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## SIMULATORS USED IN TRAINING FOR INTERNAL SAFETY PURPOSES

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## ABSTRACT

The author of the article is trying to solve the research problem posed in the form of a question: in what way can the simulators be used in training sessions for the sake of safety and what is the level of effectiveness of such training sessions? The author uses theoretical and empirical methods in order to address the research problem. Simulators taken advantage of in the Police Academy as well as their capabilities and ways of usage, during the training or drilling sessions, have been described in the article. In the last part of the article, the results of the evaluation of the training sessions, using the simulators, have been indicated.

For over 60 years, the Police Academy in Szczytno has been an important centre for training staff for the security sector in Poland. Training sessions in Szczytno Academy started on the day of 15 September 1954, when the Officers School of Citizens Militia was transferred to Szczytno. After just 3 weeks – on the day of 1 October 1954, the yearly course, of improving the professional qualifications of the policemen of the Officers School of Citizens Militia, began. This very first course was completed by 651 graduates (60 years of the Police education in Szczytno (1954-2014), 2014, p. 9). However, a crucial development of the Szczytno school began on the day of 27 July 2005, at the time the Act of the *Higher education law* entered into force, basing on which, the Police Academy in Szczytno became a school of state services, subordinate to the Minister of Internal Affairs (Article 252 Sub-paragraph 1 Point 5 of the Act of 27 July 2005 Higher Education Law, Journal of Laws from 2005 No 164 item 1365). Since that time, the Szczytno school began the competition and cooperation with other schools. This change allowed the Szczytno school to acquire financial means, conduct scientific research and development works, financed from the domestic and foreign means. A part of these means was devoted for the development of didactic equipment such as simulators, which were destined to increase the competences of the students studying the course of *Internal Safety*: both undergraduate and graduate programs, as well as of the policemen and commanders of various levels raising their qualifications in the Szczytno school.

**KEYWORDS:** *simulators, safety, training session, police, training*

Contemporary challenges, connected to the didactics, are the changes in the act of law on higher education, among others. Especially with the requirement that in general academic studies, more than a half of the ECTS points is assigned to the classes connected with the scientific activity conducted at the school. The changes are also connected with the rising expectations of preparing special courses and training for the Police officers. In case of the Police Academy in Szczytno, it especially concerns the police commanders of the Polish Police. The changes in the didactics are not only dictated by the changes in the rules. Today, the education market is extremely demanding. The policemen need technical knowledge which is based on the newest technological advances and which is the effect of the scientific researches conducted. The policemen preparing themselves for the job, as well as those who improve their skills, may drill the required capabilities with the use of the simulators.

According to *The Universal Polish Language Dictionary*, a simulation is *artificial rendering (e.g. in a laboratory, often by means of computers) of the properties of a given object, phenomenon or spaces existing in nature which are difficult to observe, explore or repeat* (*Uniwersalny Słownik Języka Polskiego*, 2003, p. 1471). Whereas a simulator is described as *a device allowing for rendering of real events in artificially created conditions; it is used for exploring phenomena and processes (modelling) as well as for training of e.g.: pilots, astronauts, drivers, tank drivers, shooters, radar operators* (*Encyklopedia Powszechna PWN*, 2010, p. 979). Simulators are the tools which make it possible to acquire complicated and technical skills within the extent of training in a virtual environment. Drilling some skills in reality is not always possible. It is hard to imagine a commander of a police operation drilling to distract an aggressive crowd, at a stadium of several dozen thousand places, with the use of subunits and gathering for this purpose the entire spectrum of coercive measures. Such elements cannot be trained in real conditions, but the simulators provide such a possibility. Today, it is hard to imagine a training of a pilot without the use of simulators. Attention is also drawn to the obligation of flying a certain amount of hours on the simulators and the duty of drilling many manoeuvres, in the conditions of virtual reality, which are impossible to complete in the real conditions. An example is the duty of drilling landing without the extended chassis.

The Police is undoubtedly at the beginning of this road, however the training sessions with the use of simulators are a standard today, and they will undoubtedly be an obligatory procedure in a few years. Currently, in the process of scientific research and the process of teaching in both the undergraduate and graduate

programmes, as well as during training sessions dedicated for the offices subordinate to the Ministry of Internal Affairs and Administration, the following simulators are used in the Police Academy:

**The Simulator of Police Actions in Critical Situations** (Dąbrowski, and others, 2014, p. 81-88 ). Project no OR00004107, financed with the funds allocated by the Ministry of Internal Affairs and Administration, within the framework of the 7th call for development projects to the extent of defence and security. The project was delivered under a scientific and industrial syndicate by: the Police Academy in Szczytno as a leader of the project and ETC-PZL Aerospace Industries Sp. z o.o. [Eng.: *Limited Liability Company*] in Warszawa. The duration of the project is from the year of 2009 to 2012. This simulator makes it possible to perfect the Police officers especially in the range of shaping and developing the skills of commanding, making decisions in situations of gatherings or mass events and in critical situations. The act of improving the skills takes places on several levels. The commander of the operation has the possibility of planning and conducting the police operation while reacting on the dynamically changing situation, with the help of the deputies and staff. Commanders of sub-divisions may make decisions on the way of delivering the orders of the commander with planned forces and means. Every single drilling session is recorded, which makes it possible to replay and analyse commanded issues as well as their accuracy and methods of implementation. The drills may be planned, placing them basing on the owned information concerning potential threats, owned forces and means in various places of the virtual city. The simulator has its own complex virtual environment, support forces such as ambulances, municipal polices forces, police officers of other services, for example road traffic. Tactics of actions of compact Police departments and a full range of coercive measures used were also implemented to the simulator. The simulator also makes it possible to change the atmospheric conditions, time of the day, night or year. The virtual environment reflects a huge fragment of the Capital City of Warsaw but the virtual environment, which does not exist in reality, was also added. Industrial area, mountainous area, wooded area, expressways including motorways, which aim to enable the exercise of various critical situations in close proximity to the city centre, were added to the centre of the virtual Warsaw. This simulator is especially intensively used in the process of education. Training within the

extent of specialist course for commanders of police operation are conducted periodically (Decision no 327 of the Police Commander in Chief of 2 August 2013 amending the decision on the specialist training course programme for Police operation commanders. Journal of Laws for the Police Headquarters no 59 of 2 August 2013). The policemen undergo training, within the extent of professional improvement, on this simulator – it concerned the policemen of provincial police headquarters in Białystok, Bydgoszcz, Gdańsk, Poznań and Rzeszów. Also the students, of the undergraduate and graduate programmes of *Internal Safety* within the extent of the subjects of *Crisis Management and Security of mass event*, conduct several-hour drills in this workshop. The quality of training sessions conducted on this simulator, may also be determined by the fact that in the year of 2014, the training on the simulator were completed by all of the Police voivodeship commanders for matters of prevention, and the presentation of the simulator is done within the extent of the visits of foreign policemen visiting the Police Academy. In total, in various forms of the training, over 1300 officers subordinate to the Ministry of Internal Affairs and Administration were trained, out of which the majority of them were Police officers, especially the commanders of police operations from all over the country, but also the representatives of the State Firefighting Services or Military Police.

**The simulator of driving privileged vehicles during typical and extreme actions** (project number: O ROB 0011 01/ID/11/1) – a project financed from the means of NCBR within the extent of the 1 project contest from the security and state defence areas. This project was delivered between the years of 2011 and 2013 by the scientific and industrial syndicate consisting of: the Police Academy in Szczytno – the leader of the project, ETC-PZL *Aerospace Industries* LLC – the partner, and the ITAM Institute of Medical Technology and Equipment – the partner. The simulator is devoted to the training of Police officers and other services subordinate to the competent minister of internal affairs and administration. Substantially, of all services which while performing business activities, drive on public roads in privileged vehicles. Besides the fact that the drivers of privileged vehicles are moving at significant speeds, they operate other devices that are included in the equipment of such a vehicle. Operating lights and emergency signals and conducting radio correspondence shall be mentioned here. Traditional

training sessions improving the driving technique are conducted in the Police Training Centre in Legionowo. However, there is no possibility of drilling such skills which would ensure training on a simulator. For example, training the skills of getting out of a slip of a vehicle that moves at significant speeds, during mechanical damages occurring while driving such as damage to the braking system, breaking the windscreen or flooding it with oil coming out of the vehicle's engine or finally shooting at vehicles. All of the skills mentioned, as well many others, may be drilled in virtual conditions since drilling them in reality is impossible due to enormous health or even life hazards loss of the people being drilled. In the simulator of driving privileged vehicles in typical and extreme actions, a whole range of obstacles, which make the ride more difficult for the person being drilled and the very drilling would be impossible in reality, was provided. The intrusion of pedestrians and animals under a high-speed vehicle, a decrease in load from the vehicle behind which the emergency vehicle is moving, change in vehicle tire adhesion caused by oil spills or the introduction of winter conditions, and exercise on a completely or partially icy road, belong to the basic *obstacles*. What is also important, is the fact that the virtual environment provides a drive on various road types or times of day and year, and the change of these conditions is only subject to the training needs. The simulator consists of five vehicles which make it possible to drill the whole spectrum of skills from riding in a column to drills of pushing or slowing down vehicles participating in the exercise. The simulator also has an expanded system of assessment of medical parameters which may be collected during drills and evaluated after its finishing. The medical module consists of devices used for EKG measurements, breathing frequency, pulse and oxygen saturation of the exercising person's blood, electromyographic parameters, skin impedance parameters, EFG waveforms. The simulator is also equipped with an ophthalmic device which allows for tracking the movement of the driver's eye ball. The data analysis of the ophthalmic device allows the leader of the training to indicate mistakes made by the driver after conducting the exercise (Instrukcja użytkowania Systemu SKP-BIO, 2014, p. 9-15). For example, police officers often use vehicles of various brands and types for service, which causes that in the early phase of driving they unconsciously direct their eyes on the shift lever, which makes them take their eyes

off the situation on the road and look at the gearbox (Gudzbeler and another, 2014, p. 207-214). The simulator is used for training sessions. Presently, within the extent of 8 training sessions and one internal improvement session, 134 people, mainly the officers of the Police, Military Police and State Protection Service, were trained. It is worth mentioning that this simulator is used for scientific research within the range of traffic safety.

**The Virtual Intervention Measure Tactics and Shooting Training System for Security Services** (Project Number: DOB-BIO7/19/01/2015) – the Project financed with the funds allocated by NCBR [Eng.: *National Centre for Research and Development*] within the framework of 7th Call for Projects in the area of the state security and defence. That simulator was developed by the syndicate: the Police Academy in Szczytno – the Project leader, and partners: Warsaw Technical University, ETC-PZL *Aerospace Industries Sp. z o.o* [Eng.: *Limited Liability Company*], Alex Stern sp. z o.o. [Eng.: *Limited Liability Company*], Dynamic Safety Corporation sp. z o.o. [Eng.: *Limited Liability Company*] in the period from 2015-2017 (Wirtualny system doskonalenia, [30.03.2021]). The simulator allows to practise coercive means usage skills and firearms. The virtual environment contains scenes displayed on parabolic screen, that make the impression that a police officer, while being drilled, is watching the virtual reality, staying in that environment. Depending on the situation, a police officer also sees the patrol partner with whom the intervention measures are undertaken. While being drilled, a police officer has fractions of seconds to undertake measures, that is to assess the situation, to choose appropriate coercive means or firearms and the way to use them. The situation development is lead by the artificial intelligence that has been programmed on the basis of the information on cases and coercive means and firearms usage rules and most of all the conduct of a police officer being drilled. The artificial intelligence system notes which coercive means will be used by the police officer being drilled in the moment the police officer reaches out to the main menu. If, for instance, the police officer has resolved to use firearms and shot, the artificial intelligence system assesses whether the shot has been effective, which has an impact upon the situation development in the virtual world. The simulator allows to assess whether the usage of firearms or other coercive means has been compliant with the regulations and usage rules. The drilling superintendent

assesses the intervention courses related documentary proof upon completion of the drilling. That simulator is designed to drill basic skills of a police officer. All the interventions may be recorded and analysed together with the police officer being drilled in terms of correct assessment of the emergency situation, choice of appropriate coercive means, the usage correctness and grounds and the conduct after the usage as well as the correctness of preparation of the documentary proof for the usage of the coercive means. The simulator contains full selection of coercive means used by Police officers and most popular firearms. That device is designed to educate, improve skills and some social competences and to teach the police craft mostly to the extent of proper usage of firearms and coercive means. Therefore it may be most often used by the Police officers undergoing the basic police training. However, due to the fact that after the firearms or coercive means have been used, a police officer is obligated to give first aid to the person against whom coercive means have been used, it is essential to teach 1st and 2nd degree students within the faculty *Internal Security* by means of the subjects: *Firearms Usage Theory, Self-defence, Special Physical Skills, Physical Force Usage, Qualified First Aid*.

**The Integrated Crisis Management Simulation System** (Project number: DOBR-BIO4/041/13177/2013) – the Project financed with the funds allocated by NCBR [Eng.: *National Centre for Research and Development*] within the framework of 4th Call for Projects in the area of the state security and defence. The Syndicate members, that developed the simulator or rather the simulation platform, were the Police Academy in Szczytno – the Project leader, the partners are: the Firefighting Academy in Warszawa, ETC-PZL Aerospace Industries Sp. z o.o [Eng.: *Limited Liability Company*], PIAP Institute of Automation Engineering and Measurements. The Project was implemented from 2013 till 2016. The simulator, as it has already been mentioned, is rather a common platform that allows for efficient co-operation of simulators used by various uniformed services (Zintegrowana Platforma Symulacyjna, [30.03.2021]). The objective of that Project was to continue the operation by means of all the simulators concurrently in the course of joint drilling session but in such a way that all the operators of the simulators work within one virtual environment and that all the measures undertaken by respective officers being drilled are visible online in the common virtual



environment. That task was the so more complicated as the simulators were located in various places in Poland. The basic problem was to create the virtual environment for all the existing future simulators used for training purposes of the services subordinate to the Minister of Internal Affairs and Administration to link the simulators that are operational and will be operational in the future in various places in Poland. For the purpose of that Project the common virtual environment integrated the simulator of the Police operations in critical situations, the privileged vehicle driving simulator in typical and extreme situations, the training and drilling simulator aiding to command rescue operations in the case of fire in multi-storey buildings and traffic accidents, the mobile robot simulator (Gryf and Ibis pyrotechnic robots), the helicopter simulator, the drone simulator. from the point of view of the integration, the key issue was to choose the interface standard. The HLA standard (High-Level Architecture) was chosen to facilitate the exchange of information among various simulation environments in order to ensure interoperability of the simulators co-operating with one another. That standard accounted for achievement of target parameters. In the end of 2016 the first drilling was carried out for representative officers of various services who took advantage of the simulators located in various places in Poland. The drilling carried out in November 2016 fully displayed the capacity of the simulation platform. Tests were conducted concurrently in four locations: at the Police Academy in Szczytno, the Firefighting Academy in Warszawa, ETC-PZL *Aerospace Industries Sp. z o.o* [Eng.: *Limited Liability Company*] in Warszawa. Within the framework of tests, all of the aforementioned simulators were tested in terms of their co-operation and mutual impact in one virtual environment in the course simulated operations in progress. All the simulation systems mutually impacted upon one another notwithstanding the distance among them and the undertaken measures were visible online.

**The Simulator Aiding the Police Officer On-site Traffic Incident Training**, in progress, no DOB-BIO9/06/01/2018. The Project is implemented by the Syndicate members: the Police Academy in Szczytno (leader), the Firefighting Academy, the General Ground Tadeusz Kościuszko Military Academy of Land Forces, *MORATEX Security Technology Institute*, ETC-PZL *Aerospace Industries Sp. z o.o.* in the period from 2018 till 2021. The Project major

objective and its ultimate deliverable is to develop a fully functional simulator aiding the Police officer on-site traffic incident training. Its immediate objectives include: the geographic database module development; the facility database module development, including the experimentally validated models of a passenger car, commercial vehicle, a heavy truck, a bus, a cistern. It has also been intended to develop the metric module; the documentation module; the projection module; as well as the drilling module with all possible traffic incidents integrated with the geographic database and the simulated vehicles and facilities – typical traffic incidents (collision, accident) and untypical ones (inter alia a critical incident such as a mass-casualty incident, traffic disaster); the training dossier for traffic Police officers on the basis of the newly-developed simulator, and to conduct the training session at the Police training centre (online evaluation of the training dossier and the simulator). The simulation system is to provide for changing a season of the year and time during the day, including the changes in the weather conditions such as road icing, fog, fumes of varied, wind speed and direction, etc.). The system will have the geographic database containing diversified areas: urban area (city centre), suburban area and industrial area, mountainous area (varied inclination roadway – long driveways and exit ways and switchbacks), highways, expressways, single lane and double lane roadways, hardened and unhardened roadway carpets. The designed dynamics models of a passenger car, commercial vehicle, bus and cistern will provide for the mileage and traffic incident causes to be determined by means of information, communication tools, and others (for instance, those used for measuring a vehicle breaking distance) that are actually used by the Police on the spot. The software will allow to document the duties performed on the spot by means of valid template forms of reports. The simulator will also provide for undertaking first measures on the site of the traffic incident in the virtual world, including the first aid given to the traffic incident victims. The incident as a whole will be documented and will allow to be assessed automatically in terms of undertaken measures. The simulation system will be developed in compliance with the HLA international standards (High Level Architecture), which will provide for incorporation of a subsequent simulator into the Integrated Crisis Management Simulation System.

The simulators found at the Police Academy as well as various kinds of occupational education, training and drilling carried out with the use of them are very highly esteemed by the persons who have had the opportunity to participate in that kind of professional qualification improvement schemes (Exhibit 1 and Exhibit 2).

**Exhibit 1.** *Evaluation of drilling sessions carried out by means of the simulators by police operation commanders. Answers of responders to the question: Does the simulator-aided drilling, according to your opinion, prepare police officers to undertake real measures?*

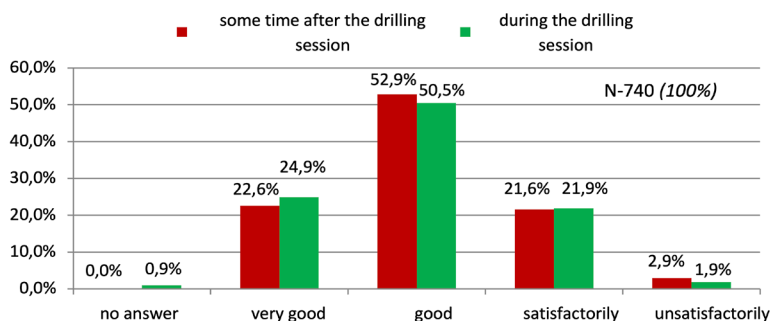


**Source:** J. Kamiński, *Trening symulacyjny w doskonaleniu dowodzenia w Policji* p. 58. Szczytno, 2016.

It is no doubt that usage of simulators for the purpose of a variety of drilling sessions and studies seems to be the inevitable change. The requirements set by the contemporary labour market within the framework of global competition impose new standards derived from advanced technologies on training centres. The Police Academy in Szczytno does not only welcome global trends but it bears noting that it takes an active part in shaping those trends. It seems that one essential issue needs to be currently addressed. It is related to the maintenance of the education and research potential at the Police Academy to the extent of usage of simulators – as the Academy's assets – during the education process. Those simulators are a few years old. Since their acquisition

they have been used intensively therefore it is extremely important to estimate their maintenance costs, development costs, and upgrade costs properly in order to prevent the upgraded versions from errors that are so characteristic for any prototypes.

**Exhibit 2.** Evaluation of the simulator-aided imitation of real measures undertaken by the Police by police operation commanders. Answers of responders to the question: How do you assess the imitation of real measures undertaken by the Police in the simulator-aided virtual reality?



**Source:** J. Kamiński, *Trening symulacyjny w doskonaleniu dowodzenia w Policji* p. 104, Szczytno, 2016.

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