



The program «Marksmanship exercise constructor «Sniper»



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Novosibirsk, 2009

The program «**Marksmanship exercise constructor «Sniper»** is intended for teaching rules and techniques of shooting an automated rifle and a sniper rifle to security and law-enforcement agencies, improving the shooting proficiency level and assessing the practical skills of performing fire missions.

The program operates as a component part of the interactive laser shooting range «Rubin».

For the purpose of training, visible radiation (650 Nm) and black light (780 Nm) laser gunnery trainers are used:

- LT-310PM
 - LT-310PM (the invisible being)
- with adequate attachment points for small arms (Kalashnikov's automatic device, Sniper rifle and others).

The program capabilities allow to use ready-made marksmanship exercise databases created for marksmanship courses (Pistol Course 2000 of the Ministry of the Interior of the Russian Federation, etc), modify marksmanship exercise settings and create marksmanship exercises according to training program requirements and specific requirements of trainers and instructors.

The program takes into account:

- Ballistic and structural characteristics of weapon
- Weather conditions
- Topographic conditions of shooting

The program allows choosing:

- Topography (placement of targets)
- Shooting conditions (day, night, dusk)
- Sounds
- Visibility of targets
- Number and types of ammo and shooting modes
- Shooting imitation mode

When marksmanship exercises are created:

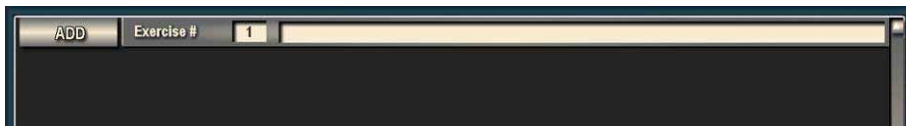
- single and group targets can be used
- pop-up targets and moving targets can be used
- targets can be divided into 2 groups: neutral targets and enemy (intended) targets

Program capabilities allow to specify for each target:

- number of targets (for group targets)
- shooting range
- target position in the field
- target pop-up and exposure time
- target pop-up sequence
- number of target exposures
- direction of movement
- movement rate

The main target parameters (target position in the field, target pop-up and exposure time, movement rate and direction) can be definite or random values in the specified range of values.

OPERATIONAL FEATURES OF THE PROGRAM



When the program is started, **Archive of Exercises** window opens displaying a complete list of exercises available in the archive. In order to select the exercise, move the mouse pointer to the header of the necessary exercise and click the left mouse button.

Exercise Setting window is now displayed. Start the exercise by clicking the button **NEXT** (in the bottom right corner of the screen) and the button **START** in the opened window. If the change of parameters is needed, select one of the setting groups in **Exercise Setting** window.

The program has seven setting groups:

- **General settings**
- **Settings of task**
- **Ballistics**
- **Group target parameters**
- **Target parameters**
- **Group target exposure parameters**
- **Group target movement parameters**



After editing or creation of a new exercise and exiting **Exercise Setting** window, the program displays a message **Save/Reset all changes** or **Don't save, but to execute exercise with new setting**.

Click the button **Save** to save the exercise with new parameters in the exercise archive or click **Reset all changes** to keep the exercise unchanged.



The following control buttons are displayed in **Exercise Setting** window:

- **«Add target»** - a group target is added in the field, and the settings panel **«Group target parameters»** appears on the right side of the screen;
- **«Delete target»** – the selected group target is deleted from the field;
- **Archive of Exercises** – transfers to Exercise Archive window;
- **Help** – program description is displayed on the screen;
- **Zeroing** – sets the mode of registration fire and calibration;
- **English/Russian** – selection of the English/Russian language program interface;
- **Next** – starts exercise performance;
- **Exit** – program exit.



GENERAL SETTINGS

Parameter	Parameter variation range
- Number of shooters	from 1 to 100
- Width of screen, m	from 2 to 5, step 0,1
- Distance to the screen, m	from 2 to 50, step 0,5
- Hole on a target, %	from 0 to 100, step 10

As a rule, general settings are selected only during the first start-up of the program.

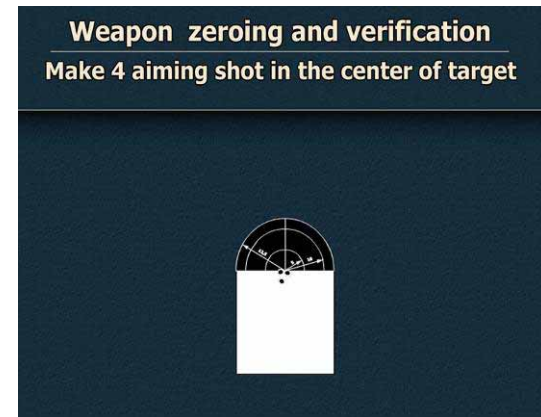
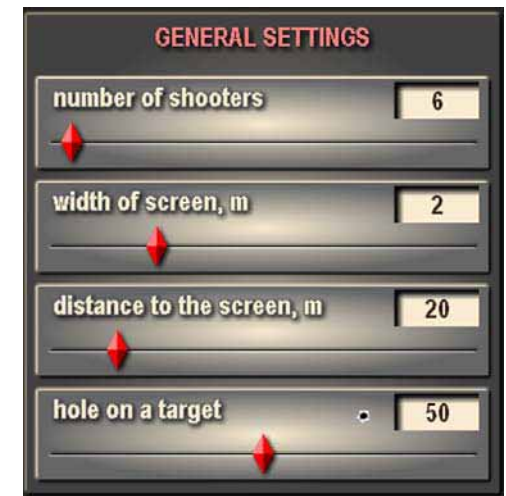
Default settings are displayed in brackets on the right side.

The parameters **With of screen** and **Distance to the screen** (distance from the shooter to the projection screen) are inserted in the beginning of work to enable the program to calculate target sizes on the screen in relation to the firing position.

By default the distance up to the screen is established 20 meters.

The mode of calibration is specially provided in the program (**Zeroing button**).

In this mode, testing target and fire position of 100 meters, Installation of a sight – 1 are displayed on the screen. The weapon is calibrated by four shoots in the center of the target. If the results are saved, the adjustment values (deviation of center of impact from control point along X, deviation of center of impact from control point along Y) are added to the general settings and further used in the program for correction of the hole position in relation to the laser point on the target.



SETTING OF TASK

Parameter	Parameter variation range
- Number of cartridge	from 1 to 60, unlimited
- Type of fire	Single/ automatic fire 2 shots./ automatic fire 3 shots
- Background	One of 60 offered background prompts
- Opacity of target, %	from 0 to 100, step 5
- Illumination, %	from 0 to 100, step 5
- Sound background	Yes/No
- Imitate reciprocal fire	Yes/No

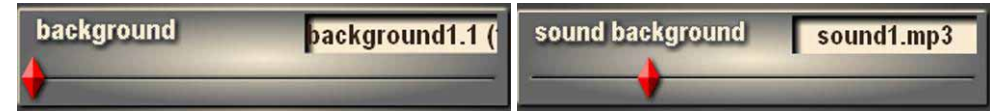
The program allows to specify the number of cartridges for this exercise: from 1 to 60, or assign unlimited number of cartridges. If a trainee runs out of ammo, the exercise finishes ahead of time. If the parameter «**number of cartridges**» is set to «**unlimited**», the exercise finishes when all the targets have been hit or when the target exposure time is over.



The program gives the opportunity to choose a «**type of fire**»: single or automatic (burst of 2 shots, burst of 3 shots). The fire mode is specified once for the whole exercise: single or automatic mode.



The folder «**background**» on the computer's HDD contains files with backgrounds. Sound background files are located in the folder «**sound_background**». If necessary, instructors can add their own backgrounds in *.jpg, gif, png, swf formats to this folder (for example, a picture of a shooting range, a shooting ground, a scenery, premises, etc), as well as sound files for the exercise in *.mp3 format.



The parameter «**Opacity of target**» allows to regulate a contrast of targets in the external background, thus taking into account the impact of weather conditions (rain, snow, fog, etc.). The parameter «**Illumination**» enables to measure the illumination level of the target field and imitate various times of the day (day, shadows of evening, night).



When «**Imitate reciprocal fire**» mode is set, alternating lights appear during the exercise performance simulating counterfire.



BALLISTICS

Parameter	Parameter variation range
- Sight	from 1 to 8
- weapon	Updatings AK, CVD
- Distribution	on / off
- Temperature, degrees	from -35 to 40, step 1
- Pressure, millimeters Hg	from -500 to 800, step 10
- Speed of a wind, meters per second	from 0 to 16, step 0,5
- Direction of a wind	At the left /On the right
- Point of district	from 0 to 100, step 10
- Show distance to the target	Yes/No

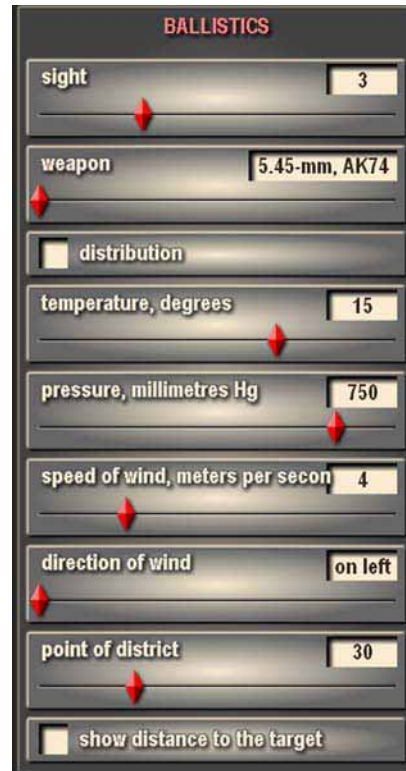
The sight is established at formation of exercise, and also can vary during performance of exercise. With this purpose on the projective screen in the top left corner current value of a breech-sight which can vary the instructor or a trainee from the keyboard is displayed.

In the program following types of the weapon are incorporated:

- 5,45-mm AK74
- 5,56- mm AK101
- 5,56- mm AK102
- 5,45- mm AK105
- 5,45- mm AKC74U
- 5,45- mm RPK74
- 7,62- mm AKM, AKMC
- 7,62- mm AK103
- 7,62- mm AK104
- 7,62- mm CVD

The ballistics of a bullet depends on calibre of a small arms and initial speed of a bullet. For example, for automatic device AK74 ballistic characteristics pay off from conditions: calibre of a bullet 5,45x39 mm, initial speed of a bullet of 900 meters per second.

In the program the opportunity to change temperature of air and a charge, pressure of air, speed of a lateral wind and its direction is stipulated. At performance of exercise on the screen in the left top corner a developing flag which allows to estimate an arrow speed and a direction of a wind shows, and correctly to choose a point of an aiming.



There is no wind



Weak wind 2-3 m/s



The moderate wind 4-6 m/s



Strong wind 8-12 m/s

To make the shooting more realistic, the parameter «**distribution**» has been added to the program. It allows for horizontal and vertical drift of a bullet (impact point) according to the characteristics of the weapon.



Additional options «**Point of district**» and «**Show distance to the target**» allow



to facilitate or complicate performance of exercise.

If to an option «**Show distance to the target**» and «**Point of district**» are switched off, it is necessary for trainee to define independently range up to the purpose, to choose installation of a sight and a point of an aiming.

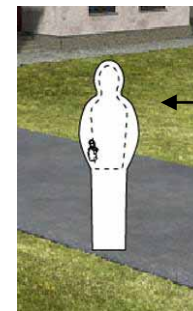
The size of the aiming mark on the screen depends on the value of the «**Point of district**» parameter and changes in the range from 0 to 100%, with the interval of 10%. The recommended value is 20%.

If the option «**Show distance to the target**» is switched off and the value of «**Point of district**» parameter is set to 0, trainees have to define the shooting range, choose elevation range and aiming point by themselves.

If the option «**Show distance to the target**» is included, a trainee, knowing range up to the purpose, should establish a sight and choose a point of an aiming.

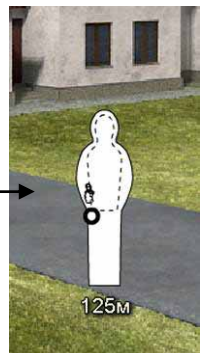
The simplest case is when the value of the parameter «**Point of district**» is set to a number more than 0, for example, 20% (the chosen value determines the diameter of the aiming mark on the target). The trainee only has to direct the weapon toward the aiming point and to softly pull the trigger.

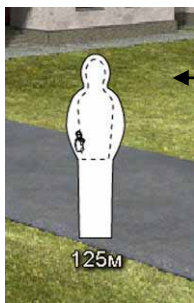
The program allows to conduct shooting with constant installation of a sight on дальностях a direct shot or to change installation of a sight depending on range for each purpose.



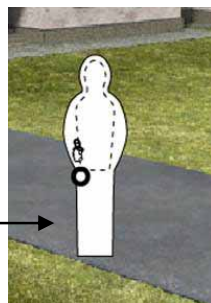
The options «**Show distance to the target**» and «**Point of district**» are switched off

The options «**Show distance to the target**» and «**Point of district**» is included





The option « **Show distance to the target** » is included.

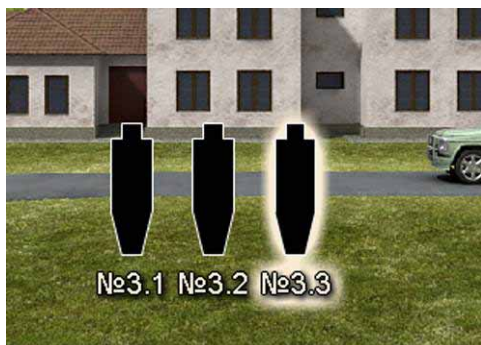


The option « **Point of district** » is included.

GROUP TARGET PARAMETERS

Parameter	Parameter variation range
- group target strength	single / group (from 1 to 10)
- distance, m	from 100 to 700, step 25
- distance range, m	from 0 to 200, step 50
- position, X-line, m	in proportion to distance
- random position, X-line	on / off
- position, Y-line, pixels	from 0 to 1000, step 1
- lateral distance, m	from 0.5 to 10, step 0.5
- range distance, m	from -50 to 50, step 5

Parameter «**group target strength**». There are single targets (containing one shooting mark) and group targets (containing several shooting marks, up to 10).



Parameter «**distance**» specifies the average distance for the selected target. The distance is measured in the range from 100m to 700m with the interval 25m.



Parameter «**distance range**» specifies the range in which the distance changes randomly. For example, if the distance is 300m and the distance range is 100m, the minimal distance value is 250m ($300-100/2$) and the maximum distance value is 350m ($300+100/2$), while the distance value is a random variable in the range from 250 to 350m. If the parameter «**distance range**» is set to 0, the distance is defined by the parameter «**distance**» and its value is strictly determined.



The target position on the screen is defined interactively by dragging the target with the mouse to a certain point on the screen or by using the «**position, X-line, m**» and «**position, Y-line**» scrollers.



The X-coordinates of the target are shown in metres from the left side of the screen in proportion to distance, and the Y-coordinates are shown in pixels (from 0 to 1000). If the option «**random position, X-line**» is on, the lateral position of the target in the field (X-direction position) is chosen randomly.



Parameter «**lateral distance**» varies in the range from 0.5 m to 10 m with the interval 0.5 m and determines the dispersion (the distance between shooting marks in a group target).



Parameter «**range distance**» changes in the range from -50 m to 50 m with the interval 5 m. The parameter defines the range distance between proximate shooting marks within a group target. For example, in a group target consisting of 3 shooting marks, if the average distance is 300 m and the value of the parameter «**range distance, m**» is set to 50 m, the left shooting mark has the distance of 250 m, the middle one – 300 m, and the right one – 350 m.



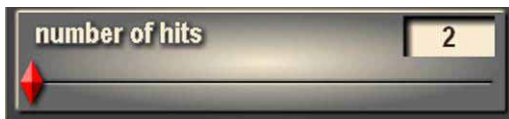
TARGET PARAMETERS

Parameter	Parameter variation range
- Type of target	Annex 1
- hitting target	Yes/No
- Texture	Yes (file name)/ No
- number of hits	from 1 to 10

Target types are described in Annex 1. For each target an adequate texture from folder textures can be selected. Every target can be marked as hitting and as hitting. It is done by turning on/off the option «**hitting target**».



Once a target is hit with a shot, it disappears from the screen. Therefore, the parameter «**number of hits**» defines how many times the target will appear if the value of the parameter «**number of exposures**» is more than zero. For example, if for a given target the value of the parameter «**number of hits**» is set to 2 and the value of the parameter «**number of exposures**» is equal to 3, this target pops up 3 times if it has not been hit during one of the exposures, but it pops up only 2 times if it has been hit during the first 2 exposures. The maximum value of the parameter «**number of hits**» is 10.



GROUP TARGET EXPOSURE PARAMETERS

Parameter	Parameter variation range
- pop-up time, seconds	from 0 to 60, step 1 / random
- exposure time, seconds	from 1 to 60, step 1 / random
- number of exposures	from 1 to 10
- time between exposures, seconds	from 1 to 60, step 1 / random
- activated by a group target	yes (# of target) / no

All shooting marks of a group target appear on the screen and disappear simultaneously. If any shooting mark within a group target has been hit, only this shooting mark disappears, while the others remain exposed.

The exercise completion time depends on the total exposure time of all group targets, the total time between target pop-ups, and the total time between target exposures.

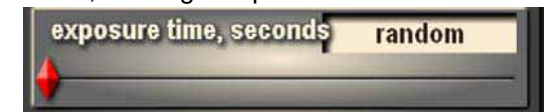
Parameter «**pop-up time**» determines the time between the start of the exercise and the appearance of the first group target on the screen, as well as the time between the appearances of each two consecutive group targets. Pop-up time varies in the range from 0 to 60 seconds with the interval of 1 second.

If the value of the parameter «**pop-up time**» is set to «**random**», the pop-up time can have any random value in the range from 0 to 10 seconds.



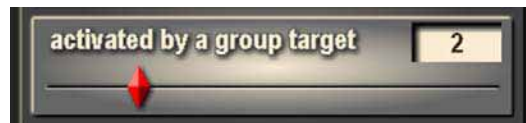
Parameter «**exposure time**» defines the exposure time for a given group target. The exposure time is assigned in the range from 1 to 60 seconds with the interval of 1 second. If a shooting mark is hit with at least one shot, it disappears from the screen. Meanwhile, other shooting marks in a group target remain exposed. If all shooting marks of a group target have been hit, the target exposure finishes ahead of time.

If the value of the parameter «**exposure time**» is set to «**random**», the target exposure time is a random variable in the range from 10 to 20 seconds.

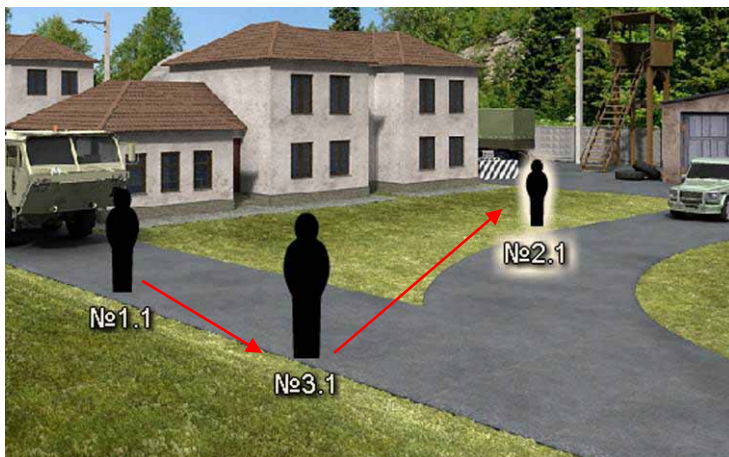


Parameter «**number of exposures**» defines how many times the shooting mark will appear on the screen; the maximum value is equal to 10. Actual number of exposures depends on the value of the parameter «**number of hits**» and fire accuracy (whether the shooting mark has been hit during this exposure or not). For example, the number of hits is 1, and the number of exposures is set to 3. In this case the shooting mark appears only once if it has been hit during the first exposure. If the shooting mark has been hit during the second exposure, it appears only twice. Finally, if the shooting mark has not been hit during the first 2 exposures, it appears for the third time.

Parameter «**time between exposures**» defines the interval between exposures of a given group target. This interval is assigned in the range from 1 to 60 seconds with the interval of 1 second. If the value of the parameter «**time between exposures**» is set to «**random**», this time is a random variable in the range from 5 to 15 seconds.



Parameter «**activated by a group target**» allows to set a sequence of group target exposures. For example, if the third group target is activated by the first group target, and the second group target is activated by the third group target, the exposure sequence will be the following: 1st, 3rd, 2nd. The group targets will appear on the screen consequently after the corresponding group target has been hit or if the exposure time of the group target has ended up. One group target can activate several group targets.



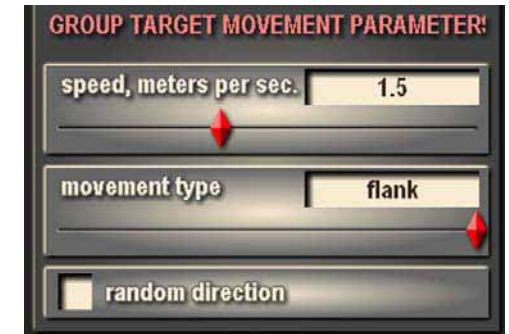
GROUP TARGET MOVEMENT PARAMETERS

Parameter	Parameter variation range
- speed, meters per second	from 0 to 5, interval 0.5 / random
- movement type	frontal / oblique / flank
- random direction	on / off

If the speed is not equal to zero, the group target is a moving one. The distance covered by the group target depends on its exposure time and the group target's speed. If the group target reaches the side of the screen but the exposure time has not finished yet, the group target starts moving in the opposite direction.

The speed varies in the range from 0 to 5 meters per second with the interval 0.5 m.

If the value of the parameter «**speed**» is set to «**random**», the group target moves at a randomly chosen speed in the range from 2 meters per second to 3 meters per second.



All shooting marks of a group target move at the same speed. Three movement types are available in the program:

- frontal
- oblique
- flank

Types of movement are accounted for in the group target travel angle with reference to the shooter in advance.



Frontal group target movement. A group target moving frontally approaches or retreats at an angle from 10° to 30° in both sides from fire direction. Angle value (in the range 10-30°) and movement direction (attacking, retreating) are assigned randomly.

The average angle of frontal group target movement is 20°. If the parameter «**random direction**» is turned off, the group target moves at the average angle of frontal movement (20°) and shifts away from the shooter (retreating).



Flank group target movement. Flank movement means that the group target moves from left to right or from right to left at an angle (from - 60° to - 120° or from +60° to +120°) with reference to fire direction. Angle and directions are chosen randomly.

The average angle of flank group target movement is 90°. If the parameter «**random direction**» is turned off, the group target moves at the average angle of flank movement (90°).



Oblique group target movement means group target travel from left to right or from right to left with simultaneous approaching or retreating at an angle from - 30° to -60° or from +30° to +60° with reference to fire direction. Group target angle is chosen randomly within the range. Movement direction is random.



The average angle of oblique group target movement is 45°. If the parameter «**random direction**» is turned off, the group target moves at the average angle of oblique movement (45°) and moves away from the shooter (retreating).

Moving group targets are placed near the right or the left side of the screen depending on the movement direction. The initial position of group targets has a small random component in the range from 0 to 3 m.




SHOOTING RESULTS

After the completion of an exercise the shooting results are shown on the screen.

The table of results shows the number of the targets hit, the number of penal (unintended) targets hit, the time of exercise completion, evaluation, minimal circle diameter (estimated for one shooting mark only), pictures of targets with holes. The evaluation for the exercise and the name of the

СТАТИСТИКА	
количество попаданий	3
количество попаданий мимо цели	4
количество промахов	10
время выполнения упражнения	11:19
минимальный диаметр круга	0,0000000000000000
имя	Иванов Иван Иванович
номер группы	Иванова Иванов

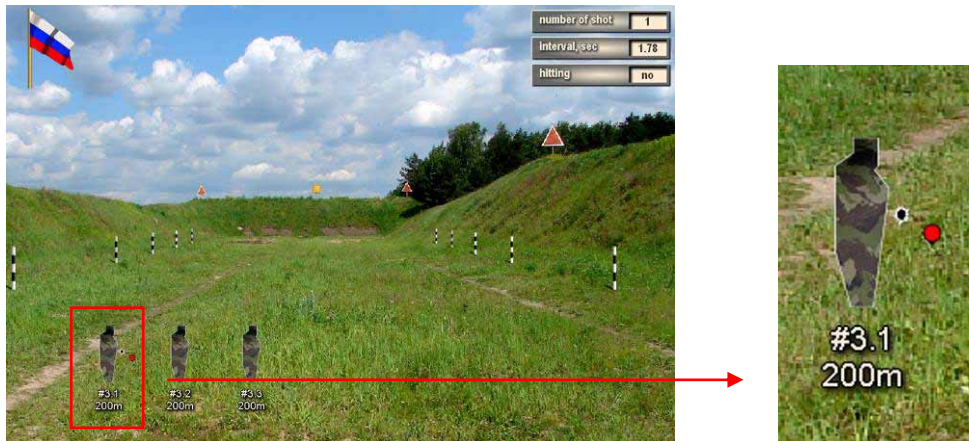


shooter are entered by the shooting instructor manually.

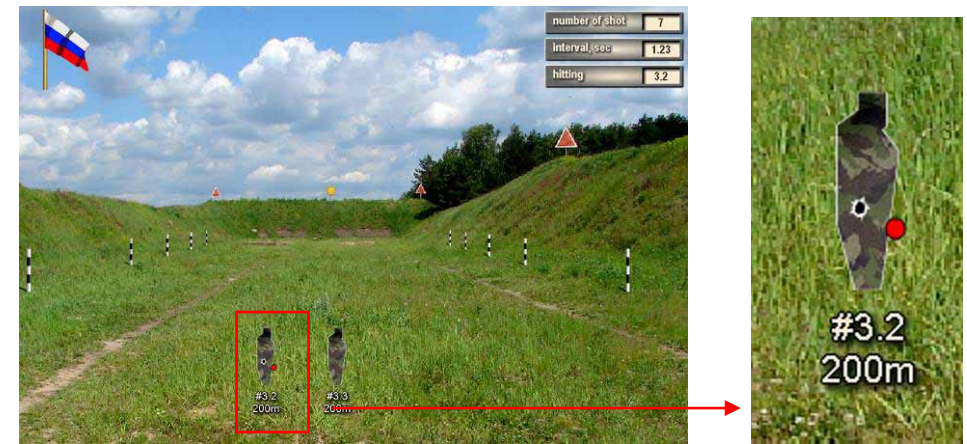
In the «Results» window there is a button «Post-shooting debriefing».



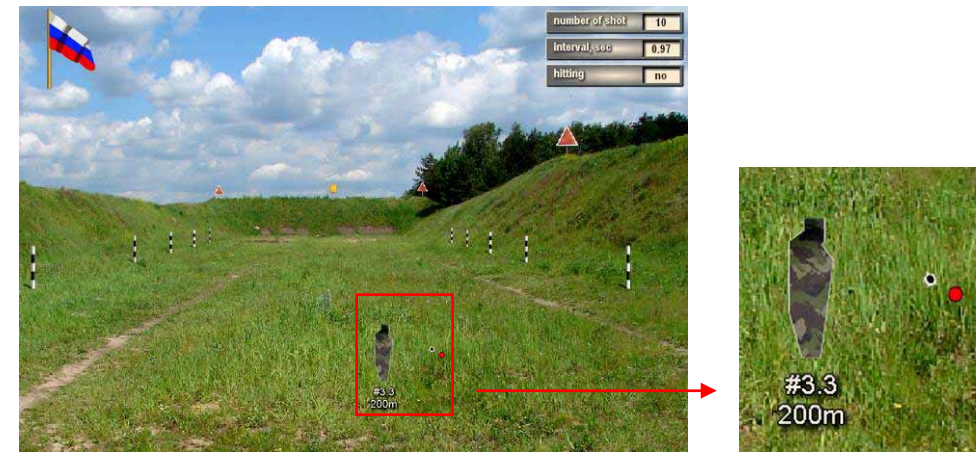
By pressing this button, the instructor opens the window «Post-shooting debriefing», where s/he can see the characteristics of each shot for each target for the given shooter. The shooting mark, the aiming point (the point hit by laser), and the desired point of impact are shown in the field.



Post-shooting debriefing for the first target



Post-shooting debriefing for the second target



Post-shooting debriefing for the third target

Post-shooting debriefing data are only saved for the current shooter. After the next shooter starts completing the exercise, the post-shooting debriefing data for the previous shooter are deleted.

When the exercise is finished by all the shooters, the summary table of shooting results, available for printing out, is displayed.

SHOOTING REPORT Exercise #29 27.5.2009					
shooter	number of targets hit	number of no hitting targets hit	number of miss	time of exercise execution, second	evaluation
1	3	0	1	4.16	excellently
2	0	0	0	16.11	unsatisfactorily
3	3	0	1	11.03	good
4	3	0	3	13.63	satisfactorily

The program allows exercises of pistol practice courses such as.

- Pistol Course 2000 of the Ministry of the Interior of the Russian Federation
- Pistol Course 2003 of the Ministry of Defense of the Russian Federation
- Pistol Course 2006 of the Ministry of Justice of the Russian Federation
- Pistol Course 2002 of the Ministry of the Interior troops of the Republic of Belarus
- Pistol Course of the Ministry of Defense of the Republic of Kazakhstan

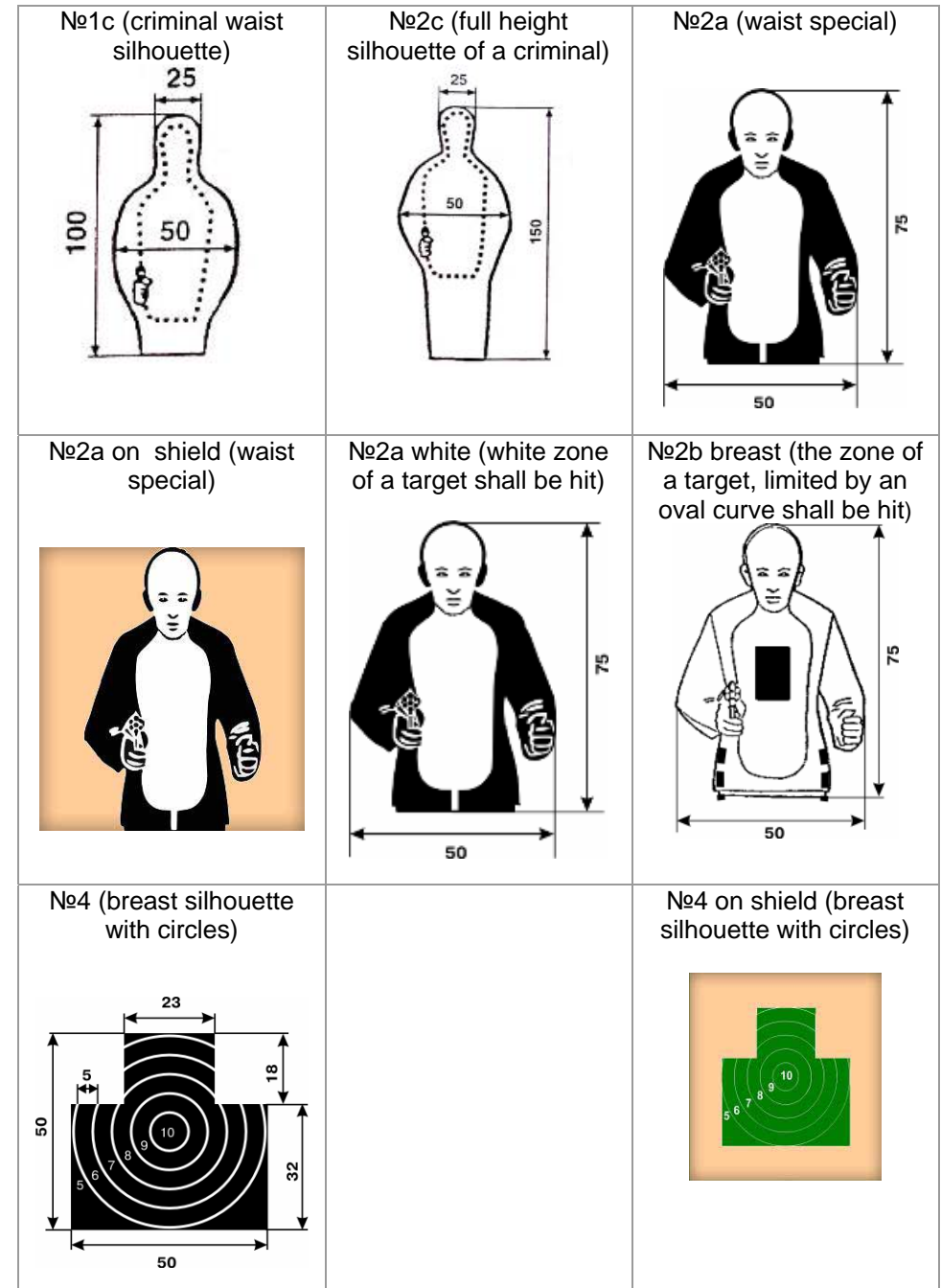
To install a new exercise database for the program, for instance, the database «Pistol Course 2003 of the Ministry of Defense of the Russian Federation», run the executive file **kc-2000 mvd rf.exe** located in the folder «**rubin**» and press the button «**Install database**» in the dialogue window that will open. Meanwhile, the database «**User exercises**» is saved to archive. To return to the database «**User exercises**», run the file **kc-2000 mvd rf.exe** once again and press the button «**User exercises**» in the dialogue window that will open.


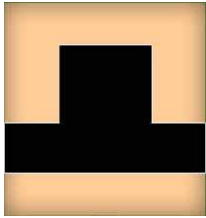
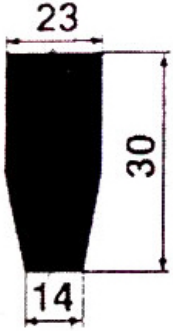

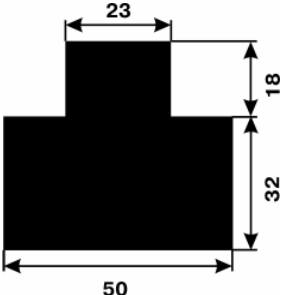
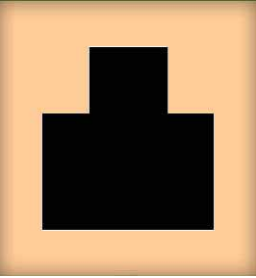

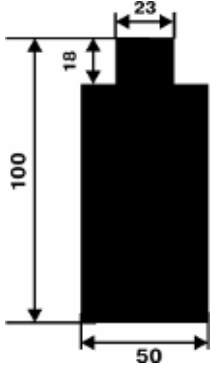
Exercises are only saved in the database «**User exercises**». If you are using other databases, all changes made to exercises are only saved in the current program session. If you download a new database or repeat the download, all changes made to the previous database will not be saved.


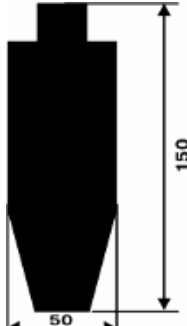
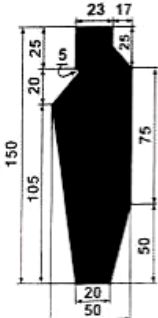


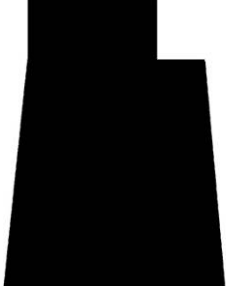


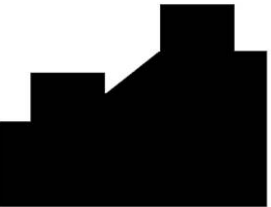
If you have questions or comments about the program, do not hesitate to contact us at the following address:

Your suggestions will help us to improve the program for you.

Annex 1. Target types



<p>№5 (head silhouette)</p> 		<p>№5 on the shield (head silhouette)</p> 
<p>№5a (head silhouette)</p> 	<p>№5b (head silhouette)</p> 	<p>№6 (breast silhouette)</p> 
<p>№6 on shield (breast silhouette)</p> 	<p>№6a (criminal with a hostage)</p> 	<p>№7 (waist silhouette)</p> 

<p>№7a (waist silhouette)</p> 	<p>№8 (full height silhouette)</p> 	<p>№8a (full height silhouette)</p> 
<p>№9 (Manual anti-tank grenade cup discharge)</p> 	<p>№9a (Anti-tank grenade cup discharge in an entrenchment)</p> 	<p>№9b (Portable PTRK on a gun position)</p> 
<p>№9v (Calculation PTUR in an entrenchment)</p> 	<p>№10 (Manual machine gun)</p> 	<p>№10a (Machine-gun calculation)</p> 

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