UKRAINIAN DEFENSE REVIEW

№1 [JANUARY-MARCH 2018]

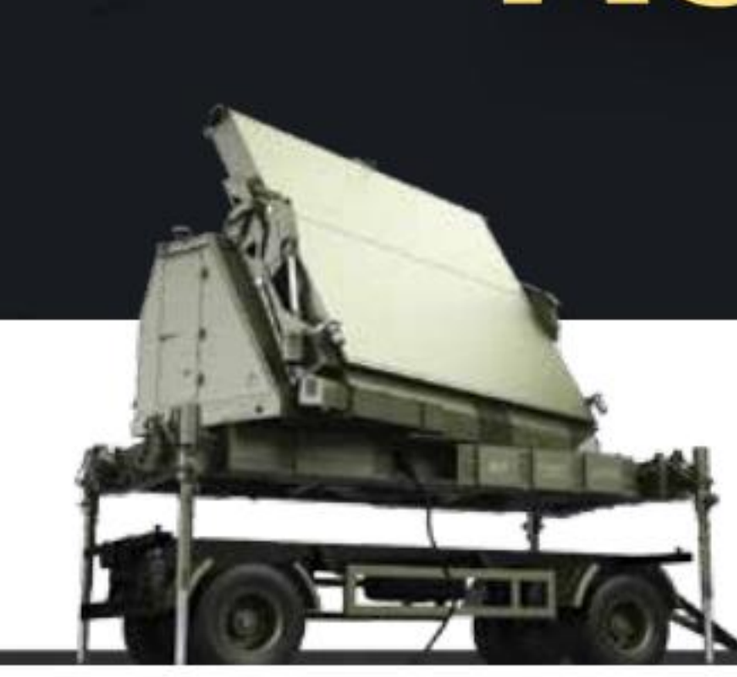
UDR

Defense express

SPAITECH'S SPARROW FAMILY OF MILITARY UAVS

MALYUK AUTOMATIC RIFLE

BORN TO BE THE BEST



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BTR-4MV1

A FOLLOW-ON DEVELOPMENT TO THE BTR-4E APC TECHNOLOGY

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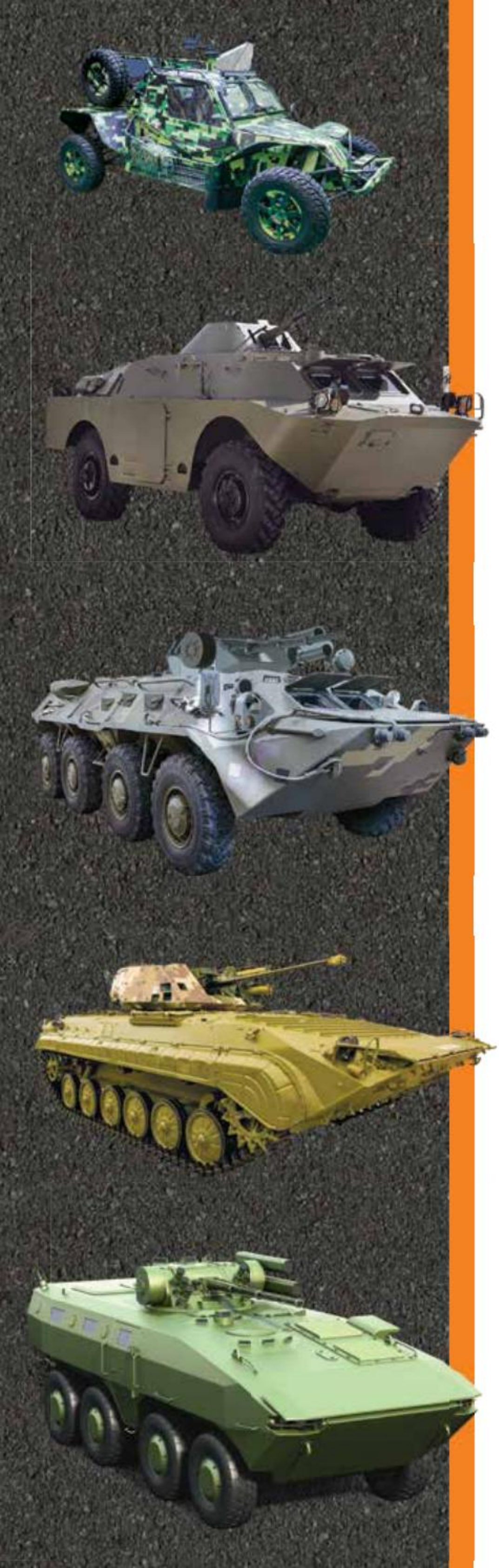
SMART AMMUNITIONS FROM UKRAINE



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battlefield arsenal

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guided weapons
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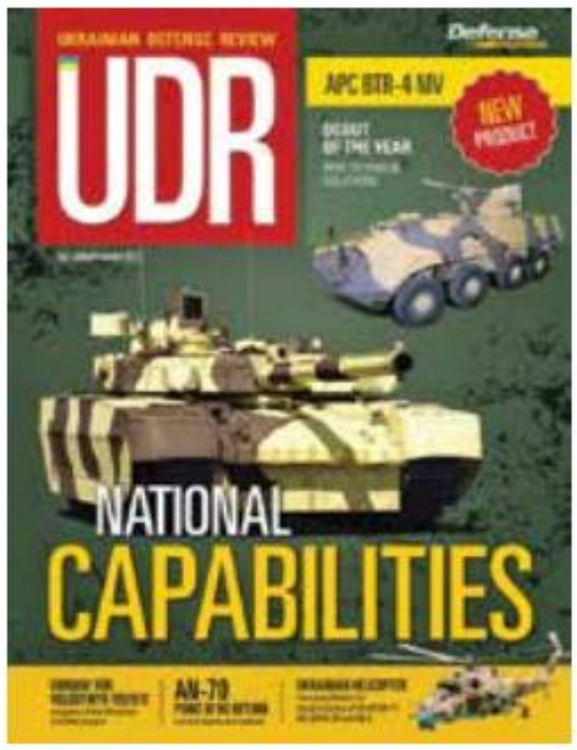
R-27 AIR-TO-AIR MISSILE
FROM SOVIET HERITAGE
TO ADVANCED TECHNOLOGIES



At the beginning of 2018, Ukrainian Defense Review Journal marks its fifth year in business.

During its years of existence, UDR Journal, published privately by Defense Express, has proven that it is needed and has a good promise ahead of it. The publication has been successfully performing its key mission – to make Ukrainian defense & arms products known on foreign marketplaces and to inform readers on key defense & security sector events related to Ukraine.

Presidents of Ukraine, Cabinets and defense ministers, CEOs and senior managers of companies and industries groups have been coming and going, companies opening and closing, and wars and military conflicts beginning right before our eyes. We observed it all, analyzed, overviewed and gave our expert comments on pages of this journal.

By team work of Defense Express employees the UDR Journal has been revamped and improved both in terms of content and appearance, up to standards seen in counterpart publications in Europe, America, and Asia.

Our professional team is committed to keeping its readers informed on successes and achievements of the Ukrainian defense industries and on the progress in Ukraine's international cooperation in defense industrial production and technology development.

Best Regards,

Editor-in-Chief UDR Journal
Anton MIKHNENKO

UKRAINE'S MINISTRY OF DEFENSE 2018 BUDGET APPROVED AT $3.1B

For 2018, Ukraine's Armed Forces have been assigned a budget of UAH 86.0 billion (USD 3.09 billion) equaling 2.58 percent of GDP. This represents a year-on-year increase of 24.3 percent or UAH 16.8 billion (USD 0.6 billion), with one-fifth of the sum reserved for armaments and military equipment programs.

Finance Department at the Ministry of Defense gave these figures citing the Law on "Ukraine's State Budget for 2018".

Of this, UAH 81.7 billion (USD 2.93 billion) will be funded in the base budget and UAH 4.3 billion (USD 119.5 million) in the non-base budget.

The Defense Ministry has selected three areas of focus to be given first-priority for funding in 2018:

- Procurement of armaments and military equipment;
- Logistics, replenishment of contingency reserves, building a network of military bases, modernization of infrastructure;
- Social security of military servicemen.

UAH 18.1 billion (21.0 percent of the total) has been budgeted for armaments procurement programs, including UAH 107 billion for armaments procurement and modernization and UAH 4.2 billion for armaments repair, while operating, personnel, and sustainment costs will take UAH 50.4 billion or 58.6 percent of the total Armed Forces' budget.

Overall for FY2018, UAH 163 billion or 5 percent of GDP has been allocated in funding for Ukraine's defense and security sector, including the Armed Forces. This represents a substantial increase from UAH 129 billion and UAH 113 billion allocated in 2017 and 2016 respectively.

UKROBORONPROM DELIVERED 3,673 PIECES OF ARMAMENTS TO UKRAINE'S DEFENSE AND SECURITY SERVICES IN 2017

State-owned UkrOboronProm defense industries holding company, the biggest defense contractor in Ukraine, delivered 3,673 units of weapons and military equipment to the Ukrainian Armed Forces during 2017, thus completing 100 percent of the government's defense purchases planned for that year, the Company reported in a press-statement.

"In 2017, UkrOboronProm completed 100 percent of the Government Defense Procurement and Acquisition Plan, which, as in previous years, was the Company's primary task.

Over that period, 3,673 units of weapons and military equipment, including 2,053 brand new and modernized products, were delivered to the Ukrainian Armed Forces, National Guard and other national security services," the statement says.

In particular, Ukrainian forces acquired tanks, infantry fighting vehicles, airplanes, artillery guns, anti-tank rocket systems, air defense systems, and other types of armaments, including over five dozen Bulat MBTs, dozens of new BTR-3 and BTR-4 APCs, radar and EW capabilities, and new rocket and missile systems.

PRIVATE DEFENSE INDUSTRIES ACCOUNT FOR NEARLY HALF OF GOVERNMENT DEFENSE CONTRACT

Private-sector defense industries currently account for nearly 50 percent of the Government Defense Contract, Valentyn Badrak, CEO of the Center for Army, Conversion and Disarmament Studies (CACDS) said at a media conference in Kyiv.

"2017 signaled positive changes in the way army modernization issues are being handled. One such positive change is that there is a major revision about the role and importance of private defense industries that now account for some half of the total amount of works subcontracted under the Government Defense Contract. That is, those industries have a strong presence in the army modernization effort," the expert said.

He especially highlighted the fact that Ukraine was able to switch to new, secured communications technologies despite strong resistance from within and outside.

«2017 also saw the start of the 'mosquito' fleet buildup. Another positive example – as far as army modernization is concerned, Ukraine's international cooperation in military technology has never involved projects benefitting the country's own military. Now we have two such projects: one is the aforementioned secured communications, and the other is the Sokil [tactical ISR/ground attack UAS] which is being developed with support from foreign technology suppliers," V. Badrak said.

Along with that he noted some negative trends, «As before, we have problems with the quality and quantity of the armaments produced and delivered to the Armed Forces. We have outstanding issues with launching long promised production lines, especially for the Oplot tank, Dozor [APC vehicle], and certain unmanned aircraft systems".

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SAUDI ARABIA TO LAUNCH IN-COUNTRY ASSEMBLY LINE FOR AN-132 AIRLIFTER IN 2019

Saudi Arabia will begin assembling An-132 aircraft in-country in 2019, at a facility located at a new airport to be built to serve the city of Taif, the Makkah Region, Eastern Saudi Arabia, Uaprom reported citing Ukraine's National Information Portal 'TISK'.

Construction of the facility and production lines will take about a year's time to complete, and a further nine months will be needed to build the first An-132 airplane which is due for roll-out in the third quarter 2019.

The launch customer for the An-132 airplane will be the Royal Air Force of Saudi Arabia, which is planning to acquire a total of 30 airplanes, including 10 in military transport configuration and 20 configured for special-mission roles such as reconnaissance surveillance, maritime patrol, electronic warfare, close air support, search and rescue, paratrooper dropping etc.

Saudi Arabia is considering other potential roles for the An-132, including as a gunship (similar to the U.S. Lockheed AC-130 Spectre/Spooky [Close Air-Support /Air Interdiction/Force Protection] Gunship).

In the Middle East context, gunship airplanes would be useful especially in fighting opponents that have weak air defenses or lack these altogether. If the An-132 Gunship project is materialized, it is not impossible that, in the near-term, we will see this Antonov airplane used in its heavily armed configuration on battlefields in Yemen, Syria and other countries that are home to militarized terrorist organizations and forces hostile to Saudi Arabia.

Saudi Arabia is looking to supply about 80-100 locally built An-132s to export markets and already has preliminary orders from five potential customer countries. Persian Gulf governments are interested as well, but procurement decisions will depend on how the An-132 transport fares in Royal Saudi Air Force service.

Meantime, a production line for the An-132 light transport airplane will be launched at Antonov, Kyiv, as early as in 2018.

MOTOR-SICH AWAITING UKRAINE'S GOVERNMENT CONTRACT TO DEVELOP EMERGENCY RESPONSE HELICOPTERS IN 2018

PAO "Motor-Sich" PJSC, Ukraine's biggest manufacturer of aircraft engines, is set to win Ukraine's Government contract worth UAH 400 million to develop helicopters for use by emergency and disaster response services, Vyacheslav Bohuslayev, President and Chief Designer at Motor-Sich told the media.

"This information is fully reliable. Such a program does exist, and it's true that we will produce helicopters for use by emergency response services. These helicopters will be able to operate in all weathers, including on icy surfaces, and will help emergency services do their duties in a timely and efficient way," Mr Bohuslayev said. "Work is now underway to develop specifications and operational requirements for new search-and-rescue helicopters, including the general appearance, configuration and details of the equipment fit. It is assumed that these will be different types of helicopters that will be differently equipped for different roles," he said.

Motor-Sich is going to commence work on its emergency-response helicopter production program some time during the first quarter of 2018, with initial deliveries expected in May 2018.

FOUR NEW UNMANNED AIRCRAFT SYSTEMS ACCEPTED INTO SERVICE WITH UKRAINE'S ARMED FORCES

On 5 December 2017, Ukraine's Defense Minister Stepan Poltorak issued directives granting operational use approval for four unmanned aircraft systems – the ASU-1 «Valkyrie» developed by Aviation Systems of Ukraine LLC, the Hawk UAS developed by NPP Ukrainian Aviation Systems, the UA-BETA UAS developed by UA Technology LLC, and the UAS-MP-1/003 «Spectator-M» (a second-generation evolution of the UAS-MP-1 «Spectator» technology), developed by Korolev Meridian JSC.

The operational use approval, which will be valid for the duration of the contingency period, followed successful completion of the required testing and evaluation cycles.

The operational use approval was granted pursuant to Procedures for the supply of weapons, military and special equipment during periods of contingency, civil emergencies, and Anti-Terrorist Operation, enacted by Ukrainian Cabinet of Ministers Decree No. 345.

According to the Procedures, the Defense Ministry, after the end of the contingency period, should take decisions to either decommission the aforementioned systems or to accept them into permanent service in due course.

Training for said systems will be provided by their respective developer entities, to be followed by advanced training at S.P.Korolev Military Institute, Zhytomyr.

UKRAINE'S INDIGENOUS «HRIM» TACTICAL MISSILE SYSTEM TO BE READY FOR FIELD TEST-FIRING IN 2018

Ukraine's brand new tactical/theater missile system Hrim (Ukrainian for 'thunder'), which is now at the final stage of development, will be ready for field test-firing in 2018, the National Industry Portal reported in early December 2017, citing Leonid Shiman, CEO of NVO Pavlohrad Chemical Plant.

«The system has reached its final stage of development. So far testing has been completed for control, missile transport, hydraulic, and mechanical sub-systems and everything related to transportation, and it is most likely that the [Hrim] missile system will be ready to enter its field test-firing phase in a year's time," Mr Shiman said.

KB Pivdenne (Yuzhnoye) began developing the Hrim short-range missile system in 2005.

The Hrim missile is meant to defeat targets in hostile territory, at ranges up to 280 km. Targets that can be engaged are enemy firing positions (SAM batteries, missile launchers); airplanes and helicopters on airfields; air defense and anti-ballistic missile facilities; command, control, and communications centers.

Analysts expect that the Hrim could be inducted into Ukraine's Armed Forces within a three to four year's timeframe. That would give a major boost to Ukraine's national defense capacity, because the Hrim technology could provide the baseline for development of a lineup of SAM/ABM systems as well as tactical and strategic range missiles.

Hrim missiles are able to effectively engage targets at ranges out to several hundred kilometers and to defeat enemy air defenses with a 96 percent probability of success.

The Hrim missile has been developed with an eye to making it a versatile weapon platform meeting the varying needs of Ukraine's Armed Forces. It could be modified to be fired from launchers other than the Hrim, and equipped with suitable guidance systems and warhead payloads for defeating targets on land, at sea, and in the air.

UKRAINE SUCCESSFULLY TEST-FIRED ITS NEW MISSILES IN DECEMBER 2017

On December 22, 2017, Ukraine's new indigenously developed missiles were successfully test-fired at a test and training facility outside Odesa in the presence of Oleksandr Turchynov , Secretary of Ukraine's National Security and Defense Council.

Upon completion of the test firing session, Turchynov said that this event"...marks a final milestone in the work by Ukrainian missile developers and manufacturers, and now we can say with certainty that Ukraine possesses a new highly capable weapon that will become a strong argument for deterring the aggressor».

Mr Turchynov furthermore elaborated that the tests focused on validating ballistic performance, the accuracy of guidance, efficiency of new solid propellant, and the probability of first-round hit. «Also, very importantly, we tested the quality of the new missile body, which is made out of high-strength alloys manufactured using tailor-made production line that has been set up recently at Artem State Holding Company".

«During test firing, the missiles hit right on targets, proving again the advantages of Ukrainian missile technologies over Russian counterparts," Turchynov said.

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UKRAINIAN ARMOR LLC UNVEILS ITS NEW VARTA-NOVATOR APC

TOV Ukrainian Armor LLC, a Kyiv-based armored military vehicle manufacturer, unveiled its new armored personnel carrier, the Varta-Novator, during a demonstration at a Ukraine National Guard base on December 15, 2017, Uaprom portal reported.

The demonstration was attended by officials of the Interior Ministry's Research and Development Institute among other defense and security officials.

The vehicle has been especially developed to meet operational requirements of Ukraine's National Guard.

The Varta-Novator is a 4x4 drive armored carrier with a gross vehicle weight of 9,000 kg, including a payload of up to 1,000 kg. Built as a pick-up truck with an open cargo-carrying bed, the vehicle can seat five passengers within its cabin and its spacious enough open topped bed can be configured for both cargo and passengers.

The vehicle is based on a redesigned and ruggedized Ford F550 chassis and powered by a 300hp, 6.7L turbo diesel providing it with a maximum speed of 120 km/h and an operational range of 700 km thanks to the 160l fuel tank capacity.

The Varta-Novator can ford water to a depth of 0.7m and negotiate gradients and slopes of 50 percent and 60 percent respectively. It is designed to comply with modern requirements made upon special operations vehicles and equipped with facilities for crew/passengers comfort, safety and security.

UKRAINE LAUNCHES PRODUCTION OF ACOUSTIC WEAPON LOCATING SYSTEM POLOZHENNYA-2

Lviv-based LORTA Factory company of the State-owned UkrOboronProm defense industries holding group has launched a production line for the acoustic weapon locating system "Polozhennya-2", UKrOboronProm told Defense Express.

Molniya R&D Company, Odesa, designed Polozhennya-2 as a follow-on evolution to its Soviet-era AZK-7 "Mezotron" acoustic counter battery technology.

A prototype Polozhennya-2 system has been introduced into service with Ukraine's Armed Forces following completion of the full cycle of government-commissioned trials.

Polozhennya-2 can accurately, rapidly and automatically locate hostile mortars, artillery and Grad MLRS launchers, and may also be operated in a friendly fire mode to correct and improve the accuracy of counter battery return fire. It can effectively detect even extremely low-noise shots at ranges up to 35 km and adjust friendly fire out up to 15 km.

The system is capable of being used also for conducting registration or mean point of impact calibrations for friendly artillery.

It integrates a meteorological sensor suite that allows for the effects of the weather to be factored into the computation of impact points. With this capability at hand, targets can be defeated with high hit probability without the need of conducting preparatory fire, thus leaving the enemy with no time to prepare for counter action.

UKRAINE'S NAVY LOOKING TO ACQUIRE 30 NEW WARSHIPS BY 2020

The Ukrainian Navy is planning to acquire 30 new warships worth together UAH 10 billion by 2020 as envisioned by Ukraine's Armaments Development Program 2020.

The Navy headquarters has developed operational and tactical requirements on maritime platforms for the Navy's «mosquito" fleet. These platforms will have to be NATO compatible technologically and, also, in terms of technical quality of the hull's construction and the effectiveness of the onboard weapons systems used.

Captain 1st Rank Andriy Ryzhenko, the Navy's deputy chief of staff for Euro-Atlantic integration, stated one time that Ukraine's Navy, despite the current budgetary pressures, is planning near-term procurement of small, fast, low-signature, well-armed boats and craft for various purposes, which would naturally fit into the Navy's 'mosquito fleet' concept.

For performing the tasks of defending Ukraine's coastal area out to 100-150 nm offshore; protecting maritime economic facilities, coastline infrastructures and sea lines of communication; securing national borders at sea; and countering the threat of Russian invasion from sea, including, in the first place, the prevention of amphibious assault operations by the adversary or intrusions of hostile saboteur/reconnaissance groups, the Navy headquarters developed a three-echelon structure for operational deployment of the future combat craft fleet.

«The first echelon will be comprised of missile boat platforms carrying long-range attack missiles, torpedo weapons, artillery guns, and EW systems. Their task will be to deter intrusions by the aggressor's ships (first and foremost to Ukraine's exclusive economic zone) and to conduct fire on its surface and subsurface combatants,» Captain 1st Rank Andrii Ryzhenko said.

In the future, these tasks will be performed by Lan'-Class fast attack missile boats.

The second echelon will consist of multipurpose patrol and mine countermeasures platforms. Their task will be to patrol certain sea areas; to escort, protect and convoy ships, especially in maritime shipping route areas. This echelon will also include mine countermeasures platforms that will detect and neutralize mine threats and will provide anti-sabotage protection for harbor and port infrastructures. In other words, these platforms will defend Ukraine's sea ports and maritime lines of communication. The U.S. Island-Class offshore patrol boats that are being considered for handover to Ukraine's Navy will likely fill this niche requirement, but other platforms for similar purposes need to be constructed as well, Mr Ryzhenko said.

The third echelon will include fast amphibious boat platforms, built locally or imported –highly mobile, low observeable, and capable of speeds up to 50 kts. They will deliver marines and Special Forces to their objective destinations. Kuznya na Rybalskomy is now building Centaur-Class amphibious assault boats to meet the Navy's requirement, and the Swedish amphibious boat CombatBoat 90-Class is being considered as a potential addition to the Navy's amphibious assault capability.

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BTR-4MV1 REINCARNATION

BTR-4MV1 -- A FOLLOW-ON DEVELOPMENT TO THE BTR-4E APC TECHNOLOGY – WOULD OFFER IMPROVEMENTS IN THE VEHICLE'S OPERATIONAL EFFICIENCY AND BATTLEFIELD SURVIVABILITY

Morozov Machinery Design Bureau's BTR-4MV1 armored personnel carrier – a 8-wheel drive, amphibious all-terrain vehicle -- was certainly a special thrill of the Ukrainian display at the Arms & Security 2017 exhibition where is was demonstrated to the public for the first time in October.

Development of the BTR-4MV1 vehicle has fed in lessons from BTR-4E APC operations in real-world combat scenarios in Eastern Ukraine.

If compared to the original BTR-4E technology, the BTR-4MV1 features a number of improvements in terms of battlefield survivability and operational efficiency. Other enhancements include modular, multilayer armor protection as seen in some of APC vehicle designs developed by NATO countries. Another obvious benefit of the BTR-4MV1 upgrade is that the vehicle can be easily reconfigured for specific missions being dealt with, particularly by equipping it with additional armor protection or fuel tanks, buoyancy chambers etc. and, in contrast to the BTR-4E, damaged armor plates can now be easily replaced even under field conditions.

The upgrade additionally includes a new, steeper inclined front section, enhanced armor protection of the vehicle sides, and new, blast attenuation seats in the troops compartment. In the rear hull there is a hydraulically operated ramp enabling troops to exit and enter the vehicle much quicker. Overall, the upgrade would offer a 12-15 percent improvement in protection of the crew, passengers and internal equipment over the original BTR-4E vehicle, it is claimed by Morozov.

With new, multilayer armor protection solutions implemented in the BTR-4MV1 APC technology, and with enhanced protection of the crew and passenger compartments, the upgrad-

ed vehicle is almost three tons heavier than the BTR-4E while retaining the original vehicle's swim capacity as well as mobility performance due to its being equipped with a 450hp Deutz engine coupled to Allison transmission. The upgraded vehicle is able to safely cross water obstacles even in rough waters up to state 2, according to Morozov. Mobility performance is improved further by adding run-flat inserts that enable the vehicle to continue to be driven in the event a puncture results in complete loss of tire pressure.

The BTR-4MV1, like the original BTR-4 E, carries a standard-issue weapons module BM-7 «Parus» equipped with a new, domestically manufactured opto-electronic sight integrating a highly capable thermal imaging camera and a laser rangefinder to enable target acquisition under any day or night weather conditions at ranges up to five kilometers. Improved situational awareness is provided by a 360-degree camera system interfaced with a display unit in the driver's workstation.

The BTR-4MV1 upgrade is now ready for testing and evaluation, which successful completion will allow it to be commissioned for operational use by Ukraine's Armed Forces. UDR

Andriy LYSENKO,
for Defense Express

BTR-4MV1. KEY SPECIFICATIONS

Overall weight with ammunition allowance	24...25 t
Crew + infantry squad	3+7
Engine	450hp
Max. speed on highway/while afloat	110/10 kmph
Range	650 km
Armaments	BM-7 Parus weapons module
Gun caliber/Ammunition allowance	30mm/300 rounds
Caliber of grenade launcher/Ammunition allowance	30mm/57 rounds
Machinegun caliber/Ammunition allowance	7.62mm/2,000 rounds
Barrier ATGM launchers	2

ARMORED VEHICLES UPGRADE AND UPDATE: UKRAINIAN ACCENT

Valerii RIABYKH, Defense Express

The armored vehicles sector still remains among the most promising and effective sectors of the Ukrainian defense industry. Ukrainian armored vehicles industries have pursued a number of projects that would give whole new capabilities to some of the time proven, Soviet-legacy armored ground vehicles.

SECOND WIND FOR THE T-72 MBT

Kharkiv Morozov Machinery Design Bureau of the state-owned Ukroboronprom defense industries holding company has developed a comprehensive upgrade program for the T-72 main battle tank, which it pursues in collaboration with state-owned Malyshev Factory company.

The upgrade pack encompasses improvements to the vehicle's mobility performance, command and control equipment, and the level of armor protection along with the addition of some new capabilities.

The key element of the upgrade will be the new, 6-cylinder 1,200hp 6TD-2 engine that would allow for potential benefits in terms of better mobility and maneuverability ,and achieving a higher level of protection by means of adding extra armor or/and installing an active protection system.

Engine and transmission system of the T-72 MP tank / Photo courtesy of Defense Express

The T-72 MBT upgrade additionally includes an improved transmission enabling higher speeds, both in forward and reverse drive modes. With an improved reverse gear in place, the vehicle will be able to be relocated quickly on the battlefield without the need of being turned around.

Other enhancements include the EA10-1/EA8 auxiliary power unit for powering additional electronic subsystems, electromechanical actuators, the active protection system "Zaslin", the optronic countermeasures system "Varta" and other systems on the vehicle.

Enhanced capabilities against hostile tanks would be achieved by using more capable weapons and a new fire control system supporting the gun-

launched anti-tank guided missiles "Kombat" and "Konus".

Developed by KKB Luch Design Bureau, Kombat and Konus ATGMs are being produced by state-owned Artem joint-stock holding company.

Designed to be fired from guns on the T-72, T-80UD and Oplot MBTs, the Kombat missile can be launched when both the tank and the target are moving. Although intended primarily to engage targets beyond the effective range of the tank gun firing 125mm gun rounds, the Kombat can be efficacious also against hovering helicopters and fortified emplacements. It uses laser-beam-riding guidance where the laser beam is directed above the target without actually illuminating it. It illuminates the target (tank or helicopter) for just 0.3 seconds prior to impact, making the missile virtually immune to enemy countermeasures.

The Konus ATGM uses a similar guidance technique, but is designed specifically for launch from a 120-mm NATO standard gun.

SECOND WIND FOR THE BMP-1M IFV

In Ukraine, armored vehicle industries are also active in upgrading Soviet-legacy fleets of infantry fighting vehicles. Zhytomyr Armored Vehicles Factory company offers its BMP-1UMD upgrade of the BMP-1M infantry fighting vehicle. As by this date, the BMP-1UMD technology has successfully come through the final series of factory-level trials that included mobility and live firing trials among other types of performance trials.

A major part of the upgrade is re-engining the vehicle with the 6-cylinder turbocharged 330-hp Deutz TCD2013 L64V engine replacing the Russian-sourced UTD-20.

The BMP-1UMD upgrade encompasses enhanced firepower, upgraded fire controls, improved ergonomics and comfort for the crew, as well as expanded functionality. Special emphasis was placed on reducing the vehicle's signature in visible and infrared regions.

The BMP-1UMD vehicle is offered with different options for turret mounts.

In 2016, comparative testing and evaluation of Shkval vs Stiletto turret weapons modules was performed, attended by Ukrainian Defense Ministry officials.

Intended mainly for use against armored targets at ranges out to 5 km, the Shkval turret is armed with a 30mm ZTM-1 cannon, a 7.62mm KT-7.62 coaxial machine gun, an AG-17 30mm automatic grenade launcher, and an ATGM launcher.

The Stiletto turret features a similar weapons set, but with a ZTM-2 cannon in place of the ZTM-1 cannon found in the Shkval turret.

Targeting and weapons control capabilities are provided with new digital sighting systems OTS-20.04-01 for Shkval and Treck-2-01 for Stiletto. Both are fitted with a laser rangefinder and a thermal imaging camera, but use differing algorithms for fire control.

Ukrainian companies offer upgrade options that incorporate modern engineering solutions, components and materials, and can improve dramatically the capabilities of Soviet-era armored equipment. The proposed upgrades would give a second wind to outdated Soviet-legacy armored vehicle inventories and help them maintain their military usefulness for many years to come – this all at a cost far lower than that of newly built vehicles. Those who spend money wisely would be well advised to watch the experience and expertise Ukraine has in upgrading and updating armored military vehicles. UDR

"Stiletto" turret module on the BMP-1UMD infantry vehicle / Photo courtesy of Zhytomyr Armored Vehicles Factory

BMP-1 upgrade option equipped with "Shkval" turret module/ Photo courtesy of Zhytomyr Armored Vehicles Factory

TEMP-3000

DESIGNED & MANUFACTURED IN UKRAINE

PRODUCTION

Current **PRIMARY** and **EMERGING** lines of production:

- Production of **Para-aramid Fabrics** – TPS fabric line – **high strength** and **durability**
- Production of **Meta-aramid Fabrics** – Conex fabric line – heat and flame resistance
- **Sintering of Ceramics**

PRODUCTS

On the basis of our raw materials, we manufacture the following products, which can be customised upon request to meet customer' requirements:

- Ballistic Helmets
- Hard Armour Plates
- Covert Bulletproof Vests
- Overt Bulletproof Vests
- Bomb Disposal Suits
- Bomb Disposal Equipment
- Tactical Gear
- Tactical Equipment
- Ballistic Shields

TESTING

Our ballistic protective products are tested and verified in our accredited **TESTING LABORATORIES** according to specific threats. There are three laboratories that operate in the company, specifically:

- Laboratory for fibre, yarn and textile materials testing
- Laboratory for x-ray inspection of sintered ceramic plates
- Laboratory for testing of complementary materials and finished goods on fragmentation resistance

TEMP-3000 is the only company in Ukraine that developed and launched the production of flame-resistant meta-aramid material Conex with ignition temperature – 610C. Unique features of **Conex**, specifically, its heat- and flame-resistance, are set on molecular level an as a result do not change and remain to be stable during the whole term of use. Conex provides the protection from 2nd and 3rd degree burns due to its self-extinguishing. Under the influence of high temperatures, Conex becomes denser and forms charred surface that continues to provide excellent isolation of skin. Conex does not melt or form stains, has low conductivity and is antistatic. Material structure provides high tensile strength and enhanced abrasion resistance.

Production of **HIGH-STRENGTH MATERIALS** is the basis of our **SUCCESS** and **COMPETITIVENESS** as it allows us to produce materials with customised properties.

The introduced recently new **high-temperature sintering of ceramic** allows the production of hard armour plates of IV level according to the standard NIJ 0101.06 USA of the most popular ceramics – B_2C_4 (boron carbide), SiC (silicon carbide), Al_2O_3 (aluminium oxide).

Our own production of ballistic fabrics is the foundation of the company as it allows manufacturing and controlling the full cycle of ballistic helmets and soft armour panels' production, which afterwards used in bulletproof vests.

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KOZAK-2M

ERGONOMICALLY DESIGNED FOR CREW COMFORT

The Kozak-2M light armored vehicle (LAV) is a tactical multirole vehicle designed to perform varying battlefield roles requiring high mobility, maneuverability, and protection abilities.

LAVs exceed heavily armored counterparts in maneuverability and strategic mobility while simultaneously providing far better protection compared to military utility vehicles like the HMMWV. Special emphasis is placed here on protection against mine and IED blast attacks that are common threats in asymmetrical (guerilla) conflicts.

Although designed primarily for providing fire support to dismounted soldiers on the field, the Kozak-2M is suited also for roles like battlefield reconnaissance and transportation of battlefield supplies. The Kozak-2M technology could provide a platform for development of a comprehensive family of specialist vehicles, including personnel carrier, command & control vehicle, battlefield ambulance, and military utility truck, in addition to peacetime configurations to support peacekeeping and Police operations.

The idea for a vehicle that is the Kozak-2M now was first conceived by Practika in late 2008 when Ukraine's Defense Ministry announced plans to develop a new vehicle to replace Soviet-legacy wheeled armored vehicles in

the Ukrainian military inventory. Practika was selected to design and develop the vehicle due to its huge experience and expertise in armored vehicles for civilian use.

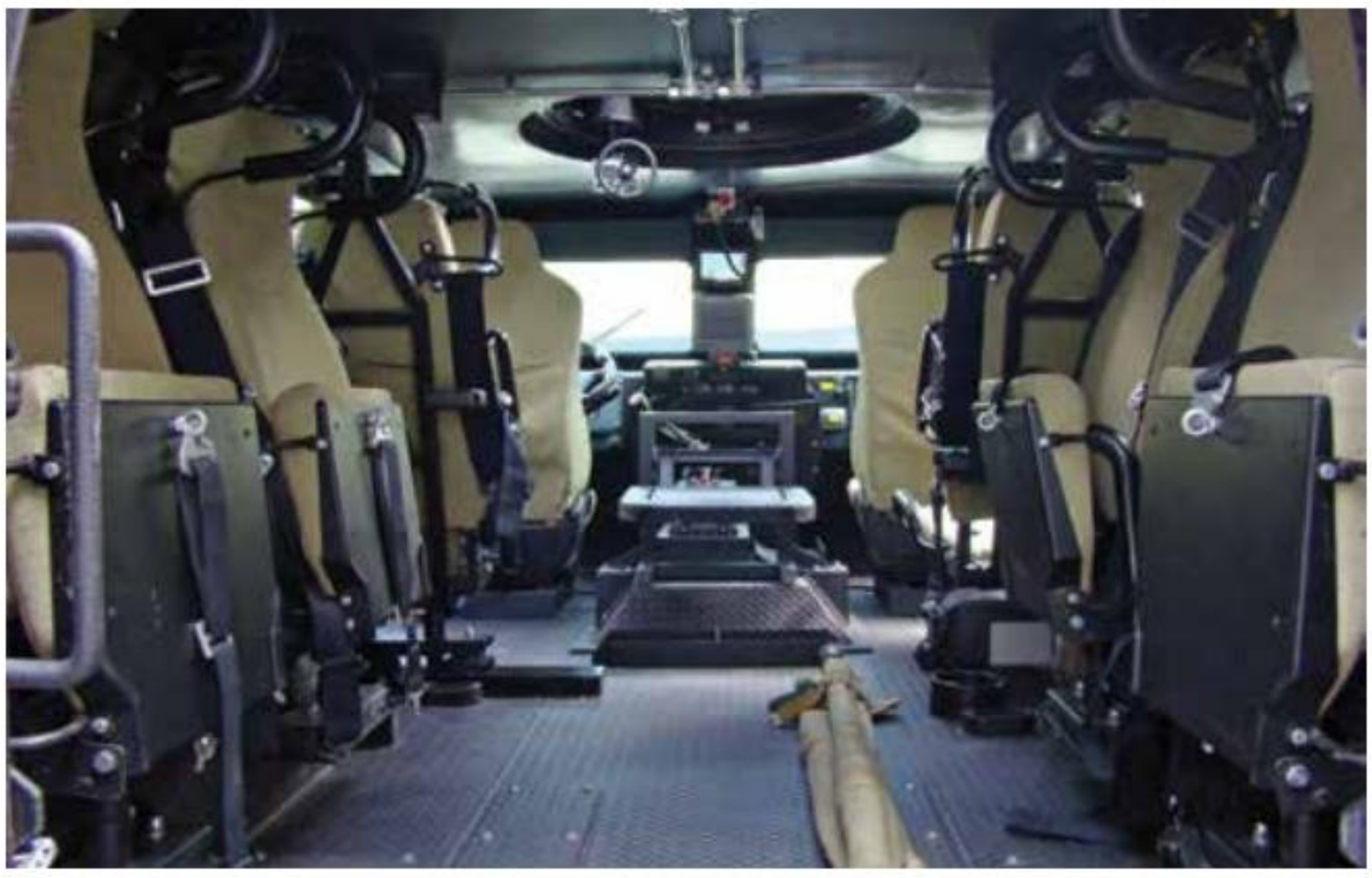
On 24 August 2009, a prototype Kozak vehicle was first seen at Ukraine's Independence Day military display in Kyiv. At the time, however, the Kozak project was found not mature enough to proceed to the next stage of development. So it remained on hold until 2014 when Practika was forced to shift focus to military vehicles due to the onset of Russian military aggression in Eastern Ukraine's Donbas region.

The Kozak was fully redesigned for the second-generation evolution named Kozak-2, a prototype of which was demonstrated to the ministers of defense and interior in November 2014. It received favorable reviews, and the Company proceeded to developing a production vehicle in 2015. After succeeding through government trials, the Kozak 2 vehicle was adopted for operational use by Ukraine's Armed Forces and brought to series production, with over one hundred vehicles manufactured so far to address the requirements of Ukraine's Armed Forces and National Guard.

In 2016, the Kozak-2M (with the M standing for «modernized") vehicle was developed by Practika as a further evolution of the Kozak-2 technology.

Unlike its older sibling Kozak-2, which is based on a truck chassis, the Kozak-2M is a unibody, independent suspension vehicle.

Following completion of the prototyping phase in 2017, the Kozak-2M is now undergoing government trials.



DESING

Due to its being of unibody construction, the Kozak-2M vehicle is engineered to accept varying levels of armor protection and equipment sets, while the use of independent suspension translates into very high mobility and maneuverability in off-road settings.

BALLISTIC PROTECTION

Ballistic protection is provided by steel armor plates and bulletproof windows. The vehicle's hull is made out of specially-alloyed Miilux armor steel that combines ultra-high strength (480…540 HB) with high ductility.

The hull can accept armor protections ranging from lighter STANAG 4569 Level 1 through standard Level 2 (7.62 mm armor piercing bullets) to enhanced Level 3/4.

Windows are of bullet-resistant, no-spall glass produced in-house by Practika.

SITUATIONAL AWARENESS

- day/night cameras
- night driving system
- parking camera

- all the cameras are provided with protections from weather influences
- remote control searchlight

COMPLEMENTARY EQUIPMENT

- radio set
- intercom system
- military grade navigation
- radiation detector system

AUTOMATIC FIRE SUPPRESSION SYSTEM

- in power pack compartment
- in crew compartment
- flame/high temperature detectors
- "forced on" button

DEPLOYABILITY

With its small dimensions relative to other vehicles of its kind, the Kozak-2M is transportable by:

- air in Lockheed C-130 "Hercules" type aircraft
- railway
- water.

ERGONOMICS

The Kozak-2M is designed with a special emphasis on the level of comfort as the crew and passengers will sometimes have to spend long periods staying in the vehicle.

The crew compartment is spacious enough with comfortably high ceiling. It is designed to minimize noise, and its interior is lined with a long lasting, sound absorbing carpet type burn-proof material. Seats are covered with a burn-proof fabric or, optionally, a painted metal material. The flooring is of grooved design shape to prevent slipping in wet shoes or boots.

Each seat is equipped with a storage rack for personal weapons and ammunition.

The lighting system in the crew compartment offers several levels of light, and individual goose-neck lamps would be used to provide concentrated lighting.

Country of origin	Ukraine
Designed in	2016
GVW, kg	14 000
Length, mm	6 280
Width, mm	2 500
Height, mm	2 400
Clearance, mm	470
Max. speed, km/h	120
Engine	diesel, Iveco
Power, HP	275 / 352
Torque, N*m	930 / 1200
Transmission	manual / automatic
Suspension	independent
Bullet protection	STANAG Level 2
Blast protection	6 kg. / 8 kg.

COST-REDUCING OPTIONS FOR PRODUCTION

Standard option – vehicles are manufactured by Practika at its facilities based in Kyiv, Ukraine.

Employing a workforce of 207 workers, Practika has 9,700 sq.m. of production and testing areas, and other facilities. Production rate is 150 vehicles per year.

Alternatively, individual vehicle components are manufactured by Practika at its facilities based in Ukraine for final assembly and integration in the Customer's home country. This option is cost saving, in that some components such as engines or transmissions, for example, can be purchased at cheaper prices in the Customer's domestic market. Practika already has such experience with customers from Nigeria and Georgia. UDR

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LEAGUE OF DEFENSE COMPANIES OF UKRAINE

Громадська спілка «Ліга оборонних підприємств України» об'єднує підприємства, які розробляють, виробляють або сприяють просуванню на ринок продукції і послуг оборонного та подвійного призначення, а також супутню продукцію

«League of Defense Companies of Ukraine» brings together enterprises, that develop, produce and contribute to market products and services of military and dual-use purpose, as well as related products.

ldc.org.ua

Системи розвідки
та виявлення об'єктів

Особиста
зброя та амуніція

Reconnaissance
and object-detection
systems

Особистий
захист

Personal
armament
and ammunition

Personal
armor

Військова
електроніка
та прилади

Military
electronics
and devices

Soldier outfit
and rations

Військове
спорядження
та харчування

LEAGUE

Cryptographic
protection
of information

Armored
vehicles

Броньована
техніка

Криптографічний
захист
інформації

Repair and
modernization
of military enginery

Авіаційні системи

Aerial systems

Ремонт і
модернізація
військової техніки

80K6T RADAR MAKES ITS DEBUT

CAPABILITIES OF ISKRA'S NEW RADAR PRODUCT

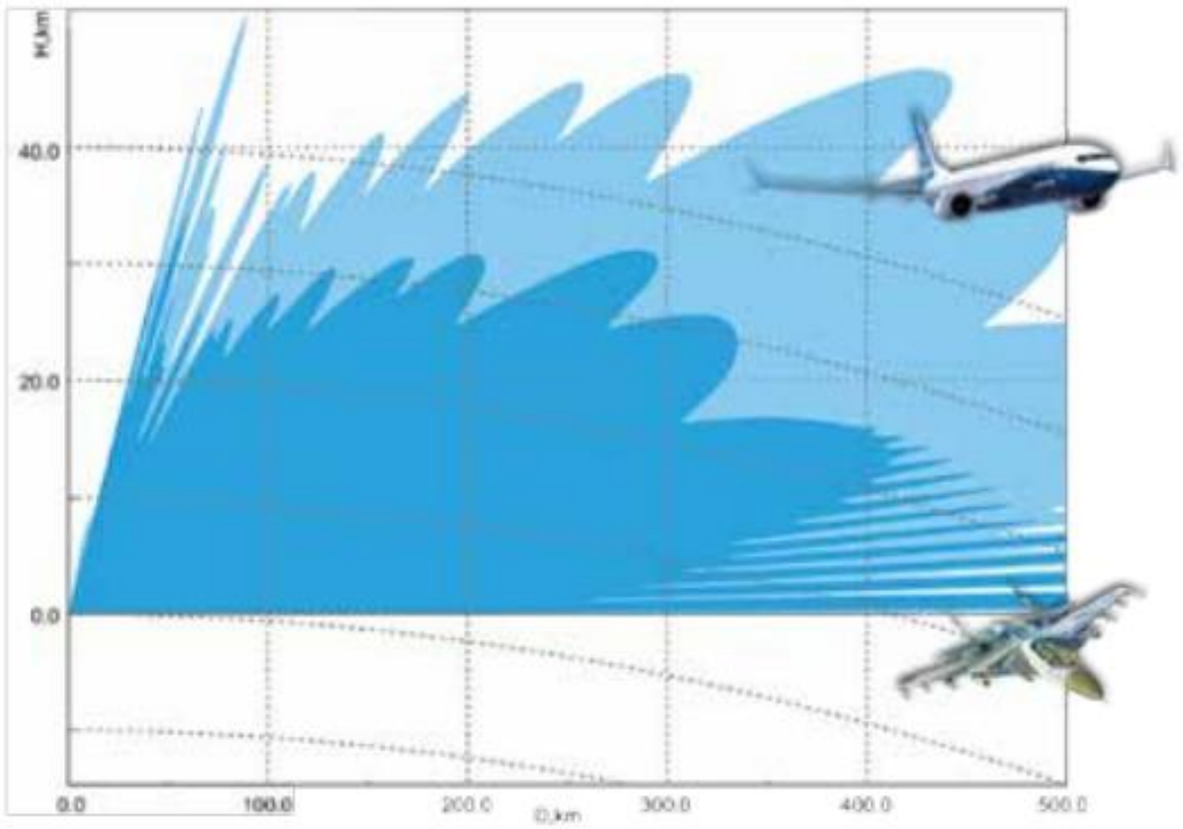
State Enterprise "Scientific and Production Complex "Iskra" of the Ukroboronprom state-owned defense industries group is pursuing the development of an advanced digital Active Phased Array Radar (APAR) solution the Company already implemented in its brand new 80K6T radar technology that was seen exhibited for the first time at Arms & Security 2017, Kyiv, in October.

The 80K6T – a three-dimensional, 360-degree Ground Controlled Interception (GCI) air defense search radar – provides a broad range of target detection and location finding capabilities, and is able to function effectively even in the presence of substantial environmental and electronic countermeasures influences.

The product integrates technology solutions for high resolution detection and tracking of aerial threats of various kinds. Being a digital active

KEY SPECIFICATIONS

Operating frequency range	S
Radar envelopes:	
in range	500 km
in azimuth	3600
in elevation	0...700
in altitude	40 km
Scanning intervals	5/10/20 s
Target detection range, (RCS=3m2; at P=0.5; F=104; at altitudes of 10...30 km	300...350 km
Transmitter type	Solid State
Transmitter peak power	30 kW
Antenna type	DAPAR
Number of beams	16
Resistance to clutter	≥50 dB
Resistance to jamming	≥20 dB
Number of targets tracked simultaneously	≥300
IFF capability	available
Number of vehicle platforms required for transportation	2
Deployment/stow time	10...15 min



phased array radar, the 80K6T enables targets to be detected and tracked with ultra-high resolution while simultaneously providing a three-dimensional measurement solution for range, azimuth and elevation in an integrated package. It is able to detect aerial threats out to ≤500 km in range and ≥40 km in altitude, and track up to 500 targets simultaneously.

The antenna rotates at the rate of 12 rpm, thus enabling target data updates in every five seconds, while the radar's 70-degree elevation capability enables early detection of tactical/tactical-and-theater range missile attacks. The technology furthermore uses advanced radar output processing algorithms for effective detection of low-RCS targets as well as highly maneuverable cruise missiles while flying on extremely low-altitude trajectories.

The 80K6T radar technology is compatible with all of the SAM capabilities currently in service with Ukraine's Armed Forces, and it is suitable for use also during Air Force operations.

To ensure high tactical mobility, the 80K6T radar is carried on two light vehicle platforms, one accommodating operator workstations and power supply units, and the other carrying the radar and its associated facilities. It moves from stowed to ready configuration in 10-15 minutes.

For strategic mobility, the 80K6T is designed to be air transportable with light military transport aircraft. UDR

[enemy at the gates]

KREMLIN CONTINUING BUILDING UP FORCES ON BORDER WITH UKRAINE

Russian military intervention has inspired drastic changes in the military-political and military-strategic environments both around Ukraine and across all of the European continent. After Ukraine's 2014 Revolution of Dignity, Russia's military-political establishment intensified effort to build up Russian military strength in the Kaliningrad enclave, Crimea and along the eastern border of Ukraine. This set off responses from NATO and USA. The Parliamentary Assembly of the Council of Europe and the International Criminal Court stated the fact of Russia's military incursion in Ukraine in their respective decisions and resolutions issued in 2016 and 2017.

As well as the military annexation of Crimea and the deployment of Russian Armed Forces units and formations to Ukraine's Ilovaysk and Luhansk areas in August 2014, the waging of war against Ukraine is strongly evidenced by the presence of regular Russian forces in Ukraine. Ukrainian military intelligence estimates that there are now over 30,000 regular Russian troops deployed in Ukraine, including Crimea.

As of this date, the 1st and 2nd Army Corps of Russia-backed insurgent forces reaching over 30,000 personnel total have been set up and deployed in Russia occupied areas of Donetsk and Luhansk Oblasts. These forces are taking orders from the newly organized 8th Combined Arms Army of Russia's Southern Military District. Regular Russian forces deployed to those areas include: two battalion task groups and one company task group, about 2,900 personnel, 197 tanks, up to 409 armored fighting vehicles,

Oleksiy Serdyuk for UDR

up to 140 artillery gun systems, up to 87 multiple launch rocket systems, up to 66 air defense missile launchers.

The Russian force grouping deployed in the temporarily occupied Crimean Peninsula is comprised of a joint force grouping, a battalion task group, about 32,200 personnel, 30 tanks, up to 583 armored fighting vehicles, up to 106 artillery gun systems, up to 56 multiple launch rocket systems.

Another key threat facing Ukraine on its eastern frontiers is related to Russian military buildup in very close proximity to Ukraine's State Border.

Top Russian military officials have reported completion, ahead of the original time schedule, of deployment of three motorized rifle (MR) divisions in the Russian cities of Smolensk (144th MRD), Valuyki (3rd MRD), and Novocherkassk (150th MRD).

Moreover, Russia's Western Military District is completing forming its 20th Combined Arms Army (Voronezh) – comprising: 144th MR Division (Smolensk, re-organized from the 28th Independent MR Brigade) and the 3rd MR Division (Valuiki, reorganized from the 9th and 23rd Independent MR Brigades). The aforementioned brigades were redeployed for that purpose to Russian locations bordering Ukraine. The 144th MR Division is comprised structurally of the 254th and 488th MR regiments (Klintsy, Bryansk Oblast), 856th Combined Air Regiment (Pochep, Bryansk Oblast), 148th Independent Reconnaissance Battalion (Smolensk), 340th Independent Engineer Battalion (Yelnya, Smolensk Oblast), 686th Independent Communications Battalion (Smolensk), 1259th Independent Antitank Artillery Battalion (Yelnya), 673rd Independent SAM Battalion (Smolensk).

The 3rd MR Division is structurally comprised of: 237th Tank Regiment (Valuyki, Belgorod Oblast), 152nd MR Regiment (Kantemirovka, Voronezh Oblast), 752nd MR Regiment (Valuyki/Boguchar, Belgorod Oblast), 99th Combined Air Reg-

Russian base near Valuyki (Belgorod Oblast, 30 km near the border of Ukraine) 8/9/2013 (left) and 8/11/2017 (right), foto: Google Earth Pro

iment (Valuyki), 84th Independent SAM Battalion (Valuyki, Belgorod Oblast), 337th Independent Engineer Battalion (Boguchar, Bryansk Oblast), 692nd Independent Communications Battalion (Valuyki), 159th Independent Antitank Artillery Battalion (Valuyki), 1143rd Independent SAM Battalion (Valuyki).

The 9th (Nizhny Novgorod), 23rd (Kryazh), and 28th (Yekaterinburg) independent MR brigades have been redeployed to locations bordering Ukraine (Valuyki, Boguchar, Klintsy).

The Southern Military District is continuing forming its 150th MR Division (Novocherkassk) that is being manned primarily with professional soldiers and officers with combat experience in Donbas. The 150th MR Division has been organized as part of the new 8th Combined Arms Army that is being formed in Rostov Oblast.

The organizational and staff structure, the weapons and military hardware that are being supplied to them indicate that these Russian divisions are essentially strike ones and are intended for rapid offensive operations. Even their staff name contains the concept 'strike,' which makes them different from the other divisions and emphasizes their special purpose distinguishing them from the other divisions and motivating personnel to choose them as a duty station of choice.

The accelerated militarization of the Crimea is progressing. As compared with the period prior to the Russian occupation, deployed enemy forces have almost doubled in numbers, while the amount of deployed armaments has increased over five-fold. With the deployment of the newly organized 22nd Army Corps, respective numbers would increase by another one and a half to two times.

The Black Sea Fleet has seen its combat capability boosted substantially. It already has more than 30 warships, 6 missile craft, and 5 submarines. In this case, one frigate warship and three submarines are armed with modern, nuclear-capable Kalibr missiles capable of ranges up to 1,500 km.

The Russian military presence in Crimea is likely to involve the deployment of weapons of mass destruction; work is being under-

taken to rebuild a nuclear weapons storage capability (Facility Feodosia-13) and to prepare for the deployment of strategic aircraft at Hvardiyske Air Base.

Beyond that, it is expected that a significant aviation component which is now dispersed among 18 air bases in the Southern and Western military districts may be called into supporting Russian ground forces operations. Two more newly organized Army Aviation brigades have been deployed in Voronezh and Stavropol.

Lessons learned from Russia's hybrid warfare and other military conflicts of our time suggest that profound changes have taken place in the nature of warfare. Russian military operations are gaining in dynamics, intensity and effectiveness. Tactical and operational pauses are disappearing. This puts forward additional requirements in terms of forces maneuverability, and mobility and the overall sustainability of reserves and resources.

Frontal encounters of large force groupings at the strategic and operational level are gradually receding into the past; there is a blurring of the differences among the strategic, operational and tactical levels, and between offensive and defensive operations.

Employment of electronic warfare (EW) capabilities is assuming ever increasing relevance in the conduct of modern warfare. As evidenced by the current Ukraine-Russia armed confrontation, the Russian Federation has achieved much progress in this domain and is willing to put to full use its EW capacity it has developed over the past decade.

Territory of the 144th MR Division (Klintsy, Bryansk Oblast, 50 km near the border of Ukraine), 10/27/2014 (left) and 9/11/2017 (right), foto: Google Earth Pro

The propaganda component of Russia' hybrid war strategy is a particular concern as it strongly affects the consciousness of both the civilian population and military servicemen. So counteraction to Russian propaganda influences is assuming special relevance in the context of the ongoing confrontation.

Summing it up: Despite Russian official statements that Moscow is strengthening its defenses on its western frontiers in response to the threats and challenges emerging from there, it is, in actual fact, building a powerful attack force grouping that is being deployed to intimidate Ukraine and, potentially, to militarily attack the country that dared remove itself from Russia's geopolitical orbit. That said, the Kremlin, in pursuing its self-interests, is probing different strategies for the use of its existing forces and equipment across the broad spectrum of hybrid warfare tools. UDR

Aerotechnica

www.aerotechnica.ua

SAM 2K12M1-2D "Kvadrat-2D"

Upgraded SAM System 2K12M1-2D «Kvadrat-2D» has service life of 15 years, increased target engagement envelope, increased efficiency and mobility, improved operation in conditions of heavy jamming. 2K12M1-2D «Kvadrat-2D» has increased reliability (achieved largely by replacement of 90% of original elements) and MTBF of 1500 hours.

Key upgrade features:

- improved operation in jamming conditions, in presence of reflections from underlying surface;
- automation of control from command post, automation of detection and tracking, prelaunch preparation and launch of missiles;
- reduced response time and firing cycle;
- full crew training by simulation of air situation, jamming and action scenarios;
- notably simplified maintenance;
- replacement of gas turbine generator with diesel power plant;
- integrated climate control system;
- improved ergonomics.

Max. detection range: 75 km

Engagement slant range: 24 km

MTBF: 1500 h

SAM S-125-2D "Pechora-2D"

Max. detection range: 46 km

Engagement range: 37 km

MTBF: 1500 h

Upgraded SAM System S-125-2D has service life of 15 years, increased target engagement envelope, increased efficiency and mobility, improved operation in conditions of heavy jamming. Upgraded S-125-2D also features automatic distribution of air situation and combat monitoring data to higher level Command Post.

S-125-2D has increased reliability (achieved largely by replacement of 90% of original elements) and MTBF of 1500 hours.

Latest generation of the system's Antenna Post UNV-2D is mounted on a semi-trailer, has built-in crane equipment and diesel generator to ensure transfer time from combat to travel position and vice-versa of 40 minutes. In emergency situations travel can be initiated after 18 minutes with the remainder of operations performed on the move. Upgrade of UNV-2D leads to much more mobility to S-125-2D operation.

"AMBER-1800" mobile VHF radar

The ground-based AMBER-1800 mobile VHF range surveillance radar performs automatic detection of aircraft, coordinates determination (azimuth and range) and radar data distribution to users.

Transmitter and receiver have solid state design.

AMBER-1800 radar uses multi-section antenna mast with rapid lift. It is capable of working in severe climatic conditions.

Time required for radar complete readiness, after installation at the position and completion of preparation for deployment, does not exceed 12 minutes.

Transmitter: 8 or 30 kW

Frequency band: 140 – 180 MHz

Deployment: 12 min

Radar functions:

- automatic detection, azimuth and range finding and displaying of targets (aircraft);
- automatic tracking of aircraft and calculation of target motion parameters;
- automatic control of height finder (radar altimeter), equipped with A-1000H extractor. Altitude calculation and referencing with two – dimensional coordinates (option);
- automatic output of radar data via telephone channel;
- manual retrieving of radar data using digital data of aircraft labels in azimuth – range coordinates;
- radar data recording;
- technical control and diagnostics of the main radar units.

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UKRAINE OFFERS UPGRADE OPTIONS FOR STRELA, IGLA MANPADS

The ever rising role of combat aircraft in contemporary military conflicts dictates the need for enhancing and improving defenses against air-to-ground attacks. Man-portable shoulder-launched surface-to-air missile (MANPAD) systems are used to defeat aircraft threats attacking from low and very low altitudes, and still remain the most efficient anti-aircraft weapon to date, and in certain scenarios they have no alternative as a means of countering hostile aircraft.

Currently deployed with more than 60 armed forces, Strela and Igla MANPADS have been well-proven in war conflicts throughout the globe. Ukraine has developed options to upgrade the Strela and Igla to more capable STRELA-2MM and IGLA-1M configurations.

Capability improvements in the two legacy MANPADS are achieved by means of replacing their original IR guidance units with more up-to-date designs developed by the ARSENAL Special Device Production State Enterprise (ARSENAL SDP SE). The key elements of the upgrade packs are the optical seekers OGS 36-45 for the STRELA-2MM and the OGS UA-424 seeker for the IGLA-1M, which both have already been showcased at international defense exhibitions.

The upgraded STRELA-2MM is a head-on attack missile that is effective against both fixed-wing and rotary-wing targets. The missile's new optical seeker integrates technologies enabling it to defeat IR decoy flares and natural interference, and it is especially efficacious in severe clutter and ECM environments.

The optical seeker OGS UA-424 for the IGLA-1M provides enhanced capabilities against IR countermeasures. It boasts an improved single-launch kill probability and, most importantly, offers a far extended range as compared to the original missile while attacking its targets head-on.

MANPADs seeker developed by the ARSENAL SDP SE

The Arsenal's 336-24 package for the Igla-M1 upgrade incorporates a newly-designed guidance unit replacing the 9E418 IR seeker used in the original IGLA missile. The new seeker would improve the missile's performance capabilities to levels much higher than those found in the established MANPAD systems such as the STINGER, IGLA-1 or IGLA, and far more superior than the STRELA-2M's. In particular, the Igla '336-24' has a kill probability of 0.4-0.6 while operating in heavy ECM environments, as compared to 0.1 for the IGLA. The 336-24 upgrade offers a maximum effective range of 5,200 m.

The 336-24 upgrade pack for the IGLA-1 MANPAD system provides a good example of highly fruitful cooperation between Ukrainian defense industries. In particular, the new 336-24 optical seeker could be manufactured by the R&D and Production Complex Progress company, and the Pavlohrad Chemical Plant, Ukraine's top manufacturer of rocket propellants, has developed a new solid propellant for the 336-24 missile, enabling extended effective ranges and enhanced maneuverability performance.

The STRELA-2MM and IGLA-1M MANPADS can be integrated into packs of 4, 6 or 8 launchers deployed on armored vehicles. In this case, weight constraints are much less critical than in man-portable configurations, and so missile ranges can be extended by using a more powerful (hence heavier) propulsion system.

With these MANPAD technology upgrades in place Ukraine can fill in the gap in its short-range tactical air defense capabilities and help foreign militaries upgrade and update their Strela/Igla MANPADS inventories. UDR

NEW CAPABILITIES FOR THE ZSU-23-4 SHILKA

PROVIDED WITH INNOVATIVE TECHNOLOGY SOLUTIONS DEVELOPED BY STATE-OWNED ARSENAL FACTORY

Anton MIKHNENKO, UDR

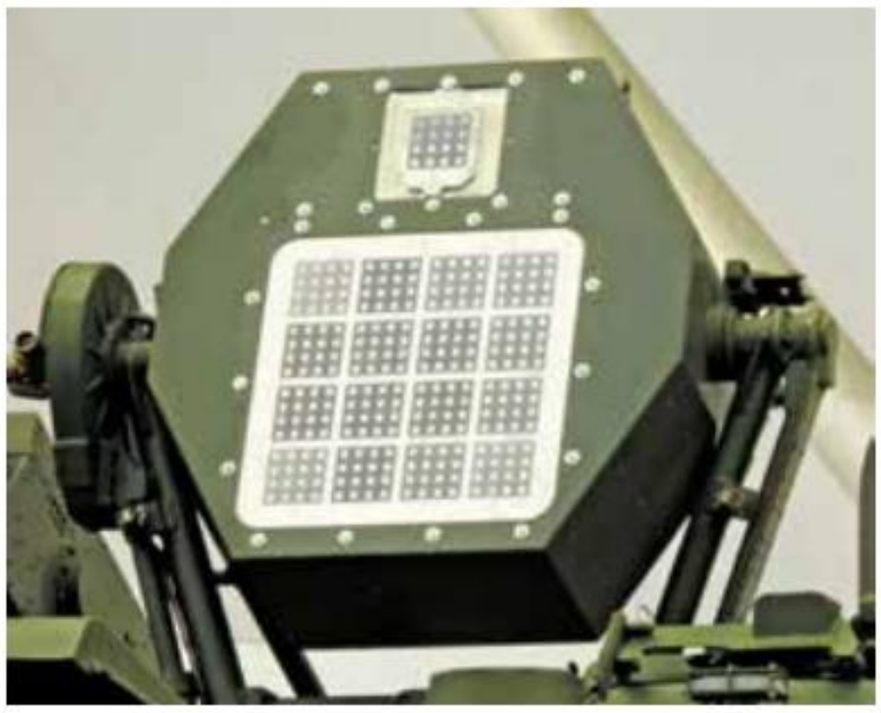
One of conceptual priorities of the Ukrainian Armed Force's program on the air defense, missile and artillery weapons development in the current context focuses on comprehensive modernization using the latest technologies and achievements in science and technology. Guided by this approach, the Arsenal Factory company, Kyiv, has developed a comprehensively upgraded version of the ZSU-23-4 «Shilka» anti-aircraft gun system, incorporating some major changes to its design and significantly improving the capabilities of the Soviet-era technology.

Shilka was designed as a self-propelled anti-aircraft (AA) weapon system intended for AA defense of ground forces and military facilities, and for shooting down air and land (surface) targets, while on short stops or on the move. In Soviet times, Land Forces' regiment

Shilka batteries were fielded in an anti-aircraft role. Shilka's ability to effectively engage targets with its four 23mm autocannons while moving along with tactical formations, combined with its high operational reliability and usability made it a particularly valuable asset on the battlefield. For more than half a century of employment in conflict-affected settings in 39 countries around the globe the Shilka has successfully proved its worth and, despite its being old legacy system, still remains operational in combat by many militaries, including Ukraine's.

But with all its merits the ZSU-23-4 Shilka, however, has become obsolescent by now as it is rendered inadequate to meet present-day challenges and threats. Its radio equipment and most components and subassemblies need to be upgraded to the modern-day requirements or replaced with more current-generation counterparts. The Shilka technology is too good to be retired as it has yet to reach its full development potential. Arsenal Factory company has developed an upgrade package for the Shilka, giving it whole new capabilities.

Arsenals' Shilka upgrade, known under designator ZSU-23-4M-A, includes a multirole digital phased array radar Rokach-AS replacing the 1RL33M radar in the original version; a new optical location system; the addition of a missile channel; a new fully digital computing system in place of the old analog computing device; integration of advanced weapon control algorithms; and replacement of other components with more up-to-date counterparts. Future improvements will include replacement of the currently used gas turbine power unit with a more economical electric power supply source.



Arsenals' Rokach-AS radar is undoubtedly the key element in the upgrade. It offers three-mode operation for 360-degree surveillance, air search and autotracking in an integrated package.

The radar Rokach-AS has the capability to pick up and track low-observability UAV targets with RCS as low as 0.01 square meter up to 7 kilometers away. It far exceeds its predecessor in almost every area. Compared to the original radar, which could scan a 15-degree sector and track targets within its 1-degree FOV beam, the Rokach-AS has coverage angles of 18 degrees, both in azimuth and elevation, and it can search and detect targets much quicker than its predecessor.

The new digital phased array radar is swift enough in detecting targets using its own capabilities or inputs from external sensor sources. Moreover, it can simultaneously track multiple targets within its field of view.

Finally, whereas 1RL33M radar occupied the entire perimeter of the turret inside the «Shilka» vehicle, the Rokach-AS is a compact device accommodated in a container on top of the vehicle, with the resulting benefit of a considerable amount of internal vehicle space released to improve the comfort for the crew and passengers, and enabling the installation of additional equipment such as a HVAC system.

Initial tests of the Rokach-AS radar technology carried out by Arsenal Factory at a test and training facility outside Chernihiv showed very high capabilities, especially in tracking targets, including inter alia low observability/low Radar Cross Section targets.

As well as the Rokach-AS radar, the ZSU-23-4M-A upgrade additionally includes the installation of an optical location system integrating television and thermal imaging cameras and a laser rangefinder. The system has the capabilities for the detection and autotracking of targets and for automatic/semi-automatic generation of target location coordinates for the digital computing system. The system would support air surveillance and target engagement control missions. It is able to lock-on and automatically track targets

at ranges up to 10 km, and detect targets up to 12 km away.

To ensure increased operational versatility of the ZSU-23-4M-A, a missile channel has been added to support control of four man-portable Igla surface-to air missile launchers, which are operated remotely from within the vehicle.

The upgraded ZSU-23-4M-A Shilka would be able to defeat targets at ranges up to 5 km, which is twice the range of the previous-generation system.

Ukraine's Armed Forces are in dire need of having their legacy inventory of ZSU-23-4 Shilka AA gun vehicles (fielded since the 1960's/70's) upgraded and updated to present-day requirements.

Modernization of Ukraine's air defense capacity has been rendered highly relevant in the present-day context, and especially so in the light of Russia's continuing military aggression in eastern Ukraine. Time and the outcome of the State Trials process (that is scheduled to take place in the spring of 2018) will tell whether the Shilka upgrade by Arsenal Factory will be to the liking of potential military users in Ukraine. And the Ukrainian upgrade could well suit the requirements of international users of legacy Shilka gun systems around the world, too. UDR

TABLE 1. ZSU-23-4M-A SHILKA AIR DEFENSE GUN SYSTEM. KEY SPECIFICATIONS

MULTI-ROLE DIGITAL PHASED ARRAY RADAR	
Dimensions	≤ 0.9 x 0.9 x 0.4 m
Receiver antenna type	Digital Phased Array (DPA)
Two-dimensional field of view	16° x 16°
Scan sector:	
- in azimuth	360°
- in elevation	-5° ... +85°
Transmitter type	Solid state
Instrumented range	35 km
Detection range for:	
- 1 sq. m RCS target	20 km
- 0.1 sq. m RCS target	10 km
Tracking range for:	
- 1 sq. m RCS target	15 km
- 0.1 sq. m RCS target	7 km
Mean square measurement error for:	
- range	5.0 m
-angular location coordinates	0.1 deg
- velocity	0.1 m/s

Consumed power	250 W
OPTICAL LOCATION SYSTEM	
Target detection range	≤ 12 km
Autotracking range	≤ 10 km
Filed of view	
- television	2...40 deg
- thermal imaging	4 deg
Coverage	
- in azimuth	360 deg
- in elevation	0...75 deg
MISSILE CHANNEL	
Deployment/stow time	≤ 20 s
Coverage	
- in azimuth	360 deg
- in elevation	0...75 deg
Number of missiles being prepared for launch simultaneously	≤ 2
Number of launches with a single nitrogen charge	12
Pre-launch preparation time	5 s

At the Arms & Security 2017 exhibition in Kyiv, the Progress R&D and Production Complex and Central R&D Bureau Tochnist, Nizhyn, demonstrated their joint products for artillery delivered high-precision munitions – the 152/155mm Kvitnyk and the newly developed 122mm Karasuk.

BULL'S EYE STRIKE

SMART AMMUNITION BUILT WITH CURRENT-GENERATION COMPONENT TECHNOLOGY

Due to its use of semi-active laser guidance technology, the Karasuk is claimed to have 100% first-round hit probability at ranges up to 12 km. It can be deployed from artillery guns of 122 mm caliber, including the D-30 gun and self-propelled 2C1 gun system currently in service with Ukraine's Armed Forces. Karasuk's older sibling, the Kvitnyk, which is available in 152 mm and 155 mm calibers, has a range of up to 20 km.

Electronic and opto-mechanical components of the projectiles are designed to withstand overloads of ≥10,000g.

«Using «smart», precision-guided munitions enables combat missions to be performed with cost and time efficiency and with reduced casualties. In the modern-day operational environment and under conditions of counter-battery warfare, the use of high-precision munitions gives a clear edge over the enemy,» Progress Senior Vice CEO and Chief Designer Mykola Klochko, who doubles as CEO at Tochnist told Defense Express in an interview.

Both Karasuk and Kvitnyk use laser designator and range-finders in their guidance systems. Semi-active laser seekers for the Kvitnyk were manufactured with the use of Russian-sourced components till 2014 when Ukraine's Government imposed a ban on defense

industrial cooperation with Moscow following the start of Russian military aggression in Eastern Ukraine. The Ukrainian companies created a new version of the Kvitnyk, substituting the previously Russian supplied components for domestically developed alternatives that are used also in the newly developed Karasuk projectile as exhibited at Arms & Security 2017. And it turned out, in the process of reasonable import substitution, that a three-layer circuit board will well suffice instead of an 11-layer board used in the Russian supplied seeker head for the original Kvitnyk (see the difference in the photo). And this can be minimized further. UDR

Volodymyr TKACH, Defense Express

STATE KYIV DESIGN BUREAU «LUCH» – THE LEADING

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

BARYER | VEHICLE-CARRIED LOG-RANGE ATG MISSILE SYSTEM

KOMBAT | GUIDED MISSILE ROUND

KONUS | GUIDED MISSILE ROUND

FALARICK 105 | 105 MM GUIDED MISSILE ROUND

STUGNA | GUIDED MISSILE ROUND

FALARICK 90 | 90 MM GUIDED MISSILE ROUND

KORSAR | MAN-PORTABLE ATG MISSILE AND LAUNCHER

Type of carrier platform
Missile mass
Missile diameter
Missile length

DEVELOPER OF ANTI-TANK SYSTEMS IN UKRAINE

25 kg | 1609 mm | 130 mm Ø

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**

Armor penetration capability

Light portable missile system Corsar

Man-portable rocket grenade launcher

Man-portable ATGW system Skif

FLIGHT OVER WAVES

PROFESSIONAL CRAFT FROM KOLIBRI BOAT MANUFACTURING COMPANY. MADE IN UKRAINE

The recent Arms & Security'2017 exhibition in Kyiv showed products by KOLIBRI Boat Manufacturing Company, Dnipro, which is well known in Ukraine and Europe.

During its years of existence the Company has been producing a lineup of boat types in various classes and categories for both commercial and national security operators. The following is an interview conducted by Defense Express with Mykyta Merkulov, Chief Marketing Officer of KOLIBRI BMC on the Company's capabilities and products line.

– Would you say a few words about your Company: when it was founded, its fields of expertise, and its employee competencies?

– KOLIBRI Boat Manufacturing Company was founded in 1995. It is a leading manufacturer in Ukraine and one of the major producers of crafts in Europe. The Company's production facilities are based in the city of Dnipro (ex Dnipropetrovsk), Ukraine. At our factories there are more than 300 employees with an average age of 34 and 7+ year experience in the boatbuilding industry.

– What kinds of boats are in your Company's products line?

– KOLIBRI products line includes inflatable boats; RIBs (Rigid Inflatable Boats with a solid aluminum hull and inflatable, foam or hybrid collars); aluminum, plastic boats; kayaks; pedal boats, accessories, and optional equipment for recreation and operation on the water.

KOLIBRI STARK is division of KOLIBRI Boat Manufacturing Company, which designs and produces special-purpose crafts for operation by Military, Police, Emergency response forces, as well as SOEs, NGOs

and industrial companies all over the world.

– Are the materials and components used in your products supplied locally or imported?

– The main materials used in manufacturing our boat products – both for commercial and special-purpose operation – come from foreign suppliers: fabrics for inflatable tubes from Germany and Belgium; and aluminum for boat hulls from Norway and Germany. These are all well known World manufacturers whose product quality is beyond doubt. A major boatbuilding company, KOLIBRI BMC has contracts arranged directly with manufacturers of materials and components, with no agency involved.

Most of complementary equipment and furniture are manufactured by our Company.

KOLIBRI BMC has within its structure its own R&D department, three modern equipped boatbuilding yards with a combined production capacity up to 70,000 boats per year, and several factories manufacturing accessories and other related products for boatbuilding.

– What are the advantages of your products in comparison with other foreign trade marks? Are they produced according to the international standards?

– First of all, it should be mentioned that KOLIBRI BMC has under its belt state-of-the-art technologies and equipment, and a 20-year experience in manufacturing world-class crafts. The Company boasts a range of its proprietary, time proven know-how and technologies in boatbuilding, especially for High Frequency Welding of PVC/PU fabric; welding-in sealing inserts between air-chambers; semi-automatic hot-air welding; use of aluminum and composite materials in folding boat construction etc.

KOLIBRI BMC has obtained certification verifying compliance with ISO/CD 6185 and other international standards establishing boatbuilding quality requirements. Each boat we build is issued a permanent unique fourteen-digit identifier – the Craft Identification Number (CIN) issued to all marine crafts in the World.

The Company holds valid certificates from Bureau Veritas, Germanischer Lloyd, Shipping Register of Ukraine and other international certification organizations.

Our products' main advantages over foreign competitors are in cost effectiveness and shorter delivery periods from order receipt. KOLIBRI BMC employs state-of-the-art production technology and equipment, and uses in its boats materials from world-renowned brands ensuring high quality products.

KOLIBRI Boat Manufacturing Company is rated among the world's top ten manufacturers of aluminum-hull RIB boats.

Our Company works with Ukraine's defense&security sector and emergency management institutions; its customer portfolio includes government, municipal, public and commercial organizations, among them SJSC Chornomornaftogaz and JV Nibulon LLC.

– What are the defense/security sector institutions KOLIBRI BMC is working with?

– The National Police of Ukraine, SES of Ukraine for Emergency Management, DP Ukroboronservice etc.

Our boats are officially operated by the MOD of Ukraine and included into NATO codification system.

KOLIBRI BMC has partnered with Dnipropetrovsk Oblast Police-Patrol Department to develop and test a high-tech KOLIBRI STARK VOIN-650 aluminum-hull RIB-type riverine/offshore assault-patrol boat.

During Arms & Security'2017 show, we were able to

work effectively with Ukrainian security officials, discussing their equipment requirements.

– Last year, the Ukrainian Navy added U.S.-donated fast patrol boats to its fleet. Are you able to produce something competitive with those boats?

– Yes, it's true that, in 2015, a Special Forces unit based in Odessa received as gift five RIB-type, aluminum-hull fast offshore patrol boats built by a renowned American shipyard company. Gifts should always be accepted. But in this context, I must say that KOLIBRI BMC is no doubt capable of providing the Ukrainian Navy with same-class capabilities. The Company produces series of crafts KOLIBRI STARK VOIN – aluminum-hull fast patrol boats.

– Are the KOLIBRI products being supplied to markets outside Ukraine? Who are the major customers for your products on those markets?

– KOLIBRI boats are supplied in more than twenty countries. We produce boats for a wide range of users – individuals, entrepreneurs, government agencies, industries, defense&security institutions, emergency services, etc.

In addition to the aforementioned security institutions, industries and organizations in Ukraine, we are working effectively in the Special Purpose marketplace with Ukrspecexport's companies on issues pertaining to development and export of dual-capability products.

– Would you say a few words about future plans? What are the milestones and priorities to be achieved?

– We are planning to expand our contacts and collaboration with Ukrainian defense and security institutions. There are lot of things to do. Keeping the defense and security authorities informed in a timely manner about KOLIBRI Boat Manufacturing Company and its manufacturing capacities; collaboratively developing technical and operational requirements, testing products and updating technical specifications to achieve the best suitable solutions is what the Company needs to do collaboratively with defense and security institutions to ensure that the Armed Forces, Navy, National Police, and Emergency Response Services are provided with truly high-quality, reliable, and modern world-class equipment.

Further promotion and contacts increasing in international distribution of KOLIBRI STARK products on the military and special equipment international market, and of course to design and to build new crafts – this is the work we are going to provide in 2018. UDR

Interviewed by Anton Mikhnenko, UDR

UKROBORONPROM
Ukrainian Defence Industry

60 MW

45 MW

25 MW

16 MW

10 MW

6 MW

5 MW

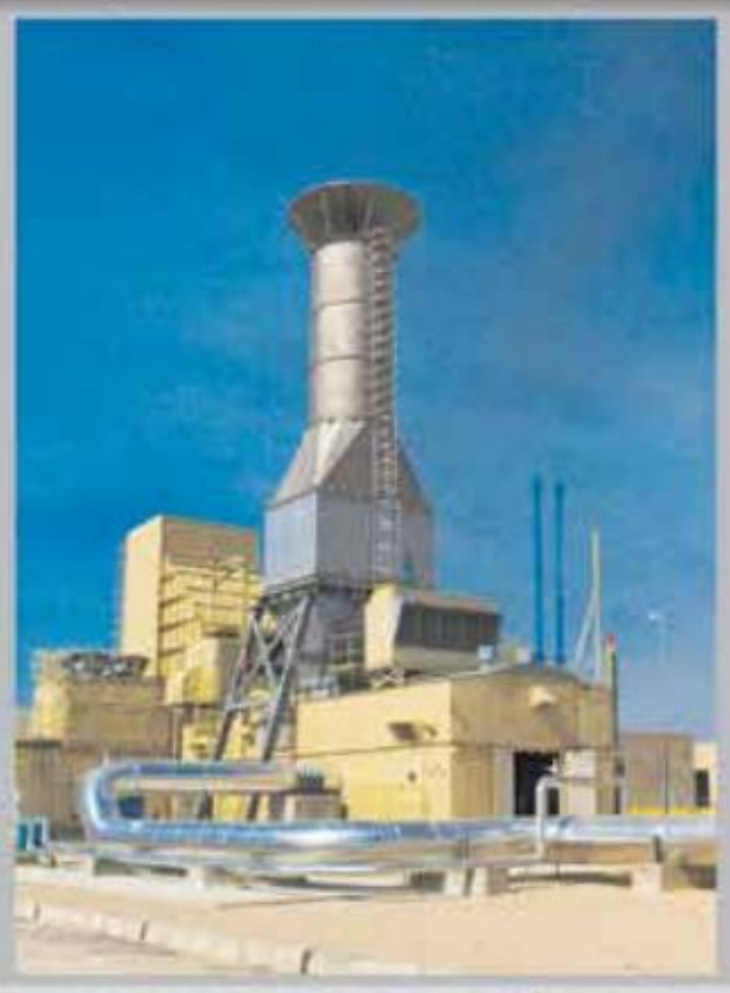
3 MW

2,5 MW

UKRAINIAN GAS TURBINES

For marine propulsion

For gas industry



For power generation

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MALYUK AUTOMATIC RIFLE: BORN TO BE THE BEST

The Ukrainian company InterProInvest has developed, brought into production, and arranged deliveries of its new, highly effective automatic rifle to Ukraine's Armed Forces. Ukraine's Armed Forces' Special Operations users already have had opportunities to appreciate the advantages provided with this new weapon, and the new Malyuk bullpup automatic rifle will now be available also in other countries as InterProInvest has been promoting military-grade and sporting/hunting versions of the weapon for sale in the export market.

Valerii RIABYKH, Defense Express

The automatic rifle Malyuk provides the best optimum solution in terms of the effectiveness of use in various battlefield scenarios.

Special Operations forces, armed paratroops, amphibious assault forces, military scouts, combat vehicle crewmen, and dismounted soldiers in harsh battlefield situations will all be able to appreciate excellent precision, reliability performance, and ergonomy of use provided with the automatic rifle Malyuk.

During 2015-16, the Malyuk successfully passed official trials and was allocated to Special Operations units and other combat elements of the Ukrainaian military forces for a two-year user evaluation; it proved its worth in the current Russia-Ukraine military conflict in eastern Ukraine.

During testing conducted as part of the Official Trials program, Malyuk proved far more effective on the battlefield than any other counterpart currently operated by Ukraine's military.

This made Malyuk approved as a standard-issue rifle for Ukraine's Armed Forces, in a version known as "Special Automatic Rifle 'Volcano'" in the domestic market. On August 3, 2017, Ukraine's Minister of Defense issued Directive No. 408 granting operational use approval for the Malyuk rifle.

The automatic rifle "Volcano" (expanded-functionality version of the Malyuk rifle) is now used as a standard-issue weapon by Ukraine's Special Operations Forces and already proved its worth in real-world combat operations. Feedback from Special Operations soldiers suggests the Volcano is a reliable, trouble free weapon. Users also praised the weapon for its ergonomics and high density of hits. As some users put it, "the automatic rifle fully meets the requirements and missions of special military operations units".

Using the Malyuk rifle with its improved ergonomic design, optimum weight balancing, and the technological innovations applied, an inexperienced shooter will be able to hit two times the number of targets, and experienced shooter 3.5 times the number of targets they could otherwise hit in a given period of time with a weapon of conventional design.

The Malyuk rifle has a bullpup design. It features three Picatinny-style rails for mounting a different variety of optical and mechanical devices, such as sights, grip handle, bipod etc. Also available is a quick-detachable suppressor that allows long sessions of automatic rifle fire to be conducted without compromising ballistic performance of the bullets.

The magazine is mounted within a dedicated shaft, which facilitates better fixation and is designed so that to allow the magazine to fall down under its own weight with a press of the release button located next to the trigger, and it is easy to load into the receiver from whatever position the shooter chooses to take.

The weapon's design makes an optimal use of the energy of the combustion gases. The barrel is cooled by air convection, resulting in a considerably longer barrel life. The air convection system and a smart gas ejecting mechanism help reduce the amount of gases being ejected near the shooter's face.

The Malyuk has had its recoil reduced substantially without compromising its rate of fire of 600 rpm. InterProInvest has gone even further in this direction, by developing an innovative trigger mechanism, al-

Parametric comparison of the Malyuk bullpup rifle vs similar-class international counterparts




Physical characteristic/ performance parameter	Malyuk (Ukraine)	TAVOR (TAR-21) (Israel)	Fort 221 (Ukraine)	AUG A2 (Austria)
Mass without magazine, kg	up to 3.8	3.27	3.9	3.8
Full length of the rifle, mm	710	720	645	805
Length of the barrel, mm	415	460	375	508
Caliber of cartridge used	5.45x39 mm/ 7.62x39 mm/ 5.56x45 mm	5.56x45 mm	5.56x45 mm	5.56x45 mm
Firing patterns	Single-shot/ automatic	Single-shot/ automatic	Single-shot/ automatic	Single-shot/ automatic
Rate of fire, rds/min	660	750	500	680
Muzzle velocity, m/s	900 / 715 / 940	850-900	890	970
Effective range of fire, m	500	500	500	300
Magazine capacity, rounds	30/45	30	30	30/42
Standard sight	as required by Customer	Red-dot	Red-dot	1.5 power optical
Type of sight mounting	Picatinny (length 315)	-	-	
Underbarrel grenade launcher	Mounting possible	Mounting possible	Not available	Mounting possible

lowing a higher rate of fire at 720 rpm. Users will soon be able to appreciate the advantages of the Malyuk rifle upgraded with the new trigger mechanism.

The Malyuk automatic rifle is designed to be ambidextrous for both right-hand and left-hand shooters. The ergonomic bolt handle doesn't move when firing to preclude finger or chin injuries, and this also enables the direction of the weapon firing to be changed quickly.

With the "Malyuk" rifle, shooting from two hands now ceases to be an exclusive privilege of action movie heroes and can be easily mastered by any well-trained soldier.

The weapon's layout allows the key operations – unlocking, firing, removing and replacing the magazine and reloading – to be done with a single hand, which enables achieving effective mission performance and can be life-saving in dangerous situations.

Those who already tried the InterProInvest's new automatic rifle in real-world combat missions maintain that the automatic rifle Malyuk is the best precise, best reliable, and best ergonomic weapon they have ever tried to use. UDR

TRY IT, CHECK IT, LIKE IT!

FUSION OF PRACTICES AND TECHNOLOGY

INNOVATIVE MAGNETIC SURGICAL INSTRUMENT PRODUCTS FROM MICROIN

During the ongoing military conflict in eastern Ukraine, not only did we learn to fight, but also how to save human lives. Here is just one fact: up to 70 percent of metal fragments can remain lodged in the body of victims of gunshot injuries. This military surgical statistics has changed dramatically with innovative technology solutions developed by Private-Sector firm Microin, Kharkiv, succeeding with sponsorship by Progress Specialized Export-Import Firm. The new products enable the removal of up to 70% of ferromagnetic foreign bodies by a magnet. With this innovative technology in place, surgeries become less invasive and promote faster recovery for victims of shrapnel and bullet injuries. This is our key accomplishment on the medical front. Now let's proceed to details.

Volodymyr TKACH,
Defense Express

... A silver-colored briefcase and a wooden box were seen at the Arms & Security'2017 show displayed in the front most row of the Progress' display stand. The contents of the open briefcase and the box did not attract much interest from the uninitiated. Rods of different lengths, thicknesses and shapes fitted with bizarre inserts seemed to be strangers among the other exhibits like new radar technologies and armored personnel carriers that gathered crowds of visitors. But actually these are things of the same order. While effectiveness, accuracy and reliability are what a soldier needs most from his weapon, a military surgeon's weapon is a good surgical instrument.

In a speech introducing the new products, Medical Lieutenant-Colonel Volodymyr Nehoduiko, Surgical Department Head at the Military Medical Center, Northern Region, said: "I am a military medic. Where I work we create and introduce new technologies into warfighting practice. Regarding the company «Microin», it was founded by a physicist at Kharkiv Institute of Physics and Technology (KIPT), and the team of technology authors includes two doctors and two physicists of KIPT. The physicists are dealing with the development and production of instruments, while we employ these all for surgeries and introduce into practice the benefits the new technology generates.

The physicists approached us in 2014 to ask if we needed any help. We did not even imagine then that this collaboration would produce such results».

THE EFFECT OF NEW SOLUTIONS

«A surgeon needs five-fold less time to remove a foreign body with this new instrument than with a conventional counterpart. This is first. Second is the proportion between the number of foreign bodies removed from and retained in the wound. This proportion is 30 per cent and 70 percent with conventional technologies, while with magnetic instruments it reverses to 70 percent and 30 percent respectively. Is this 40-percent difference much or not? With the help of these instruments, it is possible to successfully remove ferromagnetic fragments of mines, grenades, shells and bullets. Ferromagnetic fragments usually amount to some 80 percent of all the fragments in the wound. The other, non-magnetic fragments are removed using the main instrument, which [like its magnet-based counterpart] has been produced and registered as invention, and already proved its suitability.

Our methods/techniques and this instrument help surgeries become less invasive as they involve much smaller incisions, in full conformity to the minimal-

ly invasive surgery concept that means less operative trauma, other complications and adverse effects than a traditional open surgery. These have additional benefits in terms of sooner wound healing, shorter hospital stay, and a faster recovery time, allowing soldiers to quickly return to service.

Using our methods/techniques and the new instruments results in the number of post-surgery complications reduced by an order of magnitude compared to conventional surgery. This is true and proven by our statistics. We have registered 26 inventions and published about 80 scientific reports on these new methods and techniques over the past three years", Mr Nehoduiko said.

MARVEL INSTRUMENTS

Microin has developed two sets of magnetic surgical instruments.

The smaller set is intended for expert surgical use in hospitals, especially mobile field hospitals. Deliveries to forces in the field began in 2015. All military hospitals in Ukraine (including inter alia the Kyiv Central Military Hospital and military hospitals in Kharkiv, Zhytomyr, Vinnytsia and Odesa) are now fully provided with smaller sets of Microin's magnetic surgical instruments.

The expanded set of instruments, named "Magnetic Surgical Instruments Set (Large)», is tailored for specialized surgical procedures. A single pre-prototype set of instruments has been produced so far and delivered to the Northern Region's Military Medical Center, Kharkiv. This pre-prototype unit was displayed at Arms & Security'2017 show in Kyiv.

Volodymyr Nehoduiko elaborates: «The small and expanded sets of instruments are both designed to identify and remove ferromagnetic metal foreign bodies from soft tissue wounds. Multifunctional instruments from the sets later began to be used for the removal of foreign bodies also from the chest/heart, and abdomen wounds. The smaller set would be useful in 80% of cases. We use the expanded set if foreign bodies cannot be removed with instruments from the smaller set.

The expanded set is comprised of a magnet-based instrument, an instrument for the removal of non-magnetic foreign bodies, and titanium clips allowing simultaneous use of magnetic and non-magnetic instruments. Titanium doesn't «stick» to magnetic instruments, allowing easy manipulations in the affected region. It is as important as it is expensive. One titanium clip, for example, carries a price tag of USD300.

The instruments were modified and redesigned to suit our needs. We even have an instrument tailored for one single patient. An engineer was allowed only one week to develop and make an instrument that we used to quickly remove a foreign body from the man's foot joint.

Development work on new instruments is continuing. So in the future, the expanded set might have a changed composition". UDR

UDR note:

Typical types of injuries suffered by Ukrainian soldiers deployed in the Donbas conflict area are changing with the changing nature of the operations being conducted. While shrapnel injuries prevailed at the initial stage of the conflict, amounting to 60-70 percent of all the injuries suffered, mine blast injuries tend to dominate the statistics in the past 12-month period. The rate of bullet injuries has remained almost unchanged at 15 percent.

INNOVATIONS DEVELOPMENT PLATFORM

Innovations Development Platform - the agency in Ukraine on incubation and implementation of innovative projects in the area of defence technologies

We are supporting innovative projects in the defense area on all stages of implementation – from the idea to the sale of finished products

COMPLETED PROJECTS

Unmanned Aerial System **ANSER**

Unmanned Aerial System **SPARROW LE**

Unmanned Multipurpose Vehicle **FANTOM**

Combat Module **TAYPAN**

PROJECTS IN PROCESS

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SPAITECH'S SPARROW FAMILY OF MILITARY UAVS

UKRAINE IS ADVANCING IN DEVELOPMENT OF TACTICAL BATTLEFIELD DRONE TECHNOLOGY

Anton MIKHNENKO, UDR

The beginning of Russia's military aggression in Ukraine has driven extensive development of tactical drone technologies in this country, resulting in the emergence of a variety of UAV designs for different tactical uses. Most of them have already got their baptism of combat in east Ukraine's Donbas conflict area, and these include those developed by TOV "R&D and Production Company 'Spaitech'" LLC among others.

Spaitech – a specialist company in developing and manufacturing composite-material unmanned aerial vehicles – has, over the past two years, developed and produced the "Sparrow" family of military UAVs. These are designed to be used mainly for intelligence, surveillance and reconnaissance (ISR) and situational awareness (SA) roles, and are suitable both for military and civilian uses.

The following are brief descriptions of the Sparrow UAV family members:

Sparrow – a tactical battlefield unmanned aircraft system (UAS) based on a flying wing, electrically powered UAV platform – was unveiled by Ukroboronprom at Eurosatory 2016 international defense and security industry trade show in Paris and, in the following months, showcased at several international expos both in Ukraine and abroad.

With its EO/IR camera payload, the Sparrow UAS is equipped to perform ISR tasks and to find out location coordinates of fixed targets – at day and night, and under all weather and climatic conditions. It has small dimensions, a takeoff weight of 3 kg, an operating radius of 70 km,


Sparrow LE UAV


Sparrow LE UAV

a 20-km range data downlink, and a mission endurance of 45-85 minutes. It has maximum flying altitude and speed of 2,000 m and 60-110 km/h respectively.

The Sparrow UAV is fitted with 2-axis stabilized gimbaled platform carrying a steerable 10x zoom visual daylight camera or a thermal imaging camera payload. Real-time digital data streams are downlinked and recorded by onboard devices in HD resolution, and encrypted to conform to NATO standard requirements.

The Sparrow UAV doesn't require a free ground space to take-off or land; launch is catapult-assisted, while recovery is automatic through the use of a parachute.

It is especially suitable for use in highly mobile and special operations.

Spaitech inaugurated its Sparrow-LE UAV with Ukroboronprom's Spetstechnoexport in a joint display at the 2017 Aero India international aerospace and defense exhibition, Bangalore, in September.

The UAV Sparrow-LE is built on a classic V-tail platform and, like its elder Sparrow sibling, is electrically powered. Designed to conduct aerial ISR missions, it can transmit real-time digital data streams via an encrypted link to ranges up to 25 km from its related ground control station. With a max takeoff weight of 7 kg, the Sparrow-LE can fly out to 250 km and up to 5,000 m, at speeds ranging from 60 km/h to 110 km/h, and has an in-air endurance of up to 3.5 hours.

The UAV carries a steerable 10x-20x zoom visual daylight camera or a 4x zoom thermal imaging camera payload mounted on a 2-axis stabilized gimbaled platform. Sparrow-LE, like Sparrow, doesn't require free ground space to take-off or return to base. It is hand launched and recovered through a parachute recovery system.

With a wingspan exceeding three meters, this UAV has far better flying performance compared with same-class counterparts while simultaneously retaining stealth characteristics in terms of low visual and radar signatures.

The Sparrow-LE UAV airframe is built with high resistance to mechanical, thermal and moisture stresses.

The vehicle can be operated via manual or autopilot control, and has automatic takeoff and landing capabilities. It can provide accurate target location and survey even while operating in severe weathers or in mountainous terrains.

With a hybrid flight control system comprising an autopilot function, interfaced with a digital map system, three autopilot modes of navigation are possible: a pre-programmed flight path; a pre-programmed waypoint-based flight path, and via an automatic flight path control.

The Sparrow-LE UAS technology uses Spaitech's proprietary Remote Video Terminal solution that allows live streaming and data to be delivered directly to the warfighter on the field within a radius of two kilometers. The Company believes this capability will be of particular benefit for recon groups operating in hostile territories.

Spaitech is producing its Sparrow family of UAVs at its facility based in Odesa, Ukraine. In developing its UAV technology solutions, the Company doesn't use large hangars, wind tunnels or other engineering facilities, but instead relies solely on its expertise across the spectrum of computer assisted engineering, simulation and modeling. Spaitech can put out UAVs at a production rate of one per week.

Sparrow UAVs have been extensively used by Ukrainian government forces deployed in the Donbas conflict area, and Ukraine's Navy also has developed interest in this Spaitech's technology following a series of successful technology demonstrations in December 2017. UDR

Sparrow UAV, December 2017

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YURI KASYANOV, CO-FOUNDER OF NPK MATRIX UAV

WE CREATE UNIQUE, MULTIROTOR, HYBRID ENGINED UAV DRONES

Russian military aggression in Donbas has driven a rapid development of unmanned aerial vehicle (UAV) technologies in Ukraine. Lots of companies emerged to address this market by offering promising products for a broad spectrum of commercial and military applications. Among these companies is R&D and Production Company Matrix UAV with its extensive experience in UAV drone operation in the Donbas conflict area. The Company boasts being the only one in Ukraine to produce multirotor, hybrid engined UAV drone platforms. The following is an interview conducted with Yuri Kasyanov, co-founder of Matrix UAV, by UDR on the Company, its products and plans for the future.

– UDR regularly reports on Ukraine's emerging companies addressing defense and special products markets. As far as we are aware, you are quite young company, but with a serious background and great ambitions for the future. Would you tell us more about your Company? How it all began, and what are the key goals and priorities being pursued?

– Matrix UAV was born and developed in years of Russia-Ukraine war. Initially, there was a volunteer team of enthusiastic aviators who, with people's donated money, were building unsophisticated, low-maintenance reconnaissance UAVs, multi-rotor copters, and associated ground control equipment. We were passing the amateur-built drones over to deployed units, and teaching personnel to operate them, while we ourselves spent lots of months at the front lines helping operate the UAVs as voluntary operators.

This has given us a wealth of experience in drone operation in difficult/dangerous battlefield conditions, in severe air defense and electronic attack environments. We then tried to translate this experience into innovative, more advanced drone technologies that are really needed in modern warfare.

This all ended up with the creation of the private-sector company focusing on the development and production of UAV drone products.

Our key focus in developing our products is to ensure the ease of use for aerial reconnaissance/surveillance and Skyview missions. We are now working on developing several different platforms for commercial and military applications ranging from cargo transport and tethered UAVs to simple scouting UAVs and data transmission drones.

- At Arms & Security'2017 show, your Company unveiled a range of UAV products, including the fix-wing drone "Katana". Could you elaborate on it please?

– Katana is a light, multi-purpose, flying-wing type, "launch and forget" unmanned aerial vehicle. All the operator needs to do is draw a flight path with his finger on a screen monitor, turn on power supply, and to flip the wing up. All the other functions – takeoff, flight along a pre-programmed flight path,

and landing – would be performed automatically without operator's handling.

Fully automatic, semi-automatic, and manual operation modes are available. Missions can be performed in all day/night/weather conditions and in heavy ECM environments.

Camera sensors that are part of the standard payload package can be swapped with signals intelligence, radiation detection or other sensor modules depending on specific mission requirements.

The integrated Katana system, comprised of two fix-wing drones and a shared ground control unit, is relatively cheap at about USD 10,000 plus taxes. Tested and proven in real-world combat scenarios in eastern Ukraine, the Katana is now in full-rate production.

It's worth to mention that the Katana is produced in different configurations equipped with purpose-specific payloads – the Katana-Agro with multi-spectral camera payload for crop-monitoring; and the Katana-Patrol with equipment payloads tailored for the needs of the Police, emergency and disaster response services, and several other government and private entities.

The Katana UAV technology is being continuously improved and matured, and so other, more advanced configurations might be added in the future.

– Has the Katana system been officially adopted [by the Ukrainian Armed Forces]?

– Not yet, but these UAVs are deployed in the Donbas conflict area, procured and supplied by voluntary aid organizations for the Ukrainian military. Beyond this, we make them available to our deployed forces "at no cost" so they could do their missions more effectively. But still we aim to get the Katana adopted as standard issue by the Armed Forces, and to put it through the required testing and evaluation process. We are planning to submit a product evaluation application for the Katana product to the Armed Forces' Research and Testing Center (AFRTC) soon.

Commander is a 20+ kg payload, hybrid engined multicopter drone platform

– Will there be applications for other products besides the Katana?

– Indeed we are going to demonstrate all our products, and these will include a lineup of rotor drone platforms in addition to the fixed-wing drone product you've mentioned. We are focusing precisely on the former class of drones as we have recently been bombarded with requests from military users asking if we can make multirotor VTOL UAVs.

I believe that this is our Company's basic (and highly promising) line of business, which will remain our focus for future growth. That is why drone products in this category dominated our display at Arms & Security'2017 show in Kyiv. We demonstrated several products at this show, among them the VTOL UAVs named "Commander", "Oko" and "Chimera".

The Commander is a heavy-lift, multi-rotor hybrid-engined UAV. As opposed to conventional multi-copters, it has longer flight endurance and flight range, and can carry payloads of more than 20 kg. It is particularly advantageous for its ability to carry a variety of sensor payloads for situational awareness, such as video cameras, radar and laser scanning sensors, etc. The Commander is also suitable for use as an aerial platform carrying a variety of weapons payloads for air-to-ground attack, such as anti-tank guided missiles, projectiles or bombs. Other possible uses include the delivery of ammunition, food, medical aid stores, and other battlefield supplies and, potentially, the evacuation of wounded casualties from the battlefield.

The Oko is an electric drone cable powered with a ground-based Power Supply Unit. It actually performs the role of a flying surveillance tower with its ability to loiter at 50+ meters around a target area for as long as the mission requires.

The range of missions that can be performed with this drone include surveillance of enemy forces, target acquisition support, crop and forest monitoring, road traffic surveillance, and border security monitoring.

Not only can the Oko drone climb to and loiter at a selected altitude but follow the ground vehicle carrying its associated control station and power supply unit.

Finally, our most recent product, the UAV drone "Chimera", is being developed in several configurations.

The "Chimera-H", powered by a gasoline generator, has a payload capacity of 5 kg and flight endurance of 3 hours. At Arms & Security'2017, the Chimera-H was showcased fitted with a dummy load simulating smart bombs for attacks on enemy command and control centers, positions, and storage areas. Beyond this it can be used for roles such as remote data transmission, ar-

tillery fire adjustment, and border security/urban areas monitoring. Commercial uses would include delivery services for remote residential areas or individual residences.

Another member of the Chimera drone family, the Chimera-T, is cable powered by a power supply unit on the ground. Being in essence a kite balloon, the Chimera-T drone is free of the latter's disadvantages such as bulky dimensions, high visual signature, an excessively long time into and out of action, and high vulnerability to wind effects. Launched from a container carried in a pickup truck, the drone climbs to 150 meters altitude that enables it to see as far as 45 km with its 30x zoom camera. It can carry payloads for EO/IR surveillance/reconnaissance or remote data transmission missions. Most importantly, the drone is designed to stay airborne at a selected altitude over the launch point for up to 45 days before it will need to undergo routine maintenance.

The Chimera-T is a complete system fully equipped for launch, flight and recovery operations. As well as motor vehicles, it can be launched from the ground, ships or building-tops.

Our hopes rest on products like the Chimera, because it has a modular architecture exploiting as much as possible commonalities. It is easily reconfigurable for specific missions by swapping payloads in and out as needed, and, being hybrid, it can run on both electric and gasoline power. This has enabled improved product reliability, product efficiency, reduced product cost and a high degree of production commonality which enabled the product to be mass produced.

– Where do components and subsystems for your UAV drone products come from?

– Unfortunately, as you know perfectly well, universities here in Ukraine are more focused on training in sales management, marketing, or law rather for electronic engineering jobs. It is therefore hard to find a competent electronic engineer, let alone components and subassemblies. Most of components that we use in our products come from foreign suppliers. For the Katana product, for example, polystyrene and electric motors are bought from abroad. Propellers are bought from domestic suppliers; materials for the manufacture of laminated fiberglass components, and electronic components come from foreign firms, while software products are sourced both from domestic and international suppliers. This is too bad indeed, but we are seeking ways to leave this situation behind, gradually and to the extent possible.

The Oko is an electric drone cable powered with a ground-based Power Supply Unit. It is able to loiter at 50+ meters around a target area for as long as the mission requires

It should be appreciated, however, that we never aimed to make a fully indigenous product. We define ourselves first and foremost as an aviation-sector company. What we sought to do was to integrate existing software solutions with hardware components to create a new finished product. This is what is essentially done by Boeing for instance, who uses French avionic equipment, British engines etc to create a unique finished product that no one else can create. In this sense, our Company is of approximately same kind [as Boeing]. We are more focused on achieving a high level of parts commonality between the Katana and all the other drone products in our portfolio.

– In the end it could be said that the your Company is placing preference on the creation of highly effective drone designs tailored for specific functionalities using a combination of indigenous/imported technology solutions and components, and on further integration of resulting outputs into a higher level system (of systems) ...

– Yes, indeed. And, that said, we are seeking to create technologies that combine unique flight performances with price tags that can be found nowhere in Ukraine or elsewhere, and especially so if we are talking about payload capacity and operational radius of multi-rotor drone platforms. In Norway, for example, they made an unmanned, electrically powered copter platform that can carry a 180-kg payload, but for 10-15 minutes only. The Chinese have created an equivalent product – a helicab with a 20-minute flight endurance. The U.S. and Switzerland are producing unmanned air vehicles that are pretty good but too expensive – the money paid for one single vehicle would be enough to buy a full squadron of multi-rotor copters. We, in contrast, create hybrid engined rotor drones that offer a good lifting capacity, combined with cost effective pricing. UDR

Interviewed by Anton Mikhnenko

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