Proceedings of 4th International Conference CNDCGS'2024
ISSN 2669-2023 (print) / ISSN 2538-8959 (on-line) / DOI 10.3849/cndcgs.2024.221

Constructive Simulation Tools in the Armed Forces of the Slovak Republic

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Abstract

Currently, simulation technologies are an integral part of training not only in the military sector but also in the civilian sphere. The main aim of this paper is to describe and assess the use of constructive simulators used by the Armed Forces of the Slovak Republic. In this paper, the author analyzes the use of simulation technologies in the training and education of the land and air forces of the Slovak Republic. This paper also analyses the advantages and disadvantages of using constructive simulators for military training. The paper structure respects the general principles of simulation technology and crisis management.

KEY WORDS: *modelling, simulation, virtual simulator, Armed Forces of the Slovak Republic.*

Citation: Brezina, D. (2024). Constructive Simulation Tools in the Armed Forces of the Slovak Republic. In: Proceedings of the Challenges to National Defence in Contemporary Geopolitical Situation, Brno, Czech Republic, 11-13 September 2024. ISSN 2538-8959. DOI 10.3849/cndcgs.2024.221.

1. Introduction

Modelling and simulation tools have been used in the military since ancient times. Throughout history, they performed essential cognitive and military functions. Modelling and simulation participated in the overall development of the military, especially in the military art, military tactics, the construction of the army and the training of commanders. Modelling and simulation were used in the period of preparation for wars as well as during the war. In the 1960s, simulation was an increasingly common phenomenon, especially in the armies of more technically advanced countries. Different types of simulators were created, which reduced the financial expenses and time required for training. At the same time, they increased safety and efficiency with the possibility of better analysis and evaluation of the overall activity. The performance of computers could have improved the quality of simulators. Therefore, the development itself was conditioned mainly by the improvement and modernization of computer technology. Over time, more and more modern and realistic simulators began to be developed, which became an integral part of the training of all advanced armies of the world.

The entry of the Slovak Republic into the North Atlantic Treaty Organization brought with it increased requirements for the training of units and the ability to effectively cooperate with the armies of other countries. To achieve these requirements, using simulators and trainers is a rational choice. This initiated the building of simulation centres on the territory of the Slovak Republic. The participation of the Slovak Republic in the Partnership for Peace program enabled the provision of financial, material and personnel assistance in the field of modelling and simulation.

2. Theoretical backgrounds and definitions in modelling and simulation

In the paper introduction, it is necessary to define the basic terms and concepts related to the problem being solved. These are part of the theoretical basis for assessing constructive simulators' use in the Armed Forces of the Slovak Republic. Virtual reality is the simulation of a real or unreal (imagined) environment using a computer and its input and output devices (Uríček, 2019). It is a term to describe a three-dimensional computer-generated environment that a human can explore. A person becomes part of the virtual environment and can manipulate objects or perform a series of actions. We can perceive the virtual reality environment from all directions in space (Quyang, 2014). The basis of virtual reality is the display of spatial models and scenes in real-time with all its regularities and rules. In doing so, basic procedures from the field of computer graphics are used (Ridpath, 1997). Virtual reality is a shift from a simple (two-dimensional) human-machine interaction to a form where this interaction takes place in a three-dimensional environment. These methods are usually enhanced by special peripherals that ensure visual, tactile, sound and positional interaction (Oulehlová, 2017).

Peer-review under responsibility of General Jonas Žemaitis Miltitary Academy of Lithuania and University of Defence, Czech Republic

Virtual simulator is a set of devices that allow audio and video output. Its aim is to simulate the environment and events as close as possible to reality. The condition is that these devices work together. Primarily these simulators work on the principle of screens and sound speakers or headphones (Mendelová, 2019). Such simulators are often used in the training of various specialists to simulate the conditions, environment, means of action or event as accurately and faithfully as possible. Training simulators can provide virtual training in challenging or hazardous environments (Petz, 2010). Simulation is defines as implementing a model in time. It contains input data that defines the initial conditions or initial state for the simulation. The simulation model produces some form of output data that can be considered as the result of the simulation (Andrassy, 2018b). Simulation is a process where a given problem is solved, or a specific activity is practised on created models. It is a practice performance of various activities according to the type of specific simulation and its purpose (Bučka, 2012).

Simulations since their implementation in the educational and training environment have reflected the need to increase the effectiveness of personnel preparation for events that are very difficult to carry out. The benefits of implementing individual types of simulations and their tools point to the growth of interest and the social need for their use in personnel training. Categorizing simulations is difficult due to the lack of boundaries between categories. The involvement of the human factor defines them. The level of human participation in simulations is very diverse, as is the level of technical equipment. Among the categories of simulations, there is also a category for simulated people working with real equipment (weapons, equipment) missing. A commonly used classification for simulation is:

- Live simulation – persons working on real systems (e.g. a pilot controlling an aircraft);
- Virtual simulation – works on practising motor skills (a pilot piloting an aeroplane in a flight simulator), decision-making skills (deployment of emergency services into action) and communication skills;
- Constructive simulation – involves simulated people working on simulation systems. Living people participate in this type of simulation by entering input data (weather, terrain, situation) but are not included in the outputs (Andrassy, 2018a).

This paper will further analyze specific constructive simulation tools in the Armed Forces of the Slovak Republic. For that reason, it is necessary to mention this type of simulation's main advantages and disadvantages. Constructive simulation is most often used. It is also often referred to as a universal method with vast application possibilities. It is based on computer-based planning and management of staff activities. It shows a virtual synthetic environment based on mathematical methods and the wide use of modern computing and information technology. The basis of simulation is the use of logical and mathematical models. Equations and systems of mathematical equations, inequalities and algorithms express these. Currently, computer technology processes logical and mathematical models in the form of application programs with the corresponding phases of data for their solution. The basic principle consists of simplifying the real system's representation by its simulation model. Experiments are performed based on pre-defined parameters. They ensure the behaviour of the system according to established standards and principles (Rybár, 2000). Among the main advantages of constructive simulation are universality, quantification of phenomena and processes of armed conflict, objective expression of the influence of the terrain and other factors. This kind of simulation applies the influence of subjective factors of armed conflict. The shortcomings of constructive simulation include the difficulty of developing complex models of constructive simulation of combat activity. Constructive simulation is based on a rational basis (suppression of emotional, ethical and volitional aspects of combat activity). This type of simulation can only be used in the field of command and control, while it has high demands on the precision of workers (especially in the preparatory phase).

3. Constructive simulation and its use in the Armed Forces of the Slovak Republic

The main aim of simulation technologies is to provide the armed forces (and other components) through simulations with the most realistic environment for dealing with combat and non-combat situations on the modern battlefield. This contributes to the training of units and the education of leaders. The Armed Forces of the Slovak Republic are no exception. The exercises performed by the following virtual simulators are unique in their preparation and execution phases. A systematic approach was established for the organization of joint exercises using simulation tools, shown in Fig. 1.

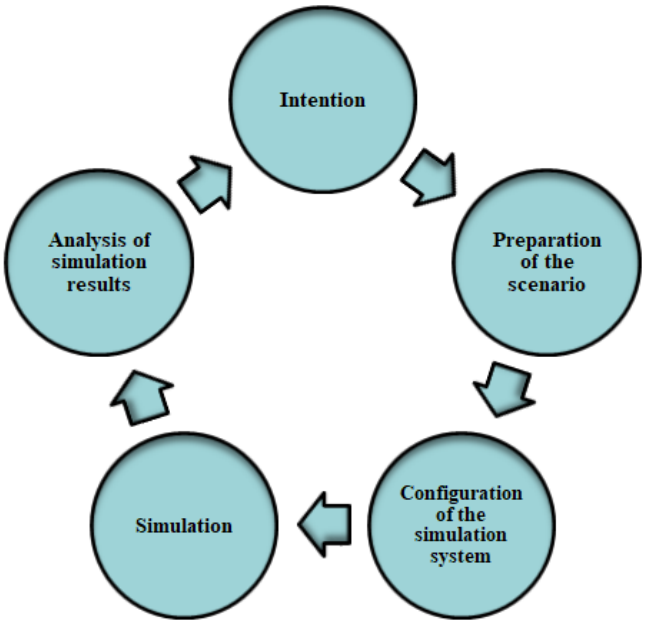

Fig. 1. Scheme of the use of workplaces for the training of the Armed Forces of the Slovak Republic.

3.1. Land virtual simulators

3.1.1. Team Leader Simulator (TLS)

TLS is a virtual simulator designed to support tactical training. Individuals and small groups can be added to the distributed virtual simulation. The primary function of TLS is to generate a virtual synthetic environment as close as possible to actual conditions. TLS creates prerequisites for supporting tactical training of small units, focusing on different types of groups/teams (priority, however, military, rescue, police and fire units). It is used in the Armed Forces of the Slovak Republic to practice crises. TLS complements the existing hardware and software base of the Armed Forces of the Slovak Republic, built on constructive and virtual simulation. It supports the training of commanders of units/groups/teams by simulating the course of resolved crises using virtual synthetic digital terrain. TLS develops coordination and mutual communication, tactical thinking, command and control skills. Emphasis is placed on decision-making (solving tasks of psychological preparation, behaviour in stressful situations, and making decisions under time constraints). It can be used for individual training and to control exercise play within the implemented exercise. Specialized simulator software and hardware provide two workstations in separate cabins (Fig. 2).

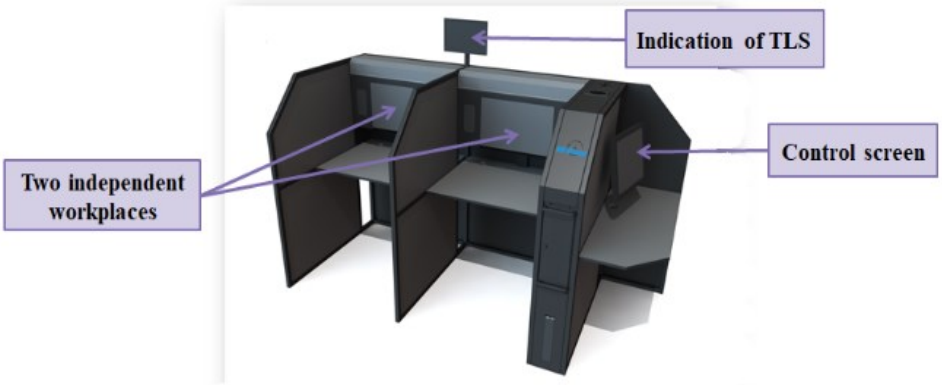

Fig. 2. Division of two independent workplaces of TLS.

Hardware components to ensure the connectivity of the communication interface to the OTB simulation system in 2.5 allow the creation of a complex simulation process. It is connected to a unified environment defined by the DIS protocol. The ASTRA voice communication system simulates a radio connection and allows the simulation of individual radio networks (channels) in conference calls. The view allows an eye-level view of the simulated entity. The trainee obtains information in the same way as in real life, based on observation, cooperation and communication with a cooperating unit, group or team. TLS is a valuable and used system in the Armed Forces of the Slovak Republic. It effectively replaces forms of training for commanders, which would be more demanding in time, material and personnel. TLS provides a wide range of scenario settings. This enables the simulation of various situations and supports the commanders' tactical thinking.

3.1.2. MILES 2000

MILES 2000 is intended for bilateral tactical training. It allows for realistic training with the simulation of shooting and recording of its results without the risk of personal injury or equipment damage by live ammunition. This simulator can be mounted on combat, non-combat, and individuals. It is a tactical simulator and not a shooter. The laser beam does not penetrate obstacles. During the training soldiers of the Armed Forces of the Slovak Republic, it had a negative impact in some situations. It was impossible to hit an opponent who was hidden behind an obstacle. In a real situation, it would be shot through, and the enemy would be eliminated. The principle of operation of the tactical simulator can be seen in Fig. 3.

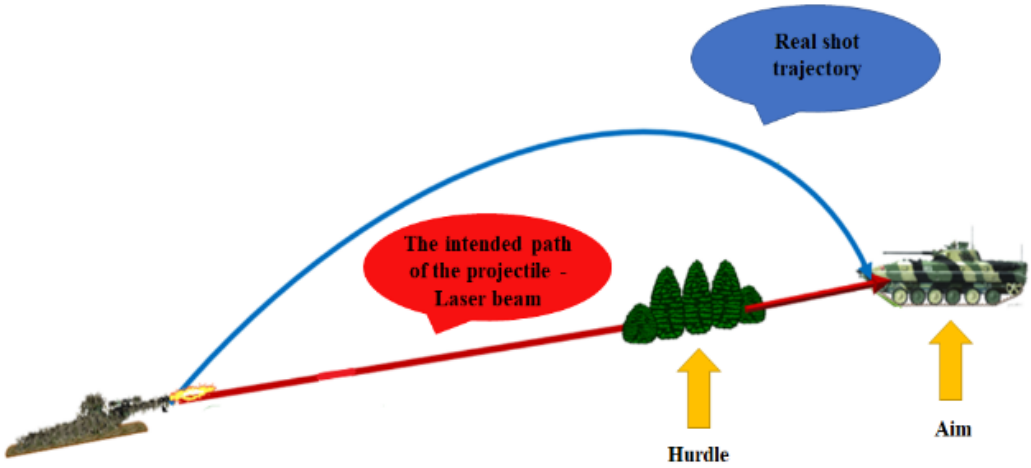

Fig. 3. Working principle of the MILES 2000 tactical simulator.

3.1.3. One SAF Testbed Baseline (OTB)

The OTB simulation system is designed for constructive simulation. Currently, it is used to train commanders and staff at the tactical level of management of the Armed Forces of the Slovak Republic. OTB uses detailed simulations of weapon systems and subordinate units. the software architecture provides a unified methodology and program support for creating and controlling various types of entities on the virtual battlefield. Simulated units can behave autonomously. This means that they can move, shoot, detect, communicate and react without the intervention of any operators. Figure 4 shows the layout of the elements of the OTB simulation tool. The picture shows a detailed simulation of weapon systems and units. It is essential to distinguish between the leadership and management of combat and non-combat operations. The graphical representation enables the simulation of chemical contamination, radioactive radiation, floods and traffic accidents (Hubáček, 2013).

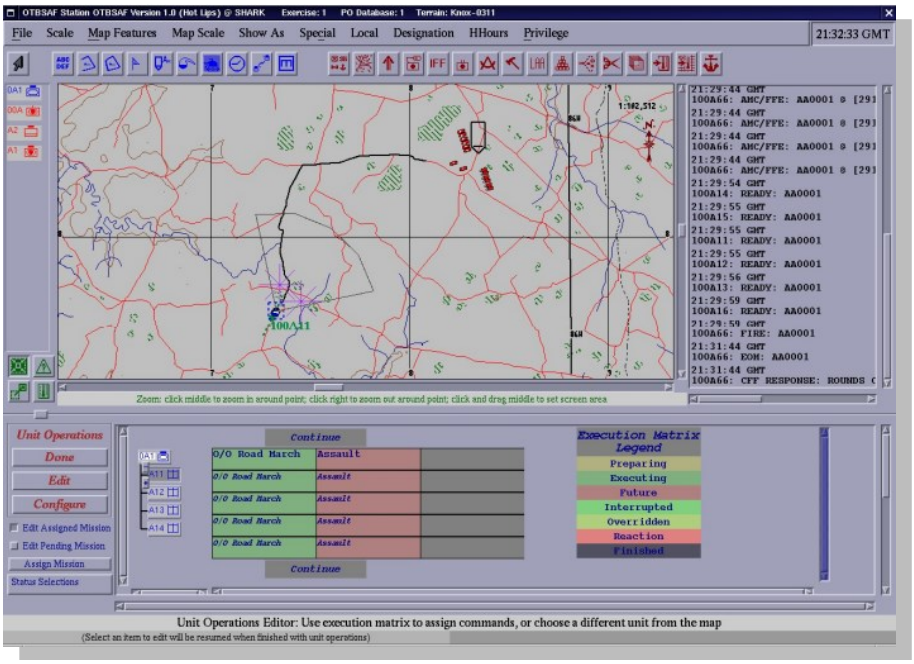

Fig. 4. Layout of OTB simulation tool elements.

As part of the modernization of the Armed Forces of the Slovak Republic, the OTB was expanded to include a module for active camouflage of combat vehicles and the expansion of the tasks of a rocket launcher, mortar and artillery support. In the system, it is possible to conduct research and create minefields or defensive ramparts. Since 2007, the Armed Forces of the Slovak Republic began to cooperate intensively with the Police Force of the Slovak Republic in crisis management. The new aim was to practice activities during non-military situations (for example, demonstrations, rescue operations and eliminating the consequences of natural disasters). Since 2009, the system has also been adapted to the training of EOD units focused on the disposal and handling of explosives.

3.1.4. WASP - Support simulation tool

WASP is also a unique constructive simulation software tool. It allows the simulation of human activity, technology and phenomena associated with human behaviour in a simulated environment. It is designed for computer support of individual and tactical simulation of entities, technologies and phenomena in a synthetic virtual environment. WASP is used to stimulate the situation and develop activities and related accompanying phenomena corresponding to real conditions (Andrassy, 2018b). The technical and program solution ensures ease of use, good configurability and the possibility of expanding the system. The synthetic virtual environment of natural areas for the WASP system is created in the OTFv8 format and allows defining of extensive sets of terrain elements attributes. Subsequently, a generic synthetic virtual environment is used to create and prepare scenarios necessary to ensure the simulation. A specific MDX format is used for 3D visualization of terrain databases. The graphical user interface enables the preparation and creation of scenarios and supports simulation management and display of required outputs (VR Group a.s., 2015).

3.1.5. Virtual shooting range VS – STING

This shooting range is a computerized shooting simulator for training in handgun shooting. It is intended for practising shooting from a place at fixed targets. The trainer works on the optical principle and is entirely safe, as it does not use a laser. The weapons the trainer uses have the exact dimensions, weight, sights and trigger characteristics as real weapons. The virtual shooting range VS – STING uses the evaluation of the course of aiming and the level of the shot. The trainer also includes a set of targets that can be controlled independently. The entire software allows accurate analysis of both aiming and firing. The preparation can be from basic training (handling a weapon, the practice of firing small arms) to the implementation of advanced training (tactical behaviour of trainees in simulated combat conditions).

3.2. Flight virtual simulators

The main educational aim in flight training is the ability to estimate distances correctly. An experienced pilot can judge distances better because of his extensive experience in judging distances. An inexperienced pilot needs to gain this ability and must gain it from flying experience. This aspect of flight training is challenging to train in traditional simulators without depth perception. The screen on which the outside world is projected is placed constantly from the pilot's eyes. Each object projected on the screen appears at the same distance from the pilot (a runway 10 meters from the pilot or a tower 10 kilometres from the pilot). Virtual reality glasses offer stereoscopic screens that present two slightly different images of the same scene. Virtual simulators can accurately and intuitively represent distances in a flight simulation where this aspect is crucial (e.g. during landing practice, where it is essential to correctly assess the height above the runway in a flare, or when a helicopter hovers half a meter above the road). Figure 5 shows the difference in distance perception between the curved screen typically used in traditional flight simulators and virtual reality glasses. Three targets marked with a yellow, green and blue X are shown at the same distance on a curved screen. In virtual reality, they appear to be at the correct distance from the observer. Targets that are further from the observer than the screen appear closer (blue X). Targets closer to the observer than the screen appear further away (green X). Only when the target is at the same distance from the observer as the screen will the distance perception be correct (yellow X).

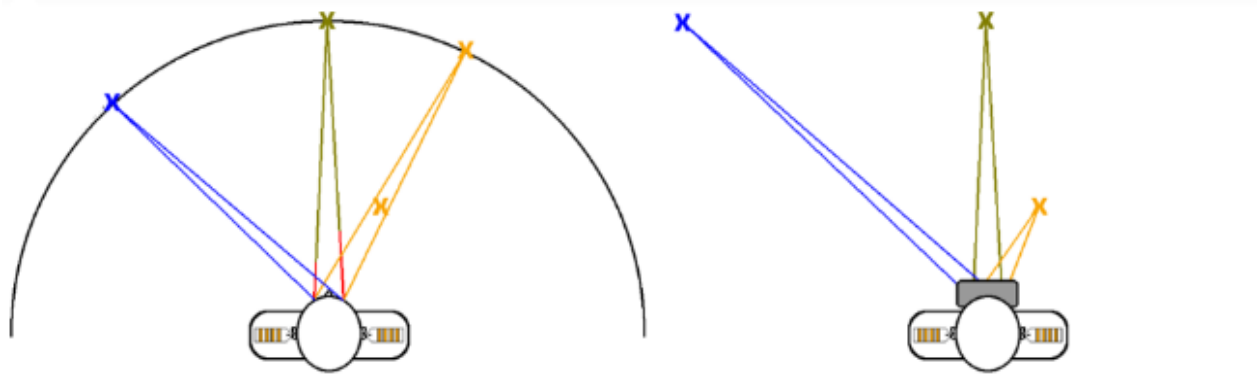

Fig. 5. Working principle of the MILES 2000 tactical simulator.

3.2.1. Flight Visual Information System (LETVIS)

Air traffic management is a complex activity that requires cooperation and mutual communication between workers. This communication aims to ensure the safe and efficient flow of air traffic. Many errors in air traffic control are related to improper coordination between air traffic controllers or insufficient coordination with another station or sector. These errors will likely increase due to the ever-increasing traffic density. The use of simulation in the training of air traffic controllers is the primary and proven method that will find its use in the future as well. In the Armed Forces of the Slovak Republic, the LETVIS is used as a trainer and for air traffic control. A virtual air traffic control simulator was installed at the Armed Forces Academy of General Milan Rastislav Štefánik in 2010. Its construction was divided into several phases to meet the "Real High Fidelity Simulator" requirements. Such a simulator should provide computer simulations that give students a high level of interactivity and realism.

Training on such a simulator is necessary so that the air traffic controller does not acquire bad habits during training. The training carried out through a real certified simulator can provide complex functionality for the training of the Air Force of the Armed Forces of the Slovak Republic. Among them, in addition to the radar air traffic controllers themselves, we also include tower and radar controllers, operators and aircraft pilots. The aim of building this training organization was mainly the creation of a training centre suitable for the training of military air traffic controllers in the service of the Armed Forces of the Slovak Republic. The primary effort was to guarantee the creation of a high-quality and comprehensive workplace where it is possible to conduct training that meets internationally valid standards and regulations. Practical training is the basis for preparing new and existing air traffic controllers, which is why various short-term courses are organized. Among other things, the simulation of unusual and highly stressful situations is also significant for developing and maintaining driver skills (Grega, 2017). According to Baňas (2012), air traffic control is a field in which accuracy and speed of response are required. A big problem in management is optimizing the distribution of visual attention to display devices, communication elements and recording devices.

According to Bálint (2016), LETVIS supports air traffic control operations in the area control centre (ACC – Area Control Centre), in the approach centre (APP – Approach Centre) and the airport control tower (TWR – Air Traffic Control Tower). In addition to the mentioned places, it can also be used in training centres for the air traffic control simulator, for the overview data network, for tracking overview data from several sources, search and rescue operations. The LETVIS system is designed and proven to be modular, flexible and configurable for any size and functionality of the air traffic control system. It integrates solutions for effective airspace control, reliable conflict detection, better interoperability, alerts and warnings, a fusion of overview data from many sources and airspace management. Operational benefits include optimized system life cycle costs and high reliability for business continuity. It is designed to control the airspace efficiently. It simulates radar and flight plan information obtained through its processing and subsequent generation and display.

3.2.2. Mi-17 Simulator FTD/FMS

The FTD provides excellent flexibility in training normal, abnormal and emergency procedures and flight manoeuvres for initial training, refresher training and qualification certification. A realistic loading control system (CLS), combined with vibrating seats, creates a realistic cockpit environment. Steering feel, control forces and displacement characteristics correspond to real helicopters. The Mi-17 Full Mission Simulator (FMS) provides cost-effective, fully secure, initial and repeatable crew training. It is based on an exact replication of the real environment of the helicopter and the mission. FMS systems are designed to cover every aspect of routine, emergency and mission helicopter operations in various scenarios. This includes flying, terrain orientation development and combat mission training. This simulator is based on the HLA motion platform with six degrees of freedom and a hardware copy of the cockpit with realistic copies of all equipment. The FMS has sound effects, an equipment lighting system in the cockpit, instructor operating stations, a media classroom and a spherical display for visualizing the outside world. This simulator can operate in a shared virtual environment between itself and other simulators using the HLA protocol.

The Mi-17 FTD/FMS simulator works on the principle of four main features:

- Networking and interoperability - Network interactions with other simulators or parts of simulators using the HLA 2010 Evolved protocol allow aircrew or formation flight training and the execution of combat missions in formation. The simulator supports integrations with other simulators to conduct interdisciplinary military training with different types of simulators. The simulator supports HLA integrations with air traffic control simulation to teach pilots and controllers (or air traffic control officers) how to work together.
- Cooperation with hardware and hardware simulation - Simulation of onboard systems works based on electrical diagrams. Electrical engineers know how to describe and implement the onboard equipment model with developers. The simulator supports different types of cockpit visualization systems (for example, a spherical screen with a set of glued images from different projectors).
- Operations instructions and operational development - The development of instructor operating stations allows the instructor to monitor the operation of flight and mission tasks, the status of onboard equipment, the environment in 3D and on maps and visualize equipment malfunctions. Recording all distributed activities during the simulation allows the simulation to be replayed from any point. The main aim of modelling airport facilities and environments is to teach pilots how to work with them.

- 3D visualization and terrain - Realistic modelling of areas of real terrain works on automatic zooming using height data, digital vector maps, terrain images and 3D models typical for the given region. 3D visualization of the development of terrain areas simulates these areas precisely as in real conditions (same altitude, terrain types and objects) Artificial intelligence simulates complex patterns such as decision-making, target selection and shooting. Physics and ballistic principles are mainly used in the simulation core of the software.

3.2.3. VRM FMS-M29 (Mig-29 Simulator)

VRM simulator FMS-M29 can be made and applied in two ways. Either as a completely new system or as a complete upgrade of an older Russian KTS-21 simulator or MiG-29 cockpit. Considering the price of the cabin, instrumentation, simulator construction and other aspects, this design is more advantageous for the Armed Forces of the Slovak Republic. Only the cockpit and complete instrumentation are used from the original simulator.

All software and hardware accessories are updated and modernized to date. The display system was also modernized. Six projection systems replaced one screen. The system can project the scene within 180 degrees horizontally and 90 degrees vertically. The simulator has a helmet to aim fire and a real HUD (heads-up display). This system is fixed due to its weight. If it were not fixed, it would not be able to simulate the real acceleration and overload of the Mig-29 fighter. This simulator was created for the needs of the Air Force of the Slovak Republic in 1997 as FSM29, but later in 1999, it was improved and modernized by VRM.

The software generates a 3D image with high resolution and high accuracy of aircraft flight. It contains a navigation system and weapon systems that allow the aiming and firing of cannons, missiles and dropping bombs. When using these weapons, the system also cooperates with the visual and audio parts of the simulator. The map contains two airports, buildings, hills, rivers and landmarks. Of course, it is possible to use 3D objects and change the map. Realistic ortho-maps are available to pilots at Sliač Air Base. Fourteen computers and four powerful speakers ensure the operation of the entire system. At this air base, it is possible to connect the FMS29 simulator with the L-39 Albatros simulator, allowing the simulation of the flight of two aircraft simultaneously. The entire simulation is stored in the so-called black box, which serves to evaluate the simulation. The modernization by VRM aimed to harmonize the simulator with the MiG-29AS version used by the Armed Forces of the Slovak Republic. The cockpit equipment was modernized, and the hardware and software components of the simulator were renewed.

4. Advantages and disadvantages of using constructive simulators for military training in the Armed Forces of the Slovak Republic

Simulation technologies and means are used in the Armed Forces of the Slovak Republic, especially during training in the control of various types of heavy land and air equipment or when practising shooting with small arms or a wide range of weapon systems. This aims to eliminate financial expenses and shorten the time required for training. The main advantages of constructive simulation methods include the following:

- universality results from the mathematical basis - applicability to the description of almost all material-energy processes (Palasiewicz, T., Rolenec, O., Kroupa, L., Manas, P., Coufal, D., 2023) of armed struggle;
- quantification of the phenomena and processes of the armed struggle enables their more accurate analysis and application of optimization in the decision-making activities of command and control bodies;
- objective expression of the influence of the terrain (Jančo, Kompan, 2023) and other environmental factors (Kompan, Hrnčiar, 2024) on the processes of combat activity ;
- CAX-type exercises take place in any geographical region, in different climatic and meteorological conditions, with different opponents and with different (even non-existent) military equipment;
- relatively low economic demands for building training centres for constructive simulation of combat activity and low costs for the maintenance and operation of these facilities - compared to other categories of simulation of armed struggle, constructive simulation in the field of training is the most economically acceptable (low costs for the implementation of exercises in simulation centres and lower difficulty for organizational security of exercises);
- the possibility of high-quality registration of the course of the exercise and its use for a more objective evaluation;
- the possibility of connecting constructive simulation systems with simulation systems of other categories.

Thanks to the simulation of the activities mentioned above, there is no consumption of fuel and wear of equipment, which saves the environment. The possibility of accidents or damage to expensive military equipment is also ruled out. Using simulators is, therefore, an efficient means of training from the financial and time point of view. Simulation devices create an environment where it is possible to practice the operation of heavy equipment and weapon systems in a controlled and safe manner without any risk of injury. By practising various scenarios, the soldiers of the Armed Forces of the Slovak Republic gain the necessary self-confidence and skills that will help them in the future in the absolute control of military equipment and weapon systems. Another positive is that the creation tools of simulators allow the creation of an unlimited number of variants of the environment and training conditions. Soldiers can therefore practice fighting in different climatic and weather conditions, overcoming terrain obstacles, or making decisions and acting in specific situations. Using simulators during training makes it possible to analyze in detail the overall activity of soldiers and evaluate the correctness of their decisions. This benefit can help the soldiers of the Armed Forces of the Slovak Republic to improve gradually. The instructor

can accurately and concretely point out the shortcomings and mistakes that the soldiers committed during the simulation while performing the assigned task. Modern simulator software can also collect statistical data.

Using simulation in the military understandably also has its limits and shortcomings. The most significant disadvantages of constructive simulation include the following:

- difficulty in developing complex models of constructive simulation of combat activity, especially DIS (Distributed Interactive Simulation) systems - smaller armies are dependent on the procurement and application of simulation systems from other more advanced armies);
- constructive simulation models are based on a rational basis - emotional, ethical and volitional aspects characteristic of combat activity are strongly suppressed;
- using these methods, they can practice within the so-called CAX-type exercises only the command and control bodies in their decision-making activities, respectively staff work - soldiers cannot practice using these methods and systems. However, their activity is fully simulated by mathematical means;
- the use of simulation systems requires great precision from staff, especially in the preparatory phase of the exercise when filling the database with relevant data on the parameters of weapons, military equipment and the organizational structures of the staff and troops included in the simulation (exercise).

Most military operations are physical activities. These are performed in a specific space containing many variants of the terrain surface, objects, natural obstacles, forests, watercourses, buildings and objects. All these elements in the real world also have their physical, chemical and biological properties. These must be taken into account when creating the most realistic model possible. Creating the most identical virtual three-dimensional space, showing the most significant possible identity with the original, is time-consuming. The subsequent simulation process may need to be more accurate in low model similarity and bring the desired benefits. Powerful and modern computers are needed to calculate and process this vast information flow, especially if it is a real-time simulation. Then the fastest possible response of the computer is needed to ensure the smoothness of the simulation process. If the computing technology's capacities are insufficient, errors and a too-long response of the simulation to a specific action of the subject may occur during significant interaction of the subject with the environment. The financial costs of building a high-quality simulation centre are also directly related to this.

5. Conclusions

The use of simulation technology is one of the fundamental pillars of modern information society's scientific and technical progress. Simulation technologies have a huge benefit in the training of the Armed Forces of the Slovak Republic from several points of view. The training is closer to the real situation and also saves financial resources. Simulation technologies represent a significant trend in the training and education of units and units of the Armed Forces of the Slovak Republic. They enable the preparation and development of individuals and entire groups for more efficient and effective military operations on the territory of the Slovak Republic, but also in cooperation with foreign armies.

By studying this topic, virtual flight simulators are more affordable for the Armed Forces of the Slovak Republic than the training itself. Another advantage of simulators is their safety and the possibility of creating an almost real environment. In this way, the trainee can master the control of the machines and prepare for various critical situations during regular training and combat deployments. An important question is how the Armed Forces of the Slovak Republic will solve the gradual modernization of military equipment. Modernization should occur not only on the equipment but also on individual simulators. In the future, the training requirements in the Armed Forces of the Slovak Republic should reflect the changing training requirements within NATO. Individual training weapon systems are integrated into a unified, centrally controlled evaluation (Sedláček, M., Dohnal, F., Rolenec, O., 2022).

This will subsequently be part of the overall training strategy of the advanced armies of the world. Means of live simulation will become part of combat and support means and equipment of the soldier of the 21st century.

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