

SIMULATOR FOR OPERATOR OF ANTITANK GUIDED MISSILE "KONKURS-M"



Basic characteristics

- ◆ Structural adequacy of the simulator
- ◆ Adequacy of operating procedures of complex equipment
- ◆ High quality of visualization
- ◆ Adequacy of model of missile travel
- ◆ 3-D model of tactical field
- ◆ Full scope of exercises of Firing Course, wide range of conditions for exercises and trainings, fairness to assess trainees actions, results documentation.

Purpose of simulator

The Simulator is designed for education and training of operators of antitank guided missile "Konkurs-M" in conditions similar to the modern battle conditions with the purpose of formation and maintenance at them steady skills of detection and tracking ground targets, choosing right time for guided missile launch, ATGM launch and targeting, firing effect evaluation

Capabilities of simulator

- Studying of arrangement and operating of controls of an 9P135 launcher;
- Formation of skills at ATGM "Konkurs-M" operators to conduct reconnaissance of the battlefield using optical sight 9SH119;
- Formation at operators skills to track ground moving targets in various conditions of combat situations, as well as skills of firing by the antitank guided missiles on different kinds of targets

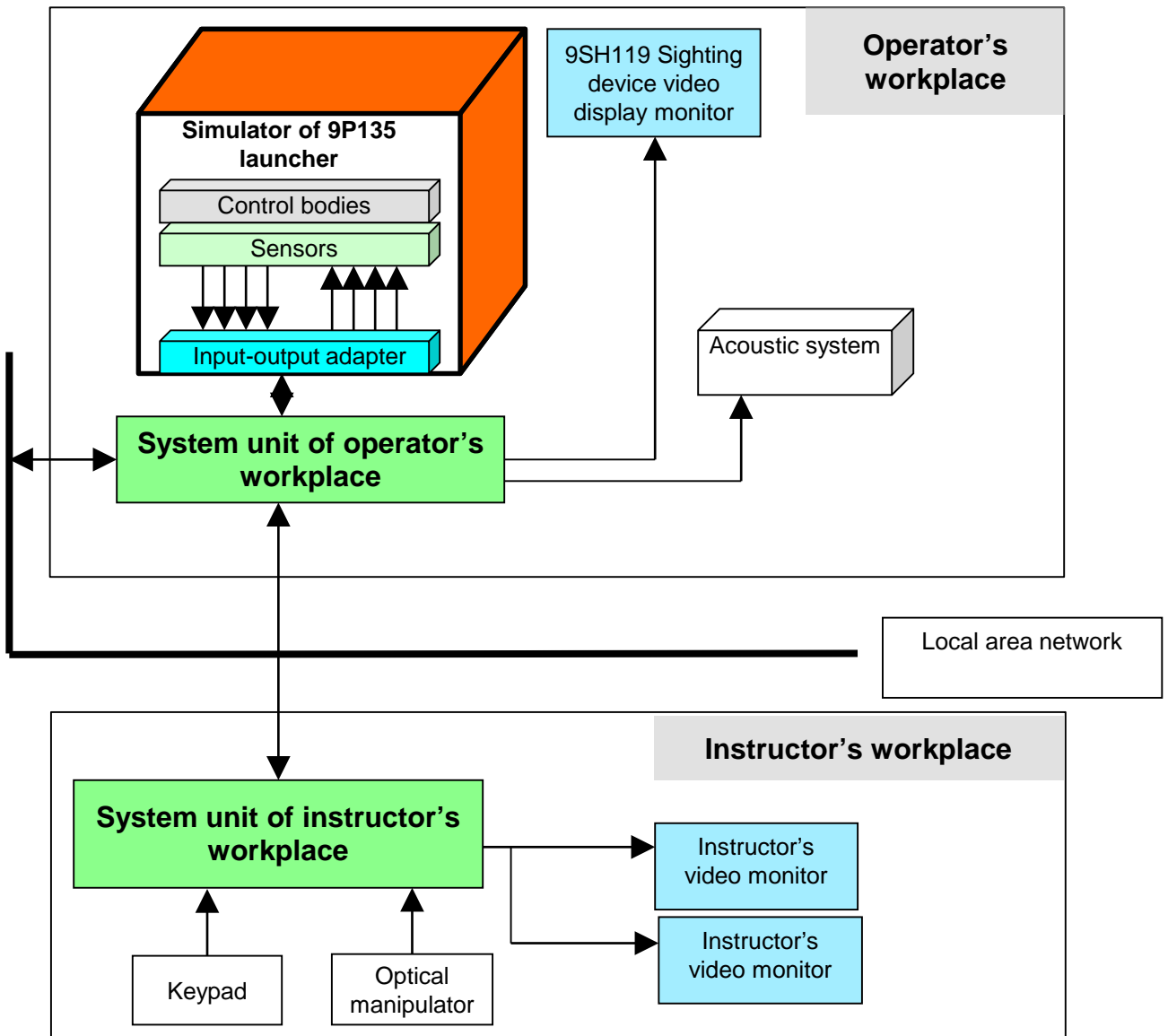
Field of use of simulator

ATGM "Konkurs-M" operator training simulator can be used in the system of combat training of motorized infantry (mechanized), as well as antitank subelements, in training units and in institutions of Land Forces.

Specifications of simulator

No. in a sequence	Specification	Unit of measurement	Value of specification
1	Quantity of simultaneous trainees	---	1 operator
2	Minimum area of training class	m ²	10
3	Readiness to work after switch on	min	Maximum 5
4	Duration of continuous work	hour	Minimum 12
5	Electric supply: voltage	V	220±10%
	frequency	Hz	50±1
6	Maximum consume power	kW	1.5
7	Range of working temperatures of the simulator	deg. C	from +5 to +40
8	System of diagnostics	---	Integrated semi-automatic
9	Size of tactic field	km	4x4
10	Quantity of terrain types	---	3 (plain, desert, mountain)
11	Evaluation of trainees actions and documentation	---	Computerized, in accordance with indices and criteria of Firing Course
12	Conditions for exercising	---	Day, night, winter, summer, mist, diverse optical visibility radius, range of temperatures from -20 deg. to +50 deg.
13	Ability to simulate failures and faults of complex equipment	---	Input of failures and faults is implemented from instructor's workplace
14	Mean time between failures	hour	1000
15	Specified run	years	10
16	Guaranteed use period	years	1

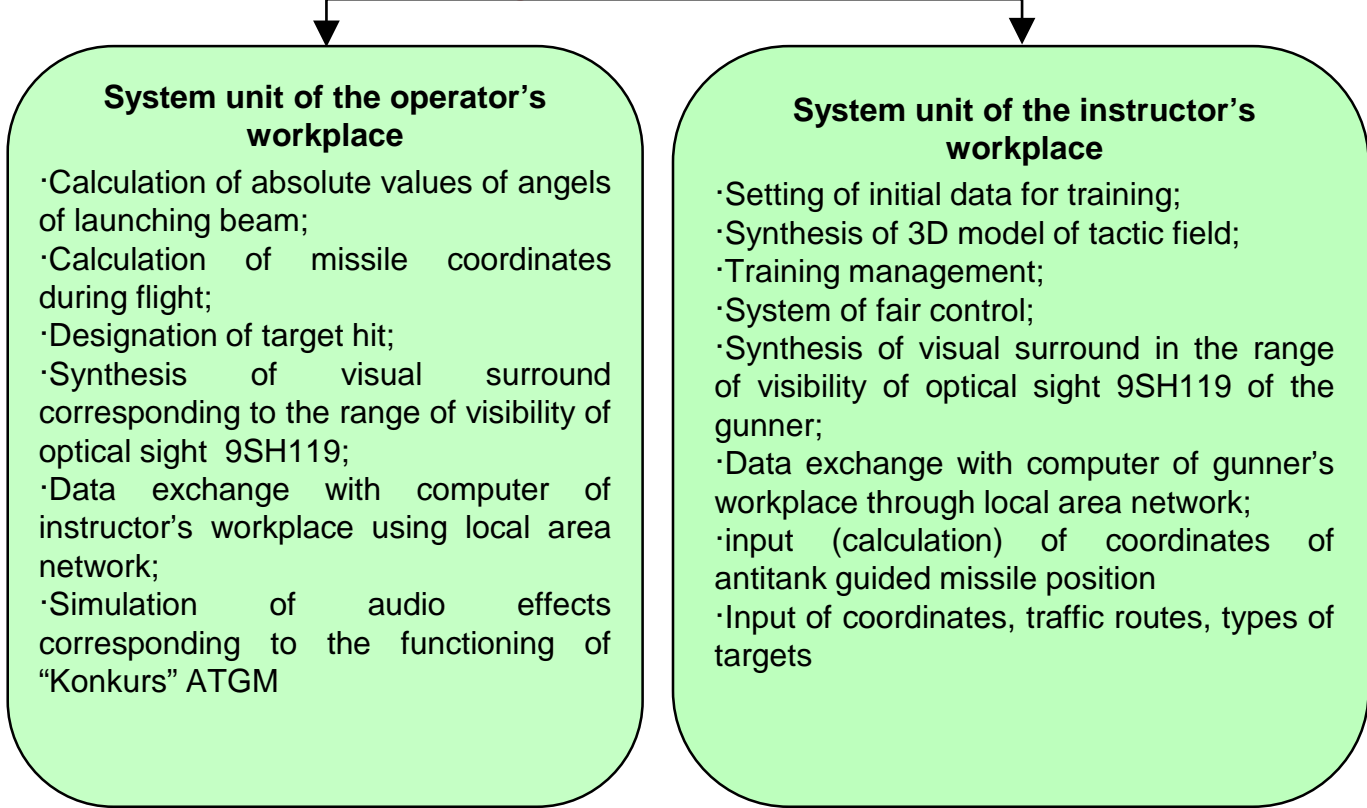
Block scheme of the simulator



Simulator of 9P135 launcher **ensures adequacy of sensor-motor field of operator's workplace, and characteristics of devices and equipment**

Complex of general and special software, computing facilities, as well as device and equipment simulator interface sets with computing facilities of the simulator represents software and hardware package of the simulator

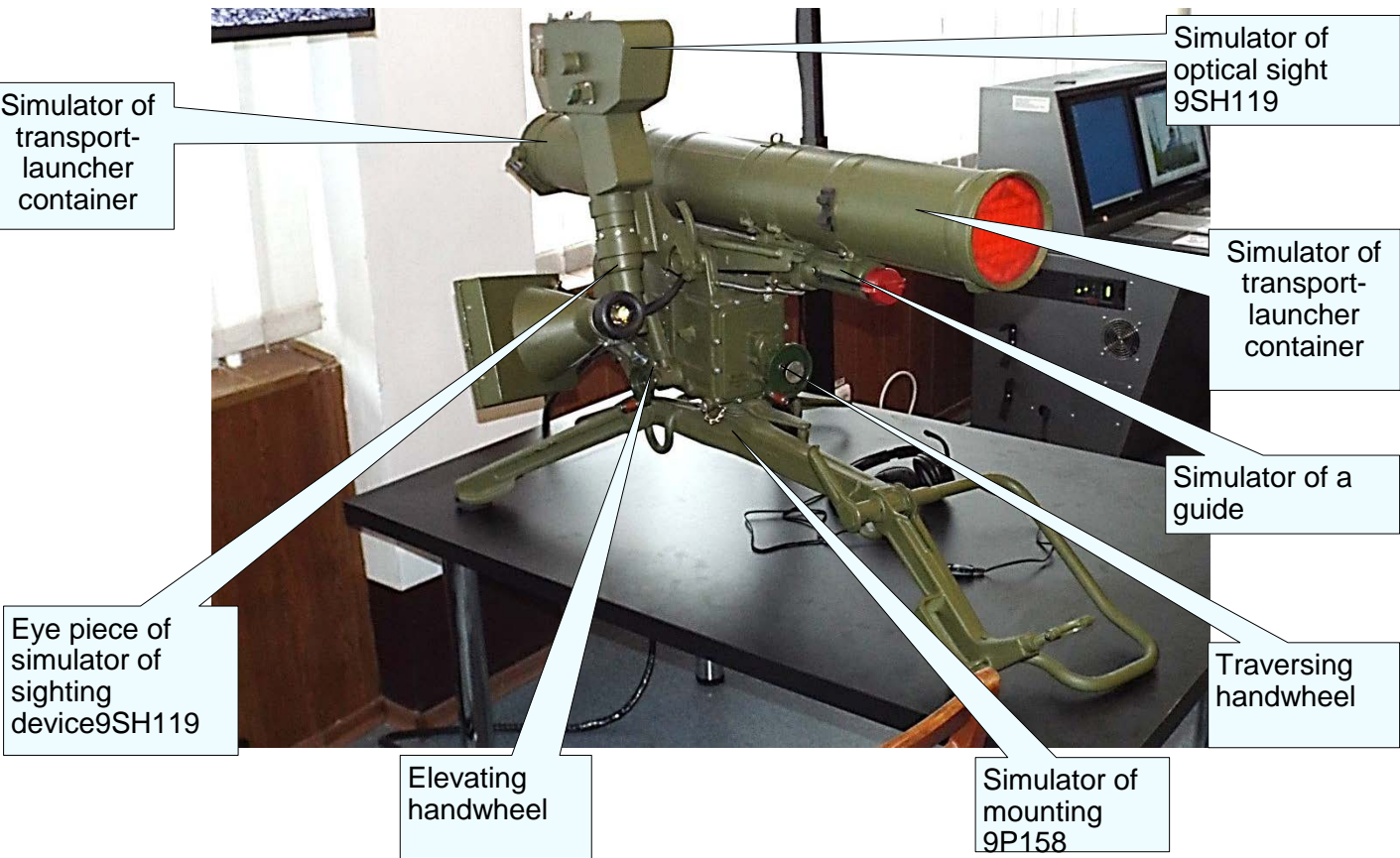
Tasks to be solved by the software and hardware package of the simulator



Basic characteristics of software and hardware package

Characteristics	Value
Quantity of firing exercises in accordance with the Firing Course	2
Quantity of exercises prepared by the instructor	9
Quantity of types of targets in accordance with the Firing Course(3D dynamic models of tanks, infantry combat vehicles, helicopters)	8
Maximum quantity of targets downrange	9
Established time of target exposure, sec	0 – 9999
Established velocity of target motion, km/hour	0 – 25
Established direction of target motion	0 – 360 deg.
Maximum quantity of landmarks reflected downrange	12
Quantity of types of reflecting landmarks	7
Endurance distance for target installation, m	4000
Limits of wind velocity installation, m/sec	0 - 30
Established wind direction, deg.	0 – 360 deg.
Limits of variation of visibility conditions, %	0 – 100

Operator's workplace



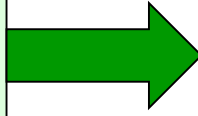
Composition of the launcher 9P135

No.in a sequence	Name of simulators of control inits and bodies	Q-ty, piec.
1	9P135 Launcher mounting	1
2	Body of elevating and traversing mechanism with steering wheel of elevating mechanism and steering wheel of traversing mechanism	1
3	Body of ground control equipment unit (full-scale mock-up)	1
4	Launch mechanism	1
5	Guide	1
6	Transport-launcher container (full-scale mass mock-up)	1
7	Optical sight 9SH119 incl	1



Specifications

Adequacy



Simulator ensures execution of more than 90% of operator's actions of antitank weapon system in the course of preparation and target servicing

- Correspondence of dimensions of simulator's control units and bodies and their mutual placement with the actual complex
- Maximum resemblance of design of devices and equipment simulators with actual ones, correspondence of sighting device scale and lighting with the actual complex
- Full list of implementing functions of observation devices, control bodies of ATGM "Konkurs-M"
- Correspondence of motion, force and reaction ranges of steering wheels of elevating and traversing mechanisms in the simulator with specifications of the actual complex (correspondence of human factors and sensor-motor field of trainees workplace in the simulator with ATGM "Konkurs-M" operator's workplace)
- Correspondence of algorithms of simulator devices and equipment functioning in all the modes and reactions of control bodies and indication of the simulator on the control actions of trainees with the actual complex
- Calculation of visibility of ground objects with respect to optical characteristics of the optical sight 9SH119
- Correspondence of sound effects of complex operations during missile launch in the simulator with the actual ones
- ATGM flight path calculation based on the characteristics of semiautomatic guidance contour
- Record of vulnerability of ground targets of antitank guided missile depending on armoring extent

Placement of equipment of actual "Konkurs-M" ATGM

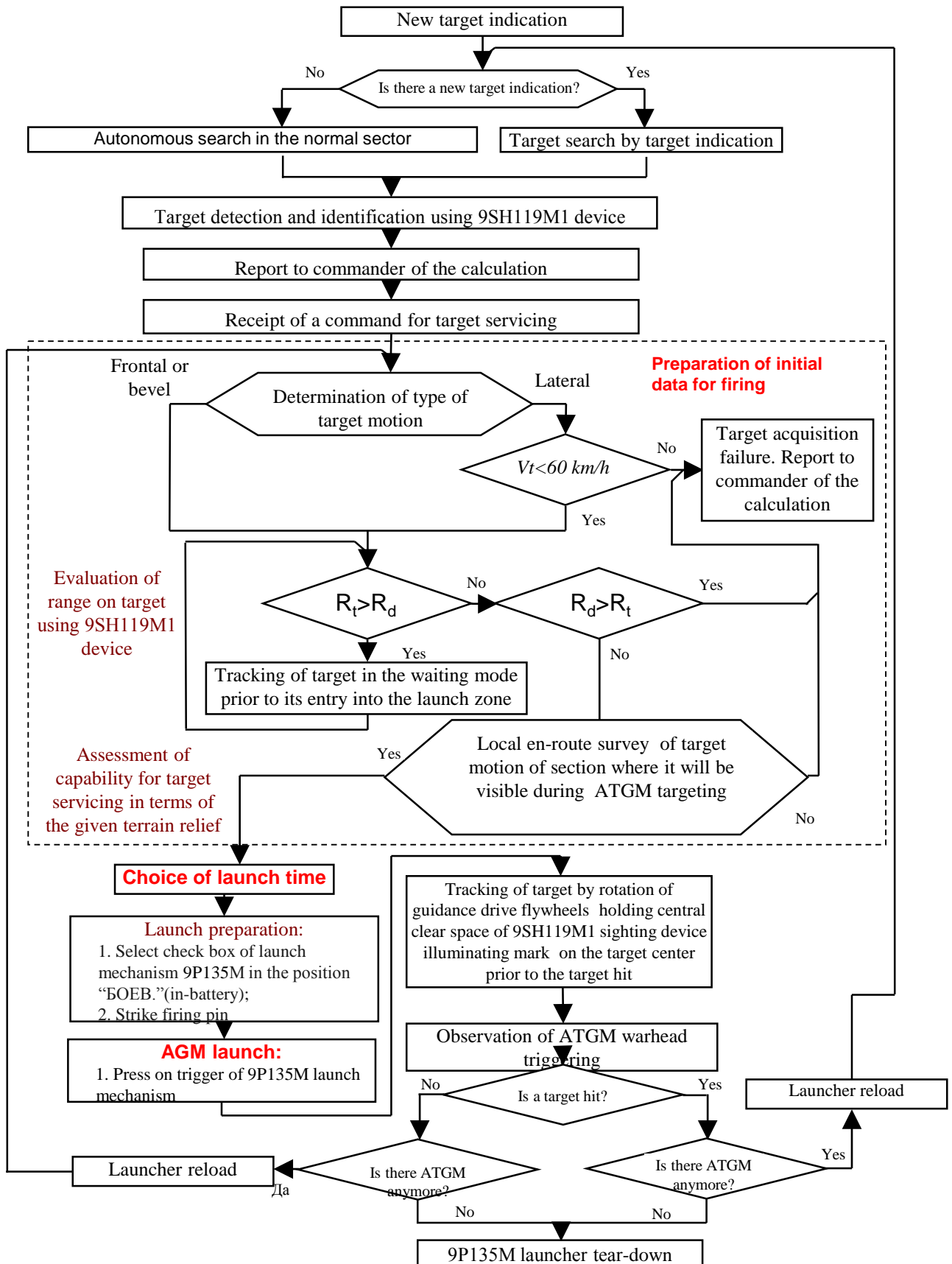


Placement of equipment in "Konkurs-M" ATGM operator's simulator

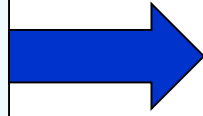


Capture rate of combat performance operations

Simulator ensures capture of combat performance operations of operator of minimum 90%



Quality of visualization of target environment

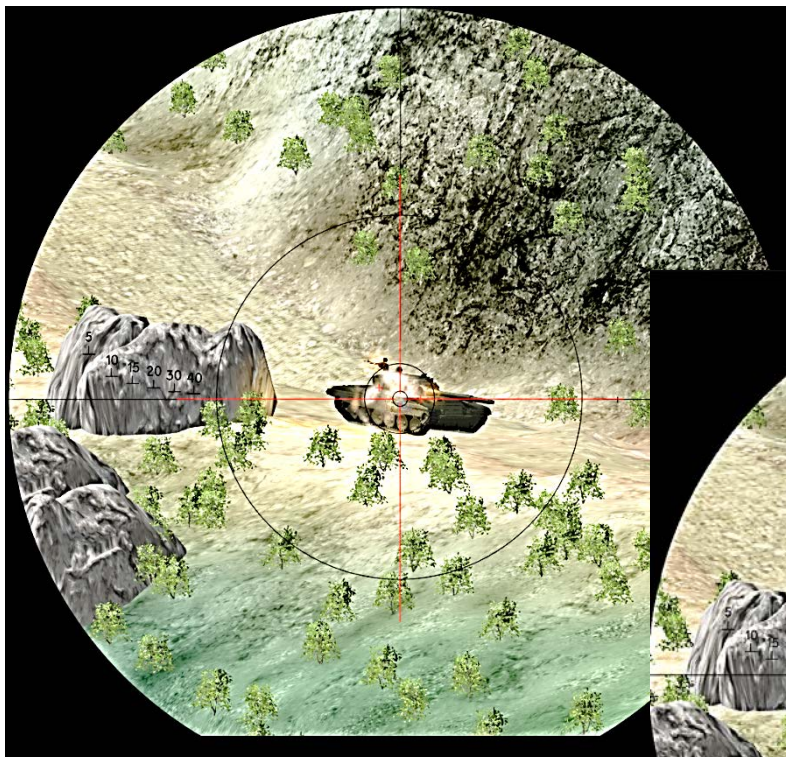


The Simulator ensures possibility to conduct reconnaissance observation and firing with respect to optical visibility, range and type of targets, weather conditions

High quality of visualization of target environment is achieved by:

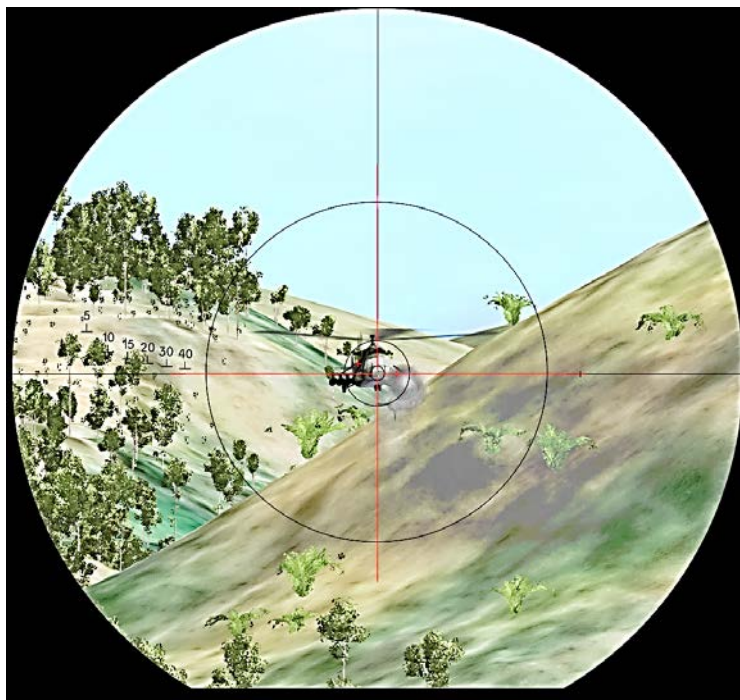
- Use of high resolution liquid-crystal matrices in the simulator of optical sight 9SH1119
- Details and render of terrain structures
- Correspondence of color range of terrain structures and objects with the actual colors and contrast
- Correspondence of angular dimensions, form, local objects, vegetation, ground targets with the actual objects in the visibility range of the optical observation devices
- Simulation of physical effects of guided missile flight and demolition on the target in the course of firing

Visibility range of simulator of optical sight 9SH1119 at the target hitting



Examples of visualization in the simulator “Trekon”

View in the visibility range of sighting device 9SH119 in the process of target engagement



View in the visibility range of sighting device 9SH119 in the course of battlefield



View of tactic field on the instructor's workplace from the external operated camera



Reliability

Simulator ensures reliable operation during the entire usage period (warranty and out of warranty usage periods)

Simulator reliability assurance program is based on the following principles:

- use of reliable components with proven experience of operation, receiving inspection
- development of software solutions excluding collisions of customized software with general, as well as with hardware
- multiple tests of developed design solutions
- use of design solutions ensuring continuous work of mechanical assemblies
- functional and stagewise quality control of mechanical and electrical assembly of simulators
- use of absolutely noncontact linear-and-angular movement pickups based on magnetosensitive chips in the structure of simulator units
- use of protective means for electronic devices printed circuit boards and connector pins against impact of the environment
- use of computers with industrial (guarded) construction
- use of uninterrupted power supplies for computers
- ensuring the required thermal operating conditions for simulator hardware
- assurance of power supply margins

- Warranty and service life period
- Guaranteed service life of the simulator is 1 year while respecting the rules of operation and maintenance according to the operations documentation.
 - Service life of the simulator is minimum 10 years at observance of the rules of operation, maintenance and repair in accordance with the operations documentation.

® Simulator ensures continuous work during 12 hours per day

® Simulator's mean time to failure is minimum 1000 hours

The training capabilities of the simulator

Simulator's capabilities for AGM operators education and training:

- Individual training of operators, including
 - directing reconnaissance of battlefield in the normal sector
 - target detection and identification, definition of motion parameters and present range
 - definition of targets priority by hazard
 - selection of target for firing
 - tracking of target during its movement
 - definition of missile launch moment
 - tracking of target in missile flight
 - observation of firing results
- Joint training of operators with commanders of units (who observe battlefield and aim operator to fire particular target) in order to improve interaction in the fight

Simulator's capabilities to form education and training conditions:

- dimension of terrain sector 3D model – 5x5 km
- types of terrain – median, desert (at the request of the Customer 3D model of any realistic terrain sector, including mountain, with urban development etc. can be created)
- time of the day – day, dusk, night
- illumination of terrain sector at night using illuminating bombs, whizzbangs, air bombs
- weather conditions – sunny weather, thick clouds, rain, snow, wind of different velocity and direction
- season – summer, winter (at the request of the Customer in accordance with geographical area conditions of trainings)
- types of targets to fire: tanks (T-72, T-90, T-80, M1A1 Abrams), armoured combat vehicle (BMP-1, BMP-2, BTR-80, BTR-3E, BTR-4, M113, “Bradly”, “Tiger”, cargo trucks), air targets (poised helicopters of type Mi-8), infantry team (openly located, in the trenches), field entrenchments

Simulator's capabilities for education and training of commanders and operators:

- execution of full range of exercises of Firing Course (FC) with computerized evaluation of trainees actions
- execution of firing tasks on the tactic field in complicated situation

Didactic capabilities of the simulator

Capabilities to control trainees actions:

- ❑ as per the current state of AGM control bodies (on the instructor's reference monitor)
- ❑ as per the duplicated visibility range of optical sight 9SH119
- ❑ as per the ATGM state form the observation point of external operated camera
- ❑ as per the firing exercises execution protocol
- ❑ as per the reports of the trainees for the communication means

Capabilities to assess trainees actions:

- ❑ computerized assessment of operator actions at the execution of standard exercises in accordance with indices and criteria of the Firing Course
- ❑ personal assessment of trainees actions as per the results of analysis by all (or random) control means

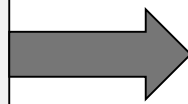
Capabilities to create education conditions:

- ❑ choice of firing weather conditions
- ❑ choice of standard or formation of random fire exercise
- ❑ choice of type of terrain, time of the day and year
- ❑ choice of type of enemy actions (counterfire on ATGM positions)
- ❑ repetition (multiple if required) of exercise or situation
- ❑ input/release of failures and faults of ATGM equipment
 - ❑ ATGM wire break
 - ❑ Optical coordinator death
 - ❑ IR jamming
 - ❑ Jet engine failure
 - ❑ Mid flight engine failure or "BSC ignator failure"
- ❑ assignment of 1, 2 or greater number of ATGM for firing (with launcher reloading)

Capabilities for processing and storage of training results

- ❑ documentation of results in soft form (printout)
- ❑ archivation of the results for a day or for a period
- ❑ simulator's integration into central record system and education results processing

Operational characteristics



The simulator is designed for use in armed forces, is simple to operate and maintain

No. in a sequence	Name of the index		Units of measurement	Value of the index
1	Minimum area for location		m ²	15
2	Type of room		---	Training class
3	Readiness for training after switch on		min	Maximum 5
4	Duration of continuous work		hour	Minimum 12
5	Electric supply	Voltage	V	220±10%
		Frequency	Hz	50±1
6	Maximum consume power		kW	1.5
7	Raised operating and limit temperature		°C	Up to +35
	Reduced operating temperature			Up to +5
9	Relative humidity at T=+25°C		%	Up to 80
10	Diagnostic system		---	Integrated semiautomatic
11	Mean time to failure		час	Minimum 500
12	On/off control		---	From the instructor's workplace
13	Maintenance		---	Checkup inspection, daily maintenance operations, MO-1 (once in 6 months), MO-2 (once a year)
14	Electrical safety of trainees and maintenance staff		---	Exclusion of dangerous voltage on the operator's workplace (+24 V DC is used). Short-circuit protection
15	Record of simulator service hours			Motor hours software counter
16	Weight of simulator assembly		kg	170
17	Operation documentation		---	Logbook, operation manual, instructions for installation and setup at the place of using simulator as intended, spare parts, tools and equipment set list
18	Guaranteed service life		years	1
19	Dimensions of workplaces	operator	LxWxH	1300x800x800
		instructor	LxWxH	1430x990x1100
20	Specified run of simulator (without limit of service hours), minimum		years	10

Educational program of technical experts of the Customer

Specially trained technical staff (instructors-operators) shall be used for operation and maintenance of the simulator (simulators). Quantity of the staff shall be determined by the number of simulators and combat training program (training process).

One expert is sufficient for operation of 6 (six) simulators.

The objectives of operator instructor include preparation of exercise (training) and input of initial data in accordance with the operation manual, plan and order of the exercises (training), assurance of control over the course of training for the instructor and control over the actions of trainees at the execution of exercises, as well maintenance of the simulator (simulators), their performance control and repair in accordance with operation manual requirements.

Education of technical experts is carried out in the following scope:

No	Name of the topic	Number of hours
1	Safety regulations for the operation of simulators	1
2	Arrangement and operation procedures (including repair) of simulators	4
3	Study of functionality of simulators to ensure combat training	8
4	Procedure to conduct exercises (trainings)	4



The effectiveness to use simulator in the process of combat training of mechanized infantry and antitank units

Introduction of simulator into the combat training practice enables to:

1. Implement the main principles of combat training

- ▶ perform reconnaissance, fire training of ATGM “Konkurs” operators as a real basis for activity of mechanized infantry and antitank units, ensure controllability of education and training
- ▶ exclude simplification during trainings and exercises
- ▶ create learning environment close to combat
- ▶ provide intensive training of the entire staff of divisions
- ▶ Provide organizational and methodical communication of exercises and trainings on simulators with exercises and training on the battlefield, including with ATGM combat launch
- ▶ provide objective control of operators training level and units teamwork
- ▶ Implement principle of training “from simple to complex”, individual approach to training, ensure continuous education and training process

2. Solve tasks of combat training

- ▶ provide real capability to form and maintain the required level of combat operations skills for ATGM operators
- ▶ Teach ATGM operators of weapons capabilities effective use in complicated combat conditions, day and night
- ▶ Develop skills of unit commanders to control over ATGM operator’s actions in battle
- ▶ Effectively train ATGM operators and units for field firing, to conduct tactical drill and tactical training
- ▶ provide the required level of training standard of ATGM operators during the entire training period
- ▶ prepare motorized infantry and antitank units to conduct effective actions against tanks and other armored vehicles in modern warfare

3. Reduce by 70-80% costs for military training provided to achieve the required level of training standard and combat teamwork