IX INTERNATIONAL SCIENTIFIC PROFESSIONAL CONFERENCE
SECURITY AND CRISIS MANAGEMENT – THEORY AND PRACTICE (SeCMan)
- IX INTERNATIONAL FORUM „SAFETY FOR THE FUTURE 2023" -
29th and 30th September 2023, Belgrade, Republic of Serbia

APPLICATION OF SIMULATIONS IN TARGETING TRAINING

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Received: 12th August 2023
Accepted: 16th August 2023

Review paper

Abstract: *Through the definition of shooting with small arms and simulations, the paper presents the process of fire training of soldiers. The importance of applying modern technologies in training through the use of simulation simulators for shooting as a useful teaching tool was emphasized. The VirTra simulation trainer intended for shooting training with rifles and pistols was presented.*

Key words: *shooting, armament, training cours, simulations*

1. INTRODUCTION

The training of individuals and units has always been given great importance. It is believed that in approximately the same conditions, victory in battle belongs to those units that are better trained. For the above reason, training and education were also one of the most important tasks of elders and soldiers in peacetime conditions. Training, as a process of acquiring knowledge, skills and habits, is a vital element in creating conditions for implementing the goals and objectives of the defense system.

The development of technology inevitably influenced the modernization of the army, as well as changes in the way of warfare. For the needs of the war machine, scientific and technological novelties are being developed, which will later be a flywheel in other branches of the economy and society. Of course, all those changes also affected the process of military education.

Fire training, along with tactics, is one of the fundamental subjects in the soldier's training process. Its influence on the trained subject is directly reflected in the final outcome of combat operations. Considering the importance of this subject, it was always approached innovatively. One of the innovations is certainly different types of simulators.

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Simulation trainers have long been integrated into the training plans of foreign armies, where they provide opportunities to create almost realistic training conditions.

In the Serbian Army, simulators have been used in training for many years in different branches and services. Recently, a modern simulation trainer for shooting with an automatic rifle M-70 and pistols CZ 99 and Glock 17 has been available at the Military Academy within the course of Armament with shooting instruction for cadets, listeners for reserve officers and professional military personnel.

The aim of the work is to show the possibilities of using the simulation trainer for shooting with shooting weapons, as well as its contribution to the improvement of teaching in the subject Armament with shooting instruction.

2. SHOOTING WITH ARCHERY WEAPONS

In a broader sense, weapons can be defined as devices for the destruction and incapacitation of the enemy's manpower, its individual and group targets, fortifications and other material assets in wartime conditions, as well as for the defense of the lives and property of citizens in peacetime conditions, as preventive and repressive means of the police and as tools for hunting, fishing and sports. A weapon is also any tool intended for conducting combat operations (Randjelovic & Komazec, 2016).

The criteria for sharing weapons are different. For fire training of soldiers, listeners for reserve officers and cadets of the Military Academy, the most important division is according to purpose, energy source and number of servers. In the following text, firearms will be discussed, with an emphasis on automatic rifles and pistols.

Archery arms are basic, firearms intended for shooting: individual and group live targets (discovered, camouflaged, moving and instantaneous), armored vehicles, bunkers, fortified buildings and fire means. Firearms are part of the equipment of the Serbian Armed Forces, a formation tool of the unit and are personal weapons of members of the Serbian Armed Forces in peace and war. It is prescribed by material formation, and includes semi-automatic and automatic firearms.

Due to their mass use, all units of the Serbian Armed Forces, especially infantry units, carry out training in the field of small arms in accordance with the approved plan and program of training of soldiers and units. Shooting weapons training consists of: theoretical lessons, exercises and shooting.

Within the framework of theoretical classes, the content of knowledge, handling, storage and maintenance of shooting weapons is realized. Through exercises, the necessary knowledge and skills in the field of shooting rules are acquired, and shooting is a test of previously acquired knowledge and the pinnacle of training for a given weapon. They are carried out on simulators and shooting ranges, both closed and open, in accordance with valid instructions and shooting programs for a specific type of firearm.

The process of organizing, preparing and firing a projectile at a target is called shooting (Military Lexicon, 1981). Shooting solves the problem of meeting the projectile and the selected target. That problem involves determining the position and condition of the target relative to the firearm. Based on the specific position and state of the target (in cover, out of cover, in motion, behind the mask...) and the conditions on which the projectile's flight depends (temperature, speed and wind direction), the angle of the barrel and the direction of firing are determined.

Shooting with small arms is a special organizational form of individual training, in which all the knowledge, skills and habits acquired in the training process, during the implementation of lectures and exercises are integrated. Shooting is the most reliable measure of an individual's level of training in solving fire tasks and his combat capability. The importance of shooting is reflected in the efficient (successful) application of small arms fire. Small arms fire is the primary means of neutralizing and destroying enemy manpower on land. The basic principles in the realization of fire are: economy, massiveness, timeliness, surprise, supremacy and elasticity. The success of the application of fire, as a decisive factor in the outcome of combat operations, is evaluated by the material effect (Military Lexicon, 1981).

The goal of shooting with small arms is to train the shooters (soldiers, students, cadets, students of courses for reserve officers and senior officers) for: (Randjelovic & Komazec, 2016)

- proper and safe handling of firearms;
- correct choice and way of shooting different targets;
- economical use of available ammunition.
- execution of fire tasks on command;
- independent, accurate and quick destruction of various targets in combat operations.

Shooting with small arms is carried out under the supervision of the shooting manager - instructor, and in accordance with the rules of shooting with firearms, while respecting certain specificities that distinguish it from shooting with other weapons.

3. SIMULATIONS AND MODELS

The very origin of the word simulation is etymologically related to the Latin word simulacio - pretending, obfuscating or otherwise showing the real state than it actually is. In addition to this meaning, simulation is also a method that determines the behavior of systems, models, etc., under changed conditions (Vujaklija, 2004).

According to Shannon (1975), simulation is "the process of designing a model of a real system and conducting experiments with that model in order to understand the behavior of the system or to evaluate different strategies."

Simulation modeling is a complex activity that contains three elements:

1. A real system is an ordered, interdependent set of elements that form a whole and act together to achieve a given goal. The real system is the data source for the model specification.
2. A model is an abstract representation of a system, it gives its structure, components and their interaction. In computer technology, a model represents a set of instructions (program) that serve to generate the behavior of a simulated system. The model has its own objects that are described by attributes and variables.
3. A computer is a device for expressing model instructions, which generate the development of a model in time based on input data. Modeling is the process of establishing a connection between a real system and a model. It refers to model validity which describes how faithfully the model represents the simulation system. Simulation is the process that establishes the connection between the model and the computer. It refers to checking whether the simulation program faithfully transfers the model to the computer and the accuracy with which the computer executes the instructions. Assessing the correctness of the simulator is called verification.

„Simulation is a way of representing the behavior of a real system or the way a real process takes place, by experimenting on a model designed to represent a real system or situation, including those aspects of reality (elements and relationships between them) that are of interest to study. Today, simulation models and simulation experiments are usually developed and used with the help of computers (Jankovic & Nikolic, 2009).

The phrase "modeling and simulation" means a set of activities that construct a model of a real system, after which the dynamics of such a model is simulated on a computer. Each model represents a simplified picture of reality, which does not include all aspects (elements and relationships) of the real system.

In addition to the static structure, each model has its own dynamic aspect, which can be determined analytically, numerically or experimentally. Experimentally determining the behavior of a model is called simulation. If the experiment on the model is done using a computer, then it is a computer simulation, and the model itself, which is then given in the form of a computer program, is called a simulation (Radenkovic et al., 1999; Zeigler, 1976).

The most common areas of application of modeling and simulation in the army are: (Radenkovic et al., 1999)

- Military education, training and practice;
- Defense planning;
- Business planning;
- Procurement of weapons;
- Research and development.

4. SIMULATION TRAINERS FOR SHOOTING

The purpose of modern simulators is essentially not much different from those of half a century ago. The goal is to create as realistic conditions as possible, that is, adequate simulations for better training. What has made a drastic leap in their production is the technology that has greatly contributed to their importance. Namely, the electronic display of the situation, in addition to other electronic elements, not only physically facilitated the implementation of simulations, but also made additional contributions, such as financial, spatial, temporal, and the most important is the quality of training.

There are different types of simulations that the military uses in their operations. The first type of simulation used in the military is live simulation. This type of simulation consists of systems and people living in a situation where a large group of people participate in a simulated battle. The simulated battle uses real weapons and other equipment used in war. This type of simulation is intended to prepare soldiers for war. It is a real encounter that soldiers experience without necessarily going to the battlefield. The armies of different countries establish specific bases in their countries in order to be able to implement this type of training.

Another application of simulation in the military is the use of virtual simulation. It is one of the most used new technologies in the military. Military personnel use it to train soldiers and pilots to guarantee success on the battlefield. Virtual simulation is used in conjunction with tank simulators used in training soldiers to effectively use tanks on the battlefield.

Virtual simulation has allowed soldiers and tank operators to network and participate in simulated wars even when they are in different locations. Training offered through virtual simulation, i.e. simulation trainers, allows soldiers to participate in exercises, acquire new

skills that are crucial in war and raise both individual and collective levels of competence for future combat operations.

4.1. VirTra simulation trainer for shooting with rifles and pistols

Simulation trainers represent a significant step in raising the level of firepower of individuals and units. With the advent of modern information technologies, opportunities for further improvement of simulation trainers have appeared.

Recognizing their application in training, most of the modern armies of the world began to introduce these teaching aids into training. As demand grew, new simulators appeared on the market. One of them is the American-made simulation trainer called VirTra, which has been available to members of the Military Academy since 2018.

The device allows individuals, shooters, to experience many different situations that they may encounter in real combat through virtual training and shooting. In addition to the basic training of cadets and trainees of the course for reserve officers, the simulator is also intended for higher training, primarily with members of the military police and special units.

VirTra has offered several models to the market, such as: V - ST PRO virtual trainer, V - 100 trainer, V - 180 trainer and V - 300 trainer..

For the training of units and individuals in the Serbian Armed Forces, the simulation trainer V - ST PRO is used, which offers a superior training environment.
The system consists of the following components: (VirTra, 2013).

1. The region in which they are located:

a) UPS - uninterruptible power supply unit whose task is to enable the operator to safely turn off the computer in the event of a power failure;

b) in-line audio amplifier to power overhead speakers;

c) computer with Windows 10 operating system and VOS software (version 4.6)

2. Monitor, keyboard and mouse located next to rivers on the table;

3. A screen displaying the selected shooting simulation;

4. High-resolution projector for image broadcasting;

5. High-speed and high-resolution USB camera for detecting laser beams;

6. Tablet for controlling simulations from a distance;

7. WI-FI router for tablet and computer connection;

8. Laser adapters for M-70 rifles;

9. Laser adapters for CZ 99 and Glock 17 pistols;

10. Device for filling frames with compressed CO2 gas.

5. CONCLUSION

Through simulation trainers, a great contribution was made in fire training, which raised its efficiency to a significantly higher level. The ultimate goal of the training is a reflex reaction in a given situation, which demonstrates the psychophysical preparedness of the trained persons as well as their readiness and efficiency in completing tasks. The primary condition for effective response in a given situation is its similarity to training. This is precisely where simulation trainers found their role and became an irreplaceable factor in fire training.

The use of a simulation trainer for shooting with VirTra rifles and pistols has significantly improved the teaching of the subject Armament with the teaching of shooting by members of the Military Academy. Since the simulation trainer has been available to the cadets of the Military Academy, the improvement of their general fire skills is evident.

Further research should be focused on quantitatively determining the improvement in the shooting results of members who use the simulation trainer before combat shooting compared to members who did not have the opportunity to practice shooting on the simulation trainer before combat shooting.

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