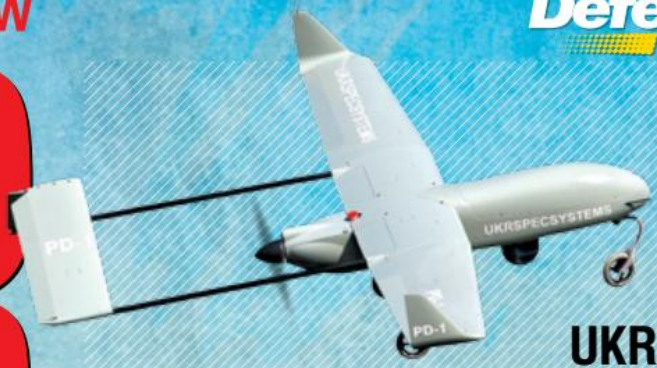
UKRAINIAN DEFENSE REVIEW

Defense express

№ 4 [OCTOBER-DECEMBER 2018]

UDR



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Print run – 1000 copies; **Price –** negotiable.
Our address: 10 Illinska str, of.5, Kyiv, Ukraine, 04070 +38 (044) 425-42-10, +38 (044) 425-16-22, marketing@defence-ua.com.
Print Media Registration Certificate – KB N 22819-12719P issued by the Ministry of Justice of Ukraine on July 12, 2017.

CABINET OKAYS ARMS IMPORT/EXPORT TRADE LIBERALIZATION

The Cabinet of Ministers has endorsed a draft legislation that seeks to liberalize import/export trade in military and defense articles and services.

The Cabinet, at its session September 5, 2018, approved the draft law on "Amending individual Ukrainian legislative acts in respect of imported procurements of military and defense articles, works and services".

This decision represents yet another step forward to liberalizing import/export trade activities of military-industrial companies in Ukraine.

The draft legislation, as expounded by Yuri Brovchenko, Deputy Minister of Economic Development and Commerce, allows government customers to import defense-related products directly from supplying companies (i.e. without mediation of specialized Ukrainian government agencies) or indirectly via intermediary entities under their jurisdiction.

Government Customers are becoming a party to international commodity transfers. This means for them the possibility to contract directly with supplying companies and to supervise contract compliance and the quality of the products being procured.

The draft legislation offers three options for State Customers seeking to import defense articles into Ukraine, which will be selectable depending on the exporting country's specifics and the type of products being imported, replacing the single-option procedure in current use. Resorting to each of the proposed options comes with its advantages and disadvantages and is strictly regulated.

ZHYTOMYR ARMORED VEHICLES FACTORY UNVEILS ITS NEW APC VEHICLE

Zhytomyr Armored Vehicles Factory, a government-run company incorporated with State Concern Ukroboronprom, unveiled its most recent development – the BMP-M1S tracked armored fighting vehicle (TAFV) – at Arms & Security 2018 expo in Kyiv. This is according to a report by Defense Express.

The BMP-M1S TAFV, developed as a comprehensive upgrade of the BRM-1K armored reconnaissance scout vehicle, features significant improvements in terms of the vehicle's firepower and the level of armored protection compared to its Soviet-era original

Due to being equipped with a high performance Deutz engine, this 15.5-t TAFV can carry up to 8 personnel and develop speeds up to 70 kmph on highway and 7.5 kmph in water.

The BMP-M1S can provide highly effective fire support to dismounted infantry soldiers with its Stiletto weapons turret module that houses a 30-mm cannon, a 7.62-mm machine gun and a 130-mm Barrier ATGM launcher. Fire control is performed with the new indigenously developed Syntez ("Synthesis") technology package that ensures precision firing in all weathers and at any time of day or night.

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BTR-70D(GM) APC UPGRADE UNVEILED AT ARMS & SECURITY EXPO

At the Arms & Security 2018 Expo, in Kyiv, Zhytomyr Armored Vehicles Factory, a State-run company incorporated with State Concern Ukroboronprom, unveiled its BTR-70D (GM) upgrade of the Soviet-era BTR-70 APC technology. This came from a press report released by Ukroboronprom.

The BTR-70D (GM) upgrade features a new General Motors GM-6.2 engine developing 290 hp (50 hp up on its predecessor found on the BTR-70 original), and allowing 20 kmph increase in max speed (100 kmph). Other benefits provided with this new engine include substantially improved hp/t ratio, battlefield mobility, and operational reliability.

The BTR-70D (GM) features the digitally controlled turret module Delta, which is armed with a 23-mm automatic gun and a 7.62-mm machine gun replacing the 14.5-mm and 7.62-mm machine gun weapons seen on the BTR-70. The weapons are controlled using a current, multifunctional digital fire control system comprising a thermal imaging camera, laser rangefinder, weapons stabilizer system, and an acquisition & tracking suite. The BTR-70D can accept other turrets meeting Customer specifications.

SHEPETIVKA REPAIR PLANT INTRODUCES ITS BM-21UM «BEREST» MLRS

At Arms & Security 2018 International Expo, in Kyiv, Shepetivka Repair Plant, a State-owned company incorporated with State Concern Ukroboronprom, showed off for the first time its BM-21UM Berest 122-mm truck-mounted Multiple Rocket Launcher (MLR).

Being the first MLRS technology developed indigenously in Ukraine, the BM-21UM Berest MLRS project, which was funded privately by Shepetivka Repair Plant, makes no use of foreign-sourced components. The BM-21UM was developed as a replacement for the aging Soviet-era BM-21 Grad MLRS currently operated by the Ukrainian military.

The BM-21UM is built upon a new truck chassis developed domestically in Ukraine. This, coupled with current digital technologies used, would provide Ukrainian forces with important advantages on the battlefield in terms of operational mobility and effectiveness.

One of the key features of the BM-21UM MLR launcher is its digital fire control system that allows the crew to make pre-launch preparations (including GPS/GLONASS positioning) while staying within the vehicle.

With these new digital technologies the Berest MLR launcher will be able to be integrated into the network-centric environment to enable communication with other platforms on the battlefield. In particular, it will be able to receive real-time target data from drones, counterbattery radars and other remote target acquisition systems. This capability enables drastic improvements in accuracy and effectiveness of firing missions.

One BM-21UM launcher is able to deliver 50 rockets in a single salvo, while the BM-21 Grad is only capable of 40-rocket salvos. A greater amount of fire delivered on a target increases kill probability and enables fire distribution between different targets to be done faster and with greater efficiency.

The BM-21UM launcher is built on a new KrAZ-5401NE four-to-four truck chassis featuring an operationally convenient four-door double cabin-over-the-engine configuration which provides comfortable accommodation for the crew and Launcher control equipment.

BM-21UM Berest is advantageous over BM-21 Grad in terms of the amount of fire delivered in a single salvo, higher precision, the availability of a network centric capability, improved mobility performance and lesser time required to have the launcher ready to fire.

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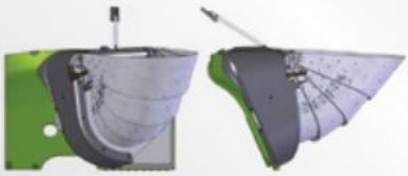
INSPECEPROM LLC'S PRODUCTS HAVE BEEN SOLD WITH SUCCESS ON UKRAINE'S DOMESTIC MARKET.

THE COMPANY FOCUSES ON THE DEVELOPMENT AND PRODUCTION OF DEFENSE-RELATED PRODUCTS.

IR SUPPRESSING SYSTEM ADROS ASH-01V



Inspeceprom, assisted by NPF Adron, has developed the IR suppressing system (IRSS) Adros ASh-01V and got it accepted for service by Ukraine's Armed Forces. The ASh-01V IRSS will be used to reduce the heat signature of TV3-117 engines equipped in Mi-8 and Mi-24 helicopters and their modifications in order to enhance survivability against infrared guided missile threats.

Aerodynamic losses and exhaust losses associated with the Adros ASh-01V IRSS have been reduced by reconfiguring (extension/retraction) and optimizing the geometry of the exhaust duct assembly.

Property – variable-geometry multi-circuit ejector, IR suppression in the 3–5 μm band – 4-5, free turbine shaft power loss – ≤ 2-3%, mass – ≤130 kg.

FAST ROPE INSERTION AND EXTRACTION SYSTEM "KANAT-1"

The Fast Rope Insertion and Extraction System "Kanat-1" is designed for fast roping and extraction of fully-armed and equipped Commando troops from and to the Mi-8MT (MTV) helicopter. Two soldiers, each weighing up to 140 kg with all his gear can slide down one and the same rope simultaneously, with the helicopter hovering above the ground at a height equivalent to or shorter than the rope length.

With the fast extraction rope hoisted in the helicopter's center of gravity, the Kanat-1 allows for up to six personnel to be extracted simultaneously, with helicopter hovering above the ground at a height shorter than the rope length. Extraction is allowable when the helicopter is flying no faster than 70 km/h and no higher than 100 meters over the surface.

HELICOPTER GROUND SUPPORT EQUIPMENT

- **Towbar** will be used for towing a helicopter to parking positions, on paved and unpaved strips.
  Max admissible towing force – 4,000±200 kg.

- **Hydraulically** operated jack system will be used for lifting a helicopter in mounting/dismounting or charging landing gear shock struts and in helicopter rigging, as well as other helicopter lifting works.
  Jacking capacity – 5,000 kg, height – 550-1,440 mm.

AIR AMBULANCE EQUIPMENT
for the Mi-8 Helicopter

The Mi-8 helicopter can be reconfigured into Air Ambulance role for transport of stretcher patients.

In this configuration, the helicopter's cargo bay will be equipped with 12 standard-size stretchers with **dismountable legs** secured to the floor and hinged together with straps and belts. In between starboard fuselage stations, there is a small **medical table** next to a movable doctor's stool.

BLADE ELEMENT

This blade element will be used to beef up performance of rotor blades and other aero structures.

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UKRAINE'S MI-8MSB-V HELICOPTERS TO BE MODERNIZED WITH BECKER RADIOS

Ukraine's military helicopters Mi-8MSB-V will soon be modernized with latest Becker radios.

The Becker RT6201 VHF remote transceiver has been selected for modernizing the Mi-8MSB-V helicopters after a series of capability evaluation tests conducted by the State R&D Institute for Testing and Certification of Weaponry and Military Technologies, according to a report published online by Ukrainian Military Pages, in August 2018.

PAT Motor Sich aeroengine manufacturer and MS AVIA-GRADE R&D and Production Firm, LLC, assisted in this testing.

As pointed out in the test summary report, "Current radio technologies produced by Becker Avionics have proved to be reliable and conforming to the required specifications. Light and compact, they offer a high level of operational flexibility and an expanded functionality".

It is worth recalling in this connection that Ukraine's Mi-8 helicopters currently use aging and outdated Baklan-20 and R-860-1 VHF radios produced in Russia.

UKRAINE WINS $40M CONTRACT FROM TURKISH GENDARMERIE TO OVERHAUL, UPGRADE 17 HELICOPTERS

Ukraine has won a $40 million contract to overhaul and upgrade 17 x Mi-17 helicopters operated by the Turkish Gendarmerie.

Defense Express reported this citing a Twitter post by Ukraine's Interior Minister, Arsen Avakov.

Works under this contract will be performed by PAT Motor Sich aeroengine manufacturer, Zaporizhzhia, and Ukroboronprom Group's Aviacon Aircraft Repair Plant, Konotop.

Avakov specifically emphasized that Ukraine "…has a unique competence in the area of aircraft maintenance, repair and overhaul, and cooperation with Turkey is our strategic focus".

The contract came as a result of six-month long negotiations with the Turkish Ministry of the Interior.

Avakov announced the deal while at a ceremony signing a joint declaration with his Turkish counterpart, Süleyman Soylu, in Ankara, on this September 4.

The declaration calls for cooperation in combating terrorism, illegal migration, human trafficking, cyber crime, criminal money laundering, drug trafficking, and transnational organized crime.

KUZNYA NA RYBALSKOMU SHIPBUILDER UNVEILS ITS VESPA CLASS FAST MISSILE CRAFT PROJECT

At the ADEX 2018 defense industry trade fair, in Baku, Azerbaijan, the Kuznya na Rybalskomu shipbuilding company, Kyiv, unveiled its latest Fast Missile Craft (FMC) project named Vespa, as reported by a Defense Express correspondent at the event.

The Vespa FMC is designed with capabilities to attack hostile warships, transports and landing assault crafts, independently or in cooperation with Naval Attack Forces.

With a length of 64.46 m and a beam of 9.6 m, the Vespa FMC has a draft (with propellers) of 3.65 m. Loaded displacement is 640 tons and maximum speed is 40 knots. Endurance amounts to 10 days. The maximum complement is set at 38 personnel (+6 crew members).

The Vespa is designed with two options for propulsion system – 19,640 kW CODAD (combined diesel and diesel) and 22,500 kW CODAG (combined diesel and gas turbine).

The main armament package comprises 8 x ship-to-ship missiles Neptune produced domestically in Ukraine (however, other anti-ship missile weapons can be used depending on specific customer needes), an anti-aircraft missile system Arbalet-K (produced, again, in Ukraine), one forward looking cannon AK-176, and two aft cannons AK-630. This package is complemented by 16 x Igla MANPADS and 2 x 12.7 mm machine guns.

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- For transmission of information about the detected radio emission sources in real time.

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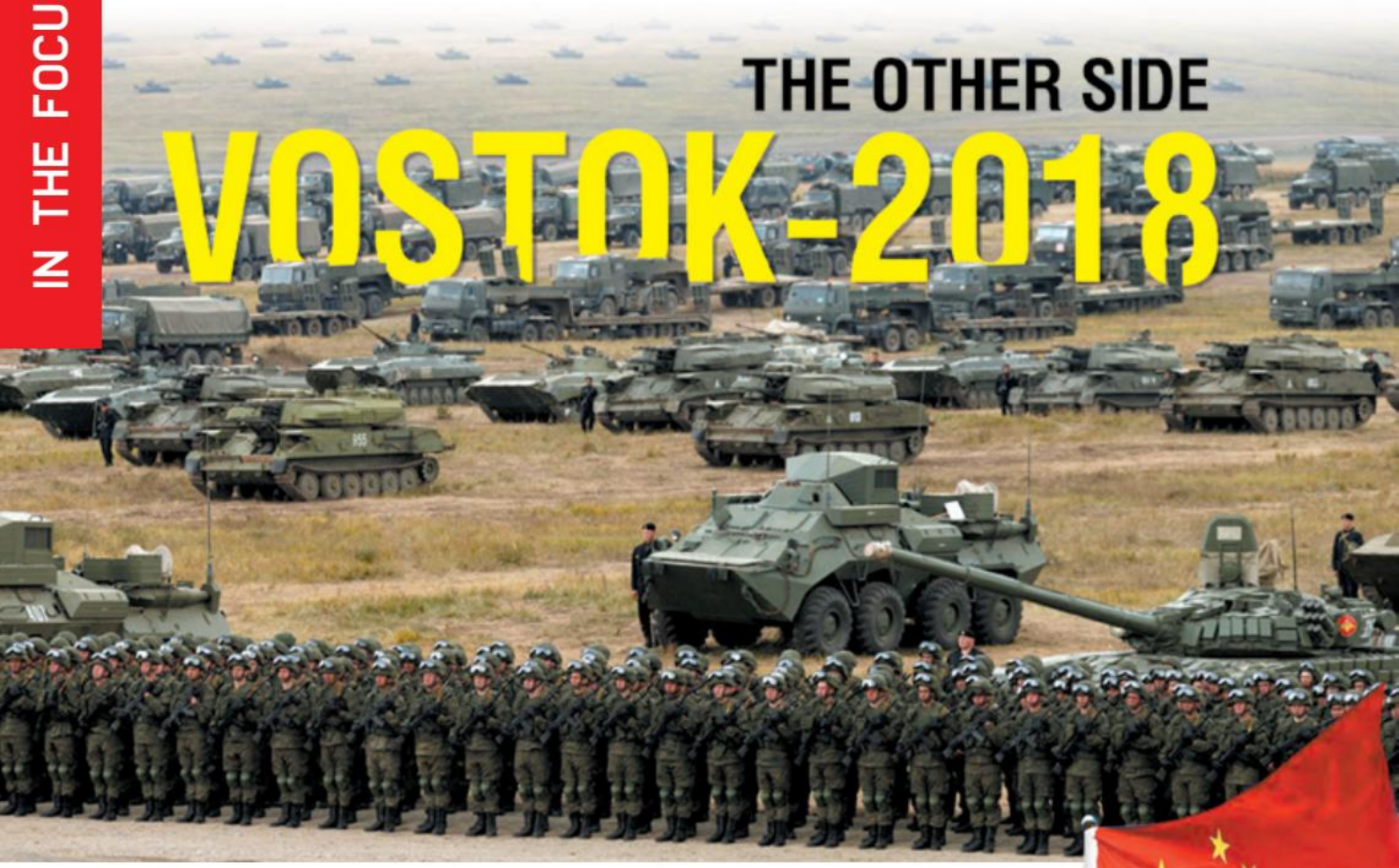
THE OTHER SIDE
VOSTOK-2018



From 11 to 17 September, the Russian armed forces conducted the active phase of the Vostok-2018 strategic-operational war game exercise. Vostok-2018 was the largest Russian military exercises held over the past four decades. Conducted as part of the Russian Armed Forces combat training plan 2018, the drills were held across Russia's Far East and Pacific waters, under the overall command of the Russian Defense Minister Sergei Shoigu. By staging this impressive show the Kremlin sought more than just to test and improve command and control and forces integration.

SIZE AND OBJECTIVES - THE OFFICIAL ASPECT

Vostok-2018 is certainly the largest military exercise ever held in Russia's modern history. The exercise was the largest held in Russia since Zapad-81 conducted by the Soviet Union – the maneuvers held in the Belorussian, Kiev and Baltic Military Districts, as well as the Baltic Sea in 1981, and with participation of military contingents deployed by several Warsaw Pact armies.

The Vostok-2018 maneuvers were held in the opposite part of the continent across three theaters of operations in the Sea of Okhotsk, the Bering Sea, and in the Avacha and Kronotsky Bays in Kamchatka, hosted by five combined-arms military ranges and four training ranges of Russia's Air Force and Air Defense Force. The drills rehearsed massive air strikes, cruise missile defense, defensive, offensive, and raid operations, as well as enveloping attacks. In the Sea of Okhotsk and the northwestern Pacific, participants practiced air defense operations and carrying out strikes on groups of warships and amphibious assault landings. Air Force crews exercised support to advancing ground forces and to coastal defense.

Officially, the exercise involved nearly 300,000 Russian service members, about 36,000 armored vehicles, more than 1,000 fixed-wing air-

craft, helicopters and unmanned aerial vehicles, complemented by up to 80 warships and support vessels.

HIDDEN GOALS

The Vostok-2018 was apparently aimed to achieve far more goals than just to test Russian army's preparedness for a military intervention in a foreign country. These maneuvers weren't just aimed to yet again demonstrate Russia's military might and to test its forces' readiness status in expansive and extensive military operations. The event took place a week before the South-North Korea summit in Pyongyang, which might indicate Moscow's intention to show itself prepared to become the key player in the region and, also, to demonstrate it has something to fight with in that weakened region under the watchful eye of neighboring China. After all, the Kremlin, by having redeployed much of its forces and equipment from the country's central regions to the Southern and Western Military Districts weakened the capabilities of its sensitive Central (TsVO) and Eastern (VVO) Military Districts.

Specifically in June 2016, the 28th Independent Motorized Rifle Brigade from Yekaterinburg was redeployed to Klintsy, Bryansk region, where it was reorganized into the 488th Motorized Rifle Regiment of the 144th Motorized Rifle Division. The 23rd Brigade was transferred from Samara to Valuyki, Belgorod region. The 9th Independent Vistula Motorized Rifle Brigade has been moved to Boguchar from Nizhny Novgorod Region. In 2016, these brigades were merged to form what is now the 3rd Motorized Rifle Division.

The Central Military District is currently below establishment in front-line aircraft and modern ground vehicles among other types of weapons. The TsVO, although recently augmented with some current-generation armaments, is still equipped mostly with technologies of the last century. There are huge gaps in its air defense capabilities that are modernized far slower than those deployed at Russia's western borders.

China's and Mongolia's involvement in the maneuvers, although initially unplanned, was part of a dual-goal strategy. One was to demonstrate to the West that the Russian Federation is exploring further its relationship with China -- its eastern neighbor and former adversary. Seemingly, this implies that "If you don't want to lose a partner such as Russia, who can well turn fully to the East, let's then talk and about sanctions among other things". The other was to demonstrate to China what capabilities Russia has in that region while simultaneously downplaying concerns that the war game maneuvers might be directed against Beijing.

It is important to note that Vostok-2018 could serve as an expedient means to deflect the attention of the Russian people away from internal problems in the country. In Russia, despite the recently adopted pension reform legislation, the falling ruble, decreasing consumer demand, and a growing job shortage, the population is very receptive to military rhetoric. These maneuvers will certainly not be able to keep people's morale high for a long time, but there will be others that will. After all, this way you can explain to the public where the taxpayers' money goes to.

UKRAINIAN ASPECT

There is one more important aspect: from 20 to 25 August, the Eastern Military District held a Logistic Support (MTO) exercise in anticipation of the Vostok-2018 in order to rehearse the full set of tasks assigned to the District's MTO service.

The exercise emphasized the shipment of weapons from storage sites to active-service units. Particularly at a storage base in Buryatia, Zabaikalsky Krai, tank crews were trained for combat use of the T-72 and T-62 tanks intended for delivery to two tank companies.

However, under the guise of exercises, the number of vehicles relocated to other destinations far exceeded the officially reported 20 tanks (10 tanks per company). And these destinations were not only in the Eastern Military District but much farther and closer to borders with Ukraine, as seen from numerous photo and video evidences that were posted on social media by Russian citizens in late August - early September 2018 and scrutinized by different media outlets.→

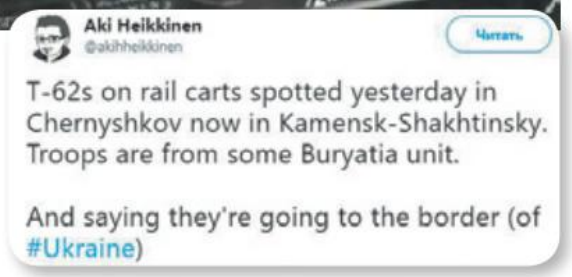
Asked about the destinations for the vehicles, Russian soldiers guarding the trains answered: "The border with Ukraine".

There could be many assumptions as to why these are the locations bordering on Ukraine. Possible purposes could be to build-up military capabilities in the occupied areas in Ukraine in preparation for future operations; to dispose of the vehicles while in combat rather than at industrial facilities; or to replace the new Russian vehicles deployed to Donbas previously with aging Soviet brand counterparts in order to conceal own presence and to pull the wool over eyes of the OSCE mission in the region among many more other purposes.

As a matter of fact, Moscow's deploying outdated and aging T-62 tanks to Donbas is aimed to achieve several goals.

In one respect, the Kremlin, while showing willingness to de-escalate the Donbas could go as far as to provide for the OSCE mission full access to its occupied area in the depths of the Donbas region. This well explains the rationale behind deploying the old T-62s there – to make members of the OSCE mission believe that the "rebellious people of Donbas" are fighting only with these obsolete Soviet-generation armaments. But they should know that the nearest and the only military equipment storage site at Bakhmut (renamed from Artemivsk), which is frequently mentioned by Russian propaganda as the location from which plenty of different military vehicles had been seized, had never stored T-62 tanks, neither had it ever been controlled by the so-called "DNR". They should know also that the T-62 and the T-64 are two fundamentally different designs, both in appearance and in internal layout.

The other rationale for Moscow to replace its armored vehicles, including the T-72 tanks and its different modifications with older-generation T-62s could be the need to fill in the capability gaps that have resulted from massed military equipment withdrawals from central Russia during 2015-17. Russia's border with China might appear to be distanced too far away from these locations of capability gaps, but still it's much easier and quicker to relocate there forces and equipment from central Russia than from the locations on its western borders that Russia fears could be subjected to a "threat from the West".



Notice should furthermore be taken of the fact that the presence of T-62 tanks in that region could be facilitative to Russia's cooperation with Syria. After all, Moscow has already deployed these vehicles to that country and employed them in military operations there. If and when Damascus requires additions to its fleet of armored vehicles, the T-62s might well fit for that purpose.

This all well exemplifies the Kremlin's trademark "multimove" strategy. By conducting this exercise, Moscow is once again trying to demonstrate its power (that has caused so many troubles over the past four years) and intention to become a key player in that region, and to show off its capabilities where it deems necessary and where China is looking at watchfully.

Moreover, the Kremlin is pursuing a dual-goal strategy in Donbas, aimed to stuff the region up with aging Soviet-era equipment while withdrawing more advanced Russian hardware to fill in the capability gaps in the Central Military District. This reveals who the Kremlin is afraid of and where the real outside threat could be coming from. And this is certainly not the West.

Whatever Russian intentions may be, we should anticipate that the second half of 2018 and the beginning of 2019 will see lots of events that can change the Donbas situation and have their impact on Donbas and the wider international situation. UDR

Anton MIKHNENKO,
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Pavlo Bukin, CEO of State Concern "Ukroboronprom"

"WE ARE INTERESTED IN A MORE PROFOUND COOPERATION WITH OUR PARTNERS"

In the wake of the ADEX 2018 International Defense Exhibition held September 25 to 27 in Baku, Azerbaijan, Defense Express was able to conduct an interview with Pavlo Bukin, CEO of SC Ukroboronprom, the premier defense contractor in Ukraine. In a short blitz interview for Defense Express, Mr Bukin was asked and answered questions about plans for the future and the progress in reforming Ukraine's defense industrial sector.

- Ukroboronprom participated with a large display and stand at ADEX 2018 defense exhibition in Azerbaijan. What are your general impressions and the results for Ukroboronprom?

- It's the third time we participate in ADEX exhibition. This is because Azerbaijan is our strategic partner. A high level of political and military & technical cooperation has developed between our two countries. In addition, [participating in] ADEX exhibitions is important to us, for there we have an opportunity to learn the needs of Azerbaijan and to agree with our partner the actions that we are implementing through bilateral cooperation.

As for the desired directions for further cooperation, we discussed this with partners and colleagues from the Azerbaijan Ministry of Defense Industry (MoDI). We need to have new areas for international industrial cooperation. So far we are a traditional partner of Azerbaijan in the maintenance, repair and overhaul of various types of helicopters and combat airplanes. We have developed close relationships in the precision weapons sector. But we have where to proceed. Simple sales have become of little interest to anyone. The trend now is towards integrating competencies in order to get new knowledge and products, as was particularly the case with Azerbaijan where, owing to Ukraine, there was launched a cartridge factory that is currently producing the ammunition products wanted by Baku.

We have discussed with the Ministry of Defense and the MoDI the need and the opportunities for bringing cooperation to a higher level. In order to achieve this, it's worth reviewing each other's competencies and agreeing on the areas where we can work together. There is feedback already about this, and I am confident all will proceed successfully and with fruitful results.

Pavlo Bukin at the time of signing the agreement

An-148-300MP

- [Similar] exhibitions will soon be held in Pakistan and Indonesia. What are the plans for these countries? Pakistan is a long-standing partner of Ukraine in the military and technical cooperation area, while Indonesia still has to work hard to develop a closer cooperation…

- In any cooperation, the key is to be reliable, predictable partners. We want to adequately respond to our customers' needs in a timely manner. In pursuing this goal we seize every opportunity available to us, and participating in exhibitions is one of the best ways to marketing promotion.

In Pakistan, we traditionally have had a large amount of cooperation in the armored industry sector, and this cooperation is only becoming stronger. We are certainly willing to expand this cooperation into other industry sectors, particularly the aviation sector. In this area, there are interesting initiatives regarding production start-ups in Pakistan. In Indonesia, we have some prospects for sales of armored equipment like the Dozor and BTR-4 APC vehicles, for example.

New approaches need to be explored in order to achieve a positive advance. We know how that should be done. A customer needs to be well familiar with any product and to be led to understanding that he really needs it. It takes some time, but the prospect is there and the results are quite accessible.

- What products do you plan to display at these exhibitions?

- In Indonesia, on display will be anti-tank armaments (SKIF and Korsar ATGM systems) and armored fighting vehicles (BTR-4 and Dozor-B APCs and MT-LB [auxiliary armored tracked vehicle]). In the aviation domain, we will try to get our customers interested in the sea patrol aircraft An-148-300MP, as well as in a range of missile weapon products - the missiles RK-2, R-27R1, R-27ET1, R-73, RS-80KO and many others.

In Pakistan, we will show off, among other things, our capabilities in the production and supply of BM Oplot MBTs, 6TD engines [for armored vehicles], and power supply units.

- Ukroboronprom is currently completing its reform and restructuring process. At what stage is the process of restructuring, privatization and clusterization of the Ukroboronprom at the moment?

- The clusterization process – I am talking about its first stage, more specifically, clusterization into divisions – has been completed now. Highly professional managers have been assigned to each of the divisions. The next challenge to be addressed is to employ highly skilled professional teams for these divisions.

This process is proceeding against the backdrop of market liberalization in Ukraine, which has its impact on reform of Ukroboronprom. A somewhat different domestic market situation is developing.

I hope work on staffing employee teams for Ukroboronprom's divisions will be completed by spring 2019. This work cannot be completed earlier than this. This, again, is taking place against the backdrop of changes to the legislative framework, which is yet inconsistent with the changes taking place in the real economy. First of all, I am talking about all that is concerned with the Government Defense Procurement Contract, persistent use of outdated standards, the need to improve relationships between defense customers and contractors, production cost management and a lot more other issues. We are confident that these issues will be resolved, sooner or later, because this has been long overdue. Ukrainian authorities are supportive of these changes, but what needs to be done now is to create conditions for qualitative growth and development.

Obviously consistent with this effort is a proposal by Ukroboronprom to set up a joint working group with the Ministry of →


8x8 wheeled armoured personnel carrier BTR-4 "Bucephalus"

Ukrainian made missile series R-27 and R-73

Defense to address standardization issues aimed to improve Government Defense Procurement Contract implementation procedures...

We indeed need to drastically update the government technical requirements pertaining to the defense industry. This would ease the arms production and acceptance process and reduce production costs and time. We propose scrapping the technical requirements for military equipment, which are dating back to Soviet era and have ceased to be consistent with modern realities. For example, the current standards require military equipment to be made resilient to radiation exposure. In order to comply with this requirement, one of our factories has to use services of a company located in Semei, Kazakhstan.

Another standard requires that equipment be able to withstand temperatures as low as -50o Celsius that are never occurring in Ukraine, and to retain full functionality in rarefied atmospheric conditions, etc. Some of the standard requirements go beyond common sense. One such, for example, requires that the Lotos-brand laundry powder be used for individual tests ... The need to comply with these standards creates conditions for corruption and malpractice.

- What about the new military technologies that appeared at the Independence Day parade this year in August? What are the prospects for Vilkha MLRS, mobile Bohdana Artillery Cannon System and other new projects?

- The Ukrainian defense industry is definitely rising back on its feet. These days are not easy. But despite all the challenges, we are witnessing a R&D boom in the defense industry sector that has produced a plethora of new promising technologies, the most conspicuous examples thereof being growing domestic munitions production and an industry new to Ukraine such as UAVs...

This year's Independence Day parade definitely displayed what we are capable of. The new military technologies displayed at the parade, after they are tested and approved for operational use, will certainly find their customers in Ukraine's defense and security sector. We are expecting that the Vilkha MLRS project will be ready to go into production for the needs of Ukraine's military as early as next year.

Of critical importance will be the level of national defense spending for 2019 and the following smooth funding of defense industrial projects. Unfortunately, it often is the case that the level of funding appropriations, including advance appropriations from the Ministry of Defense, is far below the expenditures incurred by defense-industrial companies, or the release of funding is delayed by 6-7 months from the start of the year. This is fundamentally wrong since it disrupts normal operation across the State production system. But let us be optimistic. Changes are definitely underway, and they are to bring along a new quality and new opportunities. UDR

Interviewed by **Anton MIKHNENKO**, UDR

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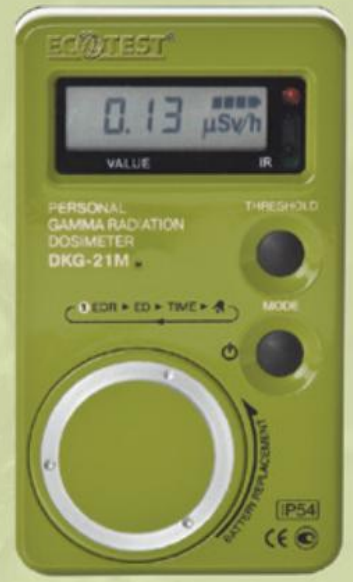

Electronic Personal Dosimeter "DKG-21M"

Provides individual dosimetry control of personnel

Multipurpose Military Dosimeter-Radiometer «MKS-UM»

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Data Panel «IT-09T»

Provides non-stop monitoring of radiation background

On-board Radiation Survey Device «DRG-T»

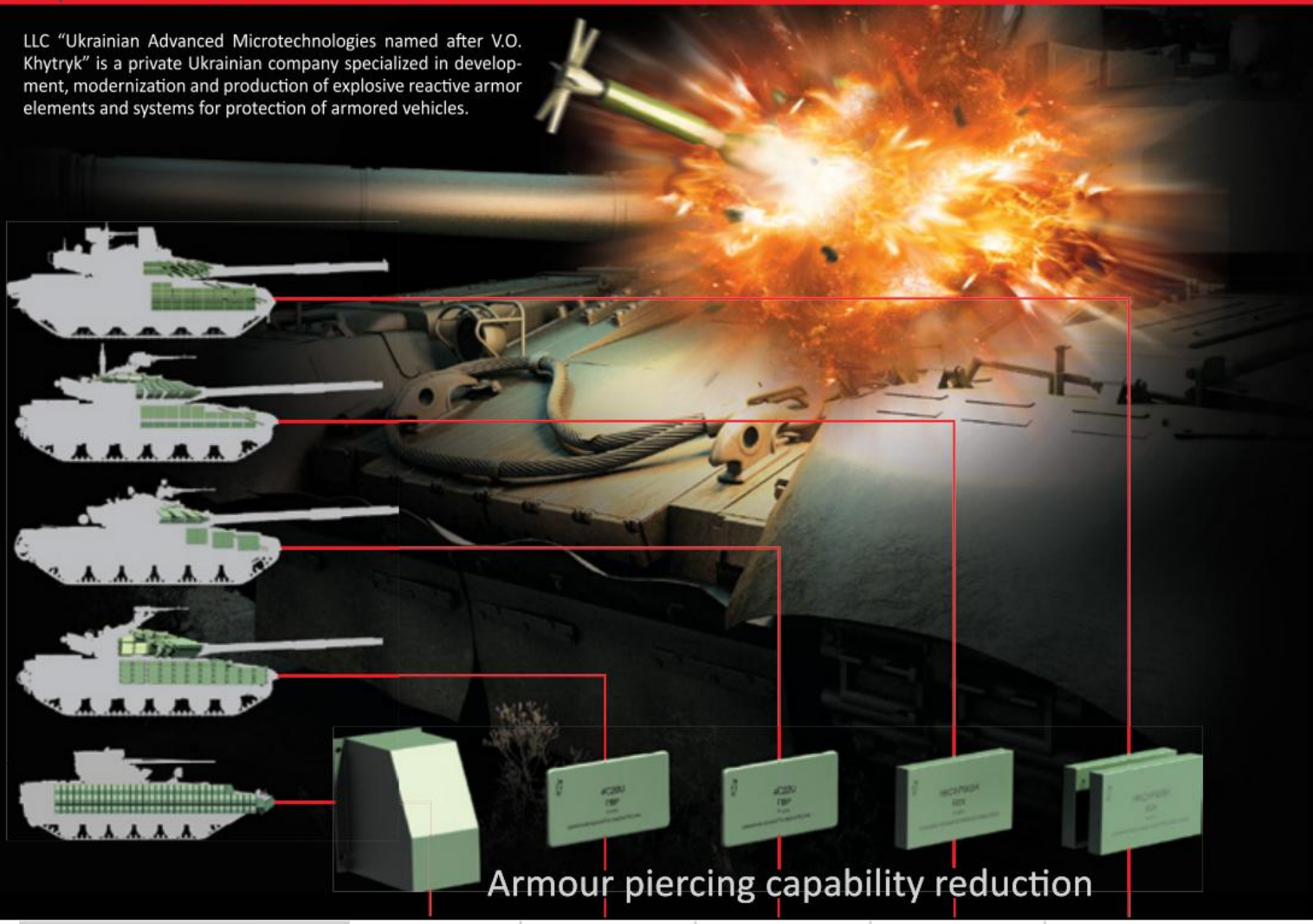
Generates signals and commands to crew protection system

UKRAINIAN ADVANCED MICROTECHNOLOGIES

named after V. O. KHYTRYK

Explosive reactive armour elements

LLC "Ukrainian Advanced Microtechnologies named after V.O. Khytryk" is a private Ukrainian company specialized in development, modernization and production of explosive reactive armor elements and systems for protection of armored vehicles.



	NIZH-LM (with HKChPWSH element)	4S20U	4S22U	NIZH-1M (with HKChPWSH element)	DUPLET-2M (with HKChPWSH element)
	Antitank grenade launchers				
PG-7V, PG-7VM, PG-7VS, PG-9V, PG-9VS	≤ 80%	≤ 90%	≤ 90%	≤ 90%	≤ 95%
PG-7VL	-	≤ 50%	≤ 50%	≤ 70%	≤ 80%
PG-7VR (tandem warhead)	-	-	-	≤ 30%	≤ 70%
	Shape charged (HEAT) projectiles				
BK-14M	-	≤ 80%	≤ 80%	≤ 80%	≤ 90%
BK-18M	-	≤ 70%	≤ 70%	≤ 70%	≤ 80%
	Antitank guided missile (ATGM)				
TOW-1	-	≤ 60%	≤ 60%	≤ 70%	≤ 80%
TOW-2 (tandem warhead)	-	-	-	-	≤ 60%
Kornet-E (tandem warhead)	-	-	-	-	≤ 50%
	Explosively Formed Penetrator (EFP)				
TM-83	-	-	-	≤ 40%	≤ 80%
	Armour-piercing projectiles				
BM-15, BM-22, BM-26	-	-	≤ 60%	≤ 80%	≤ 90%
DM-23, M111, BM-29	-	-	≤ 30%	≤ 40%	≤ 60%
BM32, BM42 (Mango), DM-33, M829	-	-	≤ 20%	≤ 50%	≤ 60%

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MEET BOHDANA

HERE IS WHAT'S KNOWN ABOUT UKRAINE'S INDIGENOUS NATO STANDARD 155-MM SELF-PROPELLED HOWITZER

Volodymyr TKACH,
Oleksiy LEVKOV,
Defense Express

Ukraine has developed its first indigenous self-propelled NATO 155mm artillery gun system named Bohdana. A prototype of the Bohdana was unveiled to the public during Ukraine's 27th Independence Day celebrations on 24 August in Kyiv. The mobile cannon was developed to conform to specifications developed by the Ukrainian Armed Forces' Central Armaments R&D Institute. The Bohdana project is being funded through appropriations under the Government Defense Procurement Budget. The first technology demonstrator prototype is currently undergoing factory-level testing.

The Bohdana is the first self-propelled artillery gun system on a wheeled chassis ever developed in Ukraine. Designed with the capabilities enabling high mobility, computer-based processing of firing mission data, and short time in a firing position, the Bohdana would come as a welcome addition to the capabilities of the Ukrainian Armed Forces artillery units. Moreover, it will enable the use of new tactic termed by NATO as "shoot-and-scoot" (alternatively, fire-and-move) – an artillery tactic of firing at a target and then immediately moving away from the location to avoid retaliatory fire. With howitzers that need to be towed, the use of this tactic was almost impossible, and howitzers on self-propelled, tracked chassis will be inferior in mobility to the 6x6 wheeled Bohdana.

The greatest pride for the Bohdana technology creators is that it will go to battle carrying the brand "Made in Ukraine", with only 5 percent of minor components, including gun control consoles, sourced from foreign markets.

The new 155-mm Bohdana self-propelled howitzer has been developed and produced by Private Sector military-industrial companies, including the Kramatorsk Heavy Machine-Tool Factory (HMTF) that developed and manufactured the gun" part of the system, including the gun barrel. And, for the record, the HMTF has recently launched production of barrels for tank guns as well.

The Bohdana project is a collaboration of around a dozen domestic companies. Particularly the PrAT AvtoKrAZ PJSC, Kremenchuk, Poltava Oblast, developed a wheeled platform based on its 6x6 military truck KrAZ-6322. It has an armor-plated, twin-compartment crew cab with four doors and 5 seats arranged in two rows. It features a central tire-pressure regulation system that allows the driver to adjust the tire-pressure to suit the terrain being crossed. There are also blackout devices and 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 platform is required to have bulletproof armor strong enough to protect the crew from impacts of B-32-type 7.62 mm bullets fired from ≤30 m within an arc of ±300 o as well as similar-energy fragments of shrapnel. Anti-mine blast protection measures include STANAG-4569 Level I compliant protection of the wheels (hand grenades, unexploded artillery shells, small explosive devices of at least 0.35-kg TNT equivalent); and STANAG-4569 Level IIa protection of the bottom hull (6kg TNT under central hull).

The Bohdana has a duplicated, computer-assisted fire control system and an autoloader based on Siemens SIPLUS and SIMATIC HM controllers. Loading, aiming and firing controls of the gun can be performed via the control panel or manually using mechanical drives. The gun can be controlled from the cab or a remote panel. At the Independence Day military parade, the prototype of the Bohdana was displayed with the autoloader missing, but the latter can be seen present in engineering blueprints for the Bohdana, and has been developed. So the Bohdana howitzer will be fully provided with all of its organic subsystems, including the autoloader, by the time it is scheduled to enter the Government Trials process.

The self-propelled Bohdana howitzer is Ukraine's first indigenous artillery gun system to have been developed tailored for NATO standard 155 mm munitions. The reason for this choice of caliber has both political and practical dimensions. First, it signifies Ukraine's commitment to move closer to new standards. Second, the provision of ammunition for the new gun can be enabled through procurement from foreign sources. Thus, as reported in September 2018, Artem, a Kyiv-based holding company, launched a widely publicized first production line for 152 mm rounds intended to be fired from the Giatsint howitzer. And, as stated by Ukroboronprom (Artem's parent corporation) in a press statement: "At the following stages, the experience and expertise gained and the production processes →

Developer Kramatorsk Heavy Machine-Tool Factory

Self-propelled Bohdana howitzer in stowed position for transport

Self-propelled Bohdana howitzer in deployed position

The gun can be elevated from -5° to +65° and traversed through +/-45° to the right and left of the vehicle longitudinal axis

- Two rear-mounted, extendable telescopic legs are used for weapon stabilization during firing

- On-board ammunition capacity - ≥20 rounds of 155-mm ammunition, ≥500 rounds of machine gun ammunition

- Mass of vehicle – 28.5 t
  Mass of cannon – 10.5 t
  Total mass of cannon with hydraulics and ammo racks – 13 t
  Caliber – 155 mm

- Gun and fire control system console

- Max firing range
  ≥40 km for HE-FRAG projectiles
  ≥50 km for HE-FRAG active-reactive projectiles

  Min firing range – ≤7.5 km

Max direct fire range against 2-km high target – 780 m

Rate of fire – 4-6 rounds per minute (with three rounds fired within the first 20 seconds)

The self-propelled Bohdana howitzer is Ukraine's first indigenous artillery cannon system to have been developed tailored for NATO standard 155 mm munitions. The reason for this choice of caliber has both political and practical dimensions.

implemented will allow in a short term to proceed to production of munitions for other artillery systems." This is particularly about the NATO standard 155 mm rounds. According to upbeat forecasts from Defense Express analysts, independent production of large-caliber ammunition (projectile, casing, powder charge, hexogen/RDX) in Ukraine would require from one to two years to establish. Until this happens, procurement of 155-mm projectiles from foreign sources looks to be the single possible option. Such munitions can be sourced from key manufacturers in the West and in Eastern Europe.

According to its stated technical specifications, the Ukrainian artillery gun system Bohdana will be able to fire ammunitions with high explosive fragmentation (HE-FRAG) projectile and HE-FRAG active-reactive projectile, to ranges of ≥40 km and ≥50 km, respectively. But these ranges will not be achievable without appropriate firing charts. And it's critically important that these firing charts be compiled as soon as practicable for both domestically produced and foreign sourced ammunitions, for, without it, a gun is just a pile of scrap metal. In Ukraine, Turingismus offers services for calculating munitions aerobaltic coefficients and compiling firing charts for new types of munitions and weapons systems. The use of the Turingismus ballistic computer and its associated processor provides the advantages in terms of significant reductions in the time the howitzer stays in a given firing position as well as in terms of reduced ammo consumption while performing standard firing missions, and it will make the gun more suited for shoot-and-scoot tactic.

The Bohdana will be able to fire at the rate of 4-6 rounds per minute. The gun will be available with two ammo racks, each holding 10x projectiles and 10x charges.

In the future, the Bohdana could be made operationally more versatile by modifying it for firing the new indigenously developed "smart" projectile Kvitnyk, which is scheduled to complete its Government Trials process by Q2 2019 at the latest. The Kvitnyk, a semi-active laser-guided HE projectile was jointly developed by Progress R&D and Production Complex and Tochnist Design & Development Company, Nizhyn. The Kvitnyk will be available in 152 mm and 155 mm calibers. Due to using semi-active laser guidance, the Kvitnyk has 90% first-round hit probability if fired from a 152mm howitzer to ranges up to 20 km. Using this "smart", precision-guided munition will enable firing missions to be performed with cost and time efficiency and with reduced casualties. But a laser rangefinder/designator will be required to be employed to enable the Kvitnyk munition to be used to best effect.

The Kvitnyk and Karasuk semi-active laser-guided HE projectiles

The Bohdana could be synergistically integrated with the mobile gun battalion/battery command, control and computer system Obolon that Lorta, a Lviv-based state-owned company, developed under the Government Defense Procurement Program. The Obolon, which is currently being prepared to enter the Government Trials process, will be available in configurations mounted on wheeled or tracked chassis. Both configurations were introduced to the public at the Independence Day display on August 24, 2018. The wheeled Obolon, networked with the wheeled Bohdana howitzer, the Zoopark-2 artillery reconnaissance system (a product by Iskra, Zaporizhzhya), and unmanned aircraft systems, could form the core of restructured artillery units.

All the capabilities of the artillery gun system Bohdana will not be revealed until validated by Government Trials. But what is clear even now is that both the Ministry of Defense and developers and manufacturers are interested in having this technology tested and brought into production as soon as possible. UDR

Aerotechnica

L-band Mobile Radar MARS-L

Mobile combined PSR/SSR L-band Radar MARS-L is a ground-based radar system comprising primary and secondary channels. Combined operation of PSR and SSR allows for significant increase in detection range and accuracy at relatively low radiation power.
MARS-L is capable of providing surveillance and combat information to anti-aircraft missile units, air force units, EW units when conducting combat operations.

MARS-L can be used as:
- low altitude target surveillance radar;
- surveillance radar of radar units to improve low altitude coverage, gap filler radar;
- aerodrome radar for air traffic control within aerodrome area;
- target acquisition and designation radar for prospective anti-aircraft missile systems.

Functions of MARS-L:

- aircraft detection, displaying of position, automatic measurement of range and azimuth by primary radar;
- aircraft interrogation, receiving and displaying SSR replies;
- combining data received by primary and secondary channels;
- automatic tracking, flight trajectory estimation;
- acquisition, displaying and processing of air situation from another radar, generation of multi-radar tracks;
- automatic height-finder control, altitude calculation;
- automatic recording and distribution of air situation;
- semi-automatic topographic referencing of radar position (GPS-based);
- technical monitoring and diagnostics.

Mobile VHF-band radar AMBER-1800

AMBER-1800 is a 2D mobile military-civilian radar for long-range air surveillance (up to 500km). Solid-state VHF-band transmitter is used. The mission of Amber-1800 is to conduct surveillance over large areas and locations such as military bases, airfields, oil production areas, arms depots, warehouses, and industrial facilities.
AMBER-1800 utilizes automatically deployed multi-section antenna system.

The antenna itself represents a stacked array of dipole-slot antennas with linear horizontal polarization.
AMBER-1800 radar system is mounted on two vehicles: antenna system semi-trailer and the hardware truck. Combined with a height-finder AMBER-1800 operates as a 3D radar complex.

Functions of AMBER-1800:

- automatic detection of air targets and determination of their coordinates (plots: azimuth, range);
- automatic generation of tracks, tracking of air targets in specified areas of airspace;
- displaying video, plots and tracks, automatic distribution of air situation to consumers over provided data links;
- automatic sending air target elevation measurement commands to height-finders, correlation of measured elevation with the tracks;
- recording and storage of air situation, interfaces of radar operators;
- control of radar operation modes, technical monitoring and diagnostics.

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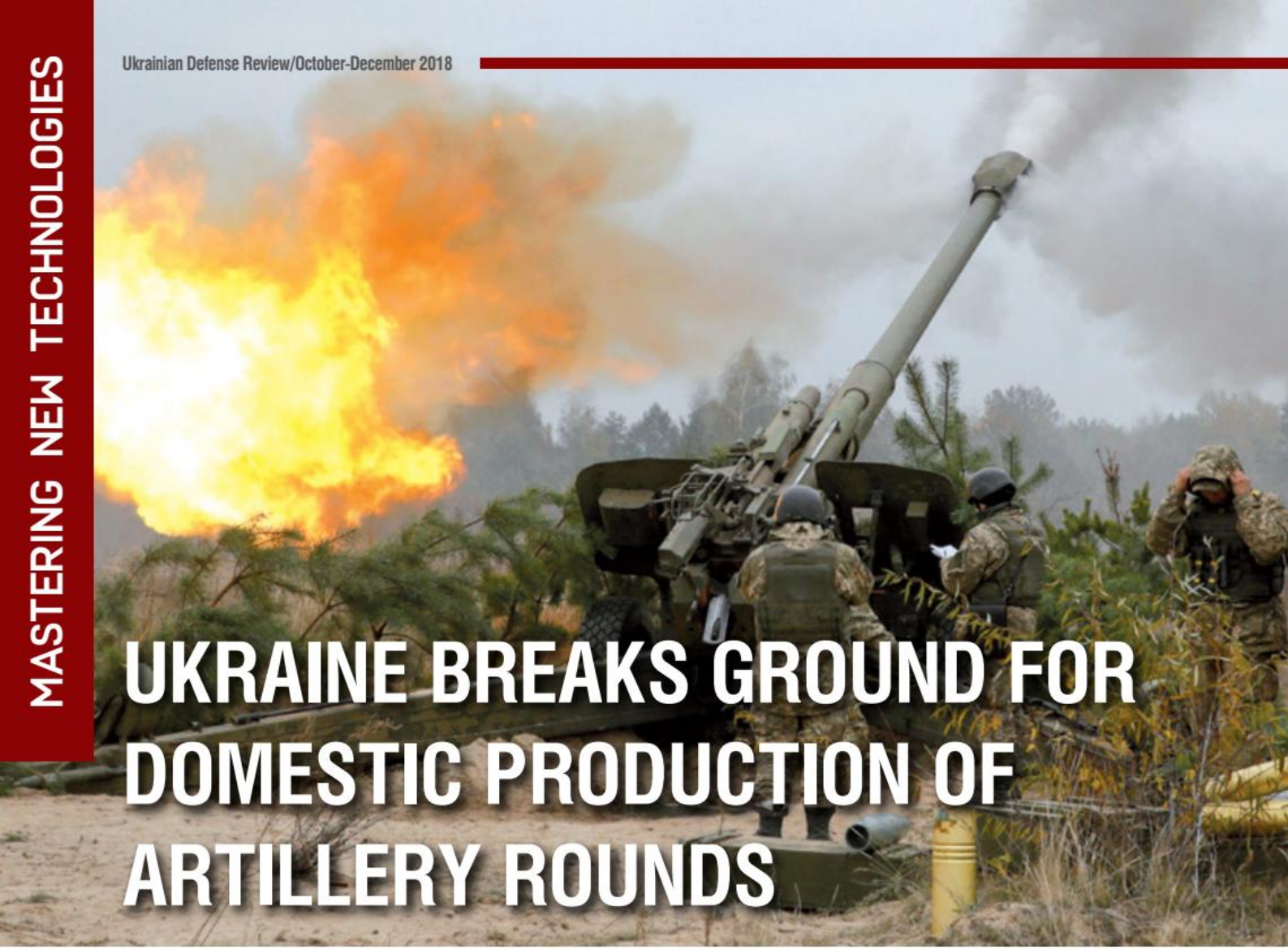

UKRAINE BREAKS GROUND FOR DOMESTIC PRODUCTION OF ARTILLERY ROUNDS

Artem State Joint Stock Holding Company (SJSHC), which is incorporated with the State Concern Ukroboronprom, is one of Ukraine's leading engineering companies that has gained national and international renown due to its products for the aviation and military ground vehicle industries. Over the past two years, Artem has built up its production capacities by launching production lines for the ammunition products that are so desperately required by Ukraine's military and had never been produced domestically previously.

Since the onset of Russian aggression in Ukraine, there has been an urgent requirement for large-caliber munitions. In the early 1990s, Ukraine found itself left without artillery ammunition manufacturing capacities, as most were left in Russia following the collapse of the Soviet Union. Ukrainian forces previously had to use legacy inventories left behind after the demise of the USSR, but these stocks have been exhausted due to hostilities in Donbass and the recent unplanned explosions at munitions depots. So Ukraine was faced with two options – buying these munitions from foreign suppliers or producing them in country. Buying munitions, especially of large caliber, on the international market is a fairly expensive and complicated affair, particularly in the current international political setting. Instead, the launch of domestic production would open up broad opportunities for the Ukrainian industries, facilitate domestic market development, and open up new export markets for the domestic defense industries.

As a result of an enormous amount of work done by defense industry executives, the requisite production equipment had been bought on the global market and, in August 2018, it was officially announced in the presence of Ukrainian President Petro Poroshenko that Artem would launch up series production of the new 152 mm OF29 round to be fired from the 2A36 Giatsint-B long-range gun system. Artem has already implemented the full range of production processes for the new product, including hot stamping, heat treatment, and other processes used in the production of large-caliber munitions. Initial production rate will be 18,000 units per year to meet Ukrainian military's requirement, and will subsequently increase to

360,000, in expectation of orders from potential export customers, particularly in Africa and Asia.

The 152 mm OF29 is a high explosive fragmentation (HEF) round that is intended to be fired from the 2A36 Giatsint-B and 2S5 Giatsint-S howitzers to engage enemy personnel, equipment and emplaced weapons - in transit, assembly points or fortified localities, at ranges of up to 28.5 km away. The product has succeeded through the full trials process and has been certified and qualified for delivery to Ukraine's Armed Forces. Production launch of the OF29 round will be followed by series production of the 3OF22 – a 152 mm, rocket-assisted HEF round that is designed to be fired from the self-propelled D-20 and 2S3 Acacia howitzers.

Essentially replicated from Soviet-era designs, both the OF29 and 3OF22 are fully indigenous products manufactured with the use of Ukrainian components and materials only, and with strong compliance with their respective firing tables.

The new production equipment that Artem has acquired can be easily adjusted to production of other caliber rounds, with the production adjustment process taking hours rather than days as is the case with forging-based production.

The next product the Company plans to launch is a 155 mm round for launch from Ukraine's new indigenous Bohdana self-propelled gun system. The Bohdana gun and its associated round are planned to be tested synchronously with one another.

With this 155 mm gun and its associated NATO round Ukrainian forces will be better equipped to defeat targets at ranges exceeding the range of the weapon. The intent is that a target would be engaged with two rounds fired in sequence – a 155 mm HE ER BT followed by a 155 mm M107. The former has a mass of 45.8 kg and a range of ≥ 34 km, while the latter weighs 43.3 kg and will be able to defeat targets at ranges of at least 18 km, but the designers expect that, in actual settings, the rounds would be able to reach longer ranges than given here. The indigenous, large-caliber rounds will be fitted with the fuzing mechanism B-429 developed by Shostka-based Impulse Factory and produced by Artem's machine tool facility. The new gun rounds had been demonstrated in mock-up form at Ukraine's Independence Day exhibition in Kyiv on August 24, 2018.

In addition to standard 155 mm NATO rounds, Artem has the capacity to manufacture smaller diameter, 122 mm rounds for launch from the howitzers D-30 and SAU 2S1 Gvozdika. Current plans are to reverse engineer Soviet-era designs to meet the urgent domestic requirement. The future focus, however, will be on the 155 mm caliber.

It should be noted that Artem also launched a production line for the 80 mm RS-80 unguided rocket for launch from ground attack airplanes and helicopters. The rocket will be available with two options for warhead: high explosive dual purpose (RS-80KO) and air-burst fragmentation (RS-80PO). The RS-80KO version, which is tailored for use against ground targets, has an effective range of 1,300-1,400 m, while the RS-80PO is able to defeat ground targets at 7,300 m and airborne targets at 3,500 m.

The new rocket has succeeded through airborne testing so far. It is of fully domestic manufacture, the only imported component being the rocket grain sourced from an EU supplier.

Another new product launched by Artem is the PG-7SM - an explosively formed projectile that has been highly demanded by the Ministry of Defense and had not been produced in Ukraine previously. Designed to be fired from the 40 mm grenade launcher RPG-7V, it is efficacious against tanks, self-propelled guns, and vehicles, both armored and unarmored. With the prototyping phase now completed, the PG-7SM technology is currently being prepared to go through factory-level tests. The munition is designed with a maximum range of 500 m and an armor-piercing capability of 400 mm RHA.

Artem, the manufacturer of the anti-tank guided missiles Stugna-P and "Corsar", the R-27 missile and its different configurations, and well as the Kombat missile, has significantly expanded its capacity to manufacture a wide range of medium-to-large caliber unguided weapons for a variety of applications. The Company has become the leading manufacturer of rocks and artillery munitions for Ukraine's military. So it may indeed be argued that the government's program for development of the domestic munition industry has already begun bringing positive results. UDR

NEPTUNE MISSILE ON COURSE TO ITS TARGET

KB LUCH SUCCESSFULLY BRINGS ITS NEW ANTI-SHIP CRUISE MISSILE NEPTUNE THROUGH ANOTHER ROUND OF TRIALS

On August 17, 2018, Ukraine's new indigenous anti-ship cruise missile Neptune succeeded through another round of trails. "During this cruicial round of flight tests, Ukraine's indigenous cruise missile successfully completed its test mission program," Oleksandr Turchynov, Ukraine's National Security and Defense Council Secretary has said. "Ukrainian cruise missiles are able to robustly defend the Black Sea and Azov Sea shores by engaging hostile ships, even, if needed, at their home bases at ranges up to 300 kilometers", he said.

The trials addressed validation of the missile's performance in approaching the attack area and the proper performance of the cruising engine after separation of the missile booster. During the live launches, the range was deliberately restricted to 100 km in azimuth and 300 m in elevation due to range safety considerations. The trials validated that the missile conforms to its declared performance characteristics and helped collect telemetry data required for future tests.

The Neptune missile is being developed by the KB Luch Design and Development Bureau, a State-owned company, in a domestic collaboration with government-run and private sector defense industries, aimed to provide Ukraine with a cost-effective solution for a 300-km-rage cruise missile. Much credit for success of the Neptune project goes to Oleh Korostelev, the CEO and chief designer at KB Luch.

The Neptune is a fully indigenous project developed and built with no international partners involved, which is of particular importance to Ukraine, given the cost considerations and the complexity of buying these weapons on the global arms market. It may indeed be argued that KB Luch had set up a new domestic high-tech collaboration that produced the missile's warhead, control system, a variety of seeker heads, and radio altimeters among other key subsystems. In this product, KB Luch displayed its signature blend of innovative and already proven solutions and components manufactured domestically in Ukraine.

The Neptune missile will be available in configurations for sea, land and air attacks, but the focus now appears to be on the land version which is configured to defend against both sea-based and ground threats. The Neptune project is given first priority for funding under the Government Defense Procurement Plan.

By mid 2019, the Shore-Based Anti-ship Missile System Neptune is scheduled to be ready to enter the Government Trials process. UDR

UkrOboronProm
Ukrainian Defence Industry

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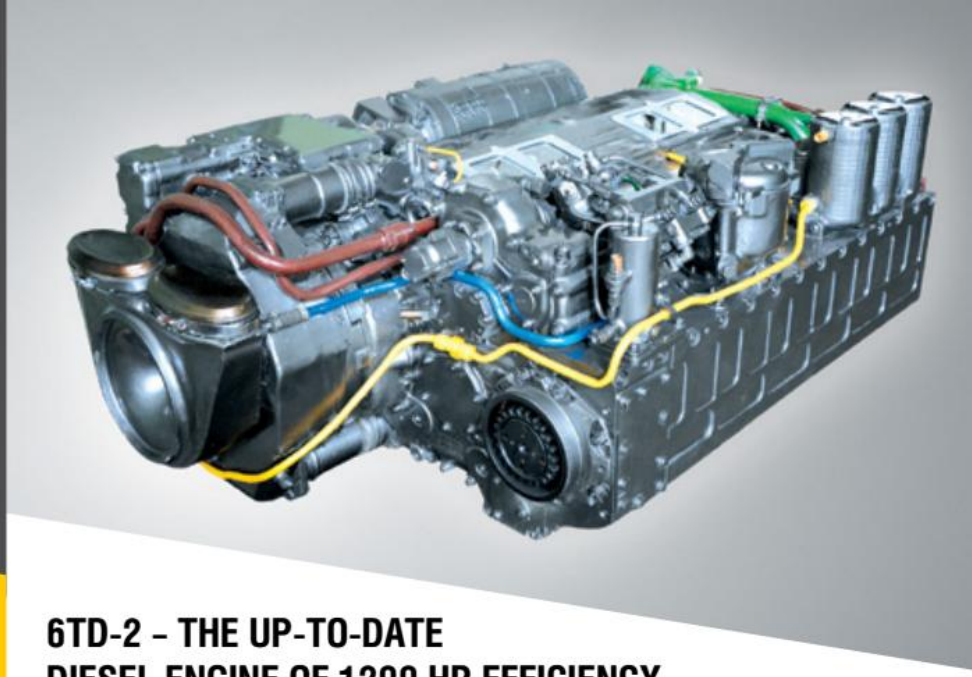


UPGRADING OF T-72 TANKS

BY MEANS OF INSTALLATION OF THE UP-TO-DATE HIGH PERFORMANCE

6TD-2 DIESEL ENGINE

WHY IS IT NEEDED TO UPGRADE THE POWER PACK OF THE T-72 TANK?

The T-72 tanks are the most numerous in the world main battle tanks of the second generation. The negative experience of their usage and losses in combat actions of the recent years show that the T-72 tanks are practically unprotected against tandem HEAT ammunition and other modern antitank means. Augmentation of the tank protection both by the additional traditional armor and by the explosive reactive armor is the main method to maintain the T-72 tank as the effective combat power for the conduct of modern war. But any attempt of significant comprehensive enhancement of the T-72 tank protection at least while maintaining its mobility is highly limited by the engine power.

To resolve the problem of insufficient power of the T-72 tanks the Ukrainian State Enterprise "Malyshev Plant" offers the 6-cylinder 6TD-2 diesel engine of 1200 hp output instead of V-46 engine and its modifications. The upgrading is carried out with insignificant changing of the bottom and power pack compartment top deck plate of the tank being upgraded.

6TD-2 – THE UP-TO-DATE DIESEL ENGINE OF 1200 HP EFFICIENCY

The 6TD-2 is the two-stroke multi-fuel 6-cylinder diesel engine with opposed pistons, liquid cooling, with direct fuel injection, supercharging compressor with mechanical drive and gas turbine drive. Practice of this engine and its modifications usage showed that it belongs to the most advantageous designs among the tank engines of the main worldwide manufacturers including the power-to-weight ratio index. Due to the compact design the minimum space compartment is required for its placement in comparison of it with any other engine of the same class.

Installation of the 6TD-2 engine opens the way to upgrading of outdated T-72 tanks up to the level of the most up-to-date battle tanks of the new generation.

Upgrading ensures increase of the following main parameters of the tank:

- increase of the tank power-to-weight ratio;
- increase of the average speed of movement and removing of load and speed restrictions during operating under the hot climate conditions;
- increase of the reverse movement speed.

THE 6TD-2 ENGINE MAIN PERFORMANCES

Maximum output, kW (hp)	882 (1200)
RPM at maximum output	2600
Weight, kg	1180
Swept volume, l	16.3
Piston diameter/piston stroke, mm	120x120
Specific fuel consumption, g/kW·h (g/hp·h)	218 (160)
Dimensions, mm: length, width, height	1602x955x581

MAIN ADVANTAGES OF USING THE 6TD-2 ENGINE

- small dimensions combine with high power;
- low infra-red signature of the tank due to the special heat emission reduction system;
- efficient cooling system enabling to operate under high ambient air temperatures (up to +55 degrees Centigrade) and in mountainous areas with no loss of performances;
- minimal weight and space of the tank power pack compartment;
- high pickup and brake power of the engine;
- maximal efficiency; low specific fuel consumption;
- high reliability and maintainability;
- use of various types of fuel (multi-fuel operation);
- universal engine layout, power take-off from two sides;
- reliable start-up;
- long service life, technological efficiency of the engine and potential for the parameters enhancement.

The high temperature mode of tank operation when this engine is installed is ensured due to the following:

• ejection cooling system of the two-stroke diesel engine, where the energy of exhaust gases creates rarefaction and ensures operation of the ejector, which allows to perform the intake of required quantity of air which is cooling the heat exchangers under the ambient air temperature up to 55°C with no reduction of the engine power. Such system automatically adopts itself to the ambient air temperature, it has a simple design and has no moving parts. In this case the necessity of using the fan for cooling is eliminated as in the basis design of the T-72 power pack compartment. Usage of the ejection cooling system leads to the dilution of exhaust gases with air, as a result of which the thermal wake of the tank is practically not left;

• possibilities of the engine operation under the cooling liquid temperature up to 130°C.

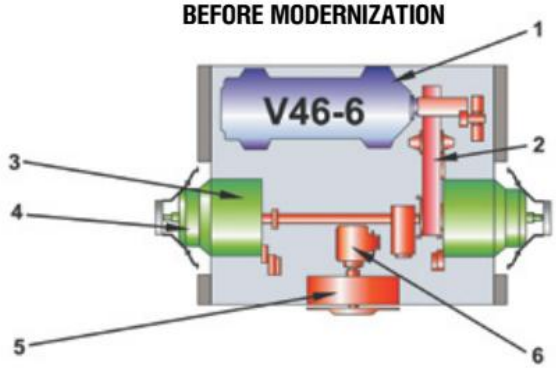
REVERSE TRANSMISSION

The new transmission is installed together with the engine. The reverse transmission is intended for the increasing of the tank speed mode during forward and reverse movement (RG). Enhanced (accelerated) reverse speed gears ensures when required quick change of positions under combat conditions without the tank's pivoting. Mechanical reverse transmission consists of two gear boxes (GB) and coaxially coupled with them reversible final drives. This ensures 7 forward gears and 4 reverse gears. The weight of transmission is 1660 kg.

The absence in the power pack compartment of such assemblies as the transmission change gear and fan drive reduce the engine power losses.

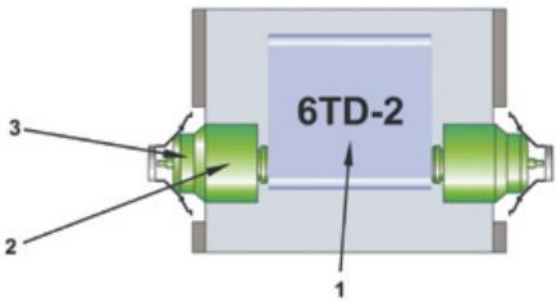
MODERNIZATION OF TRANSMISSION

BEFORE MODERNIZATION



1-Engine
2-Inlet reduction gear
3-Side gearbox
4-Side reduction gear
5-Cooling system fan
6-Conic reduction gear

AFTER MODERNIZATION



1-Engine
2-Side gearbox
3-Side reduction gear

Side gearbox

COMPARATIVE CHARACTERISTICS OF THE T-72 TANK BEFORE AND AFTER UPGRADING OF THE POWER PACK

Parameters	Before upgrading	After upgrading
Top road speed, km/h	60.0	70.0
Average speed on dry dirt road, km/h	32…38	40…45
Reverse gear speed, km/h	4.2	31.4
Engine name	V-46	6TD-2
Engine output, kW (hp)	574 (780)	882 (1200)
Power-to-weight ratio, kW/t (hp/t)	14 (19)	20.7 (28.2)*
Specific fuel consumption, g/kW·h (g/hp·h)	245 (185)	218 (160)
Oil consumption, kg/h	5	3.5
Operating temperature range, 0C	-40 … +30	-40 … +55
Air cleaner cassettes maintenance rate under the especially dusty conditions, km	300	1000
Depth of water obstacles negotiated without preparation, m	1.2	1.8
Tank's pivoting	around braked tracks	- around braked tracks - around vertical axis of the tank (engagement of the opposite direction of tracks rotation)

*- index without allowance for additional armor protection.

Separately, apart from upgrading of the power pack the following can be offered as an option: 1) Upgrading of armor protection; 2) Upgrading of fire control; 3)Enhancement of fire power by means of installation of new KBA-3 main gun.

Oleksandr Kozhevnikov,
acting CEO of Mykolaiv
Armored Plant

"MONGOOSE ARSV IS A FULLY NEW VEHICLE DESIGNED TO NATO STANDARDS"

SE Mykolaiv Armored Plant incorporated with the SC Ukroboronprom is the leader on the Ukrainian market for production and upgrade of light armored vehicles on wheeled chassis. Having passed through years of trouble, the Company is currently operating at full capacity, performing orders both for the defense and security services in Ukraine and for export customers. On a parallel track, the Company is developing new products that have already caused interest among potential export customers. The following is an interview conducted with Oleksandr Kozhevnikov, acting CEO of Mykolaiv Armored Plant by Defense Express on the Company's latest achievements and plans for the future.

- Your Company has developed the armored reconnaissance scout vehicle (ARSV) Mongoose that Ukroboronprom displayed in mockup form at MSPO-2018 exhibition held in Kielce, Poland, in September and in Prototype form at Arms and Security 2018 expo held in Kyiv in October. Would you elaborate on this, please?

- The ARSV Mongoose is effectively a new vehicle developed by our in-house design & development team. Initially, we planned to complete the full-size prototype in time for [MSPO 2018 expo] in Poland, but missed deadlines. So it made its debut in full-size prototype form at Arms & Security 2018 expo in Kyiv.

This vehicle has been designed from the ground-up. It is able to negotiate water obstacles and to develop speeds up to 100 km/h on highway and 10 km/h in water.

The vehicle is powered by new 150 hp Iveco Tector diesel engine with preheater, which ensures trouble-free operation in all weather conditions and enables 1,000 km cruising range. The engine consumes 20 L of fuel per 100 km, which is better than good for a vehicle in the ARSV category. This ARSV features Ukrainian brand tubeless tires with a highly effective tire inflation system, as well as a new torsion bar suspension for improved cross-country mobility.

Moreover, the Mongoose ARSV is armed with a remote weapon station accommodating a 14.5mm KPVT machine gun used as the main armament, this being complemented with a PKT 7.62 machine gun.

- So it appears that Mongoose is not a derivative design from the BRDM-2 ARSV…

- This is not a derived design but a fully new vehicle. Designed to NATO standards, it has a wider wheel base, is higher, has an amphibious capability, and is provided with a spare tire. The top mounted weapon station is controlled remotely from within the vehicle, with the controls being accessible to each crew member. Compared to BRDM-2 which has seats for up to four crew, Mongoose can accommodate six personnel, including crew members. The vehicle has one door on either side of the hull, in addition to two roof hatches and one rear door, the latter being intended for entry/exit of wounded casualties recovered from the battlefield.

- What is the armor protection level for the vehicle?

- STANAG 3. The hull is protected with multi-layered armor composed of 14 mm thick impact absorbing layer and 12 mm thick backing layer, complemented with 5 mm thick layer

bolted up to the hull perimeter. The vehicle is fitted with camera sensors that provide 360 degree, day/night situational awareness and imagery for the crew. Data from all the sensors can be seen on the driver's display unit, thus enabling confident driving even without the use of driving periscopes.

- Has the ARSV Mongoose been put to trails, and if so, how does it perform?

- The Mongoose technology is now undergoing plant-level testing. The vehicle fared very well in crossing water obstacles, off-road riding, performing weapon station control etc., in sum, demonstrated a high level of combat effectiveness.

- How are your relationships developing with the Ukrainian Defense Ministry?

- As you know, Mykolaiv Armored Plant is currently a major enterprise that has in its possession modern production facilities, highly knowledgeable employee team and highly qualified engineering staff who are developing technical solutions to improve this technology. We perform comprehensive modernization of the BTR-80, BTR-70, and BRDM-2 vehicles just to name a few. We are unique in our own right, being Ukraine's only company capable of providing repair, refurbishment and modernization of wheeled armored vehicles at this high level of complexity. That is exactly why we work very closely with the Ministry of Defense; so far we have three running orders for comprehensive modernization of different armored vehicles that are within our area of expertise.

- Your company and its parent corporation Ukroboronprom are frequent exhibitors at trade fairs throughout the world. What products do you offer to potential consumers?

- Our company is a specialist in repair, refurbishment and upgrading of wheeled armored vehicles. At present, our plant offers three types of armored transporters, which are the command and staff vehicle (CSV) BTR-70Di-02 Vityaz, battlefield ambulance BMM-70Di, and the BRDM-2Di, an upgraded version of the BRDM-2 ARSV. We continue working intensively, improving the capabilities of each of the vehicles. All the three are distinguishable by using the Iveco diesel engine that allows increased power output, a higher level of operational reliability, lower consumption of diesel fuel and a reduced acoustic footprint.

The CSV BTR-70Di-02 Vityaz provides command and control for battalion level. We have recently inaugurated an upgraded variant that offers enhanced crew protection and WiMAX/WiFi capability.

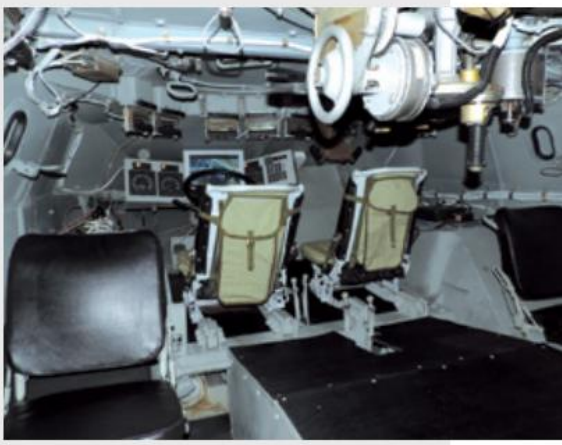
The battlefield ambulance BMM-70 is equipped to provide first aid and recover wounded (including severely wounded) casualties from remote locations, accident sites, disaster zones, and hostility affected areas. If compared to the BTR-70 original, the BBM-70 has a more spacy interior, is equipped with stretchers, lifting gear for patient loading/unloading, medical equipment and air conditioner. Beginning in the summer of 2014, we have been producing the armored vehicle in its final modification that is known by its official designation as BMM-70 "Kovcheg" (meaning "Ark").

As for the BRDM-2Di, it is a far cry from its Soviet-era original. In addition to equipping the vehicle with a new engine and making several changes to its internal layout, we, as requested by the Ministry of Defense, added side doors and rearranged the hull's interior to allow it to accommodate six personnel. Since December 2014, we have been series-producing the BRDM-2Di "Khazar" for Ukraine's Ministry of Defense.

- What are the key development priorities for your Company?

- These certainly include development and improvement of our capabilities, production modernization, replacement of fixed assets, introduction of advanced processes and technologies, improvement in the quality of production, and modernization of armored vehicles to levels complying with the modern battlefield requirements and specific customer needs. We are also looking to launch serial production of new products – the ARSV Khazar and the armored transporters BTR-70Di and Mongoose ARSV – to meet the needs of our potential customers. UDR

interviewed by **Anton MIKHNENKO**, UDR



LVIV ARMORED VEHICLE FACTORY INTRODUCES ITS

ARRV LION

Valerii RIABYKH,
Dmytro SAVCHYN,
Defense ExpressUDR

The Ukrainian Armed Forces require capabilities for use in combat for towing or repair of battle-damaged, stuck, and/or inoperable armored fighting vehicles. In tank and mechanized infantry units, these operations are typically performed with armored repair and recovery vehicles (ARRVs).

The XV International Specialized Exhibition "Arms & and Security 2018" held in mid-October in Kyiv displayed the ARRV Lion ("Lev" in Ukrainian) developed by Lviv Armored Vehicle Factory (LAVF), a State-owned company incorporated with State Concern Ukroboronprom. The Lion ARRV, built on the T-72 tank chassis, aroused interest among experts, visitors and foreign guests at the exhibition.

The ARRV Lion, albeit outwardly very similar to the Russian-designed BREM-1 ARRV, has been designed from the ground-up by LAVF using components and subsystems sourced from Ukrainian and international suppliers. In particular, the Lion ARRV technology incorporates some parts and components that LAVF has developed and is manufacturing to comply with the import replacement program launched by Ukraine following Russia's illegal annexation of Crimea and incursion into eastern Ukraine. In addition, the use of proven European brand components such as servo actuators and individual hydraulic components is a factor in improving the vehicle's

ARRV LION. KEY TECHNICAL DATA

Base chassis	T-72 tank
Dimensions	789mm x3,460mm x 2,687mm
Mass (fully loaded)	41 t
Engine Power	840 hp
Max speed	60 kmph
Specialist equipment:	
Towing winch; towing force	≥250 kN/25 tnf
Auxiliary winch; towing force	≥5 kN/0.5 tnf
Bulldozing equipment	Hydraulically operated spade
Telescope crane; lifting capacity	120 kN/12 tnf
Electric welder	ESA-1
Cargo bed; carrying capacity	1.5 t

ability to maintain stable performance in harsh and special environments.

The Lion ARRV is specifically designed to support Ukrainian army's tank units equipped with T-64 and T-72 tanks and their modified versions. The Lion is provided with capabilities for recovery or towing of inoperable and/or battle-damaged armored fighting vehicles (either rolling or tracked), and for providing field maintenance and repair support in combat. The ARRV has a telescope crane to allow the vehicle's crew to perform heavy-lifting tasks, such as removing/mounting the engine or other heavy parts. It also has equipment for welding and cutting ferrous metals, and there are bulldozer blades to aid in route clearance and construction of field fortifications.

A 200-m rope winch is provided to support recovery operations. It has a traction force of up to 25,000 kgf, which can be increased to 75,000 kgf with additional pulley blocks.

The electric welder, which is powered by the ARRV's generator, allows for welding operations to be held in field conditions.

The vehicle has a telescope crane manipulator that can lift up to 12 t loads. It is used to support field repair operations that involve replacement of heavy parts and components like tank turrets, engines, gearboxes, road wheels, etc.

The Lion ARRV has a 1.5t cargo bed for replacement parts. Powered by a 840hp engine, the 41t vehicle can develop speeds up to 60 km/h. The vehicle has the ability to operate in temperatures varying between -40°C and 40°C and has a cruising range of ≥460 km on unpaved roads.

The vehicle has a crew of three, and it is armed with a NSVT (KT-12.7) machine gun.

Lion has a telescope crane manipulator that can lift up to 12 t loads

The Lion ARRV has been put through qualifying departmental trials and approved for operational use by Ukraine's armed services. LAVF has already completed production preparations for the Lion ARRV.

It should be emphasized that, in terms of its technical and performance characteristics and functionality range, the ARRV Lion is as good as its foreign brand counterparts and is probably unrivaled on the market in terms of cost/capability trade-offs.

This Ukrainian armored recovery vehicle can well replace its Russian counterpart BREM-1, and this would entail no need for personnel retraining or restructuring field maintenance teams. This vehicle is reliable, easy to operate and indispensable on the battlefield.

The ARRV Lion is a true rescuer on the battlefield! UDR

The electric welder, which is powered by the ARRV's generator, allows for welding operations to be held in field conditions.

UKROBORONSERVICE
STATE COMPANY

SC “UKROBORONSERVICE” successfully operates since year 1993 while managing to gain the reputation of reliable business partner. During the period of its activities on international arms market SC “UKROBORONSERVICE” became the exporter of the products and services of military and double-purpose designation of various scopes.

SC “UKROBORONSERVICE” is widely-known as a supplier of products and services of special designation to the markets of Northern and Tropical Africa, South-Eastern Asia, as well as Middle East and Europe.

During the period of its activities SC UKROBORONSERVICE moved further than its typical special exporter business and opened the range of new directions. Our state company has better advantages than other state special exporters, because of its own production facilities.

BARS-8AR

ARMORED VEHICLE OF ARTILLERY RECONNAISSANCE

BARS-8AR artillery reconnaissance vehicle is designed for surface targets acquisition, information processing, short time coordinate data transmission to the defense weapons at any weather conditions, during the daytime and night thanks to the optoelectronic system that combines forward observer system (FOS) optical instrument and integrated laser range finder with ability to transmit target coordinates through digital channels, as well as to unmanned reconnaissance system.

SC “UKROBORONSERVICE” for more than 15 years is working in the area of demining activities both in Ukraine and abroad, has a huge experience related to successful cooperation with UN, NATO and other international organizations in the area of demining activities.

SC “UKROBORONSERVICE” is registered in UN as a supplier of the services related to humanitarian demining activities, certified in accordance with ISO 9001:2015 & ISO 14001:2015 standards in DEKRA Certification Sp. zo.o. system, being a permanent participant in international tenders in this area and executing the relative UN-related contract works in Somalia, Mali, Libya, Lebanon, Iran and other countries.

SC “UKROBORONSERVICE”, while implementing its experience, provides training courses for studying and training the experts in the area of humanitarian demining for the following fields of activities:

- EOD Expert (demining and 1st, 2nd, 3rd level explosives destruction);
- Expert for counteracting against handmade explosive devices;
- Expert for the issues of civil safety in the condition of mine danger.

SC “UKROBORONSERVICE” successfully cooperates with private dynamically developing companies and as a result of such cooperation our company involves brand new modern know-how, that satisfies the needs of our nowadays, being as follows:

NOTA system for combating technical means of surveillance provided by TRYTEL company. Combat designation of NOTA system: radars counteraction at counter-battery warfare; enemy radio reconnaissance means counteraction; blocking of radio-controlled IED; UAVs detection and counteraction (at the distance not less than 20 km); determination of UAVs relative bearing; suppression of the navigation channels in NAVSTAR (L1, L2, L5), GLONASS (L1, L2), GALILEO (E1, E2, E5, E6) frequency range; jamming of wireless control channels in frequency range up to 6 GHz; blocking operability of wireless communication channels in the following frequency bands: GSM 900/1800, UMTS/WCDMA/HSDPA, CDMA 800, CDMA 450, Wi-Fi 2.4 GHz, 5 GHz.

Automated field artillery fire control System

Based on KRIP-A computerized information system that had been successfuly fire tested.

The System designed by ANTABOS, LLC secures rapid and accurate determination of fire positions coordinates, angles of gun direction, navigation and fire positions location in automatic mode by means of ESMAN positioning, direction and navigation system, as well as preparation and correction of fire being led simultaneously against several targets, integration with UAVs and instrumental surveillance sensors by means of satellite communication and multiservice radio broadband access system

VOGNYANA VARTA, LLC, being the designer of fuse, HE charges designated for termination of ammunition, plastid briquettes and thermobaric ammunition.

SC “UKROBORONSERVICE” also designed and produced the sample of control station for secure and secret-related authorities.

Special control station is designated for ensuring the activities of the personnel of secure and secret-related authorities in the field conditions as the component of control points, stationary or autonomous control points.

Special control station secures the following:

Storage and transportation of secret material objects;

Ensuring the activities related to secret material objects of control point operative staff;

Installation and maintaining operative staff automated workplaces at control point in order to secure working on documentation;

Terminating secret material objects;

Ensuring the facilities related to secure and security authorities staff 24/7 duty provision, as well as having its break.

The main advantage of special station is its possibility to provide control point operative staff with the facilities related to working on documentation by means of integrated protected telecommunication network. The above mentioned increases rapidity, combat readiness of units and divisions while performing the tasks due to their designation.

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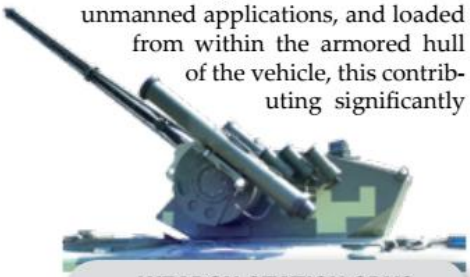
ADVANCED SOLUTIONS FROM TECHIMPEX

SPC Techimpex Ltd, a R&D and Production Company that holds a prominent place among private military/defense technology contractors in Ukraine, unveiled several of its latest products at the XV Arms & Security International Exhibition held in Kyiv, in mid-October.

The Company's display included, among others, weapon stations SPYS (Ukrainian for "Spear") and GUARDA, as well as armored transporters: the tracked APC Swimmer and 8x8 wheeled APC Varan. The bullet resistant, perforated ad-on armor kit Angel was also displayed.

WEAPON STATION SPYS

Among the most remarkable unveilings presented by Techimpex at the Arms & Security 2018 expo was the Spys Weapon Station (WS). The Company's design team have been able to accomplish the most challenging task - to create a current generation compliant Weapon Station that combines high lethality and precision in whatever conditions of combat with easy and intuitive to use controls and high reliability. The Spys WS could be designed for manned and unmanned applications, and loaded from within the armored hull of the vehicle, this contributing significantly to the host vehicle's sustainability and combat effectiveness. Armed with highly lethal weapons, the Spys WS enables its host vehicle to effectively engage enemy infantry, light armored vehicles and tanks. The Spys WS is tailored for the weapons package that includes: ZTM-1 (2A72) 30-mm autocannon, PKT 7.62-mm machine gun, KBA-117 (AGS-17) automatic 30-mm grenade launcher, 2 x Barrier ATGM launchers and 902U Khmara smoke screen system.



WEAPON STATION SPYS

Key Specifications:

- 30 mm autocannon ZTM-1 (2A72)
- 7.62 mm PKT machinegun
- 30 mm automatic grenade launcher - KBA-117 (AGS-17),
- 2 x Barrier ATGM Launchers, 4 x ATG missiles
- Smoke screen system Khmara

The Spys WS can be integrated, without any modification, onto Ukrainian/Soviet/Western brand combat vehicles, tracked or wheeled (Steyr, M113, etc.).

At Arms & Security 2018, the Spys WS was displayed mounted on the BMP-1T upgrade of the Soviet-era BMP-1 armored combat vehicle, and it featured also on the Company's Swimmer tracked APC and Varan 8x8 wheeled APC vehicle.

VERSATILE GUARDA

The Guarda is perhaps the world's only weapon station to be armed with 12.7-mm DShKM-T heavy machine gun with electric trigger designed by Techimpex, loaded up with 100 rounds of ready use ammunition, which has seen extensive use in many conflicts across the globe. As well as the DShKM-T machinegun, Guarda accommodates an automatic 30-mm grenade launcher KBA-117 (AGS-17) loaded up with 35 grenades.

APC SWIMMER

Key Specifications:

Weight	15 t
Crew	3
Troops	12-14
Engine	Diesel, 350-460 hp
Speed on highway	≤70 km/h
Speed in water	≤10.5 km/h
Range	500 km
Armaments	SPYS Weapon Station

Equipped with a current-generation fire control capability, the Guarda WS is stabilized in two axis, and can be controlled remotely from within the vehicle or via manual controls. Target search, identification and acquisition capabilities are provided with the help of a television camera and an uncooled thermal imaging camera interfaced with the operator's display unit, as well as a laser rangefinder.

The Guarda WS is suitable to be mounted on armored combat vehicles and permanent emplacements without any modification to its construction.

SWIMMER APC

Swimmer APC vehicle was developed as a Public-Private partnership that included PJSC Kharkiv Tractor

Plant, Ukroboronprom Group's Ukrspecexport and SPC Techimpex LTD.

It is built on a light tracked amphibious chassis. It has seats for 14 troops in addition to its three-man crew. Troops can enter and exit the vehicle via a ramp door in the rear hull.

Ballistic/anti-mine blast protection measures a STANAG-4569 Level 2 compliant protection of the vehicle hull and STANAG-4569 Level 2b compliant protection of the bottom hull.

The Swimmer is a suitable carrier platform for mechanized infantry squads operating in challenging, riverine terrains. Due to mounted water drives the APC can reach 10,5 km/h on water. It can be used as baseline configuration for a comprehensive family of armored combat vehicles for roles that include fire support, command & control, medical evacuation, communications support, recovery/repair, NBC protection, combat engineering support, etc. The vehicle can accept a 2C1 122-mm turret, house 1V12 artillery C2 system, an automatic 120-mm mortar and other armaments.

VARAN – ARMED AND READY FOR COMBAT

Another premiere displayed by Techimpex at 2018 Arms & Security was a driving prototype of the Varan APC vehicle integrated with the remote weapon station Spys.

Developed from the ground-up, the Varan APC is built to the same layout as modern wheeled armored carriers such as Patria/Rosomak, Otocar ARMA 8x8 or FNSS PARS 8x8.

Comfortable and safe transportation of mounted infantry personnel over the battlefield is enabled courtesy of the high level ballistic/anti-mine blast protection of the exterior and underside of the vehicle, as well as blast attenuating seats in the troops compartment. The troops can exit the vehicle via door-sized hatches on either side of the vehicle or a ramp door in the rear hull.

LIGHT WEAPON STATION GUARDA

Key Specifications:

- 12.7 mm machinegun DShKM-T
- 30 mm automatic grenade launcher KBA-117 (AGS-17)

Fire control system:

- Weapons stabilization system – digital, electromechanically driven, 2-axis
- Electro-optical device (TV camera, LRF, uncooled thermal imaging camera)

Techimpex states that the Varan, with its technical and performance capabilities and especially cost/capability trade-offs, is about to create a sensation on Ukraine's domestic market and on the global arms market as well. The Varan has already generated interest among potential customers both within and outside of Ukraine, and will soon be ready to enter departmental-level trials commissioned by one of Ukraine's security services.

"ANGEL" FOR ARMORED VEHICLES

The Techimpex Stand at 2018 Arms & Security also displayed the BRDM-2T upgrade of the widely deployed, combat proven BRDM-2 Armored Reconnaissance Scout Vehicle (ARSV), which the Company introduced in 2017. This year it was showcased equipped with an add-on, ballistic resistant, perforated armor plate package named "Angel", which is customized to protect from impacts of 7.62 x 54 mm B-32 rounds.

The Angel is designed to enhance ballistic protection of light armored vehicles to make them more resilient to impacts of large-caliber sniper bullets and innovative, armor-piercing munitions. The company offers three perforated armor kits that protect against 7,62x54 mm, 12,7x108 mm and 14,5x114 mm B-32 rounds.

These perforated armor plates are characterized by high endurance to multiple, repeated impacts, and in this respect, Angel far outperforms all of the known counterparts based on oxide ceramics. The Techimpex-developed perforated armor plates are suitable for integration on any and all light armored vehicles produced in the USSR, Ukraine and the West. They are easy to detach and are fully interchangeable and substitutable.

8X8 APC VARAN

Key Specifications:

Weight	15.25 t
Crew	3
Troops	9 - 10
Engine	Deutz, Diesel, 340 hp
Speed on highway	≤110 km/h
Speed in water	≤10 km/h
Range	750 km
Armaments	SPYS Weapon Station

The products described herein are currently undergoing testing and user evaluation by Ukraine's defense and security services, and are available to buyers from foreign countries. Techimpex declares itself ready and willing to go beyond selling fully integrated, finished solutions and to consider options involving transfer of know-how and technology and establishment of turnkey production lines for production of Techimpex products in the Customers' home countries. UDR

PERFORATED ADD-ON ARMOR KIT ANGEL

Key Specifications:

- protection level - against 7,62x54 mm, 12,7x108 mm and 14,5x114 mm B-32 rounds
- no specific tools or personnel training required
- mount, dismount and replacement by crew in field conditions
- weight of one plate 5-10 kg
- cost-effective solution

Valeriy RIABYKH,
Defense Express

UKRAINE-RUSSIA STAND-OFF IN THE SEA OF AZOV

A free and secure access to the sea is a must have necessity for Ukraine - a European maritime power and a leading global player in food production. But aggressive actions by Russia are causing economic losses for Ukraine and make it take actions in response.

BRIEFLY ABOUT WHAT IT'S ALL ABOUT

By way of reminder, the Sea of Azov is a marginal sea of the Atlantic Ocean situated off the southern shores of Ukraine and Russia and therefore considered an inland sea of the two countries. The Azov Sea forms a northern extension of the Black Sea, to which it is linked on the south by the narrow Strait of Kerch. The exploitation of this water area is currently regulated by two treaties between Ukraine and Russia: an agreement of 1993 on the so-called "fishing quotas" and a cooperation agreement of 2003 between Ukraine and the Russian Federation pertaining to exploitation of the Azov Sea and the Kerch Strait.

These documents contain no mention of concepts such as "territorial waters" or "exclusive economic zone", thus effectively preventing Ukraine from claiming its right to protect its own borders and exclusive economic zone.

The situation in the Sea of Azov has seriously deteriorated following Russia's illegal annexation of Crimea: the Kremlin had started building up capabilities of its Black Sea Fleet and FSB forces in Crimea, and deployed the proxy DNR "flotilla" and a "naval infantry force" to its occupied areas outside the town of Novoazovsk.

Additionally, Russia, in a flagrant violation of international maritime laws and the UN Convention on the Law of the Sea, has constructed the Kerch (more commonly known as Crimean) Bridge, **whose fairway arch is too low for big, Panamax-class bulkers, which had previously visited Ukrainian ports only, to be able to pass it on their way to the Azov Sea**. These ships have not been able to pass through the Kerch Strait since May 24, 2017. As a result of this, Ukraine began losing millions of hryvnias in unearned profit, along with lots of jobs, which began to have its adverse impact on the situation in the Ukrainian ports of Mariupol and Berdyansk. An access to the port of Mariupol is now effectively closed for 144 ships that the port used to handle previously. A preliminary analysis suggests that this situation carries a risk for Ukraine to lose annual exports of 1 million tons of cast iron to the Unites States alone.

Seen in this map are three areas with the highest record of maritime transit interdictions by Russia

As a matter of fact, **the Russian Federation has deliberately constrained navigation through the Kerch Strait and with it an access to the Ukrainian ports in the Azov Sea - gateways for Ukraine's trade with 120 countries**. According to Ukraine's Infrastructure Ministry, there has already been a decrease in the number of ships visiting the ports of Mariupol and Berdyansk, resulting in a drop in the economic performance of these enterprises.

With the shipping through the Strait now limited by the height and length of the ships passing under the Kerch Bridge, freight/cargo shipping

companies will apparently have to use smaller-sized ships, meaning a growth in the cost of per ton cargo transported. In the same way, **the grain transportation logistics has gravely worsened** due to a significant increase in the freight rates for ships of the sizes enabling their safe passage under the Kerch Bridge.

The Russian Federation hasn't stopped there but continued its aggressive actions. In an attempt to keep tensions high, the Russian Black Sea Fleet ships have continuously conducted "show of force" maneuvers off Ukraine's coast in the Sea of Azov, and rigorous intelligence gathering has been conducted, especially with support from special operations forces.

The aggressor-induced "Azov Sea crisis" has since May 19, 2018 begun to gain momentum and to clearly change its nature. The Russians, in alleged response to an earlier detention by Ukrainian border guards of the Crimean fishing seiner "Nord" for breaching Ukrainian law, began a coordinated campaign involving indiscriminate stoppages and temporary detentions of merchant ships heading to the ports of Mariupol and Berdyansk.

This campaign is clearly targeted at undermining Ukraine's trade competitiveness. Particularly in the period between May 22 and June 5, 2018, Russian border guards had stopped at least 24 commercial ships just to let them go after inspections and multiple hours of detention. In August-September, the number of such incidents increased to 150. On multiple occurrences, ships were stopped twice, first at the entrance to the Strait of Kerch, and then again in the Sea of Azov.

Oleksandr Turchynov, Secretary of Ukraine's National Security and Defense Council (NSDC) had claimed that the "Russian Federation has deployed a naval flotilla in the Azov Sea, reinforced its FSB's Border Guard's fleet with new vessels, and redeployed to the region several ships from its naval base in the Caspian Sea. With this reinforcement they will be able to support their naval operations in the Sea of Azov with a significant number of amphibious assault ships as well "Buyan-M" class cruise missile ships. This all makes us face serious challenges. This build-up of Russia's amphibious assault capabilities in the Sea of Azov would enable personnel and equipment of the Southern Military District's 8th, 49th and 58th armies (which pose a major threat to Ukraine on its eastern flank) to be rapidly redeployed to Ukrainian shores when needed."

The provocative actions by Russian border guards amount to an abuse of law, an explicit security challenge to the Azov Sea and yet another step towards the escalation of already high tensions between the two countries.

UKRAINIAN RESPONSE

As a matter of fact, Ukraine had never had its naval ships nor coast guard crafts deployed in the Sea of Azov prior to the onset of war with the Russian Federation. On March 2, 2014, however, 11 vessels and boats of the Ukrainian State Border Guard Service's (SBGS) Kerch Sea Guard detachment broke through from the Crimean Peninsula into Berdyansk and Mariupol to avoid being captured by Russian forces.

This small fleet had later set up the core of the naval component of Ukraine's forces in the Azov Sea. As the Donbas crisis had entered its acute phase, SBGS forces began patrolling and protecting the Ukrainian coastline.

The presence of this force, even small as it was in size, proved to be very useful, for the opponent, exploiting the lack of the formally established borderlines in the Azov Sea, continuously tried to send in its subversion and recon groups and armaments. There were reports of at least several incidents involving these shipments intercepted by Ukrainian border guards, including one that occurred outside of Berdyansk where the FSB was hopeful to set up a stronghold for its sponsored separatist forces.

Ukraine's military intelligence estimate that Russia's FSB and Navy have collectively deployed some four dozen different warships and vessels, including two missile boats, to the Sea of Azov.

It's no wonder that the SBGS ships had been subjected to deadly →

gunfire attacks. Specifically on August 31, 2014, Russian forces fired precision guided missiles at two Ukrainian SBGS boats while patrolling the Azov Sea at 3 nautical miles off the coast in the vicinity of Bezimenne village.

As a result of the attack, one boat (Grif Class) went up in flames and sunk due to a direct hit, while the other (Kalkan Class) sustained major damages. On June 7, 2015, an SBGS's Kalkan-class boat patrolling near Mariupol suffered damages as a result of running into a floating improvised explosive device. Both of the incidents inflicted wounded and dead casualties among the Ukrainian crews.

Given this situation, the NSDC, at its session on September 6, 2018, approved a package of measures to secure the national interests of Ukraine in its southern provinces, the Sea of Azov, and the Black Sea. In particular, the measures call for strengthening the naval presence in the Sea of Azov, deploying a naval force in the region, building up the appropriate infrastructure, and providing the naval coast defense forces with modern precision-guided missile capabilities. The Ukrainian Cabinet of Ministers has been charged to immediately approve and enact Ukrainian Maritime Doctrine and to update the country's legal framework with an eye to better securing its national interests in the Sea of Azov and the Black Sea.

In pursuance of this decision, two Gyurza-M class armored gunboats had been deployed to Berdyansk in September, and a naval base would be set up in the Sea of Azov by 2019. It still remains to be seen what kinds of ships will make up this planned naval force.

Russian Coast Guard vessel aggressively maneuvering around a Ukrainian counterpart in the Sea of Azov (or the Black Sea?), September 18

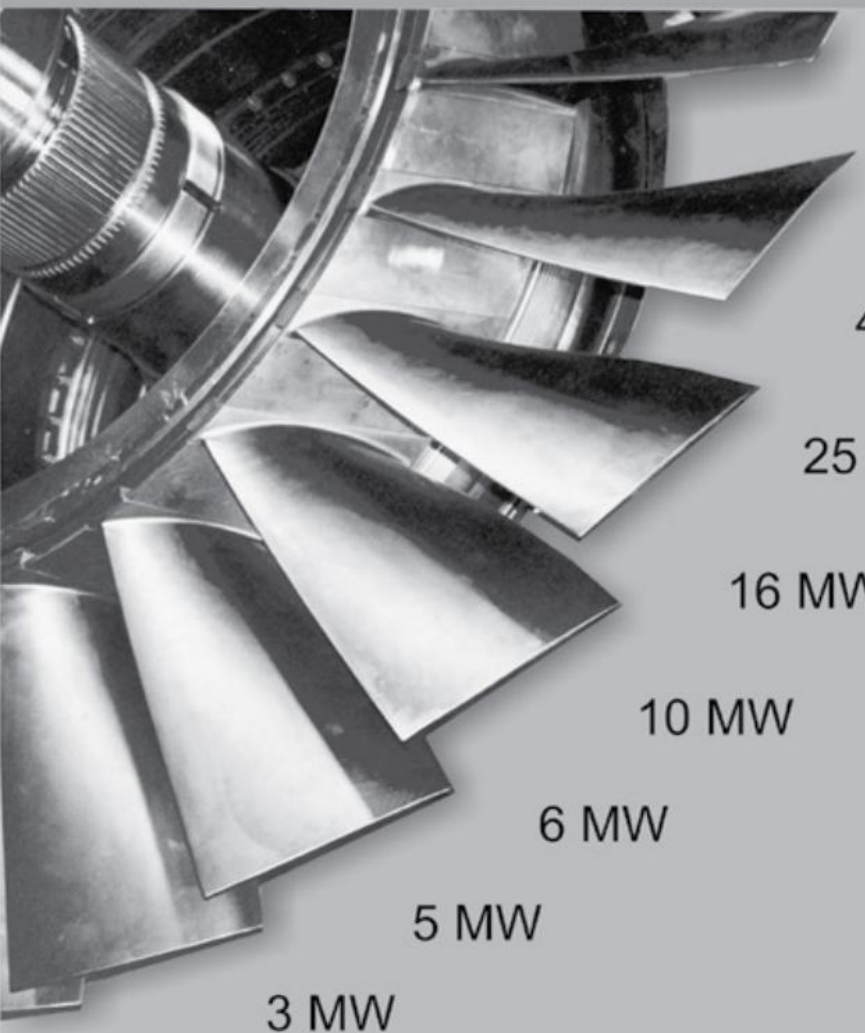
Ukrainian naval capabilities planned for deployment to the Sea of Azov will be able to counter the aggressor asymmetrically and even symmetrically while remaining within the current legal framework.

At the same time, the challenges of current realities, however, demand that Ukraine denounce - urgently and unilaterally - the agreement with Russia on the shared exploitation of the Sea of Azov and that Ukrainian parliament, the Verkhovna Rada urgently adopt a bill on "inland waters, the territorial sea and adjacent areas" in order to make statutory Ukraine's internationally recognized right to a 12 NM territorial water zone, including in the Sea of Azov.

It's hard to predict how things are going to go, but what is clear now is that the crisis is tending to escalate further. It is highly unlikely that Ukraine would be really interested in becoming engaged in a military confrontation with a powerful opponent such as the Russian Federation. The Ukrainian authorities may be more likely to use diplomatic methods to peacefully settle the current situation. But further moves by Moscow – who has yet shown no willingness nor aptitude for bringing the situation in the Sea of Azov back to normal – are hard to predict. UDR

Volodymyr ZABLOTSKY

UkrOboronProm
Ukrainian Defence Industry



60 MW

45 MW

25 MW

16 MW

10 MW

6 MW

5 MW

3 MW

2,5 MW

For marine propulsion

For gas industry

For power generation

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CENTAUR

New Capabilities for the Ukrainian Navy

The Ukrainian Navy is anticipating the addition of two Centaur-LK Class Fast Assault Craft (FAC) to its fleet. The lead ship of the series carrying series number 01 was ceremonially launched on September 14, 2018. The ships are being built by Kuznya na Rybalskomu shipyard in Kyiv on order from Ukraine's Ministry of Defense for the Ukrainian Navy.

The need for the new FACs was motivated by objective reasons, first of all, the urgent requirement for augmenting the Ukrainian Navy with new warships, as well as the lack of naval capabilities needed to asymmetrically respond to Russia's military aggression in Ukraine.

The Ukrainian FAC project was initially based on a concept design previously tested by the Swedish Navy with its Combat Boat 90 (CB90) Fast Assault Craft and later adopted by Russia for its Project 03160 Raptor Class.

Fast and low observable, FACs can be used for a broad range of missions that are commonly assigned to naval forces at times of war. This factor made FAC the warship of choice for a lot of navies seeking effective defenses against more powerful adversaries at sea.

A significant factor in the context of Ukraine's security is that 8 out of 11 Project 03160 Raptor FACs built by Leningrad Pella Shipbuilding Plant for the Russian Navy are now deployed with Russia's Black Sea Fleet. Officially listed as anti-sabotage boats, in actual practice they are used by Russia's naval fleets for special maritime reconnaissance missions.

The Centaur-LK Class FAC has a welded steel hull divided into compartments. The forward hull accommodates armor plated pilot house with navigation equipment, communications and situational awareness facilities and the Propulsion control panel as well as controls of remote weapon stations. The high degree of automation allows the crew to operate all shipboard systems, including weapons, remotely from the pilot house.

In the aft pilot house is a lightweight antenna mast for the DRS4D-NXT radar and communication facilities, including the Iridium Pilot satellite terminal among others. Located right beneath the pilot house are crew living quarters that have direct access to the Battle Station circumventing the open upper deck.

The central hull is occupied by Marine living compartment complete with all the amenities needed for comfortable stay of a Marine squad, a subversion/recon group and other special personnel. The Marine compartment is linked to the retractable forward ramp to ease landing to the shore or in shallow water.

The aft hull accommodates the engine room with the Main Propulsion consisting of 2 diesel engines driven by two Hamilton Jet propellers.

The pilot house, Marine compartment and engine room have splinter protection to protect the key systems and personnel from fragmentation damage. Beyond this, the hull is built with features for low radar cross section and low profile.

The Centaur-LK FAC, if compared to its foreign brand counterparts, has

a far more capable weapons package consisting of two remote weapon stations, one positioned atop the pilot house and the other atop the Marine compartment, each armed with a 12.7 mm machine gun and a 40 mm grenade launcher.

Located on the roof of the pilot house is a smoke grenade dispenser used for setting smoke screens to facilitate the detection of incoming missile threats and laser emissions. Once a threat is found out, a smoke screen is automatically set up to screen the craft in the infrared and visible spectrums or to block laser beams of enemy laser guidance systems and laser rangefinders.

Defense against aerial attacks is performed primarily with MANPAD weapons. Finally, the Centaur-LK is equipped with capabilities for transport and placement of sea mines.

By way of comparison, all known foreign brand counterparts of our Centaur FAC have no armaments other than machine guns only...

The Ukrainian steel-hull fast assault craft has more than twice the displacement of aluminum-hull Swedish and Russian counterparts (47 t versus 23 t), a more powerful weapons package and a significantly larger complement (32-36 Marines vs 20) while having only marginally deeper draught when unloaded (1 m vs 0.9 m) and being capable of higher speeds (up to 50 kt vs 48 kt) and a significantly longer range (500 mi vs 300 mi) at economic speed.

The weapons package on Centaur-LK is distinguishable by the presence of a multiple launch rocket system (MLRS) with two 20-round, 80-mm rocket pods. A navalized version of its Soviet-designed air launched original, it far exceeds it in terminal effect due to a new ammunition round developed by Artem, a Kyiv-based State-owned holding company incorporated with the Ukroboronprom Defense Industries Group.

Its current-generation fire control system allows for rockets to be launched against different sets of targets on the ground (enemy personnel, armored vehicles, entrenched fortifications, etc.) and in the air (UAVs, helicopters).

The weapon is able to hit ground targets out to 7,000 m and air targets up to 4,000 m (which far exceeds the max flight ceiling of small drones). For increased operational versatility, the rocket munitions are provided with different options for warhead.

Thus, the RS-80 rocket munition equipped with an air-burst fragmentation warhead is programmed to detonate a few meters above the target, allowing an increased blast radius/density and, consequently, increased lethality compared with conventional, impact-type counterparts. For use against armored targets, there is a variant of the munition armed with a explosively formed warhead.

As Russian military aggression in Ukraine is ongoing, it is to be expected that more powerful and technologically advanced FAC projects similar to the Centaur Class will be developed in the near term to improve Ukraine's naval capability, especially in the Sea of Azov and the Black Sea areas to the north of the Russia-occupied Crimean Peninsula. This would significantly improve the Ukrainian Navy's capability to respond to challenges of confrontation with the aggressive neighbor. UDR

In the aft pilot house is a lightweight antenna mast for the DRS4D-NXT radar, communication facilities and smoke grenade dispenser for the detection of incoming missile threats and laser emissions.

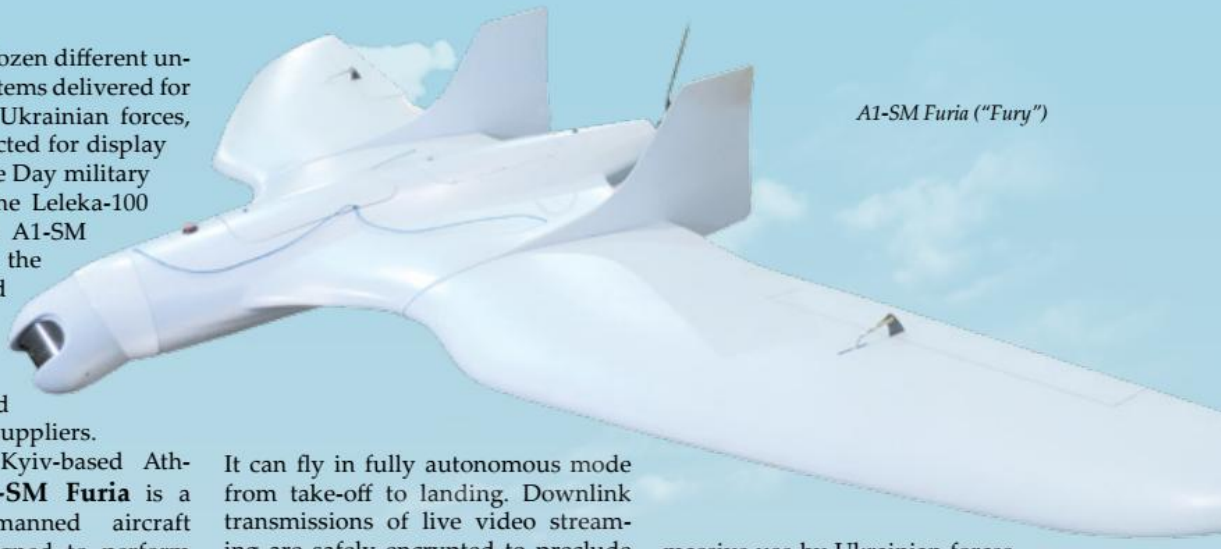
The aft hull accommodates the engine room with the Main Propulsion consisting of 2 diesel engines driven by two Hamilton Jet propellers.

Volodymyr ZABLOTSKY,
Exclusive to UDR

UKRAINE SHOWS OFF ITS NEW INDIGENOUS UAV TECHNOLOGIES

Oleksii SERDIUK,
for UDR

The military parade in Kyiv celebrating Ukraine's 27th Independence Day was remarkable for its display of the most recent military-defense technologies developed and produced indigenously for the country's Armed Forces. Visitors and residents of Ukraine's capital city were able to see Ukrainian and foreign army soldiers, including from NATO countries, as well as combat vehicles, already known and new ones, marching past the main street of Kyiv. The event saw the first public appearance of the indigenously developed unmanned aircraft systems used by Ukrainian forces in the Donbas Theater of operations.



A1-SM Furia ("Fury")

Of the nearly a dozen different unmanned aircraft systems delivered for user evaluation to Ukrainian forces, three had been selected for display at the Independence Day military parade this year: the Leleka-100 (aka Aist-100), the A1-SM Furia ("Fury") and the PD-1 – all developed and manufactured indigenously albeit with some components sourced from international suppliers.

Developed by Kyiv-based Athlone-Avia, the **A1-SM Furia** is a multipurpose unmanned aircraft system (UAS) designed to perform missions that include target detection and recognition in day and night conditions; target location identification; providing fire adjustment support to forces on the ground, and other missions within its capability range.

The Furia UAS has been officially inducted into the National Guard and qualified for operational use by Ukrainian Army artillery units. The Furia was one of the first UAS to see operational deployment in the Donbas Theater of operations, with over four dozen units delivered to forces in the field so far.

The system consists of three UAVs, swappable payload packages for day and night missions, UAV ground control and data processing station, ground antenna station, and miscellaneous equipments. Time into action is 15 minutes. The UAVs can fly in full radio silence and switch over to fully human controlled flight if necessary. Controlled via encrypted transmissions, the vehicles can return to base without the aid of GPS. The Furia uses Athlone's proprietary software on Linux platform.

Located in the gyro-stabilized forebody of the vehicle, payload equipment is swappable within 30 seconds as needed to meet specific mission requirements. Cruise altitude can be up to 1,200 m depending on the mission being performed.

DeViRo's **Leleka-100** UAS is equipped to perform missions including day/night aerial ISR, security patrolling, air-view mapping, and real-time geographic coordinate tracing. It can fly in fully autonomous mode from take-off to landing. Downlink transmissions of live video streaming are safely encrypted to preclude interception by unauthorized parties. Moreover, downlink video transmissions contain neither telemetry nor GPS data. Take-off and landing can be performed in radio silence, and downlink video transmissions can be turned on or off whenever seen appropriate by human operator.

The UAV can fly on a pre-programmed flight path or be remotely controlled by human operator. The Leleka-100 UAV is controlled via digital encrypted wireless transmissions enabling continuous telemetry monitoring during the full flight time. Optional extras include a snapshot camera that would operate either automatically capturing images at a preset frequency rate or by commands from autopilot. Leleka-100 UAVs have seen massive use by Ukrainian forces in the Donbas Theater.

The purpose of UkrSpecSystems' **People's Drone (PD-1)** UAS is to perform aerial ISR and aerial photography missions, day and night and in heavy ECM environments.

With visual daylight and thermal imaging camera sensors mounted on a gyro stabilized platform, targets can be found and tracked at any time of day or night and under adverse visibility conditions. If compared to its Furia and Leleka-100 counterparts, the PD-1 is differentiated by a larger size, a different type of propulsion used, and a higher-end payload equipment package, as well as by offering a far longer endurance in the air. The PD-1 UAS has already won positive reviews for its →

Leleka-100 UAV

performance in military as well as commercial missions.

PD-1's baseline payload sensor package includes a non-swappable high-resolution, high-altitude snapshot camera that can capture photos with preset parameters from altitudes up to 1,500 m, and a 4X digital zoom thermal imaging camera. Mounted on a gyro stabilized platform is a 36X optical zoom video camera providing long-range video footage and digital image stabilization capabilities.

The UAS technologies displayed at the 27th Independence Day military parade are distinguishable in that they have seen operational use in real-world combat scenarios in Eastern Ukraine. They have earned positive feedbacks for their performance and quality, and therefore hold much promise in Ukraine's domestic market. At the same time, manufacturers are seeking international customers for these technologies, and there should be an expectation that Ukrainian UAV products will soon be able to find their markets outside of Ukraine too. UDR

COMPARATIVE KEY SPECIFICATIONS OF A1SM FURIA VS LELEKA-100 VS PD-1

	A1SM Furia	Leleka-100	People's Drone (PD-1)
Wingspan/length mm	2,050/900	1,980/1,140	3,200/-
Mission radius, km	50	60	250
Endurance, hrs	3 or so	2.5	≥ 5
Cruising speed, km/h	65	70	100
Max speed, km/h	130	120	140
Service ceiling, m	2,500	3,600	2,000
Take-off mass, kg	5.5	6.0	31-33
Flight modes	Semi-automatic/human controlled, pre-programmed, fully autonomous	Semi-automatic/human controlled, pre-programmed, fully autonomous	Semi-automatic/human controlled, pre-programmed, fully autonomous
Propulsion	electric	electric	diesel
Take-off	with a bungee or mechanical catapult	Catapult/hand launched	like an airplane
Landing	by parachute (in normal scenarios) or like an airplane	by parachute	like an airplane

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 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. 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 has been produced and registered by Microin as invention, and already proved its suitability.

Company's methods/techniques and this instrument help surgeries become less invasive as they involve much smaller incisions, in full conformity to the minimally 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 these 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 statistics.

largest held in Russia since Zapad-81 conducted by the Soviet Union – the maneuvers held in the Belorussian, Kiev and Baltic Military Districts, as well as the Baltic Sea in 1981, and with participation of military contingents deployed by several Warsaw Pact armies.

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.

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.

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 nonmagnetic 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. UDR

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PROGRESS

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TEMP 3000

scientific-production enterprise

MADE & MANUFACTURED IN UKRAINE

TEMP-3000 began its activity in 1989 and has grown to become one of the leading Ukrainian designer, manufacturer, and supplier of protective equipment to the public and private sector. We proudly service the Ministry of Defence of Ukraine, National Guard of Ukraine, Security Service of Ukraine, National Police of Ukraine, State Border Guard Service of Ukraine, and others. We have operated in more than 15 countries all around the world and continue to develop our business by expanding into new markets.

High-strength material production is the basis of our success and competitiveness. On the basis of these materials, we manufacture the wide range of protective equipment, which can be customised upon request to meet customer' requirements and specifications.

OVERT BULLETPROOF VEST "CORSAIR F"

Designed and manufactured with function of reducing the load on the shoulders of a serviceman by transferring the weight of the body armour and additional hinged pockets to the load-bearing belt. The basic equipment of the body armour consists of three parts, namely, the chest protection element, the back protection element and the load-bearing belt.

The load-bearing belt performs the function of weight distribution of the body armour from the shoulder area to the person's torso belt. It has a rigid plastic construction in the back area, which is attached to the back protection element.

Chest and back protection elements are designed in such a way that they protect the sides of the user. The vest features a quick release system, which enables it to be released from the body swiftly during emergency situations. The bulletproof vest can be additionally equipped with the protection of the groin, neck, and shoulders. Additionally, the load-bearing belt can be supplemented with a soft armour panel.

Outer cover of the body armour is made from 100% polyamide fabrics with a waterproof polyurethane coating of our own production.

"KASKA-1M"

In 2018 the company has upgraded the ballistic helmet **"KASKA-1M"**. One of the main features of a helmet is that the proposed suspension system of the helmet eliminates overheating of the head and prevents the hair bulbs from being destroyed under conditions of high temperatures and long wearing compared to the system using damping pads. Internal energy absorbing elements are made in the form of lightweight damping parts, which provide ventilation of space between the head and the shell, due to the use of elastic materials of the mesh structure with increased air permeability.

CHARACTERISTICS OF THE HELMET SURFACE ARE CHANGED:

- The outer surface is treated with impact-resistant, refractory, anti-gloss, wear-resistant coating.
- There is no unmasking of a serviceman in the near ultraviolet and infrared wavelength range.
- The bottom edge of the shell is treated with thermoplastic protective coating, which protects it from stratification, wear and moisture.
- On the outer surface of helmets it is possible to install rail connectors and adaptors for fastening of additional equipment (lanterns, communication facilities, night vision devices, etc.).

MODERN BALLISTIC HELMETS OF TEMP-3000 PROVIDE EFFECTIVE PROTECTION OF SERVICEMEN AT THE EXPENSE OF:

- Head protection from debris of artillery shells, mines and pomegranates, shrapnel, pistol bulbs of 9 mm caliber, shock waves and drop from a certain height.
- Made of ballistic para-aramid materials with application of protective coatings.
- Ensuring comfortable conditions at operating temperatures from –40 ° C to +50 ° C.
- Application of two types of suspension systems to allow the user to comfortably wear a helmet: Boa® Fit System and Retention System H-Nape.

SHIELD "SPARTA -1"

Ceramic ballistic shield with flashlight and video camera.
The radius of the surface of the shield "Sparta-1": 950 mm

Material: **SiC**
Protection level: **IV NIJ Standard**
Protection against: **7.62 x 54R (SVD), 30 caliber M2 AP**
Protection area: **0.51 m^2**
Size: **0.9 x 0.6 m^2**

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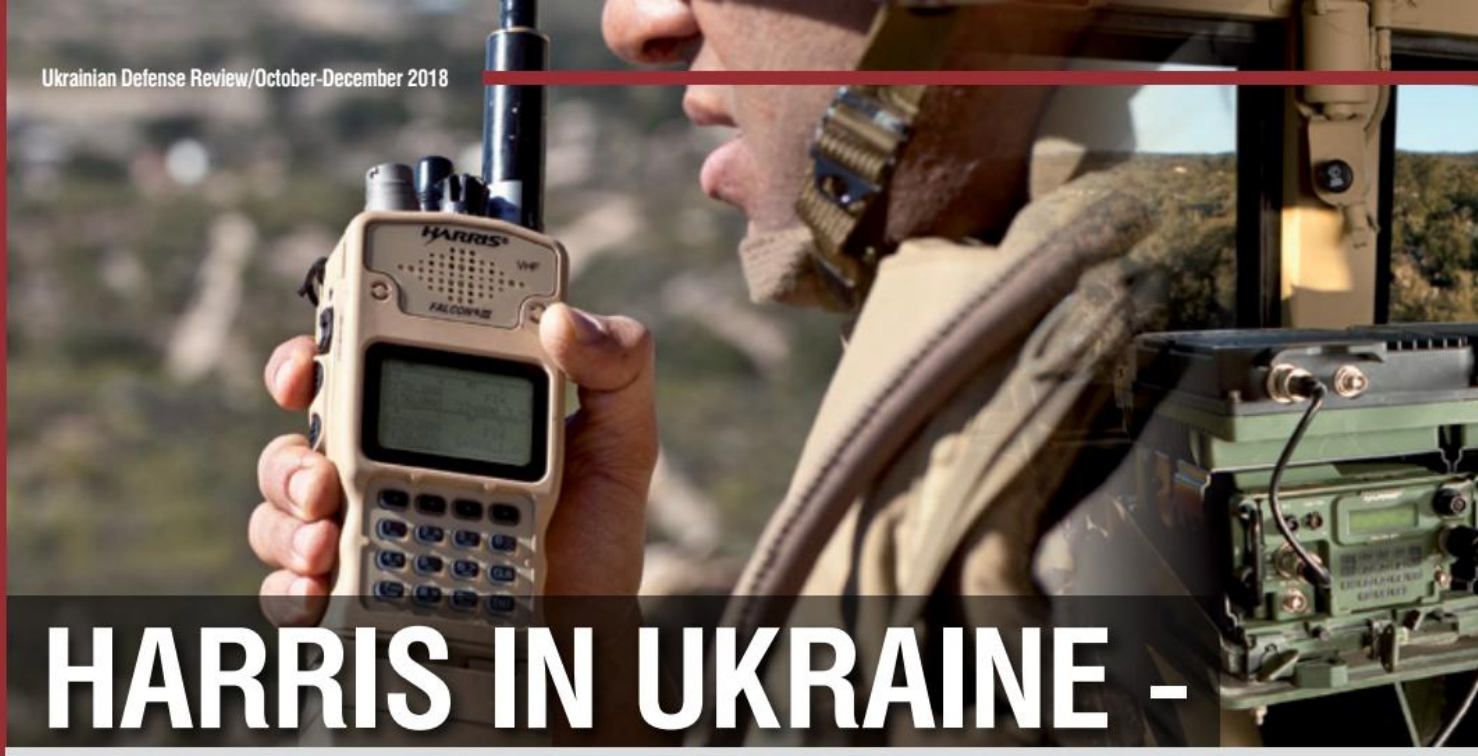

HARRIS IN UKRAINE -

EXPANDING TACTICAL COMMUNICATION CAPABILITIES

Anton MIKHNENKO,
UDR

Russian military incursion into Ukraine has catalized drastic changes in modernizing the country's military and other uniformed forces with the latest digital communication capabilities. Owing to the U.S. Foreign Military Funding (FMF) programs, the Ukrainian Armed Forces, National Guard and State Border Guard Service have received radios produced by the American corporation Harris – a worldwide leader in the tactical communications domain. A corporation with an annual turnover of over $8 billion, Harris has enormous experience and expertise in developing and manufacturing tactical radio products.

Radio Satcom Group LLC and its certified Training & Service Center are exclusive representatives of Harris-Communication Systems in Ukraine. Due to dedicated effort and leading technical expertise of Radio Satcom's employee staff, Harris radios are now operational on hundreds of combat platforms, including armored fighting vehicles, command & staff vehicles, naval warships, border guard vessels, as well as fixed communication nodes.

Initial shipments [to Ukraine] were comprised of second-generation Falcon II radios of various capacities. Ranked the best in their category, Harris Falcone II HF radios have been fielded with the U.S. and Canadian militaries, as well as many armies all across Europe, with respectively some 50,000 and 30,000 units operationally deployed to date.

These initial shipments were enabled through funding from the U.S. Foreign Military Funding (FMF) program budgets, and in 2015, Ukraine's Ministry of Defense funded a procurement of the more affordable, lower-end Falcon II MPR 9600 model (similar to the Falcon II), which is currently operational with the British army. From that time on, FMF programs have funded procurements of the latest generation of Falcon III series radios only.

After the start of Russian military incursion into Ukraine, shipments under FMF programs have increased substantially both in value and number, and included the full range of HF, VHF and UHF radios. These include tactical handheld radios that are unique worldwide in terms of some of their performance capabilities, as well as manpack radios and configurations for use on vehicular platforms and fixed installations.

In 2013, more advanced and capable Falcon III tactical radios began to be procured for Ukraine's armed services in substantial numbers under US foreign military assistance programs. These are all pretty expensive, highly capable, multipurpose, third generation tactical radio systems that are fully interoperable with Falcon II and other existing tactical radios used by NATO forces, thus enabling effective coordination with Western partners during joint training maneuvers on the ground and at sea. They are designed with a wide range of capabilities for high-speed data and voice transmissions, pseudorandom operational frequency readjustment, generation of highly secure wireless IP-networks, to name just a few. Such flexibility is supporting a wider range of capabilities, including reliable secure communication through radio networks of different sizes, and ensuring uninterrupted data and voice communications in noisy and heavy ECM environments.

The latest models are all outfitted with an USB port that is easily recognizable by external devices, including standard communication encryption devices. When connected point to point, Harris VHF/UHF radios achieve data transmission rates up to 1 MB/s. With Mobile Ad-hoc Networking (MANET) technologies used in a network of several dozen subscribers, these radios are provided with a fluctuating channel resource (64 KB/s to 150 KB/s) depending on the current requirement of each node in the network.

As well as HF/VHF and multi-band radios, Harris is also offering its Intercom systems to Ukrainian users. The Harris Intercom system for vehicular applications is universally applicable to a wide variety of combat platforms – armored fighting and command and staff vehicles of all kinds, as well as communication equipment rooms and field communication centers. The Intercom system comes in two versions, supporting two and four radios. The system provides networking for a variety of radio networks: HF, VHF, terrestrial communication channels, etc. It is possible to switch between different networks, regardless of the brand or operating bandwidth of the radio used, be it Harris, Motorola or Aselsan. The Intercome system incorporates an embedded SIP server, which essentially makes the networked radios into IP phones. Further to this, the Intercom can be connected to an Ethernet network to support IP data communication between all and any of the networked radios.

Harris radios have been especially designed to operate in heavy ECM environments. So this equipment operates faultlessly, providing secure communications to the Ukrainian forces deployed in theater.

Here let's turn to the effectiveness of utilization of the equipment received. The Harris radios provided at no cost under the U.S. Government's FMF programs over the years since the onset of Russian military aggression in Ukraine number into thousands of units valued at a combined worth of hundreds of millions of US dollars. These supplies exceed multiple times the quantities of other brand tactical radios already procured and continued to be procured with Ukrainian Government funds. The amounts of aid equipment planned for delivery in 2018 and agreed for 2019 have already prompted an urgent need for improved technical support, repair and, most importantly, professional training, being preconditions of effective utilization of these equipments. Unfortunately, this effectiveness doesn't grow proportionally with growth in supplies of these equipments.

Harris radios, which are renowned for their highest quality and robustness, are serviced and repaired at the Radio Satkom Group's service center. As for repairs, it should be noted that operational troubles of some or other origin (production defect, misuse failure, failure due to combat damage, etc.) have been found in just 60 radio units out of several thousand that are operational with Ukraine's armed services.

So the key priority now is to train uniformed users in how to properly handle Harris radio equipment while in combat. Unfortunately, the current situation, in this respect, is extremely unsatisfactory, for several objective and subjective reasons, the key one being because of the critical shortage of knowledgeable professionals. Knowing this, Harris, assisted by military communication experts, has been developing an effective professional training technique to address this shortage. Experts and instructors have compiled dozens of instruction manuals and field pamphlets, trained hundreds of operators and dozens of radio network administrators. UDR

TUNGSTEN CARBIDE-COBALT ALLOYS

MODERN TRENDS IN ARMOR-PIERCING AMMUNITION PRODUCTION

The key element of any small arms system is killing agent, i.e. the ammunition. The ammunition used is key to effectiveness of any small arms weapon system. Improving the effectiveness of ammunition is therefore the main challenge to be addressed by engineers and designers of armor piercing (AP) ammunitions.

Amor-piercing rounds produce the best lethality among all of the small arms ammunition types in current existence. AP rounds come with steel core or carbide core, the latter requiring a special technology to produce.

That being said, AP rounds cored with a material made out of tungsten carbide – a super hard compound of tungsten and carbide, cemented together with cobalt – is the a driver behind the never ending arms race between weapons and defenses. However, engineering and manufacturing of AP rounds is associated with the use of more technologically sophisticated processes to produce each of the components, and with the complexity of integrating these ammunitions into the overall armaments system of a particular military. This is due to the fact that, within a particular caliber, rounds of different types (Ball, Tracer, AP, API etc.) should be made unified in ballistics terms, which often results in their effectiveness being deliberately reduced for each particular type. Designers of tungsten carbide cored (TCC) AP ammunitions are therefore seeking to ensure:

- that a TCC AP round of a particular caliber is universally applicable for use from all of the small arms weapons available in this same caliber (assault rifles, sniper rifles, machine guns);
- minimum trajectory approximation between a given TCC AP round and ammunitions of other key types (these parameters are differing from country to country);
- improved armor penetration performance compared to the previous generation of TCC AP ammunitions;
- that TCC AP ammunitions have better armor penetration than that of same-type ammunitions available to a probable adversary;

• the TCC AP technology can be improved and upgraded to customer specifications over time as it enters full-rate, quantity production.

As for production of these ammunitions, the economic aspect is of lesser importance, since the cost of production will be compensated for by the effectiveness of a future combat use. Important factors in production of TCC AP ammunitions are the type of the tungsten powder (with differing average grain sizes) used, the proportion of cobalt (Co) content in the tungsten carbide (WC) alloy; specifics of the WC-CO alloy manufacturing process; permissible traces of other metals present in the alloy; technological effectiveness of the manufacturing process, etc.

Key factors in production of TCC AP amunitions are: the shape of the core tip (conical, double-cone, ogival or combined); shape/configuration of the core body and tail (cylindrical or truncated cone); the length/diameter/mass ratio of the core; the type of the bullet jacket used (steel or Tombak); the presence or absence of a lead jacket, etc.

These parameters will all make a big difference in terms of range and terminal effect.

Due to these specific features discussed above, and the far higher cost of production compared with other types of ammunitions, only a few ammunition factories in the world can produce TCC AP ammunitions. Just as was the case during the Cold War, two competing global powers – the West as a collective actor and the Russian Federation, the successor to the Soviet Union – are dominating this industry.

From left to right : 1) DM 31, 5,56x45 (MEN), 2) DM 151, 7,62x51 (MEN), 3) 7H37, 7,62x54R (Russia), 4) 762BS51-13, 7,62x51 (Stiletto), 5) Swiss P AP, .338 LM (RUAG).

Since 1986, the USSR (and Russia since 1991) has continuously worked to update and improve performance capabilities of small arms ammunitions. To date, many countries have adopted for military service an impressive multiplicity of TCC AP ammunition products, each coming with its specific characteristics and capabilities. Knowing this, it would be worthwhile to compare the capabilities of the world's most widely deployed TCC AP ammunition types based on their known specifications in order to see their advantages and disadvantages and to understand the trends. This is relevant especially in the context of the ongoing Russia-West stand-off that may well evolve into a military confrontation, and this is where the effectiveness of weapons vs defenses will be seen in practice.

The tables below compare key technical data and armor penetration capabilities of the main NATO vs Russian AP ammunition types.

Table 1 presents AP rounds fired from individual (vs crew served) small arms weapons: automatic rifles, assault rifles, and light machine guns. That being said, the term "penetration of protective armor" pertaining to Russian produced AP ammunition types and those manufactured by the Ukrainian company STELETTO SYSTEMS should be understood to mean full penetration through a steel armor plate, with no bullet or core fragments left in the hole after penetration or in front of the armor plate during impact. There are none of such tough requirements made in this respect by NATO countries. →

TABLE 1

Manufacturer country/ company/year of production entry	Caliber	Cartridge type	Core type	Bullet mass, g	Steel armor plate thickness, mm	Percentage of achieving full penetration	Distance, m	Type of steel armor used
Russia/ 1998	5.45x39	7N22	U12A*	3.54-3.83	5	80	250	2P(500HB)
Russia/ 2002	--------	7N24	VK8**	3.93-4.27	5	80	350	2P(500HB)
Russia/ 2013	--------	7N39	VK8	3.9-4.1	5	100	550	2P(500HB)
Russia/ 2013	--------	7N39	VK8	3.9-4.1	10	100	100	2P(500HB)
Stiletto/2014	--------	545BS-5	WC-Co	5.2	14	100	200	2P(500HB)
USA/ 1996	5.56x45	M995 ***	WC-Co	3.4	12	100	100	RHA (300HB)
NAMMO	---------	AP4	WC-Co	4.0	5	100	550	RHA (300HB)
NAMMO	---------	AP45	WC-Co	4.5	7	100	200	RHA (300HB)
MEN	---------	DM31	WC-Co	4.0	-----	-----	-----	Type SK4 CTS
Stiletto/2014	---------	556BS-5	WC-Co	5.2	14	100	300	2P(500HB)
Russia/ 2002	7.62x39	7N23	U12A	7.75-8.05	5	80	200	2P(500HB)
NAMMO	---------	AP8	WC-Co	8.1	7	100	300	RHA (MIL-A-46100)
Stiletto/2014	---------	762BS-10	WC-Co	10.3	10	100	150	2P(500HB)

*- Type U12A tool steel; **- Type VK8 WC-Co alloy with 92% WC content; ***-M995 round is a copycat version of NAMMO's AP3 round.

Table 2 presents selected types of small arms ammunitions that are typically fired from machine guns and assault rifles, and sometimes from older assault rifles.

TABLE 2

Manufacturer country/ company/year of production entry	Caliber	Cartridge type	Core type	Bullet mass, g	Steel armor plate thickness, mm	Percentage of achieving full penetration	Distance, m	Type of steel armor used
Russia/ 2002	7.62x54R	7N14	U12A*	9.8	5	80	300	2P(500HB)
Russia/ 2002	--------	7NH26	U12A	9.75-9.9	10	90	200	2P(500HB)
Russia/ 2013	--------	7N37	VK8**	117-119	10	80	500	2P(500HB)
NAMMO	--------	AP8	WC-Co	8.5	7	100	550	RHA (MIL-A-46100)
Stiletto/ 2014	--------	762BS54-12	WC-Co	12.0	16	100	200	2P(500HB)
Stiletto/ 2014	--------	762BS54-13	WC-Co	13.0	20.5	100	200	2P(500HB)
USA/ 1996	7.62x51	M993 ***	WC-Co	8.3	7	100	500	RHA (300HB)
NAMMO	--------	AP8	WC-Co	8.3	7	100	550	RHA (MIL-A-46100)
NAMMO	--------	AP9	WC-Co	9.4	7	100	550	RHA (MIL-A-46100)
NAMMO	--------	AP10	WC-Co	9.85	7	100	300	RHA (300HB)
NAMMO	--------	AP11 LR	WC-Co	10.9	7	100	600	RHA (300HB)
Lapua****	--------	AP492	WC-Co	10.7	15	100	100	Steel (400H)
RUAG	--------	Swiss P AP	WC-Co	12.7	12	100	150	Steel (type unknown)
MEN	--------	DM151	WC-Co	9.5	-----	-----	≤400	SK4 Type CTS
Stiletto/2014	--------	762BS51-12	WC-Co	12.0	16	100	200	2P(500HB)
Stiletto/2014	--------	762BS51-13	WC-Co	13.0	20.5	100	200	2P(500HB)

*-Type U12A tool steel; **- Type VK8 WC-Co alloy with 92% WC content; ***- M993 round developed by NAMMO;
****- Lapua is part of the NAMMO group.

Table 3 presents ammunition types fired solely from sniper rifles, however, there has been an emerging trend toward machine gun weapons being developed optimized for .338 (8.6 mm) Caliber rounds.

TABLE 3

Manufacturer country/ company/year of production entry	Caliber	Cartridge type	Core type	Bullet mass, g	Steel armor plate thickness, mm	Percentage of achieving full penetration	Distance, m	Type of steel armor used
NAMMO	.300 WM	AP Sniper12	WC-Co	12.3	12	100	550	RHA (300HB)
RUAG	--------	Swiss P AP	WC-Co	12.7	12	100	250	Steel (Type unknown)
MEN	--------	DM131	WC-Co	12.8	15	100	300	Steel (400HB)
Lapua**	8.6x7.0	AP485	WC-Co	16.1	12	100	550	Steel (400HB)
Lapua**	--------	AP529	WC-Co	19.4	12	100	600	Steel (500HB)
RUAG	--------	Swiss P AP	WC-Co	16.8	12	100	550	Steel (Type unknown)
Russia/ 2006	9x64	7N33	U12A*	16.35-16.65	10	80	190	2P(500HB)
Stiletto/2014	.300WSM	300BS-13	WC-Co	13.5	20.5	100	250	2P(500HB)
Stiletto/2014	--------	300BS-13	WC-Co	13.5	12	100	1000	2P(500HB)

*- Type U12A tool steel; **- Lapua is part of the NAMMO group.

The tables herein don't cover some of newer types of TCC AP ammunitions adopted for military service by several countries, and so their specifications remain unknown so far. Thus, the US Army adopted the 7.62x51 M1158 round to complement the M993 round already in use. The Russian army has in recent years adopted AP rounds of calibers .338 Lapua Magnum, 7.62x51 and 6.7x51.

The data in the comparison tables seen above give an idea of the armor penetration capabilities provided with WC-Co cored small arms ammunitions. This explains the special focus being given by both manufacturers and consumers of small arms ammunitions to developments in this domain. In the future, this type of ammunitions will grow in number and diversity, as will do the requirements placed on them. But far from all manufacturers, however, will be able to come up with solutions that will be affordable and effective at the same time. UDR

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