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FOR UKRAINE**

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UKRAINIAN DEFENSE REVIEW

**UDR**

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## UKROBORONPROM HAS FOUND SUBSTITUTIONS FOR RUSSIAN-SOURCED COMPONENTS

The State-owned Concern "Ukroboronprom" has announced it has resolved problems with finding substitutions for military equipment components it had previously sourced from Russian suppliers. This is according to a press statement released by Ukroboronprom in March 2019.

Methodical work to this end has been in progress since 2014, and the Concern has "actively worked with over five hundred privately-owned businesses in Ukraine that have been able to substitute Russian-made components for own alternatives", the statement says.

According to data released by Ukroboronprom, in 2014, the BTR-4 APC vehicle was built with 45 percent of components sourced from Russia, 45 percent sourced domestically, and the remaining 10 percent sourced from import markets. A year later in 2015, the BTR-4 began to be built without the use of Russian-sourced components, with the proportions of domestically and internationally sourced compo-



nents amounting to 65 percent and 35 percent, respectively. In 2016, this ratio changed to 85% to 15%.

The Company stated that "Overall, most critical of the component substitution issues have been largely resolved, if compared with the situation as it was in 2014-15. This holds true especially for the armored military vehicle sector,

e.g. the manufacture of track systems for BMP series of armored infantry fighting vehicles. Malyshev Factory, Kharkiv, has set up a production process for these products. But this needs the use of steel of a different grade to substitute for the old grade steel that was coming from Russia previously", the statement said.

## U.S. HAS DELIVERED 400 PIECES OF MAJOR WEAPONS AND OVER 9,500 PIECES OF OTHER WEAPONS AND EQUIPMENT TO UKRAINE'S ARMED FORCES

The U.S. has delivered 400 pieces of major weapons and over 9,500 pieces of other weapons and technology to Ukraine's Armed Forces.

This emerged from a statement released by Ukraine's Defense Ministry on 11 March 2019, quoting Maj. Gen. Mykola Shevtsov, Armaments Director for Ukraine.

"Approximately 400 pieces of major weapons and over 9,500 pieces of other weapons and technology have been delivered for fielding in Ukraine, as part of financial and equipment aid packages provided by the United States of America. Among them are anti-tank guided missile systems,

counter-battery radars, unmanned aircraft systems, Hummer-series vehicles (including armored APCs and armored ambulances), radios for various purposes, infrared thermal imaging and night-vision systems, and anti-sniper systems", the statement says, quoting M. Shevtsov.

Simultaneously, for meeting the Armed Force's MRO requirements, there have been measures undertaken to enhance production capacities of military logistics and technical support units and to optimize their strength levels and structure.

"There have been adopted and fielded domestically-manufactured new ammunition and rocket/missile weapons such as: bullets for 7.62 mm sniper rifles, grenades for 40-mm

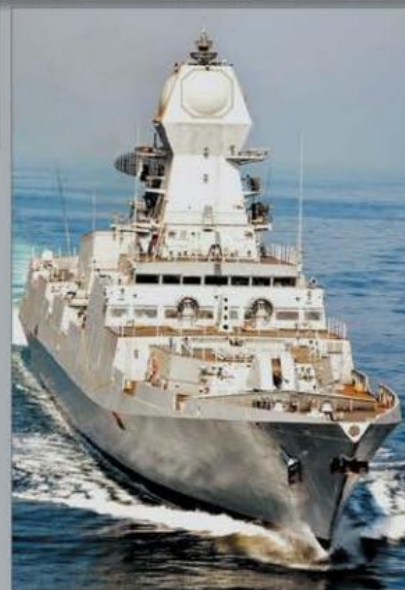
under-barrel and automatic grenade launchers, rounds for 60-mm mortars, shells for 152-mm artillery cannons, as well as 300-mm surface-to-surface 'Vilkha' guided rockets. Beyond that, the indigenously manufactured Stugna-P and Korsar anti-tank guided missile systems have begun to be fielded in mass with troops," Shevtsov said, as quoted by the statement from the Ministry of Defense.

He furthermore reported that the Armed Forces had resumed operation of eight maintenance and repair facilities to ensure their stocks of ammunition and rocket/missile weapons are maintained ready for combat. Since the resumption of the facilities, 37,000 tons of munitions and over 600 rounds of anti-tank guided missiles ammunition have been brought back to operational status, Shevtsov said.





■ For marine propulsion



32 MW

25 MW

16 MW

10 MW

6 MW

5 MW

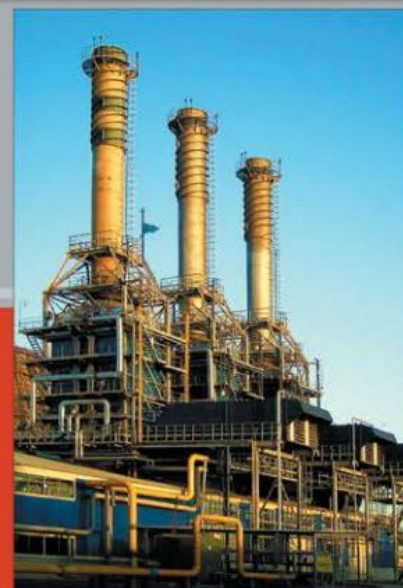
3 MW

2,5 MW

■ For gas industry



■ For power generation



# UKRAINIAN GAS TURBINES



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## LVIV AMVF MANUFACTURES A BATCH OF BTS-4BTLZ ARRVS ORDERED BY AN EXPORT CUSTOMER

SE "Lviv Armored Military Vehicle Factory" (AMVF), which is SE Ukroboronprom's affiliate, has manufactured a batch of new BTS-4BTLZ armored repair and recovery vehicles (ARRVs) ordered by an undisclosed customer from Southeast Asia.

This was reported in a press statement released by Ukroboronprom.

According to the statement, the BTS-4BTLZ, which has been developed and funded internally by Lviv AMVF, is built with capabilities for recovery or towing of inoperable and/or battle-damaged armored fighting vehicles from the battlefield. To support recovery

operations, the BTS-4BTLZ has a telescope crane manipulator that can lift up to 12 t loads. It is also equipped with a winch with a towing force of 75 t, as well as a towbar for towing damaged vehicles at speeds up to 12 km/h. Powered by a 690 hp engine, the 38 t vehicle can develop speeds up to 55 km/h.

Meanwhile, Ukraine's Defense Ministry has awarded Lviv AMVF several manufacturing contracts for over five dozen BTS-4BTLZ vehicles, totaling UAH 850 million, which will come from funding provided for the Government Defense Acquisition Program 2019. The contracts include vehicles in several dif-

ferent configurations, including a fire extinguishing tracked armored vehicle and armored fighting vehicles.

**UDR note:** Earlier, the Lviv AMVF developed, as a private venture, its ARRV "Lev" (Ukrainian for "Lion"), which was successfully put through qualifying departmental trials and approved for operational use by Ukraine's armed services in 2018. The Lviv AMVF is also the developer of the GPM-72 firefighting armored tracked vehicle that has already several times proved its worth in extinguishing highly complex fires, especially at the Kalynivka arms depot.

## UKROBORONPROM IN JORDAN NEGOTIATING POTENTIAL COLLABORATIONS ON ARMORED MILITARY VEHICLES DEVELOPMENT, PRODUCTION

CEO of the SE Ukroboronprom, Pavlo Bukin met and talked with Prince Faisal bin al-Hussein of Jordan, while on a visit to Jordan as member of a joint official team of Ukraine's Ministry of Defense and SE Ukroboronprom.

The negotiations discussed issues pertaining to bilateral military and technical cooperation and potential industrial collaborations between the two countries' defense industries. The parties reviewed the progress of the running projects being executed in Jordan with assistance from Ukrainian armor industries. The Jordanian

party confirmed its firm support for continuing and further expanding bilateral cooperation with Ukraine.

The meeting with Prince Faisal bin al-Hussein was preceded by a visit to the King Abdullah II Design and Development Bureau (KADDB) by a Ukrainian official team, and a meeting, held at the premises, between Pavlo Bukin and CEO of KADDB, Mohammad Fargal.

The parties appreciated the level of bilateral cooperation reached among the two countries' defense industries, especially armored military vehicle manufacturers.

Pavlo Bukin, while inspecting production lines at KADDB, said that good opportunities are in place for establishing bilateral Ukrainian-Jordanian industrial collaborations for development and manufacture of armored military vehicles.

The Ukrainian team, while on a visit to premises of Jordan Ministry of Defense, held negotiations with Brig. Gen. Abdallah Hassan Abdallah Huneiti, chief of planning directorate for the Jordanian Armed Forces, to discuss opportunities for developing bilateral cooperation in the defense technology area.



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## NEW LIGHT TANK BASED ON A UKRAINIAN-BUILT CHASSIS SPOTTED IN MYANMAR

Myanmar army has developed a new 105 mm light tank based on the chassis of 2S1 tracked self-propelled 122mm howitzer fitted with a new Chinese-made two-man turret armed with a 105 mm cannon adopted from the 6x6 APC vehicle WMA301 (PTL02) Assaulter. A picture of the new light tank was released on the "Myanmar Defence Weapons" Facebook account of the Myanmar armed forces.

It's worth of note, in this context, that SE Ukroboronprom, in early 2014, contracted with Myanmar to sell a package of welding equipment for welding hulls of the light armored vehicles BTR-4U and 2S1U that are due for manufacture in Myanmar.

2S1U was the designator initially given to the Ukrainian upgrade of the Soviet-designed 122mm 2S1 Gvozdika self-propelled howitzer (SPH). What is probably meant in this particular case is the planned local production in Myanmar of armored vehicles based on the tracked chassis and armored hull of the 2S1 SPH vehicle, itself built on the MT-LB chassis. The light tank in question (probably developed with Ukrainian assistance) is most likely one of these two.



It is known that deliveries under the 2014 contract began and were completed by Ukroboronprom in 2016, and, in early 2019, reports emerged that local production of BTR-4U and 2S1U vehicles in Myanmar would be set up at a new facility that is due for completion and opening sometime in the second part of 2020.

**UDR note:** Myanmar, from 2006 to 2009, bought from Ukraine 26

tracked armored vehicles MT-LBMSH, equipped with enhanced and improved capabilities and Shkval weapon modules. In October 2017, Andriy Koval, CEO of Kharkiv Tractor Plant (the Soviet-era manufacturer of 2S1 SPHs and MT-LB armored truck vehicles) announced that his company had won another contract award from Myanmar for delivery of "the full lineup of vehicles built on the MT-LB chassis".



## ANTONOV COMPLETING PREPARATIONS FOR QUALIFICATION FLIGHT TESTING OF ITS REGIONAL JET

Antonov has continued effort to find alternative substitutes for the Russian-sourced parts and components used in its 99-seat An-158 regional jet, a stretched version of the An-148, and is planning to equip the first prototype with Western-supplied avionics and other systems by 2020.

This emerged from an interview conducted with Vitaliy Chytak, vice-CEO for Production Management at Antonov, by television station Fifth Channel.

"Our plan now is to have in place the first An-158 prototype (with registration number 01-02), and we hope the airplane will be completed with Western-supplied avionics by 2020",

he said. He furthermore announced that "Certification/qualification flight test program for the An-158 will get under way in 2020, and these same avionics kits will be integrated also onto production-standard airplanes. Approval for production will be subject to the satisfactory completion of qualification flight trials".

Russian-sourced avionics used on the An-158 will be substituted for alternatives from Canada's Esterline, a company that provides systems for the fifth-generation F-35 fighter. Substitutions are also being search for the landing gear, remote control systems, and high-lift control system.

Antonov is now completing pro-

duction preparations for individual An-158 parts and components – e.g. loading ramp, pylons, engine nacelle, high-lift devices, ailerons, and flaps – that Ukraine previously manufactured in collaboration with Russian companies.

Antonov specifically notes that certification/qualification process will not take much time, since the Western avionics systems have already been certified and will only need to be checked for compatibility with systems manufactured domestically in Ukraine.

To add on this, Antonov has got a dozen half-finished An-158/148s already ordered by customers.



# TURKISH-SUPPLIED BAYRAKTAR TB2 MALE UAVS ENTER OPERATIONAL SERVICE WITH UKRAINE'S ARMED FORCES

Ukrainian President Petro Poroshenko has handed over Turkish-supplied Bayraktar TB2 medium-altitude long-endurance (MALE) tactical UAVs to Ukraine's Armed Forces, in a ceremony that took place on 20 March 2019, Ukraine's presidential press office reported.

An armed tactical UAV, the Bayraktar TB2 can fly out to 150 km and has an endurance of 24 hours. With its 'smart' bomb payload, it is well armed for attacks against enemy armored vehicles, field fortifications as well as sea-based targets.

Earlier that same day, Bayraktar TB2 UAV successfully flew its first live-fire test flight mission in Ukrainian skies. It climbed to 2,200-plus meters altitude from where it successfully hit a target on the ground with Roketsan MAM-L' micro bombs (bought also from Turkey), with a miss distance "less than 1 meter", according to Poroshenko.



President Poroshenko said, speaking to the handover ceremony: "Trial flights of the Turkish-built, armed tactical Bayraktar drones, which have entered operational service with Ukraine's Armed Forces, have been a success. I congratulate the Ukrainian Armed Forces, our Turkish partners, and all Ukrainians on the fact that we

now have in possession a completely new, modern weapon".

Poroshenko went on to say that parts and components for modern drones in the Ukrainian Armed Forces' inventory will be manufactured domestically at a Joint Venture factory to be built by Ukraine and Turkey in Zaporizhzhia.





## SPARROW

**SPARROW**, an advanced tactical battlefield Unmanned Aircraft System (UAS) developed and manufactured by the Ukrainian company **SPAITECH** SPE, LLS, is intended to perform intelligence, surveillance and reconnaissance (ISR) missions with its EO/IR camera payload and a capability to transmit live video broadcast from the battlefield. It performs target search, detection, recognition, identification, and acquisition, day and night, and under all weather conditions. The smallest UAV used by the Ukrainian forces in real combat operations, **SPARROW** is built on a 'flying wing', composite-material platform to ensure good durability and strength, as well as low-observability by enemy radar and thermal imaging sensors.

Transported fully assembled, the UAV is ready for use immediately after unpacking. It doesn't require a free ground space to takeoff or land; launch is catapult-assisted, while

recovery is automatic through the use of a parachute.

**Sparrow** is base-lined with gyro-stabilized visual daylight camera and thermal imaging camera sensors, and can be optionally equipped with a still camera, radiation dose meter and other sensors requested by Customer. Modular architecture allows payloads to be swapped in and out rapidly depending on the missions to be flown.

**Sparrow** uses **SPAITECH's** proprietary Post-Mission Review software for reporting and auto-extracting critical image data.

Enhanced security levels are provided with combat-proven GPS anti-jamming and anti-spoofing capabilities.

Ninety percent of modules used in **Sparrow** UAV are **SPAITECH's** proprietary designs based on best-of-class technology solutions.

 Take-off weight <b>3,3 kg</b>	 Wingspan <b>980 mm</b>
 Endurance <b>up to 60 min</b>	 Flight speed <b>from 60 to 120 km/h</b>
 Powerplant <b>electrical</b>	 Cruise altitude <b>300 - 700 m</b>
 Maximum flight altitude <b>2000 m</b>	 Operation range online <b>20 km</b>
 Landing <b>by a parachute</b>	 Launch <b>Catapult assisted</b>

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# INF TREATY BREAKDOWN

## CAUSES AND CONSEQUENCES

**T**he start of 2019 could mark the beginning of a new era in the missile arms race. We are talking about the Intermediate-Range Nuclear Forces (INF) Treaty. Signatories' non-compliance with this milestone historical agreement would not just undermine European stability but affect international security as well.

### CLASH OF POSITIONS

The Intermediate-Range Nuclear Forces Treaty (INF Treaty) is a 1987 arms control agreement between the United States and the Soviet Union signed in Washington D.C. by President Ronald Reagan and General Secretary Mikhail Gorbachev on 8 December 1987. The treaty obliged

its signatories not to produce, test or deploy ground-launched nuclear and conventional missiles as well as their launchers with ranges of 500-1,000 km (short-range) and 1,000-5,500 km (intermediate range). Within three years, the parties had eliminated all launchers and ground-based missiles with ranges of 500-5,500 km, including missiles and launchers deployed in the European and Asian parts of the USSR.

The INF was the first ever agreement seeking a true arms reduction with global implications, since it demonstrated that the superpowers are ready to de-escalate tensions and eliminate the threat of the nuclear-missile confrontation between them.

Over time, the situation has changed, however. These changes were catalyzed by a number of factors, including most notably the collapse of the Soviet Union. The battle for Europe – a key aspect of the Cold War – had ceased to be relevant. Military strategy and tactics have changed, with no more emphasis placed on fully







eliminating the enemy and its infrastructure. After all, the weapons of war have changed to become far more powerful and effective than they have ever been before.

Beyond that, new security threats and challenges have emerged, namely: the terrorist attack of September 11, 2001 in the United States, immediately followed by

Washington's withdrawal from the Anti-Ballistic Missile (ABM) agreement; an increase in the number of countries owning missile weapons of various ranges; the growing threat of a missile attack from Iran and North Korea.

Under these circumstances, both of the signatory parties – the USA and the USSR's successor state, Russia who had taken full responsibility for compliance with the INF treaty – began searching for loopholes and opportunities to rebuild their short-to-intermediate-range ballistic missile capacity. This trend became particularly visible with Vladimir Putin's coming to power in Russia in 2000. It was back in June 2000 when he hypothetically assumed that Russia could leave the INF treaty, citing the US intention (later fulfilled) to withdraw from the ABM treaty.

As a result, both parties have been complying only formally. Thus, the INF addresses ground-launched cruise missiles, but doesn't include sea-launched missiles, which Washington and Moscow have exploited as an opportunity to build-up their respective sea-based ballistic missile capabilities.

In addition, the treaty limited the numbers of missiles with ranges from 500 to 5,500 km, but did not prohibit the development of longer-range

ballistic missiles. At the same time, the USA's LGM-30 intercontinental ballistic missile and Russia's Yars missile both can be adapted to intermediate-range launches within the INF imposed limits.

Everything would be fine had Moscow not opted for a more aggressive stance – allegedly in response to the opponent's actions. For example, the Russian Federation has over the past 20 years produced a number of missile systems that not just cast doubt on →







the Kremlin's willingness to abide by the agreements, but, on the contrary, indicate a departure from them.

Russian developed Iskander short-range tactical missile system is capable of ranges far in excess of its stated 500 km range. Furthermore the Kremlin owns new ground-launched RS-26 Rubezh ICBM, which, from 2016, was to be fielded with the RF Strategic Missile Forces. The missile can be adapted to ranges of 2,000–6,000 km, which exceed the INF imposed limits.

But there is more: Beginning in 2014, annual reports by the US Department of State regarding compliance with arms control agreements state that the United States has information indicating that the Russian Federation has conducted numerous tests of ground-launched cruise missiles with ranges from 500 to 5,500 km. In the most recent report, published in April of this year, the State Department (again, without specifying the exact nomenclature of the missile), said that the Russian Federation continues breaching its INF obligations.

Experts believe this is about the 9M729-SSC-X-8 long-range ground-launched cruise missile system, which is effectively a land version of the SS-N-30 3M14 missile complex "Caliber-NK" and allegedly a part of the 9K720 Iskander-M complex. The missile's range as assessed by American experts is between 2,000 and 5,500 km.

The above clearly indicates that the Russian Federation has formally breached its obligations by developing and testing ground-based missiles (both ballistic and cruise) that are banned under the INF treaty.

The Kremlin, on its part, is trying to accuse the United States of widely deploying sea-based missile defense systems built around the modified Arleigh Burke-class guided missile destroyers and Ticonderoga-class guided missile cruisers (and their Aegis Combat System) armed with BGM-109 Tomahawk cruise missiles.

Moscow is convinced that the Mk41 launchers (which are usually seen mounted on Aegis Ballistic Missile Defense ships) being deployed by the United States in Romania and Poland can be adapted to launch BGM-109 Tomahawk cruise missiles, including nuclear-armed ones, in addition to ABM interceptor missiles. But multiple verifications involving experts from different countries, including former Soviet nations, refute these allegations.

### OUTCOME AND AFTERMATH

Over the past few years, the United States has taken multiple measures to prevent the INF Treaty breakdown. Meetings were held with senior officials of the Russian Federation, NATO and EU countries, etc. President Donald Trump's administration, at lots of international gatherings, recalled the Kremlin of the complexity of the situ-

ation and inadmissibility of breaching its INF commitments.

At the end of 2017, the United States imposed sanctions on Russia for the country's failure to comply with its INF obligations and gave Moscow a "chance to retreat", which it refused. The Kremlin, in its trademark manner, said, "You are all lying" and "We always abide by our commitments".

The year 2018 did not witness stability or a resolution of existing divisions. Finally, on December 4, the US embassy in Moscow sent a note to the Russian Foreign Ministry, in which it warned the US would pull out of the INF treaty if Russia does not comply within 60 days. But Moscow, again, said it honored its obligations, and all the accusations against it are faked and destructive.

The result was that, in early 2019, Washington, then Moscow formally pulled out of their INF obligations.

What can be the consequences of scrapping the INF treaty? It is quite realistic to expect the beginning of a new battle for Europe between Washington and Moscow. The Russians will most likely continue secretly developing INF banned missile technologies without advertising them. But Russia, weakened by sanctions, clearly has no capacity to engage in an arms race similar to the one in the 1970s. The Kremlin will back itself into a corner, and nobody will be there trying to help it out. For the Russian Federation, doing otherwise



is the same as letting the Europeans resign themselves to U.S. control or letting recurrence of the Euro-missiles project failure in the late 1970s and early 1980s.

Washington, for its part, will quite likely respond rather asymmetrically to Russia's behavior, as it already did in the 1980s. The United States already has all the necessary capacity for this, in the form of airborne and land-based cruise missiles JASSM-ER and Tomahawk, in addition to a sufficient arsenal of sea-based missiles deployed on AEGIS BDM ships. A symmetrical response involving the deployment of the US' own intermediate-range ground-based missiles is also possible, but it can cause a crisis in relations with its NATO allies in Europe.

While analyzing Russo-American relations in respect to the INF treaty failure and European security, one should keep in mind the factor of China. After all, Beijing has since the signing of the INF agreement in 1987 built up a powerful arsenal of ground-launched, intermediate-range ballistic and cruise missiles (up to 1,700 missiles), which the United States and Russia have had to eliminate. This arsenal makes Beijing more confident when planning for a possible confrontation with the USA, and the latter should, of course, take this Chinese missile capacity into account. Due to geographical specifics of Eastern



Asia, the United States will be unable to employ there an asymmetric strategy with the same effectiveness as this would be in Europe. It's not unlikely that Washington would try and reach a new INF treaty that would engage China along with Russia. But this is highly unlikely to occur. Many of the countries that in deciding their respective policies previously looked at the INF Treaty as a compromise between the two nuclear-capable superpowers will in this situation of instability have to think more about their own security.

Thus, Ukraine, that has become a target for Russian military aggression, has already responded to the INF Treaty breakdown. Its Foreign Ministry said in a statement issued on March 6, that "Ukraine reserves the right to develop weapons systems deemed necessary to defend itself, including, inter alia, missiles and associated launcher systems". Ukrainian President Petro Poroshenko, in a speech delivered on 11 March 2019, said: "Ukraine will have to develop extended-range missiles since the INF Treaty is no longer valid. We had abided by the restrictions imposed on us by the INF Treaty. But Russia has destroyed the treaty by creating new threats to European security".

How the situation will evolve is difficult to predict. But one thing is evident: 2019 began in a highly complex international environment where the relationships between the Russian Federation and the United States are getting worse. Under such circumstances, an extension of the INF Treaty between the Russian Federation and the USA expected in 2020 is becoming highly unlikely, meaning the whole nuclear security architecture that has been built for decades may be falling down soon. Only time will tell whether the parties will have enough restraint and prudence so as not to let the situation destabilize to unpredictable, terrible consequences. **UDR**

**Anton MIKHENKO,**  
UDR





**F**or the Republic of Moldova (RM), conflict with its separatist Transnistria region is a Gordian knot that has remained uncut for over 27 years since its independence in 1991. The situation still remains in limbo even despite some positive tendencies being observed recently: the UN General Assembly Resolution on the complete withdrawal of Russian troops from Transnistria, Moldova and Ukraine governments' proclaimed readiness to provide a 'security corridor' for the troop withdrawal, and a few compromises reached between Chisinau and Tiraspol recently. Russia has continued seeking out diplomatic but ever less compelling pretexts for keeping its forces stationed in the unrecognized state.

### THE ROOTS OF THE TRANSNISTRIAN CONFLICT

**Economic dimension.** Transnistria, also known as Pridnestrovian Moldovan Republic, is a self-proclaimed, separatist pseudo state making up 12 percent of the RM's territory. Prior to the fall of the Soviet Union in 1991, Transnistria produced over 30 percent of Moldova's GDP and some 90 percent of its energy consumption. After the establishment of an independent Moldovan state the economic factor played a key role in the escalation of the violence in Transnistria and in the establishment of a negotiation and mediation process after the fighting ended. As a matter of fact, it is the economic factor that caused the conflict and the one from where a standoff between the political elites of Chisinau and Tiraspol rooted out. As a result of Gorbachev's 'Perestroika' reforms Soviet-style regional elites on the left bank of the Dniester River, comprised mostly of senior executives at local manufacturing companies, had seen an opportunity to grab the region's industrial base through privatization. In the long run, many of the region's profit-making industrial companies had ended up at the hands of Russian conglomerates linked to the Kremlin then, and remaining so today. Transnistrian industrial elites, who were Russians and opposed to the government in Chisinau, were pursuing personal gain by taking ownership of the companies they managed. Afterwards, as a result of negotiations held between governments on the left and right banks of



### GHOSTS OF THE PAST AND A WINDOW INTO THE FUTURE



Transnistria in Europe map

Dniester, Transnistria was given special economic status and awarded an entitlement to exercise full control over all industries in the region.

**Ethnic context and an alternative identity.** Russia mounted an aggressive political and diplomatic campaign aimed to distort public opinion towards thinking that the conflict has purely ethnic roots only. An alleged "confrontation" between Moldovan/Romanian-speaking and

Russian-speaking populations in Transnistria was a fake that Russian propaganda machine was seeking to promote to the public. But the question is how an interethnic conflict can exist in Transnistria where a majority of Russian speaking population are living on the right bank of the Dniester. In the same vein, Transnistrian elites have since the early 1990s maintained a discourse about a threat that Transnistrian Russian-speakers might



be subject to discrimination because of their ethnicity.

Moscow further exploited this discourse with success in a campaign to destabilize Transnistria in 1992 by infiltrating the region with its moles and "volunteer" fighters, which eventually ended up in armed fighting. Simultaneously, the Russian propaganda machine was working aggressively to undermine the image of the Moldovan authorities and to favor the separatists. Afterwards, Russia's 14th Army played its role in how the situation was developing in Transnistria, having become a cementing factor in making the conflict "frozen" and in the establishment of the unrecognized Pridniestrovian state.

Afterwards, Moscow, while referring to itself as a "mediator", began putting strong pressure on Chisinau to recognize the so called Pridniestrovian Republic as the other side to the conflict.

### **OGRF IN TRANSNISTRIA. "PEACEKEEPERS" AND REGULAR FORCES**

After the armed fighting ended, Russia continued military, political and economic support for the separatist regime. The presence of the Operational Group of Russian Forces (OGRF) in Moldova (also known as the Group of Russian Forces in Transnistria), established as a successor to Russia's 14th Army stationed there, has become a permanent factor of concern and vulnerability in Moldova.

The mandate of the Russian forces was initially regulated by the Moldova-Russia agreement, signed in 1992, on the principles of peaceful settlement of the armed conflict in the Transnistrian region of the Republic of Moldova. According to the agreement, Russia's 14th Army stationed in Transnistria should have a neutral status and further negotiations would be needed to address issues relating to the Russian forces' mandate and procedure and timeframe for their gradual withdrawal. But time has shown that Russia had no intention to fully implement the agreement.

Russia's Defense Ministry, in 1995, issued a directive ordering that the 14th Army be reorganized into OGRF with a substantially reduced number of personnel. Afterwards, the Stan-

bul 1999 OSCE Summit made Russia obliged to fully withdraw its forces, equipment and ammunition from Moldova till 2001. Russia never did so, but instead deployed OGRF, formally part of its Western Military District.

Today Russia has two independent motorized rifle infantry battalions permanently deployed in Transnistria. These two alternate each other in the Joint Peacekeeping Force and OGRF every year in late October or early No-



*Military parade in Transnistria*

vember. Russian forces (amounting to up to 1,500 personnel together with logistics support units) therefore perform a dual role of peacekeepers and regular combat units.

The Russian force group might seem relatively small in strength. But, in truth, it's large, if compared to the military strength of the self-proclaimed Pridniestrovian Moldovan Republic (PMR). Its army consists of (1) four infantry brigades (three cadre-strength brigades stationed in Dubossary, Rybnitsa, and Tiraspol, and one full-strength brigade stationed in Bendery), (2) an independent armor battalion (stationed in Vladimirovka), (3) an independent artillery battalion and an independent engineer battalion (both stationed in the village of Zabory), (4) an independent communications battalion, an independent aviation squadron, and an air-defense regiment (all stationed in Tiraspol). Transnistria's weapon inventory includes 18 main battle tanks, Grad MLRS, large-caliber artillery cannons, as well as helicopters.

With the onset of Russia's military intervention in eastern Ukraine, there has been observed a sharp increase in

the number and intensity of military exercises held in Transnistria by both the OGRF and PMR's army. Remarkably, some training exercises were held jointly by the two forces, which is inconsistent with the obligations Russia has assumed as a "mediator". The maneuvers are apparently aimed to test and improve coordination and liaison between the two, but resemble nothing like the practicing of peacekeeping duties.

What's also needed is an understanding that not only do Transnistrian military formations serve as a reserve for possible use by the locally stationed Russian force (the OGRF personnel have been recently complemented with local residents holding Russian passports) but they are a de facto part of the Russian army.

The RM Ministry of Foreign Affairs and EU Integration has sent a few requests for information to Moscow regarding troop withdrawal, compliance with the agreements reached, and the fulfillment of international community's requirements, but all have been left unanswered. A very clear reality is that Russia is pursuing a double-standard policy toward Moldova by recognizing its sovereignty and territorial integrity on the one hand and, on the other, overtly supporting, without a hint of doubt, the separatist regime sitting in Tiraspol.

### **AN OUTLOOK FOR REINTEGRATION**

Despite the complexity of the situation that lasts almost three decades, some positive changes have been achieved in relationships between →



Chisinau and Tiraspol. Thus, in November 2017, four protocol agreements were signed at Tighina (f.k.a. Tighin) that are expected to make life easier for people residing on both banks of the Dniester River. The agreements include guarantees for (1) the normal work of Romanian-language schools in Transnistria, (2) a free access for farmers to their fields along the Dubossary-Tiraspol road, (3) the Apostille attestation of the educational documents issued in Transnistria, (4) the restoration of fixed and mobile communication networks between the left and right banks of Dniester, and (5) the issue of "neutral" license plates for Transnistrian motor vehicles.

However, it's Russia who still has a key role to play in resolving the current situation in the region.

In practical terms, to get this conflict resolved the Republic of Moldova and its Western partners should adopt a strategy that would help minimize the amount of aid money Russia spends on separatist entities. The economic aid Russia provides to government of the separatist Transnistrian region is the key enabler of keeping the conflict frozen. In the current situation where there is none straight-through traffic between Transnistria and Russia, Chisinau could impose sanctions on the regime in Tiraspol in order to reduce the Kremlin's ability to aid the separatist Transnistrian government and to supply its OGRF force.

Military aid would be less effective if not complemented with economic aid. If this comes pass, the separatist ruling elite is going to gradually lose its legitimacy in the eyes of the local population and can even end up facing a popular rebellion against it.

With a strengthened ability to create favorable living conditions for the people in Transnistria Chisinau would get one more powerful tool for regaining control over its separatist region. Chisinau should offer those people positive incentives that would make them more encouraged to live and work in Moldova. Highly trained professionals with competitive skills continue emigrating from Transnistria in search of jobs and better living. Reasonably enough, Moldova is not their number-one destination of choice, but making it such should be a goal to be sought for. The fact that young active



**After the onset of Russia's military intervention in eastern Ukraine, there has been observed a sharp increase in the number and intensity of military exercises held in Transnistria by both the OGRF and PMR's army. Remarkably, some training exercises were held jointly by the two forces and resemble nothing like the practicing of peacekeeping duties.**

people are leaving the region and rarely coming back is in itself a positive evil, for this helps them develop a higher level of social independence and see a freer, better life. This social independence could encourage the Moldovan citizens on the left bank of Dniester to change the situation for the better in the Transnistrian region where they would continue to live and support their families.

On the geopolitical level, with a lack of a sufficiently high level of external support, the RM is left vulnerable to potential confrontation with the Russian Federation. This situation arose due to the ill-working peacekeeping mechanism Russia has so persistently sought to legitimize in the OSCE. This goal has been partly achieved, as Russia's proposed provision allowing peacekeeping parties to overtly intervene into a conflict has been adopted to be used as a working arrangement in negotiations and OSCE's conflict settlement initiatives.

Still, there remains a hope that there will be an adequate response to the UN General Assembly resolution, adopted in 2017 and supported by the EU and NATO countries, that strongly calls for the complete and unconditional withdrawal of Russian forces from the territory of the Republic of Moldova.

As a final note, West-friendly international partners of Moldova should blockade the financial aid Russia is providing to the self-proclaimed authorities of Transnistria, and fine it for doing so, while simultaneously helping the Government in Chisinau improve living conditions in the RM and thus make it into an attraction pole for those living on the left bank of Dniester. In this way, the separatist regime in Tiraspol will be destroyed from within, left without any support from the people it governs. UDR

**Vladislav SARAN,**  
Exclusive to UDR





# Aerotechnica

**Aerotechnica** is specializing in the development and manufacturing of advanced surveillance data acquisition and processing systems for civil and defense markets ranging from radars, upgrades of Surface-To-Air Missile systems to advanced command posts for all types of armed forces and simulators.

- 28-year experience in manufacturing, installation and maintenance of equipment; experience of products supply to the Ministry of Defense;
- certified manufacturing of military equipment, products added to Armory of the Ministry of Defense of Ukraine;
- 400+ experts in control systems, radar equipment, Air Defense Missile systems;
- private company with private assets;
- use of COTS components from world's leading suppliers;
- a thorough quality assurance system, confirmed by a ISO 9001 Certificate.

## Main products and services:

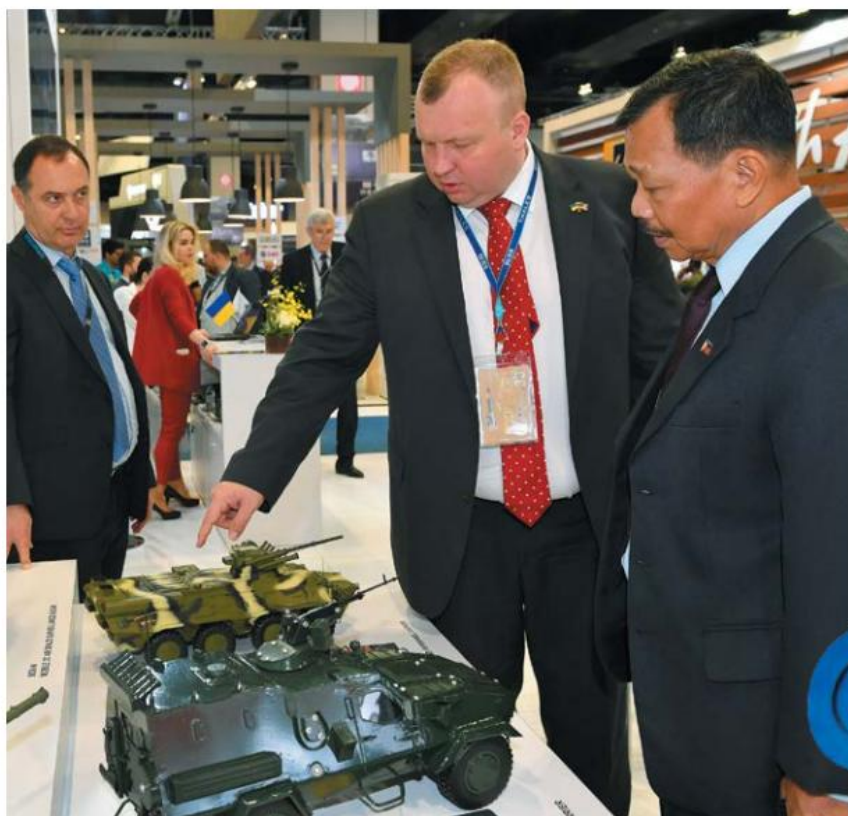
- Modernization of analogue and digital surveillance radars of former Eastern origin (P-14, P-15, P-18, P-19, P-35, P-37, 5N84, 5N84A, 44Zh6, RSP-10, etc.) as well as height-finders (PRV-11, PRV-13, PRV-16).
- Manufacturing new air surveillance radars in VHF and L-band (AMBER-1800, MARS-L).
- Deep upgrade of air defense missile systems S-125 ('Pechora'), 2K12 ('Kvadrat'), S-75M3.
- Advanced command and control posts of different levels.
- Automated systems for acquisition, processing and distribution of surveillance information for Air Defense control units.
- Digital command and control communication systems for various Air Defense and Air Force control units.
- Automated Tower for Air Force.
- Automated air traffic control systems for aerodromes (Tower and Approach).
- Automated workstations for ground-controlled interception (GCI) officers.
- Communications and interface units between Air Defense and Air Traffic Control.
- Systems for automatic distribution of surveillance information to air defense units.
- Integration of civil and military systems to increase flight safety and reduce military expenditures.
- Radar (video) extractors for all types of radars and height-finders.





# «UKRAINE IS A STRONG ACTOR ON THE ARMS EXPORT MARKET»

**Pavlo BUKIN**, CEO of State Concern "Ukroboronprom"



**U**kraine has over the past several years been able to intensify military and technical cooperation with its international partners despite counteraction by Russia's propaganda machine. This is driven by the need to buy from the import market the armaments and technologies that the country's military and public security services need on the one hand, and on the other, to improve export competitiveness of own domestic defense industries. SC (State Concern) Ukroboronprom and its affiliated companies are playing a key role in both efforts. Defense Express interviewed Pavlo Bukin, CEO of SC Ukroboronprom, about the Concern's development priorities and the current status of Ukraine's military and technical cooperation with international partners.

## What is your assessment of Ukroboronprom's current performance?

The Concern continues focusing its activities on (1) the production of new military equipment technologies and renovation, refurbishment and upgrading of legacy inventories of Ukraine's military and other security services, and (2) fostering the exports of domestic armaments manufacturers.

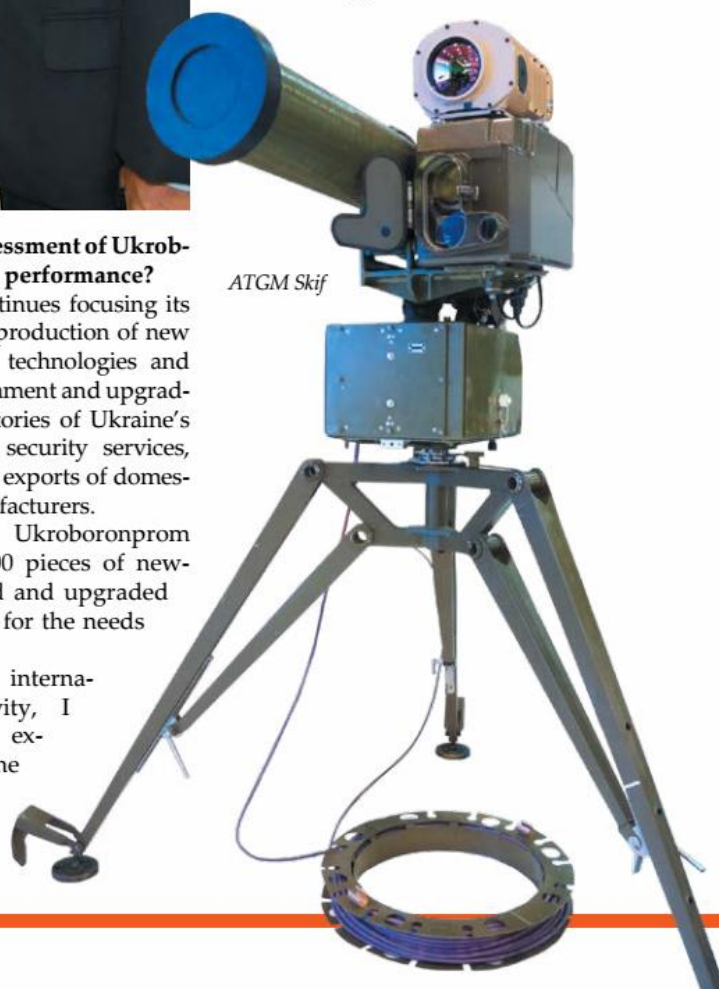
Over 2018, SC Ukroboronprom delivered over 4,900 pieces of newly-built, refurbished and upgraded military equipment for the needs of Ukraine's army.

Regarding the international trade activity, I would give as an example the work done by SE SpecTechnoExport, one

of Ukroboronprom's affiliated companies. In 2018, the Company's defense-related exports grew 27 percent year-on-year to reach \$152.6 million. Also the same year, SpecTechnoExport concluded 148 arms export contracts with a combined value of \$282.5 million – a record high for the past five years. This is just one example, minor but highly illustrative.

In 2018, Poland, the Czech Republic, India, Algeria, Myanmar, the PRC, Turkey, Indonesia, and Azerbaijan were the Concern's largest export customers, among others.

**What is the situation in the Concern with finding replacements for components that Ukrainian defense industries previously sourced from Russian suppliers?**



ATGM Skif



Methodical work to this end has been in progress since 2014. The substitution of Russian-sourced components is being achieved by setting up domestic production of the needed components and by importing some from countries where the components are in production or in surplus storage. The Concern has actively worked with over five hundred privately-owned businesses in Ukraine that have been able to substitute Russian-made components for own alternatives. Overall, most critical of the component substitution issues have been largely resolved, if compared with the situation as it was in 2014-15.

**There has been much talk recently about military and technical cooperation between Ukraine and Turkey. What is your assessment of its current status?**

Military-technical cooperation has intensified for the last three years between our countries. Today we have very close contacts with our counterpart in Turkey, SSB. Our relations are very constructive.

Ukraine has recently purchased from Turkey a number of Bayraktar TB2 Armed Tactical UAVs that have already undergone successful flight testing in the Ukrainian skies. The Turkish drones were purchased completed with Roketsan MAM-L (also known as Smart Micro Munition) micro bombs.

In the export domain, Ukrainian companies are working with Turkish partners on projects covering largely, but not exclusively (1) sales of a wide range of assemblies and replacement parts for military grade weapons and vehicles, (2) maintenance, repair and overhaul (MRO) of Mi-17-type helicopters, their associated components, assemblies and systems; training of MRO personnel, (3) deliveries of components and systems for application on Turkish-produced weapon modules armed with guided missile weapons, (4) the manufacture and sales of AI-450-type turbofan engines, and (5) deliveries of Zaslon-type hard-kill active protection systems.

I would add to this that fruitful cooperation is progressing well. We are now exploring potentially promising avenues for cooperation that include,



but are not limited to: (1) co-production and/or sales of Antonov-series transports, (2) expansion of the scope of cooperation on UAV technology projects, (3) the integration of explosive reactive armor kits and hard-kill active protection systems onto Turkish tanks, (4) the development and production of passive radar technologies.

**Little time remains before the opening of Le Bourget Paris Air Show 2019 in France. How are relationships developing between Ukraine and that European country?**

We have pretty long relationships with France as a partner in military and technical cooperation. The history of these relationships is full of successes and fails. Still bilateral military and technical cooperation has been showing a certain degree of upward dynamics.

The largest bilateral project so far was the sale by Thales Communications & Security of Electronic Warfare systems to Ukraine's Defense Ministry. The package also included follow-on support services and systems integration onto wheeled vehicle platforms. →



*Turkish UAV Bayraktar TB2*



Alongside that, Airbus Helicopters is known to have agreed to sell a quantity of its H125 choppers to Ukraine. Deliveries for the needs of the Interior Ministry and emergency response services have been already under way.

The two parties are now exploring opportunities for expanding cooperation in this regard, and specifically through the arrangement of offset compensations.

Besides the purchase therein mentioned, Ukraine, last year, bought Spy Arrow UAVs from Thales Group and night vision devices from Sagem Defense Securite.

It is to be noted, in that context, that further cooperation is hindered by a ban on arms shipment to countries where hostilities take place, including Ukraine. Resolving this issue requires support and assistance from the country's senior-most leadership.

The potential projects that hold promise and are of vested interest to Ukraine include, most notably but not exclusively (1) naval warships, systems, and weapons, (2) building a maintenance/servicing center for the Airbus S.A. helicopters being delivered for the needs of Ukraine's Interior Ministry and emergency re-



*APC Kozak 5 with Aselsan turret*

sponse services, (3) the purchase of electronic-optical systems and devices, and electronic intelligence (Elint) systems.

Overall, Ukrboronprom has over the past few years greatly intensified its cooperation in military technology with EU countries. The EU ranked first in Ukraine in terms of the number of contracts concluded in 2018, and EU companies are also top largest exporters of defense-related products, works and services to Ukraine. In Europe, Poland, Bulgaria, Turkey, Croatia, Lithuania, Latvia, and the Czech Republic are most active in cooperating with Ukraine in the military technology domain.


**There has been a perception aggressively promoted by the Russian authorities and media recently that Russia has an exclusive entitlement to do MRO of Soviet-built aircraft types. Is that so?**

Ukraine is a strong actor on the market of MRO services for aircraft, including those originating from foreign countries. We are indeed a strong competitor for Russia, and this is what is driving Moscow to pressurize its friends and partners into believing to the contrary. Ukraine holds all the required and necessary licenses and technical manuals on maintenance, refurbishment and life extension overhaul for a broad range of military aircraft brands that include MiG, Su, and Il [series of airplanes], and Mil [series of helicopters]. These licenses cannot be revoked, nor are there any legal grounds for Russia to require

additional licensing from Ukraine. Beyond that, each operator country establishes its own rules and makes changes to the design. The freedom of maneuver in this regard is only limited by the level of R&D and manufacturing capacities a given country possesses. Therefore, the claims being asserted by developers or producers, in this case, Russian, have no merit. Also noteworthy, Russia displays double standards when it makes such ungrounded claims against Ukraine while simultaneously promoting on export markets MRO services for the Ukrainian-designed Antonov series of airplanes.

**What are your nearest goals to be met with respect to SE Ukrboronprom's restructuring reform and defense-industrial modernization in Ukraine?**

Indeed, the goal is to bring to successful completion the long-talked-of endeavor of the defense industries' corporatization and clusterization into divisions. The work has been almost complete to clusterize defense industries into divisions depending on their respective industrial expertise and competencies. There will be five or so industrial clusters set up.

I am furthermore looking to build a clear-cut, transparent system of internal collaboration, a one involving public and private contractors, and we have worked intensively to this end. 

Interviewed by

**Anton MIKHENKO, UDR**



*Thales TRC 274 H/V/UHF jammer*





# RENOVATION

## OF THE DEFENSE-INDUSTRIAL BASE

**R**ussia's military aggression has exposed the need for a defense industrial modernization in Ukraine. With aid from abroad not always assured, a renovation of the domestic defense-industrial base, ensuring an appropriate environment to enable successful defense-industrial modernization, and setting up domestic production of critical military technologies are key to national security in Ukraine.

In early 2017, Ukraine adopted a federally targeted program on the national defense-industrial sector development, with the Ministry for Economic Development and Commerce (MECC) put in charge of the program's implementation. But the MECC did not have a department or other constituent entity with relevant knowledge and expertise needed to give practical effect to the purposes of the program, neither did it have the jurisdiction to manage economic activities of arms manufacturing companies or to do assets accounting relating to such activities. So a logical move was to transfer this duty to a separate Government-owned enterprise under MECC's jurisdiction – the State Enterprise (SE) "Ukrainian Bez-

peka Center" ("bezpeka" is Ukrainian for "security").

Since the summer of 2017 the Company has been able to expand its focus to encompass all defense industrial sectors excepting aviation and shipbuilding, especially as it concerned efforts to create the technological and industrial environment (production machinery and other manufacturing technology) necessary for the domestic production of the armaments technologies that the Ukrainian army requires. Thus, Ukraine has developed and built the precision-guided MLRS missile and launcher system "Vilkha". The General Contractor subcontracted

other companies to build special-purpose manufacturing machines for production of Vilkha system's components. This allows to speak about Vilkha as being not a prototype but a mature, production-standard technology already in series production.

As of this date, Bezpeka has awarded over 40 contracts, some already completed and others in process. This process involves not only Ukroboronprom's companies with a role in the Program but also the Pavlohrad Chemical Plant, for example, which is a key member of the solid rocket propellant production chain. Also, work is in progress with potential →





contractors such as Pivdenny (f.k.a. Yuzhny) Machine-building Plant, Dnipro, and Fort company, Vinnytsya, among many others.

Equipment suppliers under the Program are all dealers of world-renowned brands. Manufacturing technologies are sourced out from South Korea, Taiwan and, surprisingly as it may seem, Europe. Italy is seeking a breakthrough into the Ukrainian market with its production machinery, but at prices that are somewhat too expensive. Turkish manufacturers of production machinery have not yet been there on the Ukrainian market (though some are of interest) or, to put it more specifically, have not yet got their machinery tested for armaments production in Ukraine. Work is also in progress with the USA.

Despite the high relevance of the issue, Bezpeka is seeking more than just replacing legacy Soviet-vintage production technologies with present-generation, imported alternatives. The current technical modernization process is focused more on what competitive technology will be adopted into the fully integrated technological chain, rather than on what operations a given machine can do.

Regarding the work done by the Company so far, mention should be made of a number of projects of critical significance to Ukraine. Fort, for example, has successfully done a project to set up production of pistol-caliber ammunition, and it took just four months of a collaborative effort. Following the loss of its ammunition factory in Luhansk, Ukraine has



launched new capacities for production of 9x18 and 9x19 munitions, in amounts that fully meet the needs of its military and public security services. This was the first step done. Preparations are now in full swing to set up self-sufficient production of small arms munitions, with the planned expansion of the product portfolio to include especially NATO calibers. Core equipment types will be complemented with extensions to increase production line productivity and to progressively improve the ammunition up to the level of performance required, e.g. by military users in Ukraine. This applies to calibers between 5.45 and 12.7 mm, for which production equipment is already in process of procurement.

In the missile sector, another project being pursued (along with the

Vilkha MLRS) under the Program by Bezpeka is the one that addresses production preparations for "Neptune" anti-ship cruise missile system. Relevant contract has been signed and funded. The tender process, in progress since January 2019, will enable production preparations to be completed and production launched at the soonest possible time. The Prime Contractor for Neptune and subcontractors are ready to bring the System to production phase.

Bezpeka has also worked to correct manufacturing bottlenecks with new hulls for the BTR-3 and BTR-4 APC vehicles. For factories in Kharkiv and Kyiv, contracts to purchase laser-cutting machines needed in the manufacture of the vehicle hulls have been completed. Beyond that, Kharkiv's Malyshev Plant, in 2018, embarked on a technical modernization project for its engine production division.





This project is exemplary in implementing a fully integrated, "closed-loop" production solution instead of purchasing special-purpose production machines for each given part or component. Engine components will be manufactured at a reasonable cost and at the required production rate, with minimum scrap rate. The full engine production chain has now been worked out so that Malyshev would be ready by 2020 to batch produce its engines, in the needed amount and at the required level of product quality.

Work is now in progress with respect to Shostka's Impulse Factory – the only company in Ukraine to produce explosive trains and ammunition fuses. A contract with Impulse has been signed and partly funded. It is expected that Ukraine will be able by July 2019 to self-sufficiently manufacture the V-429 fuse for large-caliber shells and to substantially expand its portfolio of fuse products by mid-2020.

Of special interest are issues addressing domestic production setup of cannon artillery rounds and powders. Ukrainian President Petro Poroshenko, while on a visit to the State-owned Artem JSC Holding, Kyiv, in 2018, highlighted the tangible progress reached in this area so far. For this production Ukraine has chosen and is implementing a leading-edge technology that only four or so countries possess. The technological process and new production machinery being purchased for Artem allow large-caliber artillery shell cases and tubes to be manufactured simultaneously on two production lines. A provisional cost estimate shows that cannon projectiles will be twice cheaper to produce with this new technology. Artem is proceeding along this path so that



all production preparations are complete some time in 2019.

Also, a major contract is in progress with the US. In the process, there are negotiations ongoing with an American company, addressing offset obligations that include equipment deliveries under offset contracts. The company has been proposed to build a hexogen production line in Ukraine, given that the latter doesn't have production capacities for this type of explosives. Beyond that, there is a decision made by Ukraine's National Security and Defense Council to set up domestic production of hexogen as part of the national ammunition industry development program, in amounts that would fully meet the country's requirement for explosives used in ammunition and missile weapons. It has been proposed through negotiations that the U.S. party should take responsibility for the so called "second phase" of the powder production program, i.e.

production of powder using imported pyroxylin. This would reduce budget pressure on the one hand, and on the other, would allow Ukraine to set up domestic production of pyroxylin as part of the national program therein mentioned.

A major facilitating factor in defense industrial modernization is the understanding by the President, Executive and Legislature of the importance of sustainable funding for technical modernization projects.

The key challenges faced by the Ukrainian Bezpeka Center are to (1) maintain 4+ level of technological capability and to gradually elevate to fifth level at the time of tight budgets across the defense industrial sector and (2) create driving forces for technological advances in the armaments production sector.

The holistic approach being implemented in Ukraine that integrates new processes and technologies into the defense industrial modernization will produce a synergetic effect in the form of (1) productivity growth, (2) enhanced-capability technology products in production, and (3) more rapid adoption of new processes and technologies within industries and across all of the defense-industrial sector, with ensuing positive impact on the competitive strength of Ukrainian produced armaments both on the domestic and international markets. **UDR**

**Volodymyr TKACH,**  
Defense Express





# NEPTUNE MISSILE

## STRIKES AND WINS

**Serhiy ZGHURETS,**  
Defense Express

**A**t the beginning of April 2019, the first operational prototype of the mobile anti-ship cruise missile (ASCM) system "Neptune" was first demonstrated to the public while performing initial test launches. Although the exact results of the tests are shrouded in secrecy thus far, there are still some insights into the new system's configuration and capabilities.

This shore-based ASCM system has been developed by Ukraine with maximum reliance on domestic resources and capacities. It was necessary in view of the need to save resources that are nothing but limitless in a country at war, and to expedite development and production – this all in order to provide, within the shortest possible time, the Ukrainian Navy with a weapon capability needed for securing the country's national interests.

### URGENT DEMAND AMID GROWING THREAT

For Ukraine, the requirement to have an indigenous anti-ship missile capability is extremely urgent in view of the national security threats coming from the Russian Federation. The situation with Ukraine's naval capabilities has worsened critically following the Russian annexation of Crimea in 2014

and the resulting loss of a major part of its naval fleet, along with shore-based 'Rubezh' missile batteries. The Ukrainian Navy, given its current poor condition, is unable to effectively counter Russia's powerful Black Sea Fleet (BSF). Its capabilities are clearly insufficient to counter possible Russian offensive involving a Marine landing on the Ukrainian shore, or to face a threat of "sea denial".

Russia, following its annexation of Crimea in 2014, has significantly built up its offensive and defensive capacities. In Crimea, Moscow deployed an anti-ship defense system comprised of components for surface targets detection at ranges up to 500 km; automated control and generation of target data; target engagement at ranges up to 350 km (this component includes "Bal", "Bastion", "Klub" and "Utes" ballistic missile battalions, warships and submarines carrying "Kalibr" SLCMs, as well as BSF's airplanes).

The BSF's attack capability has been built up by incorporating Kalibr SLCM-armed warships and submarines into its fleet. In early 2019, the BSF's fleet comprised eight Kalibr SLCM carrying combatants (two Project 11356 frigate warships and six Project 636.3 submarines) with a combined salvo of 40 missiles. The "Kalibr" missile armed with a conventional warhead can engage ground targets as far as 1,500 km away, meaning it can reach any location anywhere in Ukraine, Eastern Europe

and up to the German border. Its nuclear-warhead armed version has a range of 2,600 km that reaches across all of Western Europe and can reach London. The BSF has also enhanced its amphibious assault capability by complementing its fleet with new landing crafts and speedboats. This poses a threat of assault landing (of up to a battalion-size Marine force) into the Azov Sea operating area.

In response, the Ukrainian Navy has deployed a new coastal (tube) artillery brigade along with an Uragan MLRS regiment. But ground-based guns are extremely ineffective against sea-based targets.

It is therefore clear why it is so critical for the Ukrainian Navy to have an ASCM capability like the Neptune: it is needed for safeguarding territorial and Strait waters, naval bases, shore-based facilities and coastal infrastructures, and for deterring adversary amphibious landings on the Ukrainian coast.

### NEPTUNE ASCM SYSTEM COMPONENTS

The Neptune ASCM battalion will be comprised of two batteries, each having three launcher vehicles, one transporter/transloader vehicle, one transporter vehicle, and a fire command and control post vehicle.

**Neptune ASC Missile.** The missile comprises a core component around which the various other System components are integrated. The SE KB Luch Design & Development Company is the Prime Contractor for the Neptune project. The Neptune is

*Missile Launch from the Neptune complex,  
April 5, 2019*





Ukraine's first indigenous missile to have been developed for use from land, sea, and air platforms. To reduce costs and logistical footprint, it was decided that the missile should be unified for use from shore-based platforms, ships, airplanes and, where appropriate, from helicopters.

It looks highly unlikely that the true technical data on the Neptune ASCM system will ever be fully disclosed. But some data was able to be leaked into the press. Thus, it is preliminary known that the missile is intended to be used against surface combatants, amphibious landing ships and transport vessels sailing in strike groups (convoys) or individually. It will have a launching mass of about 750 kg and a range from 5 to 290 km. Travelling at Mach 0.9 in midcourse, the missile will skim over the sea at a height of 10-16 meters. At this low sea-skimming height the missile will be less detectable by enemy sensors and less vulnerable to air defense countermeasures. The Neptune missile will have the capabilities to adjust its path while in flight and to attack targets in the coastal zone. It is being designed as a day-night all-weather weapon capable of operating in severe EW environments and under heavy enemy counterfire. The missiles can be fired individually, or in ripples to increase the probability of success.

The Neptune missile is armed with a high-explosive fragmentation warhead fitted with either an impact fuse or a proximity fuse that detonates at a present altitude, showering the target with fragments. The 160-kg warhead is sufficiently powerful to critically damage a surface combatant or a transport vessel displacing up to 5,000 tons.

The ASCM Neptune is identical to the US submarine-launched Harpoon in terms of key component blocks: the seeker head, command-and-control system, warhead, fuel tank and propulsion. It has conventional aft-tail configuration with a cross-shaped hard wing and extended length fins.

**Missile guidance and control system** was one of the most difficult challenges to overcome. If it is to be described in a few words, the Neptune ASCM guidance system consists of inertial navigation guidance + sat-

ellite navigation guidance + radar homing head (active or passive). The guidance and control system was a three-partner collaboration between Luch, the State Enterprise Arsenal who was responsible for the inertial sensor component, and the SE Orion-Navigation (development and production of the navigation system).

The challenge was especially difficult with the seeker head. Seeker head technologies are almost impossible to buy on the international market unless they are parts of integrated weapon system, but even this is not always the case. The value of the matter in dispute amounts to between dozens and hundreds of US dollars. In Ukraine, the challenge to develop an indigenous ASCM seeker technology has been successfully handled by Radionix, a private-sector defense technology company.

The ASCM Neptune is fitted with a new active radar homing head which, if compared to Russia's ARG-35 that equips the Kh-35 missile, is twice shorter, some 15 kg lighter, can scan over wider scan angles in azimuth and elevation, is capable of finding targets at longer ranges, and has operational modes that are inaccessible to its Russian counterpart.

The active radar-homing seeker would guide the missile to attack land and surface targets – in all operational deployments of the launching platform, at day and at night, in all weathers, from any direction and in heavy electronic warfare environments. It would search and find land and sur-



Neptune ASC missile

face targets using target information inputs; select a target for attack; find out the target location in azimuth, elevation and range; compute the final approach speed; and generate target coordinates for the missile-borne guidance system.

**Missile engine.** The Neptune missile, which is deployed in a transport-launch canister produced by the SE Zhuliany Machine-Building Plant "Visar", is propelled by two separate engines for boosting and cruising, the former used to eject the missile out of the canister and bring it to the mid-course trajectory where it would be taken over by gas turbine cruise engine.

The booster used in the surface-to-air S-125 missile has been adopted for the Neptune missile. Luch once performed a contract to upgrade S-125 SAM systems for an export customer. The contract involved deliveries of extended-life missiles and upgraded missiles. Power capacities of the S-125 missile's booster have been upgraded to suit the new role.

The off-the-shelf Motor-Sich MS-400 turbojet has been adopted, with some modifications, for use as cruise engine on the Neptune missile. →

Mobile anti-ship cruise missile system "Neptune"







*Neptun Complex on the trials, April 5, 2019*

Mounted in a 315 mm diameter nacelle, the MS-400 weighs 85 kg and is 850 mm in length. A single-shaft engine, the MS-400 is characterized by high reliability, compact design, low mass-to-power ratio, high fuel efficiency, and long shelf life with minimum maintenance needs. It can start quickly at low to high temperatures and has high tolerance to instability of the input air flow. The engine is equipped with a unified bracket system allowing both internal and external mounting.

**ASCM launching platforms.** All the vehicles comprising the Neptune ASCM battery are built on the chassis of the domestic KrAZ-7634NE 27t capacity, 8x8 truck vehicle. Powered by a 460 hp turbocharged diesel engine coupled to an automatic transmission, the KrAZ-7634NE is used as launching platform for the Neptune missile. The exhaust system is located between the first and second axles, with the ex-

haust pipe pointing to the right-hand side of the vehicle. In place of two rectangular tanks with a combined capacity of 350 liters, there are two round-shaped fuel tanks, each with a capacity of 165 liters. The highly ergonomic, low-mounted cab is 2,800 mm high (by way of comparison, the cab of the 8x6 KrAZ-7140H6 has a height of 3,170 mm), allowing various special-purpose equipment to be comfortably mounted on its roof. Wide windshield offers excellent visibility. All the Neptune ASCM battery vehicles are built with armor protection.

Equipments for the Neptune ASCM battery command-and-control post have been developed by Telekart-Prybor, a privately-run company based in Odesa. Crew workstations have modular, unified design. A workstation prototype equipped with a multifunctional display was unveiled for the first time at the 2018 Arms & Security tradeshow in Kyiv. The com-

mand-and-control post is equipped for attacks both on sea-based and shore-based targets.

The target data system is designed such as to be able to be fed from a variety of external sensors and intelligence sources. The key challenge here is to enable sea-based targets to be defeated at maximum possible distances allowed by the missile's range capability. We are talking particularly about an integrated maritime surveillance and reconnaissance system comprising beyond line-of-sight radars among other sensors.

**Today and tomorrow.** The design of the cruise missile that comprises the core component of the coastal ASM system is optimal in economic terms. Compared to known foreign brands, the Neptune offers the required capabilities at a relatively low cost. The system is now being adjusted for use also from sea and air in addition to shore-based platforms. The configuration optimized for air launches will be designed without a canister, enabling the missile to be delivered from standard aircraft rocket launchers.

The new weapon systems armed with cruise missiles unified for ground, sea and air launches are going to significantly expand the Ukrainian Navy's capabilities needed for defeating surface ships and critical coastal infrastructures of a technologically advanced adversary, under conditions where the adversary is striking back with electronic jamming attacks and heavy counterfire. It is to be hoped that more and more new pages will be added to operational history of Ukraine's first indigenous ASCM system, the Neptune 





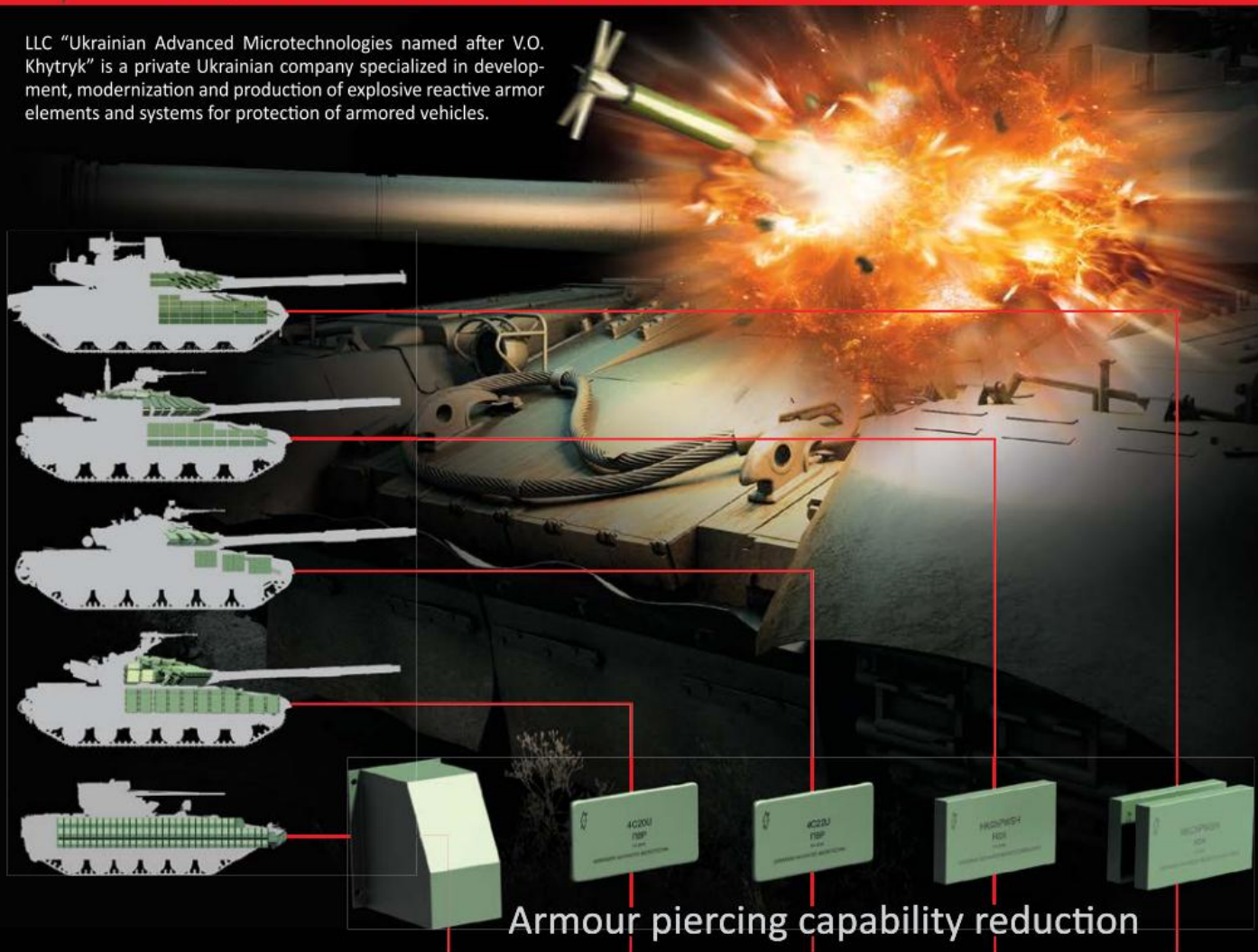


# UKRAINIAN ADVANCED MICROTECHNOLOGIES

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.



Armour piercing capability reduction

	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%





# "VILKHA" THAT CAN LAUNCH DEADLY ROCKETS

**UKRAINE'S NEW, INDIGENOUSLY DEVELOPED "VILKHA" PRECISION-GUIDED MLRS ROCKET AND LAUNCHER SYSTEM ADOPTED FOR SERVICE USE, WHILE ITS DESIGNER, KB LUCH HAS BEEN WORKING ON A CAPABILITY-ENHANCING UPGRADE**

**I**n 2019, Ukrainian Armed Forces are going to field the new, fully indigenous, highly precise MLRS rocket and launcher system called Vilkha (Ukrainian for 'alder'). The Vilkha is able to hit 12 different targets on land in a single salvo. The country's military will thus obtain an adequate weapons deterrent capability that could help contain and deter Russia's aggressive intentions.

The Vilkha has been developed out of the legacy Russo-Soviet 300-mm Smerch MLRS technology. The State Enterprise SE KB Luch R&D Company, Kyiv, is the Designer Authority for the Vilkha MLRS launcher and associated rocket system. The Design Bureau Pivdenne (otherwise known as Yuzhnoye), Dnipro, partnered in the Vilkha project among other domestic companies.

The Vilkha was developed within an extremely tight timeframe as short as 2.5 years. Only two years passed between first launches of full-size mock-up rockets in March 2016 and test salvo launches in April 2018. During a test firing session, two Vilkha rockets both hit a pole standing exactly at the target aim point. This high precision has been achieved particularly through the use of jet vents.

The rocket should be put on a stabilized course at the initial phase of its flight, but trajectory corrections might

be required at the end of the boosting flight trajectory. During the terminal flight phase, the Vilkha rocket is guided to its target using preloaded coordinate values. For this to be achieved,

Ukrainian engineers developed a rocket nose cone of a unique design.

Additionally, the launcher system





was completely redesigned from the original Smerch prototype, and its electronic "stuff" was replaced with modern technology counterparts. The resulting benefits produced a precision attack MLRS capability and a possibility to distribute targets among rockets fired simultaneously in a single ripple.

On May 26, 2017, the Vilkha was successfully test fired in a demonstration session attended by Ukrainian President Petro Poroshenko. Several rockets launched from a test range near Tuzla village, Odessa Region, successfully hit targets at a test site in Kherson Region, with an accuracy of 15 m or less.

Open source information suggests that the Vilkha is optimized to defeat targets on land and at sea at ranges from 60 to 120 km, with circular error probable not exceeding 7 m (9K58 Smerch, by way of comparison, can reach out targets at a 90-km range).

Vilkha stands out among same-class counterparts by the method of guidance used and an in-flight trajectory update capability enabled through the use of a pulse engine. It will employ a GPS-free guidance method to eliminate the risk of signal loss due to GPS jamming or spoofing attacks.

The Vilkha rocket is virtually immune to air defense attacks. Its engine gives it a speed of 1.200-1.300 m/s during the active flight phase, which is a high speed exceeding Mach 3.

All of the system's components, including rocket control equipment, rocket fuel and warheads have been developed and produced domestically in Ukraine.

The Vilkha launch platform is based on the KrAZ-7634 truck chassis (initial tests were carried out with a Vilkha launcher mounted on the MAZ-543 truck chassis).

The Vilkha MLRS rocket and launcher system has been officially adopted by the Ukrainian Armed Forces and approved for full-rate production, as announced in October 2018 by Oleh Korostelev, CEO and Designer General at SE KB Luch.

At a 2018 year-end press conference, Ukrainian Minister for Economic Development, Stepan Kubiv said that KB Luch had completed a production line for the Vilkha MLRS rocket and launcher system.



*Vilkha-M rocket can reach targets out to 130 km*

The Vilkha MLRS system is included in the Government Defense Procurement Contract 2019. It has already gone to full-rate production, with fielding due to begin by Q3 2019. The Ministry of Defense has paid an advance for purchasing hundreds of Vilkha MLRS rockets which are due for delivery during the second part of this year, Korostelev said.

The Vilkha has already generated an interest among potential export customers. Potential contracts are currently being negotiated with two Middle East governments.

Meanwhile, Luch has developed an extended range Vilkha rocket that would be capable of ranges twice as far without compromising precision. On April 4, 2019, the Vilkha-M was successfully test fired in Odessa region. New missile have a range 130 km. In terms of terminal effectiveness, the Vilkha-M competes with tactical range counterparts. It exceeds in precision the OTR-21 Tochka missile while competing with it in range performance. **UDR**

**Oleksiy SERDIUK,**  
for UDR







STATE ENTERPRISE  
«MALYSHEV PLANT»

# OPLLOT

## A LOOK THROUGH THE ARMOR

The T-84 MBT and its follow-on upgrade in the guise of the state-of-the-art Oplot MBT (which is now wholly produced in Ukraine) is one of the most outstanding achievements of Ukraine's armored vehicle industry and the domestic school of thought on main battle tanks.

## TACTICAL MOBILITY

The Oplot is powered by a 1,200hp diesel engine developed by Kharkiv Engine Design Bureau. The vehicle is unique among all of the currently existing counterparts by the ability to cross 1.8 m deep water obstacles without preparation, while preparation time for crossing river-line obstacles of up to 5m deep does not exceed 20 minutes.

## SELF-PROTECTION

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

## FIREPOWER

The Oplot MBT is outfitted with a most advanced fire control system (FCS) incorporating the PNK-6 panoramic sighting system that provides enhanced capabilities in terms of the detection, identification and engagement of targets both by day and by night. The main gun is equipped with loading system with conveyor, automatic loader and control system. The tank can also use a laser guided missile system Kombat against main battle tanks, armored vehicles and hovering helicopters within the range of 5,000 m, while standard tank rounds are employed against targets at distances up to 2500-3000 m away. The missile can be fired on the move against relocatable targets. The tandem warhead fitted on the missile can defeat targets equipped with explosive reactive armor and advanced spaced armor.





# MAIN BATTLE TANK



**UKROBORONPROM**  
Ukrainian Defence Industry



## COMMAND AND CONTROL

The Oplot tank is currently the only fielded weapon system in Ukraine that is equipped with a command and control information management system (IMS) interfaced with the tactical C4 network.

The TIUS-NM navigation support system supports data communication with armored units up to the battalion level. Its range of functionality includes the following: computing the current coordinates and directional angle of the host vehicle on the move, using the SN-370003 radio-navigation equipment NAVSTAR/GLONASS; gathering of information about the subordinate tanks' location; route setting (up to 10 routes) by setting up to 50 waypoints for each route; receive/transmit of commands with coordinates of point of destination; providing the information for the driver about the value and direction of the tank angle of turn to the point of destination; input and storage of data on authentication codes and many other things.

## SPECIFICATIONS

Total weight, t	51
Crew	3
Ground clearance, mm	470-500
Engine power, hp	1200
Movement speed, km/h:	
• average (on dry natural soil road)	40-45
• maximum (on hard-surface road)	70
Cruising distance, km	Up to 500
Trench, m	2.85
Obstacle, m	1
Deep fording (without preparation), m	1.8
Crossing water obstacles by using deep water fording equipment, m:	
• depth	5
• width	no limits
Ammunition for the main gun	46 (28 in automatic loader)
Gun ammunition types	HE-FRAG, APFSDS, HEAT, GM



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# BTR-4



## RECEIVES CAPABILITY-ENHANCING IMPROVEMENTS

**T**he BTR-4 armored personnel carrier (APC) is one of the best known military vehicles developed in Ukraine since independence. Designed from scratch by State Enterprise "Kharkiv Morozov Machine-Building Design Bureau" (KhKBM) and named "Bucephalus" after Alexander's horse, the BTR-4 epitomizes the strength, power and reliability.

The BTR-4 is designed for battlefield troops transport and to provide fire support to dismounted troops. It is intended to support Army units operating in various battlefield environments and conditions, including NBC environments. The BTR-4 is well suited to support missions performed by special operations/rapid reaction forces and marine forces. It has been designed to operate on road and cross country in extreme climates and adverse weathers, at day and night.

In terms of armor protection, the BTR-4 exceeds all of its counterparts

currently operational with Ukraine's Armed Forces. The vehicle features the weapon station BM-7 'Parus' armed with a 30-mm autocannon; ATGM launcher 'Barrier', an automatic grenade launcher and a machine gun. Aimed with a modern digital fire control system, the weapon can hit armored targets with high precision at ranges up to 5 km. High maneuverability performance is enabled courtesy of a powerful Deutz engine coupled to Allison automatic transmission, enabling a max speed of 110 km/h for the 22-ton vehicle.

The BTR-4 has a layout that is similar to that found in Western counterparts, and it is NATO-compatible. Nowadays Bucephalus is a "faithful servant" of Ukraine's military forces, especially those fighting separatist rebels in the country's eastern Donbas region.

BTR-4 has been undergoing continuous improvements based on lessons learned from its use in real-world

combat operations, with over 50 capability-enhancing changes introduced so far. Most recent updates dealt with the chassis and vehicle systems. Production-grade BTR-4 features an enhanced armor protection system that can be repaired or replaced under field conditions.

All the components and subsystems in the BTR-4 that used to be imported from Russia previously have now been substituted for domestically produced equivalents. In 2014, the vehicle had 45 per cent of its components supplied by Russia, 45 percent produced domestically in Ukraine, and 10 per cent imported from foreign markets. In 2015, the Bucephalus began to be manufactured with none of Russian-sourced components used, while the proportion of domestically produced components in the vehicle increased to 65 percent in 2015 and 85 per cent in 2016.

The BTR-4E, an upgraded and updated modification of the BTR-4 vehi-



cle, was subjected to trials at a military proving ground outside Kharkiv in the spring of 2017. The upgraded vehicle has even better level of protection for its occupants, its bullet-resistant windows withstanding direct hits of 12.7 mm and 7.62 mm rounds. Other improvements include enhanced mine blast protection, improvements in the turret, weapons control and ammunition feed systems, and the addition of an auxiliary power supply unit to enable the turret system to run without the main engine running.

In the winter of 2017, an export variant of the BTR-4 vehicle successfully completed amphibious trials at sea, and trails in mountainous and limited-access areas of Indonesia.

In March 2018, the BTR-4E underwent water-fording tests at Shyroky Lan training center in Ukraine, performed by members of the Armed Forces 92nd Independent Mechanized Brigade. Vehicles were fording water obstacles with troops mounted.

"I have something to compare with, for at times prior to being injured in action in Donbas I had an experience with BTR-series of vehicles, although of older vintage. The BTR-4E has a lot of advantages. These include a new reliable engine, comfortable conditions for all of the crew and infantry squad, powerful weapons and better vehicle handling performance enabled due to a variety of modern systems. Protection against mines is far better than one found in vehicles we fought on in 2014. We have seen that it moves as it should while in water, exactly as manufacturers said, and they deserve a lot of gratitude for that," a



member the 92nd Independent Mechanized Brigade said.


It is worth noting that initial seven BTR-4E vehicles that Morozov Design Bureau delivered to the Armed Forces in 2018 are all built from domestically produced armor steel. The special-grade steel, which meets the highest world standards of quality, underwent quality control and acceptance tests at each of the manufacturing stages. Privately-run Lozova Forging & Mechanical Plant (LKMZ) company manufactured steel hulls for the seven BTR-4 vehicles.

In order to increase production in 2018, an industrial collaboration was set up between Malyshev Plant (producer of armor steel kits), Morozov Design Bureau, and Kyiv Armored Vehicles Plant (subcontractors for

vehicle hull welding). LKMZ helped the three companies with production preparation training.

In early 2019, State Enterprise "Malyshev Plant" successfully completed the full test program for its first produced BTR-4 vehicle and was qualified to produce hulls for the vehicles, while Morozov Design Bureau is currently going through similar production qualification process.

It became known in February 2019 that Malyshev Plant and Morozov Design Bureau are completing trials on another BTR-4 upgrade featuring a new hull and enhanced armor protection. The enhancements fed in lessons from the operations in Donbas. In particular, the vehicle received enhanced armor protection for the crew and infantry squad. The tests included several hundred kilometers of off-road and paved road driving, as well as ballistic resistance, including to impacts from large-caliber machine-gun firing.

Thus, Malyshev Plant and Morozov Design Bureau are both prepared to start series production of BTR-4 vehicles using their own produced hulls. This would enable significantly sooner fielding of the vehicles with Ukraine's Armed Forces and sooner start of deliveries to export customers without relying too much on a privately run, previously single supplier (LKMZ). 

**Anton MIKHENKO,**  
UDR





# STATE KYIV DESIGN BUREAU «LUCH» – THE LEADING

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



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



**KOMBAT** | GUIDED MISSILE ROUND



**KONUS** | GUIDED MISSILE ROUND



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



**STUGNA** | GUIDED MISSILE ROUND



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



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



Type of carrier platform    Missile mass    Missile length    Missile diameter



# DEVELOPER OF ANTI-TANK SYSTEMS IN UKRAINE



**7,5 km**



**800 mm**

**5 km**



**800 mm**

**5 km**



**750 mm**

**5 km**



**700 mm**

**5 km**



**550 mm**

**5 km**



**550 mm**

**4 km**



**550 mm**

**2,5 km**



**550 mm**

Armor penetration capability



Light portable  
missile system  
Corsar




Man-portable  
rocket grenade  
launcher



Man-portable  
ATGW system Skif



# STRAIGHT ON TARGET



152 mm guided artillery round "Kvitnyk"

## KVITNYK, KARASUK, KRUCHA – NEW SMART MUNITION TECHNOLOGIES FROM PROGRESS COMPANY

**Serhiy ZGHURETS,**  
Defense Express

**S**tate Enterprise R&D and Production Complex "Progress" (SE Ukroboronprom's affiliate) has been developing new "smart" artillery rounds named "Kvitnyk", "Karasuk" and "Krucha". This would be a response given by Ukrainian armaments engineers to the Russian threat on the battlefield.

### NEW-GENERATION EVOLUTION OF THE KVITNYK TECHNOLOGY

Cannon artillery needs to be capable of striking targets with pinpoint accuracy if it is to continue to be used on the battlefield. More and more armed forces are now placing a preference on developing precision-guided artillery munitions for use from the guns already in service. The local conflicts of the modern era have forced militaries across the world to look for innovative solutions for the battlefield, while the demands placed on precision artillery weapons have become more stringent than ever.

Ukraine has in store some solutions that could be truly trend-setting.

Developed by the 'Tochnist' Central Research, Development & Technology Company (Progress' affiliate), the Kvitnyk (also known as Kvitnyk-E in its export-market version) is meant to be fired from defilade positions to deliver precision attacks on targets out to 20 km without the need for preliminary fire adjustment. Targets that can be engaged with this smart weapon are artillery, MLR and rocket launcher emplacements, self-propelled artillery systems, tanks, infantry fighting vehicles and armored transporters (both moving and at rest), bunkers, bridges and ferries, assault landing ships, transport vessels and boats.

In terms of terminal effectiveness, a single Kvitnyk round is as effective as 200-300 high-explosive fragmentation (HEF) gun-fired rounds in service with Ukrainian and other forces. With guided artillery munitions vs ordinary HEF rounds, the cost and time budgets for any given firing mission could be reduced 3- to 10-fold and 5- to 10-fold, respectively, and the number of guns required to neutralize a given target could be decreased 2- or 3-fold.

The guided artillery round "Kvitnyk" 152 was adopted by the Ukrainian Armed Forces in December 2012 after having succeeded through official qualification trials process.

However in 2014 with the onset of Russian military intervention in eastern Ukraine it turned out impossible to send the Kvitnyk into series production because it was designed with some components that needed to be sourced from Russia. To handle this challenge, Progress and Tochnist had redesigned the Kvitnyk technology with domestically-produced components in place of ones sourced from Russia previously. Beyond that, the resulting design incorporates innovative solutions that enabled substantial capability-enhancing improvements and advantages over the initial version that the Ukrainian military adopted in 2012, the two companies said.

The advantages include a wider range of the gun types suited to firing this ammunition piece, a longer range targets can be engaged, improved resistance to enemy jamming attempts, and the introduction of digital signal processing capability among other



things. As a matter of fact, the upgrade has produced a new projectile with substantially enhanced capabilities compared to the original Kvitnyk technology.

The Kvitnyk, in its upgraded configuration and without Russian-sourced components used, weighs 48 kg (including a 8 kg-plus high-explosive payload) with a length of 1.2 m.

The Kvitnyk projectile is a two-component design with guidance and explosive components. The guidance component is composed of nose assembly, target seeking head and autopilot system. The explosive component comprises warhead and stabilizing fins integrated into a single block with booster motor.

The technology designers claim the new round is capable of ranges in excess of 20 km. The upgraded Kvitnyk can be fired from 152-mm towed and self-propelled artillery cannons such as D-20, 2A65, 2S3 "Akatzia" and 2S19 "Msta-S" howitzers.

The Kvitnyk, in contrast to ordinary artillery shells, can successfully engage targets when fired from defilade – with high first-round-hit accuracy and without preliminary fire adjustment. Extensive use of precision-guided munitions in battlefield settings could alter the methods and techniques of enemy target engagement with gunfire. Guided artillery projectiles can be fired for effect without the need for handling a full set of weather and ballistic variables to accurately aim point the weapon. The Kvitnyk can be fired at stand-alone targets at a rate of three rounds per minute without preliminary fire adjustment. The projectiles can be fired in ripples against highly hardened targets, or they can be fired simultaneously from several guns against different targets without interfering with each other.

A platoon-size strongpoint, for example, will take 12 guided projectiles and 3 minutes, or 800 standard unguided shells and 12 minutes to destroy, and with substantially less friendly casualties in the former case.

The Kvitnyk projectile is designed such as to enable it to be adjusted for deployment from 155-mm cannons such as M190 A2/A6 (USA), G6 (SAR), FH77B (Sweden), or TRF1 (France).



### 120/122-MM GUIDED PROJECTILES "KARASUK" AND "KRUCHA"

The expertise that Tochnist has acquired in developing the Kvitnyk technology motivated it to expand its lineup of 'smart' artillery munitions. There is talk about the guided 122-mm projectile known as 'Karasuk' and the 120-mm guided mortar round designated as 'Krucha', which Tochnist developed jointly with Progress in 2019. The Karasuk is meant to be deployed from 122-mm cannons such as D-30 or the self-propelled gun system 2S1 Akatzia that are both operational with Ukraine's Armed Forces. The Karasuk is claimed to have 100% first-round hit probability at ranges up to 12 km. It is

intended to destroy field fortifications and light armored targets, both at rest or moving at up to 40 km/h. It can be effective also against tank targets due to having a highly lethal payload and a top-attack capability increasing the probability that the target would be hit in its most vulnerable, upper section.

The mortar round "Krucha" has been developed as a key component of a guided weapon system for use with 120-mm mortars. Conceivably, the mobile, precision guided mortar system will be an effective weapon against highly mobile opposing forces and against small-size targets like fighting vehicles and weapons emplaced in buildings or behind artificial protective barriers, in mountainous and otherwise challenging terrains. →





The Krucha is designed with a range of 8 m, a mass of about 27 kg and a length of approximately 1.2 m. Its warhead is armed with a 5 kg-plus explosive payload.

It is claimed that guided mortar weapon systems can contribute significantly to effectiveness and efficiency of mortar firing engagements – and especially so when deployed in rugged landscape terrains unsuitable for heavy guns – because they provide the ability to fire at targets moving in narrow passages and between buildings, or hidden behind hills and other barriers.

With its highly lethal high-explosive fragmentation (HEF) payload, the Krucha round could be effective not only against armored targets but personnel targets as well. It is preliminary estimated that it would take from 100 to 200 ordinary mortar shells to neutralize a gun emplacement, with crew, vs just one or two guided mortar shells.

All the guided munitions therein mentioned are fitted with a unified seeker head developed by Tochnist for these applications.

### A FEW WORDS ABOUT HOW THE KVITNYK WORKS

The use of guided munitions requires a high level of coordination between gun crews and advance reconnaissance teams with forward observers as key members. Prior to being fired at a target distanced 7 km away (in a realistic scenario, this distance is by far shorter), the weapon requires a forward observer near



the target to illuminate it with a laser beam to aim the projectile at the exact target. The forward observer would be required to have a radio and a firing synchronization device in addition to a laser designator. This task could be done by an adequately equipped drone or troops on the ground.

Once the target is selected, the forward observer would use the laser designator/rangefinder to find out the target's position in range and azimuth, and to calculate its azimuth angle. Firing charts will then be used to calculate firing data, in the manner as used for unguided artillery pieces. The data is then radio transmitted by voice to the gun crew in the rear.

The loader would then use a programming device to program the weapon for the desired mode.

Immediately once the projectile leaves the barrel, a signal is transmit-

ted via an encrypted link to the laser designator/rangefinder (that is where the firing synchronization device comes in) which would then count-down the time needed to turn on the laser target illuminator.

At a preset time (usually 5-12 seconds to impact), the laser designator would automatically switch over to pulse mode. By that time the seeker head on the projectile would be ready to capture the reflected laser beam from the target. This all is what makes the weapon so highly accurate. The same operational algorithm is applicable to the 'smart' guided shells "Karasuk" and "Krucha".

The expansive use of smart munitions would come with benefits in terms of a substantially lesser amount of ammunition required for a given mission, reduced logistical footprint and a higher level of operational and tactical mobility. **UDR**



122-mm guided artillery round "Karasuk"



120-mm guided mortar round "Krucha"



The Kvitnyk target seeking head





*Antonov An-32 airplane, overhauled and refurbished for the People's Republic of Bangladesh Armed Forces.*

# SE PLANT 410 CA: TAKING FURTHER STEP TOWARDS FUTURE

Well-developed manufacturing infrastructure, present-generation equipment, advanced aviation technologies as well as the experience and expertise gained by engineering and technical staff allow the State Enterprise Plant 410 Civil Aviation (SE Plant 410 CA) to perform high-quality maintenance, repair and overhaul (MRO) of aircraft and to hold the lead in Ukraine's aviation MRO market.

SE PLANT 410 CA is a certified MRO provider for Antonov An-24, An-26, An-30, An-32, An-72, and An-74 aircraft, Mi-8MSB helicopters, D-36 engines, as well as RU 19A-300 auxiliary power units.

## **OUR AIRCRAFT MRO SERVICE PORTFOLIO INCLUDES:**

- life extension overhaul of Antonov-series aircraft;
- CRW1, CRW2, CRW3 on Antonov An-72 aircraft at the in-house flight testing facility;
- aircraft cabin refurbishment and modification into higher comfort version;
- high-quality customized aircraft coating with modern painting materials;
- supply of aircraft components and parts.

This year SE PLANT 410 CA has expanded its service portfolio by being certified to do repair and maintenance of the An-12 aircraft AV-681 propeller system, series 4.

The enterprise has been actively working to launch an MRO service for individual components and subsystems of Boeing and Airbus aircraft, particularly, auxiliary power systems, wheels, braking systems, batteries, and has begun mastering C-checks for these brands. Currently, the enterprise is painting, besides Antonov-series aircraft, Boeing business jets according to the established international standards.

SE PLANT 410 CA is a reliable partner in aircraft MRO services for military and civilian operators.

We are open to cooperation with our business partners.

**Welcome to cooperate!**

For details, please, visit our official website:

**[www.arp410.kiev.ua](http://www.arp410.kiev.ua)**



*A Boeing airplane in the Maintenance Hangar*



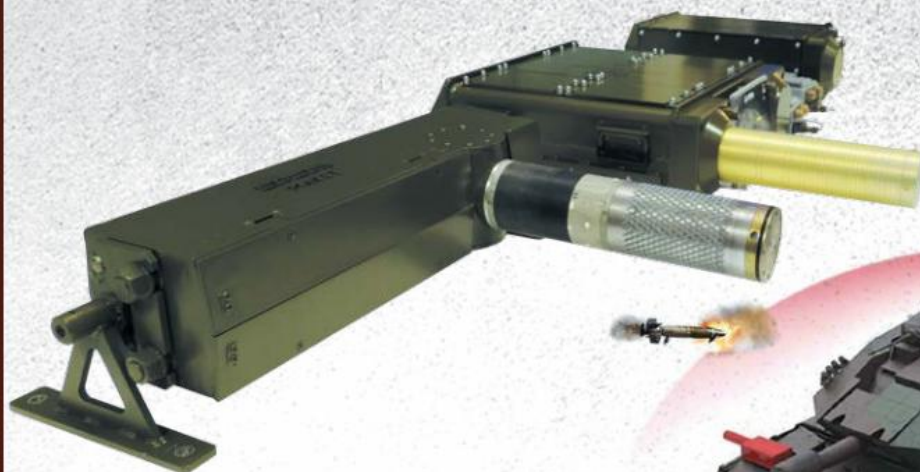
*A Boeing airplane in the Painting Hangar*



*A manufacturing site at SE Plant 410 CA*



# KEEP AWAY FROM ME!



Ukrainian active protection systems «Shershen», «Zaslon», «Zaslon-L»



Akkor Pulat, the Turkish version of the APS Zaslon-L, will go on M60-A3 Sabra MBTs in Turkish Army inventory

## HARD-KILL ACTIVE PROTECTION TECHNOLOGY SOLUTIONS FROM UKRAINE

In a modern warfare environment, armored combat vehicles need to have enhanced survivability features to be able to successfully counter anti-armor threats. More and more protective technologies with enhanced capabilities are now being developed world-wide to improve survivability of armored vehicles on the battlefield. This challenge could be handled with hard-kill active protection systems (APS) among other technology solutions already employed. Ukraine is among the few countries that produce hard-kill APS technologies for armored combat vehicles.

Prior to the onset of Russian military intervention in eastern Ukraine, Kyiv-based Microtek R&D center had developed several hard-kill APS solutions, among them "Zaslon" and its lighter version "Shershen", which both have been adopted by Ukraine's Armed Forces.

The hard-kill APS "Zaslon" is meant to protect structures as well as vehicles against antitank weapons of all types, including hand-held RPGs, armor-piercing projectiles, tank-destroying rocket-propelled (TRG) projectiles and high-explosive anti-tank

(HEAT) artillery rounds incoming at speeds from 70 to 1,200 m/s.

Zaslon has a modular layout consisting of a number of sensor-effector units housed in armored boxes, command and control unit and cabling harness. Individual boxes are installed at different points around the vehicle, offering linear coverage of the sides, front, and rear, and can be integrated also onto the turret to enhance survivability against top-attack type threats.

Command-and-control unit, housed inside a vehicle, operates autonomously, informing about the Systems' readiness status and managing all of the countermeasure modules (CMMs) on the vehicle.

In a configuration tailored for MBTs, Zaslon consists of a command-and-control unit housed in the tank's turret and several sensor-effector modules, each equipped with a millimeter waveband radar sensor and one or two countermeasures depending on the level of protection to be achieved. In each armored box there is an electrically-powered extracting device that brings the countermeasures into 'ready' position

by a command from the responsible crew member.

As the vehicle enters a danger zone countermeasures are extracted from the boxes, and radars activated, detecting objects at ranges of 8-10 meters afar, and creating a segmented perimeter at a distance of 2.5 meters around the vehicle. This perimeter functions as a threshold, acting in quick response to trigger the effector mounting that radar. As an object crosses this perimeter at predefined speed (70-1,200 m/s), specific countermeasures related to that segment are activated, throwing a thick hail of extremely fast-flying fragments to make the incoming threat detonate before it hits the armor or veer off its trajectory and away from the target vehicle. The second countermeasure is ready for action five seconds after the first one has detonated, offering protection against multiple attacks.

Specifically for application on light armored vehicles, Microtek has developed the APS "Shershen" (also known as "Zaslon-L" in its export-oriented configuration). A close-in protection system with reloadable CMMs, Sher-



shen provides all-round protection with a proven probability of success of 90% against unitary and tandem-warhead RPGs, 80% against any of anti-tank guided missiles, and 60-70% against 120/125-mm armor-piercing and explosively tipped projectiles approaching at up to 1,200 m/s. It would be also effective against threats attacking from less than 20 m and multiple threats attacking from different angles.

Importantly, the APS technologies proposed by Ukraine for application on both heavy and light armored vehicles would add almost nothing to host platform's dimensions and are 'invisible' on the battlefield. They are almost undetectable by hostile intercept receivers, and designed with substantial resistance to enemy jamming and with a high level of electromagnetic compatibility between each other and with other equipment in their surroundings.

It is worth nothing that following the start of Russia's military aggression in 2014 Ukraine has lost the Russian market along with an access to some of APS components it sourced from Russian suppliers previously. To overcome this challenge Microtek, during 2015-16, redesigned its APS technologies with a focus on fully substituting Russian components for counterparts sourced from suppliers other than Russia. As a result of this effort, Microtek developed a new transceiver module (radar sensor) for the Zaslon, and Russian-sourced components were all replaced with US-made equivalents.

The Company had manufactured three prototypes of the transceiver module and two prototypes of the countermeasures module before the APS, upgraded with this new "stuff", was subjected to successful trials held in the summer of 2017. As of this day, Zaslon and Shershen have been in series production at Artem Machine-building Plant (a State-owned company affiliated with the Ukroboronprom defense industries group). Turkey's Aselsan became the launch export customer for Zaslon-L when, at the 2017 Arms & Security tradeshow held in Kyiv, it signed an agreement to produce the technology under license from Microtek. As reported in April 2018, Akkor Pulat, the Turkish version of the APS Zaslon-L,



*Ukrainian active protection systems on UAE' APC*

will go on M60-A3 Sabra MBTs in Turkish Army inventory.

The upgraded Zaslon is advantageous in that six CMMs can be installed at different points around the vehicle, vs the original design where only one CMM could be mounted on each of the vehicle's sides. It also eliminates the problem of simultaneous activation of several CMMs. The new Zaslon has a unified design that makes it suitable for integration with heavy tanks and light armored vehicles alike, the only difference being a less powerful explosive charge used in the latter instance to avoid possible damage to the lighter-weight platform. It also introduces a new

radar sensor that causes no interference with other sensors on site. These features are all present in the systems being exported to Turkey.

Ukroboronprom continues searching for new markets for Ukrainian APS products. In 2018, Ukrainian APS projects were showcased at the international exhibitions ADEX (Azerbaijan) and MSPO (Poland). Most recently, the upgraded Zaslon-L was seen exhibited at the international defense technology exhibition IDEX-2019 held in Abu Dhabi, UAE, between 17-21 February. **UDR**

**Oleksiy SERDIUK,**  
for UDR



*Polish tank «Anders» with APS «Shershen»*



# 90K6E UKRAINIAN 3D RADAR BY ISKRA

The **90K6E** – is a 3D, surveillance radar intended for detection and tracking of different air targets at variable altitudes at operation range up to 500 km and up to 40 km in altitude. It is able to track up to 500 targets simultaneously.

This radar is equipped with a digital active phased antenna array and a distributed transistor transmitter.

Radar 90K6E designed for use in anti-aircraft missile forces (for target data acquisitions) and in the Air Force and Air Defense units to control air area.

Antenna rotation speed of 12 rpm allows to update the data on highly maneuverable cruise missiles every

5 seconds during flight at extremely low altitudes.

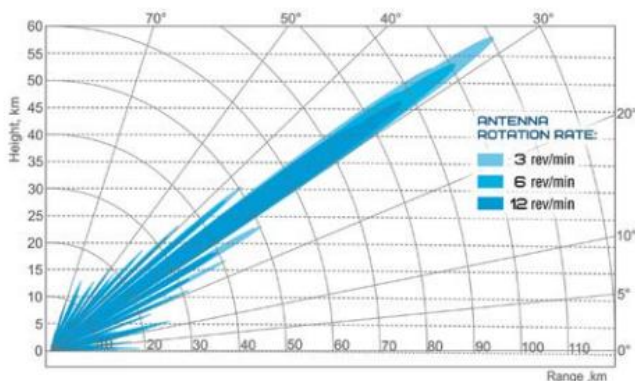
The scanning mode 70 degrees sector in elevation allows to provide target designations on tactical/artillery missiles to the air defense systems.

3 rpm antenna rotation speed and surveillance mode with the transmitter energy concentration in a narrow 3 degree beam is used for early detection of small-sized targets. The elevation-controlled concentration of the radar transmitter energy can be used to track targets with the low RCS up to 70 degrees in elevation with scanning mode 3 degrees or 35 degrees sector in elevation and highly maneuvera-

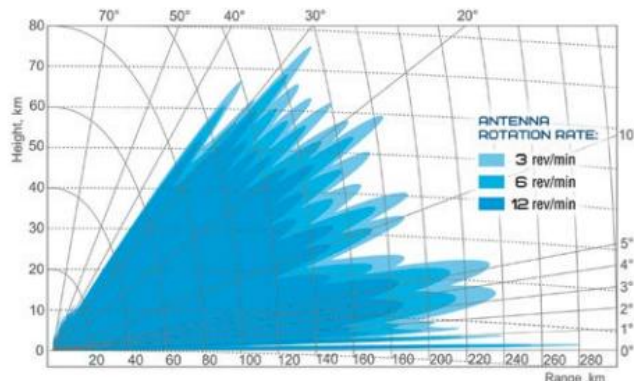
ble cruise missiles during flight at extremely low altitudes.

The designers of SE SPC Iskra paid special attention to the high tactical mobility and reliability of the product. Radar can be transported by all means of transport, including one of the world's most popular military transport aircraft C-130. The radar deployment time is 10-15 minutes, the radar post is equipped with an automatic antenna deployment system.

The 90K6E has an autonomous power supply system consisting of the main and reserve diesel generators. Radar operators receive up-to-date diagnostic data of radar equipment state. **UDR**



Coverage for air-launched missile at energy concentration mode for 32° in elevation



Coverage for MIG-29 in scanning mode 35° in elevation



## BASIC TECHNICAL DATA

Operating frequency range	S
Maximum radar operation limits:	
in range, km	500
in azimuth, deg	360
in elevation, deg	0...70
in altitude, km	40
Scanning interval, s	5, 10, 20
Target detection range, RCS=3m2	350
Transmitter type	Solid State
Transmitter peak power, kW	30
Antenna type	DAPAR
Number of beams	16
Clutter suppression, more, dB	50
Jamming cancelling, more, dB	20
Track throughput, more than	300
IFF equipment	built-in
Number of transport units	2



# 1L221E COUNTER-BATTERY RADAR

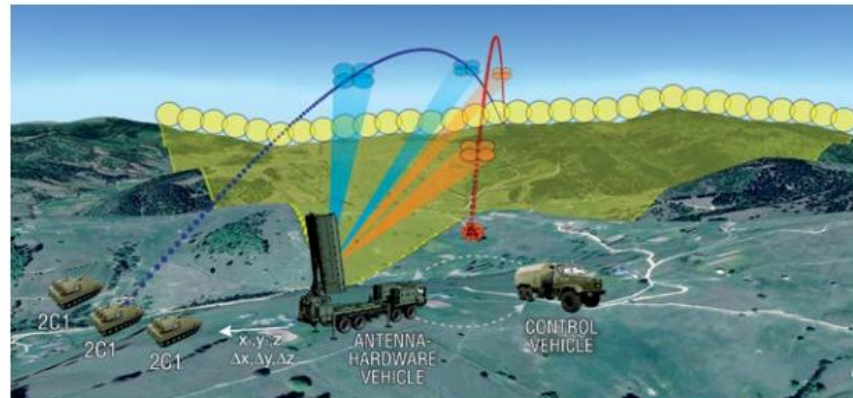
Counter-battery Radar 1L221E is one of the modern developments of SE SPC Iskra. 1L221E is a Radar complex, equipped with the digital active phased antenna array (DAPAA).

Complex provides the reliable and high-accuracy detection of hostile artillery position coordinates for the entire fire depth, verifies the shooting system classes (mortars, artillery, tactical missiles) and issues the target detections for automated fire control systems. Complex can adjust artillery and missile systems by detecting the coordinates of impact point for mines, shells or missiles, so as detects and tracks aerodynamic low RCS targets of UAV type.

Radar complex 1L221E is composed of two transport units: antenna-hardware vehicle at 8x8 chassis and control vehicle with personnel workstations at 6x6 chassis. Such separate construction improves the personnel protection against antiradiation missiles and bombs in warfighting conditions. The other advantage of such design is the possibility to operate the Radar without control vehicle using the remote workstation located in intrenchment.

This complex has the high-mobility category because of its construction and short time for deployment/closing down. 1L221E can be also operated at any weather in different climatic conditions and in conditions of intense radio countermeasures.

## OPERATING PRINCIPLE



This is courtesy of SE SPC Iskra

1L221E Radar maintain the reconnaissance and spotting modes simultaneously

## SPECIFICATIONS

Band	S
DETECTION RANGE OF FIRE POSITIONS	
- mortars	25 km
- artillery	28 km
- MLRS	45 km
- tactical missiles	80 km
ELECTRONIC SCANNING SECTOR	
- in azimuth	60° (±30°)
- in elevation	40° (+25°/-15°)
Accuracy of fire position coordinates detection	0.35% in range
Productivity of detection	≥80 fire positions /min
Deployment/closing down time	5/5 min
Crew	4 persons
Transport units	2
Power Supply	Diesel-generators or 380Vx50Hz

Radar complex 1L221E can be used in large-scale conflicts, in a wide concentration of weapons, in a difficult radioelectronic and targeted conditions, so as at necessity of limited interventions to suppress the widespread fire means and to detect the hit-and-run weapons location. Radar can be used in peacekeeping operations to control the cease-fire mode on a large area. **UDR**

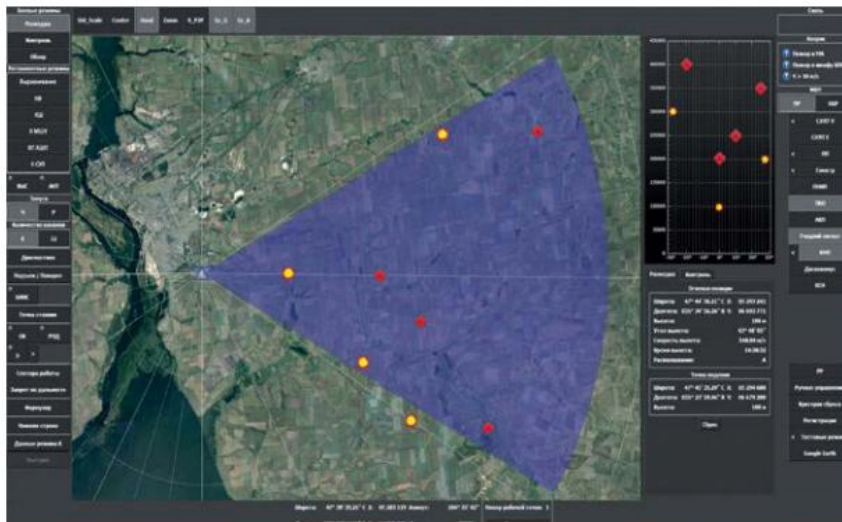


Antenna-hardware vehicle of 1L221E complex



Vehicle with personnel workstations

## DATA DISPLAY MAIN WINDOW





UKRAINE EXPANDING ITS  
CAPACITY TO DEVELOP, BUILD,  
AND UPGRADE HELICOPTERS

# HELICOPTER MODERNIZATION

**T**he ongoing military conflict between Ukraine and Russia, Western sanctions imposed on Russia for its role in Ukraine crisis, and the termination of collaborative economic ties between the two countries have marked a major milestone in the aviation industry development in Ukraine. The urgent need to end reliance on Russia has motivated Ukrainian industries to pursue some initiatives that have already brought about certain positive results. Ukraine's helicopter industry, having suffered a major blow after a break-up of traditional economic ties with Russian counterparts, has over the past five years not only been able to keep on its feet, but to grow further and to expand its business frontiers.

In Ukraine, several industries, both Government-run and privately-owned, are proposing initiatives pursuing comprehensive modernization of the country's existing helicopter fleet while promoting own products for marketing on markets in Ukraine and beyond. This could open up new opportunities for these industries, especially in the light of the urgent need for Ukraine to have aviation fleets of its Armed Forces and other national security services modernized up-to-date at the time of

Russia's continued military intervention in eastern Ukraine.

## JSC "MOTOR-SICH"

Motor-Sich was one of the first to come with initiatives on indigenous development of helicopters for the country's Armed Forces and public security services.

In the helicopter modernization area, Motor-Sich has pursued the following avenues:

- Comprehensive, MSB/MSB-V upgrade to the Mi-8 helicopter

- Mi-2 helicopter's refurbishment, overhaul, and upgrade to the MSB/MSB-V standard

- Development and manufacture of the new helicopters "Nadiya" and MSB-2.

- Development of the new MSB-6 "Otaman" helicopter in a collaboration with international partners.

The MSB/MSB-V upgrade package includes a new engine, avionics and self-protection systems developed through collaborations with top leading domestic manufacturers.



Mi-24 PU-1



The MSB/MSB-V will be powered by new, 2 x TV3-117VMA-SBM1V Series 5 electrically started engines rated for 2,500 horsepower each. The engine provides more power while consuming less fuel. It enables a cruising speed of 270 km/h and the maximum usable altitude of 7,500 m. The MSB/MSB-V will be able to carry payloads of 5 to 6 tons depending on the type and layout of the cargo carried.

For the Mi-2, the upgrade is proposed with 2 x AI450M, 465 hp engines enabling a maximum takeoff mass of 3,700 kg, a maximum speed of 220 km/h, and a maximum usable altitude of 5,000 m.

Re-engining is only one of the Motor-Sich' proposed improvements to the Mi-8 and Mi-2 helicopters, to be followed by the replacement of the avionics kit and other mission systems as requested by the Customer. Ukrainian-manufactured systems or foreign brand alternatives can be used depending on the Customer's needs and budget.

In a configuration tailored for the operational needs of Ukraine's Armed Forces, the Mi-8MSB/MSB-V is fitted with an Adron's self-protection system and Photoprylad's PM-LKT podded, integrated target detection and aiming system. Both systems are suitable for use also on the Mi-2 helicopter.

It is worth noting that both the Mi-8 and Mi-2, if upgraded, can be configured for roles and missions that include air-to-ground attacks, emer-



*Softex-Aero VV-2 helicopter*

gency air ambulance, cargo transport and search & rescue.

Given the proposed upgrade options and the number of the design changes packaged into the upgrade and refit packages, Motor-Sich has worked on relevant certification programs and on launching production of the helicopters it developed under the brand MSB (MSB-8 and MSB-2 "Nadiya").

It was reported in May 2018 that Motor-Sich had been awarded an order from Ukraine's Ministry of Defense to upgrade a quantity of Mi-8 helicopters to the MSB-V configuration. Today, the Company has several

running contracts from the Ministry of Defense. One of them – for re-engining Mi-8 helicopters under the Government Defense Procurement Plan 2018 – has been completed and the helicopters delivered to the Customer. New contracts awarded to the Company for 2019 will upgrade Mi-8 and Mi-2 helicopters to the Mi-8MSB-V and Mi-2MSB standards, respectively.

Also, Motor-Sich has in the past few years been extensively working with international partners pursuing a collaborative helicopter development project that would help Ukraine get a new helicopter developed sooner. This effort has produced the MSB-6 "Otaman" – a helicopter developed bi-nationally by Ukraine and Poland out of the Polish-designed multipurpose combat helicopter W-3 Sokol. As things stand now, however, the Otaman project has been kept on hold due to a lack of support from the Polish partners who are looking more at the EU and US brand helicopters already being assembled semi-knocked-down in Poland.

#### **AIRCRAFT REPAIR PLANT AVIACON**

The Konotop-based Aircraft Repair Plant Aviacon (an affiliate of the Ukroboronprom Defense Industries Group) has developed the PU-1 upgrade to the Mi-24 "Hind" gunship →



*Mi-2 MSB V*





*Mi-8 MSB/MSB-V upgrade to the Mi-8 helicopter*

and attack helicopter. The PU-1 package includes re-engining the chopper with the Motor-Sich TV3-11VMA-SBM1 turboshaft engine that enables payloads of up to 1,000 kg and a maximum ceiling of 1,500 m. Other major upgrades include a foreign brand electronic-optical system to support targeting of precision-guided weapons as well as navigation tasks and night-time missions.

The first Mi-24 PU-1 prototype was fitted with French-supplied Sagem Euroflir 410 optronic system. In further prototypes this was replaced with a domestic alternative – the electro-optical/infrared system PM-LKT manufactured by the R&D and Production Company "NVK Photoprylad".

The PU-1 upgrade incorporates state-of-the-art mission systems such as laser crosshair line generator (manufactured by Adron), LKK-V guided missile control system (Izium Instrument & Apparatus Factory), ASP-17VPM-V enhanced-capability sighting system (TsKB Arsenal) and improved communications.

In 2016, the PU-2 upgrade to the Mi-24 was announced and tested. Packaged into the PU-2 upgrade is a night-vision system (THL-5NV hard helmet with PNL-3 night vision goggles) developed by the Polish company PCO S.A. for PNL 3 "Bielik" helicopter pilots.

These improvements are aimed to achieve a higher performance and to add a night attack and precision-guided weapon capability.

The Mi-24 PU-1 has been adopted by Ukraine's Armed Forces, with three such helicopters fielded with Army aviation units in October 2016.

### SOFTX AERO

Softex Aero, a privately-owned firm based in Brovary, outside Kyiv, is focusing on the development and manufacture of multipurpose helicopters and business jets. Prior to the onset of the military conflict in eastern Ukraine, Softex Aero was specializing in the manufacture of the multipurpose business jet V-24.

The firm has since 2015 had three running programs focusing on the development of light multipurpose helicopters, two of which might be of interest to the military and public security customers in Ukraine.

Unveiled in 2016, the helicopter VV-2, due to its resemblance to the U.S.-manufactured Bell AH-12 Viper, has been regarded a future strike helicopter of Ukraine's Armed Forces.

The VV-2 has an airframe built out of composite materials and incorporates assemblies and mission systems sourced out from foreign suppliers. In particular, it is powered by the Czech-manufactured, ~245 hp engine

PBS Velká Bíteš TS 100 ZA. With its composite material airframe and relatively low mass and size, the copter can carry payloads up to 380 kg. It can be equipped with avionics systems of varying types and brands requested by the Customer.

The VV-2 sits two, with the pilot and passenger sitting in tandem.

This helicopter is suitable to be converted to remote controlled operation. This therefore makes it a versatile platform on which to develop a varying range of aerial vehicles with mission-specific capabilities.

Another multipurpose helicopter being produced by Softex Aero is the V-22 that is powered by a 110 hp Viking Air Engines automotive engine modified specifically for this application. As with the VV-2, the type of the avionics system on the V-22 is Customer selectable.

Softex Aero describes its VV-2 and V-22 light multipurpose helicopters as suitable platforms for roles and missions such as intelligence, surveillance and reconnaissance (ISR), emergency air ambulance, air-to-ground attacks, and pilot training, and they could also find commercial applications in industries such as agriculture and energy among many more others.

Both helicopters are designed such as to allow the incorporation of addi-



tional equipment specific to the types of missions to be flown.

Given that Softex Aero is open to adopting into its products varying aviation technology solutions developed by entities external to itself, its joint work and collaborations with the leading Aeronautical companies in Ukraine could produce awesome results that could help resolve more than one challenge associated with equipping the country's military and national security services with modern manned and unmanned aviation capabilities.

### **KB AEROCOPTER, NTK HORIZONT**

Design & Development Company "KB Aerocopter", Poltava, and R&D and Production Complex "NTK Horizont", a company based outside Kyiv, are both privately-owned specialists in helicopter development and production.

Light Aerocopter-brand helicopters meet strong demand in major EU markets and some Middle East markets. Iran has been reported to have expressed an interest in localizing production of Aerocopter helicopters.

The centerpiece of Aerocopter's portfolio is AK1-3 "Slava" – a light multipurpose helicopter powered by an automotive Subaru engine that is powerful enough to allow the aircraft to stay aloft during 2.5 hours, covering ranges up to about 350 km, with payloads weighing up to 250 kg. Its composite material cockpit has seats for two, and rotor blades are made out of composite materials, too.

NTK Horizont, another Ukrainian specialist in production of light multipurpose helicopters, has developed its Skyline SL-231 SCOUT – a three seat helicopter that has a cockpit built out of composite materials and is equipped with an avionics kit sourced out from the Slovenian company Knardia. Its design allows for integration of mission systems from Dynon SkyView, Advanced Flight Systems, and MGL. The Skyline SL-231 SCOUT is powered by the US-built Lycoming IO-390 engine rated for 210 horsepower. Weighing just 450 kg empty, the SCOUT can carry payloads of up to 400 kg to a maximum range of 600 km, cruising at approximately 190 km/h.



AK1-3 "Slava" helicopter. Flight tests, military proving ground, 21 September 2018



SL-231 Scout helicopter. Flight tests, military proving ground, 21 September 2018

In September 2018, the SCOUT and Slava both underwent successful flight testing and demonstration at the Armed Forces' training and proving range outside Chernihiv, attended by Oleksandr Turchynov, Ukraine's National Security and Defense Council Secretary.

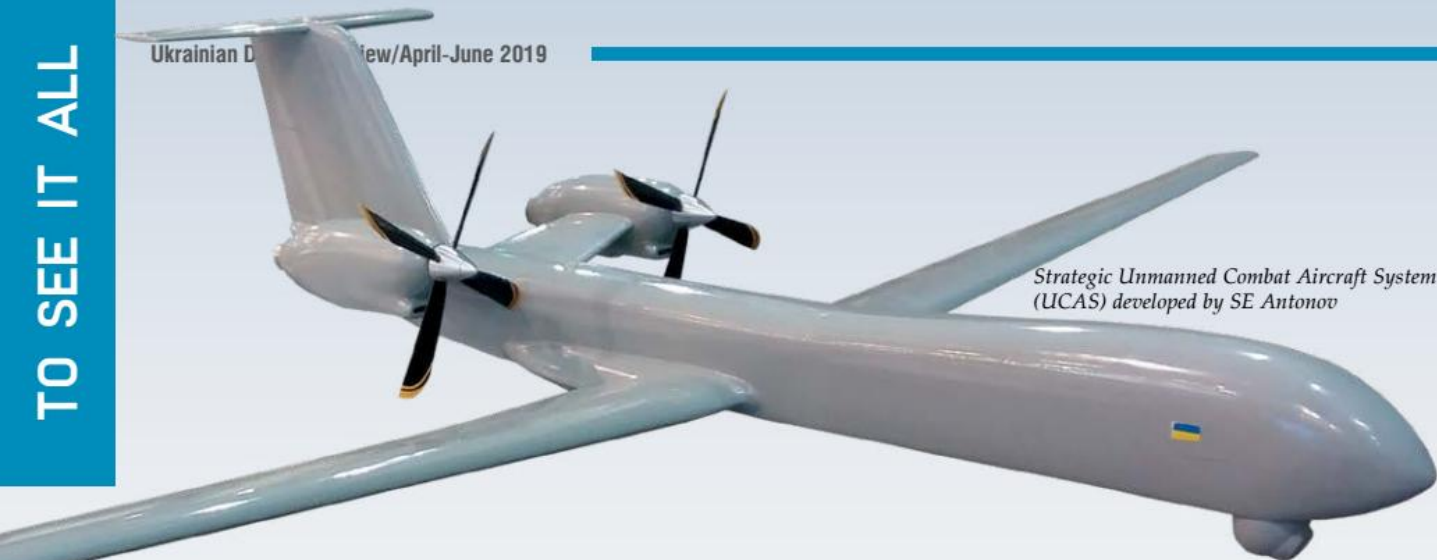
Speaking to the media immediately upon completion of the test missions, Turchynov said the Ukrainian helicopters are able to fly ISR missions, maintain liaison with troops on the ground, perform border security surveillance, and, if armed with modern weaponry, perform complex combat tasks. He specifically said that the helicopters "come equipped with day/night capabilities and, which is even more importantly, can be operated without humans on board".

Studies of the current situation in Ukraine's aeronautical industry, and specifically in its helicopter sector, show the presence of a substantially

broad range of initiatives and promising projects that could form a basis for a multi-year national program on equipping the country's defense and policing agencies with new, indigenously manufactured helicopters and their respective remote-controlled derivatives. The technical solutions proposed by Ukrainian industries (both government-run and privately-owned) are competitive and have generated a substantial amount of interest among international partners. This could be a major contributing factor in the growth and development of the Ukrainian industries involved with the development, production and MRO of helicopters, and could also motivate them to create new current-generation products for marketing in and outside of Ukraine. **UDR**

**Grygoriy KUSHCHELEP,**  
for UDR





Strategic Unmanned Combat Aircraft System (UCAS) developed by SE Antonov

# NEW UAV CAPABILITY FOR UKRAINE

## SE ANTONOV HAS BEEN DEVELOPING A STRATEGIC UNMANNED COMBAT AIRCRAFT SYSTEM

**S**E Antonov, Ukraine's top leading aircraft manufacturer, has been developing a strategic Unmanned Combat Aircraft System (UCAS). This endeavor is necessitated by multiple reasons, among them the urgency of the topic, the need for technological innovations, and a lack of capabilities Ukraine needs to regain full control over its territories under Russian occupation and over the border with the Russian Federation.

The urgency for Ukraine to develop an indigenous UCAS capability is necessitated, in the first place, in view of the ongoing Russian military intervention in eastern Ukraine. For Ukraine, it is now critically urgent to restore control over all of its 2,000+ km long border with Russia. So it would need an long-range intelligence, surveillance and reconnaissance (ISR) capability that would allow it look into the depths of hostile territory in order to be able to detect and prevent in due time preparations for and the conduct of a possible major offensive operation by Russia against Ukraine.

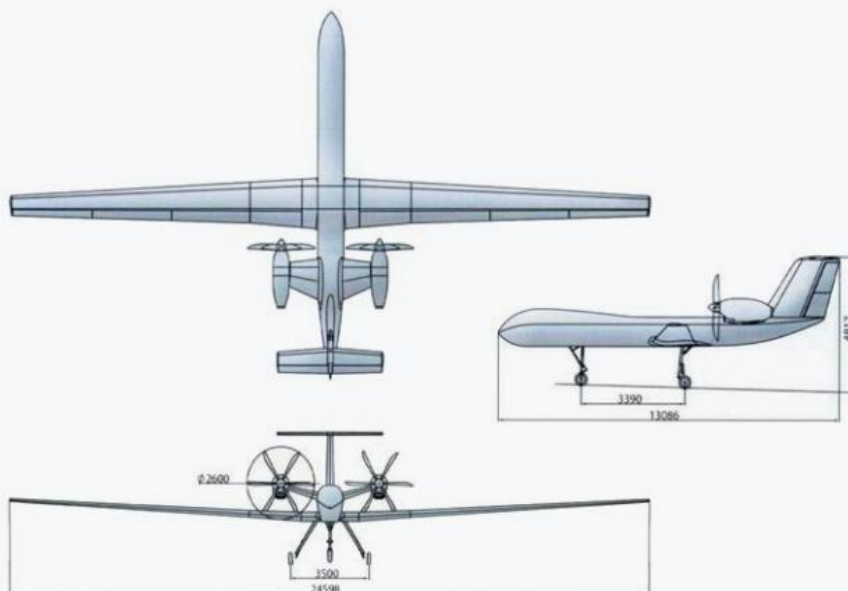
Ukraine's indigenous UCAS, in addition to ISR capabilities, is conceived with the capabilities for communica-

tions transmission and for delivering precision air-to-ground attacks with bombs and missiles.

On the positive side is also a possibility for the domestic defense industries to catch up modern technology and to gain experience and expertise in development and production of this class of high-tech armed drones for its own military as well as for export markets. This would bring Ukraine

into the elite, US-led circle of very few countries capable of developing and manufacturing such sophisticated technologies.

Despite the difficulty of the challenge, Oleksandr Turchynov, Ukraine's National Security and Defense Council Secretary said at a meeting with the country's senior military leaders and top managers of the defense industrial establishments in May 2016 that there has been set a task to achieve a significantly advantageous force balance by launching domestic production of most promising air drone technologies capable of searching and finding targets and delivering pin-point targeted strikes on enemy fighting positions. He went on to note that Ukraine is facing the challenge of establishing the domestic production of short-range tactical and strategic UAVs with a long-range threat detection capability. As Turchynov put it, "...the State has no other





alternative but to respond adequately to enemy incursions by indigenously producing UAVs equipped for ISR and air-to-ground attack missions".

At the same meeting, it was said that SE Antonov, the flagship company of the aviation industry sector in Ukraine would lead the project for domestic development and production of short-range tactical and strategic UAVs.

Shortly after, in 2017, SE Antonov unveiled its short-range tactical UAS named "Horlytsia" (Ukrainian for "dove"). The Horlytsia UAV was flight tested in October 2017 after having succeeded through survivability and wind tunnel trials. Funded privately by Antonov, the Horlytsia UAV project is still in progression.

A year later in October 2018, at the Arms & Security tradeshow held in Kyiv, Antonov exhibited to the public a prototype of its strategic UAS. Speaking at the event, Mykola Vorobyov, director of UAS programs at Antonov, said that development and production of air drones and associated systems is one of the Company's key business activities, this being carried out with innovative, current-generation R&D capacities.

The strategic UCAS project is foreseen to be done as a collaboration with international defense technology companies, in conformity to the Defense Ministry developed operational requirements document regarding the development of a strategic unmanned combat aircraft system with a maximum takeoff mass of 6 tones.

M. Vorobyov, in an Interfax-Ukraine interview, said Ukraine is unfit to do such a sophisticated technology project all on its own, for reasons that may include serious budgetary pressures and the difficulties involved with implementing some of highly complex, modern high-tech solutions. Still, this goal is achievable, provided that there is a collaboration with international defense technology partners and a particular number of orders on portfolio. "That is what we are working for together with SE UkrSpecExport", M. Vorobyov said. There has been currently negotiated a collaboration in which Ukraine would build the UAV platform and engine, and an international partner would be responsible for a part of the mission equipment package.

Antonov estimates that this UAV would be rated for a payload of 1.4 tons, including antitank weapons, bombs and missiles. The UAV is designed with a wingspan of 24.63 m, takeoff mass of 6,000 kg, cruising altitude of 12,200 m and endurance of 24 hrs. It will be propelled by two domestically produced AI-450 turbofan engines (2x750), enabling cruising speeds from 310 to 420 km/h.

It is thus far unknown which country might be selected to assist Ukraine in developing the strategic UCAS. As an interesting note, Turkey has been pretty active in developing an armed UAV with almost identical capabilities.

The Undersecretariat for Turkish Defense Industries (SSB), in March 2019, revealed fresh details of its Akinci (Raider) armed unmanned aerial

equipped with indigenously developed mission equipment, including an Aselsan-supplied active electronically scanned array (AESA) radar, electronic warfare (EW), and satellite communication systems. It will also be able to carry a wide range of external weapons, such as the Roketsan MAM-L precision-guided bombs (PGBs), Cirit guided rockets, as well as the latest MAM-C smart munition that has just entered serial production. The MAM-C can engage targets that are up to 8 km away depending on its launch altitude. Initial deliveries are due in 2021.

Given the current level of collaboration between Ukraine and Turkey in the defense sector, and especially the recent purchase by Ukraine of a six Bayraktar TB2 combat UAVs from Tur-



Short-range tactical UAS named "Horlytsia"

vehicle, which is under development by local enterprise Baykar Makina. The Akinci UAV is designed with performance capabilities that are very similar to those proposed by Antonov for Ukraine's future strategic UCAS. Thus, The Akinci UAV will have a wingspan of 20 m and a maximum take-off weight of 4,500 kg. It is expected to be capable of staying aloft for up to 24 hours and attain an operational ceiling of 12,192 m.

According to the SSB, the Akinci will be able to carry internal and external payloads of up to 450 kg and 900 kg respectively. The air vehicle will be powered by a pair of indigenously manufactured PD-222 turbo-diesel engines built by Tusas Engine Industries (TEI) in partnership with US company General Electric. The drone will be

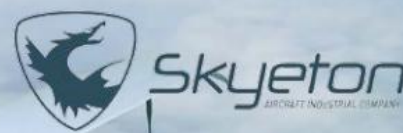
key, the possibility of the two countries expanding cooperation into developing a strategic UCAS capability for Ukraine doesn't look that unlikely, but only time will tell whether this will be the case.

Be this as it may, it is understood that – pending completion of the development of an indigenous strategic UCAS capability, in a collaboration with an international customer – Ukraine will have to employ the U.S. Air Force's RQ-4 Global Hawk UAV, which is reported to have flown since 2016 several ISR missions along the separation line in Donbas, areas on border with Russia and its annexed Crimean Peninsula. **UDR**

**Anton MIKHLENKO,**  
UDR



# RAYBIRD-3 UAS



## BORN TO FLY

**Serhiy ZGHURETS,**  
Defense Express

**S**kyeton, Kyiv, has completed the full cycle of trials of its Raybird-3 Unmanned Aircraft System (UAS) that is already awaited by the Ukrainian military. In designing the Raybird-3 technology the Company focused on three key aspects: the airframe and its capabilities; the maximum possible degree of flight automation from takeoff to landing at the selected place; and reliability of operation and durability.

It might be hard to believe, but this small-factor UAS aircraft that weighs only 20 kg fully equipped can stay airborne for nearly 24 hours performing reconnaissance surveillance missions and feeding live video footage to its associated ground control station. In terms of air endurance, it has very few rivals of similar size and weight worldwide.

Designed for professional use, the Raybird-3 UAV has an in-air endurance of  $\geq 20$  hours and can fly missions while transmitting live video streaming within a radius of  $\geq 100$  km. In terms of NATO UAS Classification by range, it could be classified as belonging to Class II (operational/theater, mission radius  $\geq 50$  km, LOS) or Class III (strategic/national, mission radius  $\geq 200$  km, BLOS).

In its current configuration the Raybird-3 UAS consists of two UAV aircrafts with mission-specific payloads, a foldable catapult launcher, a ground control station (GCS), aerials and other support equipment, including spare parts and fixings, all transportable in four containers weighing collectively about 200 kg. The UAS can be transformed from unpack to operation by two personnel within 15-20 minutes.

The Raybird-3 aircraft doesn't require any screwdrivers, wrenches or other similar tools to assemble for use or disassemble for storing. It is launched by a mechanical catapult of a proprietary design developed by Skyeton. Landing is assisted by parachute to slow down its descent and with a reusable, electrically pumped airbag to cushion the impact on the airframe. While approaching the landing site, the aircraft "turns on its back" to minimize the risk of mechanical damage to payload equipment. It is powered by carbureted engine developing 3 hp (which on several occasions proved excessive for some of the routine missions tested), while electronic fuel injected engine is optional. Max operational ceiling is 3,000 m. Onboard starter/generator provides electric power to the mission and payload equipment and enables remote engine on/off control while in flight. Critical systems such as flight control

### RAYBIRD-3 UAV AIRCRAFT. TECHNICAL SPECIFICATIONS

Range of Radio Silence flight, km	2,500
Pre-programmed flight mission radius, km	1,000
Mission radius, with live video streaming and telemetry data transmission, km	up to 140
Counter-ECM capability	Available
Max/cruising/min air speed, km/h	160/120/65
Max service altitude/*with electronic fuel injected engine, m	3,000/4500*
Cruise altitude, m	1,000-2,000
Wing span/length/height, mm	2,985/1,830/320
Max takeoff mass, kg	21
Empty weight, kg	11
Payload mass	$\leq 7$ kg, Gyro-stabilized, multi-sensor OCTOPUS Epsilon 140Z gimbal Epsilon 140Z gimbal, which integrates EO/IR sensors and laser designator-rangefinder, is capable of automatically tracking up to five objects, moving or static, simultaneously.

surfaces and servos are duplicated to improve reliability and safety of operation.

Since the flight is highly automated from takeoff through flight to touchdown, the human operator's duties are mainly limited to dealing with payload equipment. Modular architecture allows for payloads of up to 7 kg – ranging from a snapshot camera, gyro-stabilized camera, laser rangefinder or synthesized aperture



radar – to be mounted in a stabilized gimbal. Payload packages can alternatively include radio relays and electronic warfare/countermeasure equipment. During the most recent trials, an RAYBIRD-3 aircraft was flight tested equipped with a gyro-stabilized OCTOPUS Epsilon 140 electro-optical and infrared (EO/IR) sensor gimbal. The Epsilon 140 has optical and digital zoom capabilities for recognizing, identifying, and tracking objects at day and night – with excellent image stabilization. It offers a 20 cm resolution at an altitude of 2 km, enabling a car license plate number to be read from 400 m away. The gimbal is able to lock on and automatically track up to five objects of interest, moving or static, simultaneously and to automatically locate the objects within its field-of-view. The aircraft can be optionally equipped with Epsilon 140Z gimbal integrating an optically zoomed IR camera with a laser designator/rangefinder.

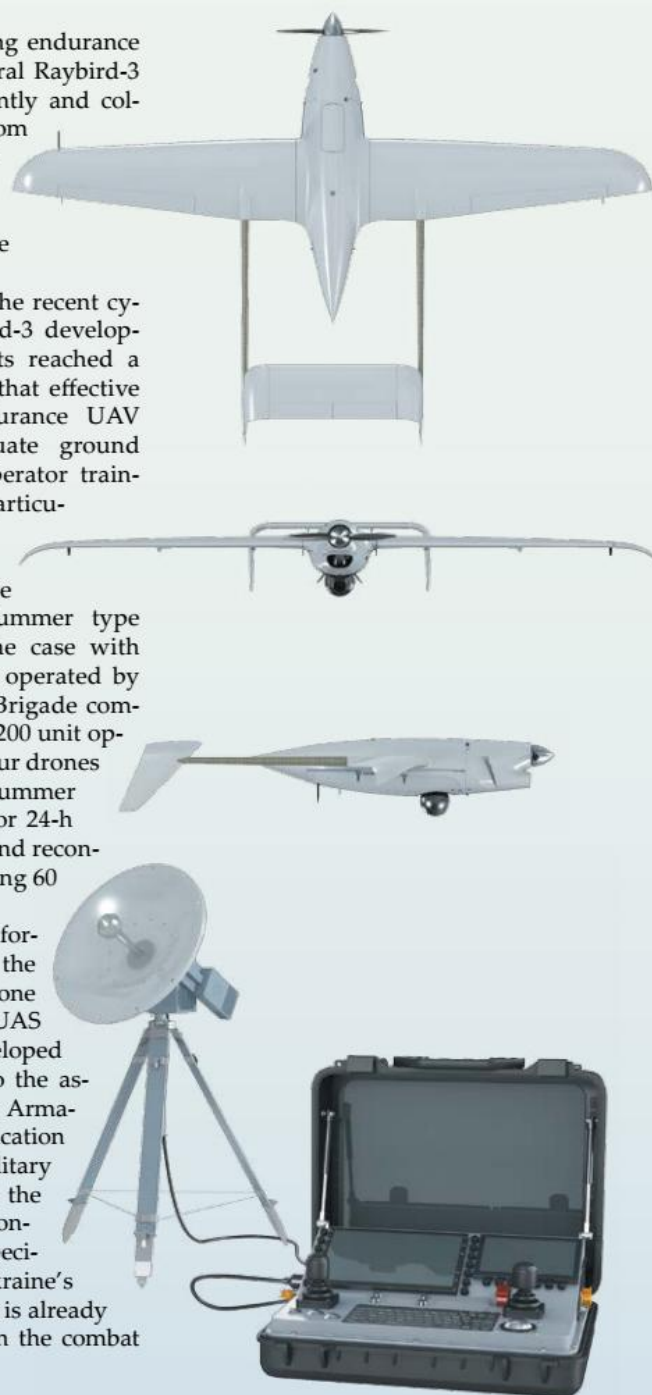
As validated by a test mission using an indigenously developed ECM jammer, the Raybird-3 UAS provides an improved counter-ECM capability that allows it to function effectively even in the presence of substantial jamming.

Regarding flight automation, Skyeton believes that the less a military or civilian user intervenes in controlling an aircraft flying a preprogrammed flight plan the better. This approach is resting on statistics gathered with Raybird-3's testing and operation. UAV flight automation is highly demanded since it allows for a shallow learning curve for new operators and offers operational benefits enabling safer and more efficient flight operation. But special emphasis placed on flight automation is more projected

to the future. With a long endurance capability in place, several Raybird-3 drones can be concurrently and collectively controlled from a single center. This would pave the ground for the use of the drones in swarms – an objective Skyeton is aiming for.

After completion of the recent cycle of trials, the Raybird-3 developers and military experts reached a consensus to the effect that effective operation of long-endurance UAV drones requires adequate ground support and human operator training. Military experts particularly recommend the US experience, where long-endurance UAS are operated from 4x4 Hummer type truck vehicles, as is the case with RQ-7 Shadow-200 UAS operated by the US Army's Stryker Brigade combat team. Each Shadow-200 unit operates three UAS with four drones each. Deployed from Hummer trailers, they are used for 24-h battlefield surveillance and reconnaissance missions logging 60 flight hours every day.

In terms of its performance capabilities, the Raybird-3 represents one of the most advanced UAS technologies ever developed in Ukraine, according to the assessment of the MoD's Armaments Testing and Certification Center, Chernihiv. Military officials have stated that the RAYBIRD-3 UAS fully conforms to the technical specifications required by Ukraine's Armed Forces, and there is already a place reserved for it in the combat organization. **UDR**



Company	Skyeton	Insitu	UAV factory	Aero Systems	Tekever
Model	Raybird-3	ScanEagle	Pengiuin B	Bluebird	Tekever AR3
Endurance, hours	20+	20+	20+	20+	up to 10
Payload, kg	up to 5	up to 6	up to 10	up to 4	up to 8
MTOW, kg	20	22	22	32	22
Cruise speed, km/h	120	90	80	80	120
Operational Range, km	up to 240	95	100	up to 150	80
Autonomous flight, km	2500	1800	1800	1800	1200



# MARINE ROBOTICS

## UKRAINIAN ACCENT

**T**he question of ensuring a broader use of marine robotic vehicles (MRVs) for naval missions has long been highly relevant and meeting the global trends in the naval technology development. Ukraine is seeking to stay in the mainstream in this technology area. Ukrainian companies have already developed a number of marine drone technologies that could find uses for a broad range of tasks and missions.

MRVs are primarily intended to be used for surface/subsurface surveillance, intelligence and reconnaissance, mine hunting, anti-Diver operations, search and rescue, and even armed attacks on enemy targets.

MRVs – operating covertly and without risking human lives or the need to employ manned ships or submarines – are capable of almost the entire range of tasks set before the naval forces at times of peace. Besides, a marine drone operates at a fraction of the daily cost of a similar manned vessel.

MRV technologies are rapidly maturing with the integration of more advanced sensors, teleoperation, mission management and communications. There have been emerging fundamentally new types and uses of MRVs optimized for operation in surface-to-subsurface environments. The integrated use of unmanned surface vehicles (USVs), subsurface drones

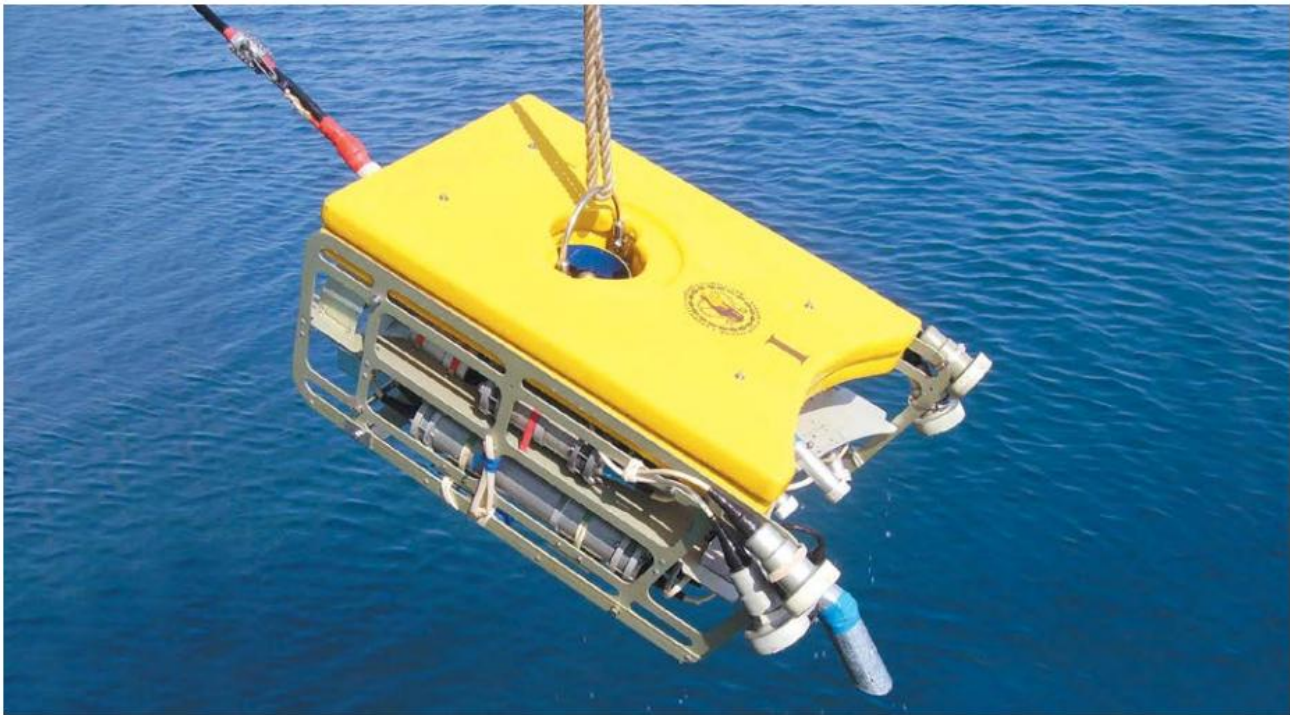
and unmanned aerial vehicles (UAVs) in future missions could potentially permit completely new capabilities never achievable before.

Countries that are at the leading edge of innovation in marine robotics are the USA, China, Russia, France and Japan among several others.

For Ukraine, marine robotics is of interest particularly in view of the fact that Russia's Armed Forces have been actively developing and fielding MRV capabilities, especially for uses with their naval ships and bases in the Black Sea and Azov Sea areas. Thus, in May 2018 at the Feodosia Naval Test and Training Facility in Russia-annexed Crimea, the Russian Navy began trials of its most recent technology







### TETHERED SUBSURFACE ROBOTIC VEHICLE PAR-T



is designed to be used to deliver special-purpose systems covertly into a deployment zone on the seabed and to retrieve them after their mission has ended.

#### PAR-T. TECHNICAL DATA

Speed with a subsurface current of up to 2 m/s:	
Horizontal, m/s	0.31
Vertical:	
a) while diving, m/s	0.5
b) while deploying special-purpose equipment, m/s	0.3
Dimensions:	
length, mm	3,840
width, mm	1,850
height, mm	7,004
Vehicle mass, kg	1,750
Payload mass, kg	81.5
Power supply	via rechargeable battery
Autonomy of operation, hrs	≥ 2
Operating depth, m	200
Max. submerged depth, m	250
Tethered length, m	600

development – the subsurface robotic system 2R52 "Klavesin-2".

There are no such capabilities available so far to the Ukrainian Navy or other military branches and national security services, this despite the fact that domestic industries have sufficient knowledge and expertise in this technology domain.

With a 30 years experience in this field, the Scientific Research Institute of Subsurface Technologies at the Admiral Makarov National University of Shipbuilding (NUS), Mykolayiv, has developed 18 unique multipurpose underwater vehicles that have seen uses in research and exploring missions in the Black Sea, Sea of Azov, the Baltic Sea, as well as in the Antarctic (the Weddell Sea).

As of this date, the NUS has completed three dozen MRV projects for various uses. Among the most recent ones is the worldwide unique PAR-T – a tethered, unmanned subsurface cargo vehicle for heavy cargo operations. Other projects by the NUS include the autonomous underwater vehicle ANPA-RB equipped with a radio control link; towed underwater vehicle "Glider"; unmanned undersea exploring vehicle "Poshuk" (Ukrainian for "search"); and underwater drone "Inspector" just to name a few. These technologies are all characterized

by high effectiveness and efficiency, performance reliability and compact size. The subsurface drone "Hydrograph", for example, which the NUS built in 2014, has been in continuous operation to date without going out of order or failure. Some of the NUS developed underwater drones have shown high performance during trials conducted in the Sea of Azov area near the city of Mariupol.

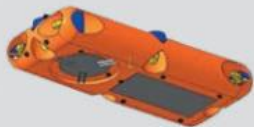
These vehicles can carry a variety of payload sets customized for specific missions that include, among others, covert surveillance of target underwater areas, mine-hunting, covert resupply runs into deployment zones and back to the home base, and they can be delivered to the operations site at a great distance from the mothership or from the beach.

The most recent designs have been developed based on experience with testing experimental MRV prototypes in the Sea of Azov. Importantly, the NUS has mastered advanced technologies like 3D printing for manufacturing parts to save the production cost and make the products more competitive on the market.

This allows to consider maritime robotic vehicles as a realistic alternative to employing expensive manned mine-sweeping vessels, at least in littoral waters. The next move would →



### TELEOPERATED, SELF-PROPELLED UNDERWATER CARGO VEHICLE "GSPN"



is intended for delivering an autonomous radio-hydroacoustic system covertly into a deployment area on the sea floor, placing the equipment at a preselected tilt angle to the vertical, and to retrieve it after its mission has ended.

#### GSPN. TECHNICAL DATA

Max. operating depth, m	200
Dimensions:	
length, mm	3,840
width, mm	1,850
height, mm	700
Cruising speed, kts	0.6
Tethered length, m	≤600
Vehicle mass, kg	1,750
Power supply	lithium battery
Autonomy of operation, hrs	≥2
Cargo equipment mass, kg	≤81.5
Operating crew	2 personnel
Mission equipment:	
360-degree sonar system	1
Video cameras	3

be to allow underwater mine-hunting drones to be delivered by an unmanned surface "mothership", which also conforms to global trends observed in this field.

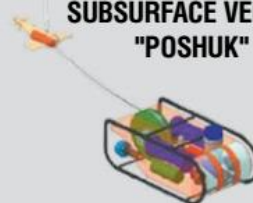
The NUS has recently developed a teleoperated, self-propelled underwater cargo vehicle, which is worldwide unique in terms of some of its performance capabilities. The final prototype has undergone through the full cycle of trials, but a lack of funding so far has prevented it from being advanced to the series production stage.

Another recent development by the NUS is an autonomous undersea reconnaissance vehicle intended for low-risk, covert reconnaissance of harbors and navigable waters, and water areas around naval bases, roadstead sites, shipberthing facilities etc.

The NUS has under its belt a number of off-the-shelf solutions and promising developments that could be of interest to the Ukrainian Navy in terms of potential deployment in the Black Sea and Sea of Azov areas in future missions, and, also, to potential customers outside of Ukraine. **UDR**

**Volodymyr ZABLOCKY,**  
Defense Express

### TETHERED, UNMANNED SUBSURFACE VEHICLE "POSHUK"



is intended for low-risk, covert reconnaissance of harbors, navigable waters and beach waters, as well as water areas around naval bases; search for and inspection of sunken objects; and for high-quality recording of the mission process and results.

#### POSHUK. TECHNICAL DATA

Speed, kts	2
Max. operating depth, m	15
Dimensions:	
length, mm	850
width, mm	420
height, mm	350
Vehicle mass, kg	35
Buoy dimensions:	
length, mm	350
diameter, mm	80
Power supply	self-contained
Autonomy of operation, hr	1
Number of human operators	1-2



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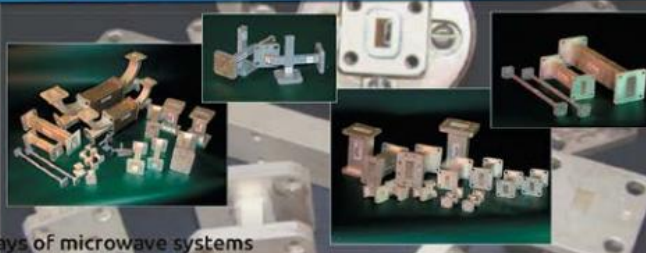
Design and production  
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receiving and transmitting modules  
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