



POLISH CHAMBER OF NATIONAL DEFENCE MANUFACTURERS

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POLISH DEFENCE INDUSTRY

AFIT CREATES INNOVATIVE
AVIATION TECHNOLOGIES > 12

ROSOMAK – VEHICLE
FOR SPECIAL TASKS > 26

NEW BATTLEFIELDS REQUIRE
INNOVATIVE SOLUTIONS > 16



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MSPO 2013

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Industry Exhibition**

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CONTENTS

POLAND 4

Poland is the largest of the East European countries which joined the EU in May 2004. It is a stable democracy with a truly fascinating history, great cultural heritage and several areas of outstanding natural beauty.

NEWS 8

The latest news from the polish defence industry.

THE NEW PIAP GRYF® ROBOT 10

PIAP GRYF® is the latest robot engineered by the Industrial Research Institute for Automation and Measurements PIAP.

AFIT CREATES INNOVATIVE AVIATION TECHNOLOGIES 12

Interview with Ryszard Szczepanik, AFIT General Director.

NEW BATTLEFIELDS REQUIRE INNOVATIVE SOLUTIONS 16

Interview with Mariusz Andrzejczak, Vice president of the Polish Defence Holding for Development.

CHEMICAL PLANT NITRO-CHEM S.A. 24

NITRO-CHEM supplies its products either to the Polish Army or to the other armies around the world and gradually develops cooperation with many producers of ammunition at the defence market.

ROSOMAK - VEHICLE FOR SPECIAL TASKS 26

The design of the Rosomak vehicles provides mobility, large remaining capacity, ability to swim and wade, overcome significant obstacles and inclinations, as well as a buoyancy reserve for the installation of special equipment.

MODERN TECHNOLOGIES FOR MARITIME SECURITY 30

OBR CTM S.A. does research, development, design and experimental work to develop and implement modern solutions in the field of naval technologies as well as other technologies related to national security and defence.

COMPANIES 34



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SŁAWOMIR KUŁAKOWSKI

Born on May 31st, 1952 in Jelenia Góra. Graduated from the Faculty of Law and Administration of the Nicolaus Copernicus University (1975), Reserve Officers School (1976) and Postgraduate Studies at the General Staff Academy (1989). Reserve colonel. Held many important functions in the institutions of the Ministry of National Defence (1976-1992 and 1996-98). Between 1992-1996 served as adviser of the head of the National Security Bureau at the President of Poland Office for Economy and Defence Affairs. President of the Polish Chamber of National Defence since 2001.

Ladies and Gentlemen

Every company, especially operating in the armaments sector, is trying to cope with the dynamic changes and challenges brought by today's constant development.

One of the areas that the defence equipment manufacturers are currently focused on are new technologies allowing not only to cut costs, but also increase productivity. In a wider perspective, Polish producers create innovative solutions through research and new technologies – they introduce new products, services or even business collaboration models.

The wide range of possibilities offered by Polish manufacturers and the highest quality of their products provides customers with a full range of solutions and services tailored to the current and future needs of the dynamically growing army.

Polish defence industry products are still actively used. They meet the needs of our troops, not only in the country but also in different parts of the world where they serve. This is the best proof that the quality of equipment produced in Poland is very high.

In this edition of our Polish Chamber of National Defence Magazine, we wish to share examples of first-class solutions, characterized by excellent quality and durability.

I wish you an enjoyable read,

SŁAWOMIR KUŁAKOWSKI

President of the Polish Chamber of National



POLISH CHAMBER OF NATIONAL DEFENCE MANUFACTURERS

On the 11th September of 1995 a constituent meeting was held, at which, a resolution to establish the chamber, initiated by the representatives of the Polish defence industry, has been adopted. A temporary management and an auditing committee has been elected by the representatives of the 67 founders, in the presence of General Henryk Mika from the Ministry of Defence and the Colonel. Sławomir Kułakowski from the National Security Bureau.

During the past 10 years, the Chamber has been initiating activities to advance the technical level and product quality for the national defence, promoted the cooperative relations, inspired projects which led to an increase in the production for the domestic and foreign markets, as well as has inspired and supported the restructuring and modernization of the Polish industry while preparing its integration with the European structures.

**DURING THE PAST 10 YEARS,
THE CHAMBER HAS BEEN INITIATING
ACTIVITIES TO ADVANCE THE TECHNICAL
LEVEL AND PRODUCT QUALITY FOR THE
NATIONAL DEFENCE**

During that period, the organization of trainings for the representatives of the Polish industry and the facilitation of foreign contacts has been a significant element of the Chamber's activity. Besides the above, it has organized experience exchange within the areas of technical, organizational and trade solutions.

Since 1998, the Chamber has been a co-organizer of the BALT MILITARY EXPO exhibition in Gdansk, and has co-organized the "Cło i Granica" (Border and Customs) Fair in Warsaw since 2004. In 2000, the Chamber has initiated and coordinated the Polish Defence Industry Days in Lithuania, during which, the associated companies have handed over equipment worth approximately 4 million Zloty, including the Chamber's contribution of 700 000 Zloty, to the Lithuanian part of the LITPOLBAT battalion. In 1998, the Chamber has been assigned to represent the Polish defence industry at the NATO Industrial Advisory Group (NIAG), and since December of 2000 it has actively taken part in the meetings of the Group.

In 1999, the Chamber initiated an industrial cooperation within the Visegrad Group. Two editions of the Polish and Czech defence industries were organized (1999 and 2001), I Visegrad Group Defence Industries Forum (2001) in Warsaw, II Forum (2002) in Trenczyn and III Forum (2004) in Warsaw.

In Poland, in addition to the agreement on cooperation with the Ministry of National Defence (12.08.1999), the Chamber signed cooperation agreements with the Army Workers Trade Union (1997), "Solidarity" National Section of Defence Industry (1998), Polish-Arab Chamber of Commerce (2004), National Association of Equipment Manufacturers (1999) and the Employers' Association of Defence and Aviation Industry Enterprises (2003).

In 1999, the Chamber issued the only catalogue of the Polish defence industry. In 1996 the Chamber started issuing the BULLETIN OF THE CHAMBER. In 2003 the Chamber started publishing a bimonthly POLISH DEFENCE INDUSTRY (in English), and a quarterly ECONOMIC – DEFENCE REVIEW in 2005.



Currently, the Chamber associates 147 public and private enterprises. These include market leaders such as BUMAR Sp. z o.o., the Polskie Zakłady Lotnicze Sp. z o.o. (Polish Aviation Works), Stalowa Wola S.A., MESKO S.A. and RADWAR as well as small businesses and private companies. ■

POLAND

POLAND IS THE LARGEST OF THE EAST EUROPEAN COUNTRIES WHICH JOINED THE EU IN MAY 2004. POLAND IS COMPARABLE IN SIZE TO ITALY OR GERMANY (IN USA LARGER THAN NEW MEXICO) AND WITH A POPULATION OF APPROXIMATELY 39 MILLION (E.G. MORE THAN CALIFORNIA) IT RANKS AMONG THE MOST INFLUENTIAL AND REMARKABLE COUNTRIES IN CENTRAL AND EASTERN EUROPE. POLAND IS A STABLE DEMOCRACY WITH A TRULY FASCINATING HISTORY, GREAT CULTURAL HERITAGE AND SEVERAL AREAS OF OUTSTANDING NATURAL BEAUTY.

PARTICIPATION IN PEACEKEEPING MISSIONS

From the initiative of the United Nations and other international organizations, activities are carried out to maintain peace and prevent armed conflicts in the world. Poland has been participating in peacekeeping missions and operations since 1953.

Between 1953 and 2009, Polish soldiers and civilian employees of the army participated in 83 peacekeeping missions and operations, 35 of them were organized under the auspices of the United Nations. The total number of professional soldiers, compulsory military service soldiers, extended military service soldiers, and civilian employees of the army that took part in the missions and operations amounted to 90,234 thousand.

In 2009, Poland took part in 9 (continuing and new) peacekeeping missions and operations.

Of the 7,138 people delegated in 2009 to serve in peacekeeping missions, 6,606 professional soldiers, 362 – compulsory military service and extended military service soldiers and 170 – civilian employees of the army.

In addition, from 2003 to 31 October 2008, Poland was part of the International Stabilisation Force in Iraq. During this period, the Polish Military Contingent (a total of 10 shifts) amounted to 15,839 people, including 13,260 professional soldiers and 2,154 compulsory military service and extended military service soldiers and 425 civilian workers. ■

MEMBERSHIP IN MAJOR INTERNATIONAL ORGANIZATIONS

- European Union
- United Nations
- Council of Baltic Sea States
- Central European Free Trade Agreement
- International Monetary Fund
- United Nations Educational, Scientific and Cultural Organization
- United Nations Children's Fund
- World Health Organization
- World Trade Organization
- Central European Initiative
- Organisation for Economic Co-operation and Development
- North Atlantic Treaty Organization



POPULATION IN COMPARISON

RANK (IN THE WORLD)	EUROPEAN COUNTRY	POPULATION (mln)
1 (12)	Germany	82.1
2 (20)	France	58.9
3 (21)	Great Britain	58.7
4 (22)	Italy	57.3
5 (23)	Ukraine	50.7
6 (29)	Spain	39.6
7 (30)	Poland	38.7
8 (44)	Romania	22.4
9 (56)	Netherlands	15.7
10 (70)	Greece	10.4

SIZE IN COMPARISON

RANK (IN THE WORLD)	EUROPEAN COUNTRY	POPULATION (km ²)
1 (43)	Ukraine	603 700
2 (47)	France	543 958
3 (50)	Spain	505 992
4 (54)	Sweden	446 964
5 (61)	Germany	357 022
6 (63)	Finland	338 145
7 (66)	Norway	323 877
8 (67)	Poland	312 658
9 (69)	Italy	301 268
10 (76)	Great Britain	244 100

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POLAND, PEOPLE, COUNTRY, HISTORY

THE BATTLE OF GRUNWALD

The Battle of Grunwald is one of the greatest battles in the history of medieval Europe. It was fought on the 15th of July, 1410. The battle was a part of the great war between the forces of the Teutonic Knights, assisted by West European knights, under the command of the Grand Master Ulrich von Jungingen, and the combined Polish and Lithuanian forces, under the command of the Polish king Wladyslaw II Jagiello. The battle ended with the victory of the Polish-Lithuanian army and a crushing defeat of the Teutonic forces. The outcome of this battle had a major impact on political relations in Europe of that time. Not only did it break the power of the Teutonic Order, but also elevated Poland and the Jagiellonian dynasty to the rank of the most important ones in the continent.

THE BATTLE OF VIENNA

The battle was fought at Vienna on the 12th of September, 1683 between joint Polish, Austrian and German forces under the command of king John III Sobieski, and the army of the Ottoman Empire under the leadership of Vizier Kara Mustafa. The Turkish army numbered close to 140 thousand people. It was the largest army that was mobilized in the seventeenth century. Austria has managed to gather 32 thousand soldiers. Jan III Sobieski called up about 27 thousand Crown troops, including 25 hussar regiments, and marched to the relief of Vienna. The battle ended with the defeat of the Ottomans. This battle is considered to be one of twenty groundbreaking battles in the history of the world.

THE ROAD TO INDEPENDENCE

The Treaty of Versailles that ended World War I sanctioned Polish independence – before that Poland disappeared from the map of the world for 123 years as a result of partitions. The official date of the foundation of the Second Republic of Poland is the 11th of November, 1918, when Jozef Pilsudski took over the military authority in Warsaw. As a result of his actions the German troops withdrew from the city, and the Polish state institutions that were being formed conferred to him the title of the Chief of State.

INDEPENDENT SELF-GOVERNING TRADE UNION "SOLIDARITY"

"Solidarity" was a national trade union formed in 1980 to defend the rights of workers. Until 1989 it was also one of the main centers of mass resistance against the rule of the Polish People's Republic. One of the leaders of the workers' strikes that led to changes in the whole Europe was Lech Walesa, who later became a Nobel Peace Prize laureate. He was elected President in a two-round general election held in November and December of 1990.



THE POLISH POPE

John Paul II was the first Polish pope, as well as the first non-Italian Bishop of Rome in 455 years. The election of a person from a communist country for the head of the church had a significant influence on the events in Eastern Europe and Asia in the 80s of the 20th century.

ARMED FORCES

The Polish Armed Forces are divided into: the Army, the Air Force, the Special Forces and the Navy. Their main task is the defence of the Polish borders against outside attacks and cooperation with NATO. The armed forces are an essential element of the national defence system, designed for the effective implementation of the security and defence policy. The Polish armed forces number nearly 100 000 troops. They have taken and are taking part in a number of foreign missions of the UN, NATO and the EU.

LEGISLATURE

In Poland the legislature is a bicameral parliament consisting of the lower house – the Sejm and the upper house – the Senat. In direct, universal and secret elections, Polish citizens elect 460 members of the Parliament and 100 senators. Both MPs and senators are elected for a four-year term.

CONSTITUTION

The Constitution of the Republic of Poland is the most important Polish legal act and the foundation of the Polish state. It guarantees the rights and freedoms of citizens, determines the relationships between the legislative, executive and judicial branches, decides on the form and way of appointing key national institutions such as the Parliament, the Senate, the President and the Council of Ministers. The Constitution has a direct influence on the form of the judicial system, local governments and state control bodies.

SOCIETY

According to data from 2011, the territory of the Republic of Poland is inhabited by 38.5 million people. In terms of population Poland occupies the 29th place in the world and the 8th in Europe. The Polish population represents 5.3% of the European population and 0.65% of the population of the world. ■

ZM TARNÓW OBTAINED A MILITARY CONTRACT

ZM Tarnów has signed a contract to supply of materials for small arms equipment used by the Polish Army. Under the contract, signed on February 20th, the supplier agreed to supply equipment and supplies, for which he will receive 2.3 million PLN. The contract is due on December 10th.

POLISH DEFENCE HOLDING WILL REPAIR BERYLS FOR THE POLISH ARMY

District Logistics Base has signed a contract with Łuczniczka Amrs Factory in Radom, part of Polish Defence Holding, for repairing and modifying Beryl rifles.

The contract was signed on February 22nd and amounts to nearly 4.4 million PLN. Under the contract, about 1500 weapons used widely by the Polish Army will undergo repairs and modifications. Since Łuczniczka is the manufacturer of Beryl rifles, negotiations were conducted with only one tenderer.

LUBAWA S.A. WILL MODIFY VESTS

Lubawa S.A. has acquired the contract for the general renovation of the protective vests used by the Polish Army. OLV (155 units) and KLV (130 units) will be renovated. The contract was signed on February 22nd. The contracts amounts to nearly 800 thousand PLN.

TENDER FOR THE HYDROGRAPHIC BOATS FOR THE POLISH NAVY

Arms Inspectorate announced a tender for providing the Polish Navy with four hydrographic boats. Marine units are to be provided in 2013 and 2014. Offers are planned to start on April 3rd. Estimated purchase price amounts to 6 million PLN. Each unit will have the following equipment: hydraulic crane, lifting frame, navigation equipment, communication equipment and equipment designed for underwater work. The latter include echo sounder, underwater high-resolution sonar (Kongsberg MS 1000 or equivalent to meet the same parameters), towed sonar, remotely operated underwater vehicle.

Maximum total displacement should amount to 20 tons, hull length should be up to 15 meters. Full-time crew should include four people, four additional people should be able to get on board.

TENDER FOR ADVANCED TRAINING AIRCRAFTS STARTED

Arms Inspectorate has published a defence and security-related tender for providing in integrated "Advanced Jet

Trainer System". The tender invites companies to send offers or requests to participate in the tender.

Its goal is to buy a system composed of advanced training aircrafts (8 units), training system (including comprehensive flight simulator, pilot / part task simulator, emergency procedures – ejection simulator, computer training support system and training package) and logistics package (ground support equipment, aircraft ground equipment, repair & maintenance equipment, spare parts and consumables, technical support, IT support system, metrology safety measurements, technical documentation: for the aircraft, ground aircraft maintenance equipment, training devices – simulators for training flight and technical crew and operational system).

The purchaser allowed the tenderer to subcontract some of the work on the condition that the offer will indicate what part of the work this will apply to.

No detailed requirements have been published yet. They will be indicated in the Terms of Reference that will be given to the tenderers invited to make offers. The realization of the contract will start on January 1st, 2014 and will end on November 30th, 2017.

SERVICING CONTRACT OF WOJSKOWE ZAKŁADY ŁĄCZNOŚCI NO. 1

Wojskowe Zakłady Łączności no. 1 signed a servicing contract with the Army amounting to 4 million PLN. Under the contract, WZŁ no. 1 agreed to perform repairs, diagnosis, maintenance and servicing on satellite terminals used by the Polish Army in Afghanistan and Kosovo.

From the very beginning, the negotiations were conducted only with WZŁ no. 1, since the company has proper experience and references.

LOGISTICS TRUCKS FOR THE POLISH ARMY

2. District Logistics Base has announced a tender to buy 32 Jelcz 862 trucks equipped with Hiab 855 crane. These four-axle vehicles are becoming standard in the logistics of the Polish Army, and equipping them with crane will ensure independence while loading and unloading the transported equipment.

MILITARY ELECTRONIC WORKS CONTRACT

1. District Logistics Base has published a protocol related to the contract for the renovation of the NUR-31M radiolocation stations' special component and chassis.

The contract between the purchaser and Military Electronic Works from Zielonka was signed on January 30th and amounts to 453 thousand PLN. The work should be completed on June 10th.

PZL Świdnik started providing new Sokół helicopters for the Air Force PZL Świdnik provided the Air Force with the first unit of PZL Świdnik W-3WA Sokół helicopter from the batch ordered in 2011. The helicopter was given to the 1st Airborne Transport Base. In total, the base will receive five helicopters from Świdnik, all of them will be used for transporting VIPs within Poland. New Sokół helicopters will join older vehicles of this type that are already used by the airborne unit from Warsaw. PZL Świdnik plant will complete the contract by the end of the year.

POLISH DEFENCE HOLDING LEADING THE LEOPARD TANK MODERNIZATION PROGRAM

The new consortium will modernize Leopard 2A4 tanks used by the Polish Army. The consortium is lead by Zakłady Mechaniczne Polish Defence Holding and also includes Ośrodek Badawczo-Rozwojowy Urządzeń Mechanicznych OBRUM S.A. from Gliwice as well as Polish Defence Holding.

The consortium was formed to develop, implement for production, deliver and maintain Leopard 2GB modernization package in close collaboration with a strategic partner – Krauss-Maffei Wegmann. This program is a response to the needs of the Ministry of National Defence related to Leopard 2A4 tanks.

POLISH DEFENCE HOLDING WILL PROVIDE RADARS FOR THE POLISH ARMY

Arms Inspectorate acquired NUR-15 Odra radiolocation stations from Polish Defence Holding. Under the contract, the manufacturer will provide the army with eight tricoordinate radiolocation stations along with two logistics packages. The contract amounts to nearly 330 million PLN. Such stations are already used by the Polish army. NUR-15 Odra is a tricoordinate device working in S band. It can locate airborne objects at a distance of 240 km and located at an altitude of 30 km. It can observe 120 objects at the same time.

POLISH DEFENCE HOLDING WILL PROVIDE "LIWIEC" ARTILLERY RADARS

Polish Defence Holding will provide the army with seven "Liwiec" stations. First unit will be received in 2015. They will join three systems of this type that are already used by the army to locate enemy firing positions.

JELCZ WILL PROVIDE TRUCKS FOR THE ARMY

Arms Inspectorate has recommended negotiations for buying military trucks from a Polish manufacturer – Jelcz. Jelcz plants, belonging to Stalowa Wola Steelworks, apply

for a contract for the purchase of 866 medium-duty military trucks and further trucks for special purposes. This program is listed in the technical modernization of the Polish Army project until 2022. The potential value of the contract amounts to 400 million PLN. New trucks will replace Star 266 vehicles. Jelcz plants can provide product that can replace them – 442 Bartek – designed in this category of trucks. The potential decision to buy trucks from this manufacturer embodies the declaration of the department to make the largest orders in the Polish defence industry.

PZL RZESZÓW WILL RENOVATE THE W-3 SOKÓŁ HELICOPTER ENGINES

3. District Logistics Base has signed a contract with PZL Rzeszów to renovate engines of W-3 Sokół multi-purpose helicopters. The contract was signed on the 2nd of January and amounts to nearly 11 million PLN. Negotiations for the contract were conducted in December last year. Each Sokół helicopter uses two PZL-10W engines with 662 kW of power each.

CONTRACT SIGNED WITH NAUTA S.A. SHIP REPAIR YARD

Armament Inspectorate has signed a contract with the NAUTA S.A. ship repair yard to perform general and dock overhaul of ORP "DĄBIE" and ORP "RESKO", fulfilling the announcement of minister Tomasz Siemoniak concerning the cooperation with Polish companies in renovating and modernizing military equipment. The value of the work will amount to 45 million PLN.

The contract that was signed on the 22nd February includes renovation of the main armaments and military equipment, as well as of internal combustion engines and auxiliary equipment, modernization of control systems of monitoring, main propulsion, ship's power plant and ship's drainage installation. The completion of works is planned for the end of November 2013.

BCC AWARD FOR WZM S.A.

On January 26 the Grand Gala of Polish Business Leaders took place. Chairman of the Board and Chief Executive Officer of Wojskowe Zakłady Mechaniczne S.A., Adam Janik was given the "First Diamond to the Golden Statuette of the Polish Business Leader". This prize is awarded to winners of the competition who have maintained or improved their position in the market. The ceremony was the culmination of the 22nd edition of the Polish Business Leader competition, recognized by the entrepreneurs as the most prestigious economic competition in Poland.



THE NEW PIAP GRYF® ROBOT



PIAP GRYF® is the latest robot engineered by the Industrial Research Institute for Automation and Measurements PIAP. It has been designed in 2011 with a view to increase functionality of PIAP's other small robot - PIAP SCOUT®.

PIAP GRYF®'s users can continue to benefit from PIAP SCOUT®'s advantages such as a hybrid, caterpillars-wheels, running gear. When necessary, moving wheels can easily be removed in order to decrease the robot's dimensions.

New construction of the manipulator allows precise control over inspected objects.

PIAP GRYF®'s new design is innovative in many ways, its advantages include:

- an increased number of degrees of freedom.** Currently there are as many as seven degrees of freedom (rotation of the manipulator's base, movement of the first and second part of the manipulator's arm, rotation of the gripper, gripper's movement in vertical plane, gripping and releasing as well as manual telescopic extension of the second part of the manipulator's arm),
- an increased load capacity of the manipulator (up to 15 kg),**
- the option to install the manipulator in any chosen position** on top of the mobile base. It is made possible thanks to a set of rails placed parallel to the top part of the robot and clamps, which are located on the manipulator's base.
- a safety clutch which protects them from damage resulting from operator's action** e.g. when lifting a load heavier than the robot's capacity.

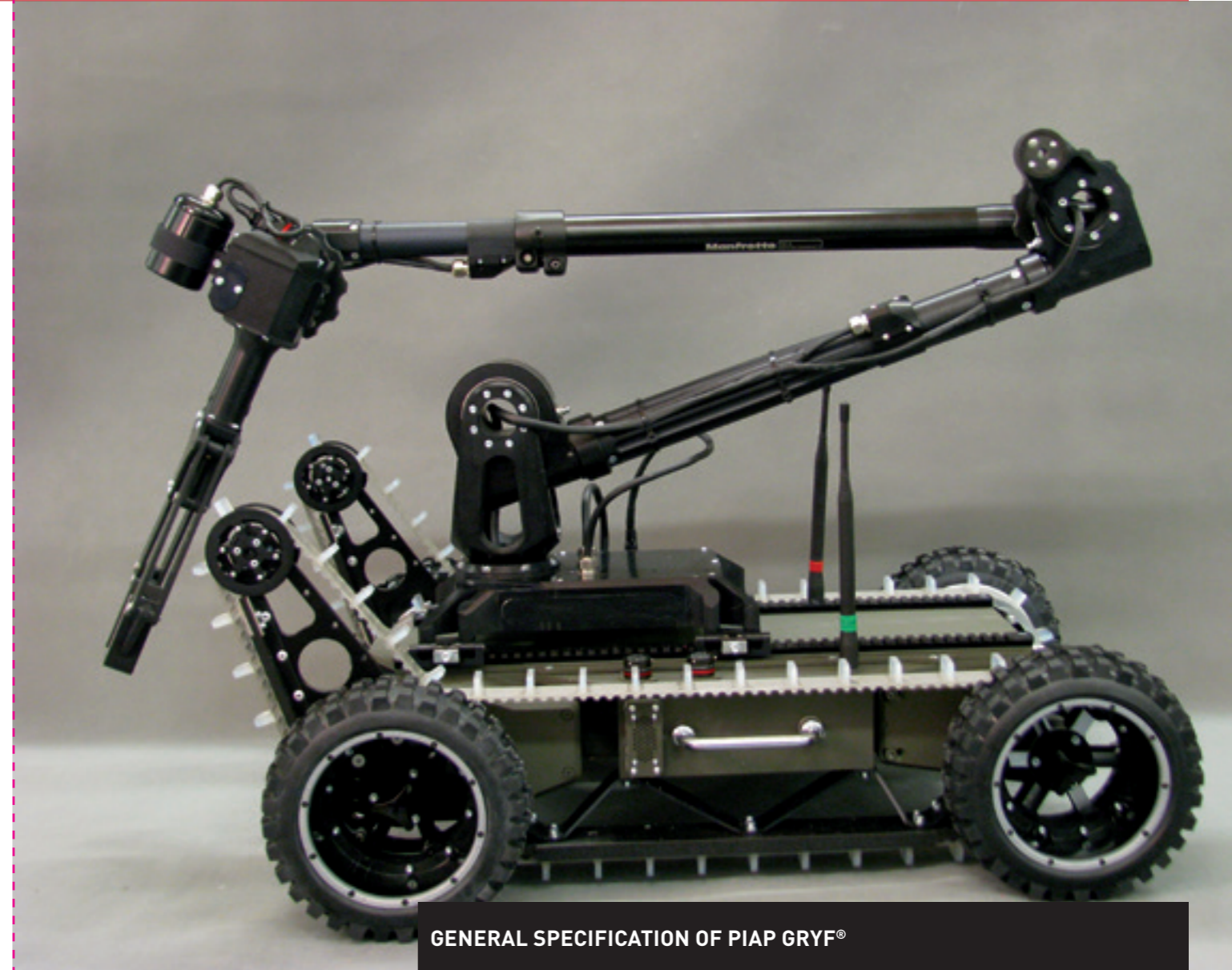
As a result of these solutions, PIAP GRYF®'s users can benefit from:

- additional abilities and a means to lift bigger and heavier objects with more precision and without fear that the robot will suffer damage.
- a option to change the position of the manipulator and of other devices mounted to the mobile base.
- greater stability of the robot when lifting objects.
- greater stability of the robot when climbing stairs and negotiation various kinds of field obstacles.
- greater reach of the manipulator (along the forward-backward direction).

In order to ensure high stability of the robot, PIAP has designed a new, enlarged mobile base with a very strong drive mechanism of the front caterpillars. It also boasts a new type of caterpillars with an increased resistance to chemical agents. In addition, the construction of the operator's post has been improved in relation to previous versions.

PIAP GRYF® can also be equipped with and adjusted to a number of optional devices such as the following:

- an automatic optic-fibre cable winder,
- disruptors,
- X-Ray devices,
- chemical, biological and radiological contamination sensors,
- explosive material detector,
- containers or baskets mountable on the robot's mobile base,
- other devices already owned by the users. ■



GENERAL SPECIFICATION OF PIAP GRYF®

Dimensions	690/580/400 mm (length/width/height)
Length + front caterpillars	840 mm
Total mass	38 kg
Speed	3,6 km/h
Manipulator's maximum lift	5-15 kg
Manipulator's maximum range	1900 mm for telescoping manipulator arm (optional), 1500mm for manipulator without telescoping extension
No. of degrees of freedom (manipulator)	7 (including 1 manual telescopic extension of the arm)
No. of robot's cameras	4
Maximum battery operation time	2 h
Drive system	Wheel-tracks





AFIT creates innovative aviation technologies

HE HAS MORE THAN FIFTY INVENTIVE PROJECTS, AND TWENTY PATENTS. HE IS AN OUTSTANDING SPECIALIST IN THE FIELD OF AIRCRAFT ENGINES, INTERPRETER IN ENGLISH AND RUSSIAN LANGUAGE. THE GENERAL DIRECTOR OF THE AIR FORCE INSTITUTE OF TECHNOLOGY, RET. COL., DSC, PHD ENG, PROFESSOR AT THE MILITARY AIR FORCE ACADEMY IN DEBLIN, RYSZARD SZCZEPANIK TALKS WITH PDI.

- **Air Force Institute of Technology (AFIT) has been brought to life 60 years ago – it is a beautiful tradition and history.**

- **Mariusz Szczepanik, AFIT General Director:** Indeed, in June of 2013 we celebrated the 60th anniversary of the Air Force Institute of Technology, but our traditions dates back much further, to the Air Navigation Section set up 95 years ago, which indirectly gave rise to our Institute. Such anniversaries are a good time for all kinds of summaries. The celebrations of the foundation of the Institute was attended by highest representatives of National Security Office, Ministry of Defence, Ministry of Economy and some Polish Parliament members. The ceremony started with opening by Mrs. Karolina Kaczorowska the "President Ryszard Kaczorowski Centre of Innovative Aviation Technologies". I believe it reflects well on the Institute itself and on how it acted in the last 60 years. During this time, hundreds of our projects, studies and systems have helped to improve the safety of aircraft operations and combat readiness of the Armed Forces of the Republic of Poland. We are proud of the achievements on the global level in the field of combat aviation, navigation and sighting systems, comprehensive tactical level military training, the development of mathematical models of aircraft flight



dynamics, numerous studies supporting control operation, modern researches in the field of diagnostics of aircraft engines, aviation and airport technology. The celebration was accompanied by an exhibition of works of the Institute, which showed a wide research and development scope, as well as the AFIT's spread of areas of interest. The exhibition included: Unmanned Aerial Observation Aircrafts and Air Target Imitations, the "Cyclops" Helmet-mounted Flight Parameters Display, Information Systems that support the operation of aviation equipment and improve flight safety, bombing training system, air target imitations launchpad, unguided missile launcher, pilot's survival/ immersion suit, thermal imaging system for individual soldier, ground system for detecting objects in space on low orbits, flight parameter recorders and conceptual design of GROT-2 training and combat aircraft. The exhibition organized outside of the building included: an unmanned helicopter robot for special tasks ILX-27 (implemented in association with the Institute of Aviation and Military Aviation Works No.1), the TS-11 Iskra aircraft modernized to AJT version (Advanced Jet Trainer) at AFIT, W3-Sokół helicopter modernization demonstrator equipped with the helmet-mounted targeting system "Orion".

- **And today? What are the main, flagship projects and research works the Institute's experts are working on?**

- With the changing organizational, technical and technological conditions, especially after the Polish accession to the NATO, the Institute adjusts the subjects range of its work to the changing needs of the Polish Armed Forces. We perform studies, research and development, implementation as well as technical and service work related to the construction and operation

of aviation and air weapons. Our experts develop technologies, research methodologies, new constructions, research programs, operational methods and technical projects of aviation equipment, munitions and weapons. A very important aspect of the activities of AFIT is its work in terms of flight reliability and safety.

Whole research potential of the Institute is subject to shaping the process of operation of aircrafts in such way that prevents unnecessary accidents or minimize their effects, which translates to continual increase of the reliability and safety of flights.

In the current situation of the Polish Armed Forces' Aviation, the Institute focuses on existing aircrafts, as well as the modernization and integration of avionic

systems. The result of extensive work in this area is the modernized W-3 Sokół helicopter, which, as part of the "Głuszc" program, was equipped with a so-called glass cockpit. Developed at AFIT Integrated Avionics System (IAS), combines virtually all the systems on board of the helicopter, in accordance with the world standards. The IAS consists of elements such as the Integrated Communications System and SWPL-1 "CYKLOP" helmet-mounted flight data display (currently implemented on the Mi-17 helicopters used by the Polish Armed Forces). In 2012 we developed the helmet-mounted fire position control system "ORION", which allows the helicopter's pilot to identify the target and start firing with movement of the head, while having all the necessary navigational parameters displayed on the screen in front of the eyes.



- **What are the main directions of the Institute's research development strategy?**

- We are up to date with technologies that are developing at a very fast pace. Trends accelerate the development of areas such as electronics, communications and digitalization. Prudent personnel policy and consistent actions as well as a good preparation for the identification of needs relating to aircrafts that are, in fact, flying computers, allows the Institute to meet modern requirements. We have a team of very well-skilled computer scientists and electronic engineers. Our strong track record in this area matches premium global solutions. The Institute is now in an elite group of research centers that can produce digital systems and integrate them aboard modern aircraft. A modern approach to the performed tasks can be evidenced by the fact that on the 60th anniversary of the AFIT, June 14, the President Ryszard Kaczorowski Center for Innovative Aviation Technologies was opened. This is where the most outstanding ideas will be born, whose fruits will successfully be used in aviation.

- **Is the Polish Army helicopter purchase program an opportunity for you?**

- When talking to the decision-makers, I am trying to persuade that the Air Force Institute of Technology, together with other scientific and research units and technical universities, as scientific and research potential subordinate to the Ministry of National Defense and - going even further - as a Polish industry, we have ready components that have strategic significance from the point of view of this program.

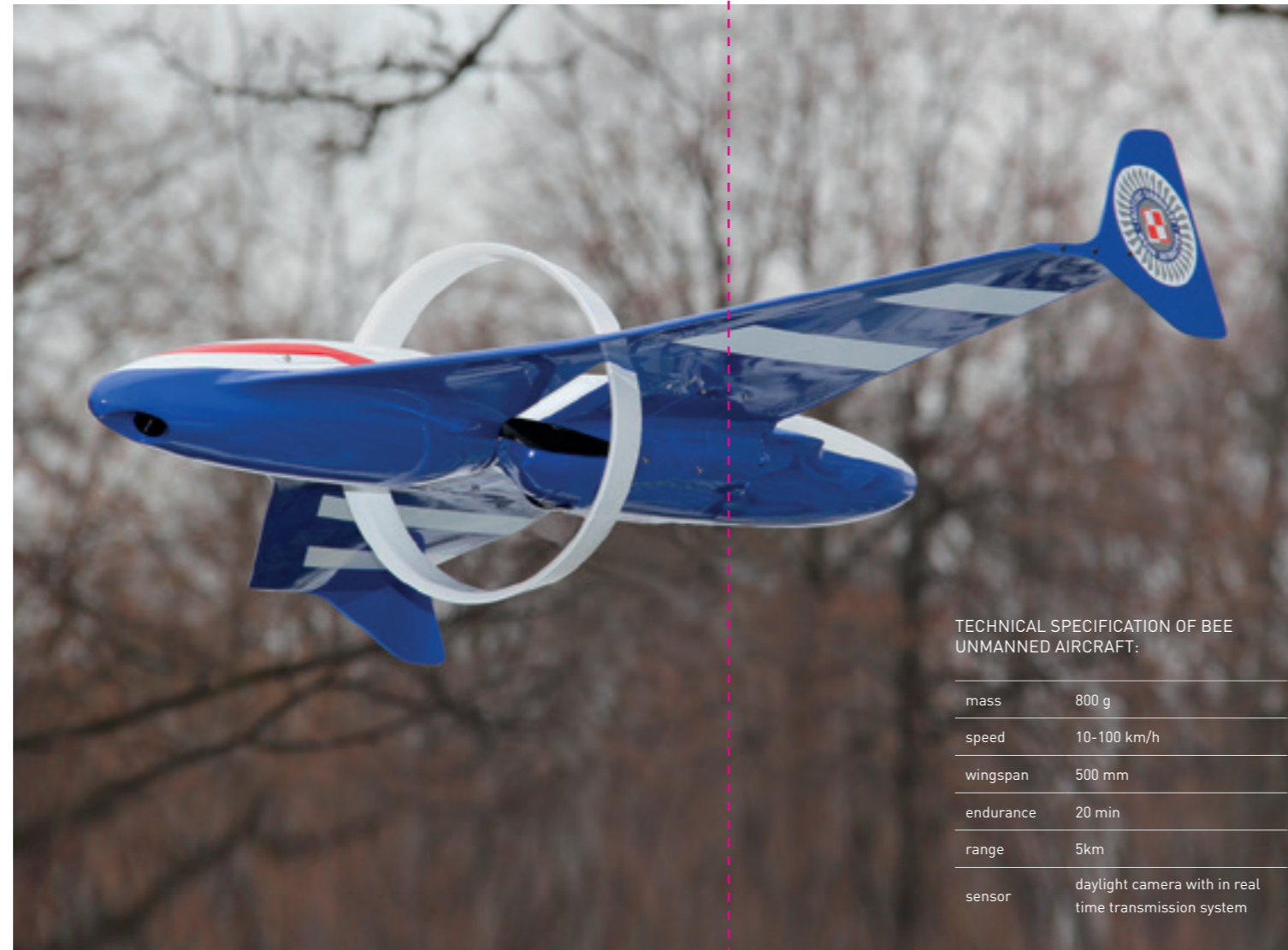
It would be best if the conditions of the tender requirement included the clause that the helicopters should be equipped with the Polish integrated avionics systems that are proven, certified and built in our W-3 Sokół helicopters and which will soon be mounted in the Polish PZL-130 TCII Orlik training aircraft. This is a good example of cooperation in the field of unification of our platforms, which in the future will allow for significant operational benefits.

- **How important are the Polish avionics systems in these helicopters?**

- If you spend a lot of money on such a purchase, it is obvious that the suppliers want to sell their finished products. But such contract also means long-term contract for services, calibrations, repairs and supplies of parts. After some time, when you need to modify the system, it will be necessary to pay again and again... and certainly, it will not be a small amount of money. If the Terms of Reference (ToR) indicate that the supplier must ensure the use of Polish source code, then from beginning to end we will have control over the system and its subsequent improvements. Please note that the purchase of the equipment amounts only (according to various estimates) to about 1/3 costs of the whole system.

- **Manufacturers will not oppose that?**

- We count on their will to collaborate. Modern Polish solutions may make the offered products more attractive and open up new export opportunities (eg. due to the lower price of Polish labour work and systems, lack of licensing and export restrictions, etc.). We should be sure that the equipment that we want to buy has been



TECHNICAL SPECIFICATION OF BEE UNMANNED AIRCRAFT:

mass	800 g
speed	10-100 km/h
wingspan	500 mm
endurance	20 min
range	5km
sensor	daylight camera with in real time transmission system

fully prepared for our conception of their use in the layer of electronics and information technology, which does not require, according to our experiences, full certification (such as the newly designed air platforms).

- **The Institute has recently completed the work on the "Bee" mini UAV, please explain the profile of this unmanned platform.**

Our wide range of unmanned aerial vehicles has recently been extended with the arrival of the smallest drone – the "Bee" (Pol. Pszczoła). It is worth mentioning that we have been the authors of various flying platforms such as the light unmanned observation aircraft "Bat" (Pol. Nietoperz) with a range of 15 km and the flight time of 1.5 hours, observation aircraft "Fisherman" (Pol. Rybak) or aerial targets, which are used by the Polish Armed

The operator is capable, based on the transmitted image, to say in a short time what is happening in the area designated for observation, whether there is a threat and what force must be directed at a particular point to eliminate the threat. The conclusions from such observation can be used to plan rescue operations conducted by the official emergency response services in case of disasters, in land traffic, construction or caused by natural phenomena. This small drone may also be used to monitor public gatherings such as demonstrations, sporting and cultural. "Bee" is ideal for places where you need immediate observation from the air, and the conditions do not allow to use a helicopter.

- **What are the benefits of the construction, what challenges did the designers face?**

- The main benefits of "Bee" drone include: ease of use, short time to achieve readiness, the option to observe terrain and objects hidden behind the houses, trees or other natural obstacles in real-time. The achievable speed – up to 100km/h – allows the "Bee" to get over a distance of 5000 meters within 3 minutes. Its small size makes it possible to start the drone from almost any place, because it does not require a runway or a special launcher. The Bee takes off "from hand" and its landing is performed in a classic manner. Experts from the Division for Aircraft and Helicopters of the Air Force Institute of Technology worked on "Bee" unmanned aircraft for three years. The main challenges were described in the draft of the National Centre for Research and Development (project carried out with the participation of the NCRaD funds): small size of the aircraft and safety of use. Small external dimensions resulted in the need for specialized, specially designed electronic components such as transmitters, receivers, sensors, propulsion and control elements.

The requirements of low weight and maintaining the sufficient rigidity led to the necessity to build the airframe as a composite structure, reinforced with glass and carbon fiber. The interleaf structure was made in negative molds. It is an innovative solution, since for such small objects (500 mm width) it is very difficult to make composite elements of low weight, yet sufficiently strong, rigid and resistant. Safety requirements resulted in the need for an innovative design of the aircraft's propeller, shielded in the middle of the airfoil. This approach enables the efficient use of propeller flow energy to allow the aircraft to fly at a very high pitch at low speed.

We developed a system that allows to perform autonomous flights. Individual and dedicated steering and flight control systems were developed, which means that the "Bee" can fly along a route that was pre-planned and entered into ground station, in which case an AutoPilot developed at AFIT is used.

More information about AFIT and its activities:

www.itwl.pl

[www.facebook.pl/InstytutTechnicznyWojskLotniczych](https://www.facebook.com/InstytutTechnicznyWojskLotniczych)

Forces to train Air Defense units. As is the case of "Hornet" (Pol. Szerszeń), we are constantly working to improve the "Jet" air target which now reaches the speed of 100 m/s. The "Bee" unmanned aerial vehicle has been constructed in the Air Force Institute of Technology (AFIT) with the aim of using it for close observation within 5 km. Ease of use and the ability to transmit images in real time enable it to soar into the air and begin transmission from on-board camera in a few minutes.



NEW BATTLEFIELDS REQUIRE INNOVATIVE SOLUTIONS

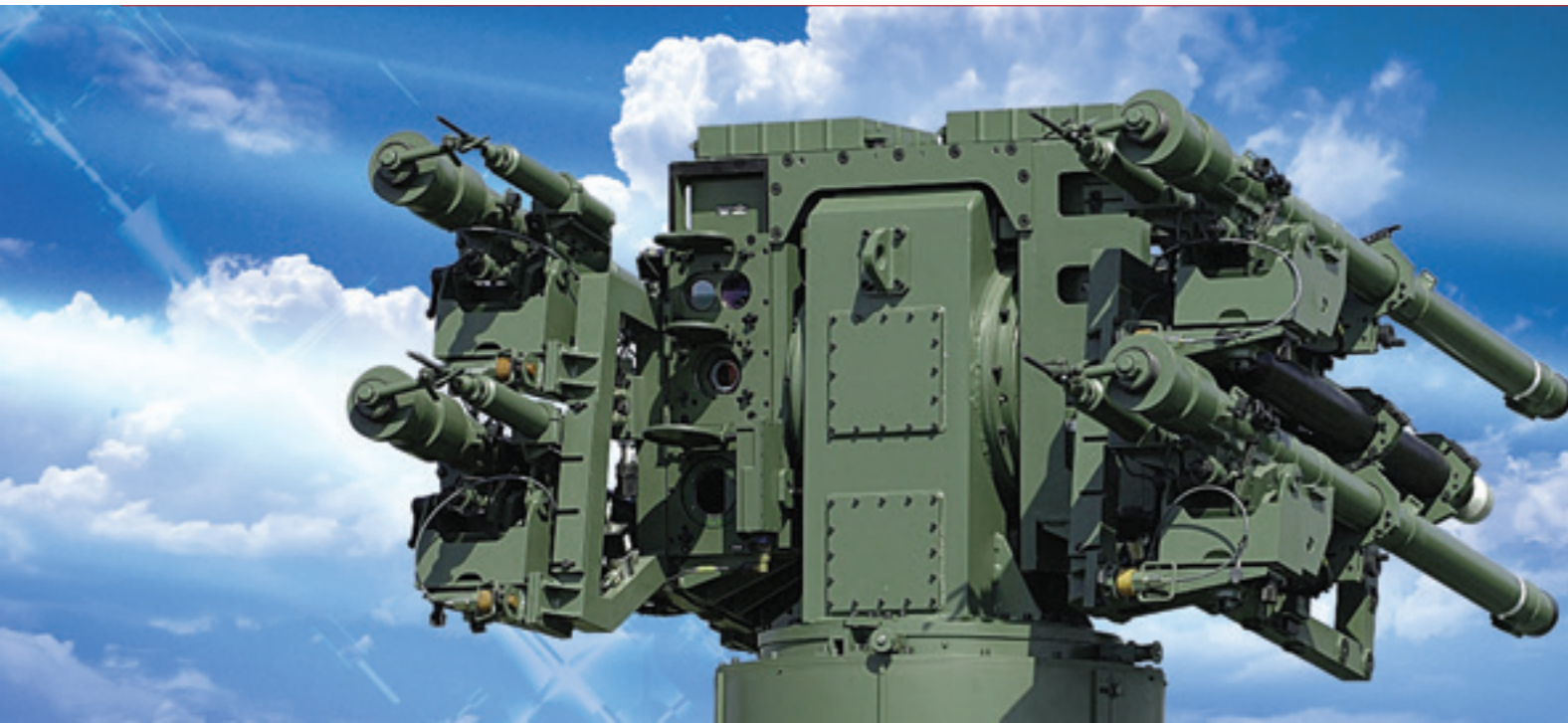
Mariusz Andrzejczak,
Vice president of the Polish Defence
Holding for Development

- Do you agree with the statement that without the money for research, in a few years the military industry may be able to respond to the needs of the armed forces?
- I agree. There is no doubt about this. Research and development departments in Polish Defence Holding employ a strong group of people. These are nearly 1000 people, which is almost 10% of all employees. This number shows how important research and development are for the Holding. The national defence industry needs to have this sector strongly developed due to higher customer expectations. Our client requires increasingly innovative products that could meet the needs brought by new conflicts and new battlefields. Today, it's hard to imagine good service provision for the clients without investing in R&D. Our estimates indicate that in order to meet the increasing requirements of the Army, the Holding should spend about 0.5 billion PLN for research. This is the amount to which we are aspiring through our present strategy. We currently assign approximately 200-250 million PLN per year, but this is still not enough. This means that we only start the programs that are really necessary. I should add that the research is mostly funded from the public money that we obtain in contests. This does not mean that we do not want to spend our own funds, but the market for the products in the field of defence is limited. Let me give you an example. If we build a tank, we know that it can be bought by the Polish armed forces first and then by foreign clients. This product needs to be cheap and the markup has to be low. So if we have low markups, and most of the products we sell to the Polish armed forces, the funding for research is therefore limited. And every company funds its development from this money.
- So how do you want to obtain the planned 0.5 billion for research?
- We want to say that it is necessary to increase the defence R&D expenditure pool both in the Ministry of Defence and Ministry of Science. On the other hand, we want to gain higher markups from export products. We need to increase export, because with it we will spend more on R&D.
- So without increasing the spending on research, but also without increasing the export, at some point the market may become blocked? There will be no compatibility between the offer and needs of the clients?
- Lack of compatibility is one of the dangers. But I believe that there is a larger threat. If we do not spend money on R&D, we do not develop and our potential enemies

How does R&D look in practice? Will the creation of Polish Defence Holding change the research policy? Which of the companies will be included in the research and development program? Our questions will be answered by Mariusz Andrzejczak, Vice president of the Polish Defence Holding for Development.

do, then the gap between capabilities widens very rapidly. We must realize that in the case of symmetric threats that are important because of our geopolitical situation, there are countries that could be potential sources of conflicts while spending money on defence and development. On the other hand, in the case of asymmetric conflicts, which are a new type of conflicts, the traditional military equipment is very poorly adapted to cope with these new conditions. History of wars teaches us about conventional battles where two armies face each other and are similarly equipped. Today, the new battlefield and new conflicts mean new challenges for which we have to be prepared.

- Research programs such as the Tytan Future Soldier System or the new generation of Piorun air defence rocket systems mean that there is no shortage of money.
- We spend about 250 million PLN on research, but a lot more is required for this purpose. We have an interesting project of 2-tier rocket, Błyskawica (Lightning), which is funded from public money and the funds are running out, which means that the continuation of this project is called into question. Without the support of public financing, research is very difficult. We also have very interesting solutions associated with the command system for air defence. We are doing our best to fund it from our own money, because we believe that it is one of strategic projects. We participate in BSL program, we have plans associated with systems' integration. We mean comprehensive ground station and communication solutions. These are key investments and they have to be funded by the Holding. One of the sources for funding is the money from the budget of the Treasury, 374 million PLN, most of which goes to R&D projects. The second source is the National Centre for Research and Development, and the third is the money from the Ministry of Defence Armament Inspectorate for development projects. We have projects that are part of the Polish Army modernization program. I believe that the potential of the defence industry is an important channel through which the state becomes a major player in the world and gains a real chance to defend its territory.



● **How does the R&D process look in practice? Does the MoD report its needs to which the program is prepared or rather, the Holding initiates research and presents its accomplishments?**

● We act in accordance with the needs of the Polish Armed Forces that are reported at the given moment. This means that the Ministry of Defence tells us that it needs such systems and funds such projects and so we work on these projects, provide models and prototypes. That is why we mostly deal with projects and programs submitted by the Ministry a few years ago. It often happened that the projects were not on the Ministry's purchase list. Someone in the Ministry has taken the decision to start the given program and directed additional public funds for it, and now is not interested in receiving the goods, because the decision maker has changed, conditions have changed, and sometimes, of course, even needs can change.

● **How long does a given project last if the needs are changing so rapidly?**

● Research projects in the defence sector, from technology to product with a military certificate, takes at least five years. Safety requirements and standards in the military are very high and we have to subject our products to the vast amount of standards and standardizations, adapt them to environmental conditions, in which the equipment will be operated and which are extremely demanding. It may happen that the equipment is tested for 18 months. These are very long processes. Because of this, the software layer in our product becomes outdated. We are not backwarded, we are up-to-date. The replacement of any electrical element requires a new testing procedure which can take several months.

● **Is this a standard process that applies to all companies?**

● Of course, it applies to everyone. Here, arms industry is similar to aviation industry because of the number of safety standards. In an airplane, virtually every electronic device is old, when compared to what is currently available on the market. This applies to the largest manufacturers, such as Boeing and Airbus. Some of the solutions used aboard the aircrafts are 4 or 5 years old because the replacement of any element leads to a re-certification process which is very long and expensive.

● **So what is the strategy of R&D?**

● In perfect systems, research is conducted and its results – in the form of technology projects – are presented to the Ministry of Defence to see whether they are interested or not. The results are presented to the specialized departments that deal with innovation. Such departments exist in the USA and France. Their job is to find innovations that can interest the army and perform the production process. Such innovations can be found, for example, on the civilian industrial market. Today, the roles of arms industry and armed forces have switched. In the past, it was the the defence industry that was the leader of change and innovation, now it usually is the opposite. Most solutions from the civilian market are more advanced. There are only very narrow areas where the military has better, more modern solutions, that are difficult to reproduce in the civilian market. But these niches exist only because nobody in the civilian market would be interested in radio-electronic warfare or concealing the heat signature. The military is highly interested in these technologies, therefore it invests in

research and production. Thus, there are technologies developed only for the military needs and in these niche technologies the armed forces still have an advantage.

If we evaluated armaments of any army in the world in terms of modernity, we would discover with amazement that they have a fairly old equipment. This results from the strategy according to which you don't need the most modern equipment to win the war, but equipment that is better than the one your enemy uses. Competitive advantage must be maintained in relation to a specific competitor, one does not have to blindly follow the new trends.

This approach can be seen in an example from history that I will use. In the first stage of the Cold War, the Russians won the arms race with the USA. In the beginning, both sides allotted a lot of money for arms and production of more missiles and tanks. At some point Americans decided that the policy of being a little bit behind of someone or outpacing them does not lead to anything. They resigned from quantitative advantage and decided to build technological advantage. This is when they started to fund research that could also be used in the civilian market and develop the economy. With the changed strategy, they started outpacing the Russians drastically. It wasn't another 500 bombs that decided about victory on the battlefield. It was a modern rocket system, precision missiles, and increased power of nuclear weapons. It was all about the investments in particular technologies. And that is how we have to build our own development – through investments in interesting technologies.

● **Conducted research programs promise a technological leap. Can they make the Polish industry appear on the international market? How do you assess the condition of the Polish defence industry? Compared to others, where are we when it comes to technological development?**

● When talking about our position in the area of modern technology development, it all depends on the technologies we mean. For example, in the case of Piorun project – the new generation of Grom missiles – we are one of few countries that have the technology for very short range missiles. The countries that have it among others are France, USA and Russia. And we should openly say that our missiles are very good. The results of the tests are secret, but they are promising. The new generation of Piorun rockets will probably make us one of two countries that have the best rockets in the world. And this technological leap was possible with R&D. The same could happen if we fund the development of technologies, eg. within the "material technology development" program. This will benefit not only the soldiers – their personal equipment will be better, more effective on the battlefield, and make them safer, and their commanders will know where their troops are. The technological leap will also be very beneficial for civilian areas and applications. Material technology means better, breathing, thin-

POLISH DEFENCE HOLDING – POLISH DEFENCE INDUSTRY COMPANIES UNDER A COMMON BRAND.

THE LARGEST GROUP OF POLISH DEFENCE INDUSTRY THAT COMBINES NEARLY 40 COMPANIES ADOPTED THE NAME POLISH DEFENCE HOLDING, AND WITH IT, A NEW LOGO. ITS GOALS INCLUDE: FOCUSING ON THE NEEDS OF SOLDIERS, HEAVY INVESTMENT IN NEW TECHNOLOGIES AND EXPANSION INTO NEW MARKETS.

Polish defence industry is on the threshold of one of the most important events in its history. Past actions that over the last ten years have been taken by the Council of Ministers and the companies were leading to this stage, which is the creation of a single national entity. United Polish defence industry companies – both large and small, together form one family, one Polish brand. The ambition of the owner, which is the Ministry of the Treasury, is to build a new brand on the basis of united Polish defence capabilities. This new phase for the Polish defence industry allows the best features of Polish enterprises to concentrate on the new brand and produce a large competitive advantage.

Polish Defence Holding will invest in research so that its Polish plants could manufacture products of the highest quality. It will become the largest entity in Poland in terms of investment in research and development. Taking care of each product, it creates power of the Polish brand. Openness to the strategic needs of the customer – the Polish Armed Forces – as well as to new technologies, competitiveness and output into new markets. These are the goals of the emerging Polish Defence Holding.

"Polish Defence Holding is the future of modern defence industry. It's also a chance to occupy an important place in Europe and around the Euro-Atlantic system. I believe that by placing the needs of the major customer – the Ministry of Defence – in the limelight of the Polish Defence Holding's interests, together with a declaration of focusing on the development of the latest technologies is a guarantee of getting a very good offer for the Polish Armed Forces and directing it to foreign markets" – said Krzysztof Krysztofowski, Chairman.

In the center of its activities, the Polish Defence Holding puts the soldier and his needs, with the ambition of providing him with the best quality, comfort and safety, achieving the needs to et the most modern and reliable equipment and weaponry. Concerned about the best soldiers' equipment, the companies will jointly build a strong Polish army. To achieve these goals, even more specifically, the Polish Defence Holding will combine its projects with the experience of Polish scientists who will realize their most innovative projects. Polish Defence Holding wants to take advantage of the opportunity to compete with the best on the arms market – as a strong business and industrial partner, manufacturer or supplier.

A resolution in this regard was passed by Bumar sp. z o.o. board on 15 May 2013. On 21 May 2013, the supervisory board of Bumar sp. z o.o. approved the adoption of the name – Polish Defence Holding (Pol. Polski Holding Obronny). Polish Defence Holding was founded with a new strong symbol – a symbol of cooperation, tradition, precision, firmness and durability, defence – for the Polish army and the Polish state.

ner clothes that we could produce for the civilians. With the development of these technologies we will be able to catch up with global leaders, which are now far ahead of us. Other companies around the world had the time to develop. We lost all that time in Poland. After the transformation period, arms sector was not a political priority. Until recently, the Polish defence industry was not a topic of conversations. In the past the companies were merely able to maintain production. There were companies that were able to develop, but in general the government did not treat the arms industry as something important. This can be seen in aviation which is not at all based on Polish aircrafts. When it comes to helicopters, the situation is slightly better because new technologies are being imported to Poland.

- By 2022, the army will spend 130 billion PLN for technical modernization. What part of this amount will be allocated to research and development of new solutions? How do you think it will influence the defence industry in the perspective of several years?

- The Ministry of Defence should allocate the money for development, not only for the purchase of ready equipment. This could lead to a significant technological leap. This can be the beginning of changes. We could develop completely new technologies in our country. This is very beneficial, because if the equipment is produced by a local company, if we also allow it to develop a new technology, this not only creates new jobs, but also the company pays taxes in the country which will have a positive impact on the state and the economy. This way everyone benefits from this – local governments, citizens and armed forces. Because nobody understands the representatives of armed forces as well as our defence sector. In contrast, when the equipment is purchased abroad, the money goes to other companies and budgets of other countries. If solutions are created by big companies that sell the same products in many countries around the world, they will not want to customize the equipment to the customer, but they will always try to sell what they have on the shelf. Mass manufacturing of 100 thousand units does not allow the company to introduce any changes in the product, since this would mean significant costs associated with changes in the technology lines. And that is not profitable. By manufacturing short runs, for example 1000 units, we can customize the product to any requests made by the armed forces.



POLISH DEFENCE HOLDING

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- **Will the creation of Polish Defence Holding change the research policy?**

- It is very important to us to show that we are changing and filling the change with new content is very important for us. We want to be seen as new quality. This is not about turning our backs on the past, but about emphasizing the changes that we want to introduce.

- **What is the Holding's strategy for the coming years? Will the efforts and funds allocated for research and development of new technologies translate to gaining competitive advantage in the foreign markets?**

- In our industry, one has to bear in mind that the really big contracts that show the potential and the market power of companies are usually the result of political decisions and activities of the state. This does not mean that we cannot be providers of interesting technologies and licenses that can bring profits. I believe that the development of technology will allow us to sell competitively - more innovative and much cheaper products on the third markets compared to what the Western companies have to offer. We will compete with them on those markets, since due to high labor costs they offer expensive products. In most cases, the production is performed in Western countries. So, if we have a comparable technology and allot comparable work with lower labor costs, this means we have a competitive advantage. While manufacturing comparable products, we will offer them cheaper. This is a real advantage on third markets.

- **Is it profitable to create our own? Is it not more convenient to borrow from others?**

- There are technologies that are more profitable when made on our own, because they cannot be obtained from abroad. For example, if someone wants to buy cryptographic processors from the USA, it is not possible because their local law forbids this. Then we simply have to manufacture them. When it comes to more popular equipment, such as tanks, the technologies are so widely available that we can order them from other countries, since the market is very competitive. But there are technologies that nobody wants to give out. And while it would be cheaper to order some parts in, for example, Asia, Western companies don't do that and leave those key innovations to themselves.

- **Is research supported by military academies? What is their part in this process?**

- The research process starts with an idea in the lab and ends with the production of a new product. At every step, research is constantly conducted. Initial



research that lies at the foundation of some technologies is always performed at the academies. In the arms industry, nobody conducts research on, for example, the nature of radio waves. We use the results of research labs. We can turn research into a product. That is why the collaboration between science and industry is necessary. Currently, our research takes 5 years. If we were to perform basic research, the whole process would probably take around 15 years. That is why the Holding mainly uses the findings of research conducted at the Polish Universities such as the Military University of Technology and Warsaw University of Technology.

- **A contract with BAE Systems has been signed recently. How will this collaboration translate into the development of technology and technical thought on the Polish market?**

- The contract with BAE System assumes collaborative construction of a new vehicle. BAE has some solutions that are universal and proven. On the other hand, we have experience and technologies that are also well tested. If both companies have experience in building vehicles, this means that we can shorten the time of work and based on that experience we can make new solutions that fit new requirements. That is why we want to develop and use the best technologies available in both

companies. During the close collaboration, we can learn something new which will benefit both companies.

- **What research and development programs and activities does the Holding want to emphasize during the next few years?**

- The anti-air defence project is the most important one for us. In this case, the priority was set by the Polish president who indicated that the state needs to create a modern anti-air defence system. We are one of the elements of the country defence and we are trying to do our job the best we can. ■



CHEMICAL PLANT NITRO-CHEM S.A.



Chemical Plant NITRO-CHEM S.A. from its establishment in 1948 to the present day, is a great, specialized manufacturer of most of all types of high explosives and ammunition for Polish and global defence markets.

NITRO-CHEM supplies its products either to the Polish Army or to the other armies around the world and gradually develops cooperation with many producers of ammunition at the defence market.

It is an undeniable fact that NITRO-CHEM is a leader of TNT production in Europe, achieving high capacity and quality of virgin TNT. Besides the company owns one of the most modern installations for HMX and RDX production that uses non-acetic method. With ability to manufacture high explosive materials, NITRO-CHEM offers pure crystalline explosive materials as well as compositions based on RDX and HMX e.g. Comp. A-3, A-4, A-5, compositions with wax or Viton and other like RDX/TNT, HMX/TNT, PETN/TNT, TRITONAL. Furthermore the ongoing R&D programs shall allow in the near future the production of new explosives such as NTO or CL20, with many applications including insensitive ammunition.

Diversified technological background, rich knowledge and experience in filling services enable NITRO-CHEM to offer a wide range of ammunition filling services for producers of artillery, tank, or mortar rounds, antitank mines, bombs, etc. NITRO-CHEM can press charges in the range of a few to several thousand grams, fill in bodies of artillery ammunition employing screw threading method in caliber from 60mm to 160mm and it also makes individual charges or fill in shells using cast method. Charges can be made in a wide range of weights [from less than a kilogram up to 25kg], and of different material, e.g. TNT, TGAF-5 composition, B-composition, etc.



The company's current range of those products includes, amongst the others: 120mm HE tank ammunition, 120mm and 98mm mortar ammunition in accordance with NATO standards, 122mm, 125mm and 152mm HE projectiles as well as aerial FRAG-HE bombs LBOB-100.

Moreover NITRO-CHEM offers special products for civil market i.e. TNT pressed boosters for boosting of industrial explosives [e.g. emulsions, ANFO] in many weights e.g. 160, 250 and 500g; TNT pressed / cast charges used in opencast mining, in the field of geophysics and in the performance of specialized blasting works. Thanks to the modern installation for boosters' production, the company is able to meet different customers' requirements, adapting to their expectations.

In addition, the company's organization based on the implemented quality management system pursuant to the requirements of ISO 9001 and AQAP 2110, standards, individualized approach to the customer and the cooperation with the world leaders of the defence market are additional factors, contributing to the company's success in the local and global markets.

NITRO-CHEM current image is formed by over 60-year-long experience in the production of explosives, high production potential, diversified technological, storage and logistic base, young, well-educated and reliable personnel. Today the company focuses on innovation, continuous development and upgrading.

For example the youngest installation, built in 2011, is an installation for production of plastic films cPP and cPET, supplied on the civil market. The modern highly automated machines allow to achieve the annual productivity at the level of 4500 T of films of various thicknesses, designated for production of packages and laminates. The production technology developed by NITRO-CHEM covers several types of film, both for standard and for special applications. ■

ROSOMAK



VEHICLE FOR SPECIAL TASKS



THE DESIGN OF THE ROSOMAK VEHICLES PROVIDES MOBILITY, LARGE REMAINING CAPACITY, ABILITY TO SWIM AND WADE, OVERCOME SIGNIFICANT OBSTACLES AND INCLINATIONS, AS WELL AS A BUOYANCY RESERVE FOR THE INSTALLATION OF SPECIAL EQUIPMENT. THIS MAKES THE ROSOMAK AN IDEAL VEHICLE FOR THE ARMY AND SOLDIERS.

The vehicles are capable of carrying 11 soldiers, including the driver, and the turret operators in the combat version. The design of the chassis and suspension of the Rosomak vehicles allow for a fast repair and replacement in case of a failure. The design of the integrated suspension arm proved itself to be more resistant to booby-trap explosions and more effective in case of repairs in the field conditions. An important condition for the introduction of the Armored Modular Vehicle to the Polish Army equipment is the gradual transfer of the production to Poland. Currently, a significant part of the components, starting with the armor plates and ending with the advanced electronics, comes from the domestic manufacturers and suppliers. Also the special versions incorporated in the Rosomak vehicle are mostly Polish designs and solutions. Due to the solutions and the commitment of the domestic potential, the process of transferring the production to Poland is progressing faster than planned.

THE EFFICIENCY AND ERGONOMICS

The first testimony on the fulfillment of the expectations concerning the vehicle modernization, are the changes and improvements made so far, to the structure and the equipment of KTO Rosomak.

- Since the commencement of the production in the April of 2005 to the present, more than 200 changes and enhancements have been introduced, newer equipment has been added, providing better parameters, higher reliability and fully meeting the expectations concerning the exploitation or improving the technical parameters. The design allowed for the modification of hydraulic and pneumatic systems, to ensure the correct and long-term operation at higher temperatures and lower atmospheric pressure and was a result of the experience gained in the operation in Afghanistan – says Zbigniew Chabera, The Deputy Executive Director for Customer Support.

Tires more resistant to high temperatures and rocky surfaces have been introduced. The air-conditioning and the cooling systems have been improved, a number of measures required for asymmetric operations, such as side cameras and screens for the troops have been introduced. The system indicating the sector of fire has been installed, the vehicles have been adapted for the mounting of active jamming devices and the Blue Force Tracking system. For the servicing time, the fire protection switch has been applied; the vehicles have been equipped with additional compartments and containers for equipment placed in the propeller locations, previously used while swimming.



- Many of the changes are to improve the ballistic resistance of the vehicle. First of all, the vehicles used in the ISAF mission are additionally armored to meet the level IV according to the STANAG 4569 and equipped with a light system of shields against the HEAT projectiles fired from handheld antitank grenade launchers. The RPGNet system can be mounted and dismantled by the crew, which allows for a simple air transportation of KTO Rosomak – says Krzysztof Omyliński, The Deputy Executive Director of Development and Marketing.

NEW IDEAS BY ENGINEERS

The light netting system covers all the types of Rosomak vehicles used by the Polish Task Force in Afghanistan – from the combat types, through the versions with open turrets, ending with the Rosomak-WEM medical evacuation vehicles. The KTO's design has also allowed to improve the ergonomics by removing the two seats from the landing compartment. The WZM SA now offers the replacement of seats with a special explosion-proof construction including multi-point safety belts, which can significantly offset the kinetic energy of an explosion under the vehicle or in its vicinity. The drivers now have a new passive device for night driving characterized by a significantly improved performance and viewing angle.

The engineers have developed a new type of battery fitted with a unit of rectifiers in a universal casing. This solution improves the energy balance of the vehicle, resulting in a longer operation of the electrical and electronic components of the weapons without the main engine operation.

One of the latest ideas of the WZM SA's development engineers is the modular design of the turret plate to enable the installation of various turret solutions or special systems according to the specific needs of the user by upgrading one element of the vehicle's top plate. This functionality is the result of the experience with the installation of the MAHSW automatic mortar and the 105mm CT-CV turret using the KTO Rosomak chassis.

THE CONSTANT DEVELOPMENT OF THE SPECIAL VERSION

The special versions of the KTO Rosomak are developed systematically. In addition to the well-known basic version of Rosomak and the combat version including the Hitfist 30P turret used in the mechanized battalions, the army has commissioned the Rosomak Medical Evacuation Vehicles, which undergo a complete cycle of the commissioning, including the swimming. The MEVs have a 4-person crew and the ability to carry three wounded on stretchers and four injured in a sitting position, to whom the first aid and support of the vital functions is provided during rapid evacuation and transportation from the battlefield, in a safe armor, to the nearest medical point.

- The Rosomak MEV is equipped with day-and-night devices for the search of the wounded in a battlefield, modern medical and resuscitation equipment and the roll-in stretchers capacity compatible with the NATO standards. The MEV vehicles serving the Polish soldiers in Afghanistan are characterized by the ballistic resistance and the resistance against HEAT projectiles, just as in the combat vehicles – says Krzysztof Omyliński, The Deputy Executive Director of Development and Marketing.

Since the beginning of 2010, the vehicles delivered to Afghanistan have been painted in a uniform desert camouflage, which has been tested in terms of properties preservation for military equipment in accordance with relevant provisions and standards. A new version of the vehicle painting, using washable paints for winter conditions is also available, and has been tested in accordance with the provisions of military masking and camouflage.

- The ISAF version of the Rosomak vehicles for the Polish Task Force in Afghanistan has different parameters to those of the vehicles used for training in the country. Most of all, they have been provided with a greater ballistic resistance and combat functionality due to the installation of the additional combat equipment related to the operations in Afghanistan – said Michat Rumin, WZM Spokesman.

The maximum weight of the vehicle has been increased from 22 500 kg (to this value, KTO Rosomak provides the ability to swim with about 20 percent displacement margin) to 26 000 kg. For the purposes of the expeditionary operations, two versions of Rosomak with open turrets have been manufactured. For the operation in the European Union's Forces (subsequently taken over by the UN) vehicles with light and automatic turrets have been designed for the application of a wide range of arms and an automatic grenade launcher for the Polish ISAF contingent.

The Rosomak-S version is designed to transport Spike sets with the operating crew. The vehicle allows for an efficient and rapid transport of two teams to the area of operations and the maintenance of a stable communication between the vehicles and the command center. The operational compartment has been adapted and retro-fitted in relation to the basic version of the KTO. The vehicle retains all the other functional and operational features of KTO Rosomak.

- The Rosomak-WD, configured as a tactical level command vehicle of a mechanized subunit, with respect to the specification of the operation and the commander's needs, will be characterized by similar functionality. The vehicle is to be equipped with communication systems, data transmission and fire control to ensure full control at this level of command – says Krzysztof Omyliński, The Deputy Executive Director of Development and Marketing.

The implemented Rosomak variants:

- Medical Evacuation Vehicle – Rosomak MEV (Rosomak WEM)
- Vehicle for the transportation of the Spike team
- KTO Rosomak suitable for PKW ISAF (M1M version with the HEAT resistant RPGNet QinetiQ and the Armstal 550 steel hull by the Huta Stali Jakościowych
- KTO with the automatic open turret for the PKW ISAF
- KTO with the light open turret for the PKW CZAD
- Rosomak NJ – training vehicle
- Multi-Sensor Surveillance and Reconnaissance System – Rosomak WSRiD

Within the development, procurements or direct operations, the WZM SA has developed new special versions of the KTO:

- The Contamination Reconnaissance Vehicle – Rosomak RSK
- The Technical Support Vehicle – Rosomak WPT
- The Technical Reconnaissance Vehicle – Rosomak WRT
- The Anti-aircraft Command Vehicle – Łowcza, Rega
- The Tactical Level Command Vehicle – Rosomak WD
- Training Vehicle – Rosomak NJ
- The General-Military Reconnaissance Vehicle – R1 command version and R2 line version
- The Fire Support Vehicle based on the CT-CV 105 mm turret





MODERN TECHNOLOGIES FOR MARITIME SECURITY

OBR CTM S.A. does research, development, design and experimental work to develop and implement modern solutions in the field of naval technologies as well as other technologies related to national security and defence. It also offers its capabilities in testing and certification of products.

Key areas of activity are:

- I. Command, Control and Communication Systems
- II. Underwater Weapon Systems
- III. Maritime Infrastructure Protection Systems
- IV. Testing and Product Certification

The organization implemented the Integrated Quality Management System compliant, among others, with ISO 9001:2008 and AQAP 2110:2009 and 2210:2006 Standards. The Research Laboratory and Product Certification Body situated in CTM S.A. are both accredited by the Polish Research and Certification Centre. They offer services research and certification of products, particularly those related to naval technologies. The scope of the European Directive is applied in compliance with the Decision of Minister of Infrastructure No. 5 / the AV / the KE / 08 an granting authorisation.

CTM'S PRODUCTS

I. COMMAND, CONTROL AND COMMUNICATION SYSTEMS

The **RKS-8000 Transceiver** is a modern radio equipment consisting of:

The exciter-receiver model RKS-8000WO-A for HF or model RKS-8000WO-C for HF/VHF includes internal modem (STANAG 4285, STANAG 4529, STANAG 4415, STANAG 4539, MIL-STD-188-110B) and supports ALE (Auto Link Establishment) function complying with MIL-STD-188-141B App A.

The control box model RKS-8000PS can be located within 50m from the exciter-receiver.

The fill gun model RKS-8000PG is used for transferring setup data between RKS-8000 radios and the power amplifier provides operation with required power level e.g. model RKS-8000WM-A (power output 350W PEP for HF) or model RKS-8000WM-B (power output 150W PEP for HF) or model RKS-8000WM-C (power output 150W PEP for HF and 50W for VHF).



II. UNDERWATER WEAPONS SYSTEMS

The **Influence Magneto-Acoustic Sweep Promienica** is designed for fighting sea mines with influence fuses set off by acoustic and magnetic fields. The sweep simulates precisely the ships' physical fields.

The **Mine Countermeasure Sonar SHL-100AM** is an equipment designed for hydro-acoustic searching, detection and localization of underwater objects lying on the sea bottom or suspended in the water in front of ship.

All equipment components are mounted inside a ship's hull and the SHL-100AM is operated by a single operator. The operator console is installed in the hydro acoustic cabin.

The **SHL 101T Mine Countermeasure Sonar** is a triple frequency wideband and very high resolution hull mounted MCM sonar.

It detects and performs classification of ground, moored and stealth mines in very shallow, brown and blue waters and in areas of strong layering or high clutter density.

Sonar SHL-101/T has outstanding detection and classification performances due to state-of-the-art hardware and software application.

It is equipped with highly integrated, low noise, front-end electronics and modern acoustic transducers manufactured by Thales Underwater System from France.

Usage of the FM signals enables pulse compression leading to signal-to-noise ratio and range resolution improvement.

These features significantly improve detection and classification performance against stealthy mines in environmentally adverse and noise limited conditions.

The **RKP-8100 transceiver** represents changes, both technically and economically, in the tactical communications sector.

The RKP-8100 Transceiver offers a solution to all aspects of tactical communication as well as unified and reduced service logistics. There is a possibility to use the RKP-8100 transceiver as an exciter for the RKS-8000 family.

The multipurpose RKP-8100 transceiver can be used as element of mobile (on board of vehicles and caterpillar vehicles) radio communication systems. The digital voice complies with the STANAG 4198 and standard MIL-STD-110B App. B.

The RKP-8100 ALE function complies with the standard MIL-STD-141B App A. and STANAG 4538. High performance and reliability of operation is guaranteed by robust design and construction.

The **KSL-1100 Tactical LINK-11 Console** provides the function of the tactical information exchange and graphical visualization on the background map.

The open design allows integration with the Polish command systems and thus secures its interoperability with other LINK-11 users.

The **Command Tactical System - SCOT** integrates anti-air, anti-surface, antisubmarine, mine countermeasure and communication subsystems as well as integrated navigation system to ensure a safety of sailing. The system supports combat activities of ship's crew to use effectively all sensors and effectors on the ship as well as planning of mission, decision-making process and monitors execution of tasks. The system ensures interoperability of command and control in the national and allied system.



III. MARITIME INFRASTRUCTURE PROTECTION SYSTEMS

The **KRYL Mk3** is a system for monitoring of situation in critical maritime infrastructure areas. The tasks of the system are detection and localization of underwater objects, alarming after their detection and data transmission of detected targets to command system.

Taking into consideration variety of protected sea areas and related to them different underwater targets, KRYL Mk3 has been built as a multi-sensor system. It is designed for monitoring of fairways to harbours, harbour basins, anchorages, drilling and oil platforms as well as terminals..

The deployable **Magnetic Linear Barrier (MLB)** is designed for continuous automatic monitoring of the underwater situation at frontiers of sea bases and harbours against terrorist attacks carried out by divers, small underwater vehicles, pontoons and boats.

This sub-system equipped with an array of magnetic transducers is installed at the sea-bottom.

The sub-system detects local magnetic field distortions caused by such objects.

The **Monostatic Acoustic Barrier (MAB)** is a multisensory hydro-acoustic system designed for maritime critical infrastructure protection such as:

- port entrance
- harbour basin
- ships moored at harbours
- fairways to harbours
- anchorages
- drilling platforms
- handling terminals

The MAB system is designed for small underwater and floating objects detection. It can be used as an autonomic system or as part of bistatic barriers or more extended harbour protection systems.

IV. TESTING AND CERTIFICATION OF PRODUCTS – RESEARCH LABORATORIES

Testing and product certification – Research Laboratories **Electromagnetic Compatibility Laboratory Vibroacoustics, Shock Resistance and Magnetic Fields Laboratory.**

The Electromagnetic Compatibility Laboratory possesses the Accreditation Certificate No. AB 295 issued by the Polish Centre for Accreditation and the certificate No 20/MON/2011 issued by Ministry of National Defence.



The **Fired Charges For Sea Mines Disposal „Toczki”** is a remotely wireless fired charges system which has been developed for the disposal of sea mines.

Charges type A and B are transported and positioned by ROVs.

Charge type C is transported and positioned by divers.

All types of charges are equipped with universal acoustic fuse. The fuse is equipped with multilevel safety system. The system is equipped with easy operated test unit which permits to test all parameters of fuse.

Scope of accreditation includes:

- Electromagnetic compatibility testing compliance with European Directive EMC 2004/108/EC.
- Electromagnetic compatibility testing compliance with Polish Defence Standards.
- Testing into attenuation of electromagnetic fields for stationary and mobile shielding.
- Testing electric and electronic equipment compliance with European Directive LVD 2006/95/EC (low-voltage LVD).
- Evaluating exposition of workers to electromagnetic fields.
- Climate-focused tests.
- Distribution of electrochemical potential in metal structures measurements in electrolytic environment.
- Vibroacoustics, Shock Resistance and Magnetic Fields Laboratory is accredited by the Polish Centre for Accreditation – Certificate No AB 296 and Ministry of National Defence – certificate No 21/MON/2011.

Scope of accreditation:

- Testing of resistance, strength and total resistance to sinusoidal vibration.
- Testing of machine resistance to single mechanical shock.
- Testing of machine resistance to repeated mechanical shocks.
- Testing to resonance frequency occurrence in mechanical construction.
- Measurements of magnetic field of mechanisms and technical devices. ■





POLISH DEFENCE HOLDING

THE POLISH DEFENCE HOLDING

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The Polish Defence Holding is the biggest manufacturer and supplier of military equipment in Poland and in Central, Eastern Europe. We are the biggest supplier for the Polish Ministry of Defence. 40 defence companies domestically and abroad operate within the Polish Defence Holding with 10 000 employees. Bumar Ltd is the leading body of the Polish Defence Holding.

For over 40 years the company has been a leader in the domestic and international market of weaponry, construction plant, mining and handling equipment. Its extensive experience, world-recognized and distinguishable brand, achievements in implementing new technologies in the Polish industry and in initiating relationships with renowned producers all over the world, professional and skilful personnel are company's main assets. PHO has been supplying and selling its equipment and services to the Polish Army and in over 40 countries in Europe, Africa, Asia, South America and the U.S., winning many international bids.

Market activities of the Polish Defence Holding are concentrated around four product groups constituting the subject matter of production and service divisions respectively:

- **AMMUNITION AND ROCKETS** – ammunitions and missiles (shooting ammunition, artillery and missiles, SPIKE, GROM, FENIKS missiles);
- **SOLDIER** – the soldier and the official (individual equipment and armament of the soldiers including: pistols, guns, optoelectronic equipment, protective means: gas masks, helmets, bullet-proof jackets);
- **ELECTRONICS** – electronics and IT (commandment systems, radars, sensors, anticraft and anti-missiles systems);
- **LAND** – land platforms (wheel, caterpillar platforms, military vehicles, tanks).



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Wojskowe Zakłady Mechaniczne was established in Siemianowice Śląskie in 1952 and since then is strongly involved in overhauls, modernization and special Production for necessity of Armed Forces.

Military Mechanical Works developed in scope of documentation and production following equipment:

- T-72 /SKZ-T-72/ tanks field control stands
- Tracked vehicles SKS – G engines' field Control stands
- Maintenance and lubrication equipment
- Compressor installation
- Power generation

Factory started repairs in scope of following engines: Henschel, Ikarus, Star 200, Leyland, Jelcz.

In 1996 upgrading works of the BRDM-2 armoured reconnaissance care began. As a result of this work the whole family of upgraded armoured reconnaissance vehicles was generated: from the BRDM-2M96i model through the BRDM-2B, BRDM-2A and BRDM-2M96iK "Szakal".

A number of vehicles were produced, which have been successfully exploited in the Polish Army, especially during peace keeping missions. Now the persisting construction works tend to follow upgrading of these vehicles, for the purpose of upgrading their reliability and battle possibilities.

In the year 2001, Ministry of National Defence invited Wojskowe Zakłady Mechaniczne, among other companies, to participate in a tender for the delivery of Wheeled Armoured Transporters (KTO) for the Polish Army. In this tender, WZM offered a fourth generation armoured modular vehicle AMV 8x8 designed by Finnish concern Patria, armed in combat version with HIFTIST 30mm weapon system of Italian concern OTO Melara.



CHEMICAL WORKS NITRO-CHEM S.A.

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Established in 1948, the Chemical Plant NITRO-CHEM S.A. Joint Stock Company, a member of the Ammunition Division of Bumar Group, is an experienced and globally renowned Polish producer of explosives and ammunition. The Chemical Plant NITRO-CHEM supplies its products to the Polish Army and to other foreign armies around the world and gradually develops cooperation with world leaders in the defence market.

NITRO-CHEM is a leader of TNT production in Europe and owns one of the most modern installations for HMX and RDX production that uses non-acetic method. With the ability to manufacture high explosive materials, NITRO-CHEM offers compositions based on RDX and HMX e.g. Comp. B, Comp. A-3, Comp. A-4, Comp. A-5, compositions with wax or Viton and other like TNT/RDX, TNT/HMX, TNT/PETN, TRITONAL. Since 2010 NITRO-CHEM has got a pilot installation for production of new insensitive explosive materials, for instance NTO.

NITRO-CHEM offers a wide range of opportunities for ammunition elaboration services. A technological background, rich knowledge and experience in filling services enable us to prepare and proceed with various elements of ammunition for different purposes.

NITRO-CHEM is able to press charges in the range of a few to several thousand grams, fill in bodies of artillery ammunition employing screw threading method in caliber from 60mm to 160mm and it also makes individual charges or fill in shells using cast method. Charges can be made in a wide range of weights (from less than a kilogram up to 25kg), and of different material, e.g. TNT, TGAF-5 composition, B-composition, etc.

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NITRO-CHEM offers TNT pressed boosters used for boosting industrial explosives e.g. emulsions, ANFO or both as separate charges in opencast mining and in the field of geophysics. They are also used in the performance of specialized blasting works. Thanks to the modern installation for boosters production, the company is able to meet different customer requirements, adapting to their expectations.



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The Air Force Institute of Technology is a research institute supervised by the Minister of National Defence. The Institute's mission is to support the aviation technology in the field of scientific research.

The contribution of the Institute in the development of the Polish Air Force results mainly from the activities in the field of reliability and flight safety in a broad sense. The significant achievements, valued both in the country and abroad, include hundreds of scientific-research, experimental and construction studies which have been applied by the Polish Air Force

The institute conducts the following innovation activities

- The design and integration of airborne systems
- Systems for logistics
- Reliability and safety
- Unmanned aircrafts
- Training systems, including e-learning
- Aircraft armament
- Airport and road infrastructure
- Substitute fuels, working liquids and lubricants
- The use of bio-components in oil and lubricant products for the air industry

AFIT provides a wide variety of complex ground and in-flight tests, including aircraft and helicopters certificate tests. It also tests pilot's individual equipment, airborne high-altitude and rescue systems, airborne and ground systems to transmit or display flight parameters, and it designs and develops of flight-test dedicated measuring and recording systems.

It also provides certification tests of aeronautical products introduced into service with the Polish Air Force, including air armament, as well as simulation tests based on models of aircraft flight dynamics. AFIT additionally develops and tests aerial rocket targets used for air defence forces training.

AFIT can upgrade weapon systems for aircraft, as well as develop new designs of air weapons and aerial targets (bombs, airborne rocket launchers and bomb fuses), and new ground-based and flying testing systems for air forces. It also tests air weapons after warranty periods guaranteed by deliverers/OEMs to extend service-life, upgrades the on-board attack avionics systems for aircraft and helicopters. Aircraft simulation, training and modeling.



PIAP

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INDUSTRIAL RESEARCH INSTITUTE FOR AUTOMATION AND MEASUREMENTS -PIAP is a leading Polish research institute, active in the fields of robotics, automation, vision and measurements systems.

PIAP was established as a government-owned research institute in 1965. For over 10 years we do innovative works over the development of mobile robotics applications for security and defence.

PIAP offers research and development works in systems integration and special products, covering design, realisation, start-up, implementation, maintenance and training activities. For many years we design and develop technologically advanced electronic and mechanical systems, dedicated to military and police applications. Over ten years of our work is devoted to mobile robotics and tele-operation issues. Our mobile robots and specialised devices are successfully used by various forces responsible for safety and security (Police, Polish Army, Border Guards).

The Institute is very active in realisation and coordination of international and national multi-partner projects. First EU Framework Programme project was executed within 3rd FP edition in 1993-1995. Currently, we execute and coordinate about 20 international research projects. We have a well established European cooperation also within NATO, EDA and ESA research programmes, as well as with US and Israeli partners.

PIAP has implemented international quality standards – ISO 9001:2009, AQAP 2110:2009, and national Export Control System. The Institute is certified with Industrial Security Clearance of First Class, and it is prepared to handle EU SECRET and NATO SECRET classified materials.

For many years we have executed projects and developed solutions in security and defence domain. Specialised internal unit – Intelligent Defence and Security Systems Department – is focused on creation of a wide spectrum of devices and systems dedicated to various applications, including:

- C-IED and EOD operations,
- Border and infrastructure protection,
- Convoys and patrols escort,
- Reconnaissance and remote observation,
- Surveillance and patrolling,
- Crisis management,
- SAR operations.



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OBR CTM S.A. does research, development, design and experimental work to develop and implement modern solutions in the field of naval technologies as well as other technologies related to national security and defence. The centre is involved in executing NATO and EU programs, including the 7th Framework Programme – the area of security. It also offers its capabilities in testing and certification of products.

Our capabilities are based on modern laboratory facilities, our research and design achievements, long time experience of the science and engineering personnel, broad collaboration with domestic and abroad R & D and industrial centres.

Our development strategy is to constantly improve our capabilities and research potential in order to ensure significant participation of CTM in execution of R & D programs for:

- the Polish Navy,
- other branches of the Polish Armed Forces,
- the services and agencies responsible for our country's security,
- NATO, EDA and EU.

The organization has managed to implement the Integrated Quality Management System compliant, among others, with ISO 9001:2008 and AQAP 2110:2009 Standards. The Research Laboratory and Product Certification Body based in CTM S.A. are both accredited with the Polish Research and Certification Centre. They render services in the field of research and certification of products, particularly those related to naval technologies. The scope of the European Directive is applied is in compliance with the Decision of Minister of Infrastructure No. 5 / the AV / the KE / 08 an granting authorisation.

Key areas of activity are:

- Command, Control and Communication Systems.
- Underwater Weapon Systems.
- Maritime Infrastructure Protection Systems.
- Testing and Product Certification.



AIR FORCE INSTITUTE OF TECHNOLOGY

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ITWL
60th anniversary
1953-2013



The institute is involved in the innovative work in the following areas:

- Design and integration of aeronautical and logistic systems
- Safety and reliability
- Integration of Data Transmission Systems LINK-16
- Unmanned aerial vehicles/systems
- Training systems including e-learning
- Air armament
- Airfield and road infrastructure
- Fuels, working liquids and lubricants



We've got:

- The State concession No. B-404/2003 granted by the Ministry of the Interior & Administration
- NATO Commercial and Government Entity Code (NCAGE) 0481H
- Internal Auditing System No. W-45/5/2012 in the field of scientific research to support operation/maintenance of military aeronautical systems
- The Industry Safety Certificate of the First Degree
- The quality-management system consistent with the NATO standardisation document AQAP 2110 and PN-ISO 9001
- Authority to confer the title of "Dr hab." - Post-Doctoral Degrees (in Poland)

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