

Antoni **KURZEJA**
Marek **KOŹLAK**
Jacek **WIELICKI**

BUILDING A SIMULATION SYSTEM FOR AMV ROSOMAK

Abstract: The article presents subsequent stages in the process of designing a modern training system for AMV Rosomak crews. The presented SK-1 Pluton was developed by OBRUM engineers using the experience gained when operating an SK-1 simulator designed for a single crew and used at the Land Forces Training Centre in Poznań. The capabilities of the training system are discussed along with the outlook for further development of the design, integration of the system with a constructive simulator used by the Polish Armed Forces and implementation of subsequent versions of VBS software in the simulator.

Keywords: simulators, training, training device design.

1. ORIGINS

The platoon version of the SK-1 comprehensive simulator has been designed to replace and supplement other training systems for AMV Rosomak crews in the field of shooting and tactical training. SK-1P is the successor of TH-1 and SK-1 systems manufactured by OBRUM in the years 2007-2011. One of the main objectives of implementing the project was to obtain a solution designed for training centres and units of the Polish Armed Forces involved in the training of AMV Rosomak crews. SK-1P was designed in such manner as to satisfy the demand for training systems at various levels (Fig. 1).



Fig. 1. The first manufactured Comprehensive Shooting Simulator for AMV Rosomak crew, currently in service at CSWL Poznań

Another objective of the project was to develop a system with variable resolution of simulation attained without software or hardware modification. As all of the system is created within OBRUM, the design team can respond flexibly to the needs of customers regarding new functions or modifications to the system.

2. DETERMINING SPECIFICATIONS AND GATHERING EXPERIENCE

In the course of supervised use of SK-1 simulators at the Land Forces Training Centre (CSWL) in Poznań, experience was gathered and requirements imposed by the users, mainly the instructors training crews in AMV Rosomak basic operation, were received. Requirements regarding the system set up, functionality and user support have been determined in collaboration with CSWL representatives. More than five years of experience exchange between OBRUM and CSWL in the area of the use of SK-1 type comprehensive simulators and other training systems for AMV Rosomak and other land vehicles allowed to develop initial versions of tactical and technical specifications and software specifications for the Comprehensive Shooting Simulator for AMV Rosomak platoon crews.

The combination of the gathered experience with the functionalities of several types of simulators led to the development of a system much more powerful than its predecessors. Its design was based on updated, in relation to the SK-1 version, basic modules of the simulator, SKMK (driver module) and SKMB (combat module), operated from a dedicated operator/instructor station. The key criteria taken into account in the course of development work on the system were the observations and remarks made by CSWL. The main result of collaboration between OBRUM and CSWL was the formulation of requirements regarding the setting up of the modules of SK-1P. Another institution that cooperated with OBRUM on the drawing up of tactical and technical specifications was the Military Academy of Land Forces (WSOWL) in Wrocław. After the device was delivered to the user in April 2012, detailed requirements were formulated regarding the configuration of the comprehensive simulator for Mechanised Platoon, available scenarios, battlefield objectives and the platoon commander's station.

At WSOWL a sound analysis of the possibilities of using the system and of the outlook for applying it in the training of combat groups of the Polish Armed Forces was conducted (Fig. 2). The Military Academy, with its long experience in training commanders of the Polish Land Forces, helped streamline the work of the OBRUM team towards maximising the usefulness of the system under development. Similarly to the setting up of the modules, which were designed to meet the requirements specified by CSWL, the requirements regarding the configuration of the platoon version of the system and programming were conceived in collaboration with WSOWL.

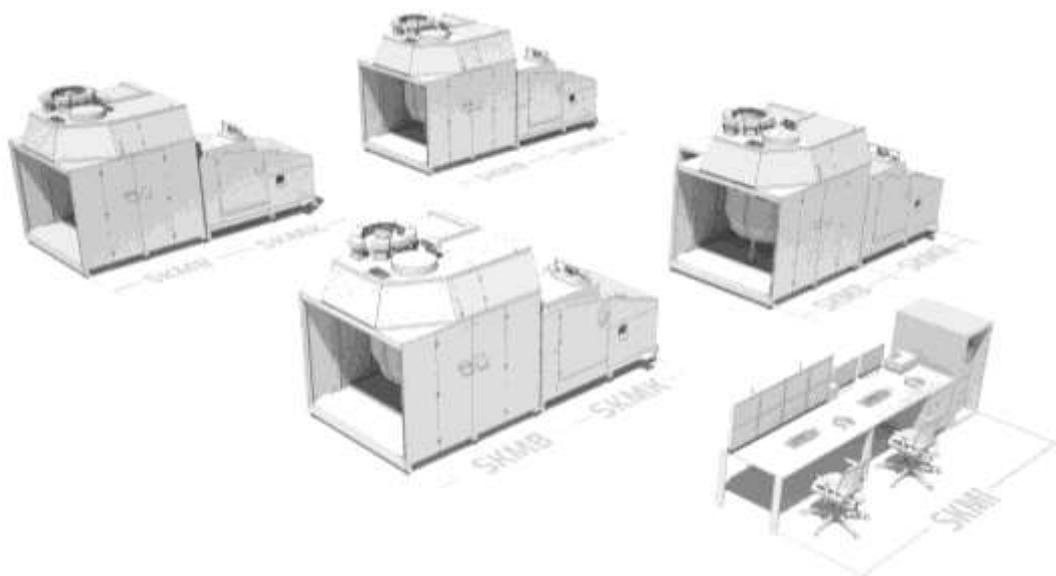


Fig. 2. SK-1 Pluton – basic kit

3. SYSTEM CREATION

As mentioned earlier, from the very beginning the SK-1P system was developed in cooperation with military units. The concept stage and subsequent stages of work were realised while constantly liaising with the future final user of the system. Experience gathered by OBRUM engineers while implementing and using earlier training devices for AMV Rosomak allowed to arrive at a solution tailored to the needs of the Polish Armed Forces. The entire product was developed and manufactured by OBRUM with the help of the Military University of Technology.

Project implementation comprised the fabrication of hardware, ie. stations for the soldiers being trained and for those conducting the exercises, and of software for generating a virtual reality and for supervising the exercise. The system's structure includes also an integrated monitoring and diagnostics system. The project included the development of exercise module enclosures for either stationary devices or for mounting on motion platforms. A major part of the project included the creation of simulator software. A group of programmers specialising in this type of solutions was established for this purpose and supported by experts of the Faculty of Cybernetics of the Military University of Technology (WAT). It was the collaboration with computer simulation experts from WAT that resulted in the inclusion of algorithms of fire control system operation in the simulator software. Both prior to commencing concept and design work, as well as during the project, the results of work were presented to and consulted with representatives of training centres. In order to fine-tune the solutions applied in the design and to supplement the required system functionalities, the simulator was subjected to a two-step testing process. The system was tested with regard to the meeting of functional and non-functional requirements defined in tactical and technical specifications of the device. The first set of tests was conducted by OBRUM employees at the OBRUM site. These were supplemented with tests conducted at WSOWL with the participation of researchers from the Institute of Command of the Joint Operations Department. The employees of WSOWL who took part in the extended tests of

the system are lecturers of that Academy responsible for training in tactics of using Rosomak armoured wheeled carriers.

4. CAPABILITIES OF THE SYSTEM

As a result of the adopted methodology of work and of the continuous feedback between the manufacturer and the user, the final outcome of the project has much exceeded what was initially anticipated. The solution created is a globally unique combination of solutions of the Serious Game type with a comprehensive crew training system including cabs with accurately reproduced interior of the simulated vehicle (Fig. 3). Faithful rendering of the crew compartments was achieved by providing them with all key functionalities specified by CSWL. Such design, as confirmed by instructors from CSWL, enables training AMV Rosomak commanders, gunners and drivers both at the basic level, as well as specialist level. Equipped with complete sets of internal device imitators, combat and driver compartments in platoon configuration, combined with all features afforded by Serious Game type solutions, they provide training capabilities never offered before in Poland and abroad.

The system has been implemented at the Military Academy of Land Forces in a configuration supplemented with additional stands as requested by the client. The training system comprises SK-1P connected to stands for squad commanders, platoon commander and company commander, the last being at the same time the exercise instructor. The simulator can be scaled to scenario requirements, meaning that additional stands can be connected thereto. These can include further comprehensive simulators, training devices of TH-1 type or Serious Game stands, based on a laptop computer for instance. Depending on the user's requirements or on availability of space, the system can be constrained to a defined number of modules or divided into separate locations with only selected modules being used at the same time. Any number of Serious Game stands mentioned above can be connected to the simulator; these stands can be adapted as needed. The Serious Game modules can be assigned the roles of a tank driver, platoon or company commander, UAV operator, or they can take part in combat or play other of the hundreds of roles available in the system.

All functions mentioned above are available in the standard version of the system; the user is required to hold a licence and be connected to the system via Ethernet.

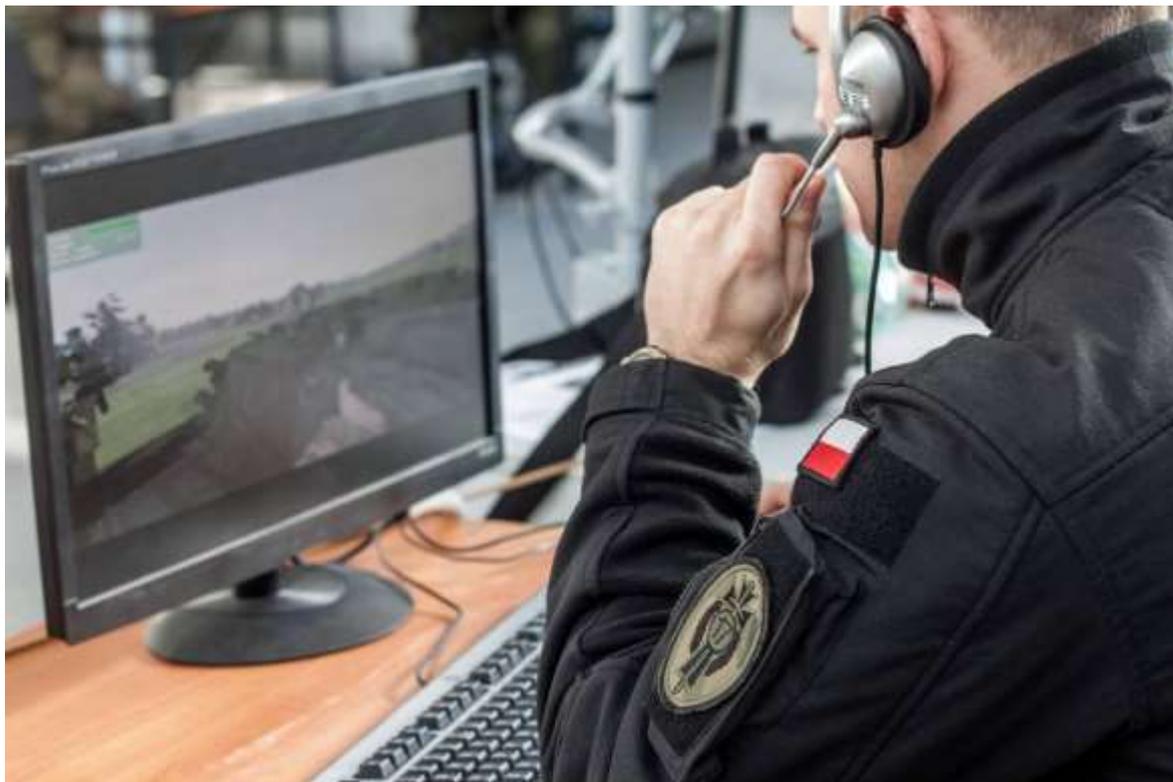


Fig. 3. Serious Games type platoon commander's stand

5. SYSTEM ARCHITECTURE

The SK-1P simulation system is constructed in such manner as to enable adapting on as many system layers as possible. From hardware layer, e.g. selection of the number of exercise modules within a local system configuration, through selection of the type of conducted exercise (skills level - basic or advanced), to changes in network configuration - the simulator can be adapted to current requirements. Modular design of SK-1P enables it to be configured in many ways. Each of the basic system modules, SKMK, SKMB and SKMI, can be delivered to the user in the required hardware configuration which depends on the use of the training device (Fig. 4).

A training system built on the basis of SK-1P can be used as a group of individual training devices controlled from the instructor's stand. The system enables conducting training in this manner on AMV Rosomak operation using eight stands at the same time. Another application of the system is the use thereof for comprehensive training in the interoperability of a single crew of an armoured carrier. The system enables training of four crews, which is controlled from one common exercise instructor's stand. The scalable structure of SK-1P training system implemented in the software also allows to supplement the system with additional stands (e.g. crew commander, platoon commander, landing party soldiers). SK-1P, thanks to its unique design, replaces a number of smaller training systems enabling the user to adapt the setup to the requirements of a selected exercise scenario or to expand the system by adding the required stands.



Fig. 4. Interior of SKMB module, gunner's and commander's stand

6. IMPLEMENTATION OF THE SIMULATOR TO USE AT WSOWL

After completing tests, the device was installed at the Military Academy of Land Forces. Since then the simulator is used in the training in the construction and operation of AMV Rosomak, and also during tactical training with the participation of a platoon of vehicle crews including the vehicle commanders and platoon commander.

The device is operated by trained WSOWL personnel, who may modify exercise scenarios to suit current demand. The use of the system by WSOWL students constitutes a continuation of gathering of comments and observations concerning the performance of the system, which will contribute to further improvements. The system, prior to starting serial production and delivery to other training units, may be modified to meet new requirements.



Fig. 5. Implementation of the system at WSOWL Wrocław – training with 17th Wielkopolska Mechanized Brigade

7. SYSTEM DEVELOPMENT OPPORTUNITIES

The course of further development of SK-1P will be determined by growth trends in the field of training devices in the Polish Armed Forces and tendencies observed in the requirements imposed by NATO, other countries and OBRUM partners. Basic development trends may be described as follows:

- interoperability – applied with the use of HLA (High Level Architecture) or DIS (Distributed Interactive Simulation) protocols supported by every simulator developed at OBRUM. Projects currently carried out by the OBRUM team include integration of the system with a constructive simulator used by the Polish Armed Forces, comprehensive simulator and with a number of desktop solutions;
- supplementing with commercial software to support scenarios and exercises executed by the client. Use of software available on the market and compatible with VBS2-3, such as for artificial intelligence modelling for CGF, battlefield object models, communication subsystems and many other offered by Polish and foreign suppliers;
- in the course of performed work the system was being prepared for migration to a new version of simulation, mapping and CGF software, i.e. Virtual Battlespace 3. This will enable implementation of even larger scenarios, improve the performance of the artificial intelligence module, physics and many more;

- as part of work on adapting the developed solution to the requirements of the various units of the Polish Armed Forces, various system variants are being worked on to enable tailoring the training to the needs.

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