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ReGUARD

NEW 3D RADAR FROM RETIA

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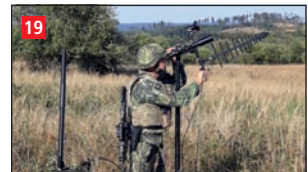
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ReGUARD

– RETIA Introduces a Brand New Radar

The RETIA is one of the leading Czech manufacturers and suppliers of radar technology and special electronics. Over more than 25 years of its existence, it has developed a range of unique and cutting-edge systems that have been used in the military sector as well as by civilian users. The latest innovation from the development of the Pardubice-based company is the ReGUARD radar, which will have its Czech premiere at the IDET 2019 trade fair.



The RETIA is a traditional exhibitor at the IDET trade fair in Brno and will not be missing this year. In addition to its proven products, it will also exhibit a novelty in the form of the multi-role 3D radar ReGUARD. It is designed for the simultaneous detection and tracking of ground targets and slow, low-flying objects with a small radar cross-section. A specific feature of this new product is that it searches the space of interest by utilizing electronic beam steering and mechanical rotation of the radar antenna.

The design of the ReGUARD radar is flexible and exclusively uses semiconductor technology, which ensures high reliability of the system, including parts redundancy. The ReGUARD belongs to the category of pulse-Doppler 3D radars, which brings the advantage of a great range and better resolution in the distance compared to the fixed wave radars. The versatility of the ReGUARD radar is underlined by the possibility of using it ei-

ther as a standalone sensor or as an integral part of a wider network.

The ReGUARD works in two basic modes, sector or rotational. The modes differ from each other in the way they scan the area in azimuth. In sector mode, the radar beam is steered only electronically in azimuth and elevation. In rotational mode, the radar sensor antenna revolves on a turntable at a speed of 15 revolutions per minute and the electronic steering of the beam is primarily used in elevation. Steering in azimuth provides rapid confirmation of detection when initiating track and enhances the quality of tracking while scanning.

The new radar enables simultaneous monitoring of ground and air targets and can detect a wide range of objects. It is, therefore, suitable, e.g. to protect borders or important infrastructure, and it works well in anti-drone systems, e.g. for the protection of airports, but also in the air defense systems.

The ReGUARD can be delivered in portable, stationary or mobile configurations. In the portable configuration, the radar antenna is mounted on a tripod allowing for easy location changes. In the stationary configuration, the radar antenna is fixed at a stationary location like a building or on a mast. In the mobile configuration, the radar antenna is fitted on a vehicle or other movable platform.

The ReGUARD is characterized by its compact dimensions and low weight, e.g. the radar antenna weighs only 65 kg. To reduce the maintenance demands, increase durability and enable deployment in harsh weather conditions (e.g. dusty environment), the RETIA designers chose passive cooling without fans.

The deployment and start-up time does not exceed 10 minutes while the radar can operate continuously for an unlimited period. Thanks to the ability of electronic beam steering, the ReGUARD allows quick scanning of the area of interest so it can identify and track priority targets within a few seconds. In the case of LSS (Low, Slow and Small) targets, its range is 18 km with an altitude coverage of up to 3 km, while in the ground target mode the instrument range is also 18 km.

The radar evaluates the information about targets using advanced signal and data processing and thus can effectively suppress clutter. The radar also has a built-in automated self-diagnostics system, which facilitates its maintenance and guarantees high reliability. Part of the ReGUARD radar is a compact workplace for the equipment operation and diagnostics, which can be placed in remote areas, away from the radar sensor position, depending on the nature of the deployment. ■

Photos: RETIA





NEW

ReGUARD

Multi-role 3D radar for the detection and tracking
of ground targets and slow low-flying targets

Instrumental range for ground and LSS targets up to 18 km

Altitude coverage up to 3 km

Easy integration on masts, rooftops, poles or mobile objects

S RTP

A New EW System of the Czech Army



The ELINT/ESM passive seekers are means of electronic warfare (EW), used to conduct passive radio-technical reconnaissance of the battlefield, especially at the tactical level. Their role is primarily to determine the activity and the azimuth of the enemy active search and target-acquisition radars in the area of interest if direct radio visibility is provided. The newest addition to these technical assets, which was included in the arsenal of the Armed Forces of the Czech Republic in 2018, is the SRTP (Směroměrný radiotechnický pátrač; Direction-Finding Radio-Technical Seeker).

The new SRTP will gradually replace the outdated MRTP (Malý radiotechnický pátrač; Small Radio-Technical Seeker) system, two sets of which are operated by the members of the 532th EB Battalion, a part of the 53rd Reconnaissance Regiment, since 2006. In the case of MRTP, this is the resulting product of cooperation between the Military Research Institute Brno state enterprise and RAMET company. It was designed as a portable system, tasked with conducting a radio-technical reconnaissance. Operating in the 2–18 GHz and 32–37 GHz frequency bands, it provides reception, monitoring, tracking and identification of radio signals, with carrier frequency accuracy of 5 MHz. The receiving antenna can be extended up to four meters above ground level, the operator's workstation can be positioned up to 100 meters away. The range of rotation of the antenna unit in the horizontal plane is a full circle (i.e. 360°), of which the reconnaissance sector is 90° ($\pm 45^\circ$). It can also be tilted vertically at an angle of $\pm 35^\circ$. The biggest drawback of the MRTP, during its service, was the need to use ordinary Land Rover 4x4 vehicle as a means of transporta-

tion. In addition, since it is a portable set, before it is put into operation, it is necessary to take all the associated equipment out of the transport vehicle and then assemble it and put it into operation at the selected site. Of course, such a solution means that the search for enemy radars cannot be done on the move or during short stops, which increases the vulnerability of MRTP and its crew on the current battlefield.

In accordance with the directions and intentions of EW and ISR development set out in 2013, a project to develop the SRTP prototype to support C4ISR (Command,

Control, Communication and Computers, Intelligence, Surveillance, and Reconnaissance) in the Czech Army was launched in the same year. The completion of the prototype worth approximately CZK 70 million took place in 2017. The Czech Army accepted it in the first half of 2017 and subsequently, the unit equipped with this piece of equipment reached initial operational capability. Apart from the SRTP prototype already introduced in the Czech Army, the delivery of another three vehicles is planned by 2020. During the test phase, the SRTP has already participated in two foreign exercises during the last two years, namely Baltic CESMO Trial 2017 and Unified Vision 2018 (both in the Federal Republic of Germany).

The SRTP, which improves the overall situational overview of the ground unit commander, was developed as a broadband moderate radio-technical seeker using an interferometric targeting method. It operates in the 1–18 GHz and 32–38.5 GHz frequency bands and is interoperable with the NATO Cooperative Electronic Support Measures Operations (CESMO) data format. It is a mobile



sensor based on the Iveco LMV M65E 19WM 4x4 light armored vehicle; the SRTP can determine both direction and, in coordination with other PET (Passive ESM Tracker), also the position of air and ground targets (emitters). By targeting the emitter, triangulation occurs and, through mathematical calculations, an error ellipse is created in the target area. The emitter can be either enemy radar, a radar warning receiver or a data link. The accuracy of the direction to target is 1° in azimuth in the axis of the antenna, off-axis the accuracy is up to 2.5°.

The SRTP is equipped with individual receivers, i.e. SRTP/RT radio-technical receiver, SRTP/RWR surveillance and warning receiver, SRTP/R 100 to 500 MHz signals and ADS-B (Automatic Dependent Surveillance – Broadcast) monitoring receiver and finally SRTP/AIS (Automatic Identification System) ship position receiver. The GPS, GLONASS and Galileo navigation signals can also be detected. In addition, it provides both the ability to fuse data from multiple SRTP stations and add information about the monitored electronic spectrum from other sources, including a new prototype of the passive radar seeker RA-PAMEP (Radiotechnický pátrač metrového pásma).



The operation of the SRTP can be conducted in three modes: entirely from the vehicle (the antenna is placed on top of it, the operator sits inside), partly outside the vehicle (the antenna remains on the vehicle, the operator dismounts and can operate the reconnaissance equipment from a control panel connected to the vehicle by a 100-meter cable) or completely independently of the car (the operator exits the vehicle, removes the antenna and places it on a portable mast,

from where the entire set is also controlled). The antenna unit can rotate in a full circle (i.e. 360°), the immediate reconnaissance sector is 90° (± 45°). Vertical tilting of the antenna is limited in the angle of ± 30°. The height of the antenna can be adjusted between 2–4 m due to the use of the telescopic mast. The SRTP crew consists of three: a driver, a commander, and an operator.

Dušan ROVENSKÝ ■

Photos: ACR

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RGW 90

- Long Range Multi-Purpose High Explosive
- Anti-Tank (HEAT/HESH)
- Anti-Structure
- Smoke
- Illumination

Redefining the Protection



Perun Vehicle Family

Is the threat level too high or the terrain too difficult? With Perun, you can still focus on the mission. Due to the Perun's unparalleled protection level and powerful drivetrain, your crew will be always safe and mobile. With more than 3,000 armored cars produced by SVOS, the Perun reflects the company's long and extensive experience in ballistic resistance materials design, development, and production. We at SVOS know how hard the hit of a blast or armor piercing bullet can be and will do anything for you not to have to find out.

Perun in lead

The Perun multipurpose military vehicle development was launched in order to address the global demand for vehicles with new standards in troops' protection. With the constantly developing threats, the protection has to evolve as well. With an ambitious aim to produce a brand new multipurpose military vehicle exceeding world protection standards, SVOS managed to introduce on the market a brand-new vehicle truly redefining the operators' safety expectations. The safety concept of the vehicle includes several patent-protected solutions and presents a sophisticated complex of matters allowing survivability of the vehicle after a blast or ballistic impact. The protection was thoroughly tested by simulation as well as vehicle samples hits and full scope blast tests. The result is protection level in both hard-top and open-top variants which can guarantee no other vehicle on the market. The special V-hull shaped vehicle body together with special blast deflecting and distribution shaping and blast-resistant seats allow to the crew to withstand even multiple

blast threats, while the state-of-the-art body armoring utilizing in-house produced ballistic glazing allow the highest possible protection against rifle bullets. All the parameters of the vehicle protection were confirmed during full-

scale tests performed by an IABG test center, a worldwide-respected and NATO-authorized laboratory. It has to be mentioned the Perun vehicle was in its open-top variant tested for threats no other vehicle was tested yet



and therefore pioneers and defines the new standard of the blast and ballistic tolerance.

Wide modularity

The Perun vehicle was publicly unveiled for the first time in open-top variant designated for support of Special Forces. With impressive terrain throughput, unparalleled blast and ballistic protection and bulky internal space for all the mission equipment Perun still provides unbeaten firepower consisting of the roof-mounted turret with a primary weapon as well as of four pintle mounts for 360° coverage of the area around the vehicle. For any Special Forces team, the vehicle allows carrying enough of supplies and equipment for long-time missions, while the internal equipment, radio communication system, and jammers plus smoke grenades launchers provide the necessary support on the battlefield. While the vehicle was designed with the aim to minimize the maintenance demands, the operator may benefit from reliable platform guaranteeing high mobility and superb protection.

With the hard-top variants, Perun presents a well-protected platform allowing the fulfillment of a wide variety of tasks of modern armed forces. Starting with troops transport, through the battlefield medical evacuation up to Command, Control, Communication, Computers, and Intelligence missions, mine disposal tasks or anti-aircraft defense role. The internal electrical and hydraulics systems are designed for easy coupling with high energy and power outputs for powering the special system. The spacious interior allows easy location of all the necessary mission equipment as well as comfortable and safe seating of the operators and soldiers. Regardless of the se-



lected variant and role, all Perun vehicles inherited the unparalleled protection level and excellent driving capabilities with the extra capability of the steerable rear axle.

Sophisticated support

To get a perfect maintenance and operation support it does not matter where is the vehicle located. Using of NATO-stock codified parts allows shared logistics with other vehicles in the inventory and also brings the benefit of the selectable licensing regime in terms of installed components.

In response to the increasing demands on the vehicle fleet and operational rates, SVOS provides a state-of-the-art support concept of maintenance and support including Virtual Reality based maintenance procedures description or electronic maintenance and operational manuals and software-based operational rate planning environment allowing round-the-clock surveillance of the status of the vehicle. With our sophisticated

tools, you can easily predict the maintenance demands, plan and execute all scheduled and unscheduled tasks and gain the highest possible rate of operational capability. For the unplanned and non-standard task, the OEM remote support is an integrated part of the system.

For the training, SVOS proposes a wide array of simulators starting with driving simulator allowing practicing of all standard and non-standard procedures including combat maneuvers. As an add-on a tactical simulator may be provided, whose task is to help to the operator to either practice tactical procedures and coordination on the battlefield, or to familiarize with the environment of the future deployment should the operator have map background. Also, the maintenance crews may be trained with extensive use of 3D model allowing fast learning process with practicing of the maintenance tasks with using of augmented reality means. ■

Photos: SVOS, spol. s r.o.



Czechoslovak Group

– A Strong Player
in the Field of Aviation



One of the largest Czech industrial groups – Czechoslovak Group (CSG) – has recently strengthened its activities in the field of aviation and radar systems. This position of CSG in these areas is further strengthened by the establishment of the CSG Aerospace Division which was formed last autumn and which immediately became the most important domestic player in the industry. Some of the CSG subsidiary companies will introduce themselves at the IDET 2019 fair.

Products and services of CSG Aerospace and other companies belonging to the CSG holding deliver complete airspace monitoring solutions for aircraft owners and airport operators dealing with civilian aerospace, military aircraft or air defense. These mainly include acquisitions and sales of aircraft and helicopters, repair and modernization of aviation technology, development, and production of radar systems, applications and systems for air traffic control, pilot and crew training, passenger air transport, aerial tasks, etc.

Part of the CSG Aerospace Division is, for example, a company called ELDIS Pardubice which is a global specialist in airport surveillance radars, precision approach radars, and



■ The EAS center offers UH-60 Black Hawk helicopter training.

■ The CANTAS A is suitable for reconnaissance, surveillance and monitoring missions or activities, both for military or civilian use.



air traffic control systems. The company supplies complete radar technology and radars including radar development, manufacture, software, installation, and servicing. At the upcoming IDET 2019, the company will show its essential products which are delivered to customers in many countries around the world. This includes, for example, the primary surveillance radar RL-2000 and monopulse secondary surveillance radar MSSR-1. ELDIS has already been successfully providing these systems and their combinations to the Czech Republic, Hungary, Poland, India, Canada, In-



■ In addition to its own ATM systems, the CS SOFT develops and operates ATC simulators which are used to train future air traffic controllers.

donesia, China, Pakistan, and South Korea. In India, for example, the combined RL-2000 / MSSR-1 radars cover 90 percent of the country, making it the backbone of civil aviation. Another product from ELDIS is the proven and commercially successful precision approach radar PAR-E.

New Space Technologies, also a part of the CSG Aerospace division, focuses on the development, design, engineering ergonomics for control systems and interiors, calculations, analyses and testing used in general aviation as well as in special and military vehicles or automotive industry. In addition, the company is working intensively on a new UAV (Unmanned Aerial Vehicle) platform called CANTAS. As for this family of unmanned aircraft, some of which are capable of vertical take-off and landing, the company will present the CANTAS version A system at the IDET 2019 fair. Type A is suitable for reconnaissance, surveillance and monitoring missions or activities, both for military or civilian use. CANTAS A can remain airborne for several tens of minutes, which is within the reach of operations performed by the ground control station. Various equipment and electronic systems may be installed in the front detachable container of this UAV.

■ European Air Services deals with the sale of aviation technology and spare parts including upgrades and maintenance.



■ In India, for example, the combined RL-2000 / MSSR-1 radars cover 90 percent of the country, making it the backbone of civil aviation.

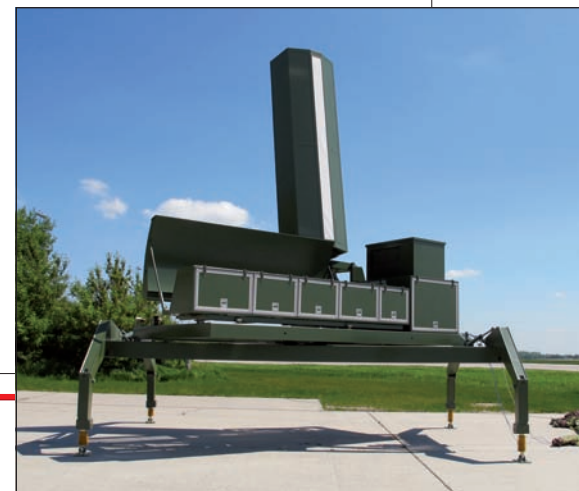
European Air Services (EAS) deals with the sale of aviation technology and spare parts including upgrades and maintenance, as well as various types of flight training. In cooperation with the MSM Group, the Slovak branch of CSG, EAS opened a Slovak Training Academy training center which was built for \$ 25 million in autumn 2017 in Košice. The center has training capacities for up to 70 helicopter pilots per year and provides basic, advanced

and special flight and military personnel training, aerial tasks as well as training for commercial air transport. The center offers nearly 20 helicopters and a flight simulator. The EAS center offers UH-60 Black Hawk, Schweizer S-300 or MD-530G helicopters. These will be exhibited at IDET 2019 fair as part of the CSG exhibition. In collaboration with Israeli manufacturer BIRD Aerosystems, the company will also introduce an advanced missile protection system POD.

The CSG Aerospace also includes RETIA company located in the town of Pardubice, which develops, manufactures and integrates radar systems for ground air defense systems, but also advanced electronic components for vehicles including sophisticated recording and evaluation systems. At the IDET 2019 fair RETIA will present a Czech novelty – the

multipurpose 3D radar called ReGUARD. This pulse-doppler radar is designed to detect and simultaneously track ground targets and slow, low-flying objects with a small radar cross-section. The new radar enables simultaneous monitoring of ground and air targets and can track a wide range of objects. In addition to the ReGUARD, RETIA will also introduce its unique radar called ReTWis 5. This lightweight and portable radar is able to detect and track

■ Precision approach radar PAR-E.





■ At the IDET 2019 fair RETIA will present a Czech novelty – the multipurpose 3D radar called ReGUARD.

people and animals behind a wall or behind other non-metallic obstacles.

In recent years, RETIA has delivered ReVISOR radars to the Czech Army or has upgraded the 2K12 KUB anti-aircraft missile systems and has developed, produced and implemented the RACCOS fire command and control system. RETIA is also currently involved in the production of special armored vehicles Pandur II CZ in the command-staff and communication versions, also designed for the Czech Army. RETIA recently completed, among other things, deliveries for the unique Alliance Ground Surveillance system (AGS) operated by the NATO.

The CSG Aerospace division also includes CS SOFT, which is primarily engaged in the research, development, and production of state-of-the-art ATM aviation systems and solutions. In addition to its own ATM systems, the com-



■ The RETIA is also currently involved in the production of special armored vehicles Pandur II CZ in the command-staff and communication versions.

pany also develops and operates ATC simulators which are used to train future air traffic controllers. In addition to the Czech state enterprise ŘLP ČR (ANS CR, Air Navigation Services of the Czech Republic), the most important customers of CS SOFT also include air traffic control companies managing air traffic in the United Arab Emirates, Bangladesh, the Philippines, Israel, Lithuania, Indonesia, Slovenia and USA. Most recently, CS SOFT has delivered its ATM air traffic control system early this year to the newly open Ramon Airport in Timna in the south of Israel.

Another member of CSG Aerospace is a company called Česká letecká servisní which offers unique capabilities and services in Central Europe. This company mainly deals with the integration and modernization of avionic systems and special equipment for civil and military aircraft and helicopters required by both domestic and foreign customers. Company specialists prepare a comprehensive turn-key solution that includes engineering design, manufacturing, integration, and certification.

Thanks to this fact, Česká letecká servisní is the key partner in the modernization process of the Czech and Slovak Army aircraft including helicopters.

The CSG holding also includes Job Air Technic, which operates one of the largest aircraft maintenance and repair hangar in the Central and Eastern Europe. In addition to various service levels, the company also trains technicians under its comprehensive schooling system. Last year, the company celebrated 25 years since its foundation and on that occasion, the company unveiled its new logo. The company began its existence by repairing L-410 and SAAB 340 aircraft. In 2008, the company began repairs of Boeing 737 aircraft and in 2011 it received authorization to service Airbus A320 family aircraft. Since the last year, Job Air Technic has been authorized to provide maintenance services for Airbus A330 aircraft. This year the company plans to open another hangar which shall further increase its servicing capacity.



■ In recent years, The RETIA has delivered ReVISOR radars to the Czech Army.

FUTURE FORCES FORUM International Platform for Trends & Technologies in Defence & Security



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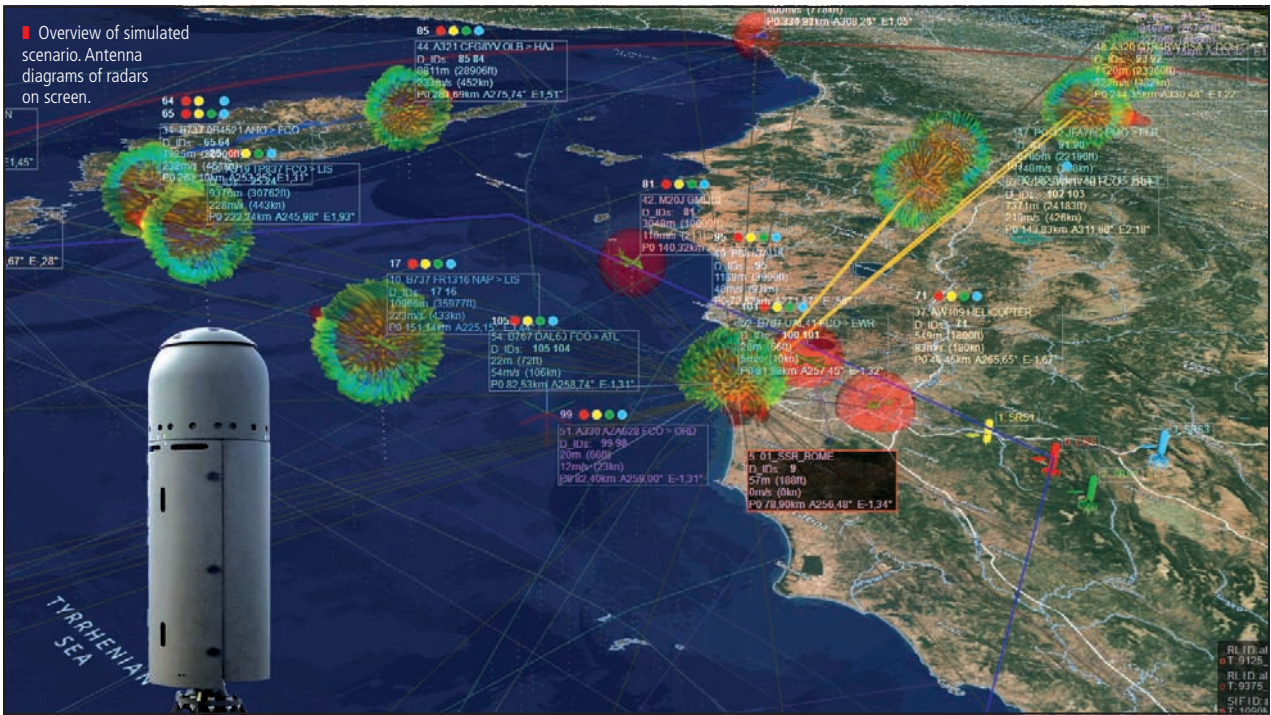
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- Networking (B2B, B2G, G2G)

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Ministry of Foreign Affairs of the Czech Republic





Passive ESM Tracker Simulator by ERA

The training simulator is a military reconnaissance tool, which provides training of passive emitter tracking systems and electronic warfare. The training simulator significantly decreases the time needed for new users to obtain experience without affecting the performance of the operational system. The simulator is an especially important training tool for the operators of the Passive Surveillance Systems (e.g. VERA-NG), as they are able to simulate any type of battlefield scenario: aerial, ground or naval.

The ERA company, a member of the OMNIPOL group, can deliver various simulator scenarios reflecting the above-mentioned themes or ERA experts can create any scenario on demand to simulate situations which might be extremely rare or almost impossible to find in the real-world environment, such as: navigation flights, aerial combat, AWACS monitoring or illegal border crossing. The training can be carried out using data from prepared scenarios for targets of all kinds – airborne, maritime or ground, on different simulated battlefields and terrain types.

The simulator system consists of the VERA-NG console as a workplace for operators (trainees), a simulator console as a



workplace for instructors (trainers), a central processing station and receiving universal military module.

The VERA-NG addresses critical elements in today's air defense (AD) and electronic warfare (EW) operations by providing the most advanced and state-of-the-art Passive Surveillance System designed for detection, location, identification and tracking of air, ground and naval targets. VERA-NG is Passive ESM (Electronic Support Measures) Tracking (PET) technology, which uses advanced techniques to conduct cross-border long-term and long-range surveillance without alerting neighbors. It effectively "sees without being seen".

The ERA is a leading company in multi-lateralization, multistatic surveillance, and reconnaissance technology. We implement systems for military and civil purposes, deployed in 65 countries on 5 continents with 24/7 operations. The ERA has developed a unique passive system VERA-NG tailored for air, maritime and land target surveillance and reconnaissance for AD and EW. In parallel, the ERA made air traffic control history when deploying the first multilateralization system and introducing gate-to-gate surveillance.



Operator's workplace of VERA-NG extended console with Scenario editor and 3D overview.



Passive ESM Tracker Simulator

Training tool for the Passive Surveillance Systems (e.g. VERA-NG)
- simulating any type of battlefield scenario: airspace, ground or navy.





AGADOS

is Introducing a Special Amphibious Off-Road Trailer

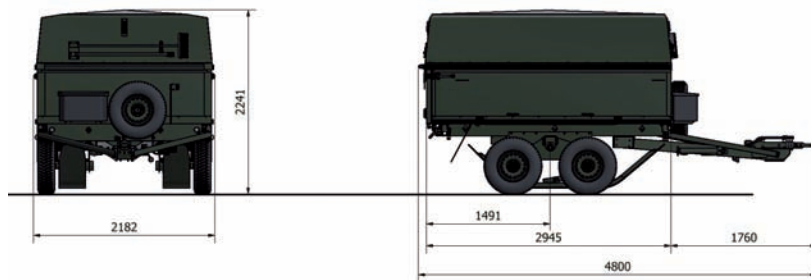
An amphibious off-road trailer has been added to AGADOS's portfolio of special projects for armed forces and rescue services. It will be presented at the IDET International Trade Fair of Defense and Security Technologies in Brno, which is taking place from 29th to 31st May 2019. It was at this fair two years ago where the PK 4 KAGA mobile field kitchen from our company was awarded a Golden IDET 2017.

The amphibious trailer is primarily designed for the wheeled and tracked vehicles driving through all types of terrain. The patented system of independent suspension of each wheel is an indisputable advantage. While using unique skis, the trailer can be easily operated in difficult terrain such as snow, mud and rocky ground. Another advantage of this newcomer is also the ability to overcome water obstacles since the trailer is able to float behind a towing vehicle. The useable load area, whose payload capacity is up to 1,500 kg, is made up of interchangeable modules for various uses, not just extreme conditions. The two-axle suspension trailer, with a total weight of 3,500 kg, uses four fifteen-inch wheels. The trailer is also equipped with a height-adjustable drawbar that enables towing by vehicles of different types (depending on the height and type of towing equipment of the vehicle). The new



Technical parameters of the Special Amphibious Off-Road Trailer

Dimensions (LxWxH)	4,800 x 2,182 x 2,240 mm
Total weight	3,500 kg
Payload	1,500 kg
Braked, two-axle trailer (4 half-axes)	
15-inch wheels including spare wheels	



Advantages of the Special Amphibious Off-Road Trailer:

- Possibility of transporting all kinds of military material
- Variable anchoring of transported military material
- Possibility of using the trailer in all types of terrain, even overcoming water obstacles
- Possibility of blocking overrun brake for off-road transport
- The patented system of independent suspension of each wheel
- System of superstructure modules

trailer, which is already being used by undisclosed foreign armed forces, can serve as a waterproof box, tank, loading platform, 8–10-foot container carrier and tilting superstructure flatbed with tarpaulin. It is also ideal, for example, to transport a power generator. The modules are attached to the bottom frame at four anchoring points and secured with pins. The trailer has two salvage eyes at the rear.

Other special products introduced by the AGADOS in the past include, besides the new

amphibious trailer, were the PK 4 KAGA mobile field kitchen, the larger PK 6 field kitchen, the NAVA 2000 mobile tank, the UVA 500 water treatment plant or the freezer box for preserving fresh food even in extreme conditions. Furthermore, the company offers chassis for gensets and a mobile lighting tower suitable for illuminating bases, areas of accidents, fires, etc. The AGADOS is focused on the production of trailers of all categories. In this area, it is a company of European importance – half of the production is exported.

Over just a year, more than 20,000 trailers were produced. AGADOS's production grows year by year due to growing interest in its products and at the same time, the company expands its rich portfolio.

Photos: Agados



CZ BREN 2 BR



In 2006, Česká zbrojovka once again entered the assault rifle market with the new CZ 805 BREN model. Over eight years, this model evolved by becoming lighter and more ergonomic firearm, the CZ BREN 2. It is chambered in both 5.56x45 NATO and 7.62x39. In 2018, another new model arrived, the CZ BREN 2 BR (Battle Rifle) chambered in the powerful 7.62x51 NATO.

With the CZ BREN 2 BR, the CZ has responded to the revival of individual basic weapons by giving operators a rifle with more range and better downrange energy by chambering the CZ BREN 2 BR in more powerful cartridges like the 7.62x51 NATO ability to deliver more energy on impact, while extending maximum effective range to 800 meters, 200 meters greater than the 5.56x45 NATO.

Battle-Proven Features

The design of the CZ BREN 2 BR has capitalized on the extensive experience the CZ has with the CZ 805 BREN and the CZ BREN 2 models. Currently, its lightweight aluminum alloy barrel is 407 mm (16") long. The bolt rotates locking it into the breach, the automatic system is powered by combustion gases collected from the barrel bore onto the piston resulting in a manageable muzzle climb –

which, the CZ has learned, gives CZ BREN 2 operators the best combination of the very best accuracy and mechanical reliability.

The easy to control gas regulator guarantees reliable operation under the most arduous condition or being improperly maintained. It comes with our own CZ-designed 25-round black polymer magazine which features a transparent window enabling operators to easily verify magazine round counts.

The collapsible folding stock is made of the carbon-reinforced polymer composite. The BREN 2 BR features the same handgrip ergonomics as our legendary modern CZ pistols and features a storage space for crucial accessories like spare batteries for optics or other small items customized to the needs of the mission.

The Bren 2 BR features a full-length MIL-STD-1913 Picatinny rail which enables operators to place a variety of sighting devices, including the combined use of telescopic, thermal, and light-intensified optics, depending on the mission requirements. An additional rail can be found underneath the barrel of the rifle allowing the attachment of lights, laser sights, as well as an underslung grenade launcher or a popular front vertical grip with precision threaded opening placed on the sides of the rifle barrel handguard for more rails. Swivels at the front and rear of the firearm to enable the use of slings for portability and increased operator stability while firing the CZ BREN 2 BR.

Easy to Control

Muscle memory gained from training and combat experience is crucial for warfighters. Therefore, all the controls of the CZ BREN 2 BR battle rifle are located at proven, easily accessible places and are designed as ambidextrous. Specifically, the fire mode selector is located on the receiver above the pistol grip and offers three positions – locked, single-round fire, and short burst.

A very good feature is a cocking handle positioned on the side of the upper part of the



receiver. It is non-reciprocating and may be moved from the left side to the right during basic stripping, according to the user's preferences and requirements.

The adjustable stock ensures that the CZ BREN 2 BR fits in the user's shoulder quickly and correctly in all circumstances, whether dressed in winter gear and wearing a tactical vest or outfitted to operate in a hot and arid climate. The stock design works in tandem with the rifle's functionality to minimize recoil, so operators using the CZ BREN 2 BR

can engage their weapons confidently and accurately under combat stress.

A Strong Long-Arm

The CZ BREN 2 BR is an outstanding choice for military and law enforcement personnel worldwide due to its combat-proven reliability, accuracy and now added lethality. Thanks to the fact, that CZ BREN 2 BR is now being chambered in the 7.62x51 NATO, it is a force multiplier, extending your unit's range and ability to inflict heavier casualties over enemies limited to just the 5.56x45 NATO or the 7.62x39.

Martin HELEBRANT ■

Photos: Česká zbrojovka

CZ BREN 2 tactical and technical data

Calibre	7.62x51 mm NATO
Number of grooves in the bore	4
Rifling [mm]	280±10 to the right
Barrel length [mm ("")]	407±1 (16)
Length of weapon with the stock unfolded and fully extended [mm]	995±10
Length of weapon with the stock unfolded and retracted [mm]	925±10
Length of weapon with the stock folded [mm]	735±10
Width of weapon with the stock unfolded [mm]	80±5
Width of weapon with the stock folded [mm]	110±5
Height of weapon without magazine and the sights folded [mm]	210±5
Cadence [rounds/min]	800±100
Effective range [m]	800
Barrel life [rounds]	20,000
Magazine capacity [rounds]	25
Weight of weapon without magazine and sling [g]	3,778±50



CZ 805 BREN



CZ BREN 2



CZ BREN 2 BR

UAX Under Andromeda Control

Unmanned aerial vehicles/systems (shortly UAV/UAS or simply UAX) are very popular and hot topic today. The market is flooded with many different categories of UAXs and the possibility of misuse grows with numbers of the users. Therefore, there is a need to ensure the protection of important infrastructure against the effects of UAX.

The legal framework for operating UAX takes place in almost all countries and forbidden or no-fly spaces are clearly defined.

Using UAXs around airports can be very dangerous too. Almost all media referred about a "Gatwick airport drone incident" during which hundreds of flights were canceled, approximately 140 000 passengers and 1000 flights were affected. A suicide UAV attack now represents one of the most serious kind of UAV misuse, in addition, if its payload is composed of chemical or radioactive substances.

Therefore, the **URC Systems** presents its solution to this problem, a counter UAX system called **ANDROMEDA**.

The ANDROMEDA is a complex modular electronic EW solution against UAX. ANDROMEDA consists of three main subsystems: Detection – Supervision and Control – Elimination. All these subsystems are equally important and they are mutually optimized for real-time operation. The detection subsystem is the first step for timely detection and identification of the UAX flying to the protected area. The ANDROMEDA system uses the set of various radio, radar, optical and other sensors with own software tools for reliable positioning, flight direction and UAX identification. The main detection subsystem for radio reconnaissance and surveillance is **SYMON AD** (Anti-Drone) from the URC Systems.

Supervision and Control is the core subsystem of the whole solution. This part consists of the **ANDROMEDA SW** command and control unit from URC Systems which occurrence overview of UAX in near real-time and allows data and information sharing with external cooperating systems. This unit is responsible for display the valid information of the whole detection subsystem and serves as the expert system to the authority how best to counteract the UAX threat. This expert system proposes to the user suitable spatial, frequency, directional and jamming scenarios that are most effective at the moment from the EW perspective.

Elimination subsystem is the last piece of the mosaic of the ANDROMEDA's subsystems. This subsystem consists of radio jammers which can be operated in the wide band of radio frequencies for purpose disable the UAX receiver to obtain pilots command and navigation signals. A non-lethal EW elimination is used so this whole solution can be operated in densely populated areas with minimal collateral damage taking place by the elimination of UAX. But it is also possible to integrate a hard-kill elimination by providing tracking data about UAX from detection and supervision and control submodules to other systems, which can "take care" of the UAV. **STAR Family** modular jammers from the URC Systems have used the non-lethal elimination subsystems with directional or omnidi-



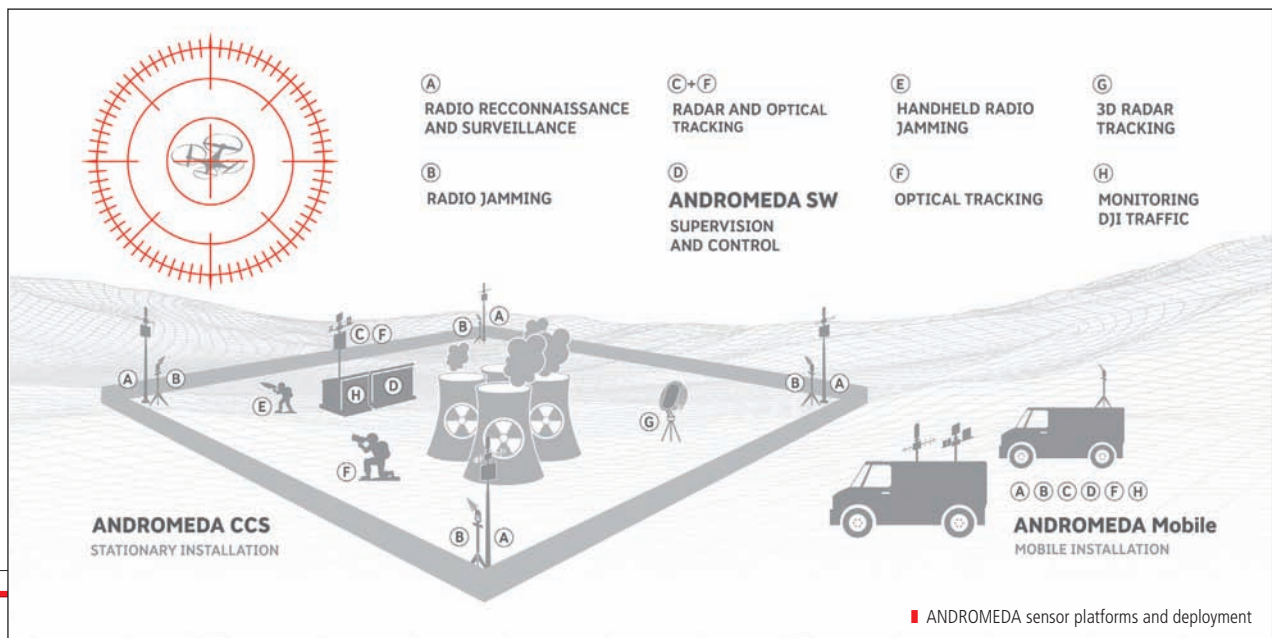
STAR Manpack AD (Anti-Drone)

rectional antennas including guidance to the desired space.

The ANDROMEDA is a tailored system which can be customized for any customer's needs. The URC Systems offers two basic variants: **ANDROMEDA CCS** for stationary deployment (e. g. powerplant, stadium, airports protection, etc.) and **ANDROMEDA Mobile** installed into vehicles. The mobile variant can use one or multiple cooperating cars, each with its own set of sensors. Both variants use previously mentioned subsystems. The specific sensors can be integrated and used by the customer's wishes.

The great advantage of the ANDROMEDA solution is the openness for integration to sensor platforms from several different manufacturers, for example, active sector/rotation 3D radar ReGUARD from RETIA company. ■

Photos: URC Systems



ANDROMEDA sensor platforms and deployment

Bell: Economy and Technology Overmatch



US aircraft maker Bell is known especially as a manufacturer of military helicopters, which are widely used by armed force around the world. In addition to combat operations the company's aircraft have proven themselves effective in dealing with natural disasters, lifesaving and security operations, says Joel Best, Director Global Military Sales and Strategy Europe of Bell Helicopter.

The cooperation with the US Marine Corps has made you famous. Why do you think you were chosen for this cooperation?

We are very pleased to be teamed with the United States Marine Corps – they are our nation's elite forces, their warriors are generally considered to be among the best in the world. Marines are very proud of the fact that they are able to go into battle anywhere in the world immediately after they receive an order. For this, they require state of the art globally deployable aircraft that are capable of operating in any environment. The Marines turned to Bell and we developed helicopters for them that have a commonality of design and flight management system. Pilot and maintainer training benefit from 85% commonality of the two aircraft. Collectively, the H-1 team of UH-1Y Venom and AH-1Z Viper achieve the greatest number of complex battlefield and domestic operation missions sets of any helicopter team. No other OEM can match Bells commonality.

Which helicopters are the most popular among the Marines?

The UH-1Y and its attack twin the AH-1Z Viper form the backbone of USMC combat multi-role and direct attack rotary wing fleet. These two helicopters routinely fly together in mixed sections. The Yankee is an extraordinarily capable combat utility aircraft – it is equipped with laser-guided 70mm rockets and heavy machine guns for fixed forward and off-axis operation. This affords full spectrum target suppression inbound to the landing zone and on departure from the pickup zone. The AH-1Z Viper is intended solely for

attacking heavy armor targets such as tanks and armored personnel carriers, with heavy precision guided Hellfire missiles, laser-guided 70mm rockets, and turreted 20mm cannon. Unique to Viper, is the ability to carry a pair of AIM-9 Sidewinder air-to-air missiles. Again, when operating the H-1 team together, 100% of the combat utility and direct attack mission sets are covered.

Is the advantage of these two helicopters mainly in their combat war-winning power?

Of course, but even militaries that aren't as robust as the US Marines will appreciate their full spectrum capability and technology overmatch. These aircraft are easy to maintain, extremely practical to employ, with a versatility that is unmatched by any other service or OEM. This is why the erudite leaders within the Czech Republic are seriously considering the H-1. Virtually all militaries have similar requirements: to transport troops in the safest possible manner into and off of the combat zone while performing the necessary action with maximum speed and efficiency. In practical terms, it doesn't matter if you are

attacking enemy positions abroad, or defending sovereign Czech territory from invasion, or performing other domestic tasks such as fire-fighting, disaster relief or search and rescue. Furthermore, Czech aircraft should be ready for action immediately and must possess robust combat sustainability. Commercial OEM that offer para-public alternatives cannot compete with purpose-built combat aircraft in this area.

So, your aircraft are also suitable for purposes other than fighting?

They can be used for domestic operations such as homeland defense and homeland security. Purpose built for combat ensures they thrive in the most demanding role required and ensures they thrive during less complex missions. They are ideal for coping with natural disasters, such as wildfires and floods as well as taking part in search and rescue operations. Their main purpose is to serve the interests of the Czech Republic, wherever they are needed – at home, or in distant lands like Afghanistan, Iraq or anywhere else.

Where are these helicopters currently in operation?

Of these two models, the UH-1Y Yankee saw combat first, deploying to Afghanistan in 2009. The first aircraft spent uninterrupted service there until the end of 2014. Since then, the US Marines have used them in other locations of this region as well as in the Middle East. Because they are designed for expeditionary service, their deployment is envisaged anywhere in the world where crisis erupts. We are currently selling Vipers to other countries – the first to purchase these aircraft were Pakistan and Bahrain.

You have established cooperation with LOM Praha in the Czech Republic. What kind of cooperation is it?

The first cooperation memorandum with LOM Praha was signed in 2015. Our partner has a 100-year long tradition, therefore it has rich experience with the servicing, maintenance and modernization especially of helicopters. They use a variety of technologies and they do great work, not only while maintaining and rebuilding machines, but also with staff training. I think it's one of Europe's best. Therefore, the cooperation is clear: we deliver the helicopter, and LOM will continue to take care of it and adjust it so that it perfectly fits the needs of the Czech government. ■

Photos: Bell Helicopter



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STV GROUP – Stability, Tradition, Vision



The STV GROUP is a private defense and security enterprise headquartered in Prague, Czech Republic. Its tradition dates back to 1920 when the First Ammunition Factory was founded in the then Czechoslovakia to supply its military with large caliber ammunition. Since then we have moved a long way at the end of which we have become a leading provider of defense products for the Armed Forces of the Czech Republic. However, our activities are not focused solely on the domestic market. For the years we have been building partnerships with companies and governmental bodies all around the world.

Today, the STV GROUP offers its customers a wide range of products which, on one hand, follows its historical tradition of large caliber ammunition production and on the other brings new products to the market that are compatible with some of the most popular weapon systems worldwide. In the past year, for instance, the enterprise has won an open tender to provide the Czech Army with 125 mm tank ammunition of various types. Apart from that, we have been engaged in the production of mortar rounds of different calibers such as 81 mm, 82 mm as well as 120 mm.

Due to the significant proliferation of RPG-7 anti-tank rocket launcher around the globe, the STV GROUP has developed its own range of ammunition for this weapon system. This includes, for instance, PG-7VM round effective against armored targets, GHE-7V

fragmentation round or TB-7V lightweight thermobaric round. We have supplied the latter, for instance, to NATO Supply and Procurement Agency. Moreover, our R&D department has also developed LGL-7, an anti-tank rocket launcher compatible with all ammunition intended for RPG-7.

Apart from LGL-7 we have developed and run production of HGL-9 and M-17. the HGL-9 is a 73 mm tripod-mounted recoilless rifle compatible with SPG-9 ammunition which is normally transported by vehicle and carried into position by its two operators. The M-17, on the other hand, is an AK-type as-



■ STV depot in Polička

Certification

- ISO 9001, 14001
- AQAP 2110
- OHSAS 18001



■ T-55 turret overhaul and modernization

Main activities

- Production of small-, medium-, and large-caliber ammunition
- Production of firearms
- Production of engineer ammunition
- Production of mortar rounds
- Production of plastic explosives
- Overhauls and modernizations of military vehicles
- Demilitarization and ecological disposal of all types of ammunition
- ADR transport with our own fleet of trucks

sault rifle with selective fire chambered in 7.62 x 39 mm.

Small-Caliber Ammunition

In 2017, the STV GROUP invested several million Euros to modernize and increase the capability to produce a 9 mm ammunition. For that reason, former small-caliber production unit was taken as a basis to create the STV TECHNOLOGY, a subsidiary company of the STV GROUP. Its new state of the art machinery ensures top precision of our 9 mm ammunition which has enjoyed increasing popularity and demand on the European market. Apart from primers and smokeless powder, all components (bullets and cases) are produced in-house. To maintain high-quality of the production, the STV TECHNOLOGY purchases all input materials from European suppliers and employs sophisticated quality control system. Cases and bullets go through 100 % control by high-speed cameras and lasers which check size, weight, shape, and surface. Praised for its precision by European media outlets and consumers, our 9 mm rounds have enjoyed increasing popularity across the continent as well as outside of it.

Solutions for Sappers

We are proud of our products designed to serve military combat engineers. Bangalore Torpedo, NR-50, UTN-11, Hayrick, TNT charges or Beehive shaped charge consist of staple products of our engineering ammunition production. They can be used to damage communication infrastructure, destroy reinforced concrete or create cylindrical openings in various types of materials. Besides, the STV GROUP is one of the very few European manufacturers of a scatterable mine delivery system. This unique system is used by sapper units to lay self-destruct anti-tank mines contained in 122 mm rockets fired from a distance mine laying device, thus providing an effective solution for defense against hostile armor.



■ LGL-7 anti-tank rocket launcher



■ Production of M-17 assault rifles

Overhauls and Modernizations of Military Land Vehicles

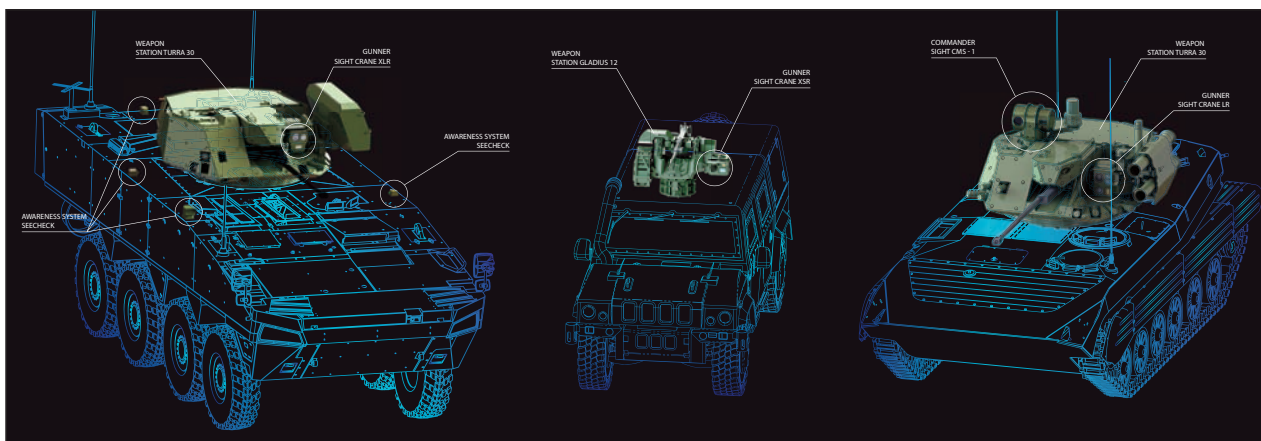
In our compound, in the historical town of Polička, we conduct maintenance, overhauls, and modernizations of military land vehicles, both tracked and wheeled. Our spacious and modern maintenance depots allow our technicians to work on several vehicles simultaneously. Thanks to our well-organized storage system and a large stock of spare parts, the work is always efficient. In the past year, apart from contracts we have been fulfilling for our foreign customers such as overhaul and modernization of T-55 and T-72 main battle tanks, we have been conducting maintenance of BMP-2 infantry fighting vehicles, maintaining 152 mm DANA self-propelled howitzers and just recently we have finished repairs of PRAM 120 mm self-propelled mortars for the Czech Army.

Photos: STV Group

STV

- Stability of an expanding enterprise that values its customers and human capital
- Tradition dating back to 1920
- Vision to the future and to constantly challenge itself to grow and improve its products and services

The Key to Victory is to See the Enemy First



One of the important rules of combat states: "If you can't see the enemy, he still may be able to see you." Therefore, it is critically important for the friendly forces in combat to be able to spot the enemy before he sees them, identify his assets and engage first – battles are won or lost with the help of element of surprise.

The EVPÚ Defence is the only Czech manufacturer of commander and gunner sights designed for special military vehicles and a leading global manufacturer of electro-optical systems.

The electro-optical systems manufactured in the south-eastern part of the Czech Republic guard frontiers of more than 40 nations all over the world and find frequent use in projects of the Ministries of Defence and police forces of the Czech Republic and Slovakia.

The EVPÚ Defence is the world's leading manufacturer of pan and tilt positioners. Thanks to their long-term development, manufacturing and maintenance pan and tilt positioners have excellent quality, reliability, long service life and first-rate adaptation to the toughest operating conditions. Due to the great flexibility of our own development department, unstabilized and gyroscopically stabilized pan and tilt positioners can be used in a variety of applications such as border monitoring, anti-drone systems, unmanned vehicles, vehicle-mobile systems, boats, and others.

Pan and tilt positioners can be tailor-made to the specific requirements of the customer with respect to the intended application. The most well-known are:

- MRP, MCM, ARM – for short-range systems, with payload up to 10 kg
- MSM, MSO, NERO – for middle range systems, with payload up to 34 kg
- GEMA – for middle- and long-range systems, with payload up to 50 kg
- MST, MSR – for long-range systems including gyro stabilization or liquid transfer option, with payload up to 150 kg
- MALLI – for radar systems, with payload up to 20 kg

Each of the models described above was developed for a specific project, which in fact shows that the EVPÚ Defence can provide flexible solutions and offer custom-made products.

The EVPÚ Defence also offers CRANE multipurpose sights – a multi-sensor electro-optical container developed for integration into remotely controlled weapon stations for short, middle and long range applications on weapon stations.

The EVPÚ Defence does not simply assemble third-party components into systems: our company is a specialized manufacturer of the dedicated sensors, which are calibrated and tested in its purpose-built laboratory.

Another interesting product fielded by the Army of the Czech Republic is known as SeeCheck – a system monitoring the surroundings of a vehicle and guarding the safety of its crew; it has been installed on Iveco LMV 4x4 armored vehicles and LOS-M and Sněžka-M tracked armored reconnaissance and surveillance vehicles. The SeeCheck system is also integrated into communications and command and control versions of the Pandur II 8x8 wheeled armored vehicles which the Army of the Czech Republic is currently preparing to field.

In addition to developing, manufacturing, and maintaining the abovementioned

elements, the EVPÚ Defence also integrates them into more complex surveillance and weapon systems. Thanks to cooperation with the parent company, EVPÚ a.s., it can deliver complete integrated solutions of remote-controlled surveillance systems and weapon stations. An example of such cooperation is the ZSRD-07, Gladius and TURRA 30 weapon stations.

The CMS-1 commander panoramic sight, exhibited for the Golden IDET Competition is a multi-sensor electro-optical system, the sensors of which are mounted on a gyro-stabilized pan and tilt positioner, providing an all-round field of vision to the commander irrespective of light or weather conditions.



Remote controlled weapon station GLADIUS 12

The EVPÚ Defence will display many products from its portfolio, including monitoring systems and all types of commander and gunner sights, at the forthcoming MSPO, DSEI, NATO Days and Expodefensa.

Additional information about products by EVPÚ Defence can be obtained at www.evpudefence.com.

Photo: EVPÚ Defence



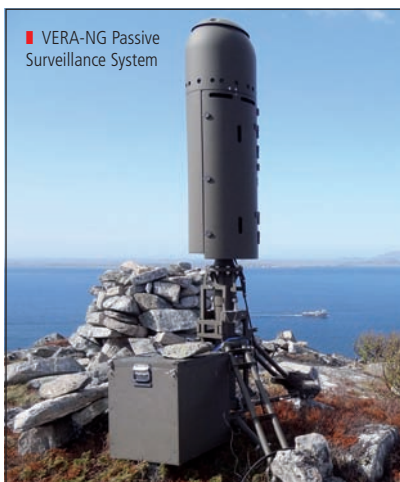
WE CREATE OPPORTUNITIES,
WE CREATE PRECISELY DEFINED,
CLEAN SPACE
FOR PROPER BUSINESS

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C⁴I AND COMMUNICATION SYSTEMS
TACTICAL AREA CONTROL SYSTEMS
SYSTEMS FOR CHEMICAL DETECTION

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OMNIPOL – 85 Years in the Defence and Security Sector



■ VERA-NG Passive Surveillance System

Origins and Key Milestones

Nowadays the OMNIPOL Group has, in its portfolio, some 1500 employees. Over the years, it has established a significant manufacturing presence in the Czech Republic, with well known, 100% owned subsidiary companies like ERA (which is part of the OMNIPOL group since 2011) and the MESIT Group of companies (acquired in April 2018).

OMNIPOL has a proud history of trading in the Czech military aviation sector, in particular with the nation's most successful exported aircraft the L-39 Albatros. OMNIPOL joined the L-39NG (Next Generation) project in June 2015 as the strategic partner and 50/50 financial co-investor alongside our colleagues from AERO Vodochody AEROSPACE. The prototype of the L-39NG was rolled out on the 12th October 2018.

The Main Strategic Partner

OMNIPOL provides a broad range of products and solutions. From passive surveillance systems, specifically the VERA-NG, and related software products, data mining, long-range passive reconnaissance system called SDD, Air Traffic Management (ATM) systems to modern jet and light combat trainer L-39NG. Also included in its portfolio is the re-engineered jet trainer L-39CW, flight simulators, and training programs, weapons, ammunition, and logistics. OMNIPOL also provides training courses to customers, integration, and commissioning of products, production, and technological cooperation or transfer/sale of know-how. OMNIPOL can provide turn-key solutions according to the requirements of its customers. It is worth mentioning the fact that OMNIPOL also supplies the food industry, specialized mainly on brewing, distilling, dairy, bakery and the sugar industry.

OMNIPOL is a leading Czech industrial company, headquartered in Prague, with 85 years of global experience in the field of international trading in defense and security products. We serve customers in more than 60 countries around the world. Export of products on the global market accounts for almost 90% of our profits.

ERA – A Leading Producer of Passive Surveillance Systems

In 2011, OMNIPOL bought ERA, which was a former part of the famous TESLA. The ERA was literally saved from near financial collapse due to the slow growth and under-investment during the period of the previous American ownership. ERA has finally managed to restore itself to the maximum possible extent. Now, ERA is a pioneer and leading global supplier of next-generation surveillance and flight tracking solutions for air traffic management, military, security and airport operations market.

The best-known ERA products are VERA-NG military passive surveillance system with a range of up to 400 km which "sees without being seen" or SDD long-range passive reconnaissance system with a range of up to 700 km. This beyond horizon range radar uses tropospheric scatter effect.

ERA is also a supplier of flight tracking solutions for air traffic management (ATM) systems. More than 130 installations in over 65 countries have been made. The latest success is supplying ATM systems for the biggest Chinese airport in Beijing. In this civil area, ERA recently worked on the MSPSR Sicorra system which enables tracking the airspace using television/radio broadcast transmission.

MESIT – Tactical Radiocommunication Systems in 40 countries

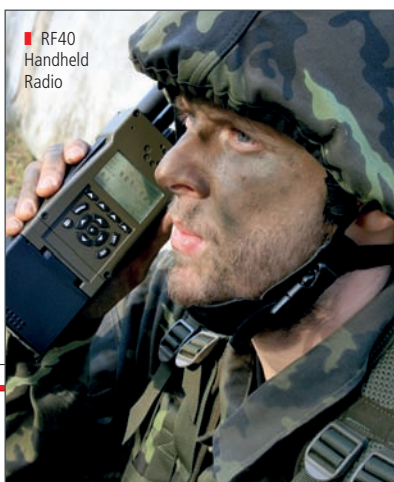
MESIT Group is very proud of more than 60 years of production in the engineering

and electronics industry. MESIT's products are used both in civil and military applications, both in air and on the ground. Typical products of the company are advanced tactical radio communications systems, systems for communication in armored vehicles, control and indication systems for civilian and military aircraft, but also special castings and complex engineering components with unique surface finishes for the field of laboratory and automotive technology. Important customers include government institutions in the Czech Republic and around the world, as well as leading domestic and foreign companies. Our timekeeping equipment can be found in the famous underground CERN laboratory in Switzerland. The major asset of the MESIT holding is not only that it has all the necessary certifications and certificates necessary for design, development, and production, but that it also possesses specific technologies.

From Radars to Jets

OMNIPOL invests in promising projects with high return potential, primarily in the area of surveillance and aeronautics. One of the key projects, together with a manufacturer AERO Vodochody AEROSPACE, is a 50% ownership and strategic investment in the L-39CW and L-39NG aircraft.

The earlier generation of L-39 Albatros is an important part of OMNIPOL's history. Not least over a period of 30 years, OMNIPOL was responsible for exporting almost 3000 pieces of this aircraft. It was not only about the export of the aircraft, but OMNIPOL also successfully took care of complex logistics and servicing for customers. The motivation for this kind of investment is due to the continual interest of present customers to keep L-39's in operation. There are more than 700 L-39's still in operation. The very first step to develop the next-generation L-39NG was the construction of a demonstrator, the L-39CW, which verifies new engine and modern avionics. This project gained necessary certification and is offered to customers, which operate the L-39 as an intermediate step before switching to the L-39NG.



■ RF40 Handheld Radio

MSHORAD

**Safe sky,
secure ground.**



Saab's MSHORAD (Mobile Short-Range Air Defence) solution – including Giraffe 1X, C2 and RBS 70 NG RWS – provides fast, effective surveillance and weapon capabilities. Easily integrated onto any vehicle, MSHORAD protects mechanised units on the move, and is the perfect example of Saab's thinking edge in action.

[Learn more at saab.com](http://saab.com)



SAAB

Military Research Institute

Focus on Engineering, Chemistry, Electronics, and Camouflage



■ **S-LOV-CBRN:** a set consisting of light armoured reconnaissance vehicle S-LOV-CBRN and trailer P-LOV-CBRN. The set is intended to conduct (a) mobile CBRN reconnaissance, (b) long-term CBRN monitoring on observation point and (c) automated remote CBRN monitoring to protect the critical elements of combat formation.

About the Institute

Military Research Institute (MRI) is the only state-owned company operating under the Ministry of Defence which is organized as a research institute.

It provides strategic and other significant interests of the state in the field of defence and security, the development of capacities of the Army of the Czech Republic (ACR), other armed services and the Integrated Rescue System (IRS) of the Czech Republic as well as it performs the activities of industrial and business nature to ensure supplies and services needed to guarantee the defense and safety of the Czech Republic and meets liabilities based on the membership in NATO and the EU.



■ **PAO:** is the advanced active ballistic protection for the current and newly introduced military equipment of the Czech Armed Forces against attacks by RPG and PTRS. The System is designed to protect the entire vehicle, including the ceiling, and is also suitable for the light and moderately armored vehicles. The system consists of detection and tracking subsystem, control subsystem, and countermeasures with an initiating subsystem.



■ **RAPAMEP:** is a passive reconnaissance system designed for detection, survey and identification of radar signal sources. The RAPAMEP is a direction finding ELINT system for fast detection and identification of radar signals in the frequency range from 30 MHz to 1600 MHz.

History

MRI was established on 29th August 2012 by the Memorandum of the Ministry of Defence. It has been established by the continual transfer of specialized activities, capabilities, property, and employees from the subsidiary company VTUO Brno of the state-owned corporation VOP CZ, Šenov u Nového Jičína.

MRI bases its business on the results of 60 year-long performance of its predecessors which took part in military research and development. We are an institution performing business activities with state property under own business name.

MRI is located mainly in the Jundrov district of Brno, in a historic building on Veslařská 230. The main building was built

at the beginning of the 20th century between 1900 and 1904 as a girl's orphanage, later used as a children's home and operated as until the 1950s. Then the building was acquired by the Brno University of Technology, which used it until the 1990s. Then the building was abandoned for three years when in 1999 the Ministry of Defence bought it for its contributory organization Military Technical Institute of Protection Brno.

Main Activities

- research and experimental development in the field of technical sciences serving to satisfy the strategic and other essential interests of the state in the field of defense and security, development of ACR capabilities, other armed services and IRS of the

Czech Republic by carrying out activities of an industrial and commercial nature in providing supplies and services necessary for defense and security the Czech Republic and fulfillment of its obligations arising from its membership in NATO and EU;

- development of ground military equipment, material, and logistics of armed security forces and the integrated rescue system by carrying out industrial and commercial activities, providing supplies and services in their fields of competence, which are:
 - Chemical and biological protection of the ACR, protection of the population against WMD, chemical and nuclear accidents, chemical and electronic terrorism and protection against attacks on important objects of the state infrastructure are dealt with by the **Section of Chemical Biological and Radiation protection**,
 - **Special electronics and camouflage** section conducts research and development of new principles, functions, methods, devices, materials, technologies and means of electronic warfare, interference, and destruction of improvised explosive devices as well as camouflage and deception,
 - Progressive material and technological solutions of armor protection and active protection of military equipment based on current and future needs of the ACR and NATO, provided by the **Material Engineering section**;
- contractual expertise and examinations, secure the training of ACR members, the MoD CR, foreign armies and international organizations regarding the activities related to the detection, identification, protection, and liquidation of the consequences of the use or abuse of weapons of mass destruction;
- accredited testing laboratory No. 1449 provides tests of climatic and corrosion resistance of coating systems and products, mechanical properties of metal and ceramic materials, determination of roughness parameters, metallographic tests, testing of spectral characteristics and determination of color coordinates and color difference values of camouflage materials.

Important Solutions

Thanks to its capabilities in the field of detection and identification of chemical warfare agents, special dosimetry and CBRN protection, CBRN reconnaissance and decontamination of persons, military equipment, materials, objects and communications, MRI was selected in 2018 by MoD CR as a main contractor in delivery of 40 CBRN reconnaissance sets (80 vehicles) S-LOV-CBRN and



■ **SRTP:** a passive reconnaissance system designed for detection, survey and identification of radar and radio signal sources. Its core represents the radio signal analyzer that allows to perform pulse and continuous signal analyzes that are fed to its inputs at the intermediate frequency level with an adjustable bandwidth between 1 MHz and 200 MHz in the frequency range from 0 to 500 MHz.

LOV-CBRN II based of light armored vehicle IVECO LMV.

At home and abroad, our chemical experts are well-known for the organization and leading of practical training and experiments with highly toxic agents in real outdoor environments. There is a modern, well-equipped enclosed working area with complete logistics facilities and a top-notch object of special chemical lagoons at the live chemical training and testing facility Kamená chaloupka.

The MRI has achieved long-term success with projects focusing on reception, processing, analysis and identification of radio and radio spectrum signals, similarly development projects such as radio exploration and jamming operations, active radio jammers, long-range stations and subsequent modernization with digital reception, radio-technical searchers land and air targets, radio searchers.

■ **IGLOO:** a special mobile shelter with excellent ballistic protection against the effects of explosions, projectiles and shell fragments of smaller calibre, including armour-piercing. The effect of the ballistic protection can be increased by paneling of the shelter. The basic version of IGLOO is designed for six people. The modular design allows to create even bigger shelter by inserting additional modules in the middle part.



■ **CHD-016:** highly sensitive detector of nerve CWA. The detector is intended for sensitive detection of agents inhibiting cholinesterase in living organisms. It mainly concerns nerve CWA of „G“ type (i.e. SARIN, SOMAN, TABUN etc.) and „V“ type (i.e. VX), which represent high risk resulting from their toxicity as well as from their physical and chemical properties. Also, it is possible to detect the TIC inhibiting cholinesterase, like selected pesticides etc.

Material engineering has been focusing on research and development of new materials and technologies to ensure the quality of military equipment. Employees participated in the solution of all major projects of development of ground technology and in the material-technological assurance of its production, repairs, and modernization. Many new types of light metal and non-metal armor systems are appreciated. ■

Photos: WVU

The Improved Božena 4+ and Božena 5+ Mine Clearance Systems

The Slovak joint-stock company WAY INDUSTRIES reaches out to its potential customers on the world market with improved versions of its world-renowned remote-controlled demining systems Božena 4 and Božena 5.



The improved remote-controlled demining systems of the Božena family are designated Božena 4+ and Božena 5+. The systems are designed for surface mine clearance of anti-personnel and anti-tank mines. The equipment of the upgraded Božena + types also includes new kinds of additional tools, enabling safe handling of dangerous unexploded ordnance or explosives (robotic handling arm) and its removal. Also available is new special equipment, enabling the Božena + vehicles to collect cluster munition bomblets, cut wires that can be connected to explosive devices, and clear sandy areas, construction sites and demolition sites with a special segregating scoop. Secondary, the Božena + vehicles can also be used to clear the area of interest from the low vegetation, shrubs, and weeds. The Božena 4+ and Božena 5+ systems are designed as compact units with a high level of safety for the operator while ensuring direct supervision of the remote-controlled vehicle.

A new remote control system has also been developed for the modernized Božena

+ family of vehicles, allowing new types of optional equipment to be operated.

Improved mine clearance systems performed both company tests and field trials in Slovakia. The Božena 5+ middleweight demining remote-controlled system represents the latest addition in the arsenal of the Engineer Obstacle Breaching Company of the Engineer Battalion, which is part of the 1st Mechanized

Brigade of the Armed Forces of the Slovak Republic, based at Sered'. In 2018, the Slovak Army ordered four improved Božena 5+ systems, which were delivered to this unit by the end of the last year.

Božena 4+

The main modernization steps in the construction of the remote-controlled vehicle of



The upgraded Božena 5+ is equipped with a T3C-928-81 diesel engine with a maximum power of 270 kW.



■ The Božena 4+ mine clearance system has a more powerful engine, a wider chassis, and a more efficient rotary mine

the Božena 4+ mine clearance system were aimed to improve the serviceability and control of the vehicle. These included the installation of a more powerful engine with higher torque, a wider chassis, a more efficient cooling system, and a more efficient rotary mine flail module – all which led to simplified maintenance. Designers have also increased both the fuel tank and the hydraulic fluid tank capacity. The volume of each tank was increased from 100 to 140 liters.

The remote-controlled vehicle of the Božena 4+ mine clearance system has a total length of 5,200 mm, the length of the vehicle is 3,290 mm, the length of the rotary mine flail module is 2,000 mm, the width of the vehicle (with tracks) is 1,985 mm and the width of the rotary mine flail module is 2,840 mm (the width of the rotor with the attached flails is 2,225 mm). The total height of the vehicle is 2,270 mm.

The total weight of the Božena 4+ system, with the rotary mine flail module installed, is 6,983 kg. The weight of the vehicle itself is 5,576 kg, the weight of the rotary mine flail module is 1,407 kg.

The demined gap behind the vehicle is 2,225 mm wide (which is an increase of 225 mm compared to the original type), the depth of demining is up to 250 mm. The system can withstand explosions of land mines (anti-tank mines, for example) with an explosive charge of 9 kg TNT. The rotational speed of the rotary mine flail module is 350-500 rpm. The maximum demining capacity is cleaning the

area of 3,500 m² per hour (the Božena 4 remote-controlled vehicle of the basic design is limited to 1,800 m² per hour). Improvements in performance have been achieved not only by changing several dimensions but also by the changes in the design (for example, in the new rotary mine flail module, the hydraulic motors are located directly on the shaft).

During the construction of the Božena 4+ vehicle, the DEUTZ BF 6L914 turbo-diesel engine, with a maximum power of 110 kW at 2,500 rpm and maximum torque of 550 Nm at 1,600 rpm, was used. Average fuel consumption is 13.2 liters/hour, maximum fuel consumption is 19.5 liters/hour. The fuel tank capacity is 140 liters. The maximum speed of the vehicle is 9 km/h. The maximum range of the remote control unit is 2000 m. The remote control battery enables up to 14 hours of operation.

Božena 5+

The design of a remote-controlled vehicle of the Božena 5+ mine clearance system has also a number of improvements compared to its predecessor, which further improve its quality and increase overall performance. The upgraded Božena 5+ remote-controlled vehicle is equipped with a more powerful T3C-928-81 air-cooled turbocharged eight-cylinder direct-injection diesel engine with a displacement of 12,667 cm³ fulfilling to the EURO III emission standard. The new engine offers a maximum power of 270 kW and a maximum torque of 1,850 Nm at 1,000 rpm (the T3A-928-301 turbocharged engine used

in the original Božena 5 design has a power of 170 kW and a torque of 810 Nm at 1,400 rpm). The fuel tank capacity of the modernized vehicle has increased to 270 liters (the fuel tank of the original Božena 5 vehicle has a capacity of 160 liters). The drivetrain hydraulic system of the modernized Božena 5+ remote-controlled vehicle operates at a pressure of 40 Mpa, the hydraulic circuit of the working equipment operates at a pressure of 19 Mpa, the hydraulic circuit for additional equipment has a working pressure of 40 Mpa and the hydraulic cooling circuit operates at a pressure of 10 Mpa. The vehicle's cooling system is driven hydraulically, not electrically.

The Božena 5+ remote-controlled vehicle has a length of 4,500 mm, a width of 2,420 mm (each track is 410 mm wide) and a height of 2,560 mm. The rotary mine flail module is 2,510 mm long, has a total width of 3,350 mm, and the width of the rotor with the attached flails is 2,655 mm. The Božena 5+ system, with the attached rotary mine flail module, has a weight of 12,340 kg. The operating range of the remote control unit is up to 5,000 m.

In the low-density soil, with low vegetation cover, the Božena 5+ system can cover up to 5,900 m² per hour, in medium-density soil and vegetation, the system will clear up to 3,400 m² per hour, and in a high-density soil, it can remove explosives from the area of up to 1,500 m² per hour.

Miroslav GYÜRÖSI ■

Photos: author

Patriot II 4x4

Czech company Excalibur Army, belonging to the Czechoslovak Group (CSG) holding, has presented for the first time the new Patriot II 4x4 vehicle at the IDET 2019 trade fair. This vehicle is a medium universal armored vehicle built on a unique chassis designed by the Czech company Tatra Trucks.

A new universal armoured vehicle on Tatra chassis

The Patriot II 4x4, like its predecessor the Patriot 4x4, is a modular vehicle and belongs to the category of vehicles with a weight of 13 to 17.5 tonnes. Thanks to its versatility and modularity, the Patriot II is suitable for combat deployment, patrol missions and reconnaissance operations. It is an ideal platform for command, communication, liaison, NBC protection, and medical vehicles or as a weapon systems carrier. However, it can also find its use among security forces and civilian emergency units, such as police, firefighters, paramedics, security services and others. The vehicle's design enables installation of turrets with manually-controlled weapons up to a caliber of 14.5 mm, remote weapon stations with automatic cannons up to a caliber of 20 mm or grenade launchers. The Patriot II can also be equipped with anti-tank guided missiles or mortars.

Like its predecessor, the Patriot II also uses a Tatra chassis with a central backbone tube, independently suspended swinging half-axles and all-wheel drive. Exceptional characteristics of the Tatra chassis are underscored by the vehicle's ability to overcome vertical obstacles up to a height of 0.5 m, trenches up to 0.9 m wide and gradeability to 45 degrees. Forging depth without preparation achieves the value of 1.2 m. The maximum weight of the new vehicle has increased to 17.5 t, and the Patriot II, unlike the original design, has also increased in dimensions (LxWxH 6,250 x 2,550 x 2,800 mm). The wheelbase has also been extended to 3,650 mm. These parameters enable the Patriot II to be easily carried by transport aircraft and landing vessels.

The Patriot II has also received more powerful engines, which together with its unique Tatra chassis ensures excellent driving abilities in rough terrain and on paved roadways. The Cummins ISL Euro 3 engine is now available with an output of 270 kW, or another option is the air-cooled engine Tatra T3C-928-90 Euro 3 with an output of 300 kW. With them installed, the Patriot II can achieve a maximum speed of up to 110 kph on paved roads, or 45 kph off-road. The driving range of the Patriot II has also been extended, up to 700 km compared to 500 km of its predecessor.

The Patriot II is protected from WMD by an NBC filter-ventilation system, including air

conditioning, and its equipment ensures flawless functionality in all climatic conditions, hot or cold. The armored protection of the vehicle has also been improved. The Patriot II can have ballistic protection of between level 2 to 4, and anti-mine protection at a level of 2a/2b to 3a/3b in accordance with STANAG 4569. There are blast-mitigating seats installed in the cabin; the cabin has also more space for the crew now, and the vehicle floor is designed to minimize the impact of an explosion under the vehicle as much as possible. The Patriot II is also equipped with an automatic fire extinguishing system in the cabin and engine compartment.

Photos: Excalibur Army



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