DIGITAL INFANTRY BATTLEFIELD SOLUTION

CONCEPT OF OPERATIONS

DIBS project

Part II

Editors

Uģis Romanovs

Māris Andžāns

Milrem in cooperation with

Latvian Institute of International Affairs

Latvian National Defence Academy

August 2017

DIGITAL INFANTRY BATTLEFIELD SOLUTION

CONCEPT OF OPERATIONS

DIBS project

Part II

Editors

Uģis Romanovs

Māris Andžāns

Milrem in cooperation with

Latvian Institute of International Affairs

Latvian National Defence Academy

August 2017

TABLE OF CONTENTS

MILREM'S TRACKED HYBRID MODULAR INFANTRY SYSTEM IN SUPPORT OF LIGHT INFANTRY OPERATIONS

POLAND

Mirosław Smolarek

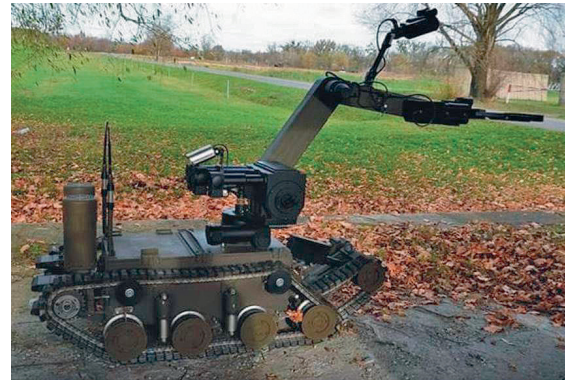
The 21st century is a period where diametric changes in the ways of conducting operations can be observed, especially by land forces. There has been a change in the role of land forces from the dominant that could be observed in the "classical" generations of war, to more complex and comprehensive assignments, which are the characteristic for wars of the fourth generation. New combat circumstances, which land forces must face, such as relocation of combat activities from deserted battlefields into dense urban areas cause new needs not only for new tactics, procedures and attitude to civilian societies (e.g. strategic communications), but also for compelling technological achievements. Another trend in military operations forced by live coverage by the media is the necessity of significant casualty reductions. These, as well as a number of other factors, such as the need to increase the effectiveness of soldiers on the battlefield, increase manoeuvrability and efficiency of operations etc., outline the direction for future armaments' development. Military thinkers talk about "non-contact warfare", which is called "5th generation war",[1] where technology like precision guided, "intelligent" ammunition or armed unmanned vehicles can engage enemy targets by operators sitting in front of a screen thousands of kilometres away. The robotisation of the armed forces and the battlespace is no longer a science fiction dream, but is becoming a fact.

Today, all military components employ unmanned vehicles.[2] UAVs observe enemies, armed versions strike enemies' objectives, UGVs, USVs and UUVs protect military compounds, facilities and heavy equipment, conduct mine clearance, ISR tasks, support soldiers logistically, engage enemies with their firepower, and so on. The greatest progress in implementation of unmanned vehicles can be observed in the Air Force, however Land Forces of modern armies are following this trend. Areas

of employment of UGVs are quite broad, however the biggest progress is observed in their use for detecting and neutralising improvised explosive devices (IEDs) (e.g. American TALON) reconnaissance (e.g. Israeli MTGRR), and combat (e.g. Russian Uran-9). Many armies and the arms industry are working on the construction of robust logistics/transportation UGVs. The tendency to introduce UGVs is not only reserved for the major powers and large armed forces; smaller countries are also trying to develop such systems (e.g. Estonian THeMIS with .50-cal. machine gun CIS50MG).[3] International armaments consortiums have spotted this sector and are preparing a wide range of UGVs' offerings for land forces. Some countries try to develop their own military systems using national military research institutions (e.g. American DARPA, Russian FPI[4] or Chinese Junweikejiwei[5]), while others focus on acquiring equipment offered by commercial manufacturers. Poland belongs to the second group.

UGVS IN THE POLISH ARMED FORCES – PAST AND PRESENT

The Polish Armed Forces have over ten years' experience in using UGVs, also in combat operations conducted in Afghanistan and Iraq. As in other countries, the robotisation of the Polish Land Forces began with the introduction of C-IED and UXO clearing robots. The Polish Land Forces use commercial solutions offered by international armaments companies, although the Polish industry also has a lot of experience and potential in the field of construction of such automatons. In 2006, the first Polish-built UGV was purchased from a manufacturer called Przemysłowy Instytut Automatyki i Pomiarów (PIAP – Industrial Automation and Measurement Institute). This producer is one of the most experienced Polish companies in the area of construction of robots and unmanned vehicles, since it has been involved in this business for more than twenty years.[6] The army purchased two different UGVs: a heavy-duty machine (550 kg) "Inspector", designed for the remote clearance of shells, munitions (UXOs) in open areas, both for "traditional" combat



Picture 1: UGV "Inspector" (PIAP). Photo: Paulina Wojciechowska, kpt. Ewa Nowicka-Szlufik (Engineer and CBRN Training Centre, Wrocław, Poland)

operations and anti-terrorist actions. In addition, the robot's equipment consists of sophisticated supplementary gear, among others the XR200 X-ray tube, recoilless gun for destroying detonators and neutralization of explosives (Richmond Maxx De Armer Disrupter) with several types of ammunition. Moreover, the development version can be used as a sentry platform equipped with several types of weapons.

The second UGV bought from PIAP was a smaller and lighter (about 180 kg) variant called "Expert". This robot is also designed to operate in small spaces including aeroplanes, buses, trucks, railway carriages or ships. This machine can lift suspicious loads of 5-15 kg from difficult to reach nooks or high shelves. Both robots were used by Polish demining teams during the ISAF mission in Afghanistan.[7] Additionally, Poland's involvement in this peace support operation created the need to strengthen troops' protection against IEDs and increase the technical capacity for explosives' detection and neutralisation. For this reason the operation was supported by small-scale UGVs Foster-Miller Talon 4 with the ability to detect and destroy anti-personnel landmines and IEDs. Next, in 2008, the Polish Ministry of Defence purchased the remotely-controlled mine clearance system Božena-4 of the Slovakian company Way Industry. The tracked automatous equipped in minesweeping gear allows the detonation of anti-personnel landmines and anti-tank mines containing up to 9 kg TNT. The use of this type of robot greatly increased the safety of not only the Polish soldiers but of the entire

Picture 2: LRR Balsa backpack. Photo: Przemysłowy Instytut Automatyki i Pomiarów (PIAP)

ISAF mission. These UGVs are still used by Polish sappers, and the operators are trained in using of the equipment in the Engineering and CBRN Training Centre in Wrocław. Currently, the Polish demining teams extend their operational capabilities in area of demining by purchasing from PIAP company 53 UGVs codenamed Balsa (demining type 1507 – based on the universal platform Fenix). This lightweight (15–20 kg) demining robot will be used to remove suspicious cargo, hazardous materials and for engineering reconnaissance. The company has already launched its first deliveries and should finalise the contract by the end of 2018.[8]

UGVS IN THE POLISH ARMED FORCES – THE NEAREST FUTURE

With the future UGVs, it is important to note that unmanned platforms are not only an area of interest for the Polish Ministry of Defence. Research funding for the development of this type of equipment (called "demonstrators") are allocated also by the "civil" ministries, which promote and support this kind of activities. For example, the National Centre for Research and Development, an executive agency of the Minister of Science and Higher Education, has provided a platform for effective dialogue between the research and business community and offers research grants for implementation of the so called "Unmanned Technology Platform". The Centre is co-founding research projects in

the following areas: *GROUP I,* including Unmanned Aerial Vehicles, Unmanned Ground Vehicles and Unmanned Surface Vehicles/ Platforms (USVs); and *GROUP II,* including subsystems, components and technologies for UAVs, UGVs and USVs, industrial applications for mission-critical crisis management support, critical infrastructure protection, environmental protection, and industrial surveillance. Such projects also indirectly support the development of unmanned military platforms as well, because research institutes and industries have access to the state's financial support and general help in implementation of the developed projects.[9]

Regarding the military concept behind the acquisition of unmanned platforms, in 2013 the Polish government adopted a multiannual programme "Priorities of the Technical Modernisation of the Armed Forces of the Republic of Poland within the framework of operational programmes". The document defines the modernisation plans of the Polish Army until 2022. The programme's goal is to increase the operational capacities of the Armed Forces by obtaining sophisticated military equipment. The goal is to be achieved by technical modernisation of the Armed Forces, and by upgrading the currently possessed hardware and purchasing new equipment.

The programme supports the tasks defined in the Strategy for the Development of the National Security System of the Republic of Poland by 2022. This strategy defines Objective No 2 – strengthening the state's defence capabilities. One of the main actions for the realisation of this objective includes "increased saturation with modern military hardware and equipment, including participation in international programmes". To achieve the intended goals, the Polish government adopted 14 operational programmes, which defined modernisation areas for all components and types of troops.

In addition, decision-makers decided to increase expenditures on the modernisation of anti-aircraft defence, airborne troops, and navy, land forces, integrated command systems, individual soldier equipment etc.; the programme also envisages intensive development of unmanned vehicles (platforms). Special emphasis is placed on UAVs – mini, short, medium range UAVs both CTOL and VTOL, as well as the

operational application of MALE-type automatons; however, the 14th programme entitled Patrol Reconnaissance assumes the acquisition of mobile unmanned ground reconnaissance platforms.[10] The result of this programme was a tender organised by the Armaments Inspectorate – the institution responsible for purchasing equipment for the Polish Army – for the purchase of fifty reconnaissance UGVs, codenamed Tarantula. This light unmanned vehicle should be capable of:

- Conducting reconnaissance tasks in direct contact with an enemy, including penetration of dangerous places and locations inaccessible for human beings;
- Performing patrols without the need to introduce live force into areas and objects, which have been mined or under enemy's' direct fire;
- Wireless audio and video data transmission from sensors to the operator's console in real time mode.

The machine should move over any terrain, including urbanised zones, off-road or vegetated areas. Its construction is designed to allow transportation inside a reconnaissance vehicle and carried by a single soldier (weight about 15 kg). Uninterrupted operation time of the UGVs should be up to six hours, including at least two hours driving. The traction system was supposed to be able to overcome field obstacles such as ditches, slopes, stairs or kerbs. Several companies have entered the tender, but the conditions have been fulfilled only by two: Reago Group Sp. (LLC); and the previously mentioned PIAP company. In the first phase of the tender, a slightly cheaper offer was presented by Reago Group, offering Israeli UGV Roboteam MTGRR. However, the tender was cancelled in November 2016, and the reason was "…untimely delivery of the equipment, which was an object of the contract…".[11] Until now, the Polish Ministry of Defence has not decided whether it is going to select the PIAP's offer, or to launch a new tender, which will cause delays in delivery of this equipment to the Polish reconnaissance sub-units.[12]

The presented applications of UGVs in the Polish Armed Forces do not exhaust the scope of research work related to implementation of the land platforms. The Polish Ministry of Defence supports creating

of military-civilian consortia established by research institutions and universities. For this purpose, the Defence Ministry has established the Inspectorate for Implementation of Innovative Defence Technologies (I3TO), which is responsible for supervision and development of selected technologies. Moreover, the inspectorate oversees implementation of chosen projects into selected systems. In addition, I3TO defines proposals and directions for research particularly important for the defence and security of the state. Furthermore, the institution deals with creation of the departmental policy for science and research development in the field of technology. An example of such military-civilian cooperation is a project related to developing a family of unmanned land platforms called BPL – Medium Platform (Class 800 kg). The arms industry, the Military University of Technology (Warsaw) and military research institutes are involved in the project. The task for these institutions is to develop two variants of a platform that could be used as a universal base for implementation of various types of equipment, reaching from logistics to combat applications.

CONCLUSION

The Polish Armed Forces have many years of experience in using UGVs. Initial employment included the use of robots for engineering and demining purposes. The introduction of this type of equipment has been forced by the geopolitical situation and Polish involvement in the operations in Iraq and Afghanistan. It should be clarified, however, that currently the Polish Army allocates considerable resources into the development of UAVs but the defence ministry does not forget about land platforms aimed at supporting demining teams, ISR process and increasing the safety of soldiers on the modern battlefield. Funds for acquiring this type of equipment are guaranteed by the Polish government and allocated in the budget for short and long-term military operational programmes. However, since the army is looking for commercial solutions offered by the international arms industry, without favour towards national producers, this process is sometimes

slowed down and delayed by external factors. Nonetheless, the Defence Ministry's area of interest is not limited only to such development. The government and the military decision-makers promote and sponsor the research and development of land platforms that could then be used to build UGVs for logistics purposes (transport and supply tasks), as well as creation of armed platforms capable of fighting with the enemy's combat power. Moreover, Poland's armament companies are not waiting for this kind of governmental support for research, and independently develop their own products not only for orders coming from the Polish Army, but also genuine constructions for foreign armed forces or entities involved in the security sector and fighting terrorism. The lack of such dependence on supplies only for the Polish Armed Forces compels the Polish arms industry to compete with other international companies for armaments markets and, on the other hand, allows the Polish Army to acquire state-of-the-art equipment offered by international arms suppliers.

The robotisation of the army, especially of the land forces, is inevitable and – like many other militaries – the Polish Armed Forces are only at the beginning of this road. The introduction of robots to modern battlespace creates new opportunities but also new challenges. Today, this is particularly visible at the lowest command and single soldier levels. The use of the unmanned vehicles in current peace support operations, particularly in Iraq and Afghanistan, has significantly reduced the number of casualties, especially in relation to attacks with the use of the IEDs. While UAVs have tremendous importance at the operational level (e.g. ISR) and attack on high-value-targets (HTVs) etc., UGVs will play a decisive role at the contemporary battlefield especially at the lowest tactical level in combat, de-mining, reconnaissance, and logistics.

It should be noted that the land forces of many armed forces are still not fully prepared for implementation of such solutions in terms of both hardware and training. The Polish Army is no exception. The Polish Land Forces should increase their investment in the implementation of terrestrial platforms not only in the field of counter-IED and ISR, but also in logistics and offensive as well as defensive combat operations. The contemporary battlespace has become more complex and armies enter very quickly into new areas that researchers are trying to identify

as the fifth and sixth generations of war - the spheres, which the military strategists did not predict even a few years ago. The Polish Armed Forces should focus especially on unmanned platforms supporting combat activities at the lowest tactical levels and even at the level of a single soldier's activities. Purchasing equipment does not solve the problem, as the soldiers need to be trained how to operate it. Decision-makers may not currently see the need for investment e.g. in offensive robots; however, it is still a good idea to train the crews to use them, and somehow, to get the soldiers accustomed to the fact that their operations will be supported by robots. On the other hand, unmanned vehicles are very technologically advanced and sophisticated devices. UGVs' operation requires skills that troops, especially reserve soldiers, do not currently possess, because they were not trained for such activities. Therefore, even if at present the Polish Army does not have typical combat or logistics robots, the soldiers should get trained in using them by utilising specialized trainers, because when the equipment appears in the military units – especially during the eruption of a conflict – it will be too late to begin such training.

The above-mentioned facts lead to the conclusion that the Polish Army should dictate standards, especially relating to the capabilities and simplicity of operating the unmanned systems, rather than accept products, which are offered by the arms industry. Robots should be simple and intuitive to use, require no advanced manual skills and extended knowledge of IT. In addition, the military automatons should have a modular structure and be easy to repair so that even a single soldier without advanced technical training should be able manually and quite quickly replace defective modules directly on the battlefield (even now the replacement of a modular drive unit in the Leopard 2 tank takes practically only 15-20 minutes).[13]

Certainly, further development of UGVs requires a very close cooperation with the military as a customer of the arms industry. The Polish Armed Forces is in a very good situation because it has military research institutes and the Military University of Technology (Warsaw), which can determine the requirements for this type of equipment, participate in development process as well as conduct verification tests

on the delivered products. Moreover, these institutions conduct their own advanced research and are involved in military-civil projects in the field of UGVs.

Finally, even though unmanned platforms can greatly increase the effectiveness of soldiers in the modern battlespace and reduce human losses, robots will probably not eradicate the human factor from the battlefield completely. Moreover, opponents are also developing solutions designed for combating the adversaries' live force and equipment.

ENDNOTES

1 S. Coerr, "Fifth-Generation War", *Marine Corps Gazette*, January 2009, 63-69.

2 Depends on armed forces "components" are: Air Force, Land Forces, Navy and sometimes Special Forces (e.g. Polish Armed Forces). In case of US Armed Forces recognise as active components: US Air Force, US Army, US Marine Corps, US Navy and US Coast Guard.

3 *Defence 24.com*, Live Fire Test – Estonian Combat Robot, Accessed April 06, 2017, http://www.defence24.com/503580,live-fire-test-estonian-combat-robot

4 DARPA – Defense Advanced Research Projects Agency; FPI - Фонд перспективных исследований.

5 Aleksey Basov, "Junweikejiwei - новая китайская DARPA", *defence.ru,* March 12, 2017, https://defence.ru/article/8159/

6 Michał Nita, "Krótka historia robotów", *Komandos*, 9/2004, 80-83.

7 Jerzy Garstka, "Sprzęt przeciwminowy w Afganistanie", *Przegląd Wojsk Lądowych* 2008/8, 49-50.

8 "Pierwszy robot Balsa już w służbie", PIAP, Accessed April 06, 2017, http://piap.pl/2016/12/09/pierwszy-robot-balsa-juz-na-sluzbie

9 "Programy obronność bezpieczeństwo", *National Centre for Research and Development*, Accessed April 08, 2017, http://www.ncbr.gov.pl/o-centrum/

10 CTOL – conventional take-off and landing; VTOL - vertical l take-off and landing

11 "MON zerwał umowę na dostawę robotów rozpoznawczych", *Dziennik Zbrojny*, Accessed April 08, 2017, http://dziennikzbrojny.pl/aktualnosci/news,1,10403,aktualnosci-z-polski,mon-zerwal-umowe-na-dostawe-robotow-rozpoznawczych

12 Likowski Michał, "Zwycięstwo Balsy, porażka Tarantuli, Raport|, *WTO* 2016/12, 28-32.

13 "12 cylindrowy silnik niemieckiego czołgu Leopard o mocy 1500 KM!", *Left Lane*, Accessed April 14, 2017, http://prawypas.leftlane.pl/t/12-cylindrowy-silnik-niemieckiego-czolgu-leopard-o-mocy-1500-km/556