

# **СПРАВОЧНИК**

**Тактика применения противником  
FPV-дронов (в схемах)  
и способы противодействия**



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## I. Введение

The analysis of the extensive use of FPV drones by the Armed Forces of Ukraine (AFU) highlights their significantly increased role in combat operations as an effective means of firepower. Despite their small size, these drones can carry payloads several times their own weight, deliver them to targets at speeds of up to 100 km/h, and operate within a range of up to 10 km.

In terms of percentages, "kamikaze" drones have gradually taken a leading role (up to 70%) in inflicting losses on enemy personnel and equipment within tactical depth. These figures are characteristic of all sides involved in the armed conflict.

Technological advancements in FPV drones and related components for their combat use—including increased range and flight duration, enhanced payload capacity, improved resistance to electronic warfare (EW), operability in limited visibility conditions, a broader range of munitions, integration of intelligent target acquisition and tracking systems, and the establishment of specialized UAV testing and operator training centers—have expanded the tactical applications and variety of tasks they can perform.

This material provides a concise and accessible overview of FPV drones, examines key tactical methods for their use in countering Russian forces, and highlights similar approaches actively adopted by our drone operators on the battlefield. A separate section includes brief recommendations and advice on countering "kamikaze" drones at the line of contact.



## II. Общие сведения об FPV-дронах

FPV (First Person View) drones are UAVs (Unmanned Aerial Vehicles) equipped with a camera that transmits real-time video to a pilot's goggles or headset, allowing them to control the drone as if seeing from its perspective. This immersive control system ~~Приимущества~~ precision drone systems for reconnaissance, and combat operations, making FPV drones increasingly valuable in both military and civilian applications.

- ❖ First-person view (FPV) drone control

Instant responsiveness and maximum control over the drone

High maneuverability and flight speed (up to 120 km/h)

Resistance to electronic warfare (EW) due to the modular design, allowing for quick configuration and setting adjustments

Customizable design to fit specific tasks

Affordability, with an average cost of 40,000–50,000 RUB

Disadvantages include:

Limited flight duration of 7–10 minutes

Flight range (without a relay) of up to 10 km

Requirement for pilot selection and quality training, with operator training taking at least one month

### 1. Комплектация



FPV-дрон



Видео очки



Аккумулятор



Пульт управления

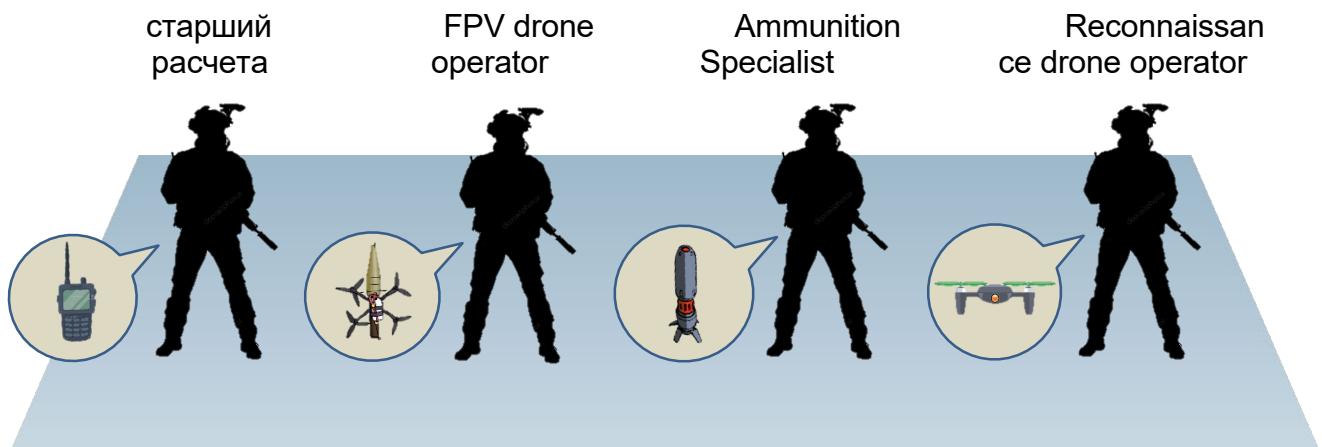
## 2. Общее устройство FPV-дрона



## 3. General characteristics of a typical

1. the size of the drone is 7 inches;
2. carrying capacity - up to 2.5 kg;
3. maximum speed (with load) – up to 120 km/h;
4. flight time with load – up to 10 minutes;
5. Flight range with load (without repeater) – 10-12 km;
6. Preparation time for launch – 2 minutes.

### UAV calculation (option)

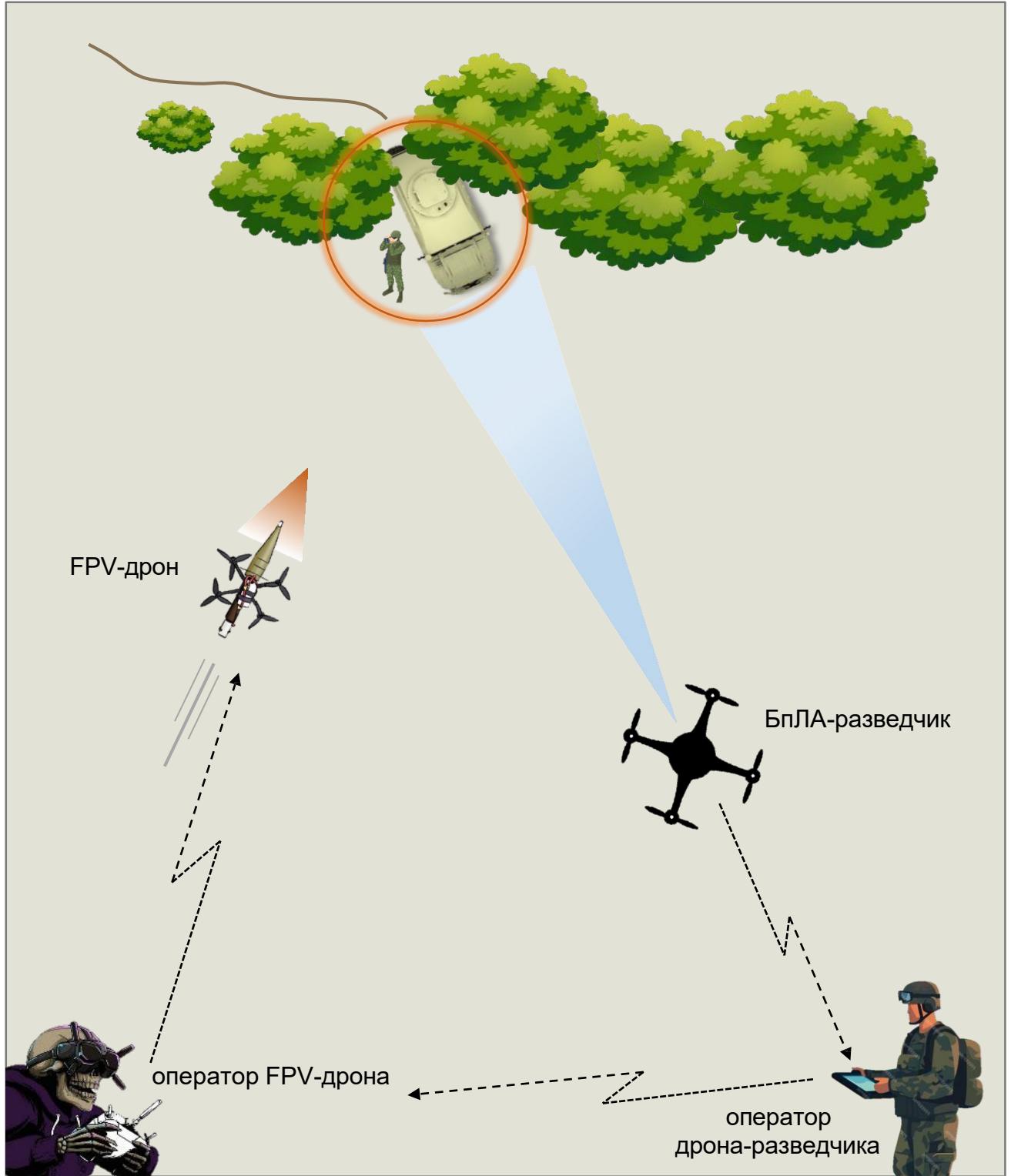


## 1. Tactical techniques for using FPV drones

### 1. "Classics"

(target detection by a reconnaissance UAV - launching the drone and its destruction)

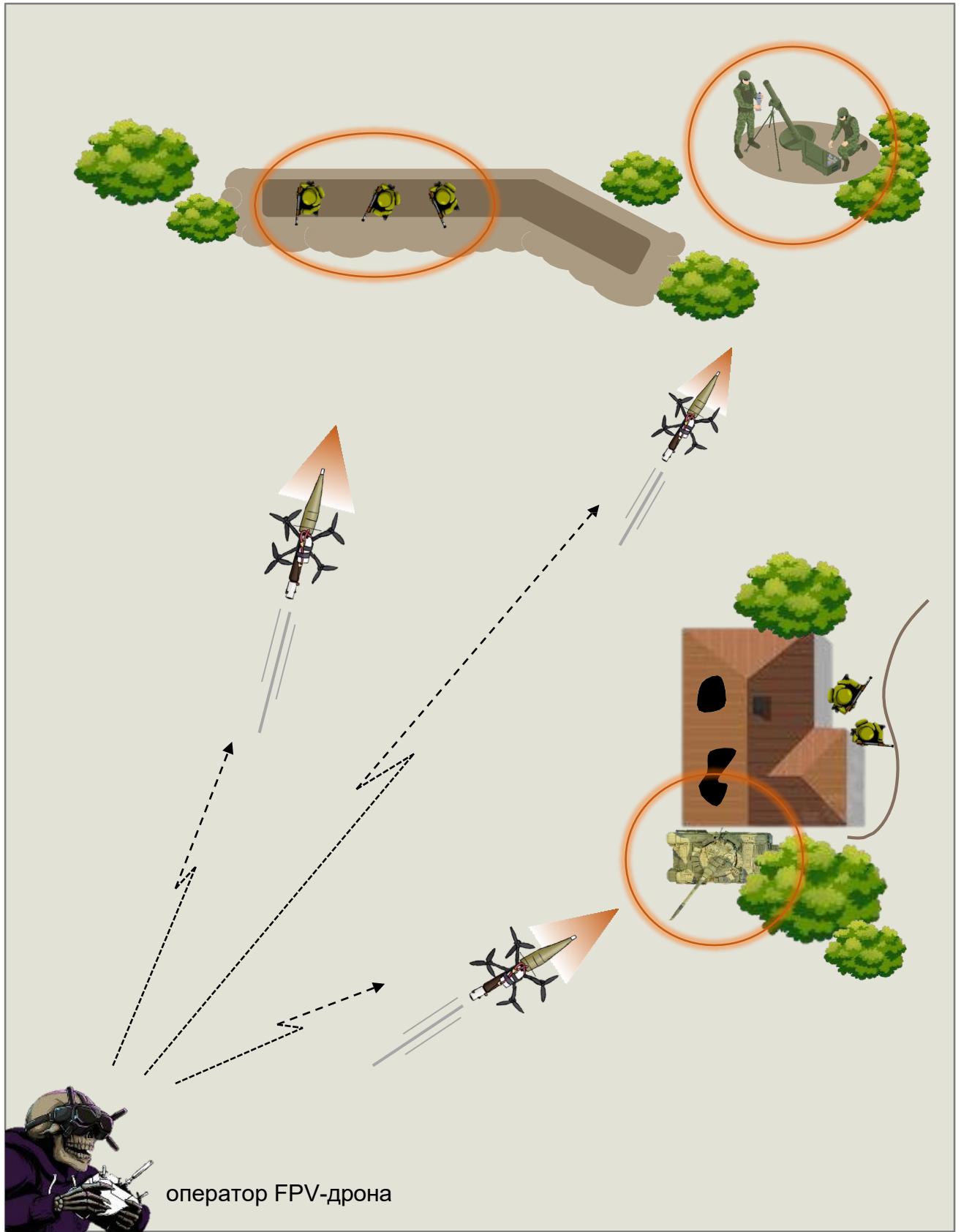
The most common method of combat use. It consists of detecting the target by a reconnaissance drone and transmitting the coordinates to the FPV operator to destroy it. Video recording of the destruction of the object is carried out by a UAV reconnaissance.



## 1. "Free Hunting"

(FPV strike on objects and positions detected in advance)

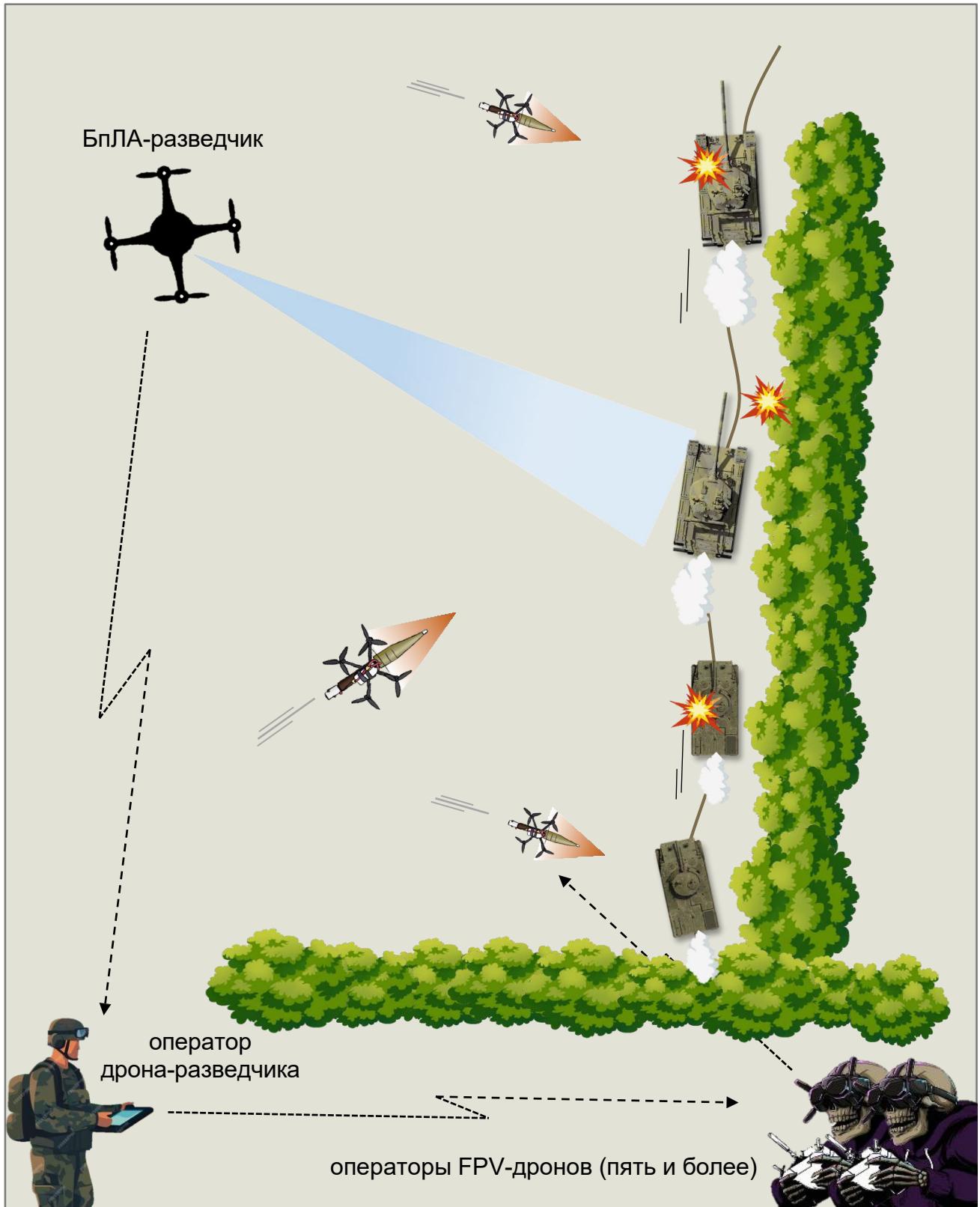
The essence of this method is the independent delivery of strikes by FPV drones on pre-discovered objects and enemy positions.



## 1. «FPV-рой»

(FPV group strike on selected targets, objects)

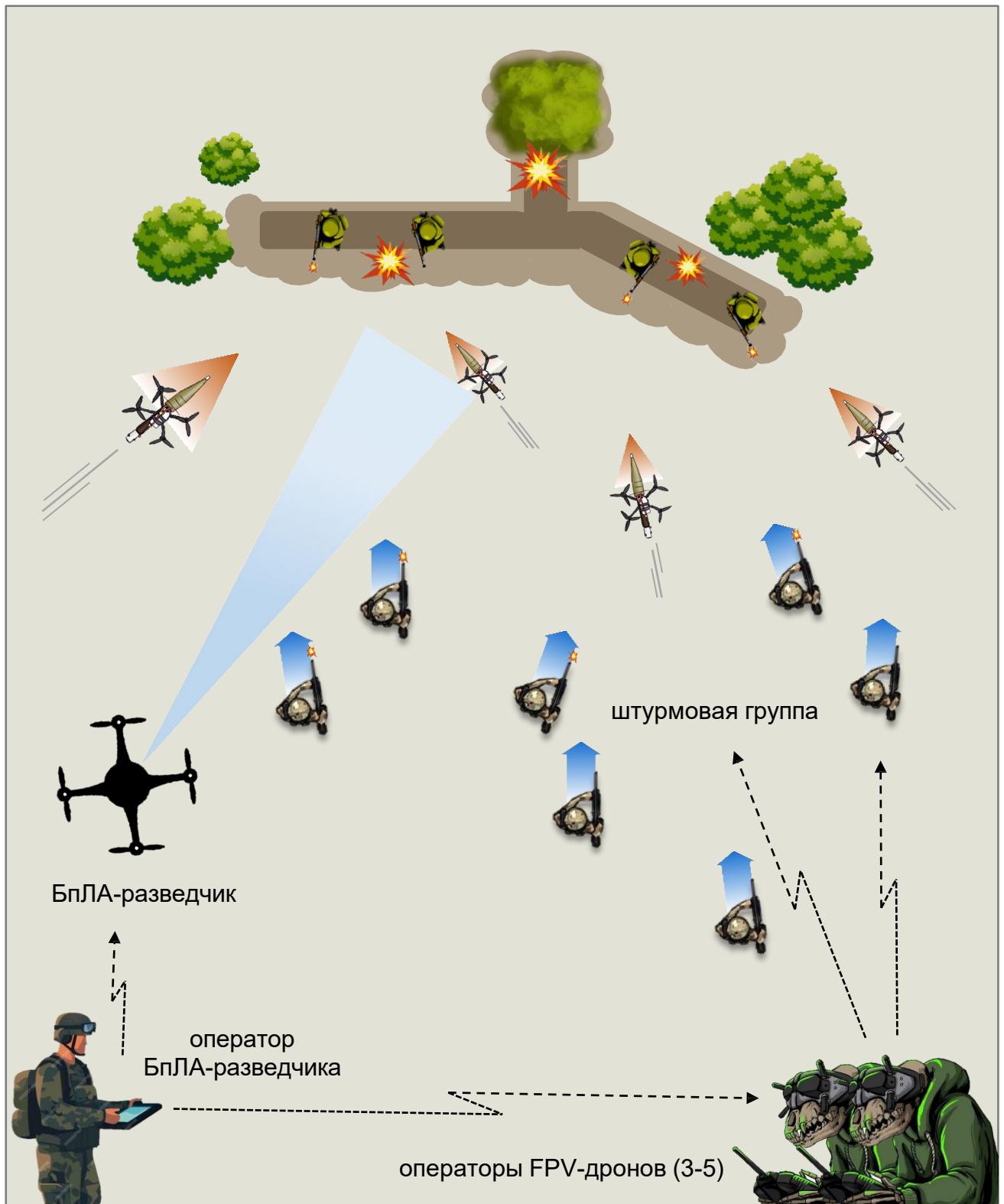
The method is based on the opening of targets (objects) by a UAV reconnaissance aircraft and the massive impact of "kamikaze" drones in order to destroy them. As a rule, the total consumption is 5-12 devices. Video recording of the destruction of the object is carried out by a reconnaissance drone. A combination of FPV drone strikes with artillery and mortar fire is possible.



## 1. "Escorting the attack of an assault group with FPV drones"

(fire support of the actions of the attacking units)

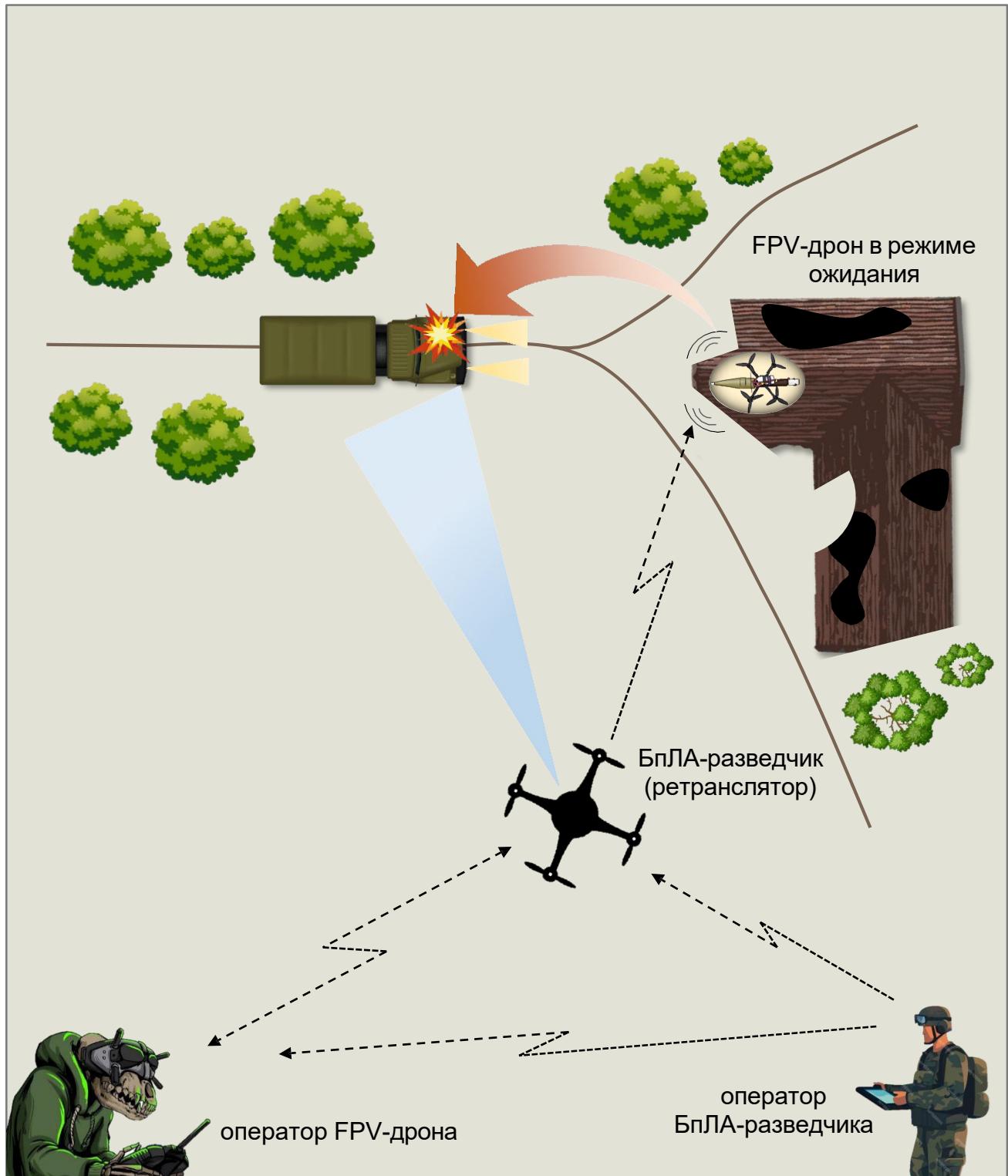
This method consists in a sequential attack on positions by FPV drones during the advance and offensive actions of the assault group. Control and coordination of the actions of units and operators is carried out through a reconnaissance UAV. A combination of FPV drone strikes with artillery and mortar fire is possible.



## 1. "FPV drone in ambush"

(landing and waiting – observation – surprise attack on the target)

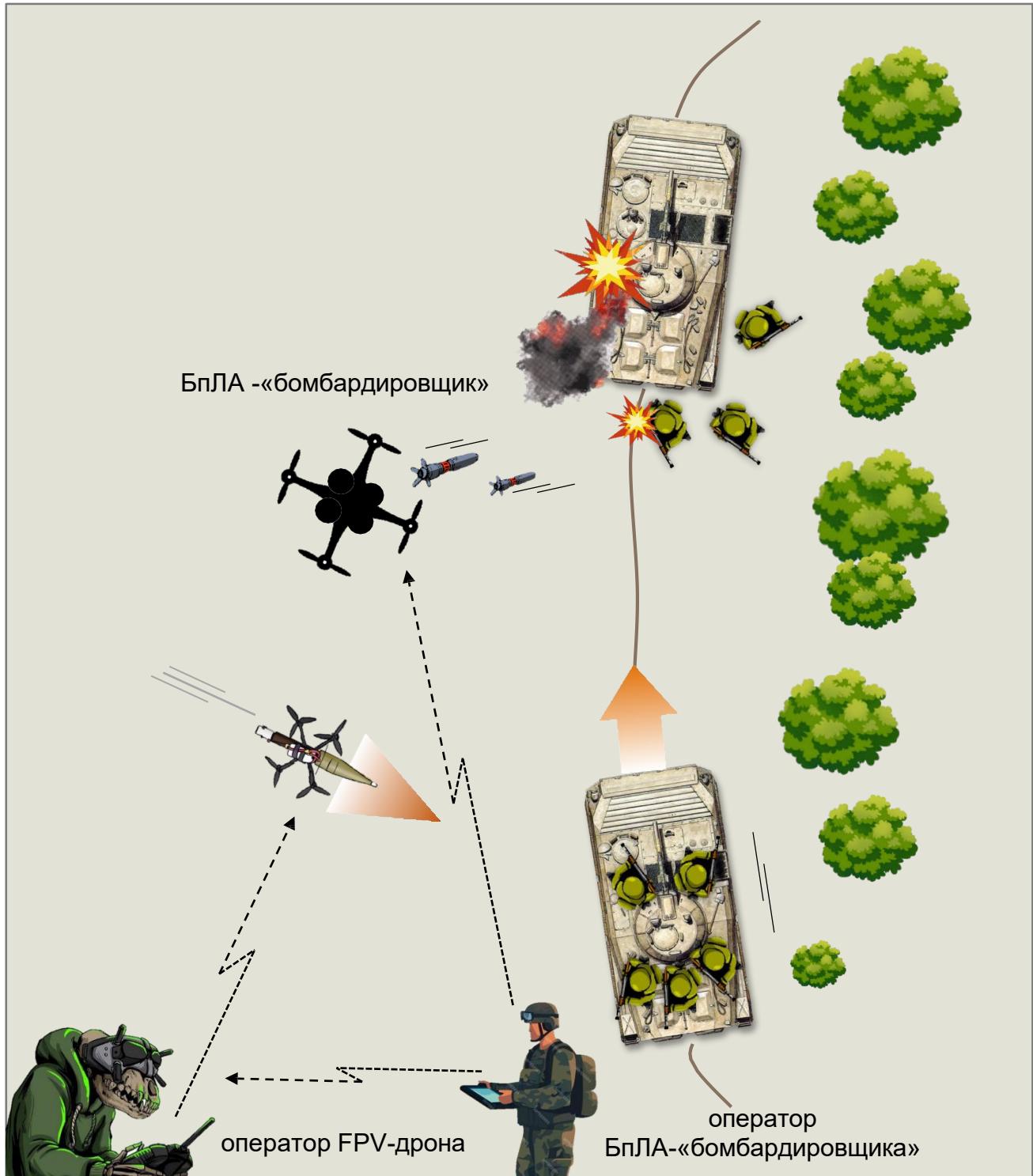
The tactical technique is based on the landing and occupation of a hidden position by the FPV drone near roads with heavy traffic, intersections, places of possible accumulation of equipment and personnel, followed by a surprise attack on the target. When working in tandem with a UAV repeater (reconnaissance): depth - more than 5 km, waiting time - up to 6 hours. (Only the control channel receiver is enabled). At night, attacks on the headlights of moving vehicles are possible, or the use of an FPV drone with a thermal imager.



## 1. "Combined Strike"

(FPV strike on the target - ammunition drops from a "bomber" drone)

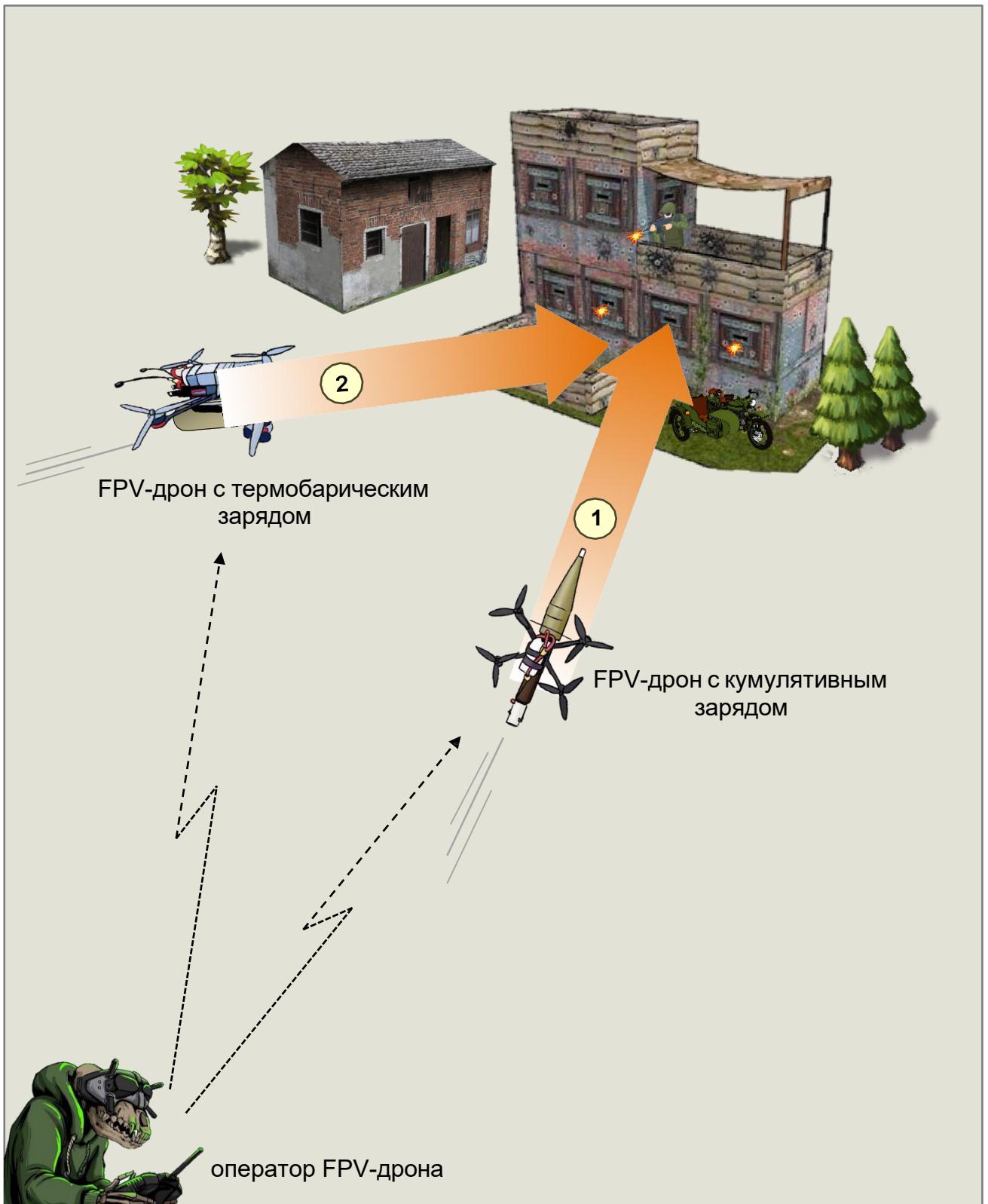
This method consists in solving the joint problem of FPV drones and UAVs. "bomber" to inflict complex fire damage on identified targets. After the destruction (disabling) of armored vehicles (object) by an FPV strike, the "bomber" drone drops ammunition on personnel during the evacuation. As another option: inflicting fire damage on personnel (unarmored vehicles) with drops in order to immobilize them, followed by the use of FPV drones.



## 1. «Double Strike»

(use of two or more FPV drones with different charges to make a breakthrough in the shelter and destroy personnel)

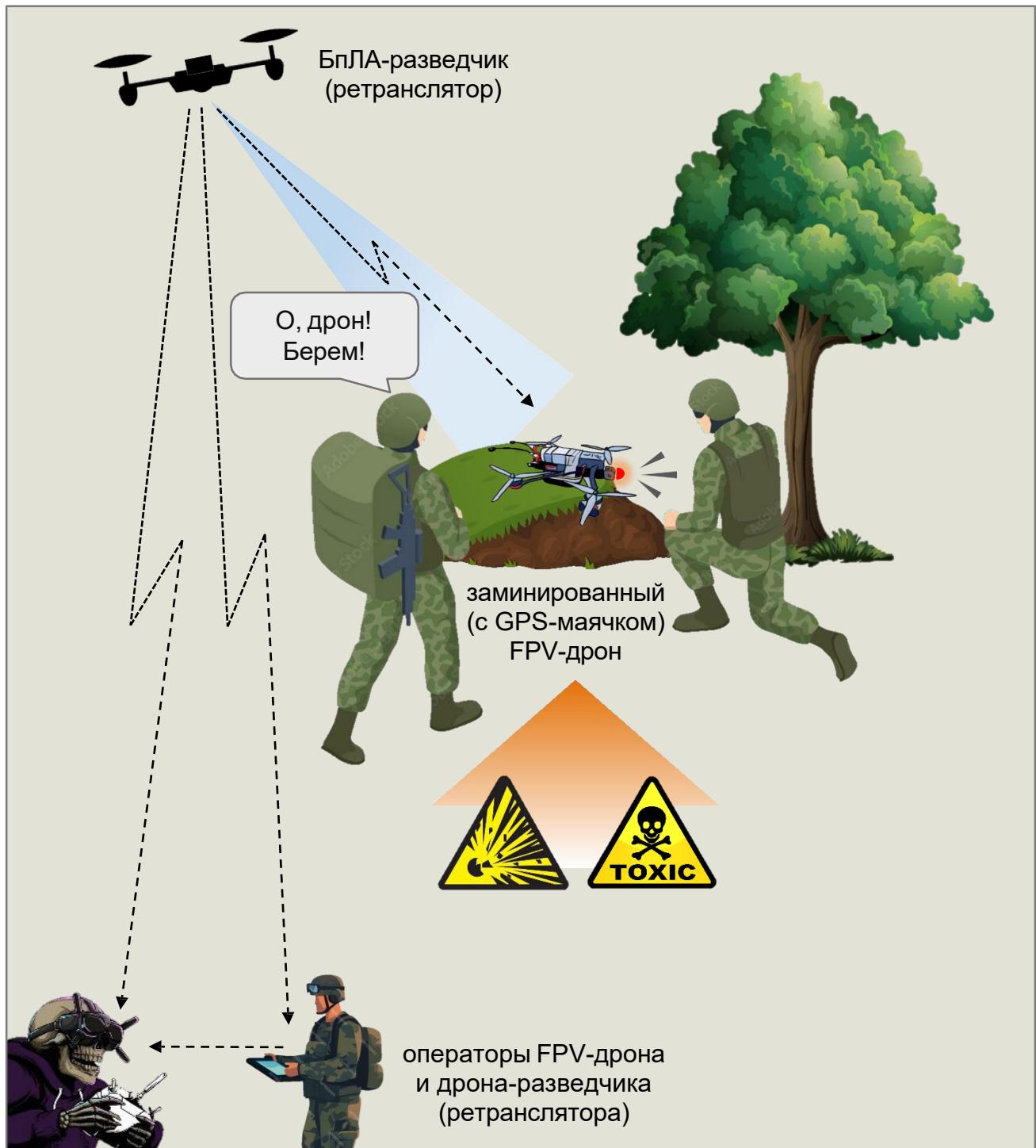
In order to destroy manpower in protected shelters, several FPVs are sequentially used: the first with a shaped charge - to break through the obstacle, the second, as a rule, - thermobaric or fragmentation action to inflict fire damage on personnel in the interior.



## 1. FPV Trap (Variants)

1. landing of the drone and sound signal – when approaching (captured), the FPV operator carries out a controlled detonation through the UAV reconnaissance aircraft (repeater);
2. when changing its position (due to a device of the "Jonik" type) – self-bursting (in addition, it is possible to install a magnetic target sensor on metal);
1. laying a 20-50 g charge in the drone structure, which is activated when it is dismantled;
  1. built-in GPS tracker, its tracking and "arrival" to the signal site;

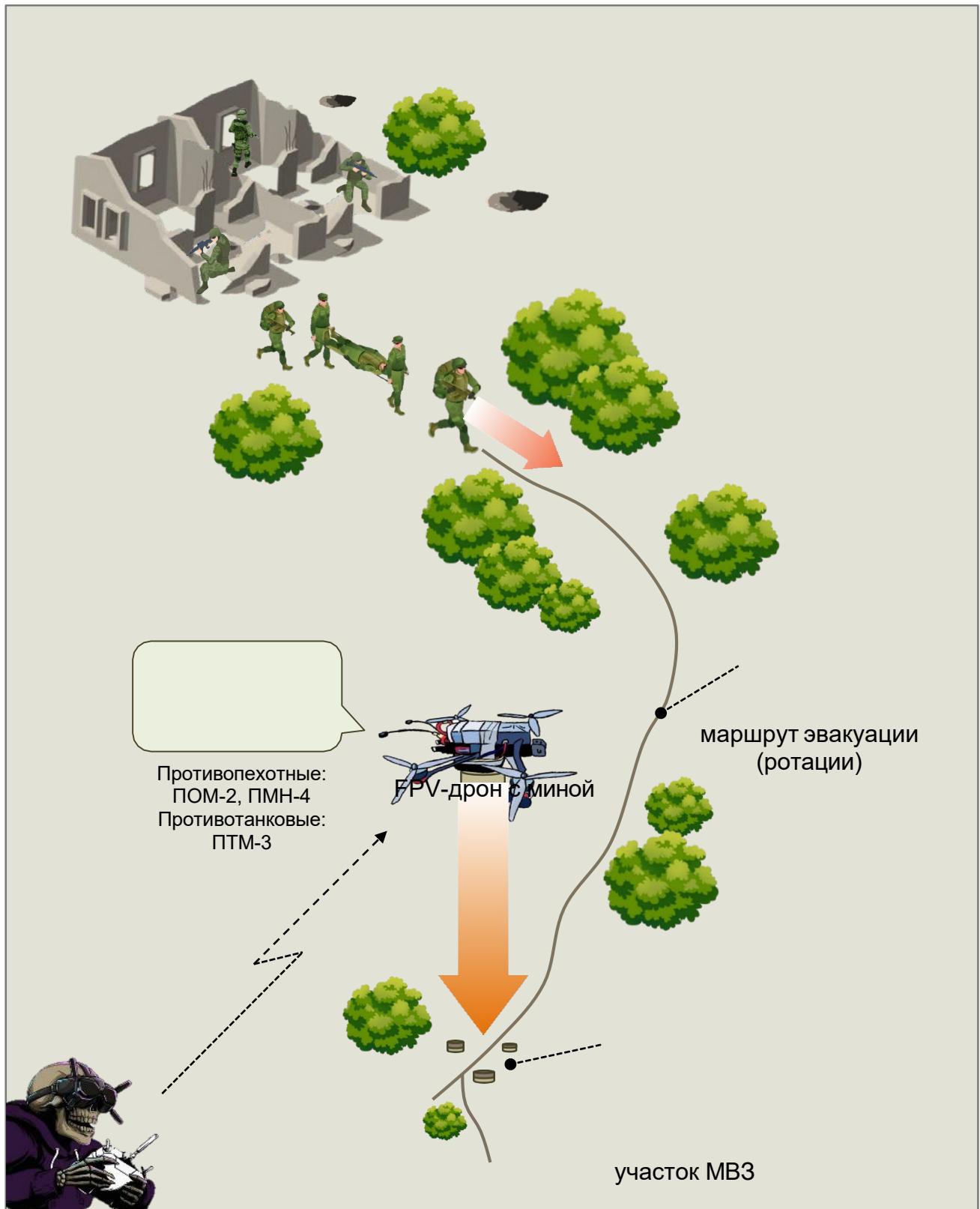
❖ обработка корпуса FPV-дрона сильнодействующими отправляющими веществами кожно-нарывного действия



## 2. «FPV-минер»

(delivery and emplacement of anti-personnel (anti-tank) mines camouflaged by IEDs on rotation and evacuation routes)

This tactic is used to covertly install anti-personnel and anti-tank mines, as well as camouflaged IEDs on rotation routes, evacuation routes or near positions (objects) to destroy manpower and equipment.

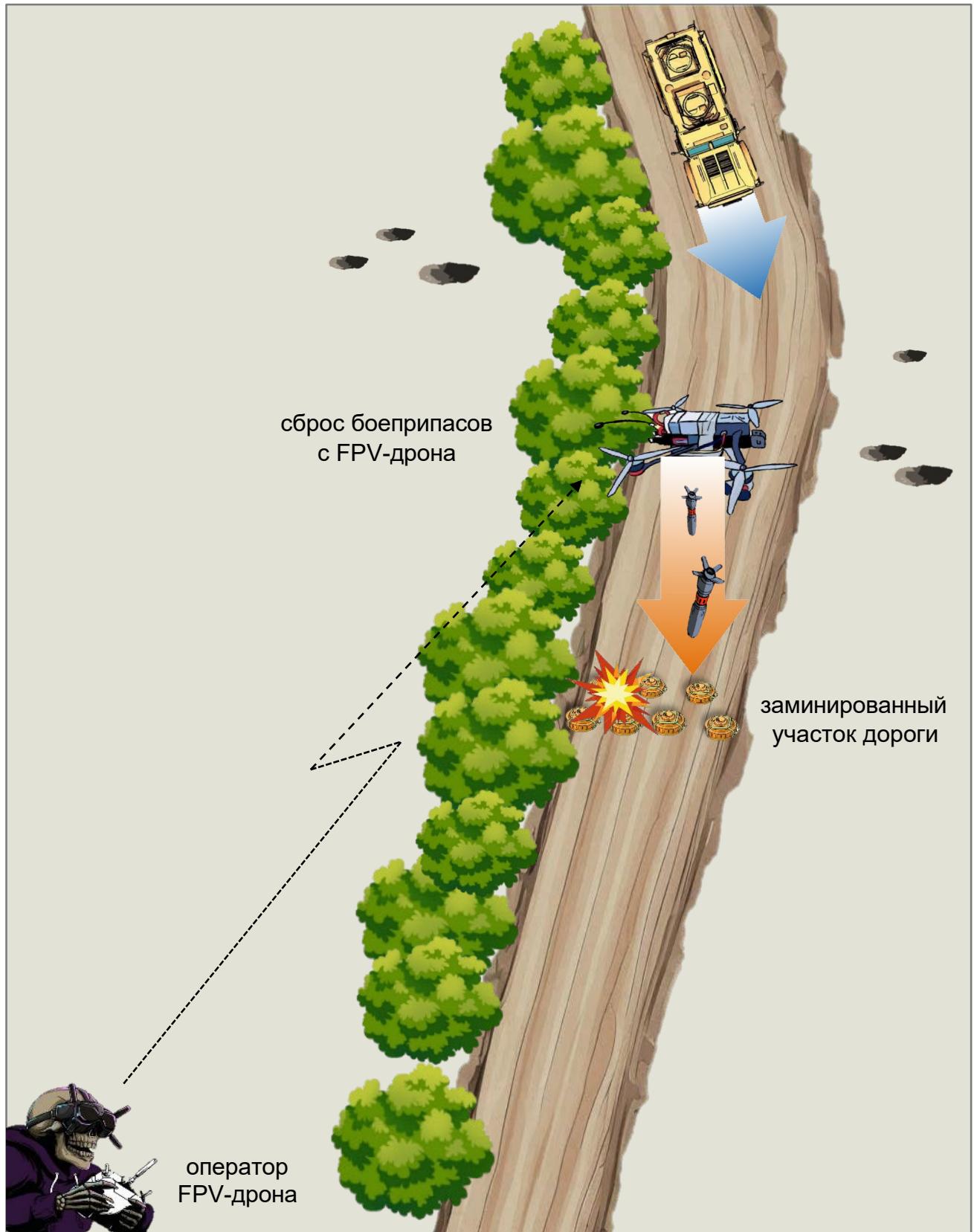


оператор FPV-дрона

## 1. FPV Minesweeper

(dropping ammunition or placing an overhead charge on mines)

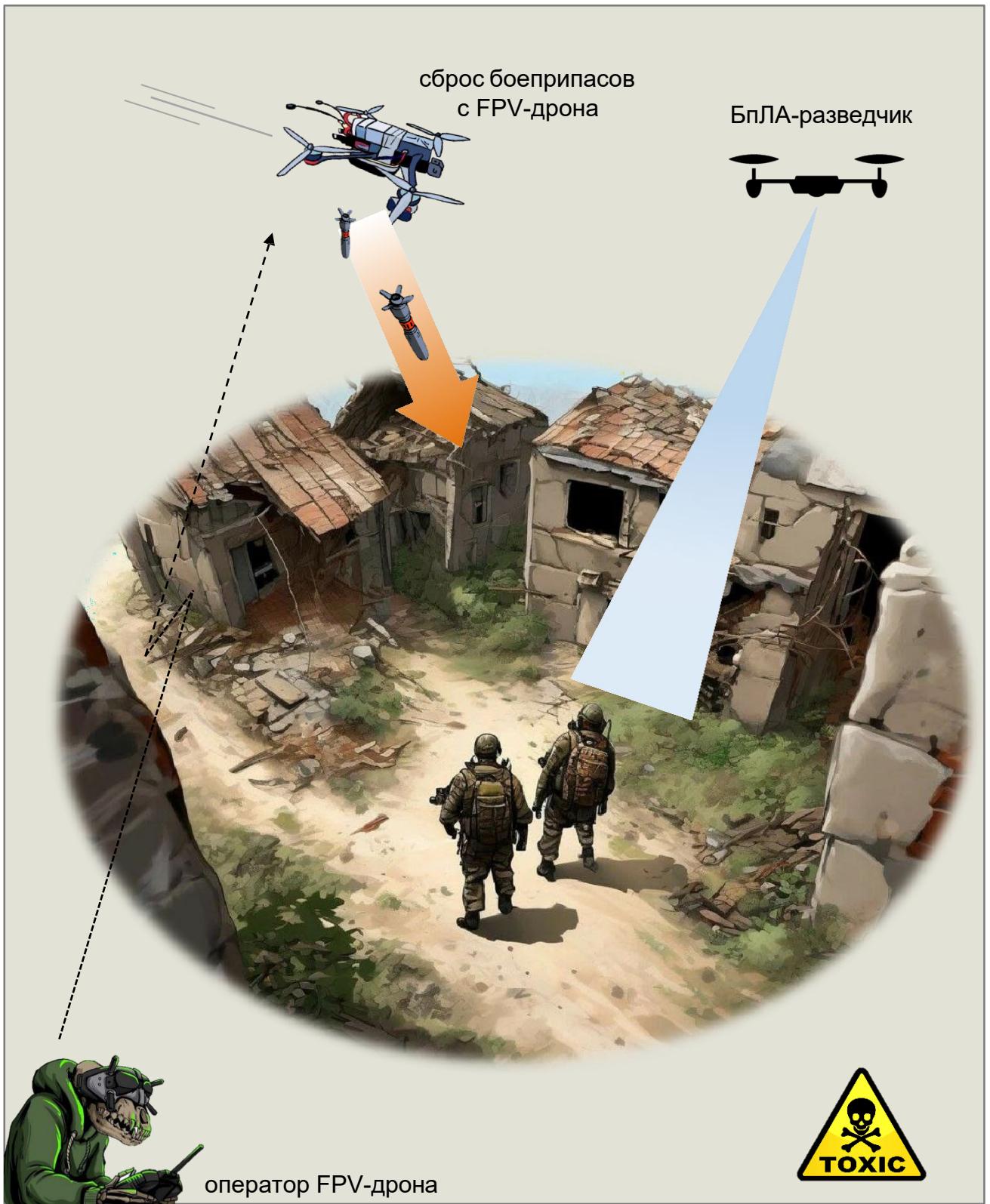
Demining of an area of terrain, as a rule, roads and paths, is carried out by dropping ammunition from an FPV drone or installing an overhead charge on open and uncamouflaged mines.



## 1. FPV Reset

(dropping ammunition on the target)

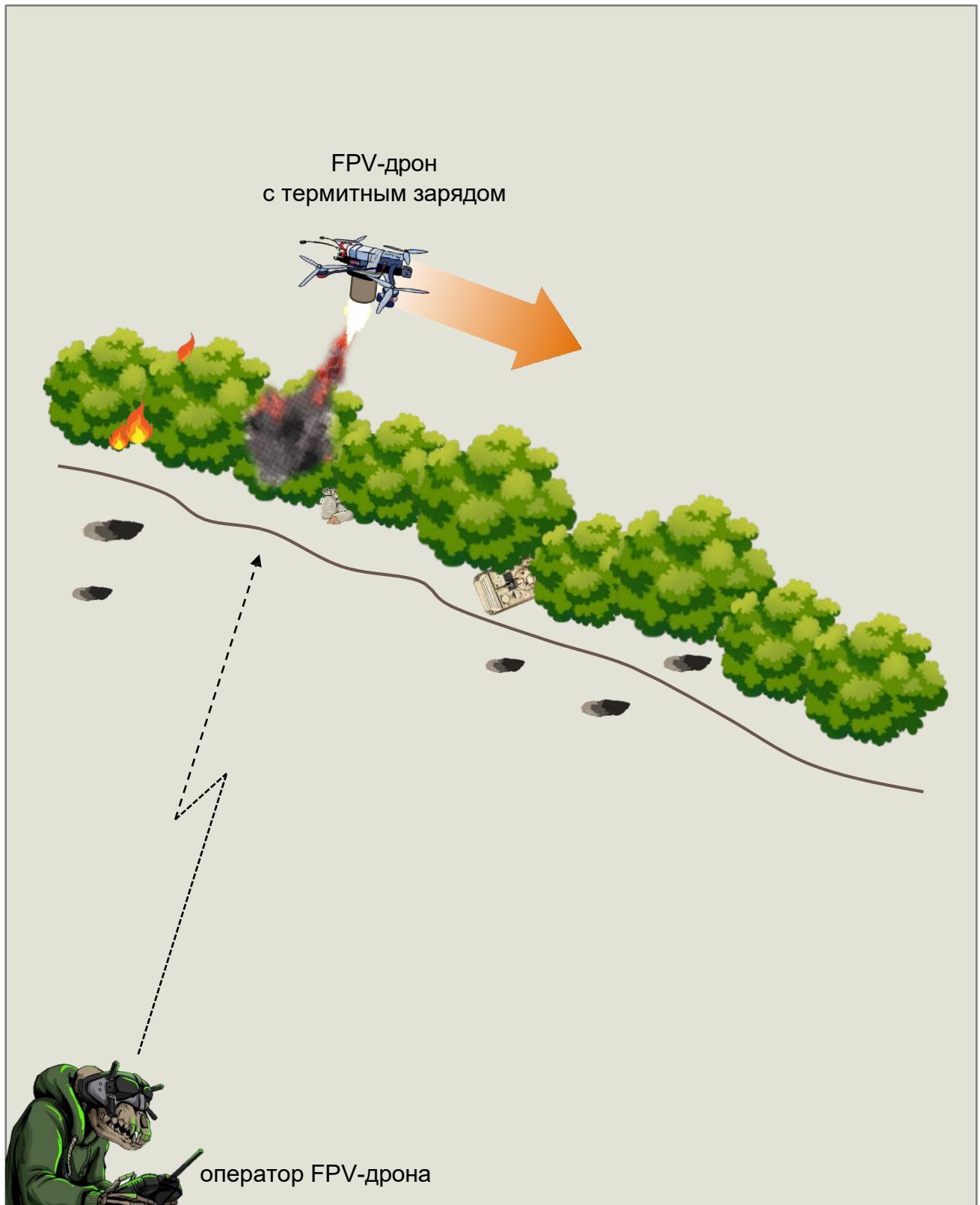
The tactical technique consists of dropping ammunition from an FPV drone to destroy personnel in an open area or in a poorly protected shelter ("burrow"). A reconnaissance UAV directs the FPV to the target. Cases of the use of ammunition with toxic substances have been recorded. In addition, this method is often used to drop payloads to your troops.



## 1. FPV Dragon

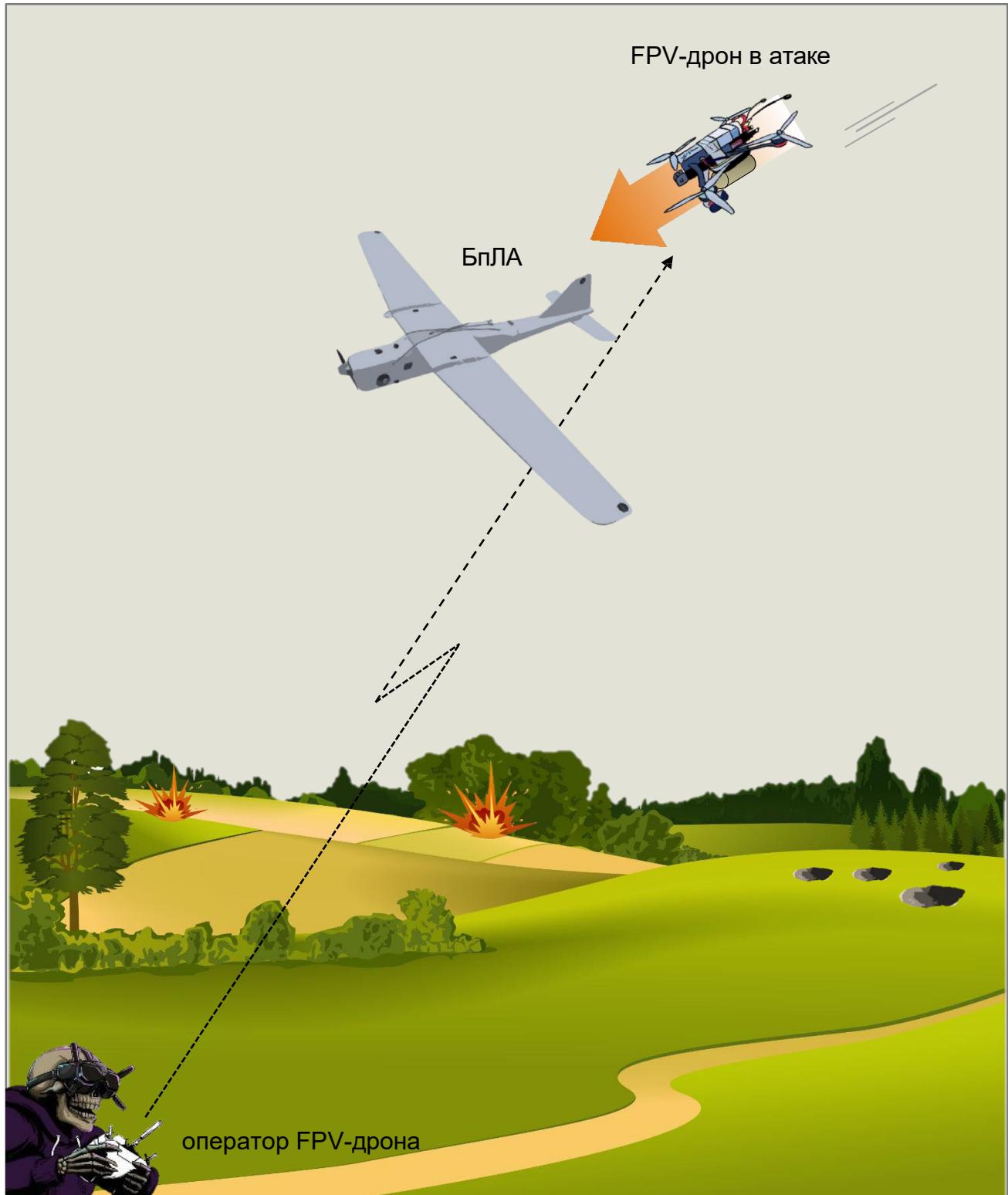
(spraying incendiary mixture over enemy positions)

FPV equipped with a thermite charge (based on a 120-mm artillery incendiary munition) is used to set fire to and disable personnel, equipment, openly placed ammunition and property. The average spraying height of the incendiary mixture is 20-50 m. Burning time is up to 2 minutes, the temperature is over 2300 degrees C.



## 1. FPV-Air Defense (UAV destruction)

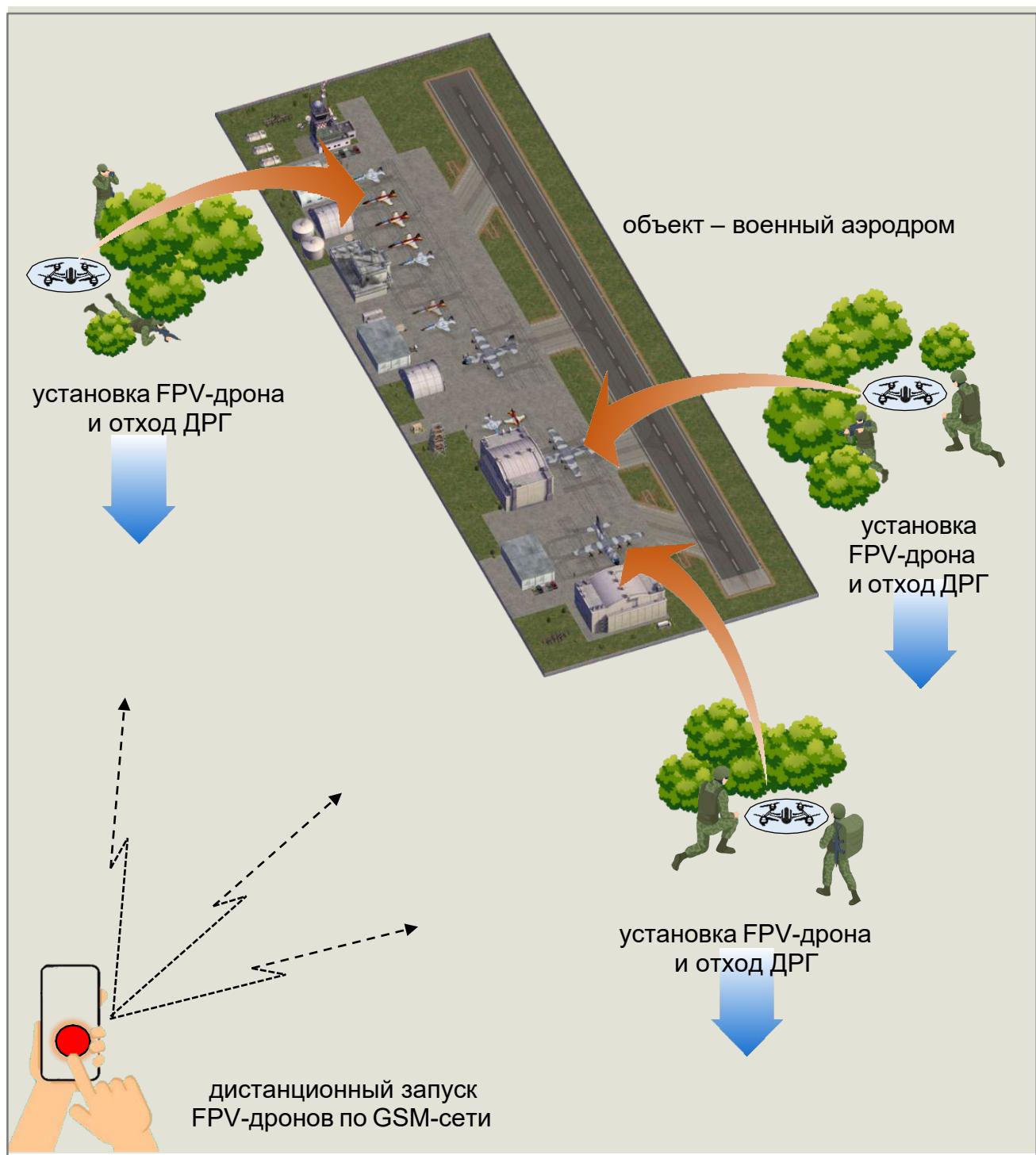
FPV drones are used to combat aircraft-type reconnaissance UAVs and hexacopters. When detected by UAV radio equipment (altitude - up to 3 km, speed - up to 110 km / h), FPV drones are launched to intercept and destroy them. Disabling UAVs is carried out by detonating a fragmentation charge on approach or ramming. Target designation is carried out by the radar operator.



## 1. "FPV-Sadivant"

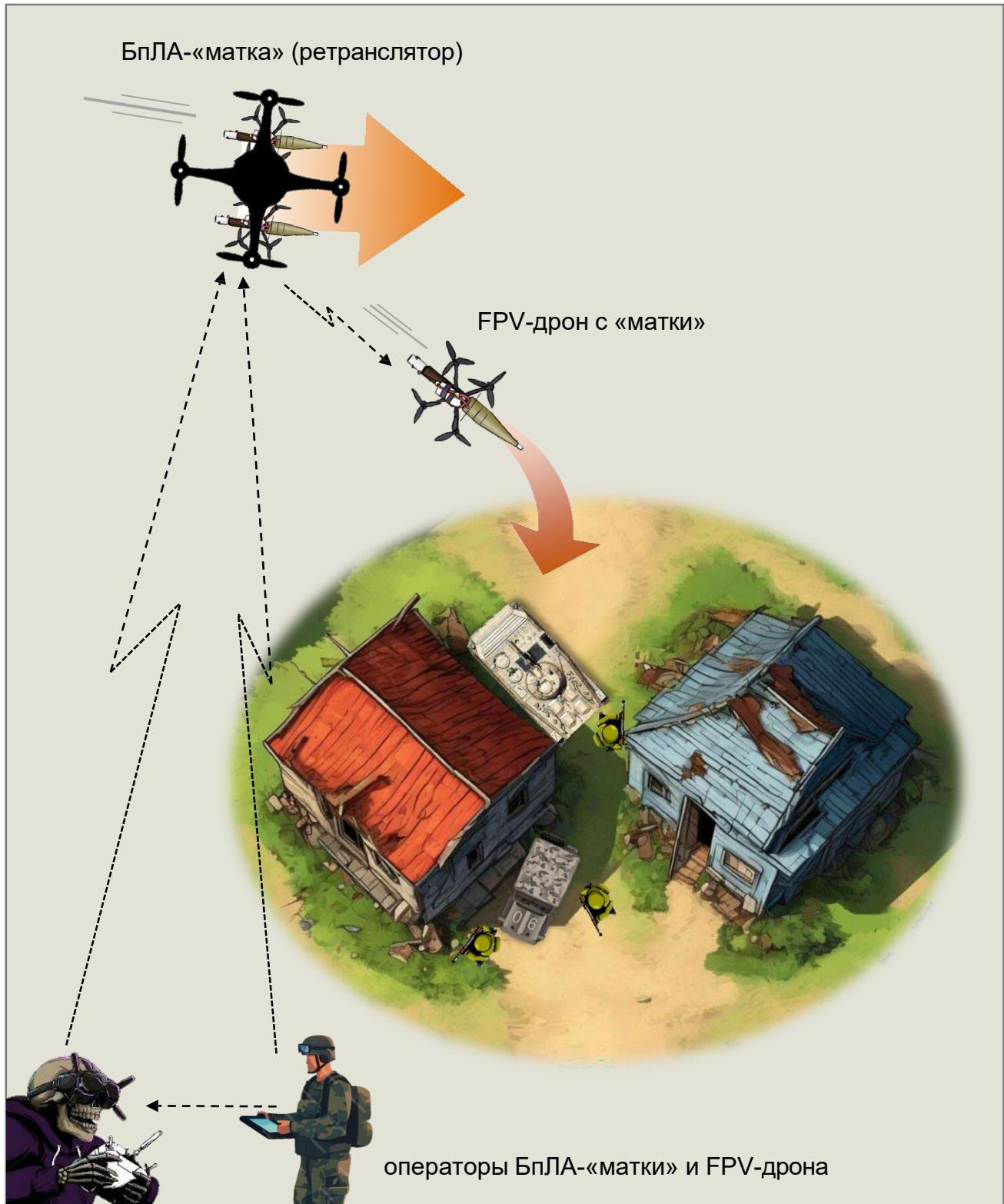
(covert installation of DRGs of FPV drones near objects in the rear - remote activation of them at pre-loaded coordinates)

This method of using FPV drones is used by sabotage and reconnaissance groups to destroy (disable) enemy military equipment and facilities. After the covert installation of sabotage and reconnaissance groups of kamikaze drones (4-6 pcs.) near the object at a distance of up to 2-3 km and switching to the "standby" mode, the UAVs are remotely activated by a signal from the GSM network to strike targets in accordance with the pre-loaded coordinates.



### 3. «FPV-на матке» (Increased Combat Radius)

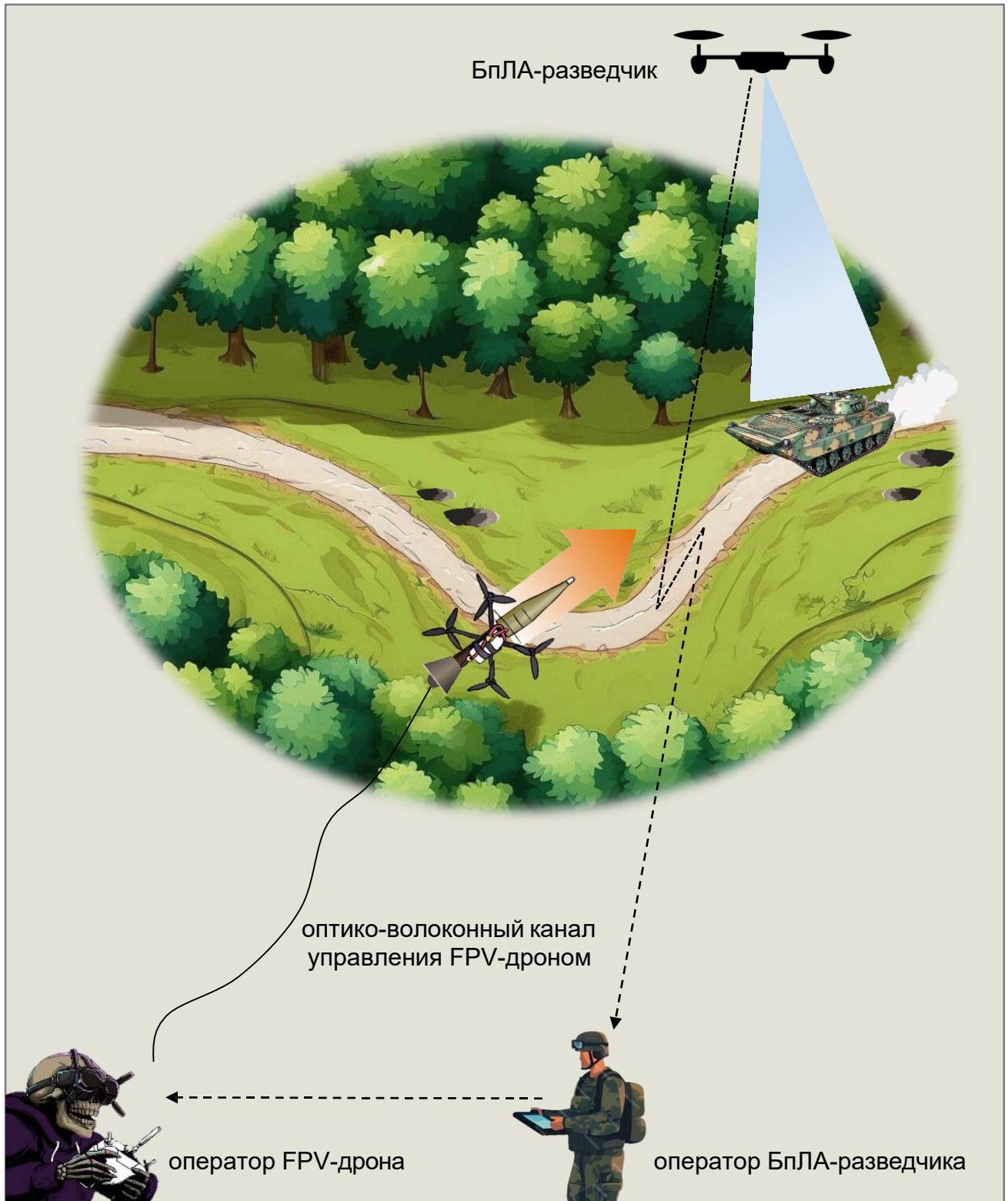
In order to increase the range of combat use of FPV drones, UAVs are used - a "mother" of both aircraft and "copter" types, which also act as a repeater. The total carrying capacity is two or three FPVs. At the same time, the range of their use (depending on the type of "mother") can be up to 60-70 km.



## 1. "FPV-on wires"

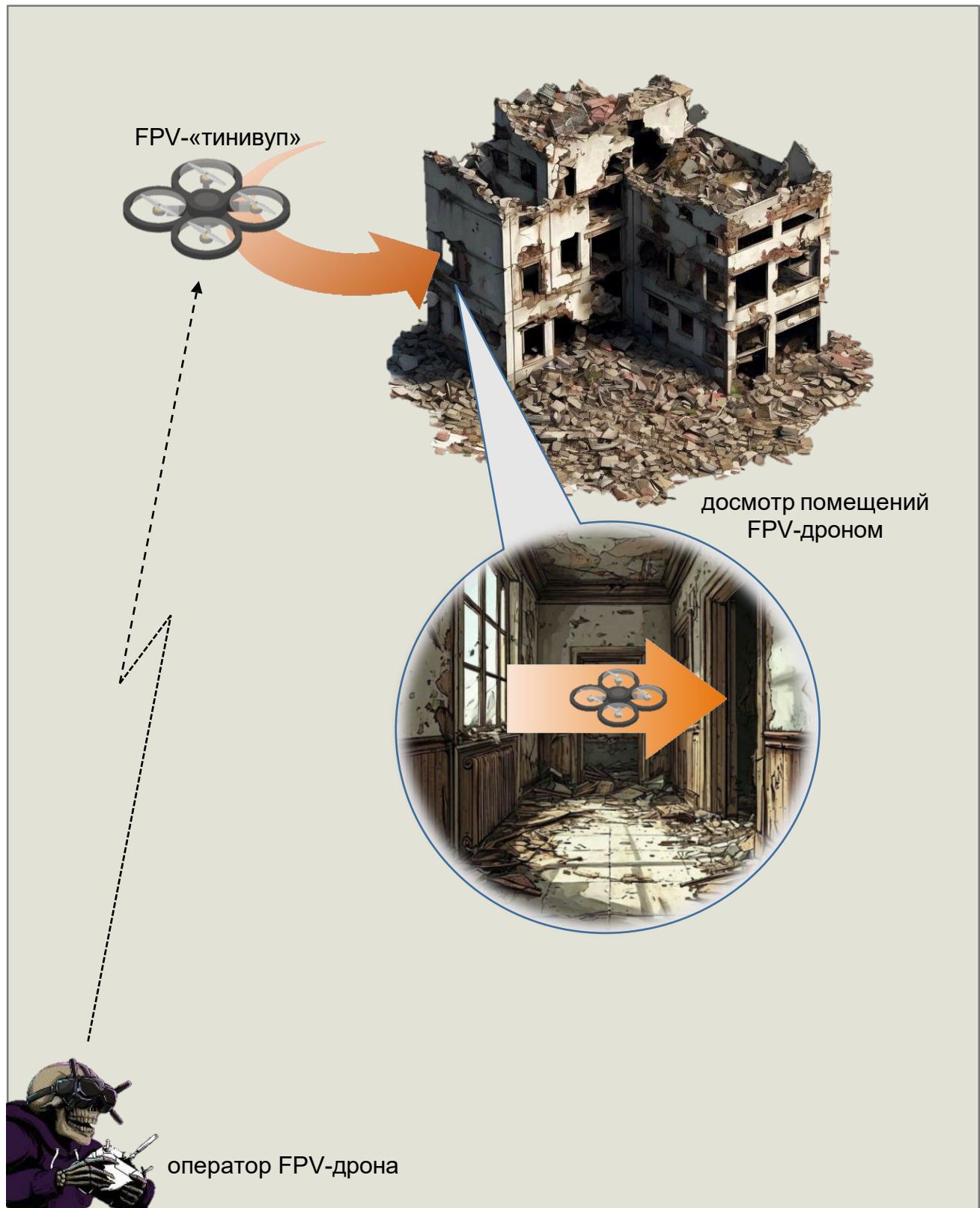
(ensuring stable control of the drone)

To ensure stable control of the FPV drone from the impact of electronic warfare and guaranteed destruction of the target at a distance of up to 10 km (in some cases up to 25 km), UAVs on a fiber-optic cable are introduced. A characteristic feature of their use is the clarity of the video image to the final point of the route. Features of application - prevention of sharp maneuvers, avoidance of fires on the route.



## 1. "Building Inspection" (control of premises inside buildings)

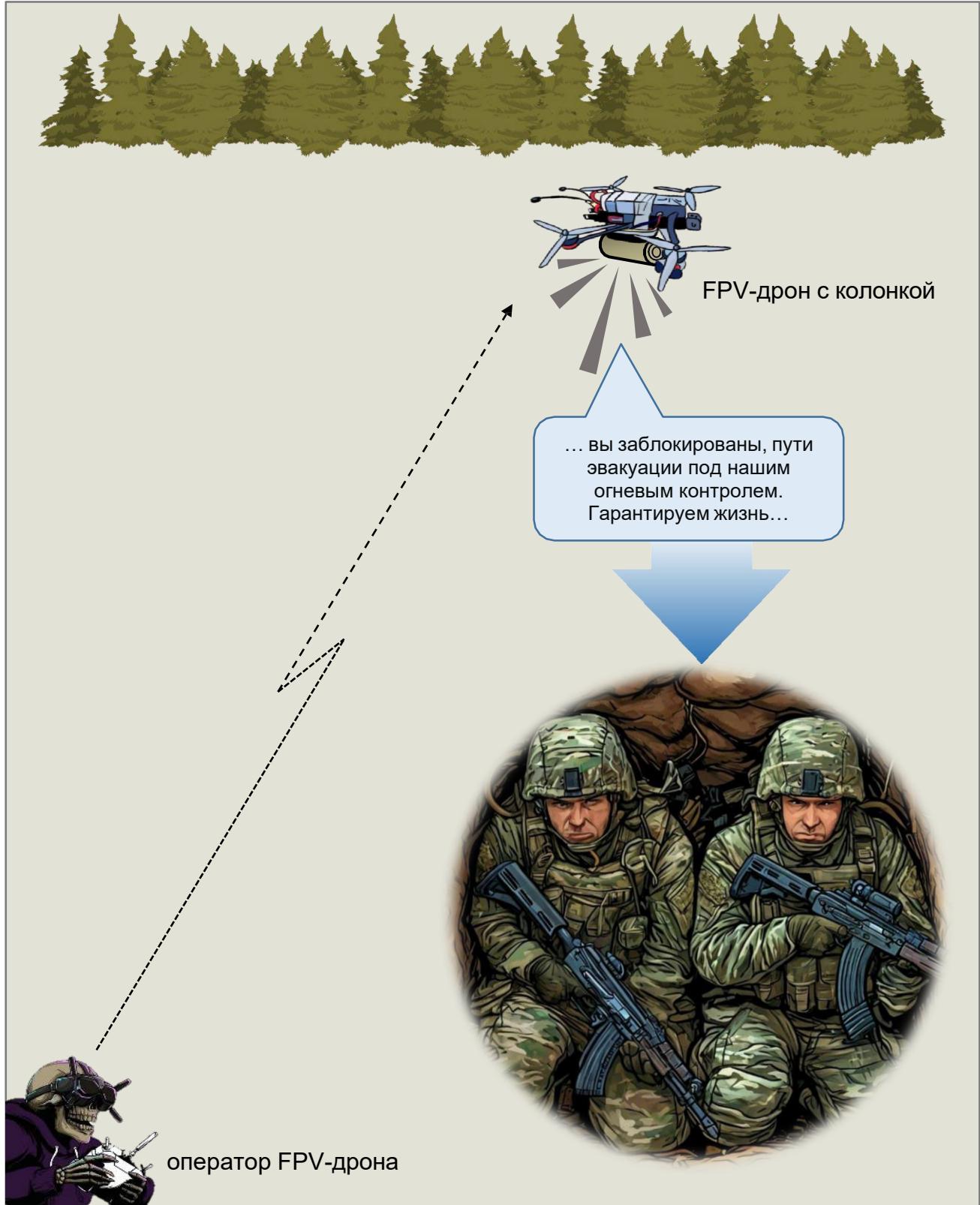
To detect the enemy and control the interior of buildings during assault operations, short-range FPV drones "tinivupy" (microcopter with blade protection) are used. General performance characteristics: dimensions up to 100 mm in diameter, weight - up to 50 g, flight time - up to 4 minutes, communication range (in buildings) - up to 500 m.



## 1. "FPV-obscenity"

(informational and psychological impact on the enemy)

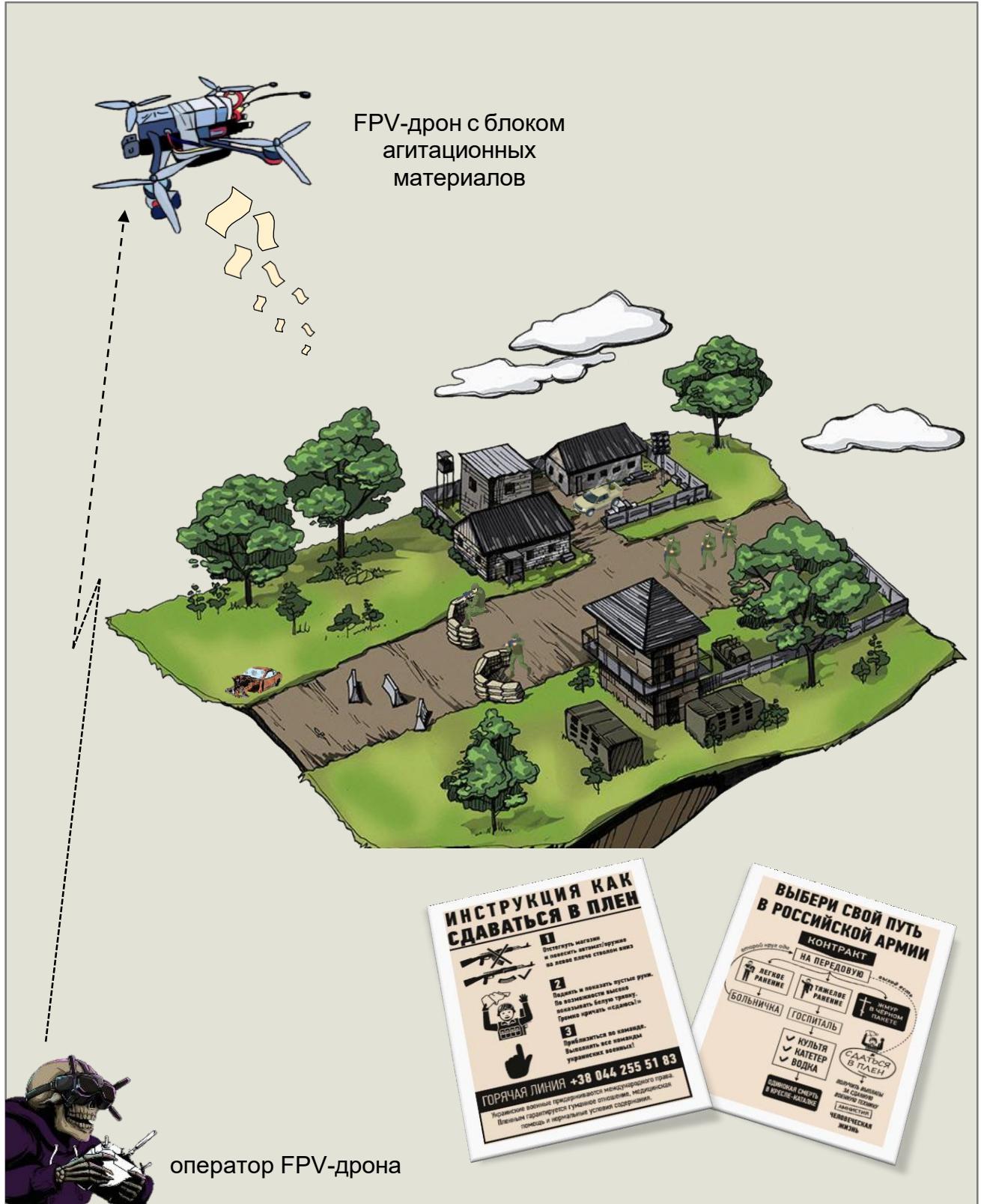
In order to reduce the morale and psychological state of the personnel and force them to surrender, FPV drones with speakers are sent to the positions to broadcast audio messages. Hanging height – up to 50 m.



## 1. "Flipping"

(dropping leaflets from an FPV drone on enemy positions)

As part of the information and psychological impact on the personnel and population, FPV drones are used by the enemy to drop leaflets. The weight of printed products is up to 2 kg (about 200 leaflets).



## 1. Ways to counter FPV drones

The fight against FPV drones provides for a comprehensive approach to protection against UAVs in the form **of active and passive measures** that must be implemented both in the unit and in the form of individual elements by each military serviceman.



**Active measures** include:

**identification and destruction** of crews of kamikaze drone operators (probable launch sites, presence of antennas, a specially prepared FPV launch site, traces of ammunition dismantling, packaging and boxes, inconspicuous cars, repeaters on high-rise buildings and infrastructure elements);

**early detection of UAVs** (visually, by ear, a signal from a detector or analyzer) **and notification** (receiving a command or message from a senior, observation post, neighbors about the presence of a drone in the area of your operations);

**electronic suppression** of radio frequencies by means of electronic warfare of control channels, video signal transmission and satellite navigation;

**reduction of the time spent in the probable affected area due to the speed** of the vehicle (a motorcycle of the "Induro" type at a speed of about 80 km/h overcomes 5 km in 4 minutes);

**fire impact** – destruction of drones by small arms fire, primarily from smooth-bore guns (up to 50 m);

**mechanical impact** – capture of drones through the use of special devices at close distances (20-30 m) – "net comets";

**maneuver** – actions of personnel to evade damage by a drone (dispersal, occupation of shelters, active movement in an open area under the threat of damage);

**ensuring the logistics** of ammunition, water, food for units on the LBS through the use of "heavy copters" and ground-based robotic systems for the delivery of goods and the evacuation of the wounded.

As a promising method of countering UAVs, developments are underway on **the optical effect** on the drone camera through the use of a laser device with a wide light beam.

**Passive measures:**

**additional fortification equipment of positions** (preparation of anti-drone niches and "burrows", bends at the entrance to dugouts and shelters, installation of hinged protective nets and barriers);

**camouflage of positions and equipment** (installation of camouflage nets with an irregular geometric shape with a distance to equipment of 0.3-0.5 m in the shade of trees and bushes, inside destroyed buildings, the use of heat-protective capes, control of unmasking signs from a drone);

**creation of false positions** (equipped with sources of heat and light) **with the installation of mock-ups of military equipment and vehicles** (including those unsuitable for operation) and imitation of their activities;

**installation of protective nets** (screens) made of fishing nets on the routes of rotation, evacuation of personnel, delivery of ammunition, water and food;

**installation of hinged protection elements** (canopies, canopies) **and "dome"** electronic warfare systems on equipment;

**taking into account weather conditions, terrain features and time of day** when planning active actions and movements;

**Installation of aerosol curtains, creation of smoke centers for positions (objects) and routes of movement** (including false ones).



## General recommendations for personnel on countering FPV drones (based on the experience of the NWO)

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The number of UAVs at the front is growing exponentially. The duty of drones in the air has led to decentralization and a reduction in the number of troops on the front line. Where there used to be a platoon, now they make do with a squad. Where there used to be a "defensive midfielder", now there are three "holes" of 2 people each. Both sides seek to minimize movement on the LBS. One "armor" can attract up to a dozen "birds", and 2-3 drones can participate in the race for the soldier. In the LBS area, reconnaissance drones, bombers and FPV crews are monitoring in shifts in their sectors in readiness for work. Some are searching, others are amazed.

### **Маскировка.**

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1. Disguise yourself from aerial observation, use canopies, fabric nets, branches, grass, foliage. They unmask the positions: plastic wrap, white bags, household garbage, fresh earth, movements of fighters.
2. From the air, you are less noticeable if you: do not move; you are in the shadow of buildings (objects); you sit, not lie down (you reduce your size); you match the color of the uniform with the terrain, that is, you do not fuss and do not "answer".
3. It is better to move and hide in the shade of trees and slopes. Do not make sudden movements and do not run – it is noticeable. Relatively safe time and weather - twilight, night, fog, rain. Protective capes from "greenhouses" are on topic.
4. Place and camouflage equipment in forest belts, along (inside) buildings and hangars, change its location, equip the simplest camouflaged sheds. Particular attention is paid to covering the windows of cars - glare. If the enemy is in the north, place the equipment behind the building on the south side.
5. Do not place the transport near the positions, put it in a hidden place for a fast "speed". Collect all garbage in bags and a separate pit. Scattered ration packages, cans, plastic bottles, polyethylene perfectly unmask the position. To control camouflage "quietly", launch your drone and inspect the area for unmasking signs.
6. Camouflage nets are always needed in large numbers. When installing them, change their configuration, the more incomprehensible and blurry the silhouette, the more difficult it is to detect the object. Satellite dishes heat up, hide them in a pit and mask them from both day and thermal imaging cameras.
7. Create false positions with unmasking signs. Install mock-ups of military vehicles or disabled vehicles. Simulate their activity. Make a fire in empty shelters at night, place "trench" candles.

1. At night, observe blackouts. Fire from a cigarette, a fire, the light of a flashlight, headlights, phone screens - attracts drones like moths to the flames.
2. Conversations "for life" are only in hiding. There is no need to "pile up" with cigarettes if you get bored. Do not shy away from positions. If called on command, warn another fighter. The main criterion for detecting you from the air is movement during the day and thermal glare at night. Keep quiet, try to communicate in whispers and gestures, listen to sounds.

### **Fortification and transport.**

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1. When equipping the trench, make a side niche at the bottom - it will protect against shrapnel during shelling, FPV strikes and ammunition drops. Exits from dugouts are in the shape of the letter "L". Hang a protective blanket at the entrance to the shelter. Equip the second entrance to the dugout (the first one can be blocked as a result of a hit).
2. As obstacles for FPV drones in front of the positions, prepare and fix corded anti-drone curtains made of ropes 4-5 mm thick: length - 6 m, height - up to 4 m, interval between hanging ropes - 20 cm.
3. Another option for protection is to install screens made of cheap fishing nets (length - up to 80, height - 4 m, cost up to 1000 rubles) - they are invisible to the operator, equip additional canopies and canopies. If there is no ingenuity, there is no shelter!
4. It is advisable to prepare and install smoke grenades at the position (at a distance of 20-30 m) in advance to activate them in the event of a threat of kamikaze drone strikes. Each has instantaneous hand smoke grenades.
5. The presence of additional protection elements on the equipment ("canopies", "braziers", shields, nets, chains, anti-fragmentation protection in the form of pieces of rubber 1 cm thick on "self-tapping screws"), will increase the survivability of the crew and passengers when attacked by drones. The main thing is not to overdo it.
6. The desired ideal option for electronic warfare equipment at the platoon position is a spectrum analyzer and a UAV detector, a device for intercepting video images from FPV drones, a portable broadband "dome" electronic suppression system, individual mobile "suppressors". On the equipment - a suitable version of the "dome" system. It's fat, but it doesn't hurt to dream.
7. To get a positively recommended electronic warfare drone jammer for equipment is military happiness. Do not cover it with a camouflage net. Control the battery charge of the miracle device. It's sad when, on a task, you thoughtlessly "turned off" the machine and unconsciously ended up without a "dome". Wait for the evil spirits...
8. In order to combat "hunters" for aircraft-type UAVs, it is necessary to install onboard electronic warfare equipment on the devices.

9. How else can you influence the video transmission channel of an approaching enemy FPV drone? To detect it, you can use an FPV monitor or glasses that search for a transmission channel (usually 5.8 GHz). On the video transmitter of your drone, the same channel and maximum power are set. After launch, interference is created with the control of the video image transmission channel (drones "operate" on the same frequency).

10. Mechanical robotic platforms and "heavy" drones for the logistics of ammunition, water, food and evacuation of the wounded significantly reduce personnel losses from FPV drones. We are looking forward to it.

### **Действия при обнаружении дрона.**

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1. Always listen to the sounds, feel the "sky". Initially, detection by sound (you can hear better at night), then visually. Spread your ears like Cheburashka's and look "both ways". Notify in a timely manner. Perceive all UAVs as enemy.
2. Learn to distinguish Maywick from FPV by sound. The first works quieter and smoother, the second is more piercing and with sharp drops when accelerating.
3. In order to improve safety, the movement should be carried out (in time and place) based on the analysis of the activity of enemy drones in a specific area of hostilities (the enemy knows about the "gray" time).
4. Try to avoid the "postcard", move along the plantings, in the settlement - from building to building. The interval in the "three" is at least 5 m. It is desirable to move covertly along the "threes" to the control point (shelter).
5. The Scout Drone is a harbinger of FPV. If you find an enemy UAV on the move (including in a car), do not lead it to your own. Take cover, wait, observe and do not reveal the positions of your unit. When planting, lean against the tree trunk and do not move.
6. Always in the course of movement, control of the "sky" by sectors. Keep your distance and spot the nearest shelters (destroyed buildings, "burrows", plantings, bushes, etc.) for a "dash" in case of a threat of being hit by a drone. A shell crater, as a "safe place", will act as a grave. Do not gather "in a heap" in one place. Concentration, maneuver and speed.
7. I heard FPV - urgently take cover. If you are on a "postcard" – make sudden movements. Leave the operator's observation sector, (fall) to the side when attacking. Masters of "shuttle" running have more chances. It is advisable to practice.
8. If the drone is in close proximity (20-30 m) – do not try "freeze" in the hope that he will not notice and fly by. Stir the tomatoes! Salvation is in reaction and movement.

1. Small arms fire is ineffective (small target size, high speed). In addition, when shooting, you are static, which makes it easier for the operator to aim the drone. At close range (up to 50 m) there is a chance for a shooter (preferably two) with hunting or pump-action shotguns. To prepare them, train on "plates".
2. There were cases of the operator playing with the "victim". If you are frisky and skillfully dodge, hide behind shelters (a tree trunk of 40 cm is also an option), and are also able to attack the drone by throwing "dryn" or other objects, the chances of survival increase. Almost fixed.
3. When moving on transport, special attention should be paid to controlling the "sky" from the rear and flanks (up to 80% of FPV drone attacks are on the rear and sides of the vehicle).
4. Move at the safest speed in dangerous areas. Do not choose long routes. When a kamikaze drone is detected, it is advisable to move to the side (preferably to a forest plantation, to buildings), stop and quickly disconcentrate. The chances of escaping from FPV on the highway are negligible.
  1. When the car stops, everyone leaves the transport very quickly, no one "huddles" and argues who will unload the ammunition. Otherwise, the priority of the goal increases. Time plays against you.
  2. The availability of high-speed motorcycles such as "induro", "buggy", ATVs with trained drivers contributes to increasing the survival rate and ensuring the logistics of goods in the LBS area. At the same time, electric samples provide noiseless movement and higher sensitivity of drivers and passengers to early detection of drones by sound.
  3. Extreme driving requires serious training of drivers. Train day and night. Be able to identify and remember landmarks during the day and then find them at night.
  4. If you find an FPV drone on the ground (especially if it "squeaks" near positions), you should not happily run to it with splayed fingers in the hope of a new trophy. Perhaps a "trap". Do not approach from the side of the camera (the cameraman is waiting for you to appear in the frame), do not touch, mark with a pole, report to the commander. A specialist will figure it out.

### III. Заключение

Thus, the technical leap in the use and adaptation of FPV drones to the modern theater of operations has led to a significant expansion of the range of combat missions they perform.

The demand for combat units in trained and provided crews of "kamikaze" drones exceeds the supply in the "war" market. The innovative development of this type of weapon will undoubtedly entail the search for and implementation of new technical solutions and methods of counteraction (radio-electronic, optical, mechanical, etc.), as well as lead to the creation of separate structural units (crews), both for their use and combating them. At the same time, in the near future, certain elements of counteraction will affect each serviceman of combat units. Competitions in the category of confrontation "drone - anti-drone" are just beginning...



**Без труда, не выловить  
и дрон врага!**

