

№3 [ JULY - SEPTEMBER 2015 ]

# UDR



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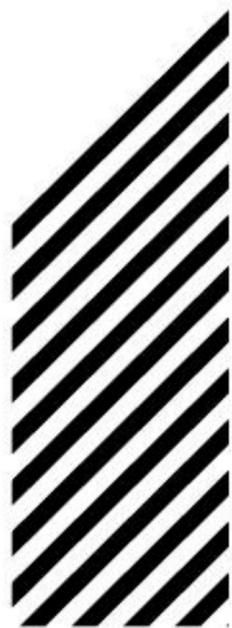


# TARGI KIELCE — THE FOCAL POINT FOR THE WORLD'S DEFENCE SECTOR

## THE 23RD MSPO LAUNCHES IN SEPTEMBER



The 23rd International Defence Industry Exhibition is held from 1st to 4th September 2015 in Targi Kielce; the expo is Central and Eastern Europe's largest business-sector event. Following the previous years' example, MSPO brings together the world's leading and largest armaments and defence-sector's companies. Last year's expo was the showcase for over 500 exhibitors from 27 countries of the world. MSPO 2014 trade show attracted well over 15,000 visitors.



## HIGH-PROFILE AND PRESTIGIOUS EXPO

It has taken the International Defence Industry Exhibition 20 years to advance and become one of the most important exhibitions of the defense industry in Europe and the third largest trade show on the Old Continent, ranked after Paris and London. The high-profile exhibition enjoys the attention of the senior state officials and military officers from all over the world.

MSPO is the only Poland's business sector event of this kind; every year the event held in Kielce attracts several thousands of visitors from all corners of the world, and among them official delegations including representatives of embassies, ministries of defense, senior representatives of the army staffs and the government-level defense bodies from home and abroad. In addition to representatives of all European countries the event has hosted delegates from, inter alia, Brunei, Saudi Arabia and Mexico.

The Kielce defense industry exhibition is the event of special significance for the Poland's defense industry companies. The expo is the meeting platform for leading equipment distributors from home and abroad. For years Targi Kielce has been the showcase for the market's front-

runners, the biggest and most popular armaments companies such as: BAE Systems, Boeing, MBDA, Raytheon, Thales and Saab. Once again the MSPO will be held under the auspices of the Republic of Poland President.

## THE BEST OF THE BEST

It has been the MSPO tradition to be the showcase for all kinds of military gear and equipment and military industry segments. Expo stands will be the presentation platform for aviation equipment, including helicopters and unmanned aerial vehicles, mechanized armoured equipment, military engineering and artillery systems, missiles and anti-aircraft systems as well as most cutting-edge reconnaissance equipment and logistics solutions. This upcoming edition will also feature, among others, modern com-



munications equipment, ITC systems, emergency rescue systems.

## NATIONAL EXHIBITION OF NORWAY

For nine years now MSPO has been accompanied with lead-nation exhibitions; particular countries can present and boast their military industry's potentials. Defence-sector companies put on display the best products and services in their portfolio. Last year the Lead Nation Exhibition featured France. Until then Italy, Turkey, Germany, Israel, the USA, Sweden, the V4 Group Countries and Great Britain had presented their military potentials, gear and equipment. The 2015 MSPO edition will feature Norway in the National Defence Industry Exhibition.

Poland is Central – Eastern Europe's largest economic part-

ner to Norway. Trade and commercial exchange enhancement, as well as economic, scientific, technical and military cooperation possibilities have not been fully utilised yet. Norway will use the MSPO 2015 as a presentation platform for ideas and solutions regarding cooperation with Polish companies representing the sector of defence.

## DISCUSSING MOST IMPORTANT ISSUES

MSPO, in addition to business negotiations and contracts conclusions is also the place to exchange views and observations as well as the stage for a whole array of substantive meetings. Last year's expo programme encompassed almost 40 seminars and congresses; they provide an ideal opportunity

to exchange experiences, to expand knowledge about the latest military technology solutions.

This year's event's programme includes substantive and problem-focused meetings, and among them the Meeting of the Secretaries of State in the Ministry of National Defence, Ministry of Foreign Affairs, the Ministry of Economy, Ministry of the Treasury, Ministry of Science and Higher Education, and the Director of National Centre for Research and Development with representatives of the defence industry,

MSPO's tradition is to bestow accolades and distinctions. The upcoming edition will include the awarding ceremony of the Republic of Poland President's Awards and the Defender Awards. These are presented for the best companies and products showcased at the trade fair. **UDR**

[ opinion ]



## NEW CONDITIONS FOR MTC WITH UKRAINE ARE APPEALING TO NATO, EU COMPANIES

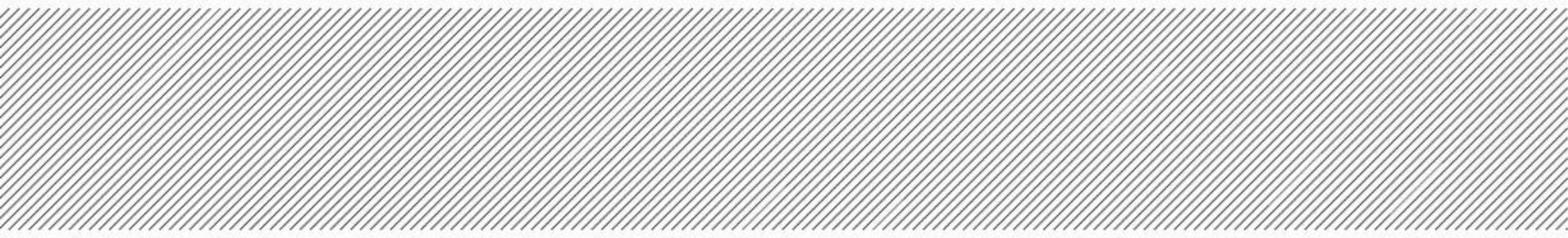
### VALENTYN BADRAK

DIRECTOR OF THE CENTER FOR ARMY, CONVERSION AND DISARMAMENT STUDIES

Ukraine has more than 15 years of experience in military-technical cooperation (MTC) with NATO and EU countries. Unfortunately, however, Ukraine's notorious reluctance to modernize its own military and, to some extent, its inability to play by Western rules preclude high levels of MTC with the West. Western defense companies, for their part, have not demonstrated openness to a flexible defense-industrial cooperation policy towards Ukraine.

### NEW TIMES. CAPABILITIES AND OPPORTUNITIES

It is worth noting that significant changes also occurred within the Ukrainian defense industry. Unlike in the 1990s when



ready-made equipment made up from 8% to 12% (by varying estimates up and down) of the country's total defense production, this level has now risen to 20-25% due to implementation of a range of export market initiatives. Beyond the aforementioned equipment types, new projects emerged such as the Oplot MBT (Kharkiv's Malyshch Factory), light armored vehicles (Kharkiv's Morozov Design Bureau), 'dual-use' and military trucks (AvtoKrAZ Holding Company), radar systems (Ukrspetstechnika), trainer simulators (MATS Holding Company), a variety of upgrade packages for combat aircraft MiG-29, Su-27, Su-25, L-39, and Mi-24 and Mi-8 helicopters, as well as modular assembly of armored military vehicles of all types.

Domestic defense industries now have the capability to produce up to 30% of the range of the AME types required by the Ukrainian Armed Forces and other security sector institutions, according to CACDS' statistics, thanks largely to the emergence and growth of brand new R&D schools of thought, most particularly on precision-guided weapons (an anti-ship cruise missile, a tactical and theater range missile system, a smart bomb etc). An experimental piece of the first indigenous SAM missile system designated Alta was inaugurated at a defense technology exhibition in Kyiv on 24-25 September 2014. Antonov aircraft maker announced being ready to launch a fighter trainer development project, while a number of privately-owned companies said they would intensify developments of new UAV capabilities.



It should be emphasized that, with the launch of the Kremlin's aggression against the Ukrainian State, new, sufficiently appealing opportunities have emerged for Western defense companies. While a persistent lack of funding for homeland defense programs was previously the key hurdle for Ukraine's partnership with the West, Ukraine is now evolving into a capacious market for defense technology.

In this new environment created by Russian aggression in Ukraine, a leap in the development of AME types for the Ukrainian military, particularly through international defense-industrial cooperation has become possible. Ukraine needs to diversify foreign sources of defense technology and manufactured products required by the country's military establishment. Therefore, an emphasis placed on leading-edge Western technology is becoming a must for the growth of Ukraine's capacity to provide its own security.

It should be emphasized that, with the launch of the Kremlin's aggression against the Ukrainian State, new, sufficiently appealing opportunities have emerged for Western defense companies. While a persistent lack of funding for homeland defense programs was previously the key hurdle for Ukraine's partnership with the West, Ukraine is now evolving into a capacious market for defense technology.

This is precisely about the technology, rather than defense products proper, because, given the availability of extensive domestic defense industrial capabilities, there should be no expectation of any significant procurements of arms and military equipment directly from foreign suppliers.

Western partners are now guided by the statement made by Ukrainian President, Petro Poroshenko during festivities celebrating the 23rd Anniversary of Ukraine's independence on 24 August 2014, wherein he promised the disbursement of about UAH40B in funding for technical military modernization programs over the next three years. This is the key signal for European countries to launch cooperation with Ukraine, as this implies opportunities for collaborative R&D and co-production programs and for the development of multinational projects.

Ukraine's Ministry of Defense budget was set at

UAH44.6B (USD2B) for 2015. On 9th February 9, the Government approved a record high level of the State Defense Procurement Order at UAH14B (USD600M), of which 15% is reserved for imported procurements. In addition, it makes provisions for a range of new R&D projects.

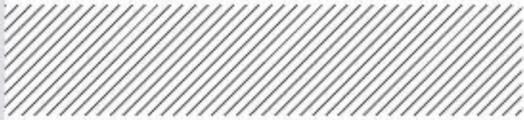
Technical status of the defense industries in Ukraine might be another contributing factor to defense-industrial cooperation between Ukraine and the West. For example, provisions regarding modernization and retooling of production lines and implementation of incentives for critical technology development in selected areas of specialization could be incorporated into offset agreements accompanying major armaments projects. It is known that, due to ineffective, incompetent military-technical policy, Ukraine is lagging seriously in important technology areas such as microelectronics hardware, microprocessor technology and nanotechnology which are all indispensable components of modern armaments. In this context it should be added that the Ukrainian Government, by its decree issued on 24 September 2014, exempted foreign defense companies from customs duties. This is significant in the context of technical modernization of the Ukrainian Armed Forces as the domestic defense industry is obviously not able to proceed as fast as needed with modernization of the homeland defense capacities. Important AME categories such as communications, IS-TAR assets, C4I systems, some weapons types (especially AT-GM and portable SAM systems) as well as some upgraded types of Soviet-built military equipment (particularly fighter airplanes and military helicopters)



could be supplied to Ukraine under the already ongoing programs. Regarding strategic priorities of future cooperation, these include the building of a robust air defense infrastructure in Ukraine; production of helicopters, ammunition and unmanned aircraft systems; as well as the upgrade of gun fire capabilities among other areas.

It might be recalled that Sweden has already stepped up its cooperation in military technology with Ukraine. In October 2014, a team of the Swedish De-

fense Research Institute visited Kiev to meet and talk with executive officials of the Ukrainian defense industry. At the conclusion of the negotiations the parties agreed to develop bilateral projects in the defense technology industry. In April 2015, Ukrainian and Turkish defense industry officials agreed to launch new collaborative initiatives in space, aeronautical and armored industries. According to statistics provided by Ukroboronprom as of early March 2015, the Company added twenty more



countries to its portfolio of international partners in the period between July and December 2014, and partnership talks were launched with Airbus, Boeing, Textron, Lockheed Martin, BAE Systems and Thales.

True, during the earlier part of 2015 Ukraine was more busy with exploring own AME production capacities. As reported by Oleksandr Turchynov, Secretary of the National Security and Defense Council on 9th April 2015, 50 new AME types have already been delivered to forces in the field. At the same time, according a statement made by Volodymyr Bashynsky, head of the Ukrainian Armed Forces' R&D and Test Center on 31st May 2015, defense industries have increased the proportion of AMEs manufactured to NATO standard requirements, while Western countries have intensified their military aid supplies to Ukraine. Particularly the USA, who decided to provide Ukraine with non-lethal defensive equipment on 11th March 2015, delivered initial ten HMMWV vehicles in late March, of the total of 230 vehicles slated for delivery to Ukraine. All those events are contributing to an intensification of MTC

and solidify the ground for further collaboration.

## AREAS OF INTENSIVE SEARCH AND OVERLAPPING INTERESTS

In 2014 NATO and Ukrainian experts resumed consultations on potentialities for developing new MTC projects.

It should be noted that a number of MTC areas have been intensified as a result of the Russian aggression. Privately-owned entities were first to come with their initiatives. HC AvtoKrAZ, for example, launched deliveries of new Cougar and Spartan armored trucks to Ukrainian National Guard units and, joined with Streit Group, developed flat-bottom armored vehicles HMPV-A and Raptor based on its 6x6 KrAZ-6322 truck chassis.

One of potential MTC areas could include a review of previously suspended potentialities. For example, Ukraine has long had the potentialities of assembling helicopters under a license from the American company Sikorsky, as well as assembling (and marketing) Antonov airplanes (equipped with

Pratt & Whitney powerplants) joined with U.S. partners. Another promising long-term cooperation project calls for getting Ukraine engaged as partner in the development and production of target missiles for use under the US national missile defense (NMD) program (previously Ukraine refused to participate due to Russia's concerns). Now that Ukraine terminated the servicing of SS-18 ICBMs of the Russian Strategic Missile Forces in 2014, and Russia announced a refusal to continue buying airplanes and Motor-Sich engines from Ukraine, not only the resumption of said projects looks realistic but sensible as well.

One more potential MTC area could encompass projects to adjust Ukrainian technologies to new conditions. First and foremost, we are talking about aircraft industry projects. It would be fully realistic to give a new lease of life to military transport and specialty aircraft projects designed and built by Antonov, such as the AN-70 and AN-178. According to Antonov's officials, other promising projects for MTC between Ukraine and the West include the An-148-300MR maritime patrol and border surveillance aircraft, the An-148T light military transport aircraft with a loading ramp, and the An-178 medium military transport aircraft with a loading ramp. The An-178 has now become a priority project for Antonov as the new aircraft made its successful maiden flight in May 2015. If accepted for MTC projects, the aircraft could be offered equipped with a Western-supplied powerplant, avionics and some other key subsystems. Regarding the An-70, the talk could be about Western defense companies replacing Russia who previously was key partner in this project.

So there are all the conditions -- political, technological, economic, intellectual -- required for the growth and expansion of MTC between Ukraine and Western defense companies.

The potential areas of partnership could include a previously suspended initiative on co-development and marketing of sonar equipment. In 2007-2008, the Kyiv Research Institute of Hydroacoustic Instruments and STN ATLAS Elektronik GmbH of Germany were co-working on a project to develop and market an active sonobuoy system. The same goes for projects on overhaul and upgrade of Soviet-built helicopters.

provided through imported supplies; the quality of live video data links is far below world standards; there have been none of high-tech secured wideband data links under development; satellite communication capabilities have not been implemented etc.

Several years ago Ukraine announced intent to develop an indigenous helicopter, which could be an appealing opportunity for Sikorsky, but with the proviso that the partners will

longer term perspective looks pretty feasible, and the more so as Kyiv Research Institute Kvant proceeds with the development of a multipurpose active phased array radar system (PHOENICS-E), a shipboard radar-optical fire control system for medium-caliber guns (Stilet), an opto-electronic fire control system for small to medium caliber guns (Sarmat-2), as well as the shipboard optronic countermeasures equipment kit Facet, the optronic naval helicopter landing system Saga, the Infrared threat detection system Selena-X, the electromagnetic interference reducing system Sovmestimost; and the shipboard combat management system CMS that are all included into the Indigenous Corvette program. This ambitious program cannot be implemented other than with a high-level MTC.

A great many projects developed under export contracts could be used as basis for development, in active partnership with Western defense companies, of new AME types for the Ukrainian military. Particularly in 2014, special instrument factory Arsenal in Kyiv launched production line for the upgraded IS-90 infrared-homing AAM seeker head. Now in production for an export customer, it could well be used as baseline for a project specifically focused on the Ukrainian military's requirements.

So there are all the conditions – political, technological, economic, intellectual – required for the growth and expansion of MTC between Ukraine and Western defense companies. Other success factors may be laying in the domain of political will, both of the Ukrainian government and the EU and NATO governments. **JDR**



Still the key focus in MTC with Western defense companies should be on new high-tech developments, which could be used by partners for enhancing their respective homeland defense capacities. The following are some illustrative examples. Ukraine is extremely interested in developing robotic vehicles using domestic R&D and manufacturing capabilities, but Ukrainian engineers have traditionally had problems with payload equipment. Gyroscopes and other components are

need to make certain compromises. JSC Motor Sich with its 30,000 employees must become a key partner in this program.

In a situation where there are varying opinions as to the re-establishment of the national Naval Forces, the indigenous corvette program has been put on hold for known reasons (limited resources and the urgent need to build a robust coastal defense and coastal fortification infrastructure). But resumption of the program in a

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[ selling ]

# PROCESS IS UNDERWAY:

ANOTHER SHIPMENT OF OPLOT-T ARRIVED IN THAILAND

At the beginning of summer 2015, the second shipment of five T-84 Oplot main battle tanks arrived in the Kingdom of Thailand. The Ukrainian tanks produced by the State Company "Malyshev Plant", Kharkiv, arrived to the Port of Sattahip (Thailand) where they were discharged and directed to the place of acceptance testing. After the final testing by the Thailand side, the tanks will be finally accepted under the terms of the contract.

The shipment of the second batch of Oplot tanks is part of a deal signed in September 2011 between SC "Ukrspesexport" and operational command of the Royal Thai Army. The deal includes the supply of 49 Oplot main

battle tanks and two armored repair and recovery vehicles built on the Oplot MBT chassis. The overall cost of the contract exceeds USD 240 million. Deliveries under the contract were to be completed during 2014. Thailand was the launch export customer for the Oplot MBT.

Malyshev began work on the Thai contract in April 2012. Un-



der the terms of the contract, the initial five vehicles were to be delivered to the Customer in December 2012. The delivery date was then postponed to May 2013, but was not met either. The five vehicles were completed and ceremoniously demonstrated in Kharkiv on 15 October 2013, and arrived by sea in Thailand on 4 February 2014.



Afterwards, Malyshev ran into serious problems meeting deadlines under the Thai contract, related to the resumption of MBT vehicle production after a decade of suspension and, on a parallel track, the need to provide urgent operational requirements to the Ukrainian forces deployed in the antiterrorist operation area in eastern Ukraine.

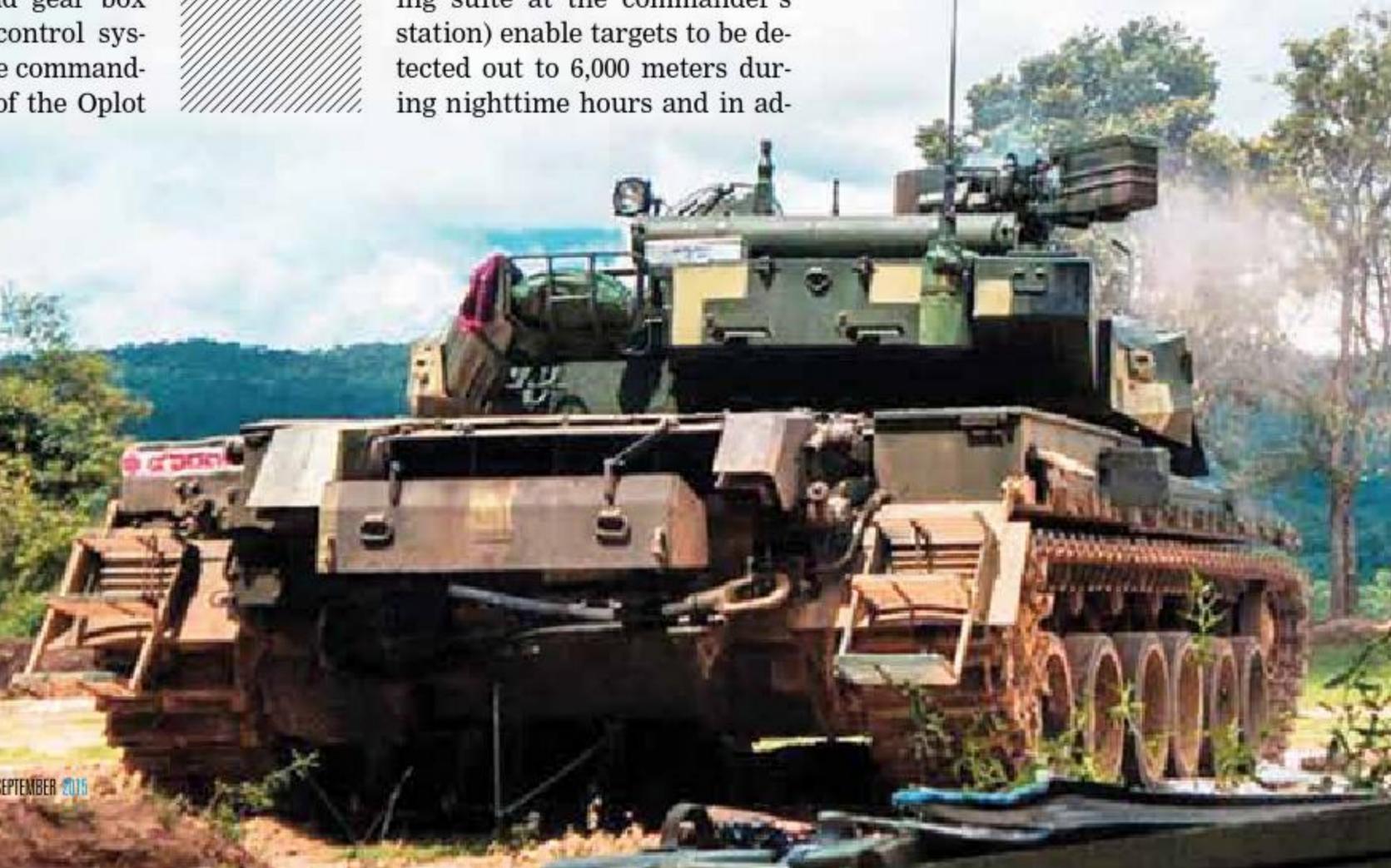
For these reasons, Malyshev, who was obliged by the contract to deliver the second shipment of ten Oplot-T MBT vehicles by the beginning of 2015, was able to deliver only five vehicles that arrived in Thailand on 31 May.

The T-84 Oplot main battle tank, which entered service in the Ukrainian Armed Forces in 2009, is the most recent development by Ukraine's school of thought on battle tanks. Designed and developed by the Kharkiv Morozov Machine Design Bureau, the Oplot is a heavily upgraded version of the T-80UD MBT, offering significant enhancements that improved the vehicle's hitting power (accomplished by way of upgrading armaments and fire control capabilities), battlefield/strategic mobility performance (power pack compartment) and protection level (reduced vulnerability to current-generation armor piercing threats). In fact, the Oplot tank is a different design that is distinctive from the T-80UD by protection system, turret and hull configurations, fire and driving controls, situational awareness capabilities, engine and gear box etc. The new fire control system enables both the commander and the gunner of the Oplot



MBT to better identify targets - and at longer distances - both in nighttime and daylight conditions. The commander has been given a new panoramic observation and sighting capability, while the gunner obtained a new tank sight. The sighting equipment incorporates French exported Thales Catherine thermal imager. New thermal imaging sights (Buran-Catherine at the gunner's station and panoramic observation and sighting suite at the commander's station) enable targets to be detected out to 6,000 meters during nighttime hours and in ad-

verse weathers. The Panoramic sighting system is designed to provide enhanced situational awareness capability to the commander and makes it possible for the latter to override the gunner and lay and fire the main cannon using his duplicate controls. Types of ammunition that can be fired by the main cannon include APFSDS (armor-piercing fin-stabilized discarding sabot), HEAT (high explosive anti-tank) and HE-



FRAG (high explosive fragmentation) rounds as well as 125mm Kombat-type laser beam-riding guided missiles. The total allowance of ammunition of the T-84 Oplot tank includes 46 gun rounds (of which 28 are positioned in the carousel-type loader), 1,250 rounds of ammunition for the coaxial KT-7.62 machine gun, 450 rounds for the KT-12.7 anti-aircraft machine gun, 450 rounds for the AKS submachine gun, 12 rounds for the pyrotechnic pistol, ten F-1 hand grenades and 12 aerosol grenades.

The tank's protection system underwent a massive upgrade. The overall survivability of the T-84 was further enhanced by adding an optronic countermeasures system consisting of three key subsystems: the laser threat warner (to give warning of impending attack by laser-guided weapons), the infrared jammers and the smoke/aerosol screen laying system. For improved battlefield survivability, an indigenously-designed latest-generation integral explosive reactive armor package – known as tandem Duplet ERA system -was provided for the turret and the hull sides. The combination of passive armor and integral explosive reactive armor makes the Oplot

tank considerably less vulnerable to the full range of state-of-the-art anti-tank weapons with tandem warheads, designers say. The power pack compartment in the T-84 Oplot tank features thermal signature reduction technology in the form of heat insulation devices mounted on its top deck, this resulting in thermal signature of the tank reduced by 20 percent. For enhanced tactical mobility, the Oplot tank is equipped with a brand new diesel engine, the 6TD-2, developed by the Engine Design Bureau of Kharkiv.

Developing 1,200 hp, the engine is designed to give good performance in all weather conditions, especially at high ambient temperatures. Although a diesel engine, the 6TD-2 will also run on other fuels including petrol, kerosene, jet engine fuel or their mixture in any proportion. The capacity of the internal fuel tanks is 700 liters, with an additional 440 liters being stowed in the fuel tanks positioned above the tracks. This gives the T-84 a fuel distance of 450 kilometers. The Oplot features an automated gear shifting in place of a mechanical gear selector, which, combined with new driver's steering controls (the driver now steers the vehicle with a steer-



The new fire control system enables both the commander and the gunner of the Oplot MBT to better identify targets - and at longer distances - both in nighttime and daylight conditions.

ing T-bar rather than tillers), allowed the load on the driver to be reduced 2-2.5-fold during lengthy rides, and driving speed to be increased by 5 percent. As claimed by the designers, the Oplot tank encompasses the technical and design solutions, which make it a state-of-the-art fighting vehicle that outperforms some of its counterparts such as the Abrams, Leopard or the T-90 in the level of protection, the amount of firepower and maneuverability performance.

The Ukraine has offered the tank Oplot in standard version for Pakistan. In July, <http://defence.pk> site reported that the Oplot has been considered over the MBT 3000 and Pakistan will not pursue the Chinese tank. 

# Oplot

## MAIN BATTLE TANK

### A LOOK THROUGH THE ARMOR

Ukraine developed and was producing two main battle tanks, the T-34 and the T-64 that were considered revolutionary new at their own time. The T-84UD MBT and its follow-on upgrade in the guise of the state-of-the-art Oplot MBT (which is now wholly produced in Ukraine) is one of the most outstanding achievements of Ukraine's armored vehicle industry and the domestic school of thought on main battle tanks.

### TACTICAL MOBILITY

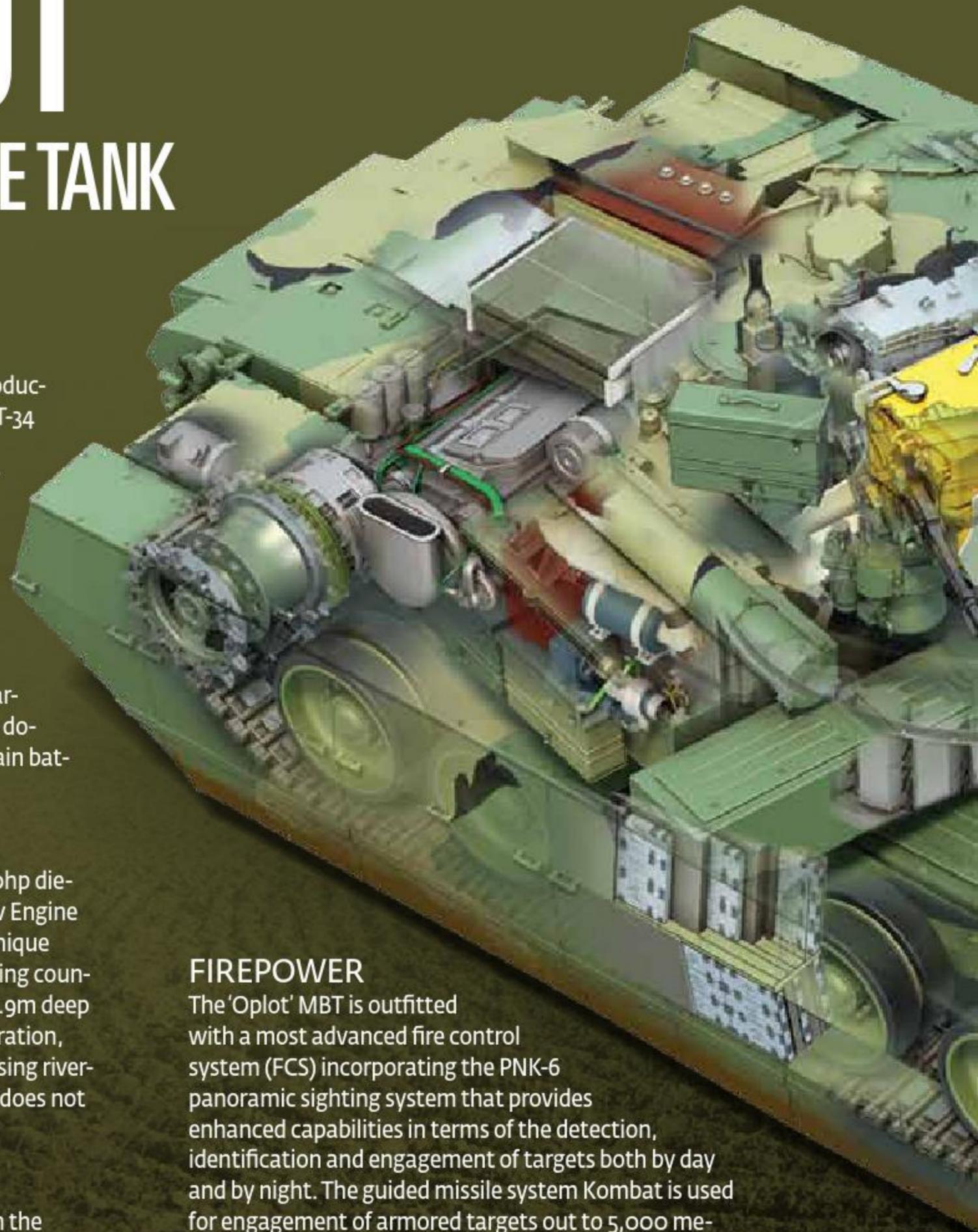
The Oplot is powered by a 1,200hp diesel engine developed by Kharkiv Engine Design Bureau. The vehicle is unique among all of the currently existing counterparts by the ability to cross 1.9m deep water obstacles without preparation, while preparation time for crossing river-line obstacles of up to 5m deep does not exceed 20 minutes.

### SELF-PROTECTION

The Oplot MBT is equipped with the Duplet explosive reactive armor (ERA) system developed by BSCT Microtech, Kiev. The Duplet provides a 100 percent probability of success against all of the currently existing antitank weapons attacking from common course firing angles.

### FIREPOWER

The 'Oplot' MBT is outfitted with a most advanced fire control system (FCS) incorporating the PNK-6 panoramic sighting system that provides enhanced capabilities in terms of the detection, identification and engagement of targets both by day and by night. The guided missile system Kombat is used for engagement of armored targets out to 5,000 meters, while standard tank rounds are employed against targets at distances up to 2,500 meters away. Gun firing range is set at 4,000 meters (at least 2,800 meters in all conditions of vehicle operation) for APFDS rounds and 10,000 meters (at least 2,600 meters in all conditions of vehicle operation) for HEAT/HE-FRAG rounds.





## COMMAND AND CONTROL

The introduction of information technologies into newly designed and upgraded armaments and military equipment is becoming a major factor that determines the level of their compliance with modern trends. The Oplot tank is currently the only fielded weapon system in Ukraine that is equipped with a command and control information management system (IMS) interfaced with the tactical C4 network. Developed by Lviv Scientific Research Institute of Radio Engineering, the TIUS-NM navigation support system supports data communication with armored units up to the battalion level. Its range of functionality includes the following: computing the current coordinates and directional angle of the host vehicle on the move, using the SN-370003 radio-navigation equipment NAVSTAR/GLONASS; gathering of information about the subordinate tanks' location; route setting (up to 10 routes) by setting up to 50 waypoints for each route; receive/transmit of commands with coordinates of point of destination; providing the information for the driver about the value and direction of the tank angle of turn to the point of destination; input and storage of data on authentication codes; display on the commander's panel of coordinates of subordinate vehicles (from an individual tank through platoon-level to company-level and up to battalion-level tank units), using the SK-42 reference system; receive/transmit of text messages (commands, requests) input by means of key-boards.

Digitec Visual  
Engineering,  
Alexander Kostur

[ direct speech ]

# PRACTIKA LAUNCHES PRODUCTION OF SECOND-GENERATION EVOLUTION OF ITS ORIGINAL *KOZAK* LIGHT ARMORED VEHICLE



R&D and Production Company Practika of Kiev has launched production of the second-generation improvement to its armored Kozak vehicle, designated the Kozak-2. This was preceded by a successful demonstration and testing of the vehicle by the Ukrainian border guards, who gave positive feedback on the performance of new vehicle. Sergiy Vilkov, Business Development Manager at Practika told Defense Express about the capabilities and features of the new vehicle and about what makes it different from the baseline Kozak.

**What are the key features that differentiate the Kozak-2 from the previous-generation design?**

The Kozak-2 is essentially an improved variant of the first-generation Kozak vehicle; it incorporates the improvements that we developed back in 2008-09. The second-generation Kozak is larger, more capable and better protected, and, in its transport configuration, can carry more passengers. The Kozak-2 is built on the Iveco Eurocargo 4x4 chassis allowing for gross vehi-

cle weights of up to 15 tons, well above its 11-t empty weight.

**Does it mean it was designed with a payload capacity of 4 tons?**

This is true for the vehicle provided with the Level Four protection by the Ukrainian PZSA standard, which is equivalent to Stanag-4569 Level I protection. With the level of ballistic protection improved to Stanag-4569 Level II (or from Level Four to Six by the Ukrainian standards), the



empty weight will rise to 12.5 tons and GVW will be lower at 2.5 tons.

**There is much emphasis currently on anti-mine blast protection. How is this challenge dealt with in this vehicle?**

The vehicle was designed with a comprehensive range of anti-mine blast protection measures to provide the crew and passengers with an enhanced level of protection and overall survivability. First, the Kozak-2, like its older sibling, has modular layout where individ-



ual modules are not connected rigidly to each other, meaning the engine protection module affected by a mine blast under a front wheel, for example, will be thrown aside and away from the vehicle without transferring the energy of the blast wave to the crew module, as would be the case with rigidly connected modules.

But this is only one of the protective measures. The second is a V-shaped hull bottom designed to absorb and deflect part of the force of explosions away from passengers inside the armored



hull. This is complemented by a multilayer floor that too absorbs part of the detonation energy and additionally reduces the secondary effects of fragments being projected inside the vehicle.

It is no small detail that the vehicle has a high ride height, which is an important survivability factor given that detonation energy decreases as the third power of the distance.

In regard to the level of anti-mine protection, our challenge now is to improve this to 6kg TNT blast under any wheel or anywhere under the hull.

**What about the design of the seats?**

The vehicle has blast attenuating seats that we developed by ourselves leveraging on international expertise and experiences. The seats are fitted to the ceiling rather than the floor of the vehicle since the vehicle roof absorbs least energy that is transferred through the vehicle hull in a blast event.

**Is there provision made for foot rests?**

There is some trouble there. We offered a detachable design for the foot rests, but were told that soldiers will not use them anyway because it would impair comfort of ride. In addition, our seats are provided with a five-point harness (that will hold the occupant in place in upward “lift-off” movements and downward “slam-down” events) which soldiers are reluctant to use either. It is indeed an issue that soldiers tend to do as they like. In MRAP vehicles of the Italian Army, for example, there is a steel rod placed under seat to prevent things being stowed under the seat and thus keep in place the gap between the seat and the floor.

**What about the seats for the driver and front passenger?**

22 July 2015  
National Guard  
received 10  
Kozak-2 armored  
vehicles

We attempted to make these two seats suspendable but gave this up for adjustability issues. So we picked an “interim” solution where driver and front passenger seats are resting on airbags that serve as an energy attenuating layer against impact loads.

**Is the troop compartment designed to carry 10 or 11 troops?**

This particular modification of the Kozak vehicle accommodates nine troops, but in transport configuration, there are seats provided for eleven soldiers. In follow-on configurations (following a worldwide trend, we intend to use the Kozak as the basis for a line-up of other armored vehicles to include reconnaissance, command, medevac and mortar vehicles and other configurations) the number of troop seats will vary depending on the purpose of the vehicle.

**Are the seats easy to dismount?**

They are pretty easily dismountable, but not in field conditions. The seats can be removed as needed to reconfigure the vehicle for a transport mission.

**Is the Kozak-2 a unibody type vehicle?**

No, it has body-on-frame construction, but follow-on modifications will be of the unibody type like the one used in the Turkish Cobra-2.

**The Kozak-2 is built on a frame fitted with add-on armor protection. What is this protection like?**

For this protection, we use 12mm-thick Stanag-4569 Level 2 compliant armor steel plates produced by Miilux in Finland. But despite their rigid standards and respect for their quality certification, we subject the plates to live fire testing.

**Is this because of the difference of the standards used?**

As a matter of fact, even the Stanag-4569 Level 2 requires a higher-level protection than does the Ukrainian PZSA standard Level 6. Still we employ the Ukrainian PZSA standard because relevant protection levels are proven by compliance certificates issued by our in-house certificate authority. For this purpose, we use not the 12mm-thick homogenous steel plate but a three-layer plate with a splinterproof spacer.

**Is this made from Kevlar or rubber-based material?**

This is not the Kevlar, but a different material which doubles as a heat insulator. We subjected it to live fire testing with excellent results.

**What about the engine and transmission?**

The engine is the 280hp/950 torque Iveco coupled to a ZF mechanical transmission.

**And the glasses?**

The glasses are of our own make, produced using a manufacturing technique that is commonly used for all types of bullet-resistant glasses.

**Are Michelin tires used, or can any tires be adopted for the Kozak-2 vehicle?**

Any tires will suit. The vehicle is currently fitted with Michelin tires, but other types of tires would be a better choice because the Michelins are too expensive as consumable items such as tires. Rosava tires, for example, would be a good replacement.

**Is there an automatic tire inflation (ATI) system provided?**

Unfortunately, none of Iveco vehicles is provided with an ATI system. But, if there is a sufficiently large order (for 200 vehicles, for example), Iveco will be able to make a customized variant fitted with an ATI system. But in any case tire inflation is useless against tire fractures or punctures due to bullet impact. This issue is dealt with globally by using the run-flat inserts.

**Can the run-flat tire inserts be integrated into the standard equipment fit for the vehicle?**

Yes, indeed. We buy the run-flat inserts from a British supplier. The inserts are optimized for use on all-terrain vehicles. Even though they are more expensive to buy, they show better performance on this type of vehicles.

**The ground clearance height is set at 400 mm...**

392 mm, to be precise. Besides that, the vehicle can ford water up to 1,400mm deep without preparation.

**Does it mean the cab is overpressurized?**

Yes, it is, to a certain extent.

**Is the vehicle provided with an air filtration system?**

Yes, it is fitted with an air filtration and ventilation system. Previously we used the Russian-supplied FVU-100 equipment, but finally we gave it up because it is too bulky and too expensive, and recently it became unavailable for known reasons. We would be happy to use a Ukrainian equivalent if it were available on the domestic market. So we have picked a ventilation filter system from a Turkish supplier.

**What types of situational awareness equipment are provided for the Kozak-2 vehicle?**

The weapons module on the vehicle roof comes complete with a daylight camera system, and there is room provided for a thermal imager and a laser rangefinder. But the problem is that the latter two are too expensive to buy, adding significantly to the overall cost of the vehicle.

**What kind of navigational aids are used?**

There is a GPS receiver system, which provides good performance but costs correspondingly high, at \$10-11,000. Indeed, it's cheaper to buy than a radio navigation system, still it's too expensive. The vehicle could also be equipped with a thermal imaging camera to facilitate nighttime driving. There are commercial cameras available for equipping VIP-class vehicles, but they are optimized for highway driving. They provide a good range performance, but with narrow field of view, while military-grade vehicles require wide FoV thermal imagers like the FLIR, for instance. But this, again, adds to the overall price of the vehicle. The problem there is that less important equipment consumes the money needed to purchase the equipment that is really essential.

**Is a remote weapon station or a manned turret installed on the roof?**

Both options are possible. In terms of the weapon station, it is controlled remotely with a joystick type control. A different type of control would suit, still joystick is a more ergonomic choice. There is also provision made for a glove-compatible key-board control. In terms of the manned turret, it can accommodate any weapon of up to 12.7mm caliber meeting specific Customer specifications.

**What type of communications equipment is used on the vehicle?**

This includes a radio produced by Orion in Ternopil, which has been fielded with Ukraine's Armed Forces.



# IRON HEART

Ukraine could be justifiably considered one of the world's established trend-setters in the tank diesel engine area.

State-of-the-art tank engines developed by Engine Design Bureau of Kharkiv (EDBK) meet the most demanding standards in this field, and they integrate innovative solutions that could propel them to a new level of quality. EDBK has developed a number of new items which have already earned themselves favora-

ble reputation both on the domestic and export markets.

The Company has recently completed R&D on a new family of three-cylinder diesel engines designed for installation on lightweight armored fighting vehicles in the armored personnel carrier (APC) and infantry fighting vehicle (IFV) categories. One of the Company's most recent designs is a two-stroke reciprocating 700-hp engine designated 5TDF, which offers unique performance capabili-

ties in terms of power-to-weight ratio, weight and bulk, and is claimed to have determined the overall outlay design of the T-64 MBT.

Using a five-cylinder engine as baseline design, EDBK has developed more capable six-cylinder configurations – the 6TD-1 generating 1,000 hp, 6TD-2 developing 1,200 hp, and 6TD-3 – with 1,400 hp intended for integration with the T-80UD MBT the T-84 MBT, respectively.

## 3TD FAMILY OF TANK DIESEL ENGINES

**5TDF** is designed for installation on the T-64 MBT

**5TDFM** is designed for installation on the T-64BM MBT

**5TDFMA** is suitable for installation on the T-72 MBT.

The **6TD-1** is designed for T-80UD and BULAT MBTs,

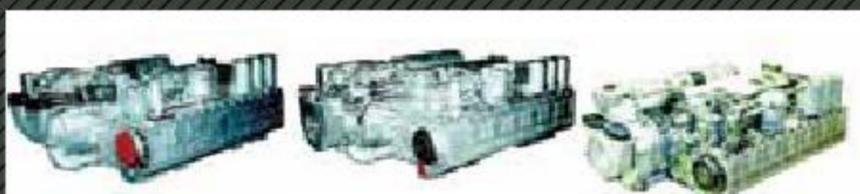
The **6TD-2** is designed for T-84 MBT.



	3TD-1	3TD-2	3TD-3	3TD-4
Output, kW/hp	205.9/280	294.2/400	367.75/500	441.3/600
Number of cylinders	3	3	3	3
Displacement, l	8.15	8.15	8.15	8.15
Crankshaft rotation rate, min <sup>-1</sup>	2,600	2,600	2,600	2,600
Specific fuel consumption, g/kW (h/hp h)	224.49 (165)	224.49 (165)	224.49 (165)	224.49 (165)
Length, mm	1,231	1,231	1,182	1,182
Width, mm	955	955	955	955
Height, mm	581	581	581	581
Weight, kg	850	850	800	800



## 6TD FAMILY OF TANK DIESEL ENGINES



6TD-1	6TD-2	6TD-3
735 (1,000)	882 (1,200)	(1,400)
6	6	6
16.3	16.3	16.3
2,800	2,600	2,850
214.8 (158)	217.7 (160)	(160)
1,602	1,602	1,698
955	955	955
581	581	581
1,180	1,180	1,210

## 5TD FAMILY OF TANK DIESEL ENGINES



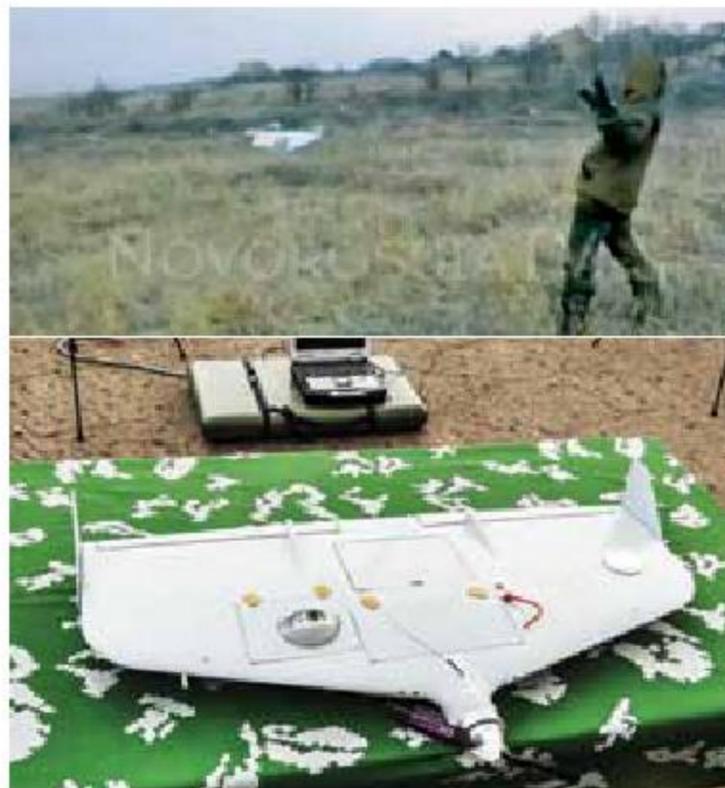
5TDF	5TDFM	5TDFMA
515 (700)	625 (850)	772 (1,050)
5	5	5
13.6	13.6	13.6
2,800	2,800	2,800
231.14 (170)	227.21 (167)	227.21 (167)
1,413	1,413	1,413
955	955	955
581	581	581
1,040	1,040	1,040

# DONBAS HAS BECOME A RUSSIA'S NEW MILITARY

The ink was not even dry on the latest UDR publication containing evidence of the presence of the newest Russian weapons in eastern Ukraine when the Kremlin staged another "display" of Russian armaments deployed to Ukraine.

Russia's defense industry continues working up a sweat delivering a broad range of armaments to the territory of Ukraine. Unfortunately, the Donbas, which prior to war had been one of Ukraine's richest and most highly industrialized regions, is now being turned by Moscow into a testing ground for its recent weapons designs. Ukrainian Defense Review already wrote about the Russian military equipment deployed to Donbas (see "Donbas has become a Testing Ground for Russia's New Military Capabilities" in the previous edition of this publication). However, the range of the Russian equipment described in that article has now become a little bit wider.

In February 2015, a video footage made by separatists outside Debaltseve on 14th February 2015 was posted on the internet showing the Moscow-backed rebels launching two UAV drones, which were clearly identified as Granat-1 and Granat-2 (both have been adopt-



Granat-1 UAV seen here operated by rebels outside Debaltseve (Ukraine) in February 2015 (above) and displayed at Alabino exhibition, Russia, in 2013 (below)



Granat-2 UAV seen here operated by rebels outside Debaltseve in February 2015 (above) and displayed at Alabino exhibition, Russia, in 2013 (below)

ed for service use by Russia's Armed Forces).

The Granat-1 is a surveillance drone designed for near-real-time monitoring of the ground situation, specific objects of interest, roads and hostile personnel and equipment movements. The drone has been officially adopted for service in the Russian Armed Forces and is now used extensively by Russia's military. The press office of Russia's Southern Military District Command reported that initial deliveries of the Granat-1 drones began in late 2013. Afterwards, in early July 2014, it was reported that the drones were used in Russian military maneuvers at the Totsk training ground, Orenburg Region, providing targeting data to self-propelled Msta-S 152mm howitzers. The guns successfully struck camouflaged simulated "enemy" command posts using the coordinates provided by a Granat-1 drone.

The Granat-2 UAS, developed by Izhmash – UAV Systems OJSC, benefited extensively from the experience gathered by the company with its UAS called "Grusha". In 2010, Izhmash – UAV Systems completed R&D on the UAS project called Navodchik-2. The Granat-2 is described as a man-portable, surveillance UAS equipped with both optical photo/video and thermal vision cameras for

# TESTING GROUND FOR CAPABILITIES. PART 2

24hr surveillance. It fared well during training exercises of Russia's Central Military District's artillery units in the fall of 2014, providing target cueing for MLRS «Uragan» and 152mm howitzers Msta-S.

On 21st May 2015, members of the Ukrainian Dnipro-1 regiment, during a joint operation with the Special Operations Center, shot down a Russian UAV «Forpost» (aka Searcher) near the Vodyane village in Donetsk Oblast. The Forpost/Searcher UAV is produced in Russia by Urals Civil Aircraft Factory, under a \$400M licensed production agreement with Israel Aerospace Industries (IAI). According to reports available as of January 2014, at least six «Forpost» UAS, including ground control stations, were fielded with the UAV unit at Yelizovo airbase on the Kamchatka Peninsula.

The Forpost UAS is equipped for real-time surveillance and gunfire spotting as well as for attacks on ground targets.

In this context it should be added that Ukrainian border guards shot down a Russian Zastava drone (for description see UDR # 2/2015) on 27th July 2015. The aircraft, which flew 1.5 km into the Luhansk Oblast, was shot down while gathering intelligence on the location of Ukrainian forces deployed some 25 km from



Forpost UAS vehicle (serial number 923) seen here after being shot down outside Avdiivka (Ukraine) on 21st May 2015 (above) and the very same vehicle seen here being assembled at Urals Civil Aircraft Factory, Russia, in 2013 (below)

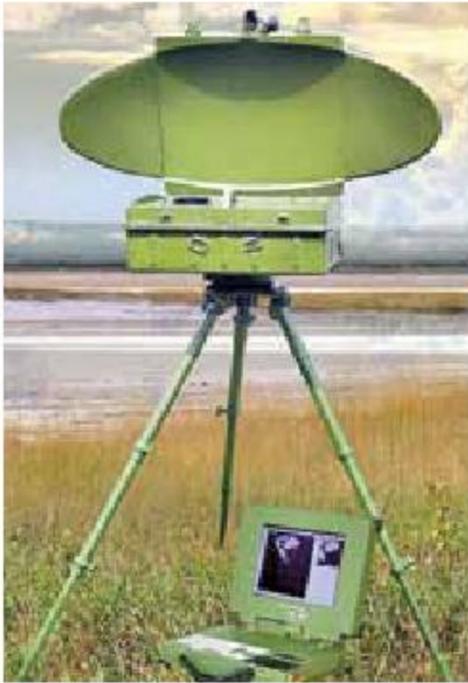


ECM system R-330Zh (also known as Zhitel) seen here deployed outside Makiivka (Ukraine) in the summer of 2015 (center) and outside Khankala, Chechnya,(RF) in 2011 (lower right)

the nearest frontline bordering the self-styled Luhansk People's Republic. The Zastava is essentially the Bird Eye 400 UAV, but manufactured in Russia under a 2012 agreement with IAI.

During an OSINT operation, InformNapalm.org found pictures of a Russian member of the Vostok (East) militant group showing him standing against the background of an ECM station R-330Zh «Zhitel» deployed outside Makiivka. Designed and produced by Scientific Innovation Company Protek in Voronezh (which is incorporated with EGO-Holding Company), the ECM system R-330Zh Zhitel is intended for the detection, direction finding and jamming of RF signals to/from GSM 900/1800/1900 cellular communication base stations, man-portable stations of Inmarsat and Iridium satellite communication systems, as well as for jamming NAVSTAR/GPS signals at ranges of up to 20-30 km. The station can operate either singly or in linked pairs, as master or slave to the automated P-330KMK electronic warfare suite (also known as Diabazol).

One station of the P-330Zh «Zhitel» ECM system is known to have been deployed since 2011 with the ECM squad of Russia's Southern Military District's 18th Independent Guards Motorized Infan-



Russian PSNR-8M ground situational awareness system seen here operated by members of the Khan illegal armed group in the Donbas area (left) and pictured in the manufacturer's promotional book brochure (right)

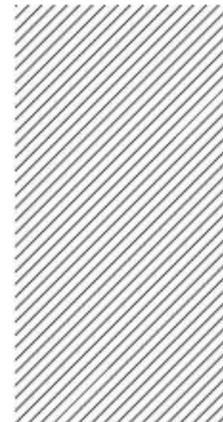
try Brigade, which is based in Khankala, Chechnya.

On 25th July 2015, it was reported that the illegal armed group «Khan», which is deployed to the Donbas area, employs a ground situational awareness system identified as Russian PSNR-8M, as seen on numerous pictures and videos posted by rebels on the internet. The PSNR-8M system can detect a variety of objects and targets at distances up to 32.4 km, under any atmospheric conditions and in zero visibility, in smoke and dusty environments, and it can also see through aerosole camouflage screens. The system was used by scout squads of the Russian Armed Forces' Southern Military District's motorized infantry brigade for determining coordinates of aerial and ground targets during military exercises held at Prudboi ranges, Volgograd Region, in February 2014. With a standard power supply, the PSNR-8M system can operate continuously for 12 hours, at temperatures as low as up to -40°C.

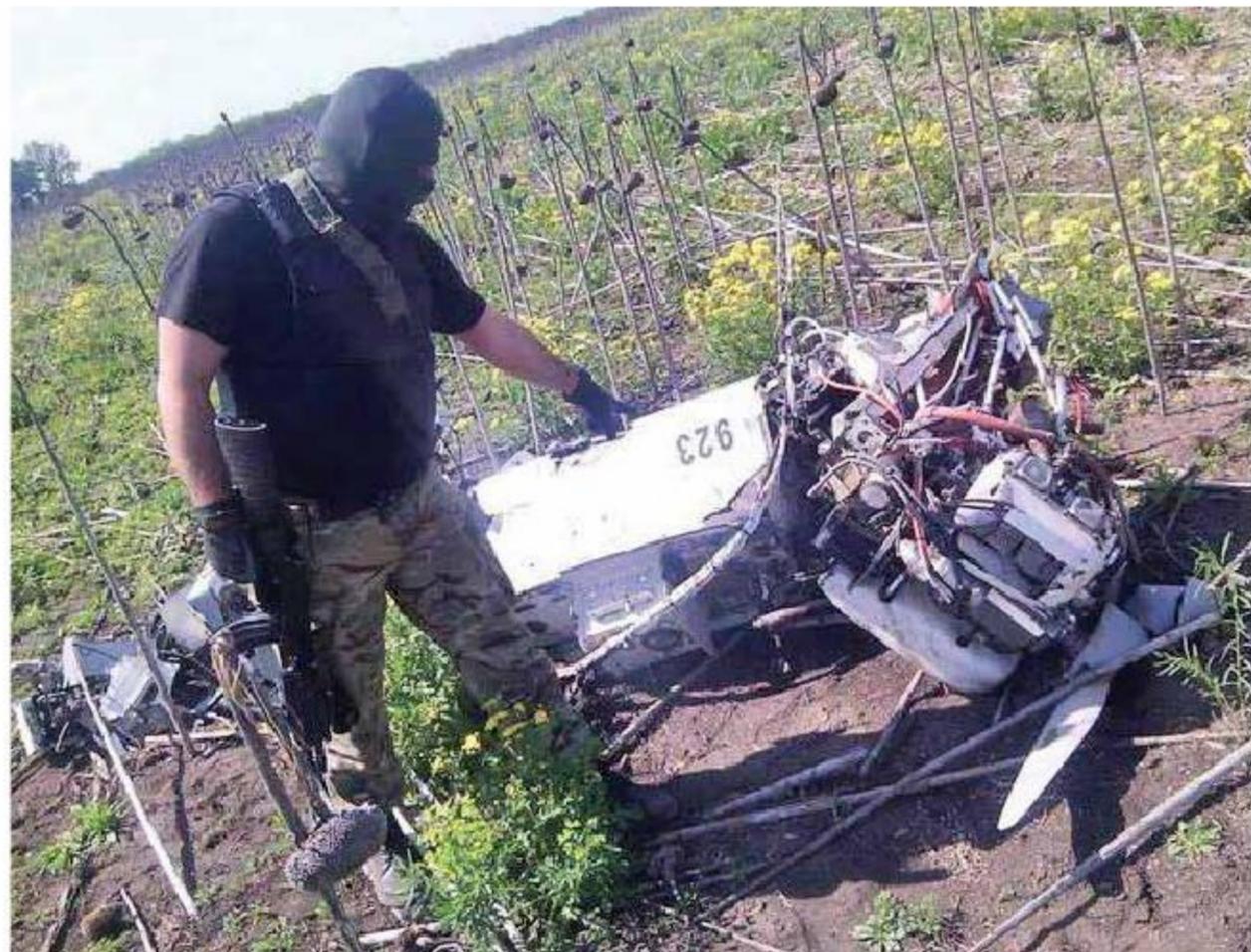
The PSNR-8M system has been officially adopted for service in the Russian Armed Forces.

Particularly in April 2015, PSNR-8M equipment was fielded with scout units of motorized infantry brigades, Eastern MD. Being a special-purpose system, the PSNR-8M is not available for sale, and produced exclusively for military use.

All of the herein mentioned technologies are not produced



in Ukraine and are Russian-army-only. So, we can see from the preceding comments that Russian military equipment continues to be employed by rebel forces in Ukraine. The Russian army employs a broad range of arms and military equipment to keep the Donbas destabilized. **UDR**



Forpost UAS vehicle (serial number 923) seen here after being shot down outside Avdiivka (Ukraine) on 21st May 2015

# Armoured Vehicles Eastern Europe

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# PRECISION-GUIDED WEAPONS FROM

**BARYER V** | EXTENDED RANGE ATG MISSILE AND LAUNCHER OPTIMIZED FOR USE FROM AERIAL PLATFORMS



**BARYER** | VEHICLE-CARRIED LOG-RANGE ATG MISSILE SYSTEM



15,7 kg

1091 mm

130 mm

**KOMBAT** | GUIDED MISSILE ROUND

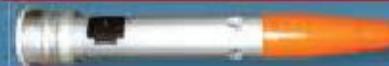


24,7 kg

1013 mm

125 mm

**KONUS** | GUIDED MISSILE ROUND



22,3 kg

923 mm

120 mm

**FALARICK 105** | 105 MM GUIDED MISSILE ROUND



25,2 kg

1015 mm

105 mm

**STUGNA** | GUIDED MISSILE ROUND



19,3 kg

1136 mm

100 mm

**FALARICK 90** | 90 MM GUIDED MISSILE ROUND



20,5 kg

977 mm

90 mm

**KORSAR** | MAN-PORTABLE ATG MISSILE AND LAUNCHER



13,5 kg

1000 mm

107 mm

Type of carrier platform  
Missile mass

Missile diameter  
Missile length

# UKRAINE

State Enterprise "State Kyiv Design Bureau "Luch" of Kiev has developed a family of precision-guided weapons. The missiles are designed for attacks against stationary and armored vehicle targets protected with current-generation hybrid armor or explosive reactive armor systems



7,5 km



800 mm

5 km



800 mm

5 km



750 mm

5 km



700 mm

5 km



550 mm

5 km



550 mm

4 km



550 mm

2,5 km



550 mm



### Guidance

For target acquisition and aiming, optical and IR sighting devices are used to enable 24-h operation in all weathers. Once the target is designated and locked on, it is tracked automatically without further operator's intervention. Luch missiles carry tandem shaped charge warheads capable of defeating ERA protection of current-generation tanks.



### Jet stream

Upon impact, high explosive content of the warhead detonates, producing a molten metal jet stream that travels at speeds up to 15 km/s, burning through the target tank's armor. The jet then pierces inside the vehicle, killing the crew, damaging equipment, and detonating fuel and ordnance payloads.



Armor penetration capability

# PROTECTION TECHNOLOGIES

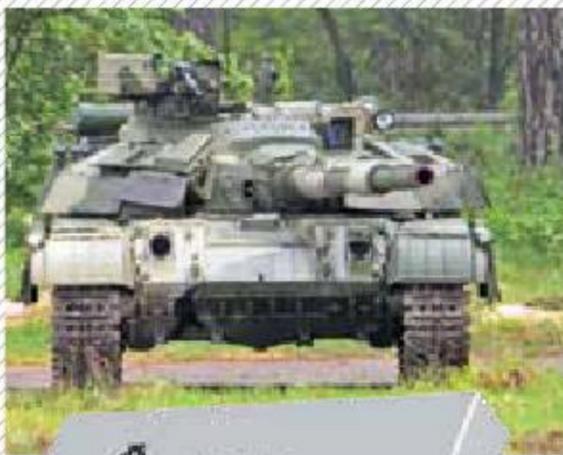
The Microtech Base Center for Critical Technologies, a State-owned company based in Kiev, is renowned both in and outside Ukraine for its innovative product designs. The Company has achieved significant accomplishments in the area of active protection and explosive reactive armor (ERA) protection technologies for heavy armored military vehicles and, recently, lighter weight armored vehicles. The R&D and technological solutions implemented in Microtech's

production-standard and experimental equipment demonstrate a high potential for effective protection of military armored vehicles.

Microtech designs for the military market, elements of the new-generation explosive reactive armor (ERA) system Nozh (or "Knife") and Duplet family of APS elements for protecting AFVs against tandem-warhead threats have been designed, developed and approved for the Ukrainian Armed Forces' service, and have been

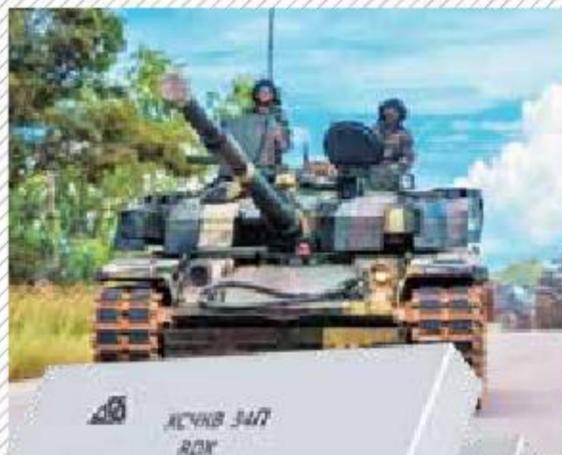
supplied to both the Ukrainian MoD and export customers. Particularly the ERA system Nozh has been integrated into the T-64BM/Bulat main battle tank (MBT) upgrade package, and Duplet has been adopted for the new indigenously developed MBT Oplot. Nozh secures the host tank against all known armor piercing threats, including subcaliber armor-piercing penetrator projectiles, non-tandem-type hollow-charge rounds or striking-nucleus-type impact munitions. The

## ERA SYSTEM NOZH



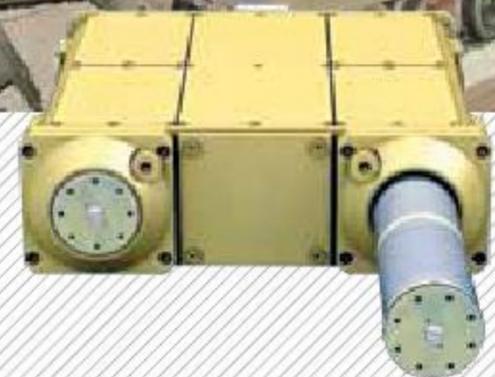
The Nizh modules are mounted on the tank's turret, upper forebody and sides – integral or add-on, or both at once. Each ERA block contains counter-HEAT devices KhSChKV-34P, KhSChKV-19 and KhSChKV-19A, as well as ballistic components, a damping unit and a container. The ERA system "Nizh" equips the T-84, BM "Bulat", T-64BV1M, T-64BV-1, T-72AG and T-72B1 MBTs. Full set of the Nizh equipment for one MBT weighs about 3,000 kg

## ERA SYSTEM DUplet



The "Oplot" MBT is offered equipped with the ERA protection system "Duplet" to counter tandem-charge threats. Each ERA block is comprised of counter-HEAT devices KhSChKV-34P, KhSChKV-19, KhSChKV-19A, as well as ballistic components, a damping unit and a container. Each KhSChKV-34 device is made of 29 component parts, and KhSChKV-19 of 46 component parts. The ERA protection is mounted on the tank's turret, upper forebody and sides.

## ACTIVE PROTECTION SYSTEM ZASLON



Illustrated here in "transport" and "deployed" configurations, the active protection system "Zaslun" was approved for Ukrainian Army service on 4th December 2009. It is suitable for integration in both heavy and lighter weight AFVs (infantry fighting vehicles and armored personnel carriers). Sample arrangements of "Zaslun" equipment on the BTR-70DI APC, Poland's "Anders" light tank and "Rosomak" APC (combined with "Nizh-L" ERA modules)

ERA system Duplet reliably shields the host armored platform from tandem-warhead shaped-charge weapons -- which have recently received huge development effort -- in addition to the range of threats defeated by Nozh. Both Duplet and Nozh designs are so far unique in the world. In addition to this, we have developed active protection system Zaslon which has been qualified for service with the Ukrainian Armed Forces. Zaslon is designed to protect an armored combat platform against antitank weapons of all types, including armor piercing grenades with unitary or tandem shaped charges which are fired from hand-held or mounted grenade launchers, as

well as from antitank guided missiles, gun fired armor-piercing rounds and shaped-charge artillery projectiles approaching at 70 to 1,200 m/s. It is so far the only APS design in the world capable of intercepting high-velocity armor-piercing threats approaching at 750 m/s or faster.

The Company's product portfolio additionally includes motion platform trainers for MANPAD weapon systems, motion simulators for training drivers of armored fighting vehicles BRDM-2, BTR-70/80, BTR-80UP, BMP, main battle tanks T-72, T-55, T-62 and others.

Microtech has also developed the passive ballistic/acoustic protection system designated "Akustik". De-

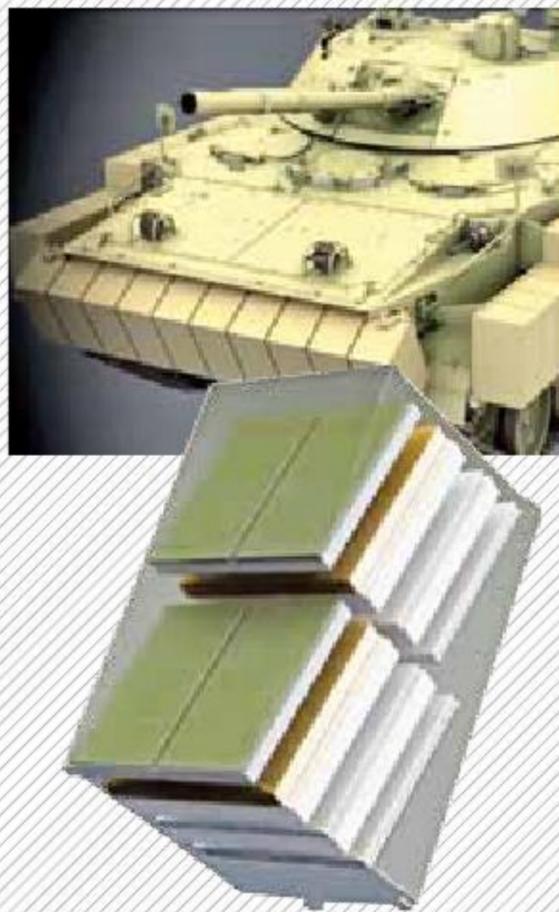
signed specifically to improve survivability of mounted infantry on wheeled AFVs, the Akustik is most effective in protecting against 7.62mm/12.7mm armor-piercing munitions of the B32 type, as well as secondary shrapnel, and it will also provide a 200 to 300 pct reduction of acoustic load on the crew and passengers. In addition to ERA protection, Microtech is working intensively in the field of active protection for AFVs. Specifically for MBTs and light AFVs, the Company has developed the active protection systems called "Zaslin" and "Shershen", respectively. Both employ non-launched-type counter-munitions for intercepting incoming threats at short ranges.

## PASSIVE BALLISTIC/ ACOUSTIC PROTECTION SYSTEM *AKUSTIK*



A BTR-80UP APC vehicle outfitted with "Akustik" ballistic/acoustic protection equipment

## ERA SYSTEMS *RAKETKA*



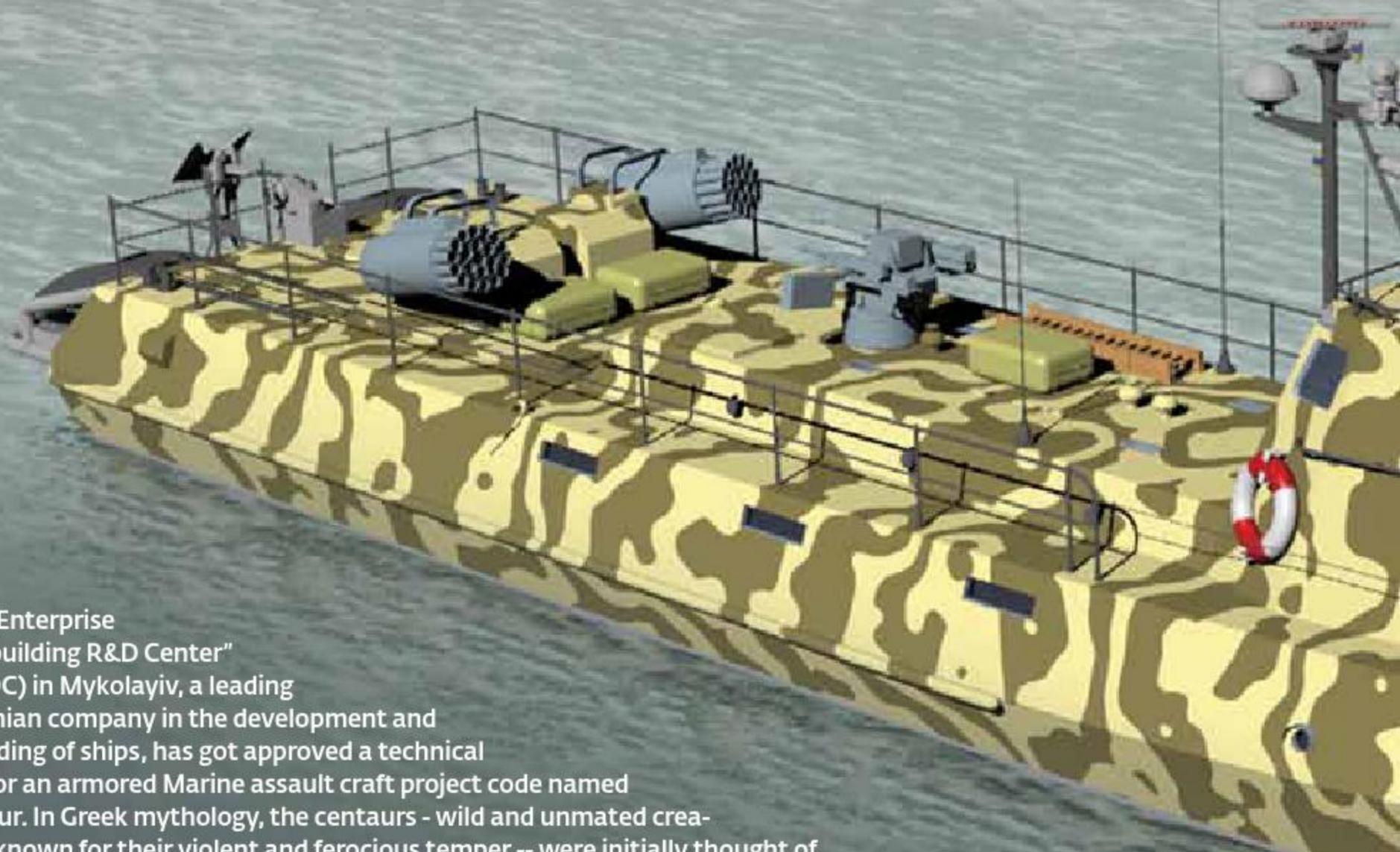
Specifically for light AFVs, Microtech has developed the ERA systems designated "Nizh-L" and "Raketka".

## ACTIVE PROTECTION SYSTEM *SHERSHEN*



A BMP-2 vehicle is seen here equipped with active protection equipment "Shershen" mounted on the forebody and sides

# MOUNT



State Enterprise "Shipbuilding R&D Center" (ShRDC) in Mykolayiv, a leading Ukrainian company in the development and upgrading of ships, has got approved a technical plan for an armored Marine assault craft project code named Centaur. In Greek mythology, the centaurs - wild and unmated creatures known for their violent and ferocious temper -- were initially thought of as the epitome of mountain rivers and fast-flowing streams. The new armored Marine assault speedboat is designed exactly for handling complex high-risk missions in littoral sea areas and river waters that involve Marine landing support and direct engagements with the enemy. As a further development to the lineup of armored boats developed by ShRDC for international customers, the Centaur Class boats are now also built and supplied to defense and security organizations in Ukraine. This is the Gyrza Class and Gyrza-M Class armored boats, in comparison with which the Centaur has extended functionality for special missions. Such combat craft are currently needed desperately by the Ukrainian military forces for use in the Black Sea and Azov Sea areas, as well as major river arteries. Defense Express interviewed leading officials of the ShRDC about the Centaur project.



# «CENTAUR»

SHIPBUILDING R&D CENTER HAS INTRODUCED  
A NEW INDIGENOUS MARINE LANDING  
AND ASSAULT CRAFT PROJECT  
TO POTENTIAL DOMESTIC AND  
EXPORT CUSTOMERS





## OLEKSANDR ZHOLOB

CEO, Chief Designer  
Shipbuilding R&D Center,  
Mykolayiv

### SPECIAL TASK FORCES WANT THE CENTAUR TO BECOME AVAILABLE AS SOON AS POSSIBLE

What pushed us to develop a new Marine assault boat was the need to augment the capabilities of our Naval Forces in response to Russian aggression. The idea to develop a new type of Marine landing and assault craft based on the Project 58155 design to provide an armor protection capability for Marine units during landing assault operations originated in the fall of 2014 when we participated in the keel-laying ceremony for the Gyurza-M boats at the Leninska Kuzhnya Shipyard.

Within a few weeks, we did the necessary research work and submitted our proposals – in the form of an analytical report on the requirement for an armored amphibious assault boat (which was later assigned the code name «Centaur») – to authorities of all

levels, including leading officials at the Ministry of Defense and the Ukroboronprom defense industry holding, as well as the Navy Staff, while Ukrspecexport [State military equipment import-export company) assisted us in the search of potential international customers interested in acquiring combat craft in this category.

It is important to note that there is a pretty stable requirement for the vessels and capabilities of this type on the world arms market, with American and Swedish companies being trend setters in this niche market.

The Americans have dealt with developing armor-protected amphibious assault boats since the war in Vietnam, where during river operations they actively used semi-sporting service boats outfitted with some elements of armor protection, to the extent that they protected boat sides with body armor. The Swedes have gone even further. In the late 80s, the Swedish MoD adopted a doctrine of anti-marine de-

fense to protect its coastline areas from potential invasion of the Soviet forces. So they built the boat SV-90. The craft proved very successful. Originally purchased for use by the Swedish forces, the boats then began to be licensed manufactured by foreign countries. Today, the boats are produced in hundreds of different versions and configurations. The lion's share of the craft are now deployed in littoral sea areas performing a great deal of different missions ranging from transportation of reconnaissance and sabotage groups to patrol missions and over-the-beach landing of Marine forces. It is significant that, in 2013, the Russians were among those who bought a license for the production of the SV-90 craft. Now it is commercially produced as Project 03160 «Raptor» in St. Petersburg and BK-16 in Rybinsk.

Ukraine, for its part, has sufficient R&D and manufacturing capacities for fully indigenous development and production of modern amphibious assault boats, which are urgently required by both the Naval Forces and Special Operations Forces of the Ukrainian Armed Forces. Whereas armored boat projects were once developed and manufactured by Ukraine primarily for the benefit of international customers, the current focus of the domestic shipbuilding community is on providing its own military with highly capable weapons and equipment to secure national interests in river and sea waters. The Centaur project, like other derivative designs of the Gyurza project, fully meets these vital needs. In conversations with our naval officers and members of Special Operations Forces we were told many times that they needed such capabilities not today but even yesterday, and wanted them to become available as soon as possible.





## SERHIY KRYVKO

Chief Project Designer  
State Enterprise  
«Shipbuilding R&D Center»

### THE «CENTAUR» WAS BORN IN THE INTERSECTION OF KNOWLEDGE OF LAND AND NAVAL WARFARE EXPERTS»

It is worth noting that all international projects of similar-class speedboats use light aluminum-magnesium alloys, including aluminum armor. We, too, have experience in creating steel armor hulls that have proven themselves well in the «Gyurza» project. Gyurza Class vessels used on the Amu Darya have repeatedly come into fire engagements, without any negative comments from users about armor protection. As a

further development of the Gyurza, the Project 58155, which was finished in 2004 (as Project 58150) is now being handled by Leninska Kuznya Shipyard.

Upon evaluating the project once again we made sure for ourselves that, with some modifications, the hull is sufficiently well configured for use in the development of new craft with enhanced functionality – for the benefit of both the Naval Forces of Ukraine and potential international customers. This is how the architectural and structural look of this boat came to be as a modification tailored for amphibious assault operations and special operations by rapid reaction forces.

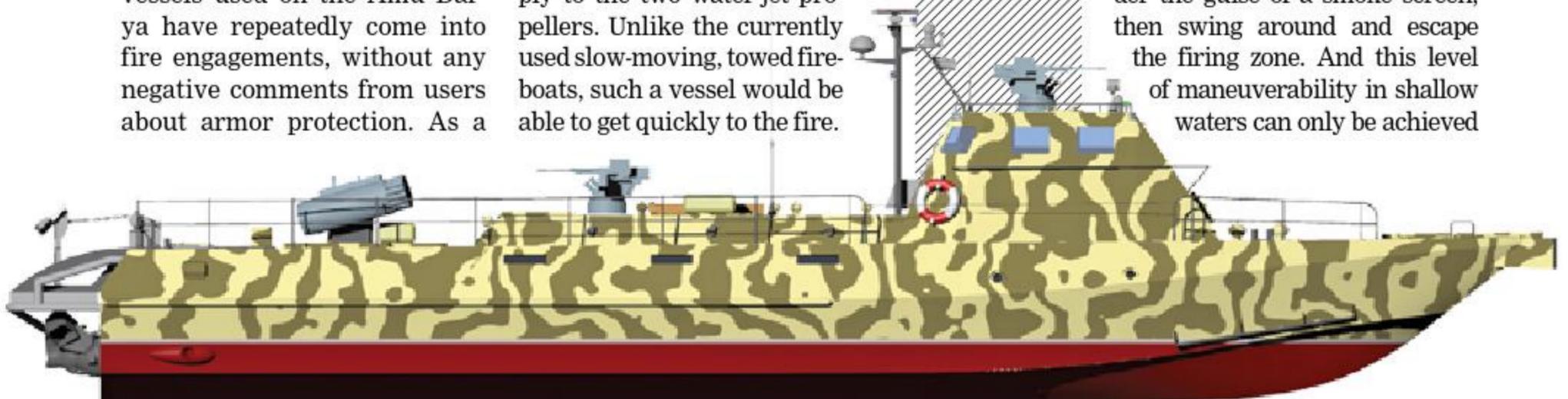
In addition to the baseline amphibious assault boat, we considered several other modifications for other purposes. For example, it could be converted into a fire support boat, armed with a modified version of the Grad MLR weapon. We furthermore considered transforming the boat into a special-purpose craft for use by Special Operations Forces. By a minor modification of the hull's architecture we could obtain speedboats for applications such as medical evacuation or fire fighting, for example, which would be suitable for use in crisis management and relief operations. With a large capacity hold in place, the vessel would be able to accommodate an additional diesel pump of sufficient capacity to provide good water supply to the two water-jet propellers. Unlike the currently used slow-moving, towed fireboats, such a vessel would be able to get quickly to the fire.

### What is special about the hydrodynamic component of the new designs, given that they are to surpass the Gyurza in terms of controllability and speed performance?

Boats of our earlier designs, like the Project 58150 and Project 58155, were mostly tailored, so to speak, for use in shallow waters, including rivers. Experience of operation on the Amu Darya, and the experience of our partnership with Vietnam, who used water-jet boats in river reaches, brought us to an important conclusion: Water jets tend to get clogged when operated in rivers rich with vegetation, rendering the boat immobilized, thus useless as combat unit.

Given these challenges, stern propellers in the Gyurza boat are placed within a sort of tunnel that allows for sufficiently free water supply to the motor to keep the screws safe. But there is a negative side as well. The control blade, which is hidden in the tunnel, must not be exposed beyond the bottom line of the keel, which has a negative effect on the maneuverability performance of the boat.

Given the specifics of amphibious assault operations, we understand that, for boats in this category, maneuverability is one of the key survivability factors when it comes to fire engagement with the enemy. The vessel is required to get quickly to shallow water, let the Marines disembark, move sternway for some distance under the guise of a smoke screen, then swing around and escape the firing zone. And this level of maneuverability in shallow waters can only be achieved





through the use of water-jet propellers.

Specifically for the Centaur we created a propulsion system using a Caterpillar diesel.

#### **How many Marines can it board?**

The Centaur can accommodate a full platoon-size unit, which is 32 Marines. Incidentally, international counterparts have room for no more than 20 personnel, while our boat can accommodate a platoon-size unit furnished with a full complement of small arms. Troop disembarkation is possible either via the upper deck or the landing ramp, which is accessible by internal passages under protection of steel armor.

#### **What about the crew?**

We forecast that the crew will be set at four or five. We propose that workstations of the commanding officer and helmsman/boatswain be positioned in the control cabin, front row, where there are all the navigational instruments, communication facilities, and visual and technical monitoring systems, in addition to power plant control devices. In the conning tower, second row, there will be stations for two operators of weapons modules, who in everyday terms are

not only gunners, but sailors responsible for supporting troop disembarkation/embarkation operations. The boat is equipped for operation in NBC conditions: the conning tower is overpressurized, while the Marines are all provided with Individual Protective Gear.

#### **What's the composition of the weapons package for the Centaur?**

– So far we have equipped it with a machine-gun and grenade launcher module developed by our counterparts in Kiev. The baseline module has been tested for integration in a ground vehicle, but a naval variant capable of reliable and effective performance in pitch and roll conditions is not there so far. Now we have a proposal from a firm in Kiev concerning a new module which we intend to offer for integration with the Ukrainian-supplied armored boats operated by Uzbekistan.

To suppress enemy resistance during Marine landing operations, we propose that the boat be additionally equipped with a MLR weapon. This mobile MLR system could be assembled from COTS components chambered for the air-launched S-8 unguided rocket, which is also suitable for launch from helicopters like Mi-8, Mi-17,

Mi-24 and Ka-29. There is also a system allowing fire to be conducted in single, two round or three round burst modes. We intend to equip the boat with two launchers, each provided with 20 ready to fire rounds. With their pretty large engagement envelope, the weapons could be fired to certain distances – ranging from 300 meters to one kilometer or a little bit longer – when approaching the shore at a high speed. And there is no need to invent anything new, just use a readily available assortment of COTS products. The full weapons package will be accommodated in the stern portion of the boat. We furthermore envisage that, under certain circumstances, the boat will be used in mine setting operations. For this purpose we provided it with a mine release system with an allowance of four YaM-type mines.

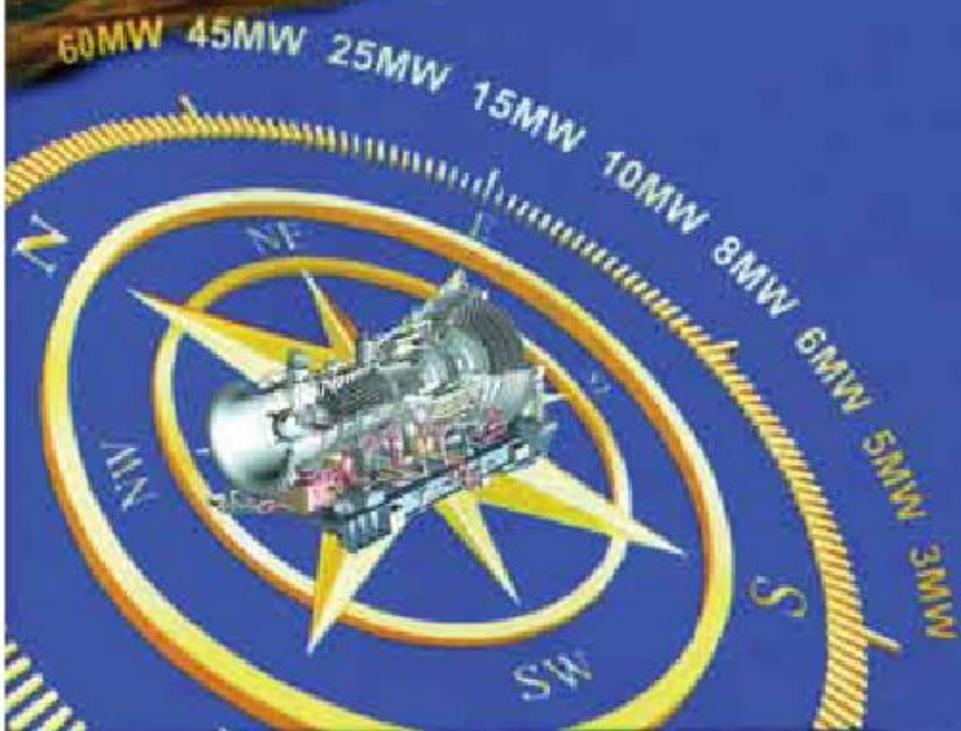
#### **The boats will have no difficulty getting to the northern Black Sea area, for example. But what about the Sea of Azov, where such capabilities are also needed? There is high risk that Russians would not let them go across the Kerch Strait.**

– We have analyzed the possibility of delivering the boat by land transport. We found out that there are trailer trucks with sufficient cargo carrying capacity here in Ukraine. We looked which bridges and highways would bring us to Genichesk or Melitopol. This is feasible technically. The boat could be transported dismantled as it was originally designed with dismantlable tower and some instruments and deck equipment. Each boat will fit into two trailer trucks – one for the hull (with removed weapons), and the other for the tower and container with weapons and dismantled equipment. 

**Interviewed by  
Serhiy ZGHURETS,  
Defense Express**



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Gas transportation industry and

Power generation.

# CENTAUR

## ARMORED AMPHIBIOUS ASSAULT BOAT

In 2015, State Company "Shipbuilding R&D Center" introduced the Centaur Amphibious Assault Boat project to potential domestic and export customers. The Centaur project has benefited extensively from the experience and expertise gathered in development and operation of the Project 58150 Gyrza and Project 58155 Gyrza-M



Design Organization  
**State Company**  
**«Shipbuilding R&D Center»**  
 (Mykolayiv)

The Centaur is designed for use in operations involving amphibious assault, littoral defense, sea patrolling, and sea-borne fire support. Its range of missions includes river and lake policing, operations in littoral sea areas, over-the-beach landing, transportation of ammunition and armed personnel, mine countermeasure operations at sea as well as attacks on hostile ships and fast attack craft on rivers. The range of potential modifications includes special operations craft; a fire support boat armed with modified Grad MLR system; emergency relief boat; medical evacuation boat and fireboat. It could be manufactured in commercial quantities by each and all of shipyard firms in Ukraine.

**Anchor** is mounted on a crane in the stern section

The boat is equipped for mine countermeasure operations at sea

**Habitability conditions**  
 The boat has living compartment with noise/vibration dampening, ventilation and heating systems; fire alarm system, flooding sensors and kitchen

### Interior arrangement



crew - 4-5 personnel



troop complement - 32 Marines

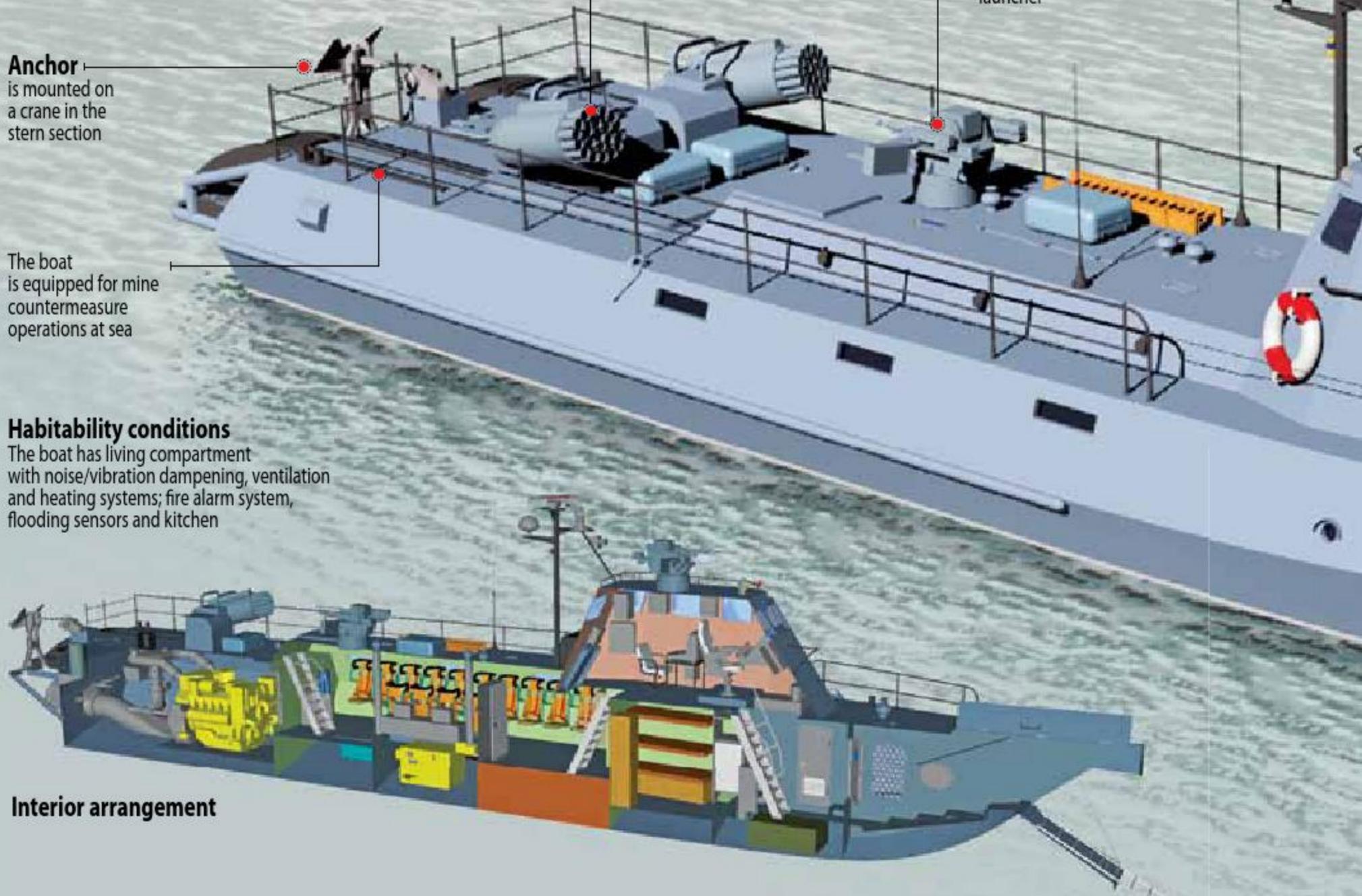
**Mobile MLR system**  
 chambered for the air-launched unguided S-8 rocket

For setting up a smoke obscuring screen, a thermal smoke generating system (adopted from an MBT vehicle) is used

**Navigation Radar**

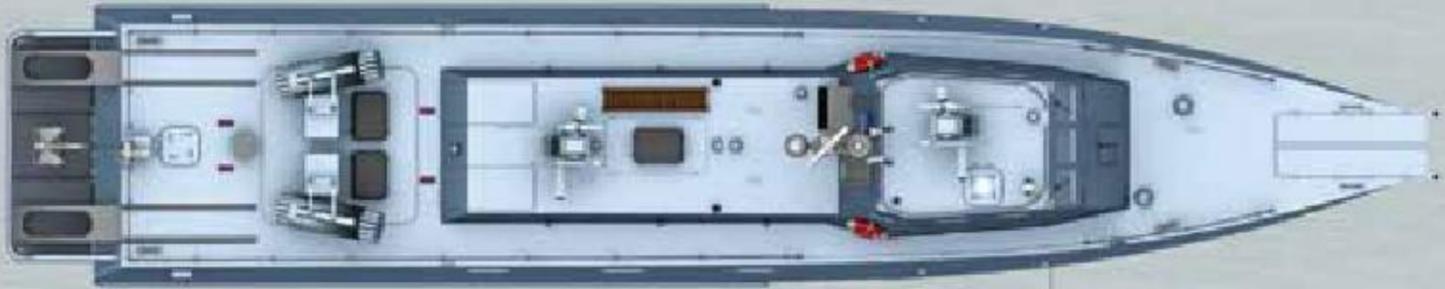
The armored boat has a comprehensive set of current-generation navigation and communication equipment

**Machine-gun and grenade launcher module**  
 integrates a 12.7/7.62 machine gun with an automatic 30mm/40mm grenade launcher





23,4 m



4,8 m

The boat is equipped with a capability to detect and warn the crew of the presence of laser radiation, enabling the commanding officer to take countermeasures such as setting up smoke obscuring screen, for example



54,5 45 720 7 1,0 9,5

**EO situational awareness suite**

EO/IR system on the commanding officer's station;  
Low-light camera system on the Helmsman's station

**Control cabin**

accommodates all the navigational instruments, communication facilities, visual observation and technical monitoring systems, and power plant control devices. Conning room accommodates workstations of the commanding officer and helmsman/boatswain in the front row, and stations for two operators of weapons modules in the rear row.



**Troop landing ramp**

The Centaur is powered by a propulsion unit integrating 2 x 1200-hp Caterpillar diesels

**The boat is provided with bullet-proof 8-mm-thick armor protection**

withstanding the impact of small arms/machinegun fire and shrapnel, and can be optionally equipped with a wire-mesh anti-HEAT screen



Load displacement, t



Full speed, kt



Operational range, MUMS



Cruising capacity, days



Water draught, m



Cargo carrying capacity, t



# UPGRADING FROM «AVIAKON»

Ukraine retains substantial capabilities to repair and upgrade the Mi family of military and transport helicopters – both for post-Soviet and former Warsaw Pact customers. The country has established the national legislative basis as well as the R&D structures for life extension upgrade and updating of military helicopters using the MoD's R&D capabilities and overhaul repair and upgrade capabilities of the State Concern "Ukroboronprom".

In Ukraine, one of the top companies in the area of helicopter overhaul repair and upgrade is the Konotop Aircraft Repair Plant 'Aviakon' from the Ukronronprom Concern, which is doing repair works and participates in a range of Mi-24/Mi-8 helicopter upgrade programs for the benefit of both the Ukrainian Armed Forces and export customers.

The Company has some achievements related to Mi-24 helicopter upgrades for the Ukrainian Armed Forces. In 2011, the Mi-24 upgrade pro-

gram was split into two phases. The first phase, dubbed as "minor" upgrade, involved domestic companies only, while the second (or "major") phase of the upgrade included the installation of equipment and systems provided by French Sagem.

As a result of the "minor" upgrade, the combat helicopter Mi-24PU1 was introduced into the Ukrainian Armed Forces' service. Upgrade improvements included modified Motor-Sich TV3-117VMA-SBM1V-02 turboshaft engines; electronic-optical jamming system ADROS KT-01AV for protection against infrared-homing MANPAD threats; video & flight data recorder/data transfer system BUR-4-1-07; upgraded aircraft gun sight ASP-17VPM-V; laser crosshair line generator

FPM-01kv; satellite navigation system GPS MAP-695; VHF radio unit KY-196B; EBC-406AFHM emergency locator transmitter; GTX-327 radar transponder with AK-350 altimeter as well as the THL-5NV hard helmet with PNL-3 night vision goggles.

In terms of its mission capabilities, the Mi-24PU1 is almost three times as effective as the original configuration, this despite the fact that the “minor” upgrade did not include the installation of the new domestically designed “Baryer-V” ATGW missile system in place of the Soviet-vintage counterpart, “Shturm-V”.

Upgrade project for the workhorse helicopter – the Mi-8 and its various modifications – (as is the case with the Mi-24) involves Sagem as supplier of night fighting capabilities and current-generation avionics. The upgraded helicopter will have improved performance due to the integration of more potent Motor-Sich TV3-117-VMA-SBM-1V power plant. Intended for use on the Mi-24, Mi-8MT and Ka-27/29 helicopters, the power plant was formally approved for service use in the Ukraine Armed Forces in 2010. During flight testing with the TV3-117VMA-SBM-1V power plant, a Mi-8MTV gained record height of 8100 meters in just 13.5 minutes, which is twice the normal climb-out speed for same-class helicopters. Prior to the upgrade, the Mi-8 could hardly climb out to higher than 5,000 meters, and it had to stay hovering at 1,200 meters during ten minutes to let the turbines get colder.

Given the national R&D and production capabilities, the Ukrainian MoD estimates that overhaul and upgrade of the Mi-24 and Mi-8 helicopter fleet will extend its service life to 40 years, meaning it will remain in operation till up to 2030.

A good example of the Company’s cooperation with foreign



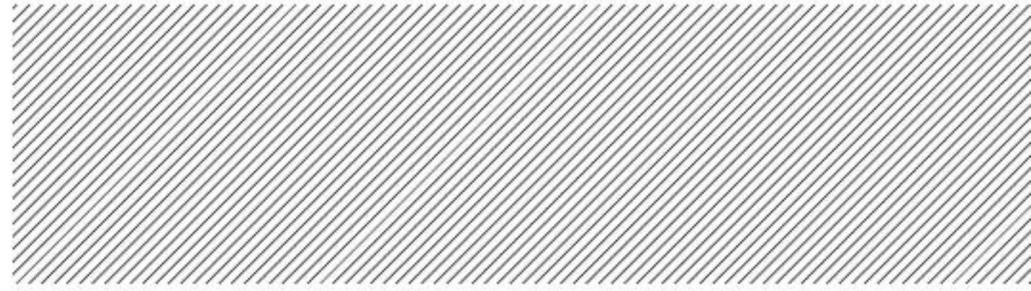
partners was a contract from Azerbaijan. In 2010, «Aviakon», jointly with the South African company Advanced Technologies and Engineering and the Ukrainian State Enterprise “State Kyiv Design Bureau ‘Luch’” remanufactured a number of Azerbaijan Armed Forces’ Mi-24 attack helicopters to the Mi-24G standard using the Mi-24 Super Hind Mk.4 upgrade package developed by the South African partner. This included Denel-supplied chin-mounted gyrostabilized optronic surveillance and sighting suite to enable all-weather and night operation. The Mi-24G uses the Luch Baryer-V ATGW missile system as its main attack weapon, of which Azerbaijan was the launch export customer.

Ukrainian-built upgrades of the Mi-8 and Mi-24 helicopters

Multi-role transport/attack helicopter Mi-24PU1. Works to remanufacture the Mi-24 helicopter to the Mi-24PU1 standard will be performed by the State Enterprise “Konotop Aviakon Aircraft Repair Plant” in partnership with JSC Motor-Sich, State Design Bureau Luch, Central Design and Development Bureau Arsenal and Research and Production firm NFP Adron.

have considerable market potential, considering that the choppers were delivered for export worldwide during Soviet era. If equipped with new capabilities in line with modern standards, a great deal of them could preserve their military usefulness for many years to come. For example, of the 8,200 Mi-8-series helicopters produced in 1996, about 2,800 were delivered to export customers in over 40 countries worldwide, including Algeria, Angola, Afghanistan, Bangladesh, Bulgaria, Vietnam, Egypt, India, Iraq, Canada, the PR of China, Pakistan, the USA, Poland, Romania, Cuba and Japan etc. Given the capabilities present in Ukraine, it would be much more cost effective for operators to have these fleets overhauled and updated than to acquire new helicopters. **UDR**





## FLYING «FURY»

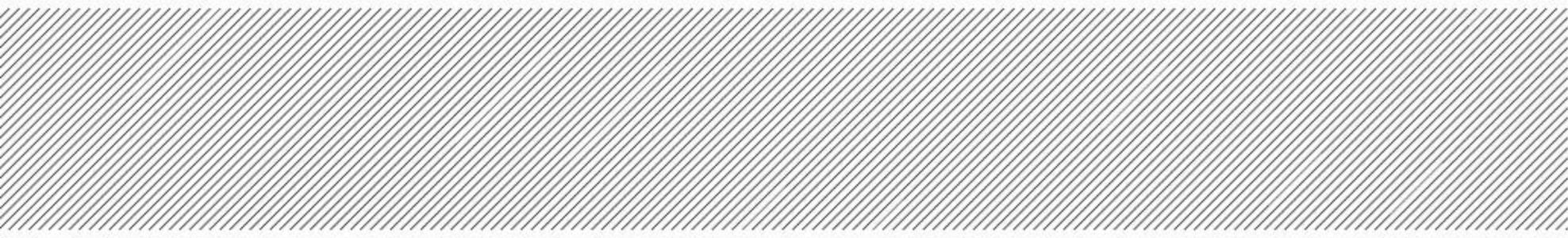
The R&D and Manufacturing Company "Athlone Avia" was established in June 2014. The main product of the Company is the Unmanned Aircraft System (UAS) "Fury" (A1-S). Originally developed for civilian use, the Fury system began flight trials in February 2014, when the situation was already destabilized in eastern Ukraine. The first production Fury UAS was built specifically for use by members of the Donbas voluntary paramilitary group. It was originally deployed in the ATO area in early June, marking the beginning of history of battlefield use for the A1-S UAS Fury as some dozen units of the system have been deployed in theater since then, priced at the unit cost ranging from \$10,000 to 22,000. The Company renders after-sales maintenance and repair services for its UAS equipment deployed in the ATO area, and provides UAS operator training to defense and security sector customers in Ukraine.

Due to support from leading officials of the R&D Department at the Ukrainian Armed Forces General Staff, and with assistance of the Ukrainian Armed Forces' State R&D and Test Center based in Chernihiv, the A1-S Fury was successfully flight tested and certified for introduction to the Ukrainian Armed Forces inventory. In 2014, Athlone Avia was awarded a contract to supply three units of the Fury system to the National Guard of Ukraine. In 2015, it was re-

vealed that the Company will also supply the product to the Ukraine Ministry of Defense. Artem Vyunnyk, CEO of Athlone Avia, says the variant of the system intended for the National Guard will be a more mature design that will surpass older siblings in terms of the level of sophistication and effectiveness.

Main technical data and specifications: full mass in a containerized configuration (including spare parts and fixings)– 40 kg; mass of the UAV

Unmanned aircraft system Fury (A1-C) belongs to the category of tactical battlefield UAS. The system is designed for airborne monitoring of the earth's surface and downlinking live imagery to a ground control station. The UAS consists of a mini UAV aircraft equipped with a gyro-stabilized optical camera module for daytime observation (it can be optionally equipped with a gyro-stabilized thermal imaging camera module); a mobile ground control station with integrated display units, a charging station and video recording equipment; an integrated computer preloaded with GIS and other necessary software; a ground data transmit/receive station; high-capacity batteries.



aircraft – 4.5 kg; payload weight – 1.2 kg; operating altitude ceiling – 2,500 m (at the max altitude the aircraft is almost undetectable by the naked eye); endurance – 2 hours, range – 100+ km; operating radius –  $\geq 30$  km; maximum/patrol/stall speed – 130/70/45 km/h; number of operating crew – 2 persons; into-action time – 10 minutes; out of action time – 5 minutes. During trials the UAS was launched three times in six hour period for missions that included the search, detection and recognition of moving and stationary targets by an operator using a X10 optical zoom camera. The operator found and successfully recognized test objects to include armored vehicles; a group of people; a man dressed in camouflage; buildings of various types; a boat. During flight tests of the UAV aircraft carrying a video camera, the uplink/downlink communications system operated effectively at ranges in excess of 30 kilometers, both in radio link and video link communications modes, with the range of the communications system for the A1-S UAS given at 25...50 km.

UAS has a standard layout. The system includes a man-portable ground control station which is compact in design, impact resistant and water-protected, and it is easily deployable where needed. Lighter than 15 kg in mass, the ground station is portable by one soldier. The unmanned aircraft is easy to transform from unpack to operation.

The ground station communicates with the UAV aircraft via a dedicated datalink for transmission of UAV control commands.



It has receiver equipment for telemetry and intelligence information (live video footage) obtained via a separate downlink from the aircraft. The ground station's screen monitor displays the map of the overflow area showing the current position of the aircraft, flight control and navigation data and mission equipment status data. The UAS includes geoinformation system (GIS) software, so now

we don't have to rely on the Internet, as we did earlier, but instead employ a georeferenced high-resolution map. The equipment is controlled by the ground control station using an actual software package. The software package is interfaced with the on-board navigation and control system and performs the following functions: operational mission planning and downloading the mission data into the autopilot's memory; preflight check (communications link, automatic testing); setting autopilot parameters; real-time visualization of the navigation data in the form of flight data and digital trajectory displayed on the instrument panel. The launch of the aircraft is by a mobile catapult, and recovery method is by the function of a semiautomatic landing system using the mode employed by fix-wing aircraft. The aircraft can fly in two modes of piloting – semiautomated GPS mode and autonomous flight by preset waypoints. The aircraft is fitted with an on-board automatic flight control system, a GPS, a telemetry subsystem for flight data transmission to the ground control station, as well as mission-specific payload equipment.

The key suppliers of components and subsystems for the A1-S UAS are: Athlone Avia (airframe); Athlone Avia (gyro stabilized optical camera system based on the Sony/Flir optical module, payload control system, ground control station, ground tracking station); Germany (electric motor and governor); USA (autopilot, UAV aircraft control system, ground control station software); Ukraine (GIS software). 

The ground control station's screen monitor displays the map of the overflow area showing the current position of the aircraft, flight control and navigation data and mission equipment status data



**MYKOLA ARKHYP OV,**  
CEO of Adron R&D  
and Production Company

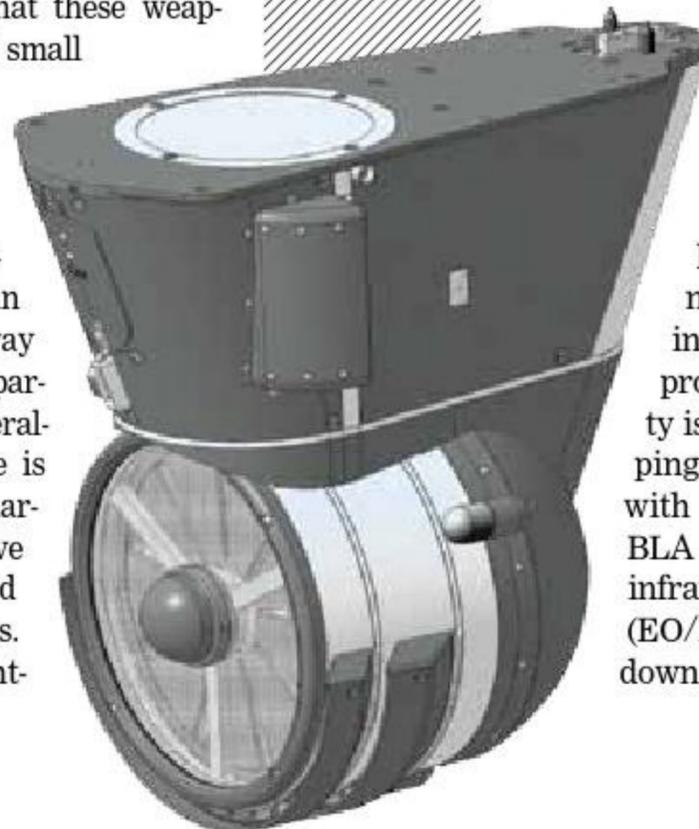
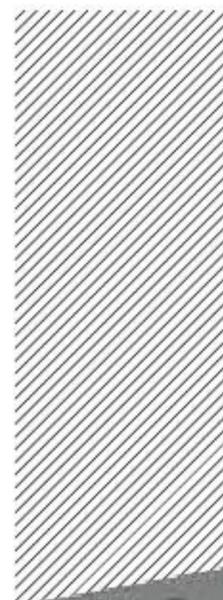
# “ IN THE AREA OF UAV TECHNOLOGIES, OUR FOCUS IS ON SELF-PROTECTION AND PRECISION ATTACK CAPABILITIES

**R&D and Production Company (RDPC) Adron is working on a range of private venture projects aimed to develop self-defense equipment and precision attack weapons for UAV aircraft applications. More details about this are given below in an interview with Mykola Arkhyrov, CEO of RDPC Adron.**

RDPC Adron is closely monitoring the situation with the development of UAV technologies in Ukraine and elsewhere. We were once exploring an idea about finding an already available UAV aircraft or developing an UAV platform to use it as a starting point on the way into the UAV technology development business. However, upon analyzing the situation, we found out that there is a huge abundance of various UAV platforms or, globally speaking, unpowered aircraft with engines available of the market. In an unmanned aircraft system, most important elements are not the airframe or motor but navigation, situational awareness equipment with a live data transmission capability and so forth. But these are precisely the technology areas with which a majority of domestic UAV technology developers have significant problems to cope. So we, realizing that we are not specialists in the area of UAV mission equipment, chose to focus on the two areas in which we have been traditionally strong.

First, we see the extensive growth of so called “counter-UAV” technologies, i.e. unmanned combat aerial vehicles (UCAV) used for destroying their intelligence-gathering counterparts. Time is not far off when unmanned aircraft will be downed by attacks of air-to-air missiles deployed from combat UAVs, as well as ground-launched missiles. This will necessitate the provision of adequate means of self-protection for UAV aircraft, especially those that weigh 150 kg or more. We’re now actively working developing protective equipment based on the upgraded Adros family of IRCM technologies. This is one focus of our work.

The other focus is on precision-attack air-to-surface missile (ASM) weapons for UAV applications. We found out that currently used UAV aircraft are lacking affordable but effective ASM weapons for precision attacks on ground targets. We understand that these weapons should be of small caliber and offer a high-precision guidance capability. To date, only USA and Israel are dealing in a systematic way with R&D in this particular area. Generally speaking, there is gap in the UAV market for cost-effective precision-guided attack capabilities. We are current-



ly intensely engaged in the development of guidance systems for UAV-launched munitions weighing from 10 to 50 kg. The weapons may vary in terms of terminal effectiveness, but they should be unique in that they will be guided to their targets with a pinpoint accuracy.

We already have obtained certain results in each of the two areas of focus, and they relate particularly to collaboration with our Polish partners. Poland and Brazil are now jointly working on a tactical UAV project. The Polish party is interested in equipping the UAV platform with the Adros KT-05-BLA electronic-optical/infrared countermeasure (EO/IRCM) system. As a downsized modification



to the baseline Adros IRCM technology, the KT-05BLA was designed specifically for UAV aircraft and optimized against air-to-air missile threats. Much will depend on government funding of this type of projects in Poland. Not everything depends on us alone. We, for our part, have everything necessary in place to do what we intended. Incidentally, this tactical UAV was designed with a weapons payload in mind.

In addition, the Polish Air Force Institute of Technology is working on an upgrade project for the ILX-27 UAV rotorcraft with attack capabilities. It is expected that the helicopter will be armed with smart bombs equipped with a guidance system that we developed. A sample arrangement of guided bombs on the ILX-27 UAV rotorcraft platform was demonstrated at the MSPO-2014 Defense Industry Exhibition in Kielce, Poland, where the aircraft was displayed fitted with a mockup guided bomb unit. This is one of the first milestones achieved within the scope of the aforementioned concept in regard to development of small-caliber munitions. The guidance unit in the smart bomb us-

es GPS/inertial navigation, with inertial navigation system steering the munition to target from the time of release to impact. Structurally, the system still needs some maturing, but what means is that we have shown ourselves prepared conceptually to create this type of technology. This will in a sense be a challenge to small-caliber ammunition developers.

The Adros KT-05BLA is an EO/IR countermeasure system designed to protect unmanned aerial vehicles from heat-seek-

ing missile threats. Due to the use of an advanced jamming signal modulation algorithm and a digital control system, the KT-05BLA is able to effectively defeat missile seeker-heads employing amplitude-phase, phase-frequency and time-pulse modulation of target-reflected signal and interference filtering system.

The Adros KT-05BLA is designed specifically to protect turboprop and piston-driven UAV aircraft. **JDR**



Probability of success against an incoming IR-guided threat .....	<b>0.7-0.8</b>
Time needed to divert an inbound missile away from the host aircraft .....	<b>0.5-0.8 s</b>
Wave range.....	<b>1.8-5.5 μm</b>
Airplane power.....	<b>+27 V</b>
Jamming envelope .....	<b>+/-600</b>
Watt consumption .....	<b>500 W</b>
Mass.....	<b>5 kg</b>



# NEW LIFE FOR AEROTECHNICS



## THE STATE ENTERPRISE «LVIV STATE AIRCRAFT REPAIR PLANT»

### Field of activity:

- repairs of the aircraft MiG-21, MiG-23, MiG-27 and MiG-29, its aggregates and equipment, including the works on renovation of overhaul service life and life time;
- repairs aggregates and airframe systems ;
- development and delivery of designing documents for the mastering of the repairs of aggregates and airframe systems ;
- training of the Customer's specialists in the technological processes of aviation equipment repairs, consulting in the repairs of aviation techniques using the Plants production base;
- the expert advice and research work at the

- Customers' enterprises to elaborate necessary recommendations during the process of new types aviation techniques mastering;
- specialists' visits to the Customers' enterprises for technical assistance in the mastering of new types aviation techniques repairs;
- producing and delivering of the non – standard technological equipment developed for aviation techniques repairs by Plants specialists;
- examination of Customers' aviation techniques state to determine its capability of repairs;
- renting of the required technological equipment

- for Customer's aviation hardware repairs;
- assistance in adjusting the technological equipment ( produced in the former USSR ) in accordance with Customer technical requirements;
- assistance in acquisition of spare parts and stuff required for the aviation techniques repairs;
- consulting services in establishing contacts with the producers of aviation techniques and repairing agencies;
- services in designing and developing of maintenance site of « MiG « type aircraft engineering.

Web address:  
[www.lsarp.com.ua](http://www.lsarp.com.ua)

By the end of 2014 the SE "Lviv State Aircraft Repair Plant" and SE "Lutsk Repair Plant "MOTOR" has completed the works for repair of two MiG-29 and 6 RD-33 engines, 7 AL-31F, and 8 AL-21F-3T, under the contracts with Ministry of Defense Of Ukraine . Today enterprises are working in several shifts and taking full advantage of their opportunities.



## THE STATE ENTERPRISE «LUTSK REPAIR PLANT «MOTOR»

### ENHANCEMENT OF COMBAT POSSIBILITIES OF AIRCRAFT MiG-29

- Enhancement of functional possibilities of aircraft navigation system by installation satellite navigation system CH-3307-01 and integration with standard navigation complex of aircraft MiG-29;
- Improvement of performance characteristic of radiolocation complex H019, namely improvement of target range detection at the expense of development of generation and processing signals' units.
- modernization of units "BPK-88 series ZKM" with solid-state storage device;
- modernized recorder "Tester UZ-L" with emergency solid-state storage device;
- modernized system of "Ekran-13M-4" with electronic indicator and flash cassette;
- change of information-control cabin field at the expense of installation of indication unit and control panel of satellite navigation system CH-3307-01;
- replace of aircraft responder CO-69 of air movement control system by aircraft responder of type A-511 with additional working modes A, C of standard ICAO;
- etc

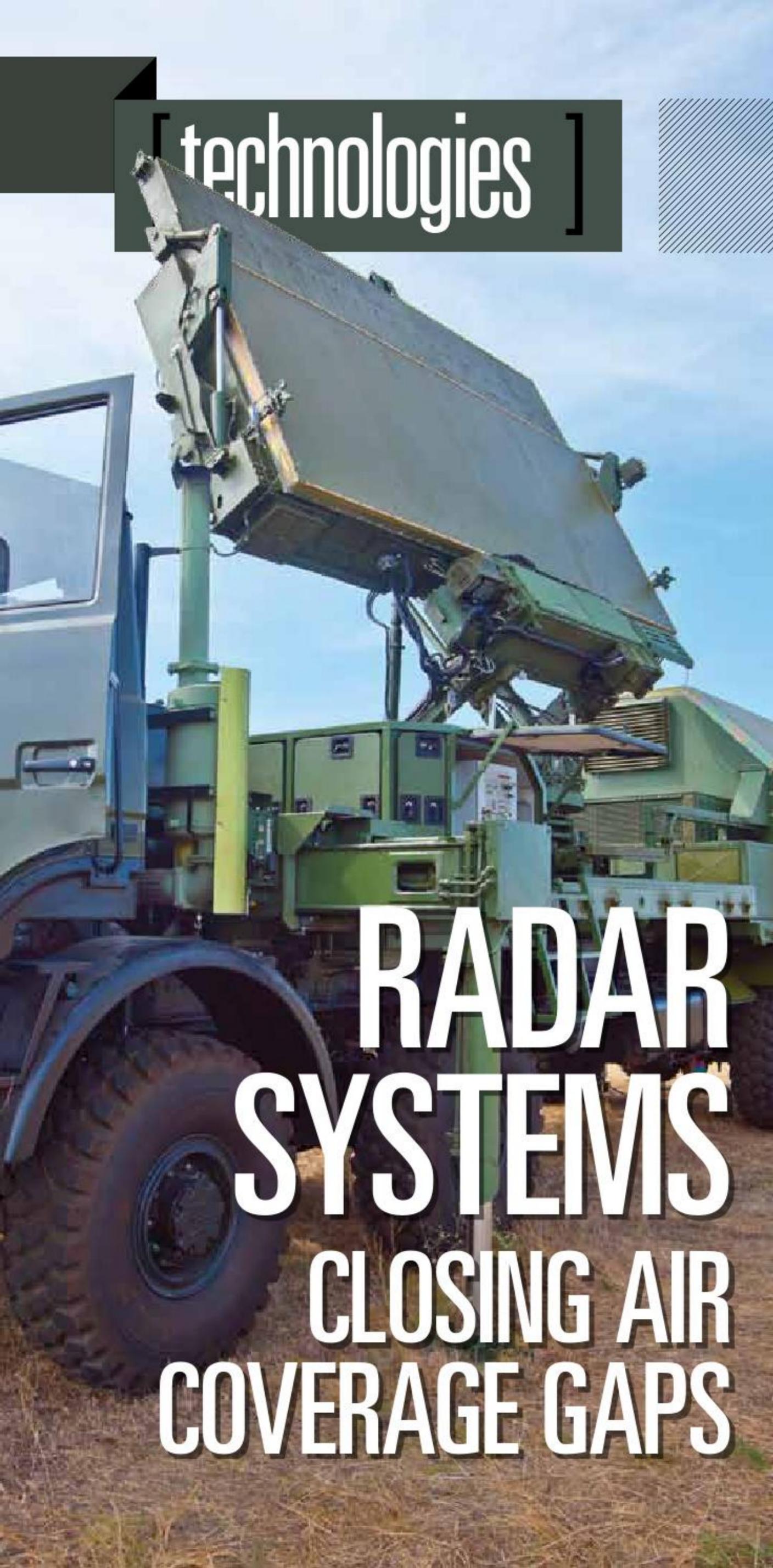


#### Field of activity:

- overhaul of aircraft engines AL- 21F -3 and all their component and aggregates (installed on the aircrafts Su-17, Su-20, Su-22, Su-24 (M));
- overhaul of aircraft engines AL -31F, remote accessory gear boxes VKA-99 and all component aggregates (installed on the aircrafts Su- 27, Su- 30);
- overhaul of aircraft engines RD- 33 and all the component units (installed on the MiG -29);
- overhaul of aggregates of aircraft engines of D-30KP (KP-2) (installed on aircrafts IL -76 , IL -78 );
- warranty and post-warranty service of the repaired aircraft;
- theoretical and practical training of specialists in overhaul of aircraft engines and all component aggregates on the base of " LRZ " Motor", and also on the Customer base.

Web address:

[www.motor-lutsk.com.ua](http://www.motor-lutsk.com.ua)



technologies

# RADAR SYSTEMS CLOSING AIR COVERAGE GAPS

Radiolocation is one of promising sectors of the Ukrainian defense-industrial complex, which has good opportunities and potential for growth and expansion. State-owned Enterprise 'R&D and Manufacturing Complex 'Iskra' is top designer and manufacturer of active radar equipment in Ukraine. That enterprise has designed and built 3D all-round-looking 80K6M and MR-1 radar systems for military purposes.

80K6M has fundamentally differences from the previous model, the 80K6. First, this is a wider scan sector in elevation; it now covers 55 degrees compared to 35 degrees for the 80K6, which is necessary for detecting ballistic targets.

Second, this is the number of carrier platforms required, as well as deployment time from unpack to operation. For the 80K6M, the number of carrier platforms was reduced to one from two, and setup time reduced to six minutes from 30 minutes in the 80K6. To fulfill these requirements, we had to develop a new digital beam forming system and apply new algorithms for computing antenna beams.

The 80K6M radar can be used for the provision of target data to any kind of SAM system, especially a mobile one - since it was created precisely for handling challenges of this kind.

While developing and building radar technology designs, company have traditionally looked at the quality of the parts and assemblies employed, rather than their country of origin, given that a sophisticated and

complex system such as radar is highly sensitive to the quality of its constituent materials and assembly units, upon which reliability of the resulting system will directly depend. Thus, 'Iskra' actively employ both imported and domestically manufactured assemblies, especially there where this would directly define performance capabilities.

In terms of its performance capabilities, the system's closest rivals include the AN/TPS 78 manufactured in the U.S.A. and the Thales Raytheon Systems GM400 of France. But our product has an advantage in aspects such as mobility and price.

The 80K6M is currently housed on a Belorussian MZ-KT truck chassis, but 'Iskra' is now developing a configuration that is optimized precisely for a KrAZ chassis.

The 80K6M is our most latest development that has been brought to serial production. So it is only reasonable that the technology generates much interest among the potential export customers who come to see our company.

According to the <http://military-informant.com> site information, now SC "Ukroboronprom" is closely working with the Ministry of Defense and Security of the Republic of Indonesia. Companies from the Concern have already completed a number of contracts for this country - supplied armored and aviation equipment, and also provides repair and modernization of some weapons. Now the Air Force of Indonesia showing interest to the 80K6M radar.

Also "Iskra" is developing – at its own cost and expense - new meter-wavelength radar system

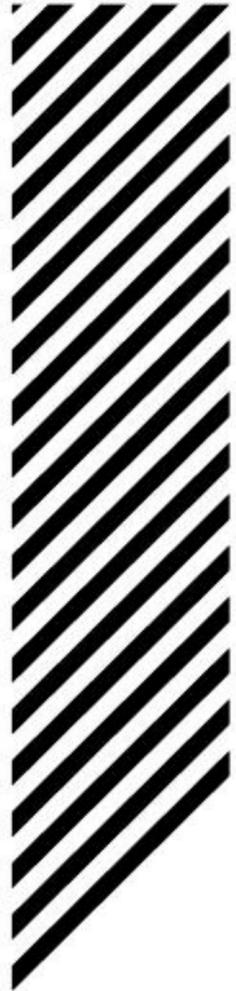
to be known as MR-1. This radar design being developed by Iskra encompasses the latest accomplishments by Ukraine's school of thought on radars designed to defeat 'stealth' aircraft targets.

A disadvantage of earlier designs was that their power requirements were to be met by a separate turbine-type generator housed on an additional vehicular transporter. The result was that the system required three to four (depending on specific configuration) vehicular platforms to transport, including dedicated platforms for interrogator unit and antenna unit together with associated transmitter and display units. By way of comparison, the MR-1 well fits into one single KrAZ-chassis based vehicle.

High mobility capability is one of critical requirements for a modern battlespace. The radar must offer 'shoot and scoot' capability, e.g. it has to be able to be relocated after each 5-10

minute work session. The MR-1 is controlled by operator without the need to leave cabin of the command & control vehicle. Air picture data is transmitted via digital radio data-links to multiple Army Air Defense command posts PU-12/15. Additionally, the MR-1 provides accurate enough target height finding functionality, making it truly three-dimensional radar.

Objectively, the MR-1 design is doomed to commercial success owing to engineering solutions adopted, and furthermore it has a considerable growth potential. It is to be hoped that the Ukrainian Government will duly appreciate Iskra's drive to support national security and homeland defense requirements, and will provide the badly needed current-generation radar capability for the national military before this promising technology finds its way to more forward-looking international customers. 



VHF Radar System MR-1. Basic Specifications

Defense Express	Operating frequency range	UHF (meter wavelength)
	Effective range limits: • minimum • maximum • azimuth • elevation	2...5 km 400 km 0...360 degrees 40 km
Scanning interval	10/20 s	
Detection range for a 3-5 m <sup>2</sup> RCS target with P=0.8 and F=10 <sup>-6</sup> • at 100 m altitude • at 10 km altitude • at 10-30 km altitude	27.0 km 260.0 km 300-380 km	
Number of targets tracked simultaneously	150-200	
Number of vehicles required for transportation	1+1 with powerplant vehicle	
Deployment/stow time	15 min	
Watt consumption	≤30 kW	

# 80K6M

## 3D ALL-ROUND LOOKING RADAR SYSTEM

The 'Iskra' R&D and Manufacturing Complex has designed a new radar system, the 80K6M, derived from the 3D all-round-looking radar system 80K6 that has been in service in the Ukrainian Armed Forces since 2007.

 Design authority  
**R&D and Manufacturing Complex «Iskra»**, Zaporizhzhia

The 80K6M is a vehicle-carried three-dimensional all-round-looking radar system designed to detect and track airborne targets flying at low, medium and high altitudes. If deployed with radio-radar or surface-to-air missile units within Air Defense Forces, the 80K6M is used for target data generation for control systems of air defense missile weapons. The 80K6M radar system offers capabilities as follows:

- The detection and tracking of air targets;
- The detection, tracking and 3D location and cruising

- speed measurement of air targets;
- Friend-or-foe identification of air targets;
- Determining azimuth and elevation bearings of active jamming devices;
- Feeding output data into radar workstations and related systems

It can operate independently or as part of regional or national C4I networks. This technology offers high resistance to environmental and electronic countermeasures influences.

### DETECTION RANGE FOR FIGHTER-SIZE TARGETS

with DCS = 3-5 m<sup>2</sup>,  
with P=0.8, F=10-6, km



### THE GENERAL APPEARANCE OF THE 80K6M RADAR SYSTEM



In carrying configuration – with the antenna collapsed.



In operative configuration – with the antenna deployed.



This link provides access to a video on the 80K6M radar

### Strategic mobility

The 80K6M radar system is air transportable on An-70 type military transports or similar aircraft types with a suitable-capacity cargo bay.



### Operating crew



### Carrying platform

The full 80K6M radar installation finds enough room onboard a single vehicle. It is transportable on a rugged terrain truck chassis – Ukrainian or foreign made depending on specific customer requirements. The 80K6M radar installation intended for the export to Azerbaijan is seen here deployed on a Belorussian MZKT truck chassis.

### Key advantages of the 80K6M radar system

- digital phased array antenna,
- high deployability,
- short deployment time

## 80K6M Radar System: Key Specifications

Operating frequency range:	5
Number of operating frequencies	6
Indicated range, km	400
Number of scan sectors in elevation	2
Mode switching time, s	0,1
Scan sector in elevation, degrees	
In mode 1	0...35
In mode 2	0...55
Scan time, s	5, 10
Clutter suppression coefficient, dB	>50
Method of beamforming	digital
Number of antenna beams	12
Root mean square error of measurement in the absence of electronic countermeasures influences:	
For range, m	100
For azimuth, min	20
For altitude at ranges up to 100 km, m	
In mode 1	300
In mode 2	400
Free-air temperature range, degrees Celsius	-40 +50 c
Number of carrier platforms required	1

**6** minutes is time needed for emplacement/displacement of the 80K6M radar installation. The short time into and out of action contributes to the system's survivability on the battlefield. The antenna folding process is extensively automated.

### Operator

Carries out control of the radar system from a computerized workstation. Airpicture data is transferred automatically via digital datalinks to air defense control centers and, directly, to SAM battery control centers. The 80K6M radar could be employed for support of autonomously operating Buk-M1 or S-300PS batteries and more types of fire units.



**M. PROKHORENKO**  
DEPUTY CEO OF  
UKRSTEPTSTECHNIKA  
HOLDING COMPANY

## OUR PRODUCTS ARE USEFUL FOR THE OBJECTIVES BEING HANDLED IN THE ATO AREA

Recently, the Joint-Stock Holding Company "Ukrspetstechnika" demonstrated to the public a number of its new products, some of which are already used in the Anti-Terrorist Operation (ATO) area, while others are awaiting "baptism in combat" soon in the future. The following is an interview conducted with Mykhailo Prokhorenko, deputy CEO of Ukrspetstechnika, by Defense Express on the Company's achievements and expectations for the future.

**Defense Express:** What kind of new products can Ukrspetstechnika boast of?

**Mykhailo Prokhorenko:** At the recent «Arms and Security 2014» exhibition in Kiev, the Company demonstrated a comprehensive range of products, among them a number of new designs. Those included an actual piece of the radar equipment "Malachite", which made its debut at the "Arms and Security 2014" exhibition. The new radar equipment has been officially accepted for service in the Ukrainian Armed Forces, and is

now being put through "test by fire" in the ATO area. Designed for air and surface surveillance roles, the Malachite is a state-of-the-art radar system with digital data processing and automatic data transfer capabilities. Of the three units of the Malachite system delivered to forces in the field thus far, two are currently employed in combat operations in the ATO area. The unit of the Malachite system that was demonstrated at the "Arms and Security 2014" exhibition will also be deployed in the ATO area. The Malachite radar system has

proved its battlefield effectiveness capabilities with regard to target detection and coordinate measurement (azimuth, range, course and speed), and successfully detected repeated Russian intrusions into Ukraine's airspace.

Also at the "Arms and Security 2014" exhibition, Ukrspetstechnika revealed its 111LM1 "Lis-M" radar system, which is intended for the detection of ground moving targets and slow low-flying helicopters during perimeter protection and battlefield surveillance missions. Designed as a follow-up configuration of the mobile "Lis" radar system, the "Lis-M" line of products includes variants optimized for specific target types, including human beings and vehicles, slow low-flying helicopters and surface vessels.

The "Lis-M" system provides the capabilities for automatic target detection and tracking in all weathers, in rainy, dusty and foggy environments and in zero visibility conditions – in daylight and at night.

Geographically referenced target data is displayed automatically on an LCD screen monitor in the form of a label with an assigned

target reference number, and includes target type and range, azimuth and velocity.

In its baseline configuration, the system is mounted on a horizontally adjustable platform, but it also can be easily reconfigured for installation on a vehicular platform (APC, AFV or a motor vehicle). The antenna mast can be extended to the height of up to 5.5 meters for longer ranges. The Lis-M can detect human beings out to 3,000 meters, vehicles and motor boats out to 5,500 meters, and helicopters out to 7,000 meters. The system has been tested and evaluated in proving ground conditions.

**Defense Express:** Ukrspetstechnika has one more innovative project on a special mission vehicle called "Jab". Would you give some details on this project?

**Mykhailo Prokhorenko:** The Jab is our promising product. Being essentially an integrated reconnaissance and electronic countermeasure system, the Jab system is designed with capabilities for the detection, classification and identification of ground moving targets and slow low flying helicopters, as well as for radio monitoring/interception, jamming warfare and target acquisition roles.

It can automatically detect (using a radar sensor) and provide geographically referenced data and detailed description (using an optical sen-



sor) on ground moving targets of all kinds; and it has the capabilities for the detection and jamming of hostile communication/telecommunication links and radio-radar emplacements.

The radar sensor is capable of maximum detection ranges of 3,000 meters for a human being and 6,000 meters for a vehicle; while the thermal imager can detect human beings out to 2,400 meters and vehicles out to 6,600 meters. The jamming capability is provided within a frequency range from 20 to 2,500 MHz. The full set of the Jab equipment is compact enough to fit on a single light armored car.

The integrated system such as the Jab is useful for a wide variety of missions handled by special operations forces as well as combat elements deployed downrange.

We are now fully prepared for the prototyping phase of the project, but we are lacking the platform chassis on which to mount the key elements of the equipment. The type of the chassis needs to be specified by the military users based on their specific requirements.

**Defense Express:** Will the role of signal jamming be assigned to the “Anklav” system?

**Mykhailo Prokhorenko:** The electronic warfare equipment set on the Jab vehicle will include portable GPS/GLONASS satellite navigation jamming system known as “Anklav”. It operates within two frequency ranges – 11,210...12,600 MHz and 1,550...1,620 MHz. Transmit power in each of the frequency ranges is higher than 10 Wt, while power input does not exceed 150 Wt. Even without the set of nondirectional antennas deployed, the Anklav can effectively jam GPS/GLONASS navigation signals within a 35-km radius, the jamming range extending to 200 km if directional anten-



nas are deployed. The weight of the Anklav equipment set does not exceed 12 kg.

On 12 October 2014 at the Bila Tserkva airfield, we carried out a demonstration of the Anklav’s capabilities to security sector experts, during which the Anklav proved its capabilities to the full extent. Particularly when operating in the “umbrella” jamming mode (i.e. with a set of nondirectional antennas deployed), the system was able to effectively jam GPS navigation signals emitted from a light aircraft platform at a range of 35 kilometers.

Based on the capability demonstration results, the experts concluded that the device is fully suited to perform its intended roles. I had a conversation with offic-

ers at the MoD’s Electronic Warfare Department, who said that the 30-km jamming range provided by our device is sufficient for the roles assigned to it.

**Defense Express:** Your Company long ago developed and produced the “Barsuk” millimeter-wave radar system that could be useful for checkpoint and patrol missions in the ATO area. Has the equipment been accepted for service or delivered to forces in the field?

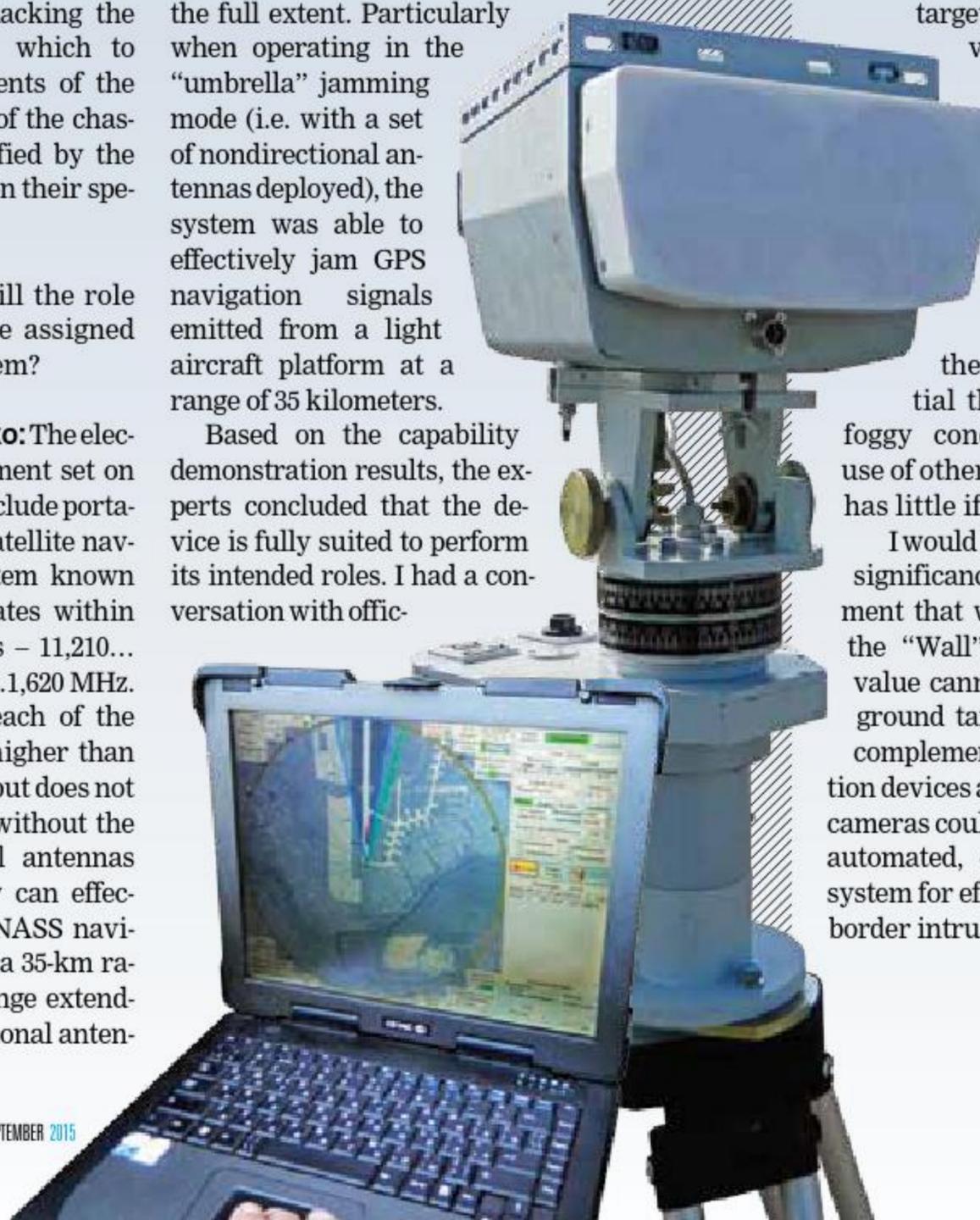
**Mykhailo Prokhorenko:** The “Barsuk” system has been accepted for Army service, with about five dozen units of the equipment being currently operationally deployed in theater. The Barsuk has proved highly effective, and user feedback has been positive. Indeed, equipment of this kind is needful in that it enables moving

targets such as humans or vehicles to be detected in zero-visibility environments and in all weather conditions.

Equipment such as Lis-M and Barsuk are highly useful for the detection of potential threats in smoky or foggy conditions where the use of other means of detection has little if any effect.

I would like to emphasize the significance the radar equipment that we produced has for the “Wall” project, where its value cannot be over-stated. A ground target detection radar complemented by visual detection devices and thermal imaging cameras could form the core of an automated, centrally controlled system for effective prevention of border intrusions. 

**Interviewed by Anton Mikhnenko**



XII INTERNATIONAL TRADE FAIR

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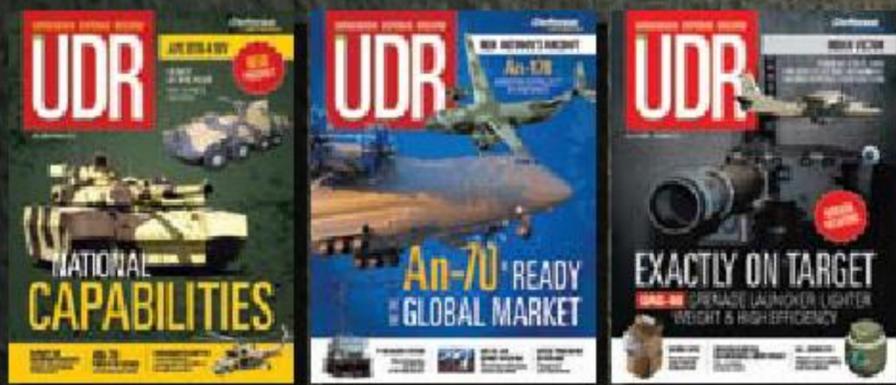
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