FIRING AND FIRE CONTROL SIMULATOR OF THE MIXED ARTILLERY BATTALION
2 Appointment and possibilities of a simulator

The simulator is intended

For development and perfection of practical skills of officers of an artillery battalion/battery in performance of tasks (exercises) of the Course of artillery fire, and also for coordination of squads of observant (command-observant) points and firing control points

The simulator provides

- Formation of land conditions on an electronic topographic map and on three-dimensional model of a corresponding site of district
- Visual supervision of land conditions (district, targets, results of firing) within direct visibility taking into account meteоconditions, time of day and characteristics of observation devices
- Definition of polar (rectangular) co-ordinates and absolute heights of gun positions, observant (command-observant) points, positions of means of artillery investigation, targets and reference points
- Imitation of sounds of shots and ruptures of shells with visualization on three-dimensional model of dust and smoke effects taking into account caliber of a shell, type of a detonator, wind direction and speed
- Maintenance and perfection of skills of officers of squads of COP (POP), firing control points by definition on setting for shooting and firing control of a battalion/battery with use of devices of preparation of data for firing (PUO-9, AK-4, PRK-69)
- Performance of trainings both as a part of a battalion, and in a battery
- Formation at trainees of skills of conducting investigation of the land targets, range definitions, directional angle, rectangular co-ordinates, angle of a place, width of front and height of target, its characteristics, skills of target pointing
- Assistance for means of artillery reconnaissance (SNAP-10, ARK-1, AZK, helicopter-corrector)
- Information interchange in a network of a battalion/battery and with means of artillery investigation serving shooting by means of simulated communication means
- The current control of actions of trainees in the course of performance of tasks (exercises) of the Artillery firing course
- Control of level of skillfulness of officers of artillery divisions during combat training with use of base of results of trainees on performance of tasks (exercises) of the Artillery firing course

The simulator can be used in the system of combat training of artillery divisions and in educational institutions of land forces.
The list of officers of the battalion, whose functions are realized in a simulator

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Position name</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The simulator of the advanced observation position</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Scout (commander SNAP-10, ARK-1, AZK, helicopter)</td>
</tr>
<tr>
<td>2</td>
<td>Radio operator*</td>
</tr>
<tr>
<td><strong>Battalion’s command-observation post simulator</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Commander of a battalion</td>
</tr>
<tr>
<td>2</td>
<td>Senior scout-range finder</td>
</tr>
<tr>
<td>3</td>
<td>Scout</td>
</tr>
<tr>
<td>4</td>
<td>Evaluator</td>
</tr>
<tr>
<td>5</td>
<td>Radio operator*</td>
</tr>
<tr>
<td><strong>Battalion firing control point simulator</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Chief of staff of a battalion</td>
</tr>
<tr>
<td>2</td>
<td>Evaluator</td>
</tr>
<tr>
<td>3</td>
<td>Radio operator *</td>
</tr>
<tr>
<td><strong>Battery’s command-observation post simulator (3 sets)</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Battery’s commander</td>
</tr>
<tr>
<td>2</td>
<td>Senior scout-range finder</td>
</tr>
<tr>
<td>3</td>
<td>Scout</td>
</tr>
<tr>
<td>4</td>
<td>Evaluator</td>
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<td><strong>Battery firing control point simulator (3 sets)</strong></td>
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</tr>
<tr>
<td>3</td>
<td>Radio operator *</td>
</tr>
</tbody>
</table>

*Workplace of the radio operator is delivered by request of the customer*
Simulator structural scheme

Server

The simulator of the advanced observation post

Workplace of the scout (corrector, commander of ARK-1 or SNAP-10)

Workplace of radio operator

Simulator of the battalion command observation post

Senior scout-range-finder’s workplace

Scout’s workplace

Automated workplace of battalion commander

Evaluator’s workplace

Radio operator’s workplace

Battalion firing control point simulator

Radio operator’s workplace

Automated workplace of CS adn

Evaluator’s workplace

Battery firing control point simulator (3)

Radio operator’s workplace

Evaluator’s workplace

Local computer network
1. A fighting order of a battalion of 152-mm self-propelled howitzer 2SZ in attack

2. Fighting order of a battalion of Multiple artillery rocket system “Grad” in defense

3. The scheme of the organization of communication of Multiple artillery rocket system “Grad” in defense
Algorithm of work of the head of training and trained officers of a battalion during performance of training on firing and a firing control

The head of training

1. Sets a task for the trained commander of a battalion/battery
   - **Ways of setting of a task on target defeat:**
     - On a map (paper topographic map or electronic topographic map on the automated workplace monitor);
     - From reference points or local subjects on three-dimensional model of a site of district (with use of a virtual reality headset);
     - By indication of rectangular co-ordinates;
     - By indication of polar co-ordinates (range and directional angle).
   - **Ways of data transfer:**
     - Personal contact (orally);
     - By a simulated communication facility.
2. Gives instructions to the assistant of the head of training (personal contact):
   - On assistance for means of artillery reconnaissance (if necessary);
   - On performance of the current control of actions of trainees in the course of performance of tasks (exercises) of the Firing course.

The commander of a battalion

1. Understands a task, puts the target on the map (FCU-9) if it is specified in rectangular co-ordinates, or finds the target on a district which is visible from COP using a VR-headset/VR-glasses. Defines the way of target defeat, height (on a map in relation to sea level) and width by front of the site target (using a VR-headset/VR-glasses).
2. At preparation of installations for firing
   - 2.1. On COP adn. sets tasks (orally):
     - To the scout – on definition of a directional angle and the angle of a place of the target, to the senior scout-range finder – on definition of range to the target (using a VR-headset/VR-glasses);
     - To the evaluator – on preparation of installations for firing with use of devices of data preparation.
     - Personally prepares data for firing (verifies them with data of evaluator), submits a command on opening of fire to commanders of batteries (to SOBs).
   - 2.2. On FCU adn. sets a task on defeat of target to CS and via the radio operator or personally by a simulated communication facility.
3. Organizes interaction with the commander of means of artillery reconnaissance and sets to him a task on firing servicing.

The commander of battery

1. At performance of firing tasks in the battalion the commander of the battery transfers a command received from the commander of a battalion (in a part, the concerning battery) to a firing position. Thus he recalculates (if it is necessary) the consumption of shells specified in a command of the commander of a battalion. Further supervises preparation of fire of the battery, finds (clarifies) the target on district (using a VR-headset/VR-glasses), establishes supervision over it and if necessary enters corrections during firing for effect.
2. At performance of a firing task independently by the battery the commander of the battery finds the target on a district which is visible from COP using a VR-headset/VR-glasses. Defines height (on a map in relation to sea level) and width by front of the site target (using a VR-headset/VR-glasses). The data is submitted to the evaluator. If necessary gives instructions to the scout to the PNP/COMMANDER of AR means (personally by a simulated communication facility) on conducting reconnaissance of the opponent and district, firing service.
   - 2.1. At preparation of installations for firing
     - On Cop batr. Sets tasks (orally):
       - To the scout – on definition of a directional angle and the angle of a place of the target, to the senior scout-range finder – on definition of range to the target (using a VR-headset/VR-glasses);
       - To the evaluator – on preparation of installations for firing with use of devices of data preparation.
     - Personally prepares data for shooting (verifies them with calculator data), submits a command on opening of fire to SOBs.
     - On FCU batr. sets a task on defeat of target to senior officer and via the radio operator or personally by a simulated communication facility.

Senior scout-range finder

- By means of the range finder simulator (in a VR-headset) defines range to the target. Reports to the commander of the battery.

Scout

- By means of the surveying compass simulator (in a VR-headset) defines directional angle and the angle of a place of the target. Reports to the commander of the battery.

Evaluator

- By means of regular computing devices prepares installations for firing. Reports to the commander of the battery.

Radio operator of COP

- Writes down and submits a command to FCU batteries by means of a simulated communication facility.

Radio operator of FCU batr.

- Accepts a command, writes down and sends it to the senior officer of the battery by voice.
Algorithm of work of officers of the artillery battery during training on a simulator

**The chief of staff of a battalion (FCU adn)**

1. Puts the fighting order of a battalion (FCU-9) on the map, makes up the bulletin "Meteoaverage" and submits it to battalion divisions.
2. By preparation of installations for firing
   - Carries out the control of performance of tasks (exercises) of the Firing Course by battalion batteries
2.1 on COP adn.
   - Defines the consumption of shells on the main gun;
2.2 on ECU adn.
   - Defines the consumption of shells on the main gun;
3. Reports to cadn. about performance of firing tasks, on opening and cease of firing, the consumption of ammunition.

**The senior officer of the battery (FCU batr.)**

1. Carries out binding of OP of the battery (in rebatr – OP of platoons), defines the amendment on deviation of temperature of charges.
   - In rebatr defines meteoamendments by means of a meteorological post of the battery.
2. By preparation of installations for firing:
   2.1. On COP batr. FCU adn.
     - After receiving a command on fire opening, makes additional calculations, submits a command to commanders of guns;
     - Accepts reports of commanders of guns on readiness for firing;
     - Submits commands on fire opening;
     - Keeps account of consumption of ammunition.
   2.2. On FCU batr.
     - Using regular computing devices, personally prepares installations for firing taking into account the calculated amendments, verifies them with results of evaluator’s calculations;
     - Counts the consumption of shells on the gun (if it was not calculated by cadn or CS);
     - Accepts reports of commanders of guns on readiness for firing;
     - Submits commands on fire opening;
     - Keeps account of the consumption of ammunition.

**Commander of a battery**

By means of a VR-headset/VR-glasses observes the results of firing, estimates deviations of rupture from the target, accepts reports of the senior scout-range finder and the scout, counts corrections, verifies them with data of the evaluator and submits them the senior officer of the battery.

**Senior scout-rangefinder**

By means of the range finder simulator (in a VR-headset) defines the range to ruptures. Reports to the commander of the battery.

**Evaluator**

Counts corrections by means of regular computing devices. Reports to the commander of the battery.

**Senior officer of the battery (FCU batr)**

Counts installations and submits them to the commanders of guns.
Carries out the control of the order of firing of the battery.
Reports to the commander of the battery on termination of firing and consumption of ammunition.

**Commander of a battery**

Accepts the report of the senior officer of the battery on termination of firing and the general consumption of ammunition.
Reports to the commander of a battalion (CS adn) on performance of the task and the consumption of ammunition.

**Head of training**

Performs the objective control of actions of trainees, estimates results of performance of a tasks of the commander of a battalion/battery.
Simulator structure

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Name</th>
<th>K-80, шт.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>General equipment</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Server not lower than Core 2 Duo 3 GHz, 4Gb. Hard drive 500Gb x 2</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Audiosystem of imitation of battlefield sounds</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Voice communication system</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Local computer network</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>Automated workplace of the head of training</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Unified desk, including the keyboard, optical manipulator, a liquid crystal video monitor 19&quot;, laser printer, UPS unit, the system unit (processor not lower than Core 2 Duo 2,6 GHz)</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Microtelephone set</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>The simulator of the advanced observation post</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>VR-headset</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Microtelephone set</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>System unit (the processor not lower than Core 2 Duo 2,6 GHz, video card GeForce 9800GT)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>The simulator of the command-observation post of a battalion</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Automated workplace (unified desk, including the keyboard, optical manipulator, a liquid crystal video monitor 19&quot;, the laser printer, UPS unit, the system unit (processor not lower than Core 2 Duo 2,6 GHz, video card GeForce 9800GT))</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>VR-headset</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Microtelephone set</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>Evaluator’s desktop with equipment</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>The simulator of battalion’s fire control post</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Automated workplace (unified desk, including the keyboard, optical manipulator, a liquid crystal video monitor 19&quot;, the laser printer, UPS unit, the system unit (processor not lower than Core 2 Duo 2,6 GHz, video card GeForce 9800GT))</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Microtelephone set</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Evaluator’s desktop with equipment</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>The simulator of command-observation post of a battery (3 sets)</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Automated workplace (unified desk, including the keyboard, optical manipulator, a liquid crystal video monitor 19&quot;, the laser printer, UPS unit, the system unit (processor not lower than Core 2 Duo 2,6 GHz, video card GeForce 9800GT))</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>VR-headset</td>
<td>9</td>
</tr>
<tr>
<td>3</td>
<td>Microtelephone set</td>
<td>15</td>
</tr>
<tr>
<td>4</td>
<td>Evaluator’s desktop with equipment</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>The simulator of a fire control unit of the battery (3 sets)</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Automated workplace (unified desk, including the keyboard, optical manipulator, a liquid crystal video monitor 19&quot;, the laser printer, UPS unit, the system unit (processor not lower than Core 2 Duo 2,6 GHz, video card GeForce 9800GT))</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Microtelephone set</td>
<td>9</td>
</tr>
<tr>
<td>3</td>
<td>Evaluator’s desktop with equipment</td>
<td>3</td>
</tr>
</tbody>
</table>
Software complex
of generation and visualization of site
and tactical conditions

Mission
● creation on an electronic topographic map of initial tactical conditions;
● preparations of a map of decision and conducting working maps;
● construction of three-dimensional model of a landscape of a terrestrial surface within a site noted on a topographic map;
● automation of process of arrangement on a three-dimensional model of a landscape of vegetation, structures, divisions of the sides;
● display of dynamics of development of tactical conditions simultaneously on an electronic topographic map by conditional tactical signs and on three-dimensional model of a corresponding site of a terrestrial surface;
● integration with hardware-software complexes of military simulators, points of management of various military formations of objects of the automated control systems of armies ACSA.

Editor of tactical conditions
The module of construction of three-dimensional model of a district landscape

- Site on a topographic map
- Panoramic space picture
- Data of SRTM about a grid of heights
- 3D model of a landscape of a site of district
Editor of three-dimensional model of a site ground surface

Module of display of scenery on three-dimensional model of a site of district

Provides

1. Display in sight of an operated external video camera (and also in simulators of sights, devices of day and night vision) of dynamics of development of conditions on three-dimensional model of a site of ground surface with the account of:
   ● Season and days, range of meteovisibility;
   ● Air temperature, direction and speed of wind;
   ● Disposition and condition of local objects, engineering constructions, flying machines, river and sea vessels, cars and infantrymen;
   ● Current position and capacity of radiation of lighting shells, rockets, bombs, projectors, headlights, the Sun and the Moon;
   ● Trajectories of flight of tracer ammunition;
   ● Presence and intensity of overcast, fog, rain, snow, dust, fires, smokes, explosions.

2. Integration with the hardware-software complexes of military simulators, control points of various military formations, objects, automated army management systems.
12 The basic technical characteristics of a simulator

1. Power supply of a simulator - a single-phase network of alternating current 220 V, 50 Hz. Power consumption (maximum) not more than 6 kw.
2. Time of continuous work - 12 hours a day.
3. Operational warranty period – 3 years.
4. By operation conditions the simulator meets the requirements:
   - high working and limiting temperature up to +40°C;
   - low working temperature up to +5°C;
   - Relative humidity up to 80 % at temperature +25°C.
5. Time for readiness to work after activation – not more than 5 mins.
6. The area of a premise for placing of a simulator– 90-100 sq.m.
7. Service life of a simulator not less than 8 years at observance of service regulations and performance of maintenance service and repair according to the operational documentation.

The technical documentation set includes:
✓ Data card
✓ Operation manual
✓ Manual for installation and setting at the place of use by purpose
✓ Spare parts sheet

Functionality of a simulator

- Conducting exercises (trainings) on firing and fire control as a part of an artillery battalion or the battery
- Conducting exercises (trainings) with a battalion/battery armed with towed (122-mm GD-30), self-propelled (152-mm SG 2C3) and jet (BM RSZO “GRAD”) artillery systems
- Performance by trainees of tasks (exercises) of the Firing course as a part of the reduced squads of observational (command-observation) points and fire control points
- Performance of tasks (exercises) of the Firing course with the regular (provided) means of artillery reconnaissance
- Viewing (studying) of educational-methodical and illustrative materials on firing and fire control theory, artillery arms, the Firing course of artillery
Educational-methodical possibilities of a simulator

1. The effective solution of more than 80% of tasks (exercises) of the Firing Course of artillery divisions
2. Performance of educational tasks of firing and fire control in various conditions (normal, mountain, deserted terrain in day and night conditions).
3. Maintenance of a principle of training “from simple to difficult”, individual approach to realization of training, maintenance of continuity of training and exercise performance.
5. Organizational and methodical interrelation of studying and trainings on a simulator with tactical exercises and doctrines in the field.
6. Objective evaluation of level of skills of the trainees.
7. Controllability of the process of studying and trainings, change of intensity of a training process.
8. Decrease in conditionality of studying and trainings, approach of conditions of training to the fighting conditions.

The program of training of the Customer’s technical specialists

For operation and maintenance service of the simulator the specially prepared technicians (instructors-operators) are involved, which quantity is defined by the quantity of simulators and the combat training program (educational process).

For operation of a simulator one specialist is enough.

The tasks of the instructor-operator include preparation of exercise (training) and input of initial data according to the operation manual, a plan and order of performance of exercise (training), assistance to the head of a training in management of a course of training and the control over actions of trainees at performance of tasks (exercises) of the Firing Course of artillery, and also performance of maintenance service of a simulator, the control of its working capacity and repair according to operation manual requirements.

Training of technical specialists is performed in the following volume:

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Subject name</th>
<th>Q-ty of hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Safety precautions at operation of simulator</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>The structure and rules of using (including repair) of a simulator</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Studying of functional possibilities of a simulator on combat training maintenance (educational process)</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>Order of formation at trained of skills of performance of tasks (exercises) of the Firing course of artillery</td>
<td>4</td>
</tr>
</tbody>
</table>

Requirements to the technicians, intended for operation of a simulator:
- presence of admission to operation of electrical installations of the consumers
- ability to work on modern means such as Pentium IV 2,6 GHz (512)
- knowledge of operational system Windows XP, Windows 7
- knowledge of Rules of Firing and Fire control, Firing Course of artillery