ARMORED COMBAT EQUIPMENT
OBRUM'S KEY PROJECTS

Abstract. The basic tasks that OBRUM has always been assigned with was to conduct comprehensive scientific, research and development work aimed at preparing and launching manufacture on an industrial scale of new or improved products. One of the principal domains of these tasks were projects on armoured combat equipment, including MBT (Main Battle Tank) class tanks. In this article the authors discuss some selected projects completed at OBRUM that were based on acquired Soviet designs (modernization of T-54/55 tanks, adaptation of T-72 tank licence) and proprietary developments (required modernization) that adapted the technical specifications of T-72 to the requirements of modern battlefield. Results of work on the Polish version of the PT-91 tank are presented, as well as R&D projects undertaken (and ended at various stages of development) related to tanks code-named: Goryl, Anders and concept design PL-01. Initial results of work on the development of a series of tracked vehicle types based on the Universal Modular Tracked Platform (UMPG) and of the Combat Support Vehicle (WWB). In the summary reference is made to the results attained over the years: developed equipment deployed in the Polish Army and in the Middle East countries and Malaysia.

Keywords: armoured equipment, tracked vehicle, tank, MBT, Goryl, Anders, Universal Modular Tracked Platform, Combat Support Vehicle

1. INTRODUCTION

OBRUM's history dates back to 1968 when an Experimental Production Plant was established at the LABĘDY Mechanical Works [1]. Since 2014 OBRUM is incorporated into Polska Grupa Zbrojeniowa (PGZ - Polish Armaments Group) which, being the parent company, exercises owner supervision over OBRUM.

OBRUM is classified as an enterprise of key economic and defence importance, which is evidenced by placing the company in the list [2] which constitutes an annex to the Ordinance of the Council of Ministers of 1 February 2002 on the list of entrepreneurs of key economic and defence importance. OBRUM also has a certified system of supervision over foreign trade in goods, technologies and services of strategic importance [3].

OBRUM designs in the area of armoured vehicles, including tanks, were a response to:

- orders placed by Defence Industry Plants,
- needs/orders of the Polish Armed Forces,
- published Strategic Programmes of the Armed Forces,
- global trends in the development of armoured and engineering equipment,
- innovative proposals of OBRUM's scientific and technical staff.

Key projects pertaining to armoured combat equipment can be grouped into four areas:

- modernization of equipment at the disposal of the Polish Armed Forces;
- implementation of purchased licenses;
2. MODERNIZATION OF ARMOURED EQUIPMENT

2.1. Modernization of T-54 and T-55 tanks [1], [6]

In the second half of the previous century the tanks of the T-54 and T-55 types were the most numerous combat vehicles. They had a number of variations developed both in the USSR as well as under licences. For 25 years they were the core of the armoured forces of the Polish Army. Tanks manufactured by the Łabędy Mechanical Works since 1958 were also exported. The first modernization projects dealt with the negotiation of water obstacles and escape towers RT-1 and RT-2 developed at the Experimental Production Plant (ZPD). At the next stage, differential documentation (B-50) for T-55A was developed at the Łabędy Mechanical Works, including the extended modernization (Fig. 1). In 1972 a model and two prototypes T-55 AM2 were built.

Fig. 1. Modernized T-55

The multi-stage modernization of T-55 tanks was carried out with significant participation of OBRUM. Modernization of the tank has created an opportunity to introduce a number of modern Polish improvements, in particular, improvement of firing accuracy and of crew protection. The most important of them was the MERIDA fire control system. A Polish design of passive night vision devices for the gunner, commander and driver was also developed and applied. In order to provide greater safety for the tank crew, an add-on layered armour (steel-composite) on the front part of the turret and complementary armour of the vehicle floor, especially in the driver's seat area, were applied, as well as side protection screens against shaped ordnance. The original Polish design was the laser irradiation warning system BOBRAWA, the first in Warsaw Pact armies, and a system to counteract this irradiation TELLUR, which enabled a quick setting of a smoke screen in the direction from which the laser beam appeared.
2.2. Infantry Fighting Vehicle BWP-1 [1]

The BWP-1 vehicle (Fig.2) was the principal means of transport and combat for the infantry in the Polish Army. The relatively high firepower, mobility and protection of the crew enabled destroying highly armoured targets at distances of up to 2.4 km and highly efficient damage infliction on airborne targets and personnel. However, the potential battlefield of the 1980s required improving the tactical and technical specifications of the equipment. At the turn of the 1980s and 90s OBRUM initiated work on the modernization of the vehicle. The proposed range of modifications included, among other things, replacement of the turret with an aluminium one with additional steel armour from United Defence, a 25-mm M242 gun with automatic loading system and a rate of fire of 200 RPM. The upgraded base chassis was fitted with a UTA-20 (300 hp) engine and a mechanical synchronized five-speed gearbox and two-stage planetary steering mechanisms.

![Fig. 2. The modernized Infantry Fighting Vehicle BWP-1](image)

A technology demonstrator that was constructed successfully passed functional tests. However, the presented modernization has not gained recognition in military circles and the design was not proceeded further with.

2.3. The T-72 Jaguar tank [1], [7], [8], [9], [10], [11], [12]

Modernization work was based on licence technical documentation acquired/purchased in the USSR and subsequently "polonized", in large part, by OBRUM engineers. Manufacture of the T-72 (Fig. 3) was launched at the BUMAR-ŁABĘDY plant with the participation of Soviet specialists. The licence agreement allowed collaboration with other Comecon (Council for Mutual Economic Assistance) member countries in the manufacture of the tank. The Soviet party also provided master specimens of the Jaguar tank.
The insight into documentation and active participation in the manufacture launch processes allowed OBRUM's research and technical staff to assess the upgradability of the manufactured armoured equipment. OBRUM's design engineers were aware that due to the high firepower (125-mm gun), three types of projectiles, gun loading machine, NBC weapons protection system, high mobility, low total weight and low silhouette, as well as a three-man crew, there was a large modernization potential in the Jaguar.

2.3.1. Modernization of T-72 tank codename Wilk

Analyses conducted at the turn of the 1980s and 1990s of tactical and technical specifications and of shortcomings of the T-72 tank, which were revealed, inter alia, during the Gulf war, have demonstrated that in order to improve this tank it is necessary to:

- improve accuracy of firing at distances of more than 2000 m;
- adapt the tank to be capable of observation, aiming and combat during night-time;
- improve the crew protection degree.

By setting goals, it was easier to plan and carry out work. In the early 1990s OBRUM developed a project for the modernization of the T-72M1 tank codenamed Wilk (Wolf) (Fig. 4), and ZM BUMAR-ŁABĘDY S.A. implemented the modernization project for the production of the modernized tank under the name PT-91 Twardy (Resilient).

This modernization, initially defined as a base for modernization of T-72 tanks intended for overhaul, formed a basis for the preparation of design documentation and the launch of production of the PT 91 tank at ZM BUMAR - ŁABĘDY. Some of the innovations implemented into PT-91 included:

- DRAWA fire control system (optionally fitted with a thermal imaging camera or with a passive night vision device);
- driver's and commander's passive observation devices;
- an 850 hp engine with air filter and exhaust system;
- ERAWА-1 and ERAWА-2 reactive armours on the hull and turret;
- metal side screens with ERAWА-1 armour segments;
- fast acting fire suppression system;
- laser irradiation warning system and counteracting system;
- suspended driver's seat and new escape hatch.
3. IMPLEMENTATION OF PURCHASED LICENCES [7]

The most important implementation task facing OBRUM was the study on the "polonization" and adaptation of the Jaguar T-72 tank licence, including the purchased technical documentation of the T-72 tank. The outcome of the work carried out was the launching of production at the BUMAR-ŁABĘDY plant. The extent of the undertaking, implementation of the T-72 licence, was enormous. Poland was not the only licensee for the T-72. Comecon members had agreed to adopt a division of labour between the tank manufacturers (each of the parties carried out chassis and turret assembly on its own), while the deliveries of other units were assigned to the parties as follows:

1. Chassis equipment:
   - engine, transmission, optoelectronic devices – Poland;
   - filtration and ventilation system, control systems – Czechoslovakia;
   - aluminium tanks, fan – Hungary;
   - tracks, drive and tension wheels – German Democratic Republic (GDR);
   - road wheels, radiators, tanks, heater – Bulgaria.

2. Turret equipment:
   - machine guns, observation devices, night sight, communications equipment – Poland;
   - cannon, stabilization system, autoloader – Czechoslovakia;
   - selected monitoring and measurement instruments and observation devices – Hungary;
   - sight/range finder – GDR.

Work carried out in the years 1978-1982 under the above arrangement (modified with time) was complicated. Nevertheless it was successful. Until recently, the T-72, the series production of which was launched, was the principal armoured equipment in service with the Polish Army. It was also sold to several Middle East countries. The design solutions applied in the tank, allowed to use the licence base in a number of applications developed by OBRUM and implemented in ZM Bumar-Łabędy in several hundred vehicle products. BUMAR-ŁABĘDY S.A. are still seeking new designs (Fig. 5) and new clients to relaunch the abandoned production of the T-72/PT-91.
As part of the implementation/adaptation of the licence for the T-72 tank, a series of training devices was also developed in the form of training devices designated SJ-01 to SJ-09, which are still used by the Polish Army as auxiliary equipment (Fig. 6) for training soldiers.

3.2. T-72 modernization to comply with NATO standards

The changing environment, including the introduction of the acquired/purchased German Leopard 2A4 tanks into the Polish Army, influenced the next OBRUM's initiative aimed at increasing technical and tactical values of a large number of operational T-72 tanks. The in-depth analytical and design work launched at OBRUM were to enable the adaptation of the modernized T-72s to the valid NATO standards, including the transition from 125 mm calibre ammunition to 120 mm calibre. This change required, in the first place, the replacement of the gun and transition to a new type of ammunition.

OBRUM's study titled: "T-72 modernization to comply with NATO standards" included tactical and technical and economic analyses of a number of possible modernization variations.

OBRUM proposed more than a dozen modernization options (Fig. 7) that combined the values of the T-72 tanks with the firepower of Leopards. On the basis of technical and economic analyses, an optimal variant was indicated, which upon final assessment was awarded the recommendation of the Command of the Armoured Troops of the Polish Armed Forces.
Fig. 7. A diagram of modernization proposals to adapt the T-72 tank to NATO standards
Unfortunately, the developed project did not find recognition and was not launched by the Polish Ministry of National Defence despite many positive evaluations and support from many military specialists. The reason for this was, among others, the acquirement/purchase of Leopard 2A4 tanks from the German Ministry of Defence.

The document developed at OBRUM, a multi-variant and comprehensive scientific study, may serve as a model for other works of a similar nature.

### 3.3. Other variations of T-72/PT-91 modernization

Upgrade of armoured equipment, being the most cost-effective form of acquiring new generation equipment, is widely applied in all armies of the world. Examples of that include the modification of the T-72B3 tank (Russia) to the level of T-90 MS, as well as the upgrade of the Leopard 2 tank from the level of 2A4 (Germany) to the level of 2A7 with numerous variants. Abrams 2 (USA) and Merkawa (Israel) tanks have undergone similar processes.

The proposition to upgrade T-72 tanks to the NATO standards made in 2000 by OBRUM was, in a way, ahead of the strategic plans of the Polish army. Therefore, in the following years, OBRUM's scientific and research staff, together with the designer engineers of ZM BUMAR-ŁABĘDY S.A., submitted (in the form of development and concept studies) to specialists in the Ministry of Defence, various versions of modernization (Fig. 8) of the T-72 and PT-91 tanks, which could be carried out during the regular annual overhauls.

![Fig. 8. Graphical representation of proposals for the modernization of the T-72/PT-91 tanks](image)

In 2016 and 2017 demonstrators were set up (Fig. 9) to present the modernization capabilities for these tanks.

![Fig. 9. PT-16 tank](image)
The actions taken by OBRUM in 2018 brought effect and Armaments Inspectorate of the Ministry of National Defence launched a technical dialogue on the modernization of T-72 tanks. The analyzes and modernization proposals made so far by OBRUM can be helpful in decision-making processes and can be presented during discussions with military experts.

4. IMPLEMENTATION OF OWN PROJECTS

The completed modernizations of armoured equipment, as well as implementation and adaptation works of the T-72 licences described above, are not the most important areas of the OBRUM's activity as a research and development unit. Projects of great weight were the innovative ones that were implemented in the industry and OBRUM's proprietary analytical and conceptual work that set trends for armament and military equipment development, including armoured equipment.

4.1. Clearing tanks

OBRUM, since its beginnings in 1968, started to work on expanding the application possibilities of the T-55 tank. One of the first designs was that of the clearing tank S-69 Sosna (Pine) (Fig.10). This was one of the variations of the T-55 tank to make passages in anti-tank minefields of enemy defence. The general configuration of the vehicle has been devised so that both before and after minesweeping it retained all the features and combat capabilities of the T-55 base tank [13].

The rapid progress in technical means in the 1980s and the fact of introducing the T-72 tanks into army equipment in place of the T-55 created the need to develop a successor of the S-69 Sosna clearing tank. Almost in parallel with the launch of the licensed product, i.e. from 1981 to 1984, OBRUM was preparing a new clearing tank S-81 Oliwka, which in 1984 after qualifying tests went into series production. Apart from the fundamental change of the combat vehicle itself from the T-55 to the T-72 (belonging to the second post-war generation of tanks), the minesweeping equipment elements did not differ much from their archetypes. The design solutions for load securing and the way of using the new model of minesweep differed significantly [14].

Fig. 10. Clearing tanks
a) S-69 Sosna; b) S-81 Oliwka
4.2. New generation tank [1], [15], [16]

During the 50 years of its activity, OBRUM repeatedly tried to compel the decision makers in the Polish Army to give a go-ahead for the launch of a research project for the development of a Polish tank by domestic scientists and design engineers, while taking advantage of the latest global solutions. In the first half of the 1990s OBRUM started work on a 3rd generation tank project codenamed Goryl (Gorilla). Analyzes of the state of the art in the world, including the most modern solutions, and initial requirements for the project to match the state of the art level, constituted an extremely ambitious challenge and an important test of qualifications of OBRUM engineers. Unfortunately, the project was abandoned in its initial development phase - after the preliminary design and selected parts of the engineering design were completed. The tank silhouette – mockup, in an open field, is shown in Fig. 11.

![Fig. 11. Silhouette of the Goryl tank](image)

4.3. Infantry Fighting Vehicle BWP 2000 [1]

Infantry fighting vehicles (IFV, BWP - Polish acronym) are the principal transport and combat means of infantry and elements of cooperation with tanks in the battlefield. Equipped with additional antitank rocket launchers, they are able to destroy enemy tanks within a distance of up to 6 km. Taking into account the fact that due to their low weight IFVs can be used by rapid reaction forces (transfer by air), it is understandable that this type of equipment is developed by all major armies of the world.

At the turn of the 20th and 21st century, OBRUM proposed, instead of the obsolescent BWP-1, its own solution named BWP 2000 (Fig. 12) based on the modernized licenced chassis 306. The main units of the vehicle included: 522-kW engine S12-K, semi-automatic, hydromechanical gearbox with hydrostatic steering mechanism, with continuously variable turning radius and pivot turn function. The infantry fighting vehicle was fitted with an OTO MELARA turret (60-mm T60/70A gun, stabilized, with autoloader). Options included 25 or 30 mm guns (maximum calibre being 105 mm).

The 60-mm gun was compatible with the following projectile types: HE, HE with proximity fuse, APDS, APFSDS. Additional armament included TOW rocket launchers, 7.62 mm and 12.7 mm machine guns and a 60-mm LM60D light mortar.
4.4. Universal Modular Tracked Platform (UMPG) [17]

OBRUM proposed a concept of a modular tracked platform as a multi-variant carrier (Fig. 13) for various types of weapons and combat equipment. One of the applications of the platform was its use in the construction of an infantry fighting vehicle.

Fig. 13. Example of an embodiment of the Universal Modular Tracked Platform UMPG.

4.5. Infantry Fighting Vehicle – technology demonstrator [18], [20]

Based on the chassis possessed, in 2011/12 and 2016 OBRUM fabricated technology demonstrators (Fig. 14) of the Infantry Fighting Vehicle with various weapons installed in dedicated turrets. These designs were presented to a wide potential clientele at the International Defence Industry Exhibition in Kielce.
The main purpose of the work above was to verify the technical possibilities of integration of various turret systems with chassis systems. The tests proved successful.

In order to take advantage of the experience gained and the research and technical staff possessed, in 2011 OBRUM, together with BUMAR - ŁABĘDY S.A., commenced the implementation of the contract concluded with the Ministry of the Treasury through the PHO (Polish Defence Holding) for the Infantry Fighting Vehicle based on the Universal Modular Tracked Platform and the Remote Controlled Turret System. However, the project was stopped at OBRUM and transferred for implementation to Huta Stalowa Wola S.A.


At present a Consortium of companies (including OBRUM), with Huta Stalowa Wola S.A. as the Leader, is carrying out a research project code-named Borsuk (Badger) as part of the 5th Security and Defence Contest announced by the National Centre for Research and Development.

The new infantry fighting vehicle (Fig. 15) is to be characterized by the ability to negotiate wide water obstacles by floating, high manoeuvrability and the ability to operate under various terrain and climatic conditions, as well as transportability. The front part of Borsuk's chassis houses a power-pack with an MTU 8V199TE20 engine and a Perkins X300 transmission. The vehicle crew consists of 3 persons.

A landing troops compartment for 6 soldiers is in the rear part of the hull. Protection for the crew and the landing troops is to be provided by a hull of welded armour plates to which add-on modular armour can be attached. The traction system consists of six (double) pairs of road wheels, front drive wheels and rear tensioning wheels and two pairs of support rollers for steel or rubber-composite tracks.
4.7. Anti-aircraft artillery system – WB PZA Loara

In the WB PZA Loara project OBRUM is the author of designs named PWU 148 (chassis, turret, armament). The project and its implementation included: tracked chassis and turret designed for installing 35-mm anti-aircraft guns. The project was carried out together with RAWAR, HSW Stalowa Wola, ZM BUMAR-LABĘDY and the Research and Development Centre for Mechanical Equipment (OBRSM) in Tarnów (Fig. 16). OBRUM, on its part, designed and fabricated the turret and, based on PT-91 tank components, a self-propelled tracked undercarriage. Following that, OBRUM combined the undercarriage with the turret and with armament fabricated at OBRSM and HSW.

The set is designed to combat air attack means (aeroplanes, cruise missiles, helicopters, unmanned means) operating at very low, low and medium altitudes. It is also capable of destroying light armoured ground and surface targets.

Turret rotation and gun elevation gears are electrically driven, which ensures high rotation speeds. Ammunition bins and gun feed system are installed in the turret. The turret is fitted with advanced sensors that allow detection and interception of air targets moving at speeds of up to 500 m/s.

Two KDA anti-aircraft guns (manufactured by HSW under Oerlikon licence) that use 35 x 228 mm ammunition ensure effective destruction of targets at distances of up to 4000 m. The guns use FAPDS-T, APFSDS-T, AHEAD type ammunition.

The target tracking and following drives installed in the turret were characterized by high operating and transfer speeds and constituted pioneering solutions in Poland. The hull and turret designs were also innovative, verified by granted patents.

The Loara project has undergone a full research and development cycle, and the qualification tests confirmed the high performance specifications of the anti-aircraft system, but production was discontinued after completing and commissioning just one system.

5. INITIATED PROGRAMMES AND PROJECTS

OBRUM was an initiator and co-author of a number of initiatives in the area of combat vehicles.
5.1. Polish vision of the future battlefield (PWPPW)

Upon analyzing global trends and prospects regarding future armed conflicts in the world, which require a new strategy and a new approach to combat equipment, OBRUM took the initiative of a theoretical study in which the requirements and characteristics of new armament from the Polish perspective - the vision of the battlefield - would be defined. In 2004-2006 an appointed team of military experts and academic staff of military universities, backed by funding from the Ministry of Science and Higher Education, drew up a document [21] describing military organizational structures and technical requirements for the new type of weapons. PWPPW is a system that is equivalent to programmes implemented and developed in Western countries, such as the US FCSS (Future Combat Systems) or the British FRES (Future Rapid Effects Systems). The study was an analytical and prediction document designed to determine the directions of organizational, technical and technological transformation, leading to providing the Polish Armed Forces with equipment and armament for the future battlefield in the years 2010-2020. The equipment and armament were supposed to be provided mainly by the Polish industrial defence potential.

OBRUM can be proud of the fact that the final results of this programme included in the Study were used in 2007 in the "Research and Development Programme for the Industrial Defence Potential" drawn up by the Ministry of Science and Higher Education. The Study was the basis for the competition for research and development projects in the area of national defence and security announced by the Ministry of Science and Higher Education, the National Centre for Research and Development and the Ministry of National Defence.

5.2. Light tank [21], [22], [23]

The ongoing process of "aging" of the equipment used by land forces, in many cases the near end of operating lifetime of vehicles (BWP-1, T-72), required a comprehensive approach to technical modernization of the Polish Armed Forces. Using, among other things, the results of the work [21], in 2007 OBRUM, as the Leader of an established Consortium, filed an application with the Ministry of Science and Higher Education (MNiSW) for the financing of works for the development project "Light Tank based on Multirole Combat Platform". The Consortium, comprising: OBRUM (Consortium Leader), Military University of Technology, Warsaw (Member) and Wojskowe Zakłady Mechaniczne, Siemianowice Śląskie (Member), received partial funding for the project.

The purpose of the project was to create the essentials and propose design solutions for a light tank, with initial verification of the Tactical and Technical Objectives and of the design of a "Technology Demonstrator" during the tests. The Light Tank based on Multirole Combat Platform was supposed to be the Polish vehicle of the future battlefield. The project, the implementation of which commenced in September 2008, was one of the most serious challenges faced by OBRUM over the past ten years. Although few people believed in constructing a technology demonstrator in less than 2 years (using OBRUM's own resources and funds from MNiSW), OBRUM has once again demonstrated the skills of Polish engineers and the capabilities of the Polish industrial defence potential. A design concept, virtual model, is shown in Fig.17.
The Consortium, including OBRUM, were appropriate. Several Western countries launched their own light tank construction programs at that time. Unfortunately, the decision makers and experts from the Ministry of National Defence did not respond positively to OBRUM's initiative and the project (despite its many tactical and technical advantages) was not given a chance for further development.

### 5.3. CONCEPT PL 01

Despite the failure of the Anders platform, OBRUM did not withdraw from work on the development of a modern tank. In the project called Concept PL 01 use was made of industrial design techniques to create a safe vehicle (chassis and turret) of streamlined shape, creating a
stealth class solution. Stealth technology is used to make objects less detectable to known observation methods ranging from human sight and hearing to technical means. The tank view in a virtual space is shown in Fig. 19.

![Tank View](image)

**Fig. 19. View of the CONCEPT PL 01 vehicle**

In this tank the driver's seat is in the font of the vehicle, and the unmanned turret is installed at the back. Commander's and gunner's stations are arranged inside the chassis. The rear part of the hull can carry a squad of up to four soldiers. The vehicle armour consists of modular multilayer ceramic/aramid coat providing a level 5+ protection to the hull front and turret according to STANAG 4569 Annex A.

Additional armour plates installed on the turret and the hull are designed to protect against shaped charge projectiles. The hull provides protection against IEDs and mines in accordance with STANAG 4569 Annex B.

PL-01 Concept was to be fitted with a 940 KM Diesel engine combined with a hydrokinetic transmission and driving assistance system. Maximum speed is 70 km/h on road and 50 km/h off road, with maximum travelling range 500 km. The principal weapon in PL-01 Concept was a NATO-compliant 105-mm or 120-mm gun installed in the unmanned turret. The gun can use traditional shells, as well as anti-tank guided missiles. The autolader enables a firing rate of 6 shells per minute.

OBRUM made a model of a vehicle representing the outer body. That model was presented at the MSPO Defence Show in Kielce in 2013: Fig. 20.

![Tank Model](image)

**Fig. 20. CONCEPT PL 01 – view**
5.4. Direct Support Vehicle WWB [23], [24], [25]

Consistent work carried out at OBRUM and an active promotional and marketing attitude allowed the company, as the Consortium Leader, to be granted funding from the National Centre for Research and Development (NCBiR) for the implementation of a project in the area of state security and defence titled "Direct Support Vehicle (WWB)". (Agreement no. DOBR-BIO4/013/13411/2013 of 23.12.2013). Current work of OBRUM is financed:

- from funds received from NCBiR;
- from funds from the Ministry of National Defence acquired by Polski Holding Obronny (currently supervised by PGZ S.A.);
- from OBRUM's own funds.

The Modernization Programme of the Armoured and Mechanized Troops [24], carried out as part of the Polish Armed Forces Technical Modernization Plan for the years 2013-2022, calls for the development and acquisition of Direct Support Vehicles (WWB), codename Gepard (Fig. 21), which are to replace the currently used T-72 tanks, and in the long-term also the PT-91 Twardy tanks. The proposal by Polska Grupa Zbrojeniowa to provide the Polish Armed Forces with the Direct Support Vehicles (WWB) manufactured by the Polish industry is also in line with the requirements set by the National Security Strategy [25] for the industrial defence potential.

![Fig. 21. Direct Support Vehicle Gepard - a concept](image)

A newly developed Direct Support Vehicle (WWB) deployed with the Polish Armed Forces will enable:

- maintaining ability to undertake strategic defence operations within Poland;
- participation in an allied strategic defence operation;
- participation in an allied defence operation within NATO territory;
- creating readiness to implement a wide variety of tasks as part of NATO, EU, UN or OSCE missions.

The Direct Support Vehicle (WWB), deployed in the Polish Land Forces, will constitute a high power source of fire (120 mm ammunition) in military operations, supporting mechanized troops equipped with wheeled armoured personnel carrier (KTO) and Infantry Fighting Vehicles (BWP) with automatic 30-mm guns, e.g:
when destroying enemy armoured forces;

- in flanking actions and fortification levelling.

The WWB will be capable of using modern programmable ammunition and will constitute a complementary link between AMV Rosomak and MBT Leopard 2A4/5.

Although members of the Consortium have been strongly engaged in the WWB project, work progress is not fully sufficient due to the lack of clearly defined operational requirements.

6. SUMMARY

The space available here does not allow a complete presentation of all projects carried out at the OBRUM Research and Development Centre of Mechanical Devices over 50 years of its research and development activities. Projects and works selected for this article were of key importance [1], [4], [5], [7], [8], [21], [22] for the development of Polish Armed Forces and modern technological solutions that stand out against the global state of the art.

The article is an attempt to familiarize the reader with the most important research and scientific works carried out at OBRUM over many years of activity only in the field of armoured combat equipment. The results of the majority of the projects have been implemented and put into production and have become key products for the Polish Armed Forces, as well as for the armies of several Middle East countries and Malaysia.

The defence industry in Silesia (BUMAR-LABĘDY S.A. and ROSOMAK S.A., Siemianowice Śląskie) creates an excellent platform for cooperation between science and industry, enabling synergy of activities.

OBRUM's strong relations with research institutions, such as the Military University of Technology in Warsaw, Military Academy of Land Forces in Wrocław, Silesian University of Technology in Gliwice, Wrocław University of Technology, enable setting up of other powerful research consortia to face new challenges.

OBRUM's many years of experience in the construction of tracked armoured equipment and project management allow for the full implementation (in a complete development cycle) of complex projects in the field of construction of new tracked vehicles.

7. REFERENCES


Armoured combat equipment - OBRUM's key projects


