Training simulator of tactical training

PURPOSE

★ Formation, fixation and perfection of practical skills of commanders of motor-rifle and tank platoons and companies on the fight organization, management of divisions and fire in combat during conducting tactical exercises and trainings in the conditions of educational class

★ Arranging divisions during bilateral educational fights

★ Performance of individual and group drills with crews of infantry fighting vehicles and tanks
Training simulator structure includes:

- Training simulator of motor-rifle company on BMP-2
- Training simulator of a motor-rifle platoon on BMP-3
- Training simulator of a motor-rifle platoon on BTR-80
- Training simulator of a tank platoon on T-72
- Training simulator of a tank platoon on T-90
- Voice communication system
- Audio systems
- Control point of a training simulator of tactical preparation (including the central server, two automated places for assistance group)
- Local computer network

Central server, local computer network, system of voice communication and training simulator audio system provide interaction in a uniform tactical environment and time scale, on a uniform virtual battlefield between control point of a training simulator and training simulator of platoons and company in the mode of organization and conducting bilateral educational fight (taking into account the simulated rendered and co-operating divisions of other combat arms, aircraft)
The structure of a training simulator of a motor-rifle company includes:
- Three training simulators of a motor-rifle platoon on BMP-2
- Complex training simulator BMP-2K of the commander of a company
- Voice communication system
- Audio systems
- Control point of a training simulator of a motor-rifle company
- Local computer network

The motor-rifle company training simulator can be used independently for performance of tactical exercises in the conditions of an educational class with commanders of company and motor-rifle platoons on organization of general fight, control of divisions and fire, for arranging platoons and company during performance of two-sided training battles.

Possibility of independent use of a training simulator of a motor-rifle company is based on the configuration of a training simulator, which includes a server (a part of control point), local computer network, voice communication system and audio system.
4 Training simulator of a motor-rifle (tank) platoon

Structure:
- Three complex training simulator of crew BMP-2 (BMP-3, BMP-80, Tank T-72, tank T-90)
- Control module of dismounted infantry (only for training simulator of motor-rifle platoons)
- Voice communication system
- Control point of a training simulator of motor-rifle (tank) platoon
- Local computer network

The training simulator of a motor-rifle (tank) platoon can be used independently for performance in the conditions of an educational class of tactical exercises with commanders of a platoon and motor-rifle divisions (tanks) on organization of combined battle, on management of divisions and fire, for arranging a platoon during performance of two-sided training battles.

Control module of dismounted infantry provides the commander of a motor-rifle platoon, who is on his observation post, with:
- Supervision over developing of land and air conditions on three-dimensional model of district by means of VR-headset
- Visualization of actions of the subordinated crew with the corresponding arms, dismounted from fighting vehicles
- Display of results of fire influence of the parties against each other, moving of crew and technics of the parties on the battlefield
- Management of the subordinated crew and fighting vehicles during conducting training battle (transfer of commands, signals, target indications)
The complex training simulator of crew of infantry fighting vehicle (armored troop-carrier, tank)

The structure of a complex training simulator of crew includes:

► The simulator of fighting compartment on dynamic platform
► The simulator of control compartment on dynamic platform
► Head’s workplace
► Control module of dismounted infantry (only for BMP-2, BMP-3, armored troop-carrier-80)

The complex training simulator of crew of infantry fighting vehicle (tank) can be used independently for performance in the conditions of an educational class of drills with crews on firing proficiency and driving.

The complex training simulator of crew provides:

- Performance by trained crew of operations and algorithms of fighting performance in full scope (from taking workplaces to detection of target, manufacture of a shot/launch and definition of results of firing)
- Traffic control and firing with use of simulators of controls, devices of aiming and supervision of simulated sample of VVT
- Display in simulators of devices of supervision and aiming only visible objects and sites on three-dimensional model of district
- Imitation of work of a regular communication facility and sound effects accompanying firing, engine and equipment operation

Control module of dismounted infantry provides to the commander of division the possibility of management models of crew of division at actions in the infantry order by means of indication on district of:

- Positions (objectives) which should occupy arrows, the sniper, machine-gun and grenade launching units
- Reference points, responsible sectors, objectives of opening or concentration of firing, specific targets for destruction
- Direction and way of movement of each motor-rifle man, unit and a whole division
- Reception of oral commands from the senior chief and imitation of reports from the subordinated motor-rifle men
# TRAINING SIMULATOR SET

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Mane of part</th>
<th>Qty pcs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Motor-rifle company training simulator on BMP-2, including</strong></td>
<td>1</td>
</tr>
<tr>
<td>1.1</td>
<td>complex training simulator of crew of BMP-2</td>
<td>9</td>
</tr>
<tr>
<td>1.2</td>
<td>complex training simulator of crew of BMP-2K of the commander of company</td>
<td>1</td>
</tr>
<tr>
<td>1.3</td>
<td>control point of a training simulator of tactical training (including the central server, two automated workplaces of assistance group)</td>
<td>1</td>
</tr>
<tr>
<td>1.4</td>
<td>local computer network</td>
<td>1</td>
</tr>
<tr>
<td>1.5</td>
<td>voice communication system</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td><strong>Training simulator of a motor-rifle platoon on BMP-3, including</strong></td>
<td>1</td>
</tr>
<tr>
<td>2.1</td>
<td>complex training simulator of crew of BMP-3</td>
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</tr>
<tr>
<td>2.2</td>
<td>control point of a training simulator of a motor-rifle platoon</td>
<td>1</td>
</tr>
<tr>
<td>2.3</td>
<td>control point of dismounted infantry</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td><strong>Training simulator of a motor-rifle platoon on BTR-80, including</strong></td>
<td>1</td>
</tr>
<tr>
<td>3.1</td>
<td>complex training simulator of crew of BTR-80</td>
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</tr>
<tr>
<td>3.2</td>
<td>control point of a training simulator of a motor-rifle platoon</td>
<td>1</td>
</tr>
<tr>
<td>3.3</td>
<td>control point of dismounted infantry</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td><strong>Training simulator of a tank platoon on T-90, including</strong></td>
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</tr>
<tr>
<td>4.1</td>
<td>complex training simulator of crew of tank T-90</td>
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</tr>
<tr>
<td>4.2</td>
<td>control point of a training simulator of a tank platoon</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td><strong>Training simulator of a tank platoon on T-72, including</strong></td>
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</tr>
<tr>
<td>5.1</td>
<td>complex training simulator of crew of tank T-72</td>
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</tr>
<tr>
<td>5.2</td>
<td>control point of a training simulator of a tank platoon</td>
<td>1</td>
</tr>
</tbody>
</table>

## COMMUNICATION SCHEME IN THE TRAINING SIMULATOR OF TACTICAL TRAINING

**Control point**

- Company commander's radio network
- Platoon commanders (PC), division commanders (DC) with portable radio-stations

- BMP-2K simulator of company commander
- BMP-3 simulator of platoon commander
- T-72 simulator of platoon commander
- BTR-80 simulator of platoon commander
- T-90 simulator of platoon commander

- On-board radio station
7 Possibilities of a training simulator of tactical training

The following tasks are solved on control point:

✦ Selection of a site of district for forthcoming drill (from available library)
✦ Automated formation of a three-dimensional model of the selected site of district
✦ Preparation of the necessary set of electronic working maps
✦ Setting of a starting position and condition of opponent divisions
✦ Preparation of a graphic part of the plan of forthcoming maneuvers
✦ Display on an electronic map of the head of true data about position and condition of divisions of the parties in dynamics of battle
✦ Navigation on an electronic map with use of technology “mini-map”
✦ Display of current co-ordinates and height above sea level in each point of map
✦ Measurement of distances between objects on a map (both by directions and by road network routes)
✦ Scaling of the image of tactical conditions on electronic map for viewing (with detailed elaboration up to each unit of combat material or motor-rifle division) and change of a fighting order of each sub-division
✦ Plotting on an electronic map by means of conditional tactical signs of initial conditions, graphic elements of the decision, and also current conditions (according to reports of subordinates and reconnaissance data) in the course of drill
✦ Display of tactical environment on three-dimensional model of district

Examples of visual information on video monitors of head’s workplace

Electronic map of a site of district with plotted environment

Three-dimensional image of a site of district during battle
8 Possibilities of a training simulator of tactical training

Structure of the software of control point of a training simulator:

- Editors of databases of ТТХ samples of arms and the military technics, rockets and ammunition, organizational structures of divisions, initial structure and a condition of opponent sides
- Program complex of generation and visualization of district and tactical environment
- Interface for setting starting position and condition of the parties, conditions of battle, management of a course of drills, assistance
- Modeling block of adaptive actions of simulated divisions and firing means
- The service modules necessary for carrying out of analysis of actions of trainees

On control point the head performs:

- Preparation of tactical exercises – definition of structure, position and condition of the parties, their tasks, meteoconditions, site of district for drill performance
- Plotting of tactical conditions on an electronic map with use of tactical symbol signs
- Accompanying (interactive management of actions of simulated divisions and fire means of neighbors and the senior chief) for each party separately
- Gathering, processing and display of data about a course and results of performance by trainees of tactical and firing tasks
- Radio exchange with trainees and the radio exchange control in their networks
- Recording and reproduction of instructive and characteristic fragments of drills
- Printing of necessary data (including and electronic topographic maps)
- Display of results of actions of the parties during battle in the form of tables and schedules (losses of the parties, consumption of ammunition, fuel, etc.)

Visualization of actions of divisions
Software complex of generation and visualization of district and tactical conditions

Purpose

- generation on an electronic topographic map of initial tactical environment;
- preparation of a map of solving and conducting operational maps;
- formation of a three-dimensional model of landscape of ground surface within a site marked on a topographic map;
- automation of process of arrangement on three-dimensional model of a landscape of vegetation, structures, divisions of the parties;
- display of dynamics of development of tactical environment simultaneously on an electronic topographic map by tactical symbol signs and on three-dimensional model of a corresponding site of ground surface;
- integration with hardware-software complexes of military training simulators, control points of various military formations, objects of the automated troop and command systems ATCS.

Editor of tactical environment
Module of construction of three-dimensional model of a district landscape

Site on topographic map

Panoramic satellite image

Data SRTM about a grid of heights

3D model of landscape of a site of district
Editor of three-dimensional model of a site of ground surface

Automatic placing of trees, bushes, grass on three-dimensional model of landscape

Arrangement of three-dimensional models of trees and structures

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

Provides

1. Display in FOV of an operated external videocamera (and also in simulators of sights, devices of day and night vision) of dynamics of development of environment on three-dimensional model of a site of ground surface with consideration of:
   + Season and time of day, range of meteovisibility;
   + Temperature of air, wind direction and speed;
   + Disposition and conditions of local objects, engineering constructions, aircraft, river and sea vessels, vehicles and infantrymen;
   + Current position and capacity of radiation of lighting shells, missiles, bombs, projectors, headlights, sun and moon;
   + Trajectories of flight of tracer ammunition;
   + Presence and intensity of overcast, fog, rain, snow, dust, fire, smoke, explosion.

2. Integration with hardware-software complexes of military training simulators, control points of various military formations, objects of automated control systems of armies.
The training simulator of tactical training expands possibilities of performance of actions of tactical training and objectively causes **occurrence of new and change of existing forms of training** and preparation which general characteristics are:

- Two-sided character of trainings and drills
- Actions of divisions of the parties on one site of three-dimensional model of district in uniform tactical conditions and in uniform scale of time
- Real time scale of display of a course and results of actions of the parties, their firing interaction mutual
- Imitation of real structure of radio networks
- Conducting training and training-simulating battle
- Possibility of repetition of tactical situations

| **Training battle** – educational battle in which trained divisions of the parties operate against each other on complex training simulator of crews of Air Force Technics | **Training-simulating battle** – educational fight in which trained divisions of the parties operate on complex training simulator of crews of Air Force Technics, and management of actions of co-operating simulated divisions and/or of the opponent is performed by accompanying group for each party separately |

1. **Trainings on firing and firing control of divisions on a training simulator of tactical training** - the form of fighting arranging of divisions, training of commanders of infantry fighting vehicles, armored troop-carriers and tanks, platoons and a company to techniques and methods of firing control of divisions.

   Trainings are conducted by means of practical processing of issues of organization of the system of firing and a firing control of divisions during conducting two-sided training or training-simulating battles.

2. **Tactical exercises on a training simulator of tactical training** – the form fighting arranging of platoons and a company, perfection of skills of commanders on the organization of battle and management of divisions in the battle.

   Drills are conducted by means of performance by divisions and platoons of tactical tasks in various kinds of two-sided training (training-simulating) battle

3. **Tactical maneuvers on a training simulator of tactical training** – the form of tactical preparation and fighting arranging of a motor-rifle company, training of the company commander to techniques of battle organization and conducting.

   Maneuvers are conducted by a company (complete crews, platoons, company without motor-rifle men) with use of a complete training simulator of tactical training by performance of tactical tasks in various kinds of two-sided training (training-simulating) battle.
Order of preparation and performance of tactical exercises in the mode of training and training-simulating battle

**Drill plan formation**
- Graphic part on a map
- Explanatory note
- Organisation of drill scheme
- Environment escalating plan
- Target(simulated) environment scheme
- Other documents

**Development of tactical task and its informing to trainees**

**Control of technical readiness of the training simulator for performance of training**

**Control of performance by trainees of the tactical task and their readiness for training**

**TRAINING PERFORMANCE**

**Sub-units’ actions**
- Taking by trainees of workplaces in training simulator, turning-on, entering in communication
- Management of fighting vehicles, conducting investigation and firing from a complex of arms BMP-2 (BMP-3, BTR-80, tanks)
- Control of divisions and firing during performance of tasks in view
- Exchange of commands and reports

**At control point**
- Taking by trainees of workplaces in training simulator, turning-on, entering in communication
- Management of fighting vehicles, conducting investigation and firing from a complex of arms BMP-2 (BMP-3, BTR-80, tanks)
- Control of divisions and firing during performance of tasks in view
- Exchange of commands and reports

**T_{tr} = 0** uniform time for training beginning

**T_{tp} = T_k** uniform time for end of training

**Performance of analysis of training, summarizing and setting of tasks**
- Display of fragments of training and their analysis.
- Demonstration of the generalized results of actions of trainees.
- Announcement of marks.
- Setting of tasks on elimination of lacks

**Approval of drill plan**

**Used means:**
- Electronic topographic map of drill district, 3D model of district
- Graphical editor, interface of accompanying actions
- Database of ammunition and organizational structures of parties
## Tactical-technical characteristics

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Parameter name</th>
<th>Qty, pcs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Quantity of simultaneously trained subunits of:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- motor-rifle platoons</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>- motor-rifle companies</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>- tank platoons</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>Quantity of operated dismounted motor-rifle divisions</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>Quantity of the simulated land targets</td>
<td>up to 120</td>
</tr>
<tr>
<td>4</td>
<td>Quantity of simulated co-operating subunits</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- divisions</td>
<td>2-4</td>
</tr>
<tr>
<td></td>
<td>- platoons</td>
<td>1-2</td>
</tr>
<tr>
<td></td>
<td>- companies</td>
<td>1-2</td>
</tr>
<tr>
<td>5</td>
<td>Quantity of simulated firing subunits, helicopters and planes</td>
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</tr>
<tr>
<td></td>
<td>- mortar battery</td>
<td>1-2</td>
</tr>
<tr>
<td></td>
<td>- grenade launching platoon</td>
<td>1-2</td>
</tr>
<tr>
<td></td>
<td>- artillery battery</td>
<td>2-6</td>
</tr>
<tr>
<td></td>
<td>- anti-tank platoon (ATP)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>- antiaircraft-missile platoon (AAMP)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>- fighting helicopters</td>
<td>2-4</td>
</tr>
<tr>
<td></td>
<td>- planes of assault aircraft</td>
<td>2-4</td>
</tr>
<tr>
<td>6</td>
<td>District</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- sizes of three-dimensional model of a site of district, km</td>
<td>10x10</td>
</tr>
<tr>
<td></td>
<td>- district types - flat, deserted, mountain</td>
<td>+</td>
</tr>
<tr>
<td>7</td>
<td>Conditions of tactical trainings and drills</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- day, night, twilight</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- winter, spring, summer, autumn</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- meteoconditions - fog, overcast, precipitations, wind</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>- smokes and aerosols</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- radio-electronic hindrances</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Occupied area</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- complex training simulator, sq. m</td>
<td>440</td>
</tr>
<tr>
<td></td>
<td>- control point, sq. m</td>
<td>15</td>
</tr>
<tr>
<td>9</td>
<td>Power consumption, kw</td>
<td>200</td>
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</table>
15 Educational-methodical possibilities of a training simulator of tactical preparation

★ Performance of trainings on firing and firing control, one- and two-sided tactical exercises of platoons, company on complex training simulator in various conditions of environment

★ Simulation of actions of the attached and co-operating forces and means, firing and radio-electronic counteraction of land and air opponent

★ Solution of a wide spectrum of tasks of tactical training: from promotion of divisions in march formation before conducting two-sided training-simulating battle (in attack and in defense)

★ Maintenance of realness of work of radio networks of control of subunits during tactical trainings, drills and maneuvers

★ Management of actions of motor-rifle divisions, platoons and companies both in the infantry, and in armored fighting usages

★ Display of dynamics of two-sided battle on the electronic working map

★ Control of actions of trained commanders and subunits

★ Integration in training systems of higher level (battalion), and also with complex training simulator of artillery, anti-tank and antiaircraft divisions
Research-and-production enterprise “Energy 2000” provides:

During delivery of a training simulator of tactical training
- adaptation of a special program and software according to arms and organizational structure of motor-rifle units and divisions of the Customer, and also its probable opponents
- training of the Customer’s staff

During in exploitation of a training simulator of tactical training
- author's support and modernization of special software and mathematical support
- integration of training simulator of motor-rifle and tank divisions in training systems of battalion level, and also with training simulator of divisions of other branches of armed forces
- working out of recommendations about introduction in a tactical link of perspective means and systems of automated control of armies