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# BATTLEFIELD SIMULATION SYSTEM GIEWONT

**Abstract.** The GIEWONT battlefield simulation system is a modern tool for conducting training at all levels in the Land Forces and Special Forces, as well as in other branches of Armed Forces. The modules of this system allow to conduct individual shooting training, as well as performing tactical exercises of platoon, company and battalion, or to engage in simulated battles in urban areas. The article discusses the most important tactical and technical parameters and capabilities of the system.

**Keywords:** GIEWONT simulator, weapons and equipment simulation system, battlefield simulation.

## 1. INTRODUCTION

Keeping the army in readiness, trained and prepared to execute tough combat operations is for many countries one of the most important tasks. Due to technological progress, military equipment is becoming increasingly precise, but at the same time it is more complex and more expensive. Operating it requires high skills and excellent technical abilities and training for the soldier to be able to use it effectively, when necessary.

For this reason all modern armies are trained with the use of simulation systems. These systems are very important and indispensable in the training process and they cannot be replaced with other systems that do not ensure adequate level of training.

The growing importance of simulators for military could be observed at the International Defence Industry Exhibition in Kielce. The Kielce exhibition in 2013 was dominated by various types of simulators and devices for training soldiers from the level of a private to crews of combat vehicles, such as armoured personnel carriers or helicopters.

## 2. DESCRIPTION OF THE GIEWONT SYSTEM

Among the many systems and methods used for training, special attention should be paid to methods that resemble the real battlefield as much as possible, providing the soldier with authentic weapons, real military equipment, real combat space, real weather conditions and real sounds of combat operations. When such system is applied during exercises, the soldier's level of adrenaline is raised, he/she feels pain, stress, and must make rational decisions to survive and succeed. In case of defeat he/she must draw conclusions, must be aware of the mistakes made to be able to improve before the next encounter. Such training features are provided by the Battlefield Simulation System GIEWONT. Very strict requirements were set for the GIEWONT simulation system to reproduce real battlefield conditions and take into account the Polish specificity of operations and to enable soldiers to master skills that are usually acquired only in a real war when facing a living and thinking enemy.

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This forces the use of the latest technical thinking and the latest technology.

To meet all demands in this area, PCO SA has established a consortium of five specialised entities, which set itself the goal of launching production of a comprehensive simulation system for every branch of the Polish Armed Forces, enabling simulation of various operations at different levels of complexity - ranging from individual soldiers to high-level multinational forces.

The idea behind the efforts of the consortium is to develop a coherent national architecture of simulation systems for various levels of command, adapted to cooperate with existing battlefield management and command support systems of BMS (Battlefield Management System) and HMS (Headquarters Management System) type in accordance with the following standards: MIP (STANAG 5525), APP-6 (STANAG 2019), Battlefield Directory (STANAG 4644), NFFI (STANAG 5527), STANAG 5500 (Adat-P3).

PCO SA, as leader of the consortium that is developing the Tytan Integrated Individual Warfare System and at the same time leader of the consortium that is developing the laser training ground system, has set itself the goal of preparing the Giewont laser simulation system to cooperate with elements of the "future soldier" system. The simulation system is to be integrated and fully compatible with soldier equipment that is being developed as part of the Tytan programme, with many of components being common to both systems, making soldier training even more realistic. Furthermore, the consortium warrants that each successive element of weapons and equipment developed and manufactured by PHO companies will be integrated with the Giewont system.

Giewont will have a modular structure, enabling its use for conducting training at all levels in the Land Forces and Special Forces, as well as in other branches of the Polish Armed Forces. The modules of this system allow to conduct individual shooting training, perform tactical exercises of platoon, company and battalion, or to engage in simulated battles and anti-terrorist operations in urban areas.

Each module of the system is a separate subsystem and also an integral part of the whole.

Therefore, depending on the needs and the training scenario, the individual set for a soldier, as the basic unit, can be used alone.

Combining such units with similar units or including them in higher level modules creates sets appropriate for training successive higher echelons.

The complete system will consist of three basic functional modules:

1. Battlefield simulation module, fully compatible with the weapons and equipment used by the Polish Armed Forces, comprising:
    a) laser transmitters, fitted to weapons, for imitating shots,
    b) detection sets with laser signal detectors worn by soldiers or attached to a combat vehicle, on passive battlefield components, such as unarmed vehicles, bunkers, buildings, etc.,
    c) simulation mock battlefield assets,
    d) optoelectronic shields for target practice.
2. Communication and positioning module, comprising:
    a) digital radio links for transmitting information between the individual components of the simulation system ("shooter" – "hit" – "battlefield management base"),

b) GPS receivers providing information on the geographical position of battlefield components.

3. Battlefield management and imaging module responsible for:
   a) exercise preparation and recording,
   b) enabling reproducing the recorded exercise in order to discuss it,
   c) enabling acting upon the various battlefield components during the exercise (by activating, deactivating, providing ammunition, simulating threats, etc.),
   d) enabling cooperation with all components of the comprehensive training support system,
   e) monitoring and displaying the positions of combat force elements during combat operations with an accuracy that allows assessing the precision of topographic location and measuring the time of combat force manoeuvre duration,
   f) monitoring of the logistic situation and statistical analysis of exercises,
   g) simulation of the arrangement of engineer barriers, passages through minefields, contaminated area, etc.

Elements of the battlefield simulation module mounted on the equipment will be "transparent" to soldiers, so designed as to enable their use in training without the need to perform any additional actions, beyond those that would have to be performed during real combat operations. This will prevent the trainees from acquiring and strengthening habits that are detrimental in the real battlefield.

**Fig.1. Laser transmitters (one of many options) attached to BERYL gun and GLAUBERYT machine gun** (Source: PCO S.A.)

**Fig.2. Simulator for soldier comprising a receiver module and laser transmitter.**
**The transmitter communicates with a decoder in the torso receiver using local radio network. The decoder then sends data to a personal radio link operating in the global network.**
(Source: PCO S.A.)

The transmitter for small arms is integrated into a vest equipped with radiation detectors and with the decoder using a short-range local radio network, so that in the event of being critically hit, shots are blocked and the soldier cannot continue combat.

Destruction of combat vehicle or a fatal or heavy wound blocks shots from the transmitter permanently. In the case of a light wound or small damage to the vehicle, blocking is temporary.

In the case of a transmitter for personal weapon of a soldier, the remaining ammunition from the transmitter of a killed soldier can be transferred to a transmitter of another soldier to enable him/her to continue combat.

The receiver module consists of: an array of laser radiation detectors, a decoder, a radio transceiver system for communicating in a local network, a radio link for global communication within a radius of ca. 1 km, and a satellite receiver for determining the geographical coordinates of the soldier's or vehicle's position.

The receiver system of a soldier hit by a laser shot does the following:

- identifies location of the hit and determines the condition of the hit soldier as either wounded, heavily wounded or killed,
- displays the mentioned hit conditions by means of medical module indicator,
- registers the time and date of the hit and number of the transmitter from which the shot originated,
- sends information about the hit (local communication) to the personal radio link designed for global communication.

The receiver system of the simulation system mounted on combat vehicles, in the event of the vehicle being hit, indicates, depending on the ammunition used and hit location, complete destruction or temporary damage to the equipment.

**Fig. 3. Prototype of a simulator for tracked vehicle BWP-1** (Source: PCO S.A.)

Downtime of the vehicle corresponds to the approximate time of carrying out necessary repairs after a hit causing light damage.

In addition, the commander's control panel displays information on both the condition of the vehicle, as well as on the effects of the hit based on the selected target and type of ammunition.

All data from the receiver system are transmitted via radio link of global range to exercise supervisors who have permanent control over the trainees (data on the location, number and types of ammunition possessed, injuries and on the opponent, who inflicted them). In case of artillery armaments, data on the angle and direction of fire are also transmitted.

System software on observation and surveillance posts enables displaying the situation on digital maps using APP6-A symbols. 3D display with constantly updated position and symbols representing exercise elements is also possible. Instructors with appropriate level of authorisation are able to remotely: bring a soldier "back to life", "immobilise" a vehicle, activate and deactivate a mock exercise element (e.g. chemical contamination or minefield), stop the exercise or restart it from the beginning or from a selected stage of the scenario.

**Fig. 4. Tactical exercise at the Military Academy of Land Forces (WSOWL) in Wrocław using the GIEWONT system** (Source: PCO S.A.)

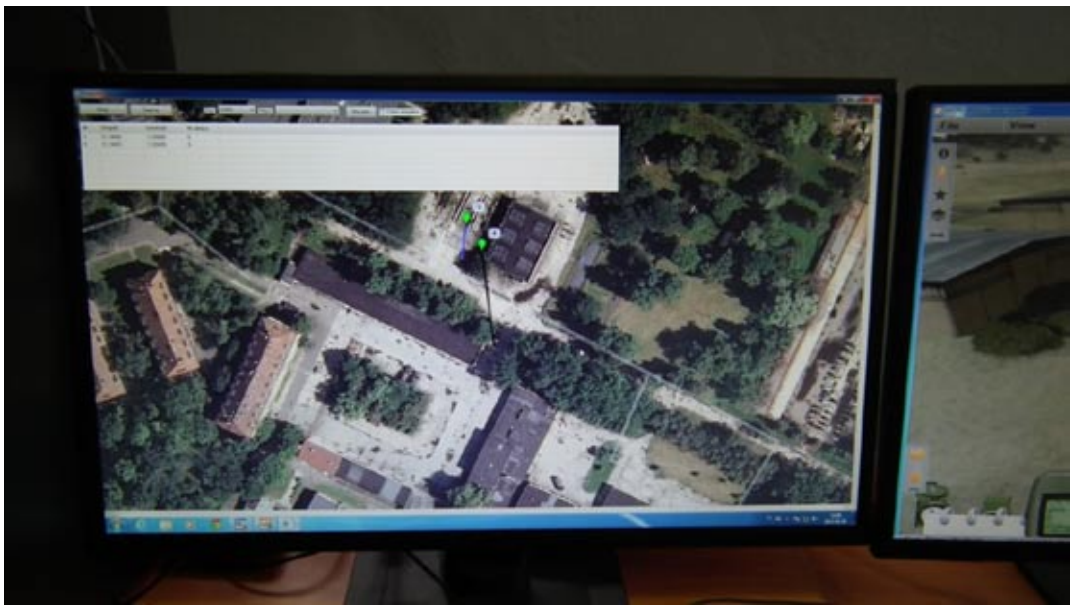

**Fig. 5. Visualisation of exercise at WSOWL in Wrocław using the GIEWONT system** (Source: PCO S.A.)

Imaging and control system supports all phases of conducting field exercises, especially their preparation (scenario development, registration of participants, introduction of virtual training ground elements), monitoring of the course of exercises and assessment of the activities of players (replaying the course of the exercise, analysis, evaluation, presentation of results, archiving, etc.).

Therefore the exercise supervisors have current information on the status of the players, and after completing the exercise a very accurate summary can be drawn up, which significantly raises the level of the training.

Simulator assemblies that fulfil the same functions are unified and are therefore interchangeable in terms of dimensions and electrical specifications.

System components directly affected by the external environment are designed to operate failure-free in accordance with the requirements of the Polish Defence Standards NO-06, A103, depending on the type of simulator, for group N14 or group N11, respectively.

They are safe for the eyes and conform to radiation safety class 1 according to PN-EN 60825-1.

*The content of this paper is of informative nature and is not subject to the review procedure.*