

UKRAINIAN DEFENSE REVIEW

Defense
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№2 [APRIL – JUNE 2015]

UDR



ADRON WILL
PROTECT
YOUR FLIGHT



MADE IN
UKRAINE



PRECISION-GUIDED WEAPONS



POWERPLANT SYSTEM

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

DETECTING ENEMY

Electronic reconnaissance had always been of particular importance for the armed forces



MALYUK – BULLPUP RIFLE

It will replace soviet-designed 5.45/7.62 mm AK weapons

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This Year On IDEF 2015:



KVITNIK-E Guided Artillery Projectile with Laser Semi-active Homing Guidance



SKIF Man-portable anti-tank missile system



«ADROS» KT-01 AVE Infrared countermeasure station



BTR-4 Armored Personnel Carrier



KOLCHUGA Radio-electronic environment monitoring complex



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UKRAINIAN DEFENSE REVIEW ARMS EXPORT AND DEFENSE INDUSTRIAL COMPLEX OF UKRAINE

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UKRAINE'S WEAPONS DEVELOPMENT PROGRAM WILL BE ACCELERATED

Ukraine will increase the funding for its indigenous weapons development programs to Hr 14 billion in 2015, Ministry of Defense has said.

«The Ministry of Defense will devote Hr 14 billion, or one third of its overall budget for 2015, to weapons development and modernization programs as envisaged by the State Budget Law 2015. This will represent an increase of 14% from 2014, when Hr 3.9 billion was spent on similar programs», Victoria Kushnir, a press officer of the Ministry of Defense told a news briefing on 10th March 2015.

Of this amount, Hr 5.2 billion is budgeted for funding contracts under the State Defense Procurement Order, and another Hr 3.6 billion for weapons maintenance, repair and overhaul (MRO) programs.

In 2015, MoD's budget amounted to Hr 44.6 billion, representing an increase of Hr 17 billion over the previous year. This amount includes Hr 4.4 billion in government guarantees to be granted by the Ministry of Defense in line with an appropriate Cabinet of Ministers decision. The allocation of Hr 39.4 billion will come from the gener-

al budget and Hr 0.8 billion from special funds.

The Cabinet of Ministers is also planning to accelerate the execution of contracts under the State Defense Procurement Order.

«The allocation of money for new arms acquisition programs needs to be advanced from the third and fourth quarters to the first and second quarters of 2015», Prime Minister Arseniy Yatsenyuk said at a Cabinet of Ministers meeting on 18th March.

The Prime Minister urged an acceleration of contracts under the 2015 State Defense Procurement Order: «The lion's share of the

[MoD's] procurement budget must be urgently allocated during the 1st and 2nd quarters. Contracts under the State Defense Procurement Order must be awarded and appropriate funding allocated on an urgent basis», Yatsenyuk said.

«The Ministry of Defense has already awarded some 100 contracts, and we have redistributed Hr 2.5 billion worth of funds to finance contracts in March and April. I have issued appropriate instructions to accelerate the signing of contracts, to buy military equipment and deploy it to the ATO area», the Prime Minister said.

UKROBORONPROM'S DRIVE TO BOLSTER UKRAINE'S NATIONAL DEFENSE CAPACITY

State Concern Ukroboronprom has over the past eight months proposed more than 40 draft laws that would contribute to the country's national defense capacity, a senior official at the Concern has said.

“To date, Ukraine, unfortunately, does not have the full nomenclature of components and subassemblies necessary for the achievement of self-sufficiency in arms production, which makes Ukroboronprom and its constituent companies rely for certain as-

sembly parts on foreign-country suppliers”, Serhiy Pinkas, first deputy director general of Concern said while speaking to the press on 27th February 2015. Ukroboronprom has proposed draft legislation that would extend the scope of the exemption from value add-

ed tax (VAT) and import duties for the components and subassemblies supplied for the manufacture of military equipment. This legislation, if adopted, would ease the importation of components and subassemblies to Ukraine's customs territory and would help

mitigate related costs,” Mr Pinkas said. He furthermore said that the proposed legislation would extend to critical imports only, i.e. the components and subassemblies that are not manufactured in-country or will otherwise remain unavailable in the near-term.

PREPARATIONS UNDERWAY BY ZHYTOMYR ARMOR PLANT FOR PRODUCTION OF UPGRADED BMP-1 IFVS

Ukroboronprom will launch series production of upgraded BMP-1 infantry fighting vehicles (IFVs) at Zhytomyr Armor Factory in the near term, the Company's press service reported on February 23.

The BMP-1 upgrade package particularly includes new modular weapons systems that would conform to most stringent current operational requirements. Details about technical data of the equipment have not been disclosed. Upgrade works on the first few vehicles have already got under way. Once upgraded, the BMP-1 IFV vehicles will be deployed to the ATO area following a brief period of tests and trials.



UKRAINE'S NATIONAL GUARD TO ACQUIRE TEN KOZAK-2 ARMORED VEHICLES

Ukrainian National Guard has announced intention to purchase ten Kozak-2 armored vehicles produced by Kiev-based Praktika R&D and Production Association, defence-blog.com has reported.

Ten vehicles will be bought initially, with the possibility to buy fifty more vehicles at a later time. Based on the Iveco Eurocargo 4x4 chassis, the Kozak-2 features an armored cab made of welded steel and a double V-shaped hull. The vehicle's design offers a diversified level of protection, with a protective capsule for the soldiers. It provides protection against small arms fire and artillery shell splinters, and withstands

blasts equivalent to 3kg TNT. The vehicle is powered by Iveco diesel engine developing 279 hp. The cab has seats for 15 men. The Kozak-2 weighs 15t and has a payload capacity of 4 t. There are mounting points provided for firearms on a roof hatch: a PKMS 7.62 mm machinegun provided with 2,500 rounds of ammunition; or a heavy 12.7 mm machinegun (NSVT or KT-12.7) provided with 450 or 500 rounds respectively; or a 30mm grenade launcher (AGS-17 or KBA-117) provided with 100 grenades; or a 40mm UAG-40 automatic grenade launcher with 87 grenades. The roof of the vehicle can also accommodate a remote weapon station, allowing the gunner to remain in the relative protection of the vehicle.





ROYAL THAI ARMY HAS TESTED ITS UKRAINIAN-SUPPLIED BTR-3E1 APCs

The Ukrainian "tank hunter" BTR-3E1 8x8 armored personnel carrier armed with a 90mm CMI CSE 90LP cannon has been trialed and tested in Thailand, vpk.name reported citing DefenceBlog. CMI Defence joined with Ukroboronprom integrated the Cockerill CMI 90LP cannon onto the 8x8 BTR-3E armored personnel carrier. The resulting solution offers current and future users of the BTR-3E APC a highly capable fire support vehicle that would contribute greatly to firepower and mobility of regiment-size mechanized infantry units. The Cockerill CSE 90LP is a low-weight two-person tur-

ret. Featuring the proven Cockerill 90mm low pressure gun (of which some 2,500 units have been sold) the turret provides a wide choice of ammunition to suit the tactical situation, ranging from HE to APFSDS-T and Canister. The fire is accurately delivered around the clock using an autoloader and a night/day digital fire control system. The low weight of the Cockerill CSE 90LP turret permits it to be fitted to a wide range of wheeled and tracked armored vehicles. Despite its high capability and advanced design, the system is simple to use and ruggedly reliable in the field.

UKRAINE, TURKEY AGREE ON STRATEGIC PARTNERSHIP

Kiev and Istanbul have agreed to jointly develop and build a new passenger plane using R&D and manufacturing capacities of the Ukrainian Antonov plant, vpk.name website reported on 24th March 2015.

This follows from a statement made by Ukrainian President Petro Poroshenko following talks with his visiting Turkish counterpart, Recep Tayyip Erdogan, to which the website refers. "We have discussed the full range of issues on bilateral agenda and relations between

the two countries under conditions of serious destabilization in the region. We agreed to strengthen the economic component by opening a gateway to large, high-tech projects», Poroshenko said. Poroshenko noted that, in addition to the new passenger plane, the two countries will jointly develop projects in the aerospace and military-technical fields. Particularly Ukraine and Turkey agreed on a multi-billion space program that would help provide business for Ukrainian companies in relevant industries.

PRODUCTION LINE FOR ANTONOV AN-38-100 AIRPLANES MAY BE LAUNCHED IN BRAZIL

Ukrainian Antonov plant is considering Brazil as potential location for the construction of a production facility that would build its An-38-100 aircraft configured for patrol missions, defence-blog.com website reported on March 18. Antonov is now searching for partners for the construction of an aircraft factory in Ilheus city, Bahia state, eastern Brazil. The USD 1 billion project includes the production of 80 An-38-100 aircraft in a patrol and multi-purpose configurations that would replace the aging Embraer EMB 110 and Bandeirante airplanes. The first three Bandeirante planes of the total 80 such planes contracted for delivery to Brazil's Air Force were delivered back in February 1973, before the plane eventually became the core of the whole military-transport aircraft fleet of the Brazilian Air Force. The EMB 110 airplanes have already reached the end of their lifespan and are now being phased out from service. The An-38-100 aircraft was developed as a fully redesigned version of the An-28. It retains all of the benefits of the original design but with new features that include an extended fuselage, more potent engines and improved comfort for the crew and passengers, with payload capacity increased to 2,500 kilograms.



ANTONOV TO DELIVER TWO AIRPLANES TO CUSTOMERS

Antonov aircraft plant is planning to deliver one more production-standard regional passenger jet An-158 to its Cuban customer, the Cubana de Aviacion airline, in February. An expert team of Cubana de Aviacion arrived at Antonov plant for accepting the new aircraft, which will be added to the fleet of five planes already operated by the airline. Antonov is also receiving an expert team from Korea, who arrived in Kiev for accepting the second An-148 plane Antonov built for a Korean customer. The An-148-100V plane (production number 04-02), painted in plain white, was delivered to the Korean customer in March, a few weeks past its delivery date.

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[direct speech]



SERHIY PINKAS

FIRST DEPUTY DIRECTOR
GENERAL OF
SC UKROBORONPROM

WE ARE ASPIRING TO ACHIEVE A DRAMATIC BOOST IN DEFENSE-INDUSTRIAL CAPACITIES OF UKRAINE IN THE NEXT FEW YEARS

The ongoing war conflict in eastern Ukraine has changed the course of things in the domestic arms industry's development process. Whereas most of Ukraine's defense production was geared to export markets two years ago, the industry now has to work for satisfying the growing domestic demand

for arms and military equipment (AME) to defend national sovereignty and territorial integrity. This has brought to the foreground a range of challenges that need an urgent focus. The following is an interview conducted with Serhiy Pinkas, first Deputy Director General of State Concern Ukroboronprom

by Ukrainian Defense Review on these and other issues.

UDR: As hostilities are ongoing in eastern Ukraine, there is a growing demand for arms and military equipment to meet the requirements of our military and security forces deployed in theater. To what

extent has Ukroboronprom been able to satisfy this growing demand?

Statistics speaks for itself. In 2014, we fulfilled our tasks mandated by the Ministry of Defense by 98%. As of this date, the State Defense Procurement Order 2014 has been completed to the full extent. Soldiers, volunteers, and experts are all saying that our army has become far more potent than it was a year ago, which would hardly be so without the equipment that our Company builds, repairs and overhauls. The most valuable asset that Ukroboronprom has is its 60,000 professional employees working at 96 factories. Our on-site recovery teams alone have done repairs on more than 1,400 pieces of military equipment deployed in the ATO area. Overall, we have delivered over 2,500 units of weapons of all kinds to forces in the field. An overwhelming percentage of the arms and equipment delivered is comprised of reconstructed, overhauled or upgraded pieces, which is due primarily to budget constraints, but there is a certain percentage of newly-made arms and equipment pieces included in in-field deliveries.

The war has put our armaments through most stringent trials, and taught us to work under conditions where component parts or an established supply chain are not there.

UDR: To what extent is it feasible to implement the statement by Ukrainian President Petro Poroshenko that Ukraine would produce twice as many armored military vehicles in 2015 than it did previously?

It is entirely feasible. Despite the loss of our 13 enterprises that



The war has put our armaments through most stringent trials, and taught us to work under conditions where component parts or an established supply chain are not there.

remained in Crimea and 8 in the Donbas, not only didn't we reduce the number of our employees, but even increased that number. We have additionally employed more than 2,000 workers over the past six months, and have intention to employ up to 3,000 more workers during this year. For the first time in its history the Company has forwarded information on its production capacities to all military and security services, which provided the basis for the formulation of the State Defense Procurement Order.

Many of Ukroboronprom's factories are now stepping up the production of modern arms and military equipment types (tanks, armored transporters, a great variety of weapons systems etc), as well as the reconstruction and qualitative upgrade of the damaged equipment that is arriving from the ATO area. To put it shortly, our core human resource is being replenished with every passing day. Our production base,

which we upgrading and expanding milestone by milestone; along with the enactment of new managerial policies and the establishment of effective industrial collaboration networks are the enablers that will allow us to meet growing demands on the part of not only military but also other services of the security sector.

UDR: Some of military production companies are located in regions in Crimea and the Donbas that are under occupation. How are things going on with these production facilities?

Thirteen of Ukroboronprom's factories are located in Crimea, which has been annexed illegally by Russia. It is clear that legally they are our property, but we have no actual authority over them, neither can we exert any impact on their operations. All of the Ukroboronprom's factories in Donetsk and Luhansk regions have already been assigned to companies located on terri-

tories under Ukrainian control, to where most of key employees have been transferred. For example, the former CEO of Petrovsky Donetsk Chemical Plant is now employed at Artem Factory in Kiev. Such examples are numerous. A certain percentage of professional employees (it's no secret) have fled to Russia and got jobs at enterprises of the Russian defense industry. There are also those who have moved from the annexed Crimea and Donetsk and Luhansk regions to other regions of Ukraine, but are now employed outside the defense industry. Overall, however, we have retained our capacities in terms of knowledge, technology and growth potentialities. Unfortunately, part of manufacturing equipment has been lost or destroyed, while some other part is now located with factories under occupation.

UDR: How are things going on with soliciting foreign investors and partners for Ukraine's defense industry?

During meetings with foreign-country business representatives, we invariably set out our position as follows: Any imported procurement will be the first step only, to be followed by a possibility to set up a semi knocked down assembly operation here in Ukraine. Afterwards we will have to be able to set up co-production projects based on technology transfer deals. They understand us, I should note. Whereas cooperation with the European Union and the United States was actually non-existent a few years ago, now we have a very different situation. Six months ago, we were challenged with the need to find replacements for about 30,000 product items with which we were supplied by Russia previously. As of this date, we have been able to find replacements for some 11,000 subassem-



Any imported procurement will be the first step only, to be followed by a possibility to set up a semi knocked down assembly operation here in Ukraine. Afterwards we will have to be able to set up co-production projects based on technology transfer deals.

bly products, which I reckon is a good result. A majority part of these products are already being produced in-country, while the remainder will be imported from Europe and the United States. Now we are negotiating with Airbus, Boeing, Textron, Lockheed Martin, BAE Systems and others. In late December of last year, we agreed on a joint partnership with LUBAWA SA, a Polish supplier of body armor and safety equipment for uniformed users. This company supplies multi-purpose camouflage to NATO, its products being very successful on markets in more than 40 countries around the world. Thales Group already supplies us with products like communications, ECM and radar equipment, just to name a few. U.S.A's Defense Technology Inc is selling brand-new counter-mortar and counter-battery radar stations. ATN Corporation, also based in the US, provides night vision devices, thermal imagers and optics. We have also contracted Barrett Firearms, USA, to supply firearms, optical devices and ammo.

Also importantly, the Company has been awarded access to NATO Item Name Directory search tool that will help Ukrainian military manufacturing companies enter the Europe-

an arms market and implement its import substitution strategy. Eight Ukroboronprom's entities are already using the search tool for information about specific items and suppliers.

UDR: In Ukraine, production of ammunition has not been in place to date. How is this gap being addressed?

We have developed a plan to launch up an ammo production line at one of our factories. This plan has been agreed with the National Security and Defense Council, and appropriate documentation has already been completed. This business operation is not growing as fast as we would like because of funding difficulties, as well as due to the fact that the factory herein mentioned is fully loaded with work on ongoing orders. However, work is progressing as scheduled and monitored on a weekly basis.

UDR: Ukrainian forces deployed in the ATO area continue to have a requirement for antitank capabilities, this being at the time when there is a domestic manufacturer of antitank weapons (which is KB Luch Design Bureau) operating in Ukraine. How is this deficiency being addressed?

Have the domestically produced antitank weapons been delivered to forces in the field?

New Stugna and Skif antitank weapons systems developed by Luch are included into MoD's orders. We are producing them, and the weapons are already being delivered to forces in the field. Particularly in early 2015, armored vehicles Spartan equipped with Sarmat weapons stations mounting Luch' ATG rocket launchers RK-3 took to the field with National Guard units. These weapons systems are as good as U.S. or European counterparts, even better in terms of some performance capabilities. A quantity of antitank weapons was delivered to forces in the field in 2014. To put it short, the process is going on.

UDR: How has Ukraine's position in the arms sales market changed?

To date, our first priority is to meet domestic market requirements. We arranged with our partners, who agreed to postpone deadlines on the completion of several contracts, especially as they know that our equipment is going to go through actual war trials, so they would get it already improved and upgraded. Some 1,000 changes have been made in engineering documentation and manuals for the BTR-3E and BTR-4 vehicles over the past few months alone. Not one single contract has been terminated nor a penny worth of penalty imposed on us. So we were able to focus on domestic supply orders while retaining our presence on external markets. Now, we must first fulfill our military's requirements to full extent before continuing selling equipment for export. The State Export Control Service acts in this system as a kind of a safeguard, issuing licenses

for both the export and import of goods. Such products can be licensed for export unless they are required by each and all military and other security sector services in this country.

UDR: What are the results of [Ukroboronprom's] participation in IDEX-2015 exhibition?

First, I should note, the mere fact that the Ukrainian President was kindly received by His Highness Sheikh Mohammed bin Rashid Al Maktoum, UAE Prime Minister and Crown Prince of Dubai, says it all. This is an important signal to other Arab countries ... On the sidelines of IDEX-2015, 20 contracts were signed with European, American and Middle East suppliers to provide the Ukrainian Armed Forces with armored fighting vehicles, mortars, antitank weapons systems and other defensive weapons. Unfortunately, I can not disclose more details.

UDR: What kind of weapons and military equipment is Ukroboronprom going to display at this year's edition of IDEF arms show in Turkey?

This year we are going to unveil a recent development by the Ukrainian defense industry, which is the Malyuk automatic rifle. Engineers were able to make the weapon more compact without sacrificing its performance. Visitors to the exhibition will be allowed to see the rifle and to hold it in their hands. As well as the Malyuk, we are going to display a mockup model of the KM-7.62 machinegun, which Ukroboronprom selected for the Saxon armored vehicle. For helicopter protection we offer the Adros electro-optical countermeasure system, which is tailored to thwart IR guided missile attacks. Also on display will mockup models of the Kvitnyk guided artillery projectile and

the Kolchuga-M passive electronic monitoring radar system.

UDR: I would like that you touch on the development outlook for Ukroboronprom from the perspective of its senior management. Does the Company need a restructuring?

We have been able to change a lot, but the domestic industry is still in the process of reconstruction and restructuring. Particularly in December of last year, Ukrainian Defense Industry Reform Program got underway. As of this date, a future model has been developed for industrial clusters with clear-cut specialization, vertical integration and closed-loop production cycles up to the final product. Companies affiliated with Ukroboronprom will be structured into seven clusters: aeronautics and related maintenance, repair and overhaul (MRO) services; radar and air defense systems; armored fighting and support vehicles; missiles, ammunition and explosives; rocket and artillery weapons systems; ELINT, ECM equipment, communications and automated command-and-control systems; and shipbuilding and marine engineering. There will be corporatization of enterprises that will involve the solicitation of investment money both from State Budget funds and extra budgetary funds (domestic as well as external), with the Ukrainian government retaining a majority stake of the shares and control of the enterprises.

This all will allow a lot to be done in the next five to ten years to achieve a dramatic increase in output and productivity, and also improve the quality of arms, military equipment and special-purpose vehicles produced by Ukroboronprom's factories for both the Ukrainian military and other security services and for export markets. **UDR**

[iron heart]



VOLODYMYR TKACH, FOR UDR

Ukraine could be justifiably considered one of the world's established trendsetters in the tank diesel engine area. The global main battle tank [MBT] fleet consists of tanks of two types: diesel engine tanks and gas-turbine-powered tanks. Diesel-driven tanks are in service with 111 armies across the world, while only nine armies operate tanks fitted with gas turbines.



tate-of-the-art tank engines developed by Engine Design Bureau of Kharkiv (EDBK) meet the most demanding standards in this field, and they integrate innovative solutions that could propel them to a new level of quality. EDBK has developed a num-



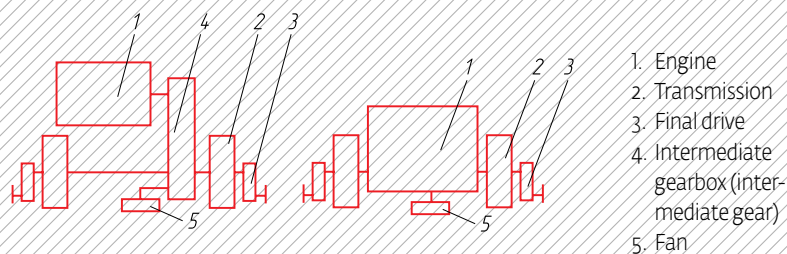
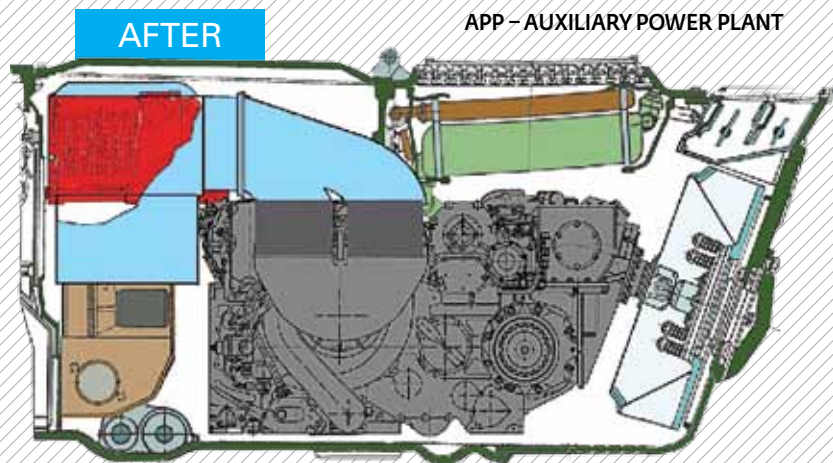
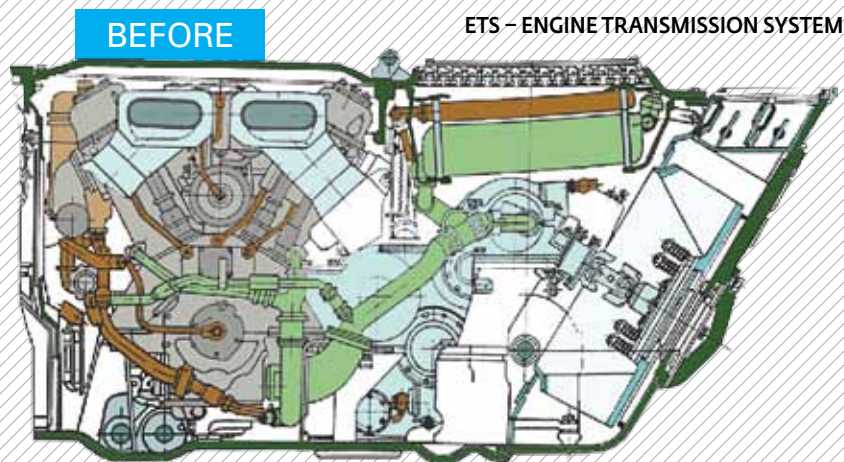
POWERPLANT

ber of new items which have already earned themselves favorable reputation both on the domestic and export markets. The Company has recently completed R&D on a new family of three-cylinder diesel engines generating 280 hp, 400 hp, 500 hp and 600 hp, designed for installation on light-weight armored fighting vehicles

SYSTEM

The upgrade package for the T-72 MBT proposed by Kharkiv's KBD Engine Design Bureau includes replacement of a standard power pack with the 5TDFMA engine, which provides the following advantages:

- a 35 percent increase in the engine-transmission system's output power with no change of the engine compartment's space requirement;
- through a change in component arrangement, an extra space is released in the engine compartment, enabling the installation of an auxiliary power plant (a 10kW EA10U) and an AC compressor;
- medium soil-road speed of the host vehicle increases from 32...38 km/h to 45...50 km/h, and oil consumption falls to 2.5...3.0 kg/h from 5 kg/h.



BEFORE

AFTER

in the armored personnel carrier (APC) and infantry fighting vehicle (IFV) categories, wheeled as well as tracked.

One of the Company's most recent designs is a two-stroke reciprocating 700-hp engine designated 5TDF, which offers unique performance capabilities in terms of power-to-weight ratio, weight and bulk, and is claimed to have determined the overall outlay design of the T-64 MBT. East-west mounting of the engine in the tank's power pack compartment, double-sided power take-off, decreased latitudinal dimensions and low heat release ensured that the tank has lower silhouette and reduced weight as compared to rival designs. The engine has undergone several improvements to its performance, producing an engine providing 1,000 hp.

Using a five-cylinder engine as baseline design, EDBK has developed more capable six-cylinder configurations – the 6TD-1 generating 1,000 hp and 6TD-2 developing 1,200 hp, intended for integration with the T-80UD MBT the T-84 MBT, respectively. Optimized for operation in desert-type environments heated up to +55°C, the two engines surpass all of the currently existing counterparts in terms of the power-to-weight ratio and engine compartment space requirement. These are two-stroke, multifuel, highly supercharged, liquid-cooled engines with direct fuel injection, counter-moving pistons and level-positioned cylinders, which can run on various fuel types, including diesel fuel, petrol, kerosene, jet-propulsion fuel or mixtures of these in various proportions.

EDBK has recently added new design – the 6TD-3 – to its range of MBT engines. Weighing 1,210 kilograms, the 6TD-3 showed bench tested horsepower of 1,400, meaning it is superior to the German Series 890 ri-

BASIC SPECIFICATIONS OF THE 3TD FAMILY OF TANK DIESEL ENGINES



Ukrainian Defense Review

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

BASIC SPECIFICATIONS OF THE 5TD FAMILY OF TANK DIESEL ENGINES



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	5TDF	5TDFM	5TDFMA
Output, kW(hp)	515 (700)	625 (850)	772 (1,050)
Number of cylinders	5	5	5
Displacement, l	13.6	13.6	13.6
Crankshaft rotation rate, min ⁻¹	2,800	2,800	2,800
Specific fuel consumption, g/kW (h/hp h)	231.14 (170)	227.21 (167)	227.21 (167)
Length, mm	1,413	1,413	1,413
Width, mm	955	955	955
Height, mm	581	581	581
Weight, kg	1,040	1,040	1,040

BASIC SPECIFICATIONS OF THE 6TD FAMILY OF TANK DIESEL ENGINES



Ukrainian Defense Review

	6TD-1	6TD-2	6TD-3
Output, kW(hp)	735 (1,000)	882 (1,200)	(1,400)
Number of cylinders	6	6	6
Displacement, l	16.3	16.3	16.3
Crankshaft rotation rate, min ⁻¹	2,800	2,600	2,850
Specific fuel consumption, g/kW (h/hp h)	214.8 (158)	217.7 (160)	(160)
Length, mm	1,602	1,602	1,698
Width, mm	955	955	955
Height, mm	581	581	581
Weight, kg	1,180	1,180	1,210

5TDF is designed for installation on the T-64 MBT | **5TDFM** is designed for installation on the T-64BM MBT | **5TDFMA** is suitable for installation on the T-72 MBT. The 6TD-1 is designed for T-80UD and BULAT MBTs, The 6TD-2 is designed for T-84 MBT.

val, which delivers a power-to-weight ratio of one horsepower per each kilogram. Consuming 160 grams of fuel per horsepower per hour, the new Ukrainian engine releases 30% less heat than a four-stroke counterpart. The new engine is currently being adjusted to a specific MBT type.

In terms of its dimensions, the 6TD-3 has little dissimilarity from the 6TD-2E motor on the T-84 “Oplot” MBT, and it has the potential to be used as the main power plant unit of engine transmission systems designed for upgrading the ‘Oplot’ and foreign-produced MBTs. With the 6TD-3, the engine compartment space requirement will not exceed 3.5 m³, enabling a record-high specific volume of 430 hp/m³.

Apart from tank diesel engines, EDBK deals with the design and development of standby electric power units. Specifically for MBT applications, the EDBK has designed several compact auxiliary power units generating 8 and 10 kW to allow the vehicle to run key subsystems without the main engine running, to ensure a more economical use of the main engine’s service life, and to provide electricity for battery recharging. Given that the modern tank engine operates idle during almost half of its service life, a standby electric power unit provides a 50 percent service life economy for the main propulsion, and also adds significantly to the vehicle’s stealth performance (as acoustic and thermal signatures produced by supplementary engine are several times lower than the main engine’s).


In addition to MBT engines, EDBK proposes its own innovative solutions for upgrading existing types of armored military vehicles. The EDBK’s upgrade package for the T-72 MBT, for example, includes replacing the tank’s standard engine with



a power pack consisting of the main power plant, an auxiliary power unit and an AC compressor, all accommodated in the vehicle’s power pack compartment. Most importantly, this package does not require any serious alternations in the overall layout design of the vehicle, which translates into reduced time and the cost of modernization, and also enables the upgrade to be performed under field conditions.

The upgrade package proposed by EDBK for the T-72 MBT would provide a single solution to three challenges facing tank designers. For one thing, replacing a standard engine with the newer 5TDFMA diesel would increase output up to 1050 hp. Secondly, the less bulky main propulsion allows for room for an auxiliary power unit to be accommodated in the power pack compartment. Thirdly, and finally, the compartment space released as a result of using a less bulky engine would allow for accommodation of an AC compressor. Upgrading the T-72 tank with the 5TDFMA diesel would provide improvements

such as better maneuverability, increased fuel and lubricant economy, and, due to reduced vibration, a higher level of comfort for the crew and a more favorable working environment for on-board electronic equipment.

Meanwhile, the Fiscal Enterprise Morozov Machine Design Bureau [MDB] of Kharkiv, Ukraine’s leading designer of wheeled and tracked armored vehicles, proposes its own solution to upgrading the Soviet-vintage T-72 MBT to more capable T-72AG configuration. The T-72AG upgrade is powered by the newly-designed 6TD-series engine which was developed specifically for the T-80UD “Oplot” MBT application, replacing a standard 780/840 hp engine equipping the baseline T-72, and enabling operation in hot-temperature environments. The 6TD engine has a highly compact layout design allowing it to be arranged east-west in the tank’s power pack compartment and coaxial with transmission gear boxes, resulting in the power pack compartment’s space requirement reduced to 3.1 m³. 

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PRECISION- GUIDED WEAPONS FROM UKRAINE

STATE ENTERPRISE "STATE
KYIV DESIGN BUREAU
"LUCH" OFFERS AMPLE
OPPORTUNITIES FOR
INDUSTRIAL PARTNERSHIP



Precision-guided weapons is a key element in creating new and improving existing systems and weapons suites used by combat units of modern armed forces. State Enterprise “State Kyiv Design Bureau “Luch” (SE “Luch”) has in its possession all the necessary R&D, technological and manufacturing capacities for the de-

velopment and mass production of precision-guided weapons systems and suites.

Today, SE “Luch” provides Ukrainian Armed Forces with a comprehensive set of anti-tank guided weapons (ATGW) systems for short, medium and long-range engagements, and is actively marketing them for export. For improving the hitting power of armored combat vehicles and enabling the use

from aerial and naval platforms, Ukrainian arms engineers developed a family of guided rocket weapons in 152, 130, 125, 120, 105, 100 and 90 mm calibers. The guided rocket is a modular technology that allows for proven design solutions to be incorporated in innovative weapons types with advanced performance capabilities. All the rockets are armed with a tandem shaped-charge warhead permitting





first-round hit of targets protected with hybrid, rolled homogeneous or spaced armor, including ERA protection.

Guided by a laser beam and representing a relatively new type of precision-guided weapons for land warfare, the rockets can be launched either from ready-to-fire launch canisters or the bore of a gun. When used as part of weapons systems on tanks, armored personnel carriers or gun mounts, the rockets are adaptable to existing rounds racks, barreled systems, sighting and fire control systems, launch systems and other attributes typical of armored combat vehicles and artillery equipment.

Efforts to develop and manufacture ATGW weapons and guided rockets have led to the establishment in Ukraine of new industrial partnership links within a R&D and production cluster of nearly 30 companies from the ammunition, precision mechanics and electronics sectors of the defense indus-

try. The weapons are 90% domestically produced.

Today company's products are used in the area of counter-terrorism operation in the east of Ukraine in Donbas region.

In February 2015 National Guard of Ukraine received the first six armored vehicles Spartan equipped by multi-target remote weapon station «Sarmat».

For the National Guard «Sarmat» comprises two (in base version - four) RK-3 missiles in transport-launch containers produced by SE «Luch» and 12,7 mm machine gun on rotating platform. Multi-target remote weapon station is used to hit static and moving modern armoured targets that have combined, spaced or monolithic armour, including explosive reactive armour (ERA), as well as pinpoint targets like permanent fire positions, tank in a trench, lightly armoured objects, hovered helicopters, waterborne targets and manpower of enemy at any time of day or night. The

missiles can be fitted with warheads of various types: tandem-charge high explosive, blast/fragmentation, thermobaric or inert. With tandem-charge warhead, the RK-2S missile is able to penetrate through 800 mm thick armor.

The «Sarmat» made debut at Eurosatory-2014 exhibition, mounted on Streit Group's Varan 6x6 armored personnel carrier.

Beside this State Concern «Ukroboronprom», according to the CEO «Ukroboronproma» Roman Romanov statement, in 2015 started the production of another SE «Luch» product - man portable antitank missile system «Stugna-P» (export variant - «Skif»). It is intended to destroy man power, stationary and moving modern armoured targets with combined, carried or monolithic armour, including ERA. The system's feature lies in its possibility to aim the missile on a target from closed emplacements and shelters that reduces the risk of the gunner destruction by reply fire attack of the enemy. The system is completed with 130mm and 152mm missiles in transport and launching containers with tandem hollow-charge (RK-2S, RK-2M-K) and high-explosive fragmentation (RK-2OF, RK-2M-OF) warheads. Guidance device consists of a TV channel, guidance laser channel, an electronic control unit. It is fitted with the thermal imager (at the Customer's request). The rocket is laser-guided in the range of 100 m to 5 km and its shaped charge can burn through armor thickness of 800 mm.

The rockets for the Ukrainian version of the Javelin are about four times cheaper than the US counterpart, are wholly made in Ukraine, and do not have any component parts of the Russian Federation.

In February 2015 National Guard of Ukraine received the first six armored vehicles Spartan equipped by multi-target remote weapon station «Sarmat». For the National Guard «Sarmat» comprises two RK-3 missiles in transport-launch containers

In 2014 SE “Luch” has successfully completed its test program of creating new anti-tank missile system and launcher «Corsar»

In its mass and size, the «Corsar» is coming closer to handheld anti-tank grenade launcher systems, being at the same time far superior in terms of effective range, first-round hit probability and lethality. With its 2.5-km range (twice as longer as that of a handheld grenade launcher), the Korsar is designed to defeat hostile armored equipment, missile launchers, hostile guns operated from fortification works or urban buildings, enemy soldiers sheltered therein, and other types of small targets – under day and night conditions. Where appropriate, the Korsar can be used to engage hovering helicopters and remotely piloted aircraft.

Meanwhile, the Ukrainian party is seeking to diversify its international cooperation under global projects.

Examples are new ATGW rockets Falarick 90, Falarick 105 and Falarick 120 (in 90mm, 105mm and 120mm calibers, respectively), which are designed to launch from guns by Belgium’s CMI Defence (part of the CMI (Cockerill Maintenance & Ingenierie) international group).

Particularly the Gun Launched Anti Tank Guided Missile (GLATGM) Falarick 105 is configured for launch from the Cockerill CT-CV 105HP gun turret. The Cockerill 105 mm



According to the CEO “Ukroboronproma” Roman Romanov statement, in 2015 SE “Luch” started the production of another product – man portable antitank missile system “Stugna-P” (export variant – “Skif”)

high pressure gun provides a wide choice of ammunition to suit the tactical situation; it fires all standard 105mm ammunition types in addition to the Falarick 105 GLATGM (ready-to-fire weight – 25.2 kg; the tandem shaped charge warhead provides armor piercing capability of 550mm of RHA behind ERA).

The 120mm high pressure Cockerill gun provides excellent lethality against a wide range of targets. The gun can fire all of the 120-mm smooth-bore NATO standard types of ammunition, as well as the Falarick 120 armor piercing projectile which is fired from the bore of the gun to defeat heavy armored vehicles at ranges of up to five kilometers. Elevating to +42°, this weapon delivers exceptional engagement capability in complex terrain, an indirect-fire HE capability to 10km range, and the use of the Falarick 120 GLATGM permits heavy armor to be engaged at extended ranges. As a matter of fact, the Falarick 120 projectile currently being promoted on the export market is a spin-off version of the Luch 120mm ATGW missile “Konus” (ready-to-fire weight – 22.3 kg, armor piercing capability – 700mm of RHA behind ERA).

Both weapons are combat used employing a common high performance, digital, fully-stabilised, day/night weapon control system. Turret weight is kept low through the use of a bustle-mounted autoloader, which permits the turret crew to be reduced to two (commander and gunner). Due to the availability of current-generation target acquisition and tracking capabilities, targets can be effectively engaged both in favorable and difficult weather conditions. The stabilized gun, combined with a PC-based day/night fire control system delivers a high first-round





hit probability on both stationary and vehicle targets.

The CT-CV turret mated with Ukrainian-supplied gun-launched anti-tank guided missile rounds is compatible with lightly armored vehicle chassis of all types. It is being offered to manufacturers of armored military vehicles seeking to improve firepower capability of their vehicles. One such is the Rosomak armored personnel carrier – a Polish variant of the Finnish-designed Patria APC being license-built by WZM S.A. (Wojskowe Zakłady Mechaniczne). As is well known, by 2019, the Polish Army is about to take delivery of 307 Rosomak APCs to be supplied by WZM S.A. under a contract from Poland’s National Defense Ministry. The Rosomak family of APCs includes the Wilk (or “wolf”) – a fire support vehicle that is configured to accommodate either

a 105mm gun or a 120mm gun on a CMI Defense’s CT-CV turret.

Luch is also seeking to employ its precision-guided rounds in a Polish self-propelled mortar project. The Ukrainian company designed and developed a new 120mm semi-active laser-beam guided 16.8kg mortar projectile. This is armed with a shaped charge warhead offering 0.75-0.8 first-round hit capability against a comprehensive set of targets at launch distances of up to eight kilometers. With an additional rocket motor in place, effective engagement range can be extended to 12 kilometers. Huta Stalowa Wola (HSW) of Poland is reported to be working on the development and production of a 120mm mortar turret to be known as “Rak”. The mortar turret will be distinguishable by the presence of mechanized rounds racks and an au-

In 2014 SE “Luch” has successfully completed its test program of creating new anti-tank missile system “Corsar”

toloader, and will be able to deliver 10 to 12 rounds per minute, according to the Designer. The turret can be elevated from -3 degrees to +85 degrees and traversed through +360 degrees. The Rak turret armed with a 120mm mortar system is compatible with armor protected chassis (including the Rosomak APC), both wheeled or tracked, providing shoot-and-scoot capability and allowing targets to be defeated with minimum time and ammunition budgets or – if armed with Ukrainian mortar projectiles -- even with first-round hit probability.

The Ukrainian-Polish alliance, cemented by the use of innovative approaches and current-generation Luch technologies, will yield highly capable, multifunctional weapons systems conforming to the operational requirements of today and tomorrow. **UDR**

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ATGM

ANTI-TANK GUIDED (ATG) MISSILES AND GUIDED MISSILE ROUNDS

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

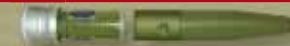
BARYER V | EXTENDED RANGE ATG MISSILE AND LAUNCHER OPTIMIZED FOR USE FROM AERIAL PLATFORMS



BARYER | VEHICLE-CARRIED LOG-RANGE ATG MISSILE SYSTEM



KOMBAT | GUIDED MISSILE ROUND



KONUS | GUIDED MISSILE ROUND



FALARICK 105 | 105 MM GUIDED MISSILE ROUND



STUGNA | GUIDED MISSILE ROUND



FALARICK 90 | 90 MM GUIDED MISSILE ROUND



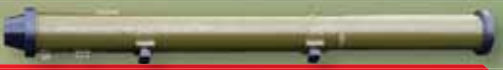
KORSAR | MAN-PORTABLE ATG MISSILE AND LAUNCHER



Type of carrier platform
Missile mass

Missile diameter
Missile length

Armed with tandem shaped charge warheads and guided by semi-active laser homing, the ATG Luch missiles feature a construction of modular architecture, reflecting the latest trends in the development of ammunition. For the production of ATG missiles, Luch has set up a cluster of domestic companies from the ammunition, precision mechanics and electronics sectors.



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



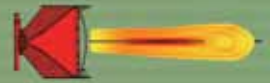
550 mm

Armor penetration capability



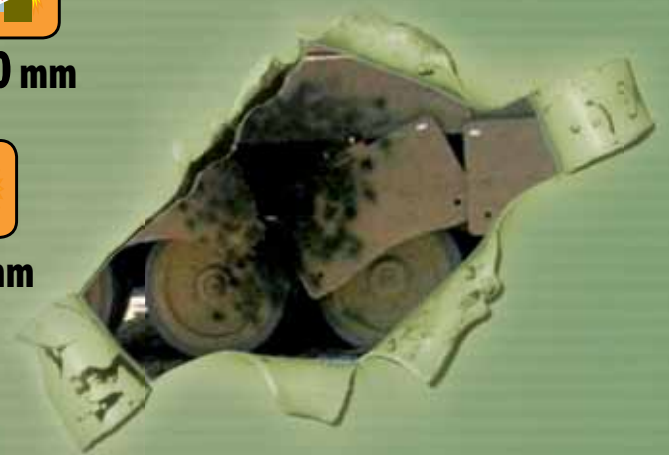
Guidance

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



Jet stream

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



[projectile]



A FOCUS ON

The antiterrorist operation ongoing in eastern Ukraine has clearly demonstrated the valuable role cannon artillery plays in a modern army's weapons arsenal. But today, when most of combat operations are conducted in urban areas, improving the precision of gunfire through the use of smart artillery projectiles assumes a special relevance, as not only does this enable a lethal payload to be delivered right to its intended target, but also to mitigate collateral damage. One of such solutions could be the use of a precision-guided round designated Kvitnyk, which was developed by R&D and Production Complex "Progress".



THE CONCEPTUALITY OF THE SUBJECT MATTER

The paramount significance of improving gunfire accuracy in a present-day operational environment has long been seen both by countries of the Western World and the Russian Federation. This is achieved precisely by employing precision-guided artillery projectiles to improve the effectiveness and efficiency of gunfire, to limit civilian deaths and to minimize damage to nonmilitary facilities.

The only two types of guided artillery projectiles to have seen service with the US Army

are the M712 Copperhead semi-active laser-guided 155 mm artillery round and the M982 Excalibur GPS-guided 155mm trajectory-correctable munition.

Initially conceived in 1970, the Copperhead CLGP (Cannon-Launched Guided Projectile) began to be developed by Martin Marietta, now part of Lockheed Martin, in 1975. After various travails, production was authorized in 1983 and continued till 1990, with the US Army and Marine Corps accumulating a limited stockpile of 20,000 rounds. Copperhead was used in Operation Desert Storm, with 90 rounds fired against hard point targets. In the US Army, the M712 Copperhead is being progressively supplanted by

the new 155mm Excalibur trajectory-correctable GPS-guided shell. The Excalibur is designed to be effective against hardened command-and-control centers, infantry, weapons emplacements and air defense facilities among other targets. Excalibur has a range of approximately 40 to 57 km, with a Circular Error Probable (CEP) of around 5 m to 20 m. The extended range is achieved through the use of folding glide fins, which allow the projectile to glide from the top of a ballistic arc towards the selected target. The Excalibur was used by US Army units in Afghanistan.

The Krasnopol semi-active laser-guided round was the first guided artillery projectile to en-

ACCURACY

ter operational service with the Soviet Army. The baseline Krasnopol projectile, developed by KBP Instrument Design Bureau of Tula and variously designated 9K25 or 3OF39, was introduced into service in 1987. It is arguably a more successful design than the Copperhead is, having a longer range and greater production longevity. It has been produced in 152 mm and 155 mm calibers. The length and weight of the Krasnopol/KM-1, which is a two-piece design, renders it incompatible with autoloaders and stowage bins aboard self-propelled howitzers. Consequently KBP has introduced the shortened one-piece Krasnopol-M, which is again available in 152 mm and 155 mm (KM-2) calibers. In place of the Krasnopol's separate rocket booster, the Krasnopol-M incorporates a base-bleed device.

Russian engineers proceeded with the development of precision-guided munitions, having developed an extended-range version of the 152mm Krasnopol-M, the 155mm M2, which is designed to meet NATO compatibility requirements. The M2, which incorporates trajectory-correctable K155M semi-active laser guided HE payload,

offers a 100 percent first-round hit capability against hardened and soft targets, both static and mobile, as well as engineer installations at ranges up to 25 km. The Krasnopol was exported to India and China, and licensed-produced in China.

In 2007, France was considering the purchase of 500 Russian Krasnopol-M projectiles at per unit price of some \$50,000 (\$24.6M total). However, the contract has never been executed to full extent, as the French customer demanded a replacement of the pyrotechnic charge in the weapon's fuse assembly to make it Nato compatible. On a parallel track, France was pressing ahead with the development of long-range precision-guided artillery projectiles under its Pelican program. Initial concept studies into such long-range (LK - 60 km-plus) and very-long-range (85 km-plus) guided artillery projectiles under the Pelican program were undertaken by Giat Industries.

China has been extensively demonstrating its extended range precision guided munition products at international exhibitions beginning in 2009. Previously, China, like India,

met its own requirement for guided artillery weapons by purchasing production-standard Krasnopol shells from Russia. In the long run, China set up domestic production of precision-guided artillery projectiles of both howitzer and mortar calibers for its own military and for export markets. In January 2012, Iran unveiled its indigenous Basir artillery fired laser-guided explosive projectile, which is claimed to be able to destroy tanks, vehicles and other static and mobile targets with high precision. The Basir is outwardly very similar to some smart artillery rounds designed in the USSR and China.

A LITTLE ABOUT THE MOST IMPORTANT THING

Ukrainian Army's artillery units rely on the capabilities of the domestic arms industries. The Kvitnyk 152mm semi-active laser-guided HE projectile was developed by Progress Research-and-Production Complex joined with Central Research, Development and Technology Bureau Tochnist (which is incorporat-

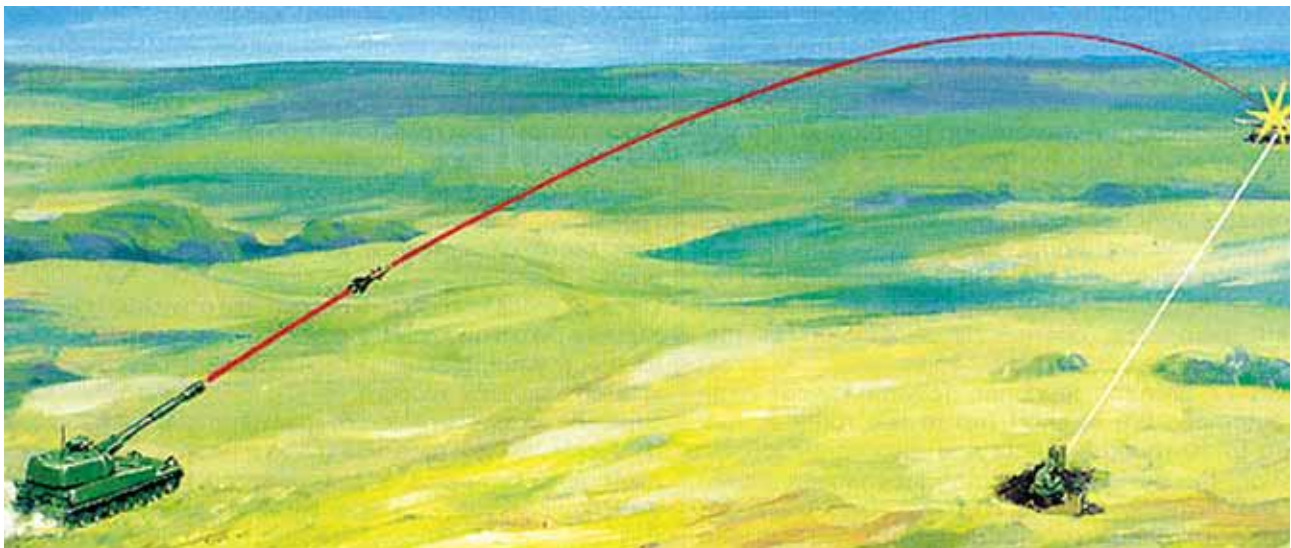


TABLE 1

Technical Characteristics



	Kvitnyk	Krasnopol	copperhead
Caliber, mm	152/155	152/155	155
Maximal range of shooting, km, not less than	20	17-20	16
Warhead type	fragmentation-high explosive	fragmentation-high explosive	cumulative
Explosive mass, kg, not less than	8	6,5	6,7
Projectile length, mm, not more than	1200	1300	1370
Projectile mass, kg, not more than	48	50	62

UDR

ed with Ukroboronprom State Holding Company). The Kvitnyk is designed to be deployed from artillery guns, with targets illuminated by laser designator rangefinder. Unlike HE rounds that are effective against area targets only, the Kvitnyk has the capability to effectively engage targets when fired from defilade positions, with first round accuracy and without adjusting fire. The projectile is available in 152mm and 155mm calibers. Guidance is by inertial navigation in the midcourse stage, followed by a semi-active laser for the terminal phase to increase the probability that the target will be hit in its most vulnerable, upper section. The Kvitnyk is effective against targets that include artillery, MLR and rocket launcher emplacements, self-propelled artillery mounts, tanks, infantry fighting vehicles and armored transporters (both static and moving), bunkers, bridges and ferries, assault landing and transport ships and boats. The Kvitnyk has 90% first-round hit probability if fired from a 152mm howitzer to ranges up to 20 km.

However, being as good as it is, and unveiled way back at IDEX exhibition in March 2001, the Kvitnyk project has yet to see completion. Ukraine's Ministry

of Defense said on several occasions that the new artillery projectile would be introduced to the Armed Forces' inventory "in the nearest time". In 2009, it was announced that trials of the weapon are nearing completion, and the Ministry of Defense would annually buy 200-300 rounds at per unit price of Hr 200,000. However, Kvitnyk is still awaiting to take to the field with the Ukrainian Army artillery units.

Delays in the fielding of the Kvitnyk are attributed particularly to the fact that the projectile is yet to go through the final phase of the official trials program that includes live firing of several dozen rounds. However, the MoD has not the money to pay for the manufacture of the requisite quantity of rounds for live-fire trails because of its limited budget.

This despite, the 152mm projectile was taken to the stage of official trials in 2012. During a live-fire session, it showed excellent results when it hit a 40x40cm target distanced at 18 kilometers.

In September 2012, the Kvitnyk underwent live fire testing during Perspektiva-2012 military exercises and maneuvers. Later in the fall of the same year, another live-fire session took place at the training range of Sahaidachny Army Academy as part of the fi-



nal stage of the official trials program. The live firing trials were conducted by officers and most experienced soldiers of the 55 independent artillery group, 72nd independent mechanized brigade of the Ukrainian Army.

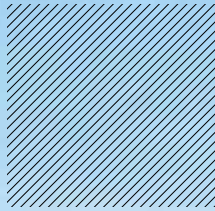
After successful completion of the final, live-firing phase of the official trials program, the 152mm Kvitnyk precision-guided projectile was officially approved for service use on 6th December 2012. It will be fired from the self-propelled Akatzia 2S3 152mm divisional howitzer, although it is compatible also with cannon systems of other types.

In 2013, Progress launched a production line for the 152mm Kvitnyk. But developments in Crimea and Donbas, and the Russian aggression overall changed the course of things. However, Progress is continuing a supply market research that aims to find potential alternative suppliers for Kvitnyk's components.

Further development of indigenous precision-guided artillery munitions is especially pertinent with regard to the need to enhance the accuracy performance of the Ukrainian Army's cannon artillery in the ATO area and, also, in the light of present-day arms market realities and Ukraine's visible presence on that market. UDR



[evidence of aggression]



DONBAS HAS BECOME A TESTING GROUND FOR RUSSIA'S NEW MILITARY CAPABILITIES

Russia's military and political leadership, despite their rhetoric that Russia is in no way involved in the crisis in eastern Ukraine, are eyewashing the international community, as a wide range of new Russian-made weapons and systems are used extensively in the Donbas conflict area. The region, which is literally teeming with weapons of all kinds, has already become a testing ground for new developments of the Russian defense industry. Here Defense Express gives a brief overview of the Russian weapons types used in the Donbas conflict area, and sheds light on some blurry circumstances.

In addition to huge numbers of the Soviet/Russian armored personnel carriers, infantry fighting vehicles and T-64 and T-72 tanks that have allegedly been "captured" by rebels from the Ukrainian forces, but actually have arrived into the conflict area from Russia on the part of the border uncontrolled by Kiev, there also can often be seen some brand-new weapons and equip-

ment types that could have come from nowhere else but Russia.

In addition to the T-72B3 and T-72BA tanks, which are 100% Russian designs and have been officially deployed with the Russian military, in the Donbas there could be seen UAV (drone) systems, various types of small arms, electronic warfare systems, air defense systems, artillery fire location systems and a



A destroyed T-72BA tank, which came from Russia, is seen on a battlefield near separatist-controlled Starobesheve

complete range of light armored vehicles, of which Russia is the sole manufacturer.

ROCKET AND GUN SYSTEMS, MULTI-LAUNCH ROCKET SYSTEMS

On 25th January 2015, Donetsk City residents reported movements of modern Russian self-

propelled surface-to-air missile Pantsir-S1 rocket and gun systems. The Pantsir-S1 (NATO reporting name SA-22 Greyhound) is a combined short to medium range surface-to-air missile and anti-aircraft artillery weapon system developed and produced by KBP of Tula. Its purpose is protection of civil and military point and area targets from any kind of modern or po-

tential aerial threats attacking from heights up to 15,000 meters. The system is also able to defend from ground-launched and sea-launched threats.

In 2008, the Pantsir-S1 was adopted for service use in the Russian Armed Forces, but it has been mostly delivered to export markets since. According to some reports released in 2010, Russia had USD2.5B worth of orders



People's Republic conducted military exercises and maneuvers in close vicinity to the nearest front-line, which employed some ten units of the BPM-97 "Vystrel/Dozor" Border Patrol Vehicle based on the Kamaz-43269 general utility truck, according to some video footage reports. Development of the BPM-97 "Vystrel" vehicle commenced in 1997 by the R&D and Manufacturing Center affiliated with Bauman Moscow State Technical University, joined with Kamaz Corporation. The BPM-97 vehicle is produced by JSC Remdizel Factory in Naberezhnye Chelny, Russia.

In years after the BPM-97 was issued an export certificate in 2005, only few such vehicles were exported to internal security customers in Kazakhstan and Azerbaijan. However, the customers rejected the purchase of the full batch of the vehicles already produced for them, this being due to a number of pretty serious deficiencies revealed in their operation (broken propshaft and springs, and cracks in armor plates on some vehicles). As a result, Russia's Defense Ministry decided to buy this batch of vehicles in 2008.

A total of about 160 BPM-97 vehicles have been produced. Of these, at least three have been fielded with Russia's Gudauta Military Base No 7 stationed in Abkhazia. Some of the vehicles have been outfitted with equipment for the launch of light drones. In 2009, four BPM-97 "Vystrel" vehicles were delivered for use by a scout sub-unit of the Russian army's 4th Occupation Base stationed in Samachablo region outside Tskhinvali, Georgia. According to reports available at the end of 2013, the herein mentioned vehicles were seen present in Tskhinvali and supposedly still remain in service with the 4th Occupation Base.

for the Pantsir-S1 system, which means a rough total of 175+ units of the system on order for export and for the Russian Armed Forces customers. Export customers for the Pantsir-S1 include Algeria, Iran, Iraq, UAE, Oman and Syria. Although Russia is expanding the geographical reach of its Pantsir-S1 air-defense missile system, it has never exported it to any country of the former Soviet Union, including Ukraine. In 2011, the Russian military took delivery of more than 10 units of the system, and 20 more units were delivered in 2012. All in all, the Russian Armed Forces will have a bit more than one hundred units of the Pantsir-S1 system by 2020.

On January 22 and 23, a video was posted on the internet showing rebels in Donetsk City conducting firing from a 2B26 Grad-K multi-launch rocket system mounted on a Kamaz-5350 6x6 truck chassis. The 2B26 is a spinoff of the 2B5 MLR system based on the aging Ural-375D 6x6 high mobility truck. Works to upgrade 2B5 MLR vehicles to the 2B26 configuration are performed by Motovilikha Factories, a firm which, according to some reports, delivered thirty-six 2B26 Grad-K vehicles to Russia's MoD in early 2012.



The 2B26 Grad-K system was unveiled on 23rd September 2011, at an exhibition on the occasion of the 275th anniversary of Motovilikha Factories in Perm city. At a later time, a few 2B26 vehicles operated by military units of Russia's Southern Military District, were seen displayed at a military parade in Rostov-on-Don on 9th May 2012.

LIGHT ARMORED VEHICLES

As well as small-arms weapons, some types of Russian-army-only light armored vehicles that have already seen combat in Russian army operations in the Caucasus, have been deployed by Russia's military command in the Donbas conflict area.

In December 2014, the armed forces of the self-styled Luhansk

Self-propelled surface-to-air missile Pantsir-S1 rocket and gun system was spotted in February 2015 in Shakhtarsk, Donetsk Oblast (below)

Furthermore, according to a May 3, 2013 statement by Colonel Ihor Ehorov of the Press-Service and Information Department at the Ukrainian Ministry of Defense, Vystrel vehicles are used by antiterrorist subunits of each and all divisions of the Russian Strategic Missile Forces, and employed by regional special-task squads of Russia's Federal Penitentiary Service as a core armored transport replacing the BTR-80 armored personnel carrier.

During a January 10, 2015 operation to disarm the "Odesa" independent operational brigade, the "law enforcement forces" of the self-styled LNR used a considerable number of other armored equipment, particularly GAZ-3937 «Vodnik» 4x4 vehicles, in addition to the Vystrel vehicles already used by rebel forces in Krasnodon city, Luhansk Oblast.

This multi-purpose modular vehicle was produced in small quantities by GAZ Group at OJSC «Arzamas Machine Building Plant» in the 1990s and 2000s, and delivered to the Russian Ministry of Defense (particularly Strategic Missile Forces and military police units), and Russia supplied 48 such vehicles as part of its debt repayment settlement with Uruguay.

GAZ-3937 «Vodnik» vehicles were also delivered for use by spe-

cial-task squads of the Russian Ministry of the Interior. A total of 250 vehicles were produced as of the end of 2006, and potential contracts on the export of the vehicles to Venezuela, Algeria, India, Pakistan and some African countries were negotiated.

In the 2000s, several Vodnik APC vehicles were made available for service in federal military units deployed in Chechnya. The vehicles were used by scout subunits of the Pskov-based 2nd Independent Special-operations Brigade of the Chief Intelligence Directorate of the Russian Armed Forces General Staff, where the subunits operated under the guise of being part of the Military Police. By the end of 2013 - beginning of 2014, several Vodnik vehicles were still operated by a special-operations brigade stationed in Pskov.

However, according to some sources, Vodnik has proved to be of little success, despite all its advantages; during the past several years, Vodnik vehicles have been removed from the Russian



The 2526 Grad-K» MLR system was spotted on 22-23 January in Donetsk city (above) and is seen here displayed at a military parade in Rostov-on-Don (below)

army along with Vystrel vehicles, and this is why they end up in the hands of pro-Russian rebels in eastern Ukraine.

RADAR EQUIPMENT, ECM/GUNFIRE SPOTTING SYSTEMS AND ELECTRONIC WARFARE CAPABILITIES

The 1RL257 «Krasuha-4» electronic countermeasure system and a portable mortar location system named "Aistenok" were spotted in the Donbas conflict area, along with air defense rocket and gun systems, MLR systems and light armored vehicles supplied to rebel forces by Russia.

In November 2014, one station of the «Krasuha-4» ECM system was deployed by Russia-backed terrorists outside a building of the Donetsk National Technical University in Donetsk. The Krasuha-4 can jam hostile radar emissions from attack aircraft, scout planes and drones, and it has the capability to disable radio communications between hostile UAVs and their operators – at ranges up to 300 kilometers.

One unit of the Aistenok system was shown to OSCE observers in Donetsk on 15th January 2015. The Aistenok was developed and is produced by Tula-based OJSC "R&D and Production Association Strela" which is incorporated with Almaz-Antey Air Defense Holding Company. Operating in the centimeter waveband, the Aistenok has the capabilities to pin-point sources of incoming mortar fire, control 80-120mm mortar fire, detect and designate tank-size moving ground targets and carry out 122-155mm artillery spotting. The Aistenok was introduced to the public at the third edition of



the MVSV Moscow International Exhibition of Weapons and Military Equipment in 2008.

At about 12:40 Luhansk time on January 16, 2015, a station of the MKTK Dzudoist integrated ECM radar system was seen deployed outside the Avrora shopping center in Luhansk city. This system is designed to do radio-, radiotechnical and special analysis of information security effectiveness and electromagnetic situation. It offers the capabilities for the detection, parameter measuring and position location of hostile sources of electronic emissions, in addition to the detection and prevention of data leak via technical channels.

The MKTK Dzudoist integrated ECM radar system, which made debut at Interpolitech-2012 International Exhibition of Equipment for State Security Forces, was adopted for service in Russia's Airborne Troops in 2012.

It will be emphasized here that equipment of this level of sophistication cannot be operated by pit-workers or retired servicemen but, rather, requires operators to have adequate skills and knowledge to operate the equipment to best effect, which the rebels in eastern Ukraine certainly do not have and could not develop.



DRONES

Most of the drones that fell into the hands of Ukrainian soldiers in the Donbas conflict area are the «Orlan-10», «Gruppa», «Zastava» and the band-new «Tachyon».

The Orlan-10, which was developed by the Russian company «Special Technology Center», has successfully passed official qualification trials and fared quite well during Russian Army and Airborne Troops exercises and maneuvers Kavkaz-2012.

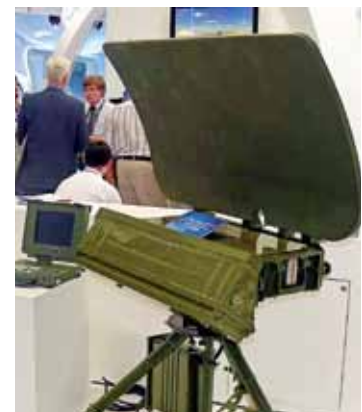
Company-size UAV subunits were set up within some brigades of the 58th Army (stationed in Vladikavkaz) of the Southern Military District Command (headquartered in Rostov-on-Don) in January 2014. The subunits are manned with technically and computer competent personnel who underwent training in UAV operation. As reported by the press service of the Southern Military District Command

in the winter of 2014, the 58th Army's UAV subunits took delivery of some three dozen drone systems in 2013 (which particularly included the Zastava, Granat and Leer systems based on the Orlan-10 UAV), and expected the delivery of the brand-new Aileron and Tachyon systems in 2014.

Seven new UAV systems Zastava, Granat and «Leer», manufactured under the State Defense Procurement Order 2014, were deployed to the Central Military District Command's Independent Motorized Infantry Brigade



The MKTK-1A Dzudoist ECM radar system is seen here deployed outside Avrora shopping center in Luhansk city on 16th January 2015 (below) and displayed at an exhibition in Russia (above)



The Aistenok man-portable gunfire spotting system is seen here deployed outside Donetsk airport on 15th January 2015 (below) and displayed at an exhibition in Russia (above)



The Orlan-10 UAV, developed by Russian company "Special Technology Center OJSC", is seen here operated by a Russian soldier during trials (above) and after being shot down in Ukraine's airspace over Amvrosivka on 23rd July 2014 (below)

stationed in Orenburg Region. The new systems will be used for support of ground operations and for maximizing gunfire effectiveness and efficiency.

In the context of the Donbas conflict, the Russian side employs UAV systems for adjusting artillery fire and for monitoring changes in the position, composition and capabilities of the Ukrainian forces. In addition to this, UAV capabilities are often used in missions that involve remote detonation of explosive devices. Particularly on November 2, 2014, an UAV system assisted in a terrorist attack on Ukraine's eastern checkpoint in Mariupol city, where a car packed with 100 kg of TNT explosives blew up, killing two Ukrainian soldiers.

Russian terrorists employ UAV systems either singly or in groups. For example, on Ju-

ly 25, 2014, a group of as many as four Russian military drones strayed into Ukraine's airspace over the Krasna Talivka area in Luhansk Oblast.

This brief review covers only a small fraction of the military capabilities that Russia provides for separatist forces in eastern Ukraine. According to the Ukrainian Security and Defense Council data, the Russian armaments and military equipment types being brought into Ukraine additionally include a wide range of firearms (Kord assault rifles, Pecheneg machine-guns and AK-74M automatic rifles), TOS-1 Buratino multiple

rocket launchers, MLR systems 9K58 Smerch and 9K57 Uragan, T-90 tanks and BTR-80AM APC vehicles. Credible video footage or photographic evidence of the presence of some Russian military capabilities in Ukraine are sometimes hard to find, but there is little doubt about this being the fact, especially as there is ample evidence of other Russian weapons and equipment types being present in east Ukraine. The circumstances speak for themselves. In the light of the preceding comments, the claims by Russian officials that their country is not involved in the Donbas crisis are at least cynical. [UDR](#)



The Zastava UAV system (which looks very similar in layout to Bird Eye 400), produced by Urals Civil Aircraft Factory, is seen here operated by Russian soldiers (left) and after being shot down in Ukraine's airspace over Kharkiv Oblast on 24th July 2014 (right)



The Tachyon UAV system, produced by Izhmash – UAV Systems OJSC, is seen here operated by Russian soldiers (left) and after being shot down in Ukraine's airspace in the vicinity to the Russian border in Donetsk Oblast on 29th June 2014 (right)

[air wings]



An-178

AMBITIOUS
PROJECT
BY ANTONOV

The Ukrainian An-178 is the most recent development in the military airlift domain. The idea to build the airplane was first spoken out in 2010. In 2012, Antonov aircraft designer unveiled that it has worked developing the multimission cargo aircraft dubbed An-178 and setting up production of the plane. The new aircraft is expected to take flight in 2015.



The ambitious plans of Ukrainian engineers are resting on a reliable technological and industrial base. The maximum possible level of commonality with the already flying commercial airliner An-158 gives every reason to expect that the A-178 would be got prepared for assembly-line production within the shortest timeframe possible. Hence the high level of multifunctionality envisaged

for the new airplane. Specifically it is foreseen that the aircraft will be used as tactical military transport for airlifting military supplies, equipment or personnel with their assigned weapons, and will have dual use as commercial cargo aircraft. The designers do not rule out the possibility that the An-178 would form a basis for a family of specialist airplanes ranging from air ambulance to patrol or command and control aircraft. In its militarized

configuration, the An-178 will be able to carry 18 tons of cargo or 99 fully equipped personnel, or to support parachuting of 80 armed paratroopers. It is furthermore envisaged that the airplane will have inner volume allowing for accommodation of shipping containers and individual military equipment types.

Antonov estimates the current market for An-178-class airplanes at



380 units. By developing the An-178, the Ukrainian firm decided to fill the market niche for transport aircraft with a payload capacity of up to 18 tons, which effectively remains unoccupied today. The An-178 is designed for transportation of medium to maximum payloads from 15 to 18 tons. This segment of the marketplace is virtually vacant thus far, except for aging or obsolete An-12 and C-160 airlifters which all need a replacement. The new aircraft will find itself in the heavier payload category than the An-74 or Europe's C-27J and C-295. The predecessor of the An-178, the An-12, has been flying for a few decades now; so Antonov will not be a newcomer to the military airlift domain.

The An-178 will be propelled by two turbojet engines instead of four turboprops seen on the An-12. However it will far surpass

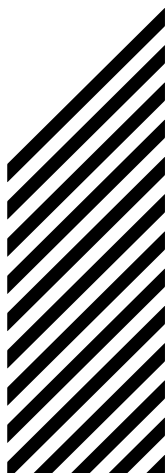
the latter in terms of fuel burn rate. The An-178 design provides the key advantages as follows:

- capacious cargo bay allowing for accommodation of standard IATA shipping containers;
- digital avionic equipment;
- “glass” cockpit;
- pressurized cargo hold.

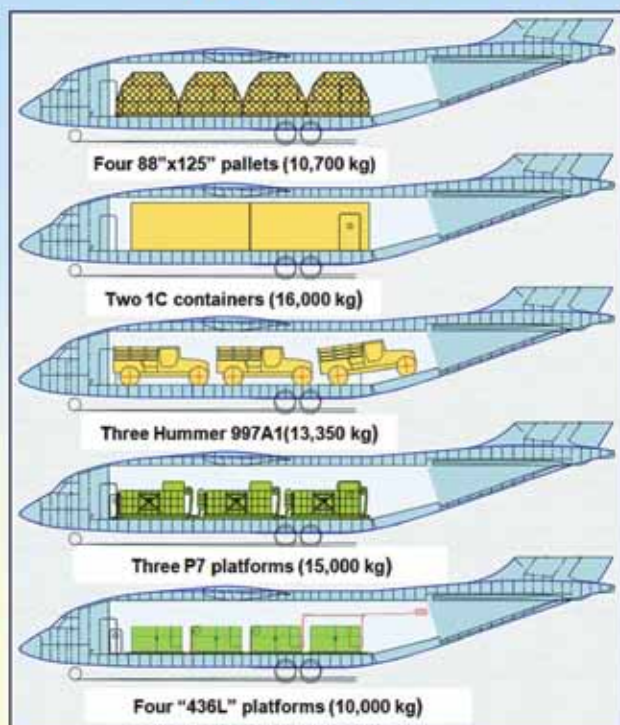
The An-178 has a cargo bay cross section that is larger than that of the An-12's, as claimed by the designer. Cargo compartment floor area will amount to 40 m² with loading ramp or 33 m² without it, and inner volume of cargo bay with or without loading ramp will be 125 m³ and 112m³, respectively. By way of comparison, cargo bay volume makes up 110 m³ in the An-12, 65 m³ in the C-27J and only 64 m³ in the C-295. In its cross section, the cargo bay in the An-178 is 2,746mm wide and 2,750mm high, which is clearly optimized

for standard 2,440 x 2,440mm shipping containers. If compared to the An-158 on which basis the An-178 was designed, the latter will have its center wing section enlarged and expanded. This will provide enough space for three Humvee vehicles (13.3 tons), or as many Land Rover jeeps (9.7 tons), or two ZIL-131-class trucks (13.4 tons). The aircraft would allow for autonomous operation during 30 days. Meanwhile, labor intensity of maintenance personnel will be reduced substantially – down to 2.5 personnel per each flying hour – this all against the background of possible dual use as military/commercial airlifter.

Antonov is working on two versions of the An-178 transport: one with a side door and the other with a loading ramp. Alternative sources of avionic equipment being considered



AN-178 – main features of the aircraft



- 18 t
- 72 soldiers
- 68 paratroops
- 70 wounded



- Transportation of aviation and marine containers
- Digital Avionics and "glass" Cockpit
- Pressurized Cargo Cabin
- Dual civil/military application

➤ Unification with AN-148/158 Aircraft by Construction, Equipment and Plane Systems

TABLE 1

Key performance specifications of the An-178 against the background of main «indirect» competitors



UDR

	An-178	C-130J-30	KC-390
Country of origin	Ukraine	USA	Brazil
Designer company	SE "Antonov"	Lockheed Martin	Embraer
Year of maiden flight	Expected in 2014	1996	Expected in 8 2014
Practical range (with payload), km	4,000 (10.0 t) 1,000 (18.0 t)	3,150 (16.329 t) 2,222 (20.4 t)	4,815 (14.7 T) 2,593 (23.0 T)
Ferry range, km	5,400	5,250	6019
Procurement price, \$mn	40-42.2	67.5-80	50-60
Number of aircraft ordered	-	80 (including C-130J)	60
Max. Payload capacity, t	18.0	19.958-21.772	23.0
Cargo bay dimensions (W/H), m	2.75x2.75	3.12x2.74	3.35x2.94
Full length of cargo bay (plus loading ramp), m	16.65 (12.85+3.8)	20.01 (16.76+3.25)	18.54 (12.68+5.86)

for the An-178 include suppliers such as Honeywell and Collins.

The cockpit is designed for a crew of two pilots. The An-178, as with any of Antonov-series military transport aircraft, will be able to operate both on unpaved and concrete runways no shorter than 915 meters. Cruising speed is set at 825 km/h. The aircraft will have a range of 1,000 km with full load and 4,000 km with a 10-ton load. A configuration with additional fuel tanks is being considered, allowing for cargoes up to five tons to be delivered to 6,000 kilometers. By way of comparison, the An-12 can deliver a 10t load to 3,200 kilometers at a cruising speed of 600 km/h.

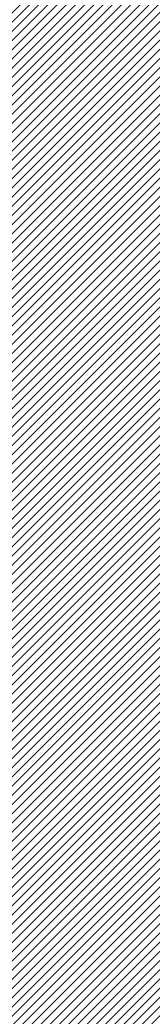
Development of the An-178 is currently being funded with own money of SE Antonov. Even before the aircraft enters into production, its designer intends to set up reliable partner ties needed for the airplane to be marketed more aggressively. However, there is uncertainty with regard to this prospect. Indeed, an order from Ukraine's Defense Ministry could give a strong boost to the development of the An-178 and help advance its service en-

try day, but the situation in this regard is hard to predict so far.

The Russian market looks clearly promising, but strained relations between Moscow and Kiev are one more impediment to the project.

In addition to the Russian Federation, Ukraine offered the cargo ramp An-178 aircraft to India for use as medium transport aircraft under the latter's MTA program. India demanded that the airplane with full load should be able to fly to destinations out to 2,500 kilometers as against 1,300-1,700 kilometers previously demanded by Russia. A configuration in the 20-ton payload category, capable of ranges of up to 2,500 km when fully loaded, was developed by Ukrainian engineers and demonstrated to the Customer. So probability is high enough that the delays faced by the Russian-Indian program to build a medium-payload military transport aircraft derived from the Russian IL-214 will make New Delhi opt for the An-178.

On 29 July 2014, fuselage assembly of the first An-178 medium transport aircraft was completed by Antonov State Enter-

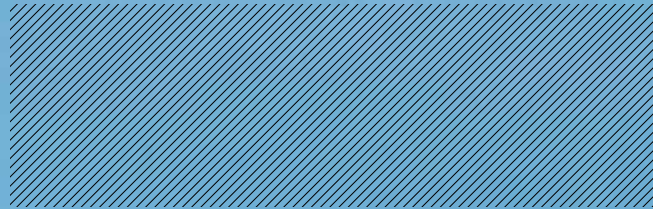


prise, the company's press-service reports. Final assembly of the aircraft was started: mating of major airframe components (wings, empennage, pylons, nacelles, etc.), installation of aircraft systems, testing of aircraft equipment and preparation of the aircraft for its maiden flight and certification testing. A special aspect of this project is that it was carried out using paper-free technique during design and production of the aircraft. The technique employs state-of-the-art PLM software NX/TeamCenter comprising electronic annotated 3D models, which helped shorten development time and labor intensity of design, production and assembly of the first prototype.

At the beginning of 2015 it was reported that "Antonov" will give first An-178 to the flight tests in next few months. Beside this the Aircrew training center of SC "Antonov" completed a training program for the test pilots for An-178.

On 16 April 2015 the first AN-178 medium transport aircraft was presented to the public on Antonov Serial Plant/Branch of Antonov Company.

[new generation]



PRAGUE 2015

EUROPEAN AVIATION FESTIVAL

MOTOR SICH JSC specializes in development, production and aftersales service of gas-turbine engines for aviation, industrial gas turbine drives, as well as gas-turbine power stations with these drives.

One of the recognized criterions of success is a participation of the enterprise in the international airshows. MOTOR SICH JSC permanently represents its products at aerospace shows in German, France, Great Britain, India, China, United Arab Emirates and other countries.

Cooperation of the aviation enterprises of Ukraine and Czech Republic began as far back as 1971, when the first AI-25TL bypass turbojet engine was installed on the L-39X-02 training prototype aircraft developed by Czech "Aero Vodokhody" company. A total of 3 thousands of the L-39 aircrafts of all versions were manufactured and today they are used in more than 40 countries of the world.

At the present day, the list of our engines for aircrafts of different purpose embraces turboprop and turbopropfan engines with power of 400 to 1,400 h.p., as well as bypass engines with thrust of 1,500 to 24,400 kgf. Among them the D-436-148 engine for passenger aircrafts of the An-148 family should be marked out. This engine meets the ICAO up-to-date requirements and is not inferior to foreign analogue by its characteristics. At present, the An-148 aircrafts are operated by 10 airline companies.

From the mid 2013 in Republic of Cuba operation of 100-seater An-148 version of the An-158 aircrafts was started.



**Vyacheslav
A. Boguslayev,
President Motor Sich JSC**

Nowadays designers of "Antonov" SE perform works on development of the An-178 transport version with capacity of 16 to 18 tons, for which the D-436-148FM engine is produced. It is the version of the D-436-148 engine with increased takeoff thrust up to 7,900 kgf and with emergency thrust of 8,600 kgf, achieved by means of improvement of engine assemblies' effectiveness. Flight tests of the An-178 aircraft should start in the first half of the year 2015.

At the present time, our enterprise takes part in works on development of bypass engine of the AI-28 family new generation in the class of 7 to 10 tons thrust, carried out by "Ivchenko-Progress" SE. The engine is designed for installation on advanced passenger and transport aircrafts, and on the base of

its gas generator high-performance turboprop and turboshaft engines can be developed.

"A.Ivchenko" Science and production association" corporation is specializing in development and manufacturing of engines for trainer- and combat training aircrafts over a period of 90 years.

Following this tradition, we take part in development of the AI-222 family engines together with "Ivchenko-Progress" SE. They can generate maximum thrust of 2,500 to 3,000 kgf, and if equipped with afterburner – up to 5,000 kgf. Nowadays the AI-222-25 engine with maximum thrust of 2,500 kgf for trainer aircrafts is in serial production.

The AI-222K-25 (non-afterburning) and AI-222K-25F (with afterburner) versions are designed, correspondingly, for installation on basic and advanced L-15AJT subsonic trainer aircraft and on L-15 LIFT supersonic aircraft, developed by Chinese "Hongdu Aviation Industrial (Group) Corporation (HAIC)" company. The AI-222K-25F engine is the first engine with afterburner developed and manufactured in Ukraine.

At the present time the L-15 LIFT aircraft and engine flight tests are continuing successfully while the L-15AJT aircrafts began to enter Air Forces of People's Republic of China.

Nowadays small aircrafts are in keen demand; thereby MOTOR SICH JSC takes an active part in works on development of small turboshaft and turboprop engines of the AI-450 family carried out by "Ivchenko-Progress" SE.

At present, the efforts of both enterprises focus on the AI-450M

version with takeoff power of 400 h.p. or 465 h.p. depending on automatic control system adjustment, designed for remotorization of the Mi-2 helicopters produced earlier, where it will take a place of out of production ГТД-350 gas turbine engine. At the same time, works on development of the AI-450S and AI-450S-2 turboprop versions with takeoff power of 400 to 750 h.p., correspondingly, designed for aircrafts of general aviation and trainer aircrafts, are carried out.

On January 19, 2015 the AI-450S engine started flight tests as a part of the DA50-JT7 aircraft of the well-known in the world DIANOND AI company in Austria.

The AI-450S-2 engine is designed for installation on the version of Czech twin-engine multipurpose EV-55 aircraft.

Considering change in the global helicopter market, our enterprise is in the process of development of turboshaft engines family of new generation – MS-500V in the class of takeoff power of 600 to 1050 h.p., designed for installation on helicopters of different purpose with takeoff mass of 3.5 to 6 tons. As predicted by the experts, market sector of such type helicopters will be one of the most prospective in the coming years thanks to their flexibility. On May 19, 2014 the MS-500V engine got Type Certificate issued by Aviation Register of Interstate Aviation Committee.

For the purpose of further upgrade of helicopter performances and efficiency when operating in high mountain areas of hot climate countries in September 2007 MOTOR SICH JSC completed the development of the TV3-117VMA-SBM1V helicopter engine. This engine meets up-to-date technical requirements by its performances. The TV3-117VMA-SBM1V engine is added to armoury of Ministry

**AI-450C ENGINE
FOR DIAMOND
DA50 AIRPLANE**



**AI-450M ENGINE
FOR MI-2 HELICOPTER**



of Defense of Ukraine. Design solutions proven on engines of the TV3-117V family and on the TV3-117VMA-SBM1 turboprop engine, as well as wide experience of development, manufacture, operation and overhaul of helicopter engines, produced by MOTOR SICH JSC more than 60 years, have permitted to develop the engine with new performances.

Engine power ratings are optimally adapted to the conditions of operation on different helicopter types. Its automatic control system permits to adjust one of the following power values at takeoff power rating – 2,500, 2,400, 2,200 or 2,000 h.p. and provides its maintenance to higher ambient temperature and flight altitude as compared with existing engine versions of the TV3-117V family. For use in projects of new helicopters the TV3-117VMA-SBM1V, Series 1, engine version with electronic automatic control system is developed, as well as the TV3-117VMA-SBM1V, Series 2, engine version with new electronic governor has been developed and already certified. Use

Maximum weight of cargo carried inside the Mi-8MSB cargo compartment is 4000 kg, and that on external load sling system is 3000 kg. The Mi-8MSB helicopters can be delivered in transport, passenger, search and rescue, fire-fighting, agricultural and military versions.

of new automatic control systems will result in further improvement of engines and helicopters performances.

The TV3-117VMA-SBM1V, Series 4 and 4E, engines (with air starting system or electrical starting system) are the TV3-117VMA-SBM1V engine versions and designed for remotorization of the Mi-8T type helicopters produced earlier with the purpose of improvement of their performances.

In June 2013 State bench tests of the TV3-117VMA-SBM1V, Series 4 (4E), were performed at MOTOR SICH JSC in the interests of the Ministry of Defense of Ukraine.

The D-136 engine, which has no competitors in the world in regard to power and efficiency, is the largest helicopter engine of MOTOR SICH JSC production. The D-136 engine is operated on the Mi-26 load-lifting helicopters and its' versions, where on 14 world records were set up.

Designers of "Ivchenko-Progress" SE have developed the project of D-136 engine upgrading, carried out together with MOTOR SICH JSC. The new engine was designated as D-136-2 and generates maximum takeoff power of 11,500 h.p. maintained up to $t_a = 40^{\circ}\text{C}$. There is also emergency power of 12,200 h.p.. The D-136-2 is designed for operation on the upgraded Mi-26T2 helicopter and can be used in projects of development of new up-to-date heavy helicopters.

The present day MOTOR SICH JSC performs active works on helicopter subject. MOTOR SICH JSC created Design Bureau specialized in development and upgrading of helicopter equipment. "Helicopters of MOTOR SICH" department was created for mastering the production of own helicopters with high performances and for market promotion of helicopter equipment.

Upgrading of the Mi-8T type helicopters to the Mi-8MSB version provides for installation of new TV3-117VMA-SBM1V, Series 4E, engines of in-house design. As a result the helicopter gained the following advantages:

- maintenance of steady-state engine power within all operational range of altitudes and temperatures;
- higher service ceiling;
- longer service life between overhauls and total service life of engines which reduces operating costs;
- ease of maintenance, high repairability and reliability;
- extended flying range by means of reduction of fuel consumption per hour;
- increase of airfield altitude up to 4,200 meters, ease in starting under high temperatures and high mountains conditions.

With the purpose of maximum use of the MOTOR SICH JSC production helicopter equipment, in works by international contracts, the enterprise is in the process of re-equipment of the Mi-8MSB helicopters with navigation instrument set completely met EASA and ICAO requirements.

Upgraded Mi-8MSB helicopter may be represented in several versions as follows: transport, passenger (including VIP version), search and rescue, am-

balance, fire-fighting, military.

In August 2013 the Mi-8MSB helicopter equipped with TV3-117VMA-SBM1V, Series 4E, engines, upgraded by MOTOR SICH JSC, broke a number of world records among which there is an absolute record of level flight altitude of 9,150 meters in the E-1 class, which exceeds the Mount Everest height.

The Mi-2 is another helicopter upgraded by MOTOR SICH JSC at the present time. Mi-2 upgrading to the Mi-2MSB version is carried out by means of installation of the AI-450M new generation engines and is performed simultaneously with overhaul reconditioning, providing the reserve of calendar life, service life of helicopter and its accessories at the acceptable price for Operator.

Advantages of the Mi-2MSB helicopter in comparison with the Mi-2:

- reduction of fuel consumption per hour by 30%;
- increase of service ceiling by 15%;
- increase of maximum takeoff mass up to 10%.

In December 2014 upgraded Mi-2MSB helicopter was cleared of production flight tests.

The development of the MSB-2 helicopter on base of the Mi-2 helicopter with improved performances and ergonomic characteristics is one of the priority areas of helicopter sub-

ject. The process of development includes two stages.

The first stage includes:

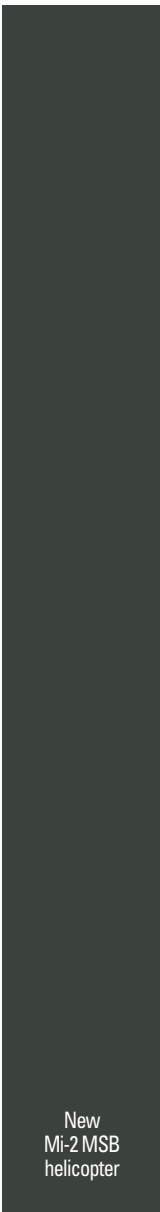
- installation of up-to-date AI-450M engines with improved fuel efficiency and increased power;
- upgrading of helicopter transmission;
- installation of new composite nose section;
- installation of up-to-date integrated flight and navigation system.

The second stage provides:

- development of design of main rotor blades and head;
- installation of new fuel system;
- installation of main fuel tanks of increased capacity outside of cockpit;
- reinforcement of fuselage structure for cockpit space saving;
- installation of rear cargo and-passenger door;
- installation of new cabin.

Nowadays MOTOR SICH JSC operation exactly complies with the criteria of market economy. The activity of our enterprise on global market is flexible and effective because of its wide experience. Quality and reliability of the engines produced by our enterprise are confirmed by their long-term operation on aircrafts and helicopters in more than 100 countries of the world.

Cooperation of Czech Republic and Ukraine may result in new creative solutions and provide mutual benefit to both Ukrainian and Czech parties.



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[protection]





ADRON WILL PROTECT YOUR FLIGHT

Ukrainian company Adron R&D Ltd has designed equipments that defend helicopters and air-plane from all of the currently-existing infrared-homing threats, including MANPAD missiles, by confusing or 'blinding' missile seekers and therefore diverting these from their courses. The Ukrainian Armed Forces (UAF) has commissioned the optical-electronic jamming systems Adros KT-01AV and Adros-KT-03UE. The Adros KT-01AV is being manufactured by the Progress research-and-production complex in Nizhyn, near Kyiv. The 20-kilo system is designed to equip MI-24 and MI-8/MI-17 helicopters. This has been tested on board MI-8 and MI-24 helicopters. Ukraine also offers potential buyers an export configuration of the system, designated Adros KT-01AVE.

CRUEL REALITY

Protection of both military and civil aircraft from IR-guided MANPAD weapons like Sidewinder, Red Eye, Chapparel, Piton, Xiuning-5 or Stinger is normally provided using false thermal targets and electronic-optical active jamming systems. Operation of electronic-optical active jamming systems for the protection of military and civil aircraft depends on the principle of modular jamming of infra-red radiation. This type of protection does better than the elimination of false thermal targets, as the latter implies an expendable protection reserve which is limited. Conversely, electronic-optical active jamming systems provide reliable protection as long as the flight continues, while remaining virtually non-sensitive to the target discrimination devices employed by IR seekers. Field testing and the use of electronic-optical active jamming systems in combat operations demonstrated their high performance and operational reliability. The systems effectively defeat a few types of IR-guided missiles, providing an adequate protection against multiple threats flying from many directions all at once, and eliminating the need for the use of special missile attack warners. The systems are easy to operate and suitable to maintain even in field conditions. Light and compact, these are easy to integrate onto helicopters from various manufacturers.

UKRAINIAN SOLUTION

Electronic-optical jamming systems are designed and manufactured in the U.S. and some European nations, as well as Russia and Ukraine. Russia, for example,

has developed and commercialized several types of jamming systems for the protection of aircraft. In one of the systems, infrared signals follow modulating voltage and are identified by the missile's optical system as self-infra-red-radiation from the protected object, and, when processed in the electronic section, generate a spurious control signal. Another such system uses an infrared flashtube as a source of IR radiation.

Ukraine offers potential buyers the Adros-KT-01AVE electronic-optical jamming system, intended for active protection of helicopters and Adros-KT-03UE for protection of An-26 and An-32 aircraft from IR-guided missiles. The system's operation depends on a new electronic-optical jamming principle. The technology incorporates a newly-designed electronically-controlled modulator with programmable processors.

The mass of the existing jamming systems are known to be primarily designed for defeating the missile guidance units using amplitude-phase modulation. To mislead the missile guidance unit and divert the missile from its course, the electronic countermeasure signals generated by the system should be 1.5-2 times (sometimes even 20 times) strong-

er than the signal emitted by the object under protection. The exclusive forte of the Adros-KT-01AVE and Adros-KT-03UE, according to its designers, is that they are equally efficacious against guidance devices using amplitude-phase modulation, phase-frequency modulation, or pulse-position modulation of target-emitted signals, as well as against guidance units with high noiseproof factors. This is the first thing.

The second thing is that the Ukrainian technology, unlike its foreign-made equivalents, does not require the intensity of the electronic countermeasure signal to differ much from that emitted by the target proper. The Adros-KT-01AVE and Adros-KT-03UE are particularly efficacious against the missiles such as Stinger, Stinger-POST, Magic, Sidewinder, Mistral and more.

It should be emphasize that the design of the Adros-KT-01AVE allows it to be adjusted to helicopters of all types. The Ukraine's research and manufacturing potential, along with an experience in maintaining the system allow it to adjust the system to military equipment and military/civilian installations of various types, as well as to develop new electronic-optical countermeasure technologies.






For maximum effectiveness for defeat aircraft it is necessary to use Engine Exhaust Shields (EES) «Adros» ASh-01V and/or combined flare dispenser «Adros» KUV 26-50 (release of decoys), which can significantly reduce aircraft infrared visibility and create a complex obstacle environment functioning infrared homing missiles of class «air-to-air» and «ground-air».

EES «Adros» ASh-01V are intended for reduce of infrared visibility of Mi-8, Mi-35 type helicopters of all modifications, equipped with turboshaft TV3-117 type engines with the purpose to decrease IR guided missile attack probability.

Needed helicopter infrared visibility decrease level is provided by multiloop gas ejector use, by screening of heated component direct visibility, by EES tract screening, by use of spe-


 Helicopter
 Mi-8MSB
 equipped by
 protection system
 from Adron
 R&D Ltd

cial materials, which decrease infrared emission.

Decrease of aerodynamic and gas-dynamic losses is provided by EES configuration change and by flow part geometry optimization.

«Adros» KUV 26-50 flare dispenser is intended for locating and dispensing 26 mm and 50 mm caliber chaff decoys and flares with the purpose to protect aircraft against guided missile attacks. Device dispenses flares under special programs to create complicated jamming situation for missiles with infrared homing heads even for those have counter countermeasure system.

Universal flare dispensing programs are developed for particular aircraft type. Salvos of two caliber flares with different and specially calculated periods provide to approaching missiles false information about

target location and lead the missiles away from the attack trajectory. «Adros» KUV 2650 can be applied on all flight stages in manual or automatic (jointly with the missile warning system) modes. «Adros» KUV 2650 flare dispenser can be installed on any aircraft type.

For KUV 26-50 Adron R&D Ltd has designed flares «ADROS» PIK-26, PIK-50, PIK-50V. They are used to protect aircraft (both helicopters and airplanes) against any guided missiles equipped with infrared seekers. Flares create false infrared targets and drag approached missiles to the distance safe for protected aircraft.

Unfortunately, Adron's protection systems were not installed on all Ukrainian helicopters that took part in anti-terrorist operation in Donbas region. But helicopters which were equipped with Adros system were protected against MANPADS. **UDR**

[small arms]



SERHIY LUHOVSKOY

VICE CEO OF INTERPROINVEST

OUR GOAL IS TO HAVE THE MALYUK RIFLE REPLACE SOVIET-DESIGNED 5.45/7.62MM AK WEAPONS IN UKRAINE



The evolution of the use of firearms in modern warfare, both by regular and special-operations forces, shows that the good old Kalashnikov assault rifle can no longer meet all the requirements of present-day customers. With this in mind, engineers at Ukrainian company «InterProInvest Ltd» have developed a modified configuration of the Kalashnikov rifle – still the most widely fielded service rifle in Ukraine and elsewhere. The modified configuration, which was dubbed as Malyuk (Ukrainian for 'baby boy') incorporates several design changes to make it more functional and modern. This Ukrainian AK bullpup conversion was the focus of an interview UDR conducted with Serhiy Luhovskoy, vice CEO of InterProInvest.

UDR: What is like the Malyuk automatic rifle that you offer? How new is this product?

Work on the Maluk rifle commenced in 2005. At that time in Ukraine, there were already attempts made to develop a bullpup version of the AK rifle, such as the Vepr, for example. Having learnt lessons from previous mistakes, we went our own way in creating the Malyuk. The result was that our engineers developed the Vulkan-M automatic rifle, which is aka the Malyuk. We have implemented more than a dozen proprietary innovations in this product. As a matter of fact, the barrel and the receiver are the only components that have been left from the original AK rifle.

The Malyuk has a bullpup design, with the trigger group moved forward on the gun and to just in front of the gun's magazine and trigger mechanism, where also the magazine release is located. The trigger guard, which is designed in the form of a but-

ton, was moved forward, too.

The weapon features three Picatinny-style rails for mounting a different variety of optical and mechanical devices, such as sights, grip handle, bipod etc. A quick-detachable suppressor is also available.

The Malyuk is compatible with a standard AK magazine. This is mounted within a dedicated shaft, which not only facilitates better fixation, but is designed so that to allow the magazine to fall down under its own weight with a press of the release button located next to the trigger. However, the shaft does not receive multiple cartridge row magazines or circular drum magazines. In any case, the magazine is easy to load into the receiver from whatever position the shooter chooses to take.

The Malyuk automatic rifle is designed to be ambidextrous for both right-hand and left-hand shooters.

It should also be noted that our design makes an optimal use of the energy of the combustion gases. The fact is that the gas eject system in the Kalashnikov rifle tends to be excessively productive, making the weapon even more reliable. We did the design such that the gas is supplied in exactly the needed amount for eject and reload. Further, the ergonomic bolt handle doesn't move when firing, lest the shooter get a hit on fingers or chin.

UDR: What kind of other benefits does the Malyuk offer?

First, it is lighter in weight compared to its Soviet-designed counterpart, this being achieved by the design features and the use of modern materials.

Moreover, we have improved the balance of the weapon by relocating the grip handle component, which is contributing also to controllability of fire. After the recoil, the standard Kalashnikov rifle, due to its forward center of mass among other things, tends to jump up and to the right, while the Malyuk has its recoil reduced significantly by almost 50 percent. It's also essential that key operations – unlocking, firing, removing and replacing the magazine and reloading – can be done with a single hand.

We have also resolved the problem of excessive emissions of combustion gases, which is common to earlier designs of the AK rifle. We really worked hard configuring the shape of the deflector shield over ejection port, and the inner layout of the rifle. The result is a substantially reduced amount of exhaust gases ending up in the receiver, and spent cartridge cases are ejected one after the other in a manner such that the direction of ejection is alternating between downward and forward at 45 degrees.

In addition to this, our rifle is designed such that aiming point





settings remain in place even when the weapon undergoes assembly/disassembly with the removal of the sight, which has been verified by marksmen who tested the Malyuk rifle for us.

Regarding the practicality of the use of the Malyuk in air assault operations, the weapon is sufficiently compact not to impede with a soldier's parachute and equipment, nor, most importantly, will it impede a paratrooper's landing.

UDR: As far as I know, the Malyuk was developed as a private venture project. Did you offer it to the Ukrainian Armed Forces or security services?

Yes, it's true that the Malyuk rifle was developed as a private venture, and the Government has some interest in this product. Thus, for example, prototyping works for the Malyuk were done under a contract that we got from Ukraine's Security Service (SBU). The service had it fire-tested, and their feedback was positive. At a later time, expressions of interest began to come in from the Ministry of Defense. This resulted in a decision to hold, under the MoD's auspices, a conference of the interested

military and security services. Such a conference took place in 2008. This was followed by talk about the need to subject the Malyuk rifle to official trials and introduce it to the inventory of all the security sector services in Ukraine, not only the SBU alone, given that Ukraine has ample stocks of Kalashnikov rifles.

However, numerous reshuffles among senior Ministry of Defense leadership, coupled with the lack of funding for official trials, delayed the progress in the implementation of this plan. This despite we, for our part, were proceeding with this work. We have made many proprietary changes to the rifle's design. In February 2015, the Malyuk was introduced to Ukrainian President Petro Poroshenko and his security guards, and they gave positive comments on the weapon and its performance.

UDR: As far as I understand, the Malyuk rifle has yet to come into mass production. How are you going to handle this matter?

The Security Service, the Department of State Securi-

The rifle is designed to be ambidextrous for both right-hand and left-hand users



ty Guard and the Ministry of Defense all have an interest in our rifle. With this market potential in mind, we are now making arrangements to set up domestic production of the Malyuk rifle, given that the manufacture of the component parts for the Malyuk, as well as material implementation of our proprietary design changes are well within the scope of expertise and competence of Ukrainian companies. We selected the Electron Corporation in Lviv to be the key production site. Now our partners are busy preparing the manufacturing premises, doing appropriate certification works and drawing up the set of documents for obtaining a license. The reason why we selected Electron to be the key production site for the Malyuk rifle is that this entity is privately owned and is capable of being sufficiently quick in executing orders. Moreover, it has relatively modern manufacturing equipment and the requisite premises. Our goal is to have the Malyuk replace the 5.56/7.62mm Kalashnikov rifles currently in use [in Ukraine].

UDR: In Ukraine, there is another manufacturer of small arms, which is Fort who offers a range of pistols and automatic rifles, including one with a bullpup design. Does it mean you will have to compete to some extent with Fort? If so, what are the advantages your product has over counterpart products offered by Fort?

I don't think it's worth talking in competition terms, especially at this date, when war conflict is ongoing in Donbas and our frontline forces need everything, and

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



UDR

Physical characteristic/ performance parameter	Malyuk (Ukraine)	TAVOR (TAR-21) (Israel)	Fort 221 (Ukraine)	AUGZA2 (Austria)
Mass without magazine, kg	3.2	3.27	3.9	3.8
Full length of the rifle, mm	710	720	645	805
Length of the barrel, mm	415	460	375	508
Caliber of cartridge used	5.45x39 mm 7.62x39 mm	5.56x45 mm	5.56x45 mm	5.56x45 mm
Firing patterns	Single-shot/ automatic	Single-shot/ automatic	Single-shot/ automatic	Single-shot/ automatic
Rate of fire, rds/min	660	750	500	600
Muzzle velocity, m/s	900/ 715	850-900	890	
Effective range of fire, m	500	500	500	
Magazine capacity, rounds	30/45	30	30	30/42
Standard sight	as required by Customer	Red-dot	Red-dot	1.5 power optical
Type of sight mounting	Picatinny (length 315)	-	-	
Underbarrel grenade launcher	Mounting possible	Mounting possible	Not available	Mounting possible

in large quantities. One should be mindful that the Fort-221 rifle – essentially an equivalent of the Israeli bullpup assault rifle TAR-21 (aka Tavor) – is being assembled from mostly foreign-supplied components. What we offer is an upgrade of the already existing weapon. Importantly, the upgrade doesn't require any substantial financial investment from government. It is designed to meet the most stringent requirements of military users, and to be produced from domestically manufactured components only.

As regards the advantages [over the Fort products], our product, as I see it, is better adapted to the Ukrainian user's needs than the Fort counterpart is. After all, soldiers are most

accustomed to using the AK rifle, to its design, simplicity and reliability. In our product we tried to enhance and improve these qualities to the maximum possible degree, adjust it to the operational environments met in modern warfare, and minimize the AK's inherent imperfections. A great many experts from security sector services have already given their appraisals of the product we created. Their feedback conveys some optimism, making us confident, that all our plans and aspirations will be reliably met.

UDR: Will you offer your product – in case it will reach the mass production stage – in export markets; and what are your expectations in this regard?

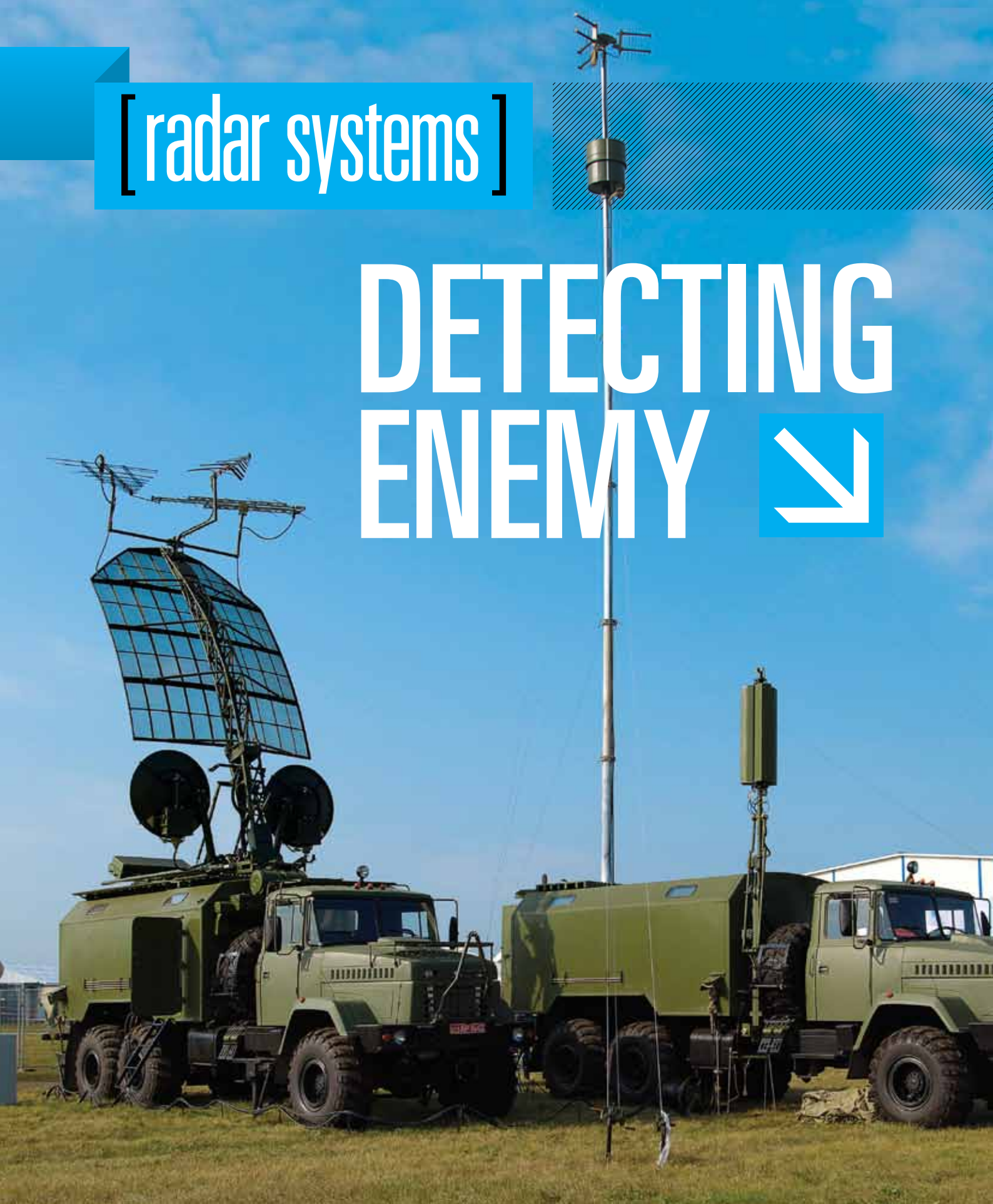
After the recoil, the standard Kalashnikov rifle, due to its forward center of mass among other things, tends to jump up and to the right, while the Malyuk has its recoil reduced by almost 50%

Certainly, we will. We are partnered in this by State Company Ukrspecexport. In November 2014, the Company's Technical Council approved a decision on the feasibility of marketing our product for export. Afterwards, a mockup of the Malyuk rifle was displayed at IDEX-2015 exhibition. So the process has got started.

Regarding my expectations for the future of the Malyuk, I would say that it turned out quite successful and no worse than the Tavor, Steyer AUG A-3 or FN F-2000, for example. Only time will tell what the future holds for the Malyuk. Let's hope that, given the current situation, it will definitely find its customers both in and outside of Ukraine. Parametric comparison of the Maluyk bullpup rifle vs similar-class international counterparts. **UDR**

[radar systems]

DETECTING ENEMY





Electronic reconnaissance had always been of particular importance for the armed forces, providing information of interest to the country's top political leadership that was necessary for military operation planning and the conduct of war. The fine art of electronic reconnaissance was most sophisticated, and demanded involvement of highly qualified specialists.

Today JSC Topaz offers its potential customers passive electronic monitoring radar system Kolchuga, which was deeply upgraded and now is a completely new solution.

Original Kolchuga was developed in 1980s by Rostov military institute of GRU and Topaz radioelectronical factory in Donetsk. Serial production since 1987. 44 units were produced before 1 January 1992, 14 of them left in Ukraine.

After break up of Soviet Union, Kolchuga was modernized by the Special Radio Device Design Bureau public holding, the Topaz holding, the Donetsk National Technical University, the Ukrspetsexport state company, and the Investment and Technologies Company. It took then eight years (1993–2000) to conduct research, develops algorithms, test solutions on experimental specimens, and launch serial production. The relatively cheap Ukrainian Kolchuga-M passive radar station is able to detect and identify practically all known active radio devices mounted on ground, airborne, or marine objects.

The Kolchuga-M long-range electronic monitoring radar

Despite of the Russian aggression in Donbas region, Ukraine has managed to save capabilities for developing and manufacturing Kolchuga passive electronic monitoring radar system. Some of the local enterprises in Donetsk and Luhansk regions were forced to move to another part of the country. According to the latest data, JSC Topaz (Donetsk) continues its work on one of the Ukrainian defense plants.

was at the time a truly last word in military technology. Kolchuga-M had provided far better detection capabilities for both ground and airborne radio emitters as compared to the radio detection assets available at the time. Priority attention in developing the radar was committed to reliability characteristics and maintainability. The item was intended in the first place for reconnaissance missions during military operations.

Enhancements included new software and a long-range electronic monitoring radar suite designated Assorti. In addition, Kolchuga itself had undergone comprehensive modernization to the configuration currently known as Kolchuga-M. SKB RTU had also rid Kolchuga of a disadvantage such as power source failures. The enhancements (which in fact advanced the design to a fundamentally new capability) made

it possible to downsize significantly the military's obsolete radar fleet and enabled electronic environment monitoring out to 600 km, while data collection and processing both for the Land Forces and Air Defense Forces had been automated to the maximum possible degree.

The Ukrainian armed forces operated more than two dozen Kolchuga radar systems, which was enough to fully support the country's requirement for electronic monitoring out to 300-400 km. But as the system came into operation it turned out that the technology "stuffed" with electronics was highly sensitive to voltage drops, resulting in backup power sources and sensitive subsystems getting out of order and adding to operators' headache. In a situation where underfunding of the Defense Ministry's needs took on chronic proportions, an effective asset such as Kolchuga was standing idle for months awaiting the arrival of maintenance teams from the manufacturer company. Ukrainian armed forces' intelligence de facto became hostage to economic situation and the monopolist company which overhead expenses grew to 1000 percent.

Kolchuga-M provides:

- the detection and analysis of impulse and continues wave signals; individual identification of practically all of the known electronic assets in various categories as well as mission systems installed on board ground, maritime or airborne carriers; long range detection of multipurpose radars, identification systems, air traffic control systems and navigation systems;



- re-targeting using rotating antennas, which allows it to identify the composition and operational mode, and to track movements of hostile radio emitters up to 150 km away in width in both far-field (up to 600 km) and near-field (up to 200 km) zones – without radar silence zones and with continuous high-precision position location of targets in whatever spot of the area being monitored.

Air defense capabilities include:

- take off detection of aircraft of various types and their identification by categories at ranges exceeding those of modern radar systems;
- tracking the movements of stand-alone and multiple targets;

A few such systems have already been exported to Ethiopia, China and Turkmenistan.

Recently JSC Topaz developed new version of Kolchuga for a foreign customer Kolchuga-5K

Each station of the complex «Kolchuga-5K» has separate sys-

tems for plotting flight tracks of different targets. Each station is equipped with a separate narrow beam detection system operating within a 0,13MHz-18-GHz frequency range. The antenna system makes it possible to achieve maximum detection range of targets at the distance of up to 600 km via the effect of radio waves propagation through troposphere. Complex «Kolchuga-5K» comprises 4 autonomously operating PET/ELINT stations. There are 3 side (slave) units and 1 central (master) unit arranged in a triangle pattern. Being fully interchangeable each station can assume a role of the master one provided all units are equipped with an extra communication and data transfer equipment suite.

In case one or even two units go out of commission for whatever reason (enemy's hostile activity, act of sabotage, malfunction etc.) the overall level of functional capabilities of the system, though diminished, remains sufficient enough to

Today JSC Topaz offers its potential customers passive electronic monitoring radar system Kolchuga, which was deeply upgraded and now is a completely new solution.

meet basic operational requirements. Decentralization ability of the kind (Graceful degradation) vastly boosts the survivability level of the whole system.

Passive surveillance system «Kolchuga-5K» can easily be interfaced with either a Mobile Command Center or with an active radar or with an SAM system of S-300, S-400 etc. type via preselected data exchange and transfer protocol. There has been a growing tendency to make use of Active/Passive layered Air Defense where passive systems function as target acquisition, track and early warning radars.

Such factors as by far longer detection range as opposed to active conventional radar and absolute «no emission covertness» enable passive systems to serve as the first line of air defense by detecting and tracing targets up to the so called target engagement area where a SAM system's active engagement radar and illumination radar are briefly activated and a missile is launched. **UDR**



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Brigadier General Pavel Adam, Director of the Division of Capabilities Development and Planning, General Staff, **Armed Forces of the Czech Republic**



Brigadier General František Mičánek, Director; Centre for Security and Military Strategic Studies, **University of Defense, Czech Republic**



Lieutenant Colonel Jiri Hrazdil, Commander of the 73rd Tank Battalion, **Czech Army**

REGIONAL EXPERT SPEAKERS:



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Brigadier Bjarne Nermo, Commander of the Land Systems Division, **Norwegian Defence Logistics Organisation**



Brigadier General Norbert Huber, Director Armament and Procurement, **Austrian MoD**



Colonel Maciej Zając, Deputy Chief, Land Forces Department, Armament Inspectorate, **Polish Armed Forces**



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