The turret of the T-72, T-90 and T-80U modifications only penetrates the mask guns, weakened areas, sides and stern.

On April 1, 2022, in the Kharkiv region, servicemen of the 95th Airborne Assault Brigade of the Armed Forces of Ukraine shot down a Russian Mi-8 helicopter from the Korsar ATGM. The downed helicopter spun and collided with another Russian Mi-8 flying behind it. As a result, both helicopters fell and crashed with all the crews and troops on board.

Safety precautions: there should be no walls or other obstacles behind the ATGM at a distance of at least 10 meters in sector 300. Launching should be done only with headphones and a helmet, or with a helmet-mounted intercom.

Preparing the Corsair ATGM for firing and firing a shot

1. Install the tripod (Fig. 5.4.2). Place the tripod on the tripod base.
the launcher by connecting the launcher mount with the tripod grooves and securing it with the mount lever (Fig. 5.4.2).

Figure 5.4.2 – Installing the tripod and trigger. Red arrow – mounting lever

2. Remove the red plug from the connector and move it to the right side in front of the starting handle (Fig. 5.4.3).

3. Move the starting handle to the starting position by pressing the clip.
on top of the handle and turn the handle clockwise (Fig. 5.4.3).

Figure 5.4.3 – Left – removing the plug; Right – the start handle, the plug has been moved in front of it; red arrow – the direction of movement of the start handle

4. Remove the plug that covers the laser and optical channels. Remove
Remove the cap from the scope eyepiece and adjust the sharpness to your eye (Figure 5.4.4).

Figure 5.4.4 – Laser and optical channels; Arrow – sight eyepiece

5. Install the rocket on the launcher, connecting their grooves (Fig.
5.4.5), after which we push the rocket forward with a sharp movement of our hand until it clicks.

Figure 5.4.5 – Rocket installation. Red arrow – direction of movement when connecting; Blue arrow – launch handle

6. Fix with the rear clamping lever (Fig. 5.4.6)

Figure 5.4.6 – Red arrow – Rear clamp lever and direction of movement

7. Remove the rear and front protective black covers from the rocket tube.

8. Take a sitting or kneeling shooting position and press the complex activation button (Fig. 5.4.7).

Figure 5.4.7 – Firing position. Red arrow – sight eyepiece; Blue arrow – complex activation button

9. A green indicator will flash in the lower right part of the eyepiece, indicating means that the complex is operational, but the fuse is not switched to combat mode position.

10. Move the trigger handle to the firing position by pressing the clip. on top of the handle and turn the handle clockwise. After 8 seconds, the flashing indicator in the eyepiece will turn solid (non-flashing) green, indicating that the ATGM is ready for combat launch.

11. Keeping your hands on the flywheels vertical and horizontal guidance, we bring the center of the sight reticle to the target. With our right thumb we press the trigger (Fig. 5.4.8 – marked with an arrow).

12. After the launch of the rocket, its entire During the flight, we keep the center of the reticle on the target, following it if it moves. *Figure 5.4.8 – Start button*

Chapter 5. Stugna-P ATGM

Portable anti-tank missile system "Stugna-P" (Fig. 5.5.1) is designed to engage moving and stationary modern armored targets with combined, spaced or monolithic armor, including those with dynamic protection (i.e. **all Russian tanks** in any location of impact), as well as small-sized targets such as long-term firing points, lightly armored objects and helicopters. Thus, in early April 2022, servicemen of the 95th ODShBr destroyed a Ka-52 attack helicopter of the Russian troops in flight with an accurate launch of the Stugna-P missile.

Figure 5.5.1 – Stugna-P ATGM with RK-2S and RK-2M-K missiles

The Stugna-P ATGM uses a semi-automatic laser beam guidance system. Target detection and guidance are provided by optical and infrared sights, which allows firing in difficult weather conditions (Table 5.4).

Table 5.4 – TTX of the guidance devices of the Stugna-P ATGM

Sight	Target detection distance type "tank" during the day, m	Detection distance of a tank type target at night, m
Mon-Thu	6500	2500
Aselsan Eye-Lr S	12000	5600

A feature of the ATGM is the ability to guide the missile at the target from closed positions and shelters, which reduces the risk of the gunner being hit by enemy fire in return. Another distinctive feature of the complex is the missile's flight trajectory: after launch, it flies above the sighting line (at an altitude of about 10 m) and descends to the target level at the final stage of the flight. The laser beam shines into the tail of the missile and is transferred to the target only a fraction of a second before impact.

up to 50 m. This is safer and (with certain approaches) can be achieved. The operator can be at a considerable distance from the lau
control of several PUs located at a distance by one person.

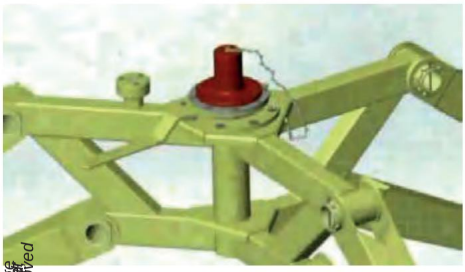
To combat infantry, field artillery, machine gun positions,

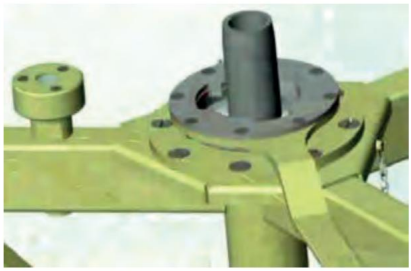
high-explosive fragmentation warhead. enemy, the greatest effect will be brought by shelling with RK-2OF, RK-2M-OF missiles with

the characteristics of which are presented in Table 5.5. 2M-K) and high-explosive fragmentation (RK-2OF, RK-2M-OF) warheads, tra

Rocket	RK-2S	RK-2M-K RK-2OF	RK-2M-OF	
Shooting distance during the day, m:	100-5000	100-5500	100-5000	100-5500
Shooting distance at night, m:	100-3000			
Flight time to maximum armor penetration for	no more than 25			
DZ, mm distance, s	900	1100	60	120

1. We unfold the ATGM tripod.
2. Remove the red plug from the tripod (Fig. 5.5.2).





install the platform on the tripod (Fig. 5.5.3) and turn the locking lever to 3. Remove the rubber plug in the lower part of the rotating p
"closed" position.

4. We install the PN-I guidance device on the rotary platform and
fix with the locking lever (Fig. 5.5.4).

5. Open the guidance device window and connect the power cable
from the rotary platform to the guidance drive (Fig. 5.5.5).

(Fig. fix 5.5.6).

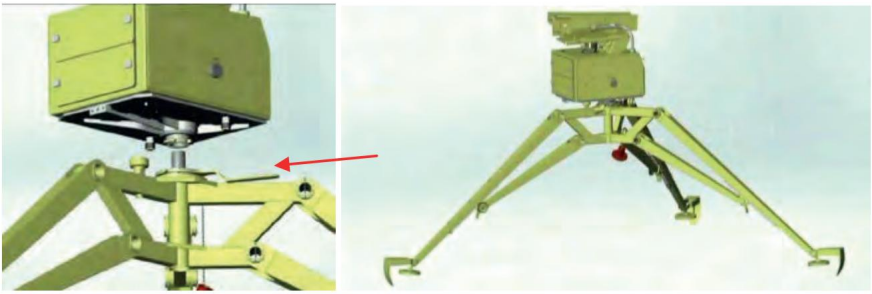


Figure 5.5.3 – Mounting the turntable on a tripod. Arrow – locking lever and direction of movement

Figure 5.5.4 – Installation of the PN-I guidance device on the platform

Figure 5.5.5 – Opening the window of the PN-I guidance device (left) and connecting the guidance device power cable

Figure 5.5.6 – Fastening the MSW and its cables

7. Connect the cable connecting the turntable to the control panel (Fig. 5.5.7).

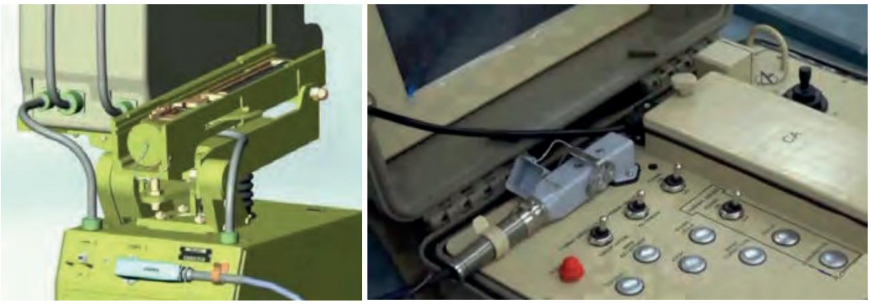


Figure 5.5.7 – Connecting the control panel to the turntable

8. Remove the plug on the guide (Fig. 5.5.8).

Figure 5.5.8 – Plug installed (left) and removed (right)

9. We install the rocket in the tube on the guide and move the tube forward fix; The white lines on the tube and on the guide should match (Fig. 5.5.9).

Figure 5.5.9 – Installation and fixation of the rocket, arrow – direction of movement

10. After completing the assembly, remove the front and rear caps from the rocket tube. 11. Place the ATGM in the

firing position, unwind the cable coil and move the control panel to a safe, concealed location.

Shooting from the Stugna-P ATGM

The entire process of firing at the enemy is carried out from the remote control (Fig. 5.5.10).

Figure 5.5.10 – Controls of the control panel, on the right – joystick for precise targeting of the missile

1. Turn on the power with the **"power" toggle switch.** The **"combat"** toggle switch **mode/survey"** to **"survey"** (Fig. 5.5.10).

2. If a PN-I camera is used, then switch the toggle switch **"thermal imager/TV camera"** to **"TV camera"** and the **"image correction"** button adjust the image to your vision (Fig. 5.5.10). 3. When

using a thermal imaging camera, turn on the **"thermal imager power" toggle switch,** switch the **"thermal imager/TV camera"** toggle switch to **"thermal imager"** and adjust the image with **the "calibration"** and **"focus"** buttons (Fig. 5.5.10).

4. Aim the crosshairs on the monitor screen at the target and press the button **"Enter distance"** enter the required distance to the target; if necessary, enlarge the image with the **"zoom"** button (Fig. 5.5.10). If something is done incorrectly, the inscription **"remove errors" will appear at the top of the monitor,** and the inscription - what is the error (Fig. 5.5.11) will appear at the bottom of the monitor.

5. After eliminating errors, if any, the following will appear at the top of the monitor: the inscription **"to launch the rocket, turn on "combat mode""** (Fig. 5.5.12), after which the **"combat mode/inspection"** toggle switch should be set to **"combat mode"** (Fig. 5.5.10).

6. The inscription **"wait for permission to start"** will appear at the top (Fig. 5.5.13).

7. When the inscription **"start allowed"** appears at the top of the monitor (Fig. 5.5.14) – press the red **"start"** button and the inscription **"start" will appear at the top of the monitor.**

Figure 5.5.11 – Fix errors

Figure 5.5.12 – Enable “combat mode”

Figure 5.5.13 – Wait for permission to “Start”

Figure 5.5.14 – Start allowed

Figure 5.5.15 – Rocket launch

8. When launching a missile, it must be guided to the target according to the same principle as the Fagot/Konkurs ATGM. Before launching the missile, use the joystick (Fig. 5.5.10) to raise the aiming mark above the target, and after 1-2 seconds, smoothly lower it to the target and hold it on the target until the missile hits (Fig. 5.5.16).

Figure 5.5.16 – 1 – Aiming; 2 – Overshoot; 3 – Hit

Chapter 6. FGM-148 Javelin ATGM

Portable anti-tank missile system manufactured in the USA. Designed to destroy armored vehicles, protected objects (such as bunkers,
bunkers, bunkers) and low-speed air targets (Fig. 5.6.1).

Figure 5.6.1 – Ukrainian Armed Forces soldiers with Javelin ATGM; on the right – rocket takeoff after launch

The Javelin missile is equipped with an IR seeker that implements the “fire and forget” principle, i.e. homing. This allows the operator to not “guide” the missile to the target manually after launching it, but to immediately search for a new target or change position, which increases the survivability of the operator and the complex as a whole. It is capable of attacking targets directly and from above, which, combined with a powerful tandem cumulative warhead, allows it to hit **all modern Russian tanks without much effort.** The missile has two firing modes: a dive attack at a 45° angle and a direct attack. The

second mode is designed to hit bunkers, buildings and helicopters. The dive attack mode provides the best targeting, because when working in the upper projection, the target signature increases and the target is hit in places with less protection (Fig. 5.6.2).

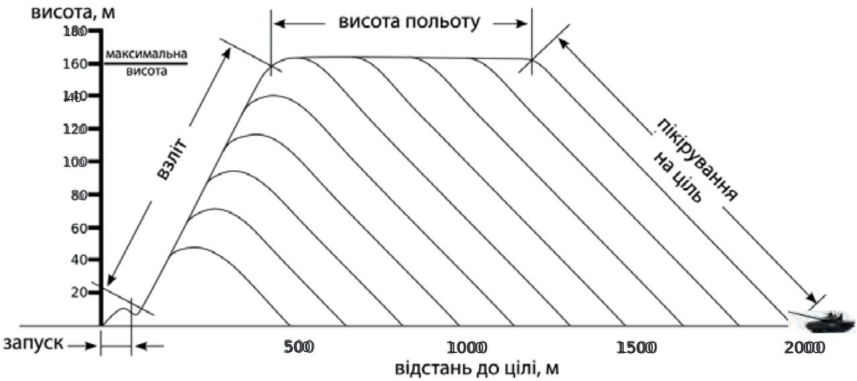


Figure 5.6.2 – Javelin ATGM missile flight pattern and its attack on the target

The Javelin is also very effective against lightly armored vehicles. (BMP, etc.), because it hits the crew with a wide wave of overpressure gases.

The missile can be guided in difficult weather conditions, with increased smoke and in the dark. The missile guidance system excludes any active illumination of the target, which can lead to the activation of the KAZ with the subsequent setting of an aerosol smoke screen. The missile cannot be countered by any means of optical-electronic suppression, since its guidance system generally receives a modulated signal, but is guided to a source of far-infrared radiation.

Firing range: 75 – 2500 m. Flight speed: 290 m/s. Flight time to the maximum distance: 19 sec. Armor penetration: 750 mm at the DZ. The launch can be done from any position: standing, sitting, kneeling or lying down (Fig. 5.6.3) but **safety precautions must be**

remembered: the area in sector 600 at a distance of 25 meters behind the ATGM must be free of personnel. And in front of the ATGM it is necessary to have at least 5 meters of free space.

Figure 5.6.3 – Firing positions

Preparing the Javelin ATGM for firing

1. Install the power battery into the control unit (Fig. 5.6.4).

Figure 5.6.4 – Installing the power battery (enough for 2 starts)

2. Open the day sight window by removing the protective covers and Unscrew and secure the sight head (Fig. 5.6.5).

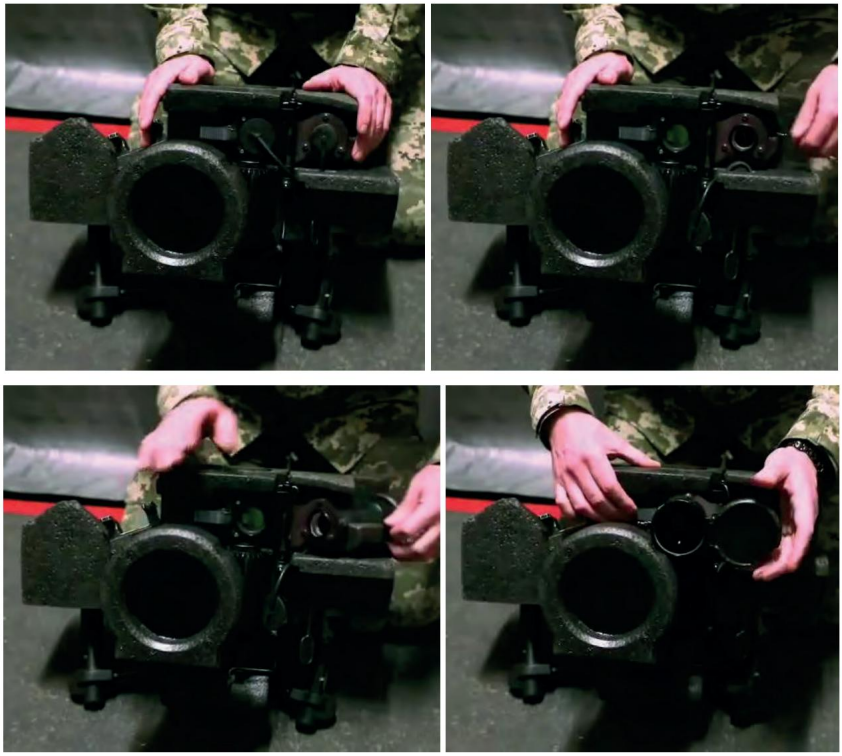


Figure 5.6.5 – Day sight deployment sequence

3. At dusk, at night and in smoky conditions, instead of during the day, deploy night vision scope, for which remove the protective cover from it (Fig. 5.6.6). Attention: the surface of the scope is very delicate, so it must be protected from damage.

Figure 5.6.6 – Deploying the Sight's TPV

4. Connect the control unit to the rocket container, for which remove protective covers, insert them into the grooves and press until they lock into place (Fig. 5.6.7).

Figure 5.6.7 – Connecting the rocket to the control unit

On the left side of the control unit (Fig. 5.6.8 and 5.6.9, item 1) there is a system start mode switch, which has the positions "off", "day", "night", "test mode".

Figure 5.6.8 – Start mode switch

Near the mode switch there is a handle with buttons: Filter button to protect the operator's eyes from laser radiation (Fig. 5.6.9, item 2); Focus regulator for aiming at night (Fig. 5.6.9, item 3); Aiming mode selection button, wide and narrow ranges (Fig. 5.6.9, item 4). At the bottom of the handle under the index finger there is a target acquisition mode button (Fig. 5.6.9, item 5).

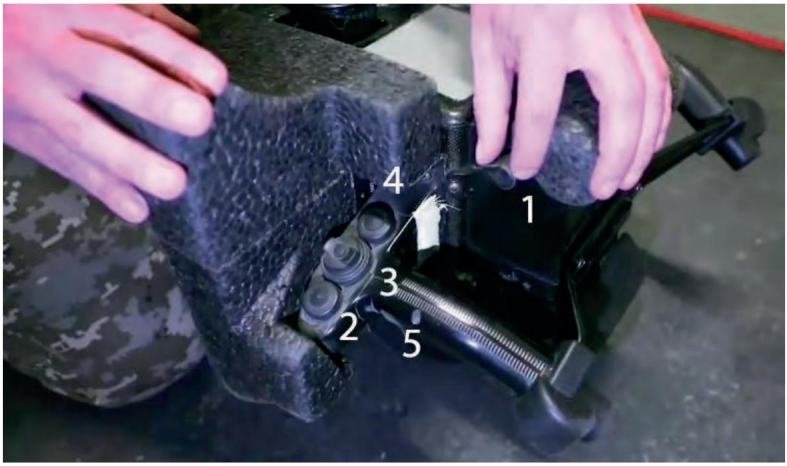


Figure 5.6.9 – Control buttons on the left side of the control unit

On the right side of the control unit (Fig. 5.6.10) there is: A button for selecting the method of attack from above or from the front (Fig. 5.6.10, item 1); A target acquisition manipulator (Fig. 5.6.10, item 2); At the bottom of the handle, under the index finger, there is a missile launch button (Fig. 5.6.10, item 3).

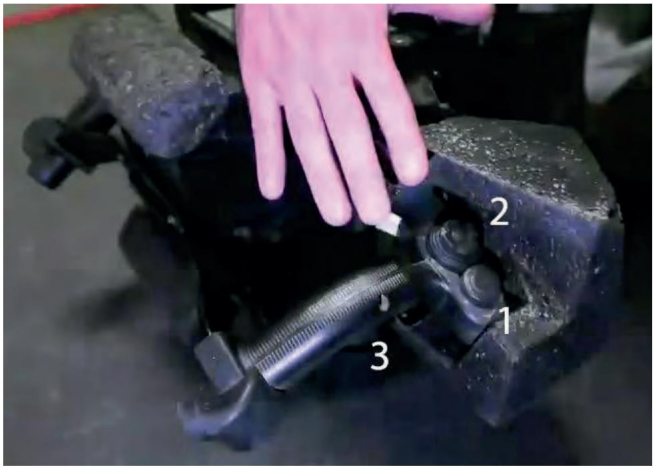


Figure 5.6.10 – Control buttons on the right side of the control unit

Shooting with the Javelin ATGM

1. Turn on **the “start mode switch”,** to “NIGHT”, or “DAY” (small 5.6.11).

Figure 5.6.11 – Enabling the launch mode switch

2. Press the **“target acquisition”** button (Fig. 5.6.9.pos. 5).
3. Start the cooling system (Fig. 5.6.12).

Figure 5.6.12 – Starting the cooling system

4. We select the aiming mode: daytime, TPV, wide, narrow (Fig. 5.6.13, 5.6.9 pos. 1 and 4).

Figure 5.6.13 – Selecting the aiming mode

5. We capture the target and refine the guidance (Fig. 5.6.14).

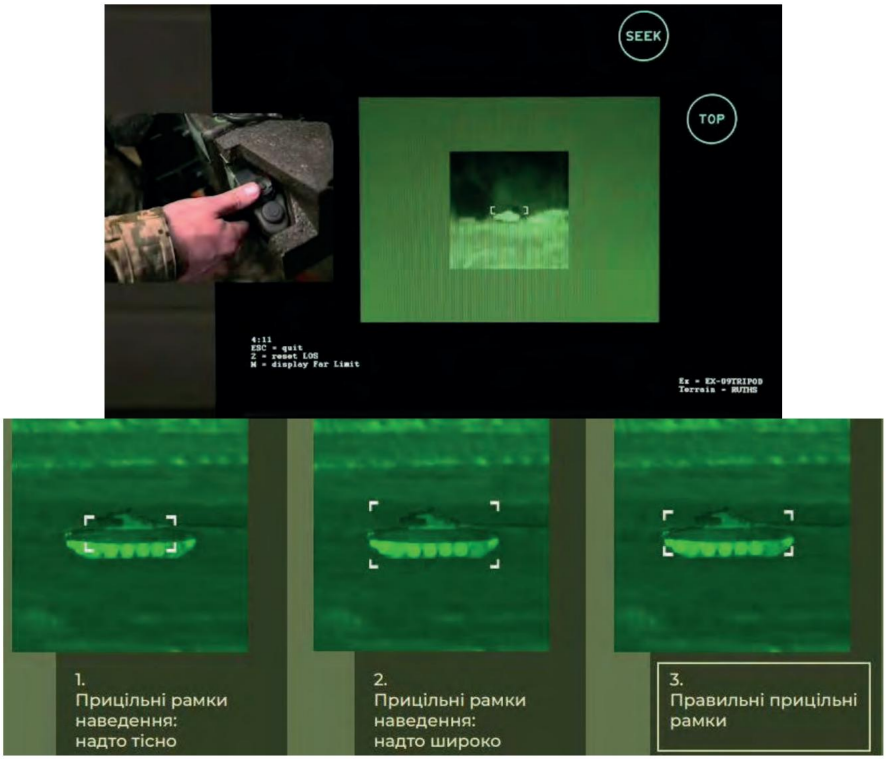


Figure 5.6.14 – Target capture and refinement

6. After clarification, hold the trigger key and start (Fig. 5.6.15).

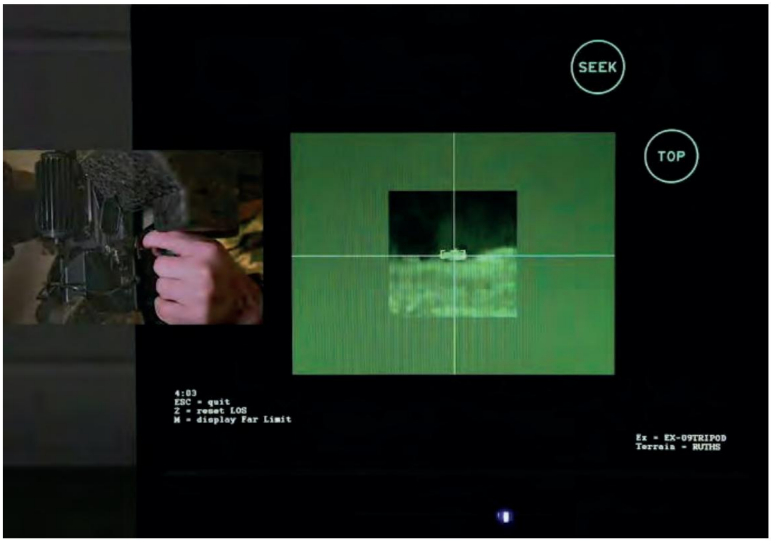


Figure 5.6.15 – Rocket launch

7. After launching the missile, release the trigger button and load another missile without waiting for a hit - the missile will then find the target itself and is guaranteed to destroy it.

Figure 5.6.16 – A soldier of the Armed Forces of Ukraine with a Javelin ATGM

Chapter 7. NLAW (Next Generation Light Anti-tank Weapon)

Disposable ATGM (Fig. 5.7.1) jointly developed by Great Britain and Sweden, a large batch of which was transferred to Independent Ukraine by the United
The Kingdom, which decided to transfer these complexes to the Ukrainian army in light of Russia's *"increasingly threatening"* behavior.

Figure 5.7.1 – ATGM "NLAW", demonstration poster for the Armed Forces of Ukraine

"NLAW" complex with inertial guidance system, bias
along the line of sight, on the "fire and forget" principle, designed to engage armored personnel carriers at distances from 20 to 800 m (up to 600 m against moving targets). The guidance system has two modes: *overfly top attack (OTA)* for destroying tanks, and direct attack *(DA)* for destroying lightly armored vehicles and fortifications, following the same principle as the Javelin.

The warhead is a single cumulative projectile that penetrates 500 mm thick armor. When firing in **DA mode,** T-72, T-80, T-90 tanks penetrate only into cities not protected by anti-tank missiles, and T-62M - into any place. But when firing in **OTA mode,** the missile attacks the armored personnel carrier in the roof of the tower/hull, where the armor is 30-70 mm thick. If there are anti-tank missile blocks on top, they will reduce the effect of the warhead by about half. That is, the final action of the ATGM will be enough to penetrate the roof of the tank and destroy it, which was confirmed in practice during the Russian-Ukrainian war in 20 (Fig. 5.7.2). It is advisable to use this mode as the main one.

Figure 5.7.2 – Russian Army T-80BV tank, destroyed by the Kholodnoyariv Infantry of the Armed Forces of Ukraine using the NLAW ATGM, no DZ helped – detonation of the BC, collapse of the turret, rupture of the hull completely. The thin, 20 mm, lower hull side sheet is clearly visible

The missile's flight time to the maximum aiming distance of 800 m is 5 seconds (Table 5.6). The warhead has a self-destruct mechanism that is triggered 5.6 seconds after launch. During this time, the missile travels about 1000 meters.

Table 5.6 – Flight time of ATGMs at various distances

Distance, m	100	200	300	400	500	600 700	800	
Flight time, sec	0,5	1	1,5	2	2,5	3	4	5

The NLAW ATGM allows you to attack from different positions. The operator can be in a trench, or shoot from cover, the upper floors of buildings or from the basement. The missile will still fly to the specified target. Moreover, it is possible to launch the missile even at an angle of 450 or do it from inside the building from a minimum distance of only 20 m. All this is very important during battles in urban conditions, where buildings limit the visibility zone. **Safety:** the missile is fired without an explosion and can be

used from an enclosed space, but there should be no people (25 m) and no obstacles (2 m) behind it. The cumulative warhead is triggered by a combined active optical-magnetic sensor.

The sensor is configured to detect typical samples of armored vehicles, and is capable of detecting equipment made of aluminum alloys.

Preparation of the NLAW ATGM for firing

1. Install the power battery (Fig. 5.7.3).
2. Check the battery health by pressing the test lever.

batteries on the control unit from yourself. The two indicators should light up green, if red - the battery is not suitable and needs to be replaced (Fig. 5.7.4).

3. For defeating lightly armored, unarmored vehicles and fortifications by contact detonation, set the attack mode lever to **"DA";** To hit tanks in the roof of the turret/hull, set the attack mode lever to **"OTA"** (Fig. 5.7.5).

Figure 5.7.3 – Installing the power battery

Figure 5.7.4 – Checking the battery charge

Figure 5.7.5 – Switching the method of defeat

4. When selecting a target distance from 20 to 100 m, the distance lever should be set to the “20m” position; When the target distance is more than 100 m, the distance lever should be set to the “100m” position (Fig. 5.7.6).

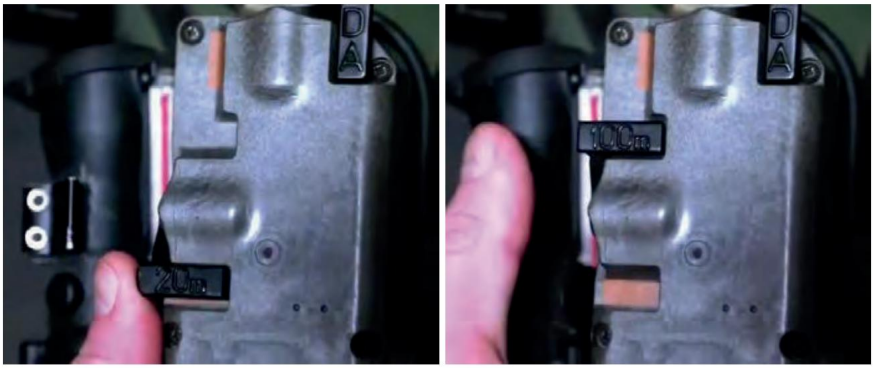


Figure 5.7.6 – Distance lever switching

5. Install the optical sight (Fig. 5.7.7) or mechanical sight (Fig. 5.7.8) into combat position.

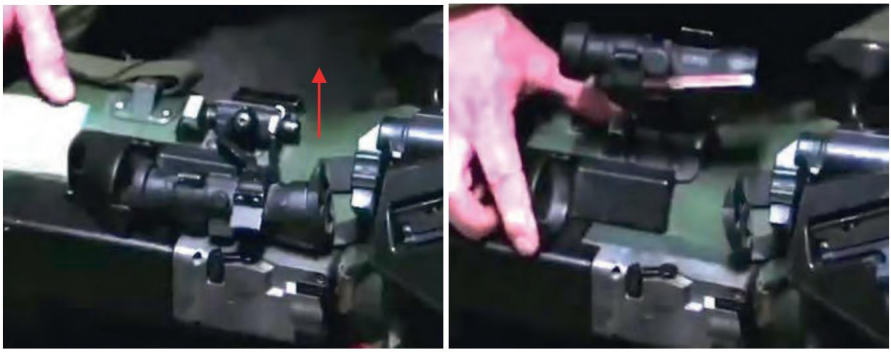


Figure 5.7.7 – Installing the optical sight, arrow – direction of movement

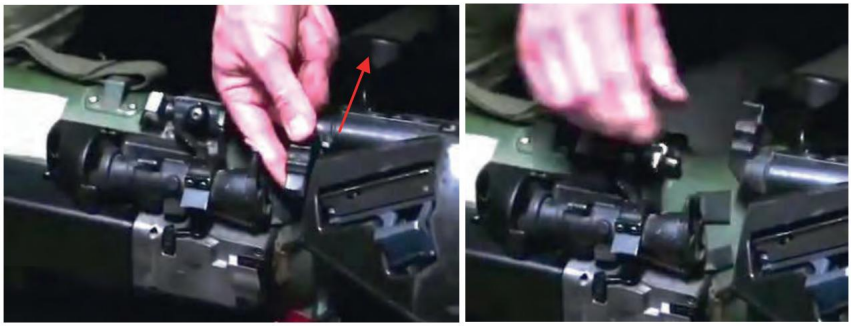


Figure 5.7.8 – Installing the mechanical sight, arrow – direction of movement

6. To adjust the brightness, use the “+” and “–” buttons (Fig. 5.7.9).

Figure 5.7.9 – Brightness control buttons

7. Unfold (if necessary) the shoulder and waist supports (Fig. 5.7.10).

Figure 5.7.10 – Red arrow: shoulder rest; Blue arrow: waist rest

Shooting with the NLAW ATGM

1. To engage a target from above, in the **“OTA” mode,** keep the sight mark on the top of the target; For direct engagement, in the **“DA” mode,** keep the sight mark in the center of the target (Fig. 5.7.11).

Figure 5.7.11 – Top-down lesion (left); Direct lesion (right)

2. While holding the target, turn the safety and tilt it to the left.
with the thumb of your right hand, press the safety clip until it clicks (Fig. 5.7.12).

3. Press and hold the controller with your index finger for at least 3 seconds. seconds. During this time, the guidance system determines the angular velocity of the target and calculates the missile's flight trajectory; Press the **"launch"** button and hold the controller until the target is hit (Fig. 5.7.13).

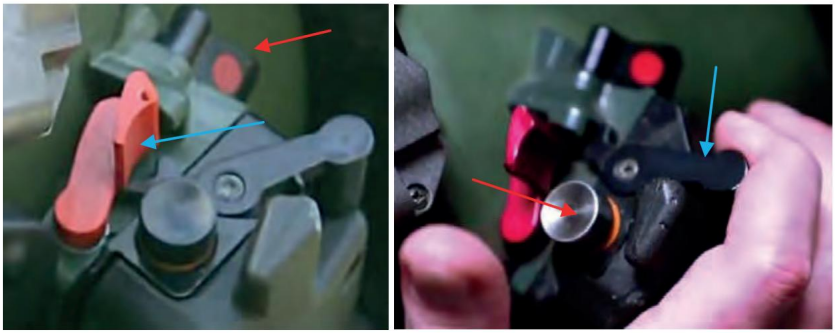


Figure 5.7.12 (left) – Red arrow: fuse; Blue arrow: safety bracket. Figure 5.7.13 (right) – Blue arrow – controller retention; Red arrow – start button

Figure 5.7.14 – The rocket engine is launched at a safe distance from the shooter

Appendix 2. Some features of the use of ATGMs (ATGMs) "Fagot", "Konkurs", "Metis", "Milan-2", against Russian tanks equipped with the "Shtora" optical-electronic countermeasures complex (KOEP)

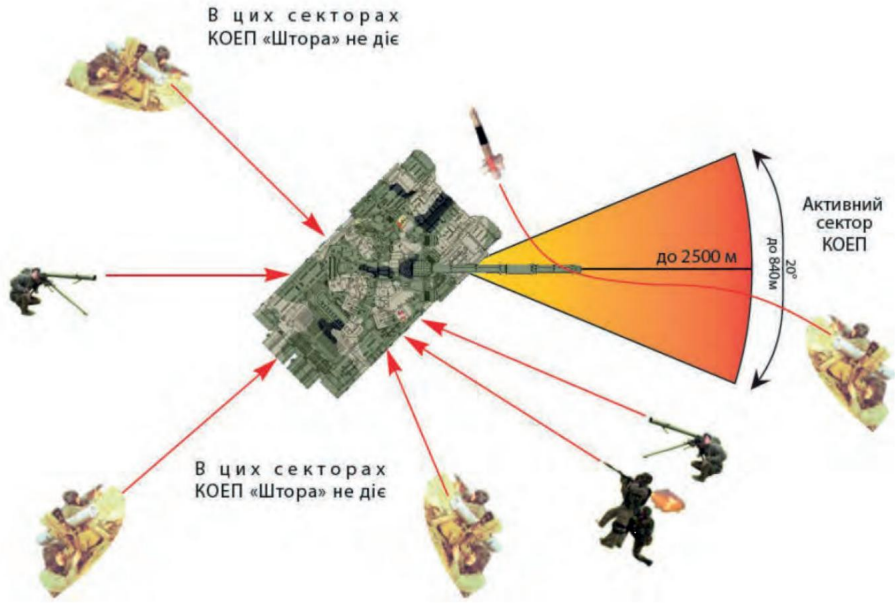
The Shtora COEP is installed on Russian tanks: T-80UA, T-80UK, T-90, T-90A, T-90A "Vladimir", T-90M "Breakthrough" (private).

The complex operates in two countermeasure options (those in service with the Armed Forces of Ukraine are marked in bold):

– against ATGMs with a tracer and coordinator of the **"Fagot" and "Konkurs" types, "Metis",** "TOW", "NOT", **"Milan",** "Dragon", tank anti-tank guided missiles **"Cobra"** (the T-90M **does not work** against these missiles);

– against ATGMs with semi-active laser homing head, working on a laser beam reflected from the target (such as "Maverick", "Hellfire" and Soviet tank TKRs **"Svir", "Reflex",** "Invar", "Sprut"), and against the guidance of laser rangefinder sights of tanks in general.

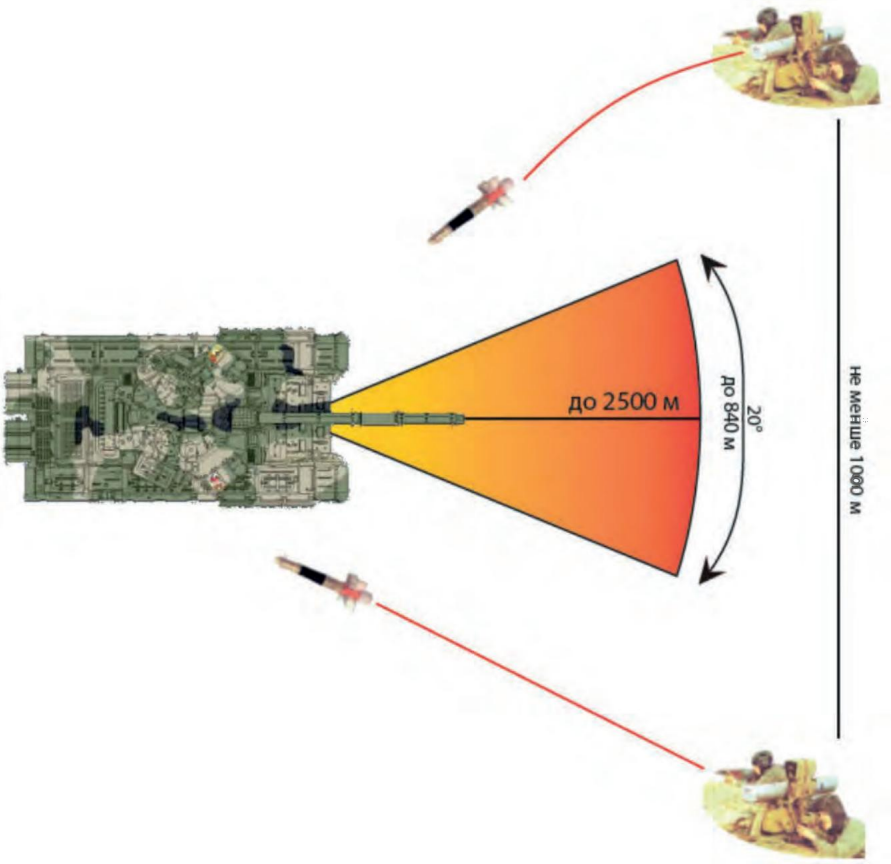
The action of the "Shtory" against ATGMs with a tracer and a coordinator (Fig. D.1). A narrow beam of 200 horizontally and 90 vertically covers an area up to 2500 m deep and up to 840 m wide, it is always directed in the same direction as gun. At the moment when the signal level from the "Shtora" exceeds the signal level from the missile tracer, it is recaptured and the ATGMs begin to fire. False flight correction commands are given, which causes the missile guidance to fail. The Shtora complex does not work against RPGs and LNG.



Item D.1 – Scheme of operation of the Shtora anti-tank missile defense system against tracer and coordinator

"Milan-2",

Asset

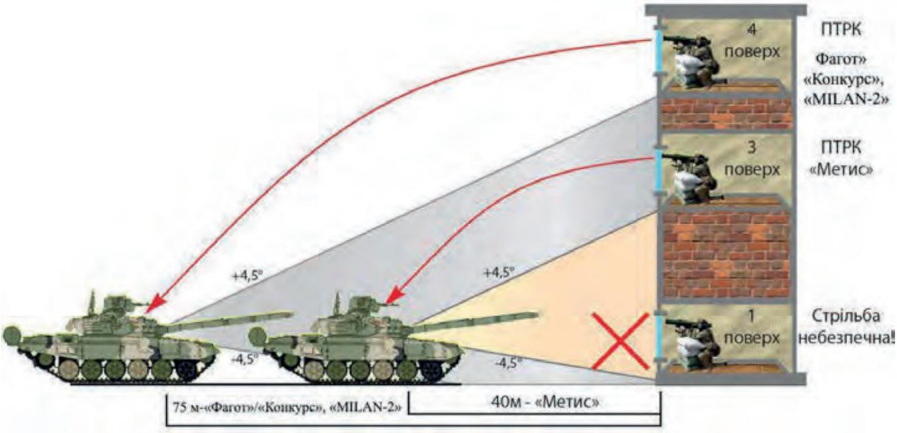


Asset D.3 – Firing of T-90/ T-80UA from two ATGMs of the Fagot, Konkurs, Metis, Milan-2 type, from one direction, when it is possible to achieve two hits simultaneously

Vertical resistance sector: constant – from -4.5° to +4.5°

direction of the gun (Fig. D.4); there is no protection against ATGM attacks from above.

Due to the large vertical angle of the Shtora, it is problematic to hit the T-90/ T-80UA tank while it is in operation. In urban conditions, during a frontal attack by a tank, when firing from the Metis ATGM, a soldier must choose a position at a height not lower than the 3rd floor in order to launch the missile from a minimum distance of 40 m, where the Shtora beam reaches at this distance. The higher the floor, the greater the launch distance. For the Fagot/Konkurs, MILAN 2 ATGMs, with a minimum launch distance of 75 m, the lowest floor is the 4th. Firing from above makes it possible to hit the missile with the roof of the tower or hull, where the armor is thinnest, because the missile flies downhill along the hypotenuse and the minimum distance for the missile increases.



Property D.4 – Scheme of operation of the "Shtora" COEP of T-90/ T-80UA tanks, vertically and in urban conditions

The Shtora complex does not respond to the laser rangefinder beam of Leopard-1A5 tanks, which are to be transferred to Ukraine from Germany, and all Leopard-2 modifications.

The complex does not provide detection and counteraction to the seeker of ATGMs of the Javelin, NLAW, Spike, Korsar, Stugna, and Barrier types. The

complex does not provide detection and counteraction to modern anti-tank guided missiles "Kombat", included in the BC of Ukrainian tanks "Bulat" and "Oplot"

Слава Україні!

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