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APPLICATION OF SK-1 PLUTON SIMULATOR IN THE TRAINING OF AMV ROSOMAK CREWS Part 2.

Abstract: The article presents initial results obtained and assessments made during testing of SK-1 Pluton simulator at the Military Academy of Land Forces in Wrocław (WSOWL). The prospects for using the simulator in the training of officer candidates are discussed. The areas of application of the simulator in training troops of units equipped with AMV Rosomak are outlined. In the final part of the article reference is made to experience gained in the use of simulation systems in international training undertakings.

Keywords: training, simulator, simulation training systems, armoured personnel carrier, officer training, training of personnel carrier crews.

1. INTRODUCTION

Military academies willingly use advanced technologies in the education of young officers. The process of moulding the silhouette of alumni requires a multifaceted approach to future officers. The disparity of the personalities and skills of high school graduates in many cases renders the application of identical methods ineffective. In this process the military educational system is aided by innovative educational tools.

The qualities that are expected from young officers, such as self-reliance, creativity and self-confidence, are undoubtedly difficult to develop. The officer candidates may either have innate predispositions or these have to be formed. This can be achieved by continually confronting cadets with various problem and stress-generating situations, with demanding tasks, and by providing them with freedom to act when solving problems.

This article is a continuation of an article [1] describing the approach to the construction of modern simulators and the results of work carried out at OBRUM on the creation of a simulator for training crews of AMV Rosomak.

2. SK-1 PLUTON SIMULATOR IN THE TRAINING OF OFFICER CANDIDATES AT WSOWL

This part of the article presents the results of test/exercises performed by the officers/instructors of the Academy with the use of SK-1 Pluton simulator.

The assumption made when educating officer candidates is that the graduate should gain theoretical and practical knowledge and acquire defined skills required on his/her first duty position, and should also take on a mature attitude and have defined personal and professional characteristics. One of the features that make a good commander stand out is the ability to make quick decisions, particularly under battlefield pressure, when the lives and health of subordinates are at hazard. A well trained commander must be able to analyse the situation promptly, draw conclusions and make proper decisions. These features are best

reflected during tactical training, which forms a major part of the entire educational process. It covers the fundamentals of specialised training in various fields, including the ability to use advanced ordnance. The gaining of the required knowledge and acquiring of the necessary level of practical skills by the officer candidates is only possible when these candidates not only have an in-depth specialised knowledge, but are also able to use that knowledge in practice. All these elements are the subject of instruction and training at the military school. However, it is very difficult to shape practical skills due to equipment, time and financial limitations. It is necessary to use proper model, methods and techniques that facilitate and enable attaining the set objectives. The most effective way of acquiring the skills of commanding a unit of troops is practical exercise, where the student personally plans, sets up and finally carries out the assigned task. However, possibilities of conducting training with a regular unit of troops under conditions resembling those of real world are limited. In the currently applied manner of training future commanders, all trainees plan the indicated type of tactical operations, but not all of them can put them into execution. The conditions of training do not allow every trainee to play the role of a commander in every task. Moreover, the conditions of implementing training do not allow the full use of armament, and because of this such training is incomplete and does not fully reflect the realities of battlefield. The conditions of conducting tactical operations during training can be brought closer to the real ones by using various simulation systems, such as laser shooting simulators, virtual reality simulators and the like. The systems used have their advantages and disadvantages, but they all serve the purpose of training commanders and troops to perform real tactical operations.

One of the simulators useful in training commanders and troops is SK-1 Pluton, subjected to tests at the Military Academy of Land Forces. This simulator is designed to train functionaries of a motorised platoon with Rosomak armoured carriers. The solutions applied in the simulator enable its use in the tactical and firing training of officer candidates.

During the tests an attempt was made to assess by the trainees the application of SK-1 Pluton in three areas:

- stage of action planning,
- commanding skills,
- tactical training.

The results are presented in the form of bar charts: Fig. 1, Fig. 2 and Fig. 3.

Action planning stage is important in the education of officer candidates. At that stage the trainee should assess the terrain, the enemy and own forces and, based on that assessment, plan the task. This stage, due to the use of the SK-1 simulator in the training, is performed in a more meticulous manner, as the planned actions are carried out by the trainees during the simulation. When drawing up action plan, WSOWL students carefully analyse terrain conditions and information on deployment and actions of enemy forces. Such action was motivated by the understanding that neglects in planning actions may cause casualties and loss of vehicles and may make fulfilment of the task impossible. In this regard all polled trainees stated that the use of SK-1 Pluton had contributed to the improvement of the quality of action planning.

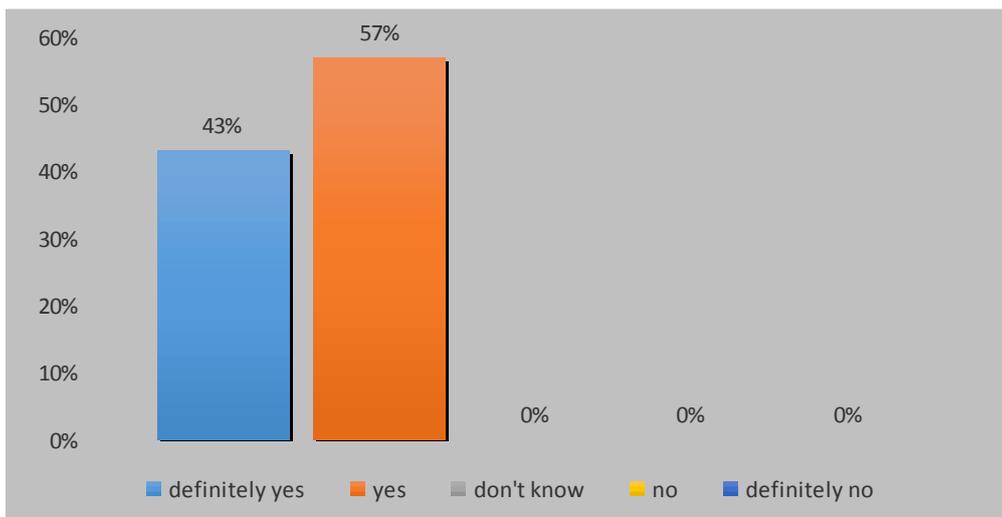


Fig. 1. Effect of using SK-1 Pluton simulator on improvement of action planning

The effect of planning is the task setting stage, wherein the commander issues a field order. The results of initial simulations, wherein errors in planning and setting tasks have deliberately not been corrected, showed that platoon losses were substantial. The analysis of the course of the combat during an after action review (AAR) resulted eventually in improved precision and accuracy of combat orders. The trainees stated that inaccuracies in the contents of the combat order caused the platoon to act not in compliance with the intents of the commander and in effect made attaining the goal impossible. The improvement in these skills was to a high degree the effect of the variability of terrain and exercise conditions set in SK-1, which forced the trainees to seek non-routine solutions and the trained commanders to formulate the order completely and clearly and to take into consideration the possible battlefield situations.

Negative effect of using SK-1 Pluton simulator on the improvement of action planning is shown on a graph – Fig. 1.

One of the most useful features of using SK-1 Pluton simulator in the education of officer candidates is the possibility of commanding a platoon during combat.

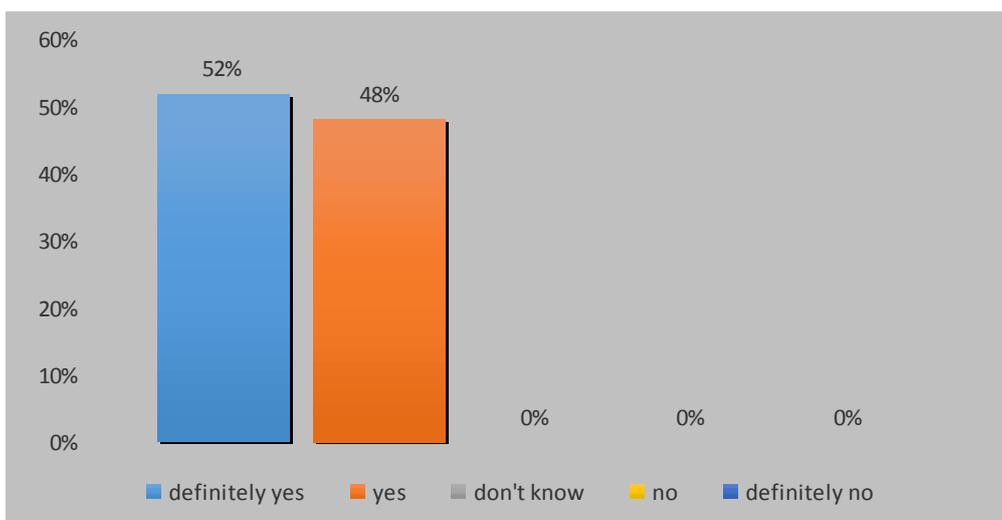


Fig. 2. Effect of using SK-1 Pluton simulator on improvement of commanding skills during combat

Making proper decisions by the trainees is of particular importance in the education process at WSOWL. Requirements set on future commanders with respect to this are very high. Efficient guidance of the platoon, responsiveness to changing situations and effective use of available means are the skills that should be developed. Training with the use of simulators enhances professional progress in this respect. Achieving similar exercise conditions in real circumstances would be very costly or, in some cases, impossible. Those who trained at WSOWL using the simulator, pointed out that when training with real equipment their freedom in making decisions was limited as the restrictions of the training ground curtail their initiatives.

Simulators are free of such limitations. For instance, it is possible to use artillery support, which may help achieve success in gaining the objective and change the unfavourable situation by overpowering enemy troops, an action eagerly taken by the trainees. Another positive aspect of training on SK-1 is the care taken in logistics and medical support, which gains particular significance in view of intensity of actions. In this respect the simulator also contributes to increased skills.

The bar chart in Fig. 2 illustrates the results of assessment.

The use of SK-1 Pluton simulator made the training more attractive because, despite increased requirements, it allowed to verify skills of the trainees in carrying out tactical actions under the conditions of enemy impact.

The results of assessment of the use of SK-1 Pluton simulator in this regard are presented in Fig. 3.

Training on a simulator, in addition to developing the skills of commanding a platoon, also contributes to improvement of the skills of commanding a crew or squad within a platoon, and of the knowledge of the tasks and responsibilities of the gunner and driver of the Rosomak AMV, as the officer candidates at WSOWL play the roles of all functionaries. Such skills of a future commander are invaluable.

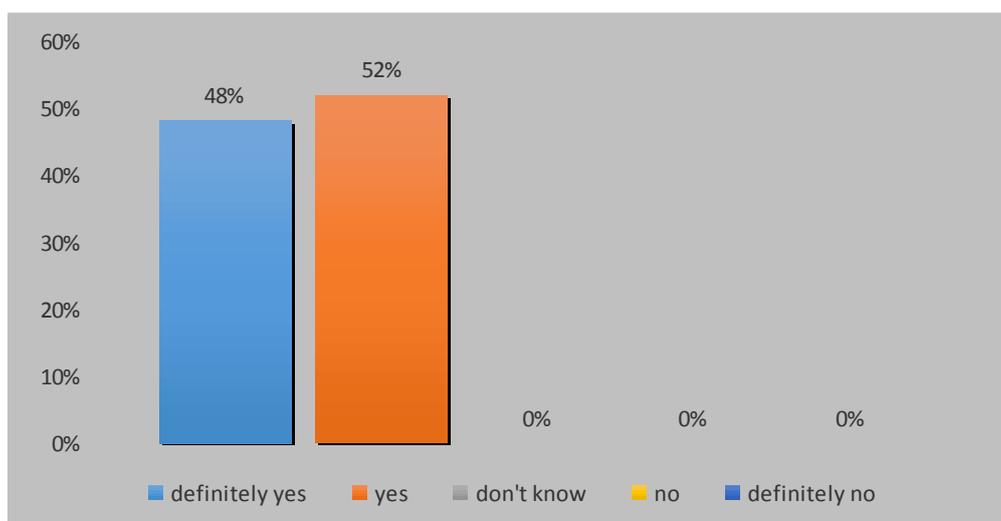


Fig. 3. Usefulness of SK-1 Pluton for tactical training of officer candidates at WSOWL

3. SK-1 PLUTON SIMULATOR IN THE TRAINING OF MOTORISED TROOPS

This part of article outlines the possibilities of using the modern SK-1 Pluton simulator designed for training crews of Rosomak AMV. SK-1 Pluton simulator described in article [1] is the most advanced product available in Poland. The possibilities of its application in training troops has not been defined and described in detail yet, because it is mainly the user that determines manner of use.

The Polish Army has been using various types of training devices and simulators for many years because of such advantages as:

- lower cost of training,
- lower risk of accident,
- lower wear of ordnance and combat vehicles.

One advantage of SK-1 Pluton simulator is its compatibility with other products based on Virtual Battlespace 2 (VBS2) platform [2][3][4]. This allows doing exercises with various types of combat arms and also enables its further development.

The simulator enables creating a combat environment that is not attainable on tactical lanes and ranges available to the army. Within an area of defence of a brigade with the width of 12-15 km and depth of 25 km on the territory of Poland there are, on the average, 25 towns and/or villages [5]. These data and the history of World War II indicate how probable is combat conducted in urban areas. At present the Polish Army has only one training facility of such characteristics. It is the Urban Tactical Training Centre at the range in Wędrzyn.

A part of the range with urban terrain is shown in Fig. 4.



Fig. 4. Urban area - part of range (photo A. Zielichowski)

Due to limitations resulting from safety considerations and the proximity of residential areas, tactical exercises with the use of weapons, in particular ammunition for ATK Mk 44 30 mm calibre gun of the Rosomak AMV, cannot be conducted. The unrestricted ability to create battlefield conditions and terrain in SK-1 Pluton simulator resolves this problem. An example that best illustrates the above is that of a scenario presented at the International Defence Industry Exhibition (MSPO) in Kielce in 2013, corresponding to terrain conditions of Ghazni region in Afghanistan where Polish soldiers pull their duty. This is in accordance with the thesis proposed above that it is the user, rather than the manufacturer, that determines how the simulator is used. The ability to precisely map the real environment enables doing exercises in any place, e.g. in the city of Wrocław, with all features of the terrain accounted for. Creating and mapping existing objects is highly justified, as the probability of real combat in a tactical lane or in other training facility is low.

For many years armies of various nations have been forming training facilities at sites similar to or resembling the areas of likely battlefields (e.g. French Guyana, Fort Benning in USA¹) in order to train their troops in the best possible way. In Poland, due to its geographical position and land relief, it is not possible to train soldiers in conditions similar to those of, for instance, Chad, where Polish soldiers used to operate using Rosomak AMV. SK-1 Pluton enables, upon creating adequate environment, closer familiarisation with the principles of carrying out operations in the specific combat environment of African plains. As Poland participates in international organisations and alliances (UN, EU, NATO), the Polish Army is obliged to act not only within the borders of the home country.

In addition to representing terrain, it is also possible to create scenarios based on anticipated, future-oriented conflict, or on real incidents. A fragment of a virtual battlefield generated with SK-1 Pluton is shown in Fig. 5. Drawing on real events, we can familiarise the soldiers with tactics and procedures used during the conflict. One of the authors of this article, while on duty in Afghanistan as a commander of a motorised platoon, and later of a motorised company (1st and 9th rotation of the Polish Military Contingent in Afghanistan), was obliged to present a detailed report on the incidents in which troops were involved; this type of reports may serve to accurately reconstruct selected situations and verify the decisions taken then.



Fig. 5. View of battlefield in SK-1 Pluton simulator

Detailed discussion and drawing of conclusions is possible with the AAR option², wherein the actions of every participant can be analysed. Determining the errors made and going over the situation several times substantially improves the level of training of the troops and increases the likelihood of avoiding errors in the future. The ability to perform two-sided exercises with other troop units without the need to translocate soldiers and equipment, which is costly, is a great advantage of the use of VBS2-based simulators. Connecting within one computer network allows to verify the decisions taken in an encounter with a second troops unit commanded by a human, rather than guided with the use of generated schemes.

The ability to run the simulator for many hours enables to implement one of the objectives of the training of professional soldiers: "forming resilience and perseverance in the long-term performance of the tasks..." [6]. The commander may plan all-day tactical exercises, the aim of which is to check on the perseverance of soldiers during prolonged driving and observation in assigned sectors. During missions in Iraq and Afghanistan soldiers had to carry out patrol operations, the duration of which was even as long as 72 hours. The

¹ Fort Benning was established in 1918, providing terrain and weather conditions corresponding to those of France to facilitate training of troops during World War I.

² AAR - After Action Review

use of a simulator reduces the probability of an occurrence of an accident or of combat vehicle damage. Such exercises enable verification of a troops unit without high financial expenses and material spending.

In firing training, the simulator enables shooting that would not be possible to perform with live ammunition, and which takes place in contemporary armed conflicts (e.g. shooting through gaps, from behind wings or over friendly troops). The freedom in creating target ranges allows to perform even the most complex shooting exercises that are difficult to carry into effect under real-world conditions for reasons given above.

The terrain with an area of 100 square kilometres that can be generated on SK-1 Pluton may be used in the teaching of topography. Marching on foot according to a map is less demanding than acting in a march column with vehicles driving at the speed of 40 kph. The time available to determine position and orientation in a moving vehicle is much shorter, and the field of view is limited to images from observation instruments and periscopes. Creating an appropriate scenario designed to prepare commanders to act during a march increases the probability of avoiding mistakes and accidents.

4. SIMULATION SYSTEMS IN INTERNATIONAL TRAINING UNDERTAKINGS

Training and instruction devices and simulation programs play an important role in the training and education of modern armed forces. Their unquestionable advantages include reduced training cost and higher realism. Modern product of this class, particularly simulation software (constructive and "serious games"), allow to conduct virtual training under every ground and weather conditions. Powerful scenario and object editors provide the trainers with possibilities unattainable with traditional methods.

Adequate selection of training system functions with regard to anticipated training goals ensures the creation of a real operating environment. Vehicle and aircraft trainer devices enable developing individual skills, while complex simulators and "serious games" and constructive software enable harmonising task teams and troop units.

In September 2013 an international tactical exercise was set up in Brno based on Virtual Battlespace 2 (VBS2) simulation system. This was part of a research and development project of a consortium of military academies of the Visegrad Group of nations³, co-funded by the International Visegrad Fund and titled: *Better cooperation for better operation of the future Visegrad EU Battlegroup*.

The tactical exercise was conducted with the aid of tactical simulation laboratory of the Czech University of Defence. It consisted in carrying out four tasks being part of a stability operation by a multinational company. The troops unit doing the exercise comprised four platoons of three infantry squads each. In order to increase intensity and in view of the experimental nature of the undertaking (exercise), each platoon in the exercise comprised three squads, but the exercise participants were only the commanders of the squads and platoons. The other soldiers of the platoons were controlled by the squad commanders and by "artificial intelligence". The structure of the troops unit in the exercise is shown in Fig. 6.

³ The consortium was made up of four officer candidate schools: project leader - Tadeusz Kościuszko Military Academy of Land Forces in Wrocław (Poland), and partners - University of Defence in Brno (Czech republic), Armed Forces Academy of General Milan Rastislav Štefánik in Liptovský Mikuláš (Slovakia), and National University of Public Service in Budapest (Hungary).

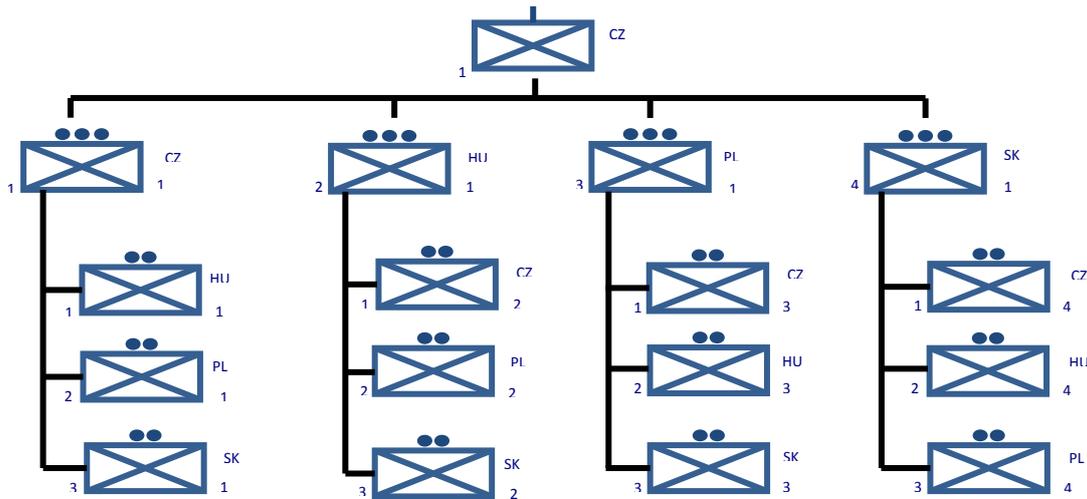


Fig. 6. Organizational structure of the multinational company participating in the "White Eagle" exercise funded by the International Visegrad Fund within the framework of the Standard Grant : *Better cooperation for better operation of the future Visegrad EU Battlegroup*
[Source: author's study – A. Zielichowski]

The exercise continued incessantly for 32 hours, during which the officer candidates of the four nations had to collaborate implementing such operations tasks as patrolling, manning a checkpoint, convoying, cordon & search, Quick Reaction Force (QRF) in one of the provinces of Afghanistan (Fig. 7). As each group in the exercise consisted of various nationals (every officer candidate in a platoon came from a different country), it was necessary to use English to communicate [7].

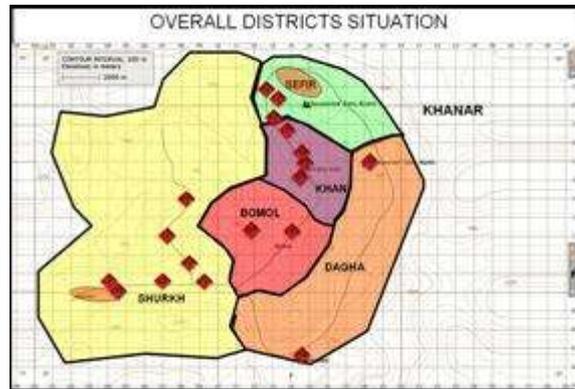


Fig. 7. Map of Khanar province and responsibility zone of multinational forces

The appraisal of the trainees was made by a group of international observers consisting of six officers (representing the three academies) participating in the research project. Using observation sheets, they assessed the skills, knowledge and competence of the officer candidates during the entire course of the exercise. There were three aspects of the observation:

- a) Communication:
 - knowledge of English,
 - using radio communication procedures,

- teamwork skills,
- acceptance of suggestions from other team members and subordinates,
- presenting ideas and doubts to the team and discussing them,
- using well thought out arguments in discussions,
- willingness to compromise in discussions and negotiations,
- willingness to learn new skills and acquire knowledge.

b) Leadership:

- self-assurance when setting tasks,
- ability to take over initiative in action,
- ability to take timely decisions,
- willingness to take calculated risk (courage) in striving to achieve the objective,
- treating subordinates with respect,
- observance of humanitarian law and international law of armed conflict.

c) Commanding:

- knowledge and use of the principles of the procedures of the command process,
- proper management of available time,
- taking account of available information in preparation of action plan,
- supporting subordinates in the process of preparing to act,
- formulation of tasks and instructions communicated in an intelligible and clear manner,
- verifying the comprehension of the task by subordinates,
- ensuring flow of information on the situation among subordinates,
- proper management of available resources.

Each exercise participant was evaluated at least once during every task, that is four times during the entire exercise, every time by another observer. This allowed to reduce the adverse factors affecting the results of observations, such as less rigorous or more favourable assessment of trainees who represented the same academy.

Due to differences in the officer educating systems in the armies of the four nations of the Visegrad Group and to the fact that the exercise participants were at different stages of education (different years of study and different occupational specialties), the results in two categories: "Leadership" and "Commanding", were distinctly poorer than communication skills. After analysing the structures of the officer education systems presented by the individual partner academies, it was found that the aspects of the command process and of leadership were included at different stages of education of officer candidates. The effect of that could be observed in the results achieved by students of younger classes during the first two tasks. The general observation results are presented in Fig. 8. [8]

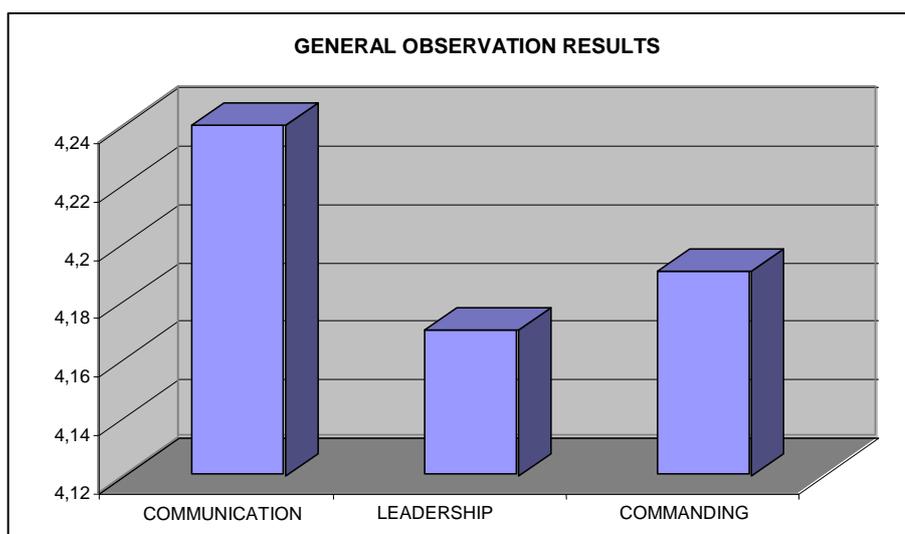


Fig. 8. General results of observation of "White Eagle" exercise participants

Within less than two days of the exercise, formation and strengthening of the desired competences has been observed. This translated into the level of task implementation. Interestingly, despite fatigue (18 hours of exercise), the officer candidates achieved best results in the third task. The conclusion is that when forced to act in a demanding environment of an international drill, put to a test of their skills, knowledge and competence, the officer candidates got deeply involved in action and cooperation within their teams (platoons).

This shows that a combination of appropriately selected tools, in this case VBS2 tactical simulation system and appropriately devised exercise scenario, and also the positioning of the officer candidate in an "uncomfortable" international environment, brings positive effects in the form of strengthening of the desired competences and skills, even in a short time.

5. SUMMARY

By virtue of the agreement [9] concluded between the Management Board of OBRUM and the Rector Commandant of WSOWL, the application of the SK-1 Pluton simulator in the training of troops is still the subject of tests and studies.

Simultaneously with the testing of the simulator, IT specialists from OBRUM and cybernetics experts from the Military University of Technology in Warsaw, with the participation of a research group from WSOWL, conducted an in-plant testing of software [10], [11].

The results obtained have confirmed the high usefulness of SK-1 Pluton simulator in the training processes covered by the test programme. This assessment applies to the training of both officer candidates, as well as crews of personnel carriers used by military line units.

Modular design of the simulator and flexibility of software [12] allow to adjust the configuration of the simulator and adapt it to enable provision of training in such areas as:

- single functionality – driver or gunner or commander,
- one vehicle crew – driver, gunner, commander (crew harmonisation exercises),
- platoon (four vehicles) – conducting tactical operations in the battlefield.

Further work on SK-1 Pluton development should include a communication system closely reflecting the real-world communication conditions within the vehicle, at platoon level, and with command environment. In the currently tested version of SK-1 Pluton this is a deficient constituent of the structure.

The flexibility of the software used in the simulator [12] allows to incorporate SK-1 Pluton (with the use of DIS and HLA protocols) into simulation training systems of higher level.

The widely used simulation training systems for tactical exercises, including those with the participation of multinational forces, enable the application of the SK-1 Pluton simulator in such exercises.

Computer simulation systems have a great training potential, which can be utilised in the working out of proper behaviour and skills. If used properly and creatively, they enable to train future officers/platoon commanders to handle the most demanding and complex tasks. In particular, simulation systems prepare the trainees to face hazards and challenges that cannot be foreseen.

It is only up to the creativity and ingenuity of the training organisers/training services what will be the purpose for which the SK-1 Pluton simulator is used.

It must, however, be remembered that no simulator can replace training on real equipment. Nevertheless it can, to a great extent, prepare to such training while keeping the cost down.

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Use was made of the results of work carried out under a contract between Bumar and OBRUM Gliwice on the development and fabrication of SK-1 Pluton simulator.