaches to them with various types of nets and curtains that will allow to detain everything the enemy tries to throw from UAVs, including FPV drones themselves (Fig. 4).

Currently, the “Anti-Drone Curtain” is effectively used, which is a rope system consisting of a horizontally stretched cord with vertical cord sections attached to it. The main purpose of this design is to prevent an FPV drone from entering the territory of a landing site or to protect small buildings and structures. Drone blades get tangled in the cords, which leads to loss of control over the drone or its fall. It is important to note that these cords are almost invisible to the drone operator at flight speed, especially against the background of vegetation [15].

3.8 Radio Horizon

The control and video signals of the drone propagate according to the rules of the radio horizon. That is, if there is a hill, a high-rise building, or a curvature in the terrain between the target and the drone's transmitter/receiver source that blocks the signal from passing in a straight line, the drone will lose control and the ability to transmit video. The drone operator will not be able to enter the target area.

Fig. 4 Netting and curtains to protect against FPV drones

Knowledge of the locality – including the terrain between enemy territory and our positions, as well as logistical routes – can greatly aid in planning defenses against FPV drones. Increasingly, however, the use of various types of remote antennas is becoming common; these can be mounted on rooftops or towers. In addition, repeater radars are often deployed, sometimes lifted to significant heights by other drones. This increases the radio range of the drone's signal and helps to overcome the above limitations of signal propagation.

3.9 Conclusions

The danger of FPV kamikaze drones carrying ammunition and the increasing use of them by the enemy makes the topic of counteraction and defense relevant.

An important aspect is the creation of units to counter UAVs, including FPV drones, within a brigade, battalion or company. Such units will have the personnel and equipment necessary to organize an effective anti-drone warfare. The creation of such units will facilitate more effective accumulation of knowledge and experience in countering UAVs. This issue requires further elaboration, particularly regarding these units and their application.

Existing countermeasure methods do not provide 100% protection against FPV drone strikes and can have varying effectiveness depending on the circumstances. Combining different protection methods can increase the effectiveness of the counteraction.

Positions should be established with consideration of potential FPV drone attacks, employing a combination of physical protection (e.g., netting over positions, metal frames on equipment) and technical protection (such as electronic warfare and drone detection systems). It is recommended that wheeled and armored vehicles are protected by mobile electronic warfare systems. These, in turn, need to be checked for effectiveness according to the conditions of use.

Timely detection of enemy FPV drones is also important. To achieve this, it is worth organizing: constant monitoring and interception of the video signal from enemy drones in every sector of the front and strengthening protection against FPV drone attacks through cooperation between units, as well as providing units with spectrum analyzers to detect drones.

Those in charge within the Ukrainian Defense Forces are advised to establish interaction and maintain constant contact with manufacturers, electronic warfare experts, volunteers, and military personnel who study and deal with countering enemy strike drones, particularly FPVs.

Given the importance, complexity of the topic, and limited publicity of information on electronic warfare (EW) means to counter UAVs, there is a need for military units to deepen cooperation with EW manufacturers and specialists. This will provide an opportunity to structure information, track promising products, test, and further recommend effective EW means against FPV drones to the military.

4 Methods (Options) of Countering Enemy UAVs Controlled via Fiber-Optic Communication Lines (FOCL)

Given the widespread use of FPV-type strike UAVs by the enemy, including those controlled via fiber-optic communication lines (Fig. 5), during 2024 and early 2025, the issue of systematizing the experience of countering this threat and developing effective countermeasures has become relevant [16-17]. At the tactical level, the fight against enemy strike UAVs is currently conducted by unit personnel, yet none of the existing methods provide high effectiveness and their success largely depends on conditions and the training of the troops.

Fig. 5 Appearance of a UAV controlled via fiber optic communication lines

The defining characteristic of FPV UAVs is their resistance to electronic warfare countermeasures. Analysis of the experience of the Defense Forces of Ukraine in countering UAVs (FPV drones) with FOCL makes it possible to identify the six most common ways of countering them, see Tab. 2.

Alongside this, the active fighting on the front is forcing a search for other, more unconventional ways to counter enemy UAVs controlled via fiber-optic communication lines (FOCLs). Let's look at some of these individually:

- use of explosive devices (detonation cords) to damage FOCLs.

Possible methods of application, namely:

  - creating mine-explosive barriers (protective perimeters) along logistical routes (unreeling from spools on the ground using various types of ground-based UAVs). Detonations to be carried out a few minutes before a convoy passes and during its movement,
  - creating mine-explosive barriers around positions (placing detonation cords on poles or unreeling from spools on the ground using UAVs) with subsequent detonation of the relevant sections using electric detonators if the

presence of fiber optics on them is confirmed, or at a distance of up to 30 cm,

- use of heated wires along positions and lines of communication to damage FOLs. Practical implementation of this method in real combat conditions is not feasible,
- use of chemical substances to damage FOCLs. The possibility of mechanical impact on FOCLs has not been confirmed,
- use of smoothbore shotguns with shot cartridges as a means of mechanically damaging FPV drones. The method of use has been proven during combat operations, but limitations exist; it can be used only by trained personnel,
- application of mechanical means of damaging FOCLs using a wire saw or grappling hook attached to a UAV. The method of application has demonstrated a potential for use during combat operations:
  - o for protection during movement – using a UAV with a wire saw is advisable for combating FOCL-controlled UAVs operating from ambushes located along logistical routes. In this case, to escort the passage of a convoy (vehicles), a UAV with a wire saw flies along the roads at a distance of 50-100 meters on both sides,
  - o to increase the level of protection of positions – by systematically flying around positions to cut (with a wire saw) or break (with a grappling hook) fiber-optic lines.

Tab. 2 The most common ways to counter FPV drones using FOCL

N.	Countermeasure Method	Short Description	Advantages	Disadvantages
1	Physical Destruction of UAV or FOCL	Destroying the drone or cutting the FOCL cable	High effectiveness in neutralization	Requires precise reconnaissance and resources
2	Attacks on the Control Station	Physical elimination or cyber destruction of control systems	Can paralyze multiple UAVs simultaneously	Difficulty in locating command posts
3	Laser Engagement of UAV	Destroying or dazzling UAVs with laser radiation	Silent operation, minimal side effects	Limitations in range and weather conditions
4	EW Against Backup Channels	Jamming radio or GPS that may be used if FOCL is lost	Prevents the interception of control	Low effectiveness against fully cabled systems
5	Camouflage and Deception	Smoke screens, decoys to disorient UAVs	Cheap and quick to implement	Only a temporary measure
6	Intelligence measures	Detecting FOCL lines and analyzing satellite data to prepare attacks	Helps in planning other types of countermeasures	Requires time and specialized equipment

5 Conclusions

As a result of the work carried out, a comprehensive analysis has been made of the enemy's methods of using FPV drones with fiber-optic communication lines (FOCLs). It has been established that this technology gives the enemy significant advantages in terms of avoiding the effects of electronic warfare (EW) systems, increasing the accuracy of drone control, and reducing the possibilities of its detection using traditional radio-technical monitoring methods.

The review of countermeasures against such UAVs has made it possible to identify the most effective courses of action for protecting personnel, wheeled and tracked vehicles from FPV drone attacks using FOCLs. In particular, the importance of actively physically detecting laid fiber-optic cables, the implementation of mechanical protection systems (barriers, traps, netting), increased visual surveillance, dispersion of personnel and equipment, the use of camouflage, as well as the organization of regular patrols to prevent the covert laying of FOCLs in nearby areas, has been identified.

During experimental studies, experts tested various methods of damaging fiber-optic communication lines and assessed their effectiveness. Based on the results obtained, experts identified the most effective methods of neutralizing UAVs with fiber-optic communication lines, which can be implemented in combat conditions by tactical-level units. The most effective of them is currently the use of a wire saw attached to the UAV for mechanical damage to the fiber-optic communication lines.

The recommendations developed today by the Defense Forces of Ukraine are relevant for increasing the level of security of military facilities and units and will contribute to reducing the loss of personnel and equipment in combat conditions, as well as to ensuring better performance of combat missions in conditions of constantly growing enemy threat using unmanned systems.

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