UKRAINIAN DEFENSE REVIEW

№2 [APRIL-JUNE 2017]

UDR

Defense xpress

ANTONOV'S AMBITIONS

LEAGUE OF DEFENSE COMPANIES OF UKRAINE

OPTRONIC PRODUCTS FROM IZYUM INSTRUMENT FACTORY

SHIELD OF THE STATE

TANK ENGINES FROM UKRAINE

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[potential]

A LEAGUE OF

UKRAINE'S PRIVATE-SECTOR DEFENSE INDUSTRIES ARE SEEKING A DUE SHARE IN THE NATIONAL ARMED FORCES MODERNIZATION EFFORT

Ukrainian companies and institutions involved in R&D and production of military and dual-use technologies have united to establish a non-governmental industrial association – the Ukrainian League of Defense Industries. The need to establish such an association was agreed at a CEO meeting of private-sector defense industries held on the sidelines of the XIII International Specialized Exhibition «Arms and Security 2016» in Kyiv.

Serhiy ZGHURETS, Defense Express

The establishment of the Ukrainian League of Defense Industries is aimed to consolidate effort of private-sector defense industries in improving domestic industrial collaboration, developing effective public-private partnerships in defense R&D and production, and marketing products produced by private-sector defense industries both on the domestic and export markets.

The League will focus its activities on ensuring that its

THE STRONG

members are given a due share in national military modernization programs to ensure that they are effective and performed at a high quality level.

The League will campaign for a gradual change in the Soviet-style rules of the game that are still dominating the domestic arms market, and more specifically a change towards ensuring that private-sector actors are placed on a level playing field with public-sector counterparts, and towards amending the national legal framework regulating the functioning of the defense industry sector.

Another focus will be on fostering government investment in defense-related R&D projects and on encouraging public-private collaborations supported by government procurement guarantees sealed by the Government Defense Procurement and Acquisition Program (subject to technology compliance with technical specifications).

In addition, the League will use mechanisms of international military technical cooperation for establishing international industrial partnerships and for encouraging an influx of new technology and investment from leading global companies.

The League is seeking to provide the Ukrainian government with alternative opportunities to ensure the national defense industrial growth based on best Western practices.

The organization is open to fruitful and mutually beneficial, bilateral as well as multilateral cooperation with international partners. UDR

[rearmament]

BUILDING UP NATIONAL MILITARY MIGHT

UKRAINE IS MODERNIZING ITS ARMED FORCES WITH A FOCUS ON MAXIMUM UTILIZATION OF DOMESTIC DEFENSE INDUSTRIAL CAPACITIES

Over a short period of time since the beginning of Russia's military aggression in 2014, Ukraine has done much to enhance the combat capability of its Armed Forces, which were being destroyed systematically during the previous two decades. But (re-)establishment of a system of effective mechanisms ensuring full-fledged implementation of national military modernization priorities still remains a challenging endeavor however.

Ukraine's Strategic Defense Bulletin; the national Defense and security sector development concept, 2020 State purpose-oriented program on military weapons and equipment development; a concept-draft of the 2020 State purpose-oriented program on national defense industry transformation and growth; a draft law of Ukraine on "Military Technology Cooperation" and other strategic priority papers have been drafted in a collaborative effort between Ukraine's ministries for defense, economic development and trade, state-run Ukroboronprom defense industries group, other companies and govern-

ment agencies responsible for implementation of the nation's military technology and defense industrial policies. These documents have made up the core of the national legal framework supporting sustainable work on the development, production and provision of military weapons and equipment for the Armed Forces, State Border Guard Service, National Guard and other branches of Ukraine's defense forces.

The Arms and Security 2016 exhibition demonstrated a quantum leap achieved by Ukraine's defense industries over the recent few years. Previous seasons of the Arms and Security exhibition were of somewhat spontaneous, not systematic nature; the exhibitors demonstrated their already available technologies at the time, rather than what was required by the Defense Ministry. In 2016, however, manufacturing companies and organizations, including volunteer-run organizations and other exhibitors showed off current-generation technologies that are so desperately needed by the nation's military forces. Many of the technologies exhibited therein, however, still need some maturing to the level required by military users.

Full year 2016 results revealed what has been achieved in terms of the provision of the country's military with new and upgraded capabilities, and of the effect this has had on the country's capacity to defend itself. Over 2016, the Defense Ministry granted Approval for Service Use for 17 military weapons and equipment products; 64 products were commissioned for operational use, and 1,191 pieces of weapons and equipment, both newly-made and refurbished, were procured to meet the Armed Forces requirements under the State Defense Procurement and Acquisition Program.

Ukroboronprom alone delivered 809 pieces of military weapons and equipment systems that included retrofitted Su- and MiG-series airplanes; refurbished/upgraded helicopters; an indigenously designed unmanned aircraft system; an airborne optical-electronic jammer combined with an IR decoy flare dispenser; retrofitted APC vehicles; automatic gun systems; MANPAD systems; and new radar equipment.

The Arms and Security 2016 exhibition demonstrated a quantum leap achieved by Ukraine's defense industries over the recent few years

Non-public contractors delivered 382 pieces of weapons and military equipment, including troop carrier helicopters, armored gunboats, armored ambulances, short-range ground radar systems, radar and radio-relay equipment, and KrAZ/MAZ truck vehicles.

2017 MoD's budget gives reason for optimistic expectations. This year, the Armed Forces will see substantial budget boosts for almost all of their critical requirements. New weapons technology programs will benefit most from this budget hike. In particular, UAH 11.7 billion (UAH 3.6 billion up on the previous year's level) or 18 percent of the country's overall defense spending has been budgeted for arms R&D and production programs in 2017. Importantly, funding for individual technology R&D projects to be undertaken under the Armed Forces Modernization Program 2020 was factored into this budget by the Ministry of Finance.

During 2017, 752 military weapons and equipment pieces are to be delivered to the Armed Forces under contracts awarded in 2016. Ukroboronprom's companies are expected to deliver 661 pieces of equipment including MANPAD systems, PC-based SODAR equipment, refurbished airplanes, armored repair and recovery vehicles, armored ambulances, and tactical wheeled vehicles.

Non-public contractors will deliver 91 pieces of equipment, specifically UAS vehicles, refurbished/upgraded helicopters, armored cars, landing assault boats, UAS vehicles with EW payloads, radio transmission jammers and radio-relay equipment.

An artillery C3I system, an upgraded multiple-launch rocket system, an air defense C3I vehicle, an upgraded MANPAD system, and an armored command & staff vehicle are scheduled for commissioning among other products in 2017.

It should be noted at the same time, that R&D and production capacity build-up at Ukrainian defense industries has just started gaining momentum. Only few of the industries maintain self-sufficiency in the production of the weapons and equipment types required by the nation's military. Effort has been continued to reduce and eventually eliminate reliance on the components, materials and primary products originating in the former Soviet countries, including most specifically the Russian Federation. With this purpose in mind, the Defense Ministry and Ukroboronprom jointly drew up and adopted an import substitution program for the components, materials and primary products needed for domestic production of military weapons and equipment products. About two dozen MoUs relating thereto have been signed between Ukroboronprom and regional and municipal governments since 2014. The result is that 394 domestic companies are currently engaged with indigenous defense production, and 1,300 components and subsystems that used to be supplied by Russia prior to 2014 have been substituted for domestically produced counterparts.

During 2017, 752 military weapons and equipment pieces are to be delivered to the Armed Forces under contracts awarded in 2016

That said, Ukraine continues its cooperation with former Soviet countries such as Azerbaijan, Belarus and Kazakhstan, and defense-industrial cooperation has been developed with East Europe and Baltic countries. Measures are also being taken to search and find new political and economic partners and allies in promising regions of the world such as the Middle East, Latin America, Africa and Asia Pacific. UDR

Ukraine continues its cooperation with former Soviet countries

PAVLO BARBUL, DIRECTOR OF THE SFTE "SPETSTECHNOEXPORT"

UKRAINE'S EVOLVING APPROACH TO DEFENSE INVESTMENT AND PARTNERSHIP

State Foreign Trade Enterprise «SpetsTechnoExport» specializes in export of up-to-date military technologies and rendering services on repair, modernization and maintenance of weapons and special-purpose equipment. Since the beginning of Russia's aggression against Ukraine, SFTE "SpetsTechnoExport" has had to adapt itself to new realities. The following are key messages from the interview with Pavlo BARBUL, Director of the SFTE "SpetsTechnoExport", by Defense Express on the State Foreign Trade Enterprise's achievements and plans for the future.

The situation that happened in 2014 and the situation of aggression we faced from our neighbouring country, we were forced to invest and to move invest people in workforce and activity into new developments in the military sphere, because most of our products were quite outdated, and our military was not ready to counteract very equipped and powerful army. And at the same time we had to find growth points for defence industry, to find methods, solutions, technologies and products where we can, at first, provide to our military, and second, provide to the world community and provide it to our partners, bringing currency to Ukraine and developing our own technology and our own military industry further.

Of course, the hybrid warfare is very specific and I believe our military was not ready for such kind of warfare. And this raised many ques-

tions: how to find the weapon-locating radars, how to counteract the intensive UAV activity, how to get oversight and situational awareness, how to understand what is going on behind the front line. And speaking about the allies, of course, we feel the support of our allies; at the same time, the bureaucracy takes some time, and when you have people dying every day in the front line we had to come up with solutions quickly and effectively in order to provide them with "turnkey" solutions to face the challenges they were facing.

As of now, we started up with UAVs, so in our company specifically we are focused on that and our goal was to find the solution of cost-effective UAV which are 1/3 of the price of rest of analogues, conventional ones, and will perform same tasks, same missions as Western ones, so we will be able to fulfil the requirements of our own military. And we have succeeded on that pretty much.

Speaking about attack platforms, combat platforms – we are now at development stage. It requires investments, instalment of different technologies, payload, and fire control system and communication channels.

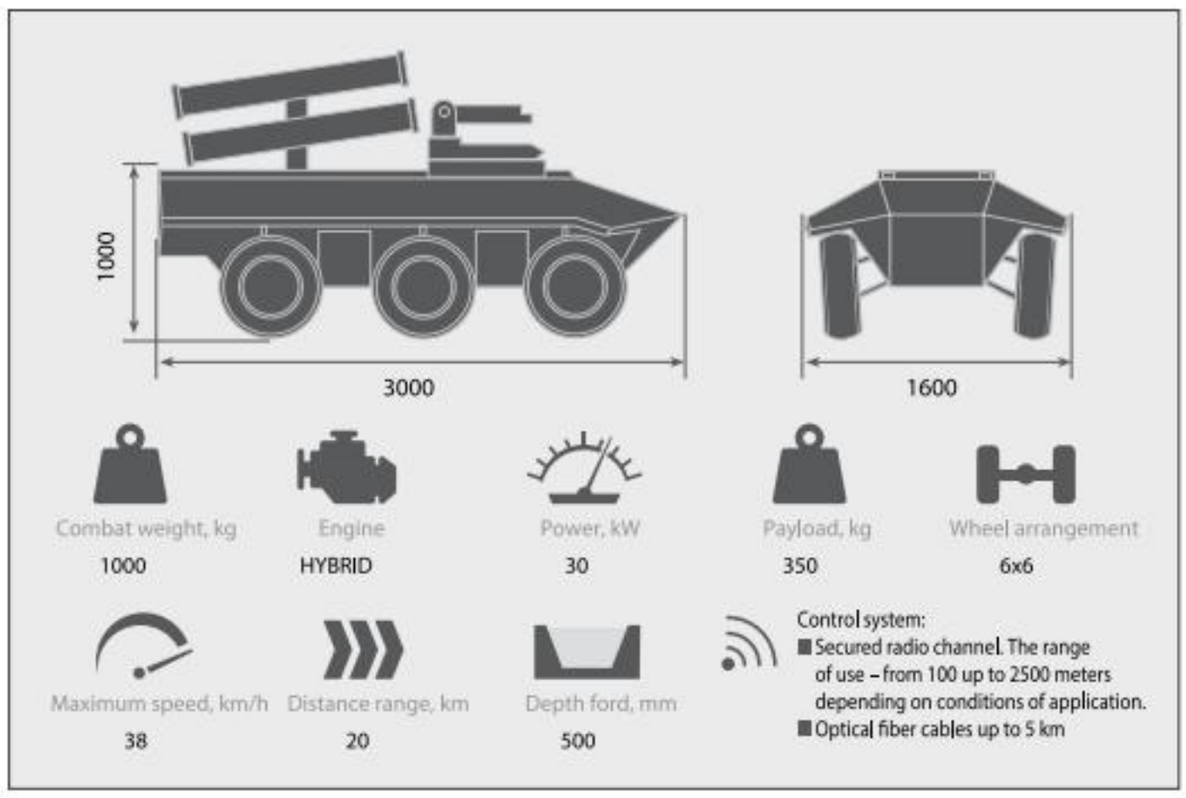
Second stage which we are working on now is the development of munitions. So historically we didn't have manufacturing in Ukraine of conventional munitions, and now our factories are focused on development in this sphere: missiles, shells, mortar shells, artillery shells and so on.

And also what we worked on – tactical unmanned multipurpose vehicle called "Fantom" which is already undergoing fire and field tests within Ukrainian Special Forces. It's heavily armed platform which is capable of delivering of sufficient payload, fire power, delivering of ammunition and also evacuation of wounded as well as participate in number of humanitarian missions. So it's indeed multirole platform which we believe and our military officers confirm will be of huge use on battlefield, specifically in hybrid warfare conditions.

«FANTOM» may be used as an ambulance and rescue vehicle, ammunition supply vehicle, reconnaissance vehicle, fire support vehicle. The current performance of the vehicle can execute reconnaissance activities, fire support, be a source of power.

Ukraine keeps its role within ten major military exporters in the world. But we switched drastically the product: so now it's more innovative products, more R&D, more cooperation, more made-to-order solutions, more development under the requirement of our customers, so something which has higher intellectual value and less, or actually none, of stock and old stock of Ministry of Defence.

We faced huge requirement in import substitution so we were dependent on spare parts, technology and equipment of neighbouring country. And already we can see immediate result – just within a little bit more than one year, in cooperation with the Kingdom of Saudi Arabia, we've designed, developed and manufactured the new aircraft "Antonov-132" which already uses Pratt & Whitney engines, Honeywell avionics and other Western conventional systems. UDR



[iron heart]

POWERPLANT SYSTEM

Ukraine could be justifiably considered one of the world's established trendsetters in the tank diesel engine area. State Enterprise «Kharkov engine design bureau» one of the leaders in the field of engine building not only in Ukraine, but also abroad.

State-of-the-art tank engines developed by State Enterprise «Kharkov engine design bureau» (KEDB) meet the most demanding standards in this field, and they integrate innovative solutions that could propel them to a new level of quality. KEDB has developed a number of new items which have already earned themselves favorable reputation both on the domestic and export markets.

The Company has 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 lightweight armored fighting vehicles 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, KEDB 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. Recently KEDB has added new design - the 6TD-3 - to its range of MBT en-

gines. Weighing 1,210 kilograms, the 6TD-3 showed bench tested horsepower of 1,400, meaning it is superior to the German Series 890 rival, 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.

Apart from tank diesel engines, KEDB deals with the design and development of standby electric power units. Specifically for MBT applications, the KEDB 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).

Ukrainian engines are exported intensively to international markets. One of Ukraine's biggest markets for military vehicle power plant systems is Pakistan who had bought 300 MBT engines 6TD-2 from Ukraine prior to 2013, and, in 2013, it contracted Ukraine to supply another 110 6TD-2 1,200 hp engines worth USD 50M to equip its Al-Khalid MBTs.

Ukrainian-built engines for armored military vehicles have also found success in markets like the PRC. In August 2011, Malyshev Factory won a contract award worth about USD 20M to supply 50 kits of the 6TD-2E Engine & Transmission system for China's MBT-2000 program. This contract came as a follow-up to a Ukraine-China agreement concluded in 2008.

It was reported at the International Defense Exhibition IDEAS 2016 in Karachi, Pakistan, that Ukraine had been selected to assist in Pakistan Army's Al Khalid-2 MBT project.

Al Khalid-2, a more advanced version of the Al-Khalid BMT, is being designed with the Ukrainian-supplied 1,500 hp diesel engine 6TD-3 replacing the 1,200 hp engine 6TD-2 that currently powers the Al-Khalid tank.

A MoU related thereto was signed between Ukrspecexport and Pakistan's land systems company Heavy Industries Taxila (HIT) on the sidelines of IDEAS 2016. UDR

Volodymyr Tkach, for UDR

BASIC SPECIFICATIONS OF THE 3TD FAMILY OF TANK DIESEL ENGINES

	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

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BASIC SPECIFICATIONS OF THE 5TD FAMILY OF TANK DIESEL ENGINES

	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

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BASIC SPECIFICATIONS OF THE 6TD FAMILY OF TANK DIESEL ENGINES

	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

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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.

COMBAT MODULE "VIY"

Remotely controlled Combat Module

Can be mounted onlight armored vehicles (LAV) such as "DOZOR-B" and intended to destroy medium armored targets, firing points, manpower and enemy air targets. LAV with CM "Viy" are designed for patrol, reconnaissance and combat missions.

CM "Viy" has a simple steel constructions without stabilization, which significantly reduces its cost. The structure of CM "Viy" is based on commander hatch of the tank T-64, which ensures the reliability of the structure of CM "Viy", simplifies the manufacture and therefore reduces its cost

"DB "Caliber" Ltd.

+380444830379
designbureaucaliber@gmail.com

CM "Viy" SPECIFICATION:

GSh-23L specification:

CALIBER
23 mm

RATE OF FIRE
3..3400 rounds/min

MUZZLE VELOCITY
700 m/s

DESIGNED RESOURCE
4000 shots

FIRE CONTROL
electric, 27 V

WEIGHT	ANGLE OF ROTATION
50 kg	**Y:-5⁰ — 60⁰ X: 360⁰**

OVERALL DIMENSIONS (not more, mm)

Length	width	height
1387 (1537)	**165**	**168**

Tank hatch is equipped with vertical and horizontal targeting drives, bracket for mounting gun carrier and other mechanisms and electric equipment.

For storage and loading of ammunition CM "Viy" is quipped with box-type ammunition mechanism with capacity of 250 pcs of 23mm ammunition. It has a rigid welded construction and is attached to the back wall of the CM "Viy".

For collection of used cartridge belts CM "Viy" is equipped with a box type cartridge belts collector.

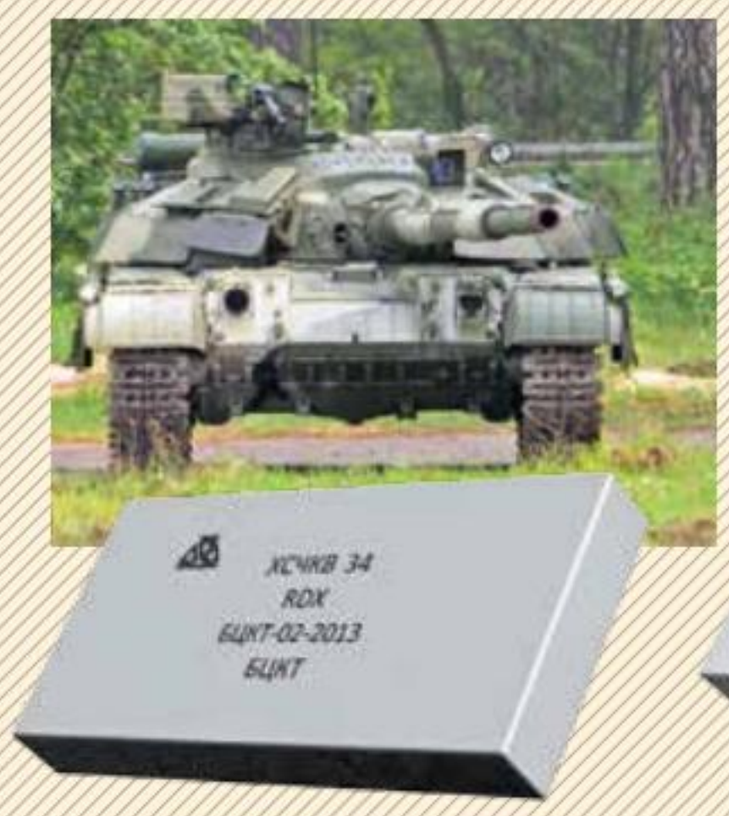
23 mm double-barreled aircraft gun "GSh-23L" designed for firing at air and ground targets with fragmentation high-explosive, armor-bursting and armor-piercing incendiary shells.
Automation work is based on usage of energy of powder gases. GSh-23L is equipped with a localizer, which are used for the directed removal of powder gases and reduce recoil force.

TO WITHSTAND A STROKE

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

Microtech designs for the military market, elements of the new-generation explosive reactive armor (ERA) system Nozh (or "Knife") and Duplet family of APS elements for protecting AFVs against tandem-warhead threats have been designed, developed and approved for the Ukrainian Armed Forces' service, and have been supplied to both the Ukrainian MoD and export customers. Particularly the ERA system Nozh has been integrated into the T-64BM/Bulat main battle tank (MBT) upgrade package, and Duplet has been adopted for the new indigenously developed MBT Oplot. Nozh secures the host tank against all known armor piercing threats, including sub-caliber armor-piercing penetrator projectiles, non-tandem-type hollow-charge rounds or striking-nucleus-type impact munitions. The ERA sys-

ERA SYSTEM *NOZH*



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

ERA SYSTEM *DUPLET*

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

ACTIVE PROTECTION SYSTEM *ZASLON*

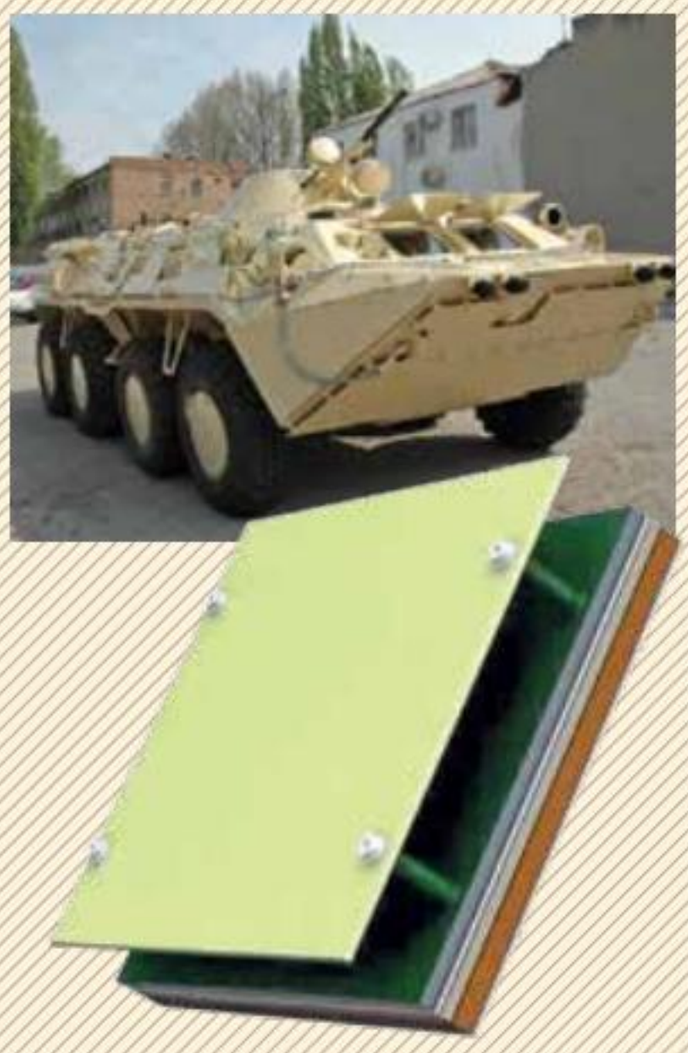
Illustrated here in "transport" and "deployed" configurations, the active protection system "Zaslin" was approved for Ukrainian Army service on 4th December 2009. It is suitable for integration in both heavy and lighter weight AFVs (infantry fighting vehicles and armored personnel carriers). Sample arrangements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

tem Duplet reliably shields the host armored platform from tandem-warhead shaped-charge weapons -- which have recently received huge development effort -- in addition to the range of threats defeated by Nozh. Both Duplet and Nozh designs are so far unique in the world. In addition to this, we have developed active protection system Zaslon which has been qualified for service with the Ukrainian Armed Forces. Zaslon is designed to protect an armored combat platform against antitank weapons of all types, including armor piercing grenades with unitary or tandem shaped charges which are fired from handheld or mounted grenade launchers, as well as from antitank guided missiles, gun fired armor-piercing rounds and shaped-charge artillery projectiles approaching at 70 to 1,200 m/s. It is so far the only APS design in the world capable of intercepting high-velocity armor-piercing threats approaching at 750 m/s or faster.

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

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

PASSIVE BALLISTIC/ ACOUSTIC PROTECTION SYSTEM *AKUSTIK*



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

ERA SYSTEMS *RAKETKA*

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

ACTIVE PROTECTION SYSTEM *SHERSHEN*

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

«KOZAK-2»

«KOZAK-2M»

«KOZAK-5»

«KOZAK-4»

Armored HUMVEE

Armored truck «KOZAK-BOGDAN»

PRACTIKA

www.practika.ua

PJSC RPA «Practika» is leading Ukrainian producer in sphere of armored vehicles.

The company was founded in 1993 and produces the vehicles of special purpose (including vehicles with armor protection) since 1997.

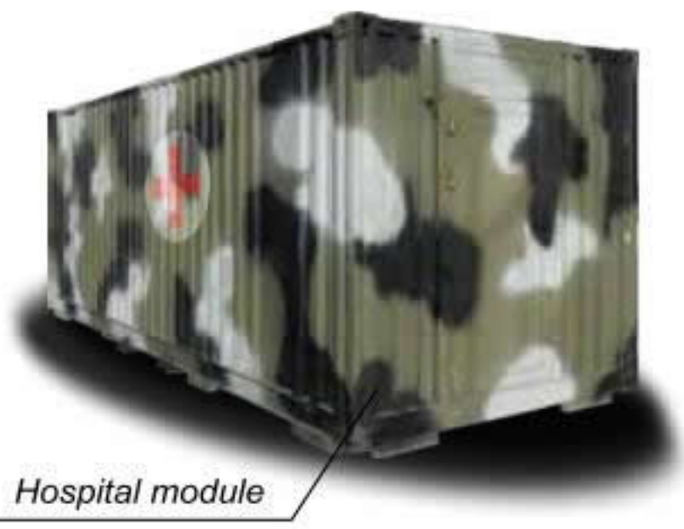
Production of military vehicles took start at 2009 (when «Practika» has received the order from Ministry of Defense of Ukraine for developing of light armoring vehicle, later became known as «Kozak-1») and in 2014 it became the main trend of company.

Since that time a huge variety of military armored vehicles of different purposes and classes were designed and went in production:

- *troop transporters on truck's basis*
- *command-and-control vehicles on truck's basis*
- *small class reconnaissance and patrol vehicles*
- *special forces vehicles*
- *front edge ambulances*
- *multifunctional tactical vehicles with dependent («Kozak-2») and independent suspension («Kozak-2M»)*
- *6x6 armored fighting vehicles*
- *deeply modernized (new engine and new body) 8x8 armored fighting vehicles BTR-60*

«Practika» has its own plant (located at Kiev) with several design departments (DD of regular products, DD of new developments, DD of electrical engineering), department of standardization and quality certification management with own testing laboratory, department of work with state secret documents etc.

Armored checkpoint



Hospital module

Armored ambulance

«OTAMAN 6X6»

«OTAMAN 8X8»

[reinforcement]

THE KOZAK-2

ARMORED VEHICLE OFFICIALLY ACCEPTED FOR OPERATIONAL USE BY UKRAINE'S ARMED FORCES

The newly-developed Kozak-2 armored vehicle has received Approval for Armed Forces Service Use following successful completion of a full range of official tests. On March 21, 2017, Ukraine's Defense Minister Stepan Poltorak issued Directive No. 158 granting operational use approval for the Kozak-2 Armored Vehicle PSZA-5 (where the PSZA-5 mark stands for compliance with Ukraine's armor protection standards).

The Kozak-2 is essentially the first armored vehicle to have been inducted into Ukrainian Armed Forces service since independence. It was developed and is being produced by Kyiv-based R&D and Production Company Practika, which is member of the League of Ukrainian Defense Industries.

The Kozak-2 has functionality that includes the transportation of personnel, infantry weapons and battlefield supplies; tactical operational support; command communications support; fire support for dismounted infantry; armor protection of the crew and passengers from 7.62 mm bullets and shell and mine blast fragments.

The Kozak-2 is built on a frame fitted with add-on armor protection. This is mounted on the Iveco Eurocargo 4x4 chassis rated for 15t GVW. Armor protection is made from 12mm-thick Stanag-4569 Level 2 compliant armor steel plates produced by Miilux, Finland. Enhanced protection of the vehicle's critical areas is provided with three-layer plates with a splinterproof spacer that doubles as a heat insulator.

The vehicle was designed with a comprehensive range of anti-mine blast pro-

Special-Purpose Armored Vehicle Kozak-2 PSZA-5 – Key Specifications and Technical Data

Vehicle category:	two-axle, all-wheel drive, enclosed-body
Wheel arrangement:	4x4
Gross Vehicle Weight (GVW):	≤ 15,500 kg
Weight in running order:	≤ 13,500 kg
Seating capacity:	1+9
Length:	8,000 mm
Width without mirrors:	2,600 mm
Hull height:	3,000 mm
Ground clearance height:	300 mm
Max road speed:	95 k/h
Highway endurance:	≥ 1,000 km
Engine:	6-cylinder, 279 hp diesel
Transfer case:	manual, 6-speed

Serhiy ZGHURETS,
Defense Express

tection measures to provide the crew and passengers with an enhanced level of protection and overall survivability. First, the Kozak-2 has modular layout where individual modules are not connected rigidly to each other. Second is a V-shaped hull bottom designed to absorb and deflect part of the force of explosions away from passengers inside the armored hull. This is complemented by a multilayer floor that too absorbs part of the detonation energy and additionally reduces the secondary effects of fragments being projected inside the vehicle. Anti-mine protection withstands 6kg of TNT equivalent blast under any wheel or anywhere under the hull. The vehicle has blast attenuating seats that Practika developed by itself leveraging on international expertise and experiences.

The roof of the vehicle can accommodate a remote weapon station or a manned turret that can mount any weapon meeting specific Customer specifications.

Practika-produced armored vehicles were previously accepted for operational use with Ukraine's National Guard, and Ukrainian Armed Forces' Research and Test Center is set to begin testing Practika's Kozak-5 -- an armored vehicle with armored unibody and independent suspension.

It's interesting to note that Practika has become the lead company in an industrial cluster of dozens of Ukrainian armored vehicle manufacturers and their subcontractors. Most of the companies, like Practika itself, are members of the League of Ukrainian Defense Industries, which incorporates private-sector defense suppliers. UDR

[resonance]

A STORY ABOUT HOW SIPRI WAS SELLING WEAPONS FROM UKRAINE TO RUSSIA

An almost sensational story has recently been circulated in the Ukrainian media reporting that the aggressor country of Russia became Ukraine's biggest arms market in 2016. The story is based on arms exports statistics released yearly by the authoritative Stockholm International Peace Research Institute (SIPRI). But a detailed analysis of SIPRI's 2016 report insofar as it pertains to defense-industrial and procurement relations between Ukraine and Russia raises doubts over the accuracy and veracity of the reported data and so it puts doubt about the credibility of the organization that released it.

It should be noted, in the first place, that the President of Ukraine, on August 27, 2014, signed into law his Executive Order No 691/2014 to enact the Ukraine National Security and Defense Council Resolution of August 27, 2014, titled «On measures to boost the effectiveness of national military-technical policies». Clause 7 Subclause 1 of the resolution puts a ban on the export of military items and dual-use products for military end-use or end-users from Ukraine to Russia.

Not a single company or organization in Ukraine has been officially authorized to export aforementioned products to Russian users since the resolution became effective, and authorized government agencies have consistently pursued a policy ban on the export of military products to the aggressor country. Not one Ukrainian company has been authorized to export these products to Russian customers, and the enforce-

ment of laws relating thereto has been closely monitored by authorized agencies and law enforcers.

Considering the preceding comments, the Ukrainian media-distributed information quoting the highly regarded international institution has put Ukraine into an awkward situation, to say the least. After all, it's a theater of the absurd where one provides weapons to his enemy while simultaneously requesting his international partners to provide military assistance to deal with this same enemy. And the Kremlin might be right when it describes Ukraine in terms of a "failed state".

A detailed analysis of the reported statistics data relating to Ukraine-Russia military technology cooperation raises serious doubts as to its relevance and accuracy, hence the credibility of the Stockholm Institute, who -- either through negligence or through the bias of its employees toward Ukraine – doesn't just discredit the standing of individual Ukrainian businesses, but also the international reputation of the State of Ukraine.

According to the data provided in the latest SIPRI report (which is publicly available on the official website of this institution), which has been published happily by some Ukrainian media outlets, Ukraine exported USD 169 million worth of defense products to Russia in 2016, and by doing so it has made its utmost enemy country into the biggest buyer of its military weapons and equipment systems during the reported period (see Fig. 1).

Here a perfectly sensible question arises – given that Ukraine has banned arms exports to Russia – How it could happen that the reported worth of defense-related products could be exported from Ukraine to Russia over the past two years. If one looks closely at the reported data about the Ukrainian companies that exported their military weapons and equipment systems to Russia and about the timeframes of the export contracts thereto related, one can easily see the logics that the (seemingly) authoritative international institution employed to compile the statistics data (see

sipri

STOCKHOLM INTERNATIONAL
PEACE RESEARCH INSTITUTE

TIV of arms exports from Ukraine, 2015-2016

Generated: 22 February 2017

Figures are SIPRI Trend Indicator Values (TIVs) expressed in US$ m. at constant (1990) prices.

Figures may not add up due to the conventions of rounding.

A '0' indicates that the value of deliveries is less than US$0.5m.

For more information, see http://www.sipri.org/databases/armstransfers/background

Source: SIPRI Arms Transfers Database

	2015	2016	Total
Bangladesh	17	24	41
Belarus	10	10	19
China	86	90	176
DR Congo		86	86
Ethiopia	7		7
India	48	20	68
Indonesia	0	3	4
Myanmar	4	4	7
Nigeria	13		13
Pakistan	4	2	6
Poland		8	8
Russia	28	169	267
Thailand	47	67	115
Venezuela		5	5
Viet Nam	13	33	46
Zambia		7	7
Total	347	528	875

Fig. 2). But this doesn't necessarily mean, however, that the conclusions it made are correct.

First, questions are arising as to what periods of time are covered by the SIPRI report as it pertains to defense-related exports from Ukraine and Russia. The report is supposed to provide arms exports statistics for 2016, but the reported data actually includes export deals completed prior to the start of the military crisis between Ukraine and Russia in 2014.

Second, the report contains false data on the status of the export contracts with the Russian customers specified therein.

In particular, it ranks Zaporizhia's Motor-Sich as the biggest Ukrainian defense product exporter to Russia for the year reviewed, with 164 engines for Yak-130 trainer aircraft exported in 2016. Here SIPRI notes that all of the engines were "probably" (sic!) delivered to the Russian customer prior to 2014. So the questions to answer are: When exactly did Motor Sich deliver these engines to the Russian customer, in 2016 or prior to 2014? And does the USD 169 million worth of arms exports from Ukraine to Russia reported for 2016 include the AI-222 engine deal?

Arms Exports from Ukraine, 2015-2016 (million USD)

Motor-Sich says it has complied with the ban on defense-related exports to Russia since 2014. «Motor Sich works within the relevant legal framework, and it hasn't carried out military technology cooperation with Russia since the government imposed a ban on cooperation thereof. It was back in June 2014 when the Company terminated deliveries of AI-222 engines for the Yak-130 trainer aircraft to Russia; and it didn't deliver AI-222 engines to Russia in 2015, 2016 or 2017», the Company said in a statement.

The situation looks even more absurd when it comes to Antonov airplanes. According to SIPRI's report, Antonov allegedly supplied 17 An-140-100 airplanes to a Russian customer during the period from 2012 to 2016, and 11 An-148-100E airplanes during 2013-2016.

But, again, as mentioned above, Ukrainian companies have not been engaged in military technology cooperation programs with Russia since 2014, and it was prior to 2014 that the airplanes, if any, could be delivered. It turns out from the report that it took respectively two years and one year for Ukraine to build and deliver the 17 An-140-100 aircraft and 11 An-148-100E aircraft to Russia. If guided by common sense, however, it's obvious that manufacturing 28 airplanes of the types such as An-

140-100 and An-148-100E over a two-year period, even with full availability of requisite financing and human resources, is a very challenging endeavor even for an industry much bigger and powerful than Antonov.

Second, the fact is that not one airplane of the An-140 or An-148 types has been built and delivered to Russia during 2016 and the entire period reviewed by the SIPRI report. Russia currently operates a fleet of airplanes of the aforementioned types, which were all built by Russian industries, specifically by Samara Aviation Plant Aviakor (An-140) and Voronezh Aircraft Building Association (An-148).

Third, did the USD 169 million worth of defense-related exports from Ukraine to Russia as reported by SIPRI for 2016 include the sale of the mentioned airplanes (which actually never took place)?

Also of interest is the SIPRI-reported data relating to the gas turbine engines DS-71 and DT-59 allegedly exported to Russia by Mykolayiv's Zorya-Mashproekt. More specifically, according to the report, the Ukrainian company exported two DT-59 engines and as many DS-71 engines to a Russian customer in 2015 and 2016, respectively. This information has been denied in an official statement by Zorya-Mashproekt. «We notify that an export deal for three M7H1 systems that included the aforementioned gas turbines was signed with Baltic Yantar Shipyard Company in February 2012. The initial delivery of two units of the system took place in 2013, and the final delivery under this deal took place in February 2014", the Company said.

Zorya-Mashproekt furthermore reported that it signed an export contract for similar products with this same customer in October 2012, with deliveries scheduled between December 2014 and December 2015. This contract was later terminated due to the imposition of the ban on defense-related exports to Russia following its military aggression in Ukraine's Crimea and Donbas regions.

Here, it should be noted that the denial was prompted by the release of a similar report by SIPRI for 2015. So it turns out that the authoritative Stockholm's institution simply ignored an official statement of denial by the Ukrainian company, and compiled its report for 2016 using same false data, again.

Based on this, we again reiterate the question: Did SIPRI include the value of the gas turbine engines delivered back in 2014 into its 2016 arms exports statistics for Ukraine?

So if we sum it up so far, it goes to show that the defense deliveries from Ukraine to Russia as stated by SIPRI in its report for 2016 actually never took place. So Russia and with it the USD 169 million worth of defense-related exports should be deleted from SIPRI's 2016 report insofar as it relates to Ukraine.

Regarding the 2016 arms exports statistics for Ukraine as reported by the Stockholm's institution, it's currently hard to say whether it stemmed from the sheer negligence or deliberate manipulation (it doesn't seem too important).

There are a few lessons to be learnt from SIPRI's 2016 report. First, any kind of data, even if it has been reported by a (seemingly) credible institution, needs to be checked and verified. As seen from the above, nobody's perfect, and even highly authoritative institutions (and those that are only seemingly so) are prone to error.

Second, the Ukrainian media should have checked and reviewed the "incriminating" information on Ukraine prior to making it public. Because it might turn out that this information is total lie, or sourced from seemingly "non-involved" stakeholders.

Third and finally, blind reliance on information supplied by an institution, no matter how highly regarded, can easily play a cruel joke. Just like this one time. UDR

Igor Fedyk,
UDR

Transfers of military weapons and equipment systems from Ukraine to Russia for 2016 (sorted by supplier)

Transfers of major conventional weapons: sorted by supplier. Deals with deliveries or orders made for year range 2016 to 2016

Source: SIPRI Arms Transfers Database

Information generated: 22 February 2017

Supplier/ recipient (R) or licenser (L)	No. ordered	Weapon designation	Weapon description	Year of order/ licence	Year(s) of deliveries	No. delivered/ produced	Comments
Ukraine							
L: Russia	(218)	AI-222	Turbofan	2006	2009-2016	(164)	For 109 Yak-130 trainer/combat aircraft produced in Russia 2009-2018 (but engines probably all delivered to Russian producer of aircraft before Ukraine stopped exports to Russia in 2014)
	19	An-140	Transport aircraft	2011	2012-2016	(17)	An-140-100 version
	15	An-148	Transport aircraft	2013	2013-2016	(11)	RUB18 b deal; An-148-100E version; delivery 2013-2017; status of production uncertain after Ukrainian 2014 ban on military exports to Russia
R: Russia	(4)	DT-59	Gas turbine	(2005)			For 2 Project-22350 (Gorshkov) frigates produced in Russia (but engines all delivered to Russian producer of aircraft before Ukraine stopped exports to Russia in 2014 and more frigates ordered but cancelled due Ukrainian export ban)
	(6)	DS-71	Gas turbine	(2010)	2016	(2)	For 3 Project-11356 (Grigorovich) frigates produced in Russia (but engines all delivered to Russian producer of aircraft before Ukraine stopped exports to Russia in 2014 and more frigates ordered but cancelled due Ukrainian export ban)
	(6)	DT-59	Gas turbine	(2010)	2015	(2)	For 3 Project-11356 (Grigorovich) frigates produced in Russia (but engines all delivered to Russian producer of aircraft before Ukraine stopped exports to Russia in 2014 and more frigates ordered but cancelled due Ukrainian export ban)

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PROTECTION FROM INVISIBLE THREATS

TECHNOLOGY SOLUTIONS FROM PRIVATE-SECTOR R&D AND PRODUCTION COMPANY SPARING-VIST CENTER

The thirty-year experience in the development and manufacture of radiological monitoring technologies has enabled Sparing-Vist Center to expand its international customer portfolio to include over 80 country markets worldwide. Having been certified to compliance with NATO standards, Sparing-Vist products are now exported to military customers in some of the NATO countries. These are just few facts from history of private-sector R&D and Production Company Sparing-Vist Center, Lviv.

The Company's top priority now is providing Ukraine's Armed Forces and other security sector institutions with current-generation technologies for nuclear radiation detection and monitoring. Five radiation dose measuring products produced and marketed by Sparing-Vist Center under the brand name of ECOTEST TM have been accepted for service use by Ukraine's Armed Forces.

Sparing-Vist Center offers its brand-new product -- the general-purpose, multiband radiation dosimeter MKS-UM – to potential customers both in and outside of Ukraine. The MKS-UM is designed for field use to detect, monitor and measure radiation exposure.

The military/civilian grade air-filtering gas masks OM-90 and SM-6.

Designed based on the proven MKS-U technology, which proved its worth with its ability to operate effectively in harsh desert-type climates in Kuwait and Iraq where it was used by Ukraine's NBC forces deployed there as part of UN-sponsored peace support missions – the MKS-UM offers reduced weight and bulk, making it more comfortable to operate. It has the capabilities for detecting and measuring gamma, beta, and alpha emission levels. The availability of an integrated GPS/GLONASS navigator enables the user to log and store ob-

tained measurement data output in a geographically referenced database.

The MKS-UM is fed by a lithium-ion battery. Measurement outputs are displayed on-screen along with the given margin of measurement error. With an analogue display of radiation dose rates it's easier to localize position of radiation emission sources.

With its IP67 enclosure rated body and protective rubber case, the MKS-UM is suitable to be operated in harsh climates, under atmospheric precipitation, and in environments with high dust loadings, and it can operate with its remote detector unit submerged to a water depth of up to 0.5 m.

It can measure gamma emission rates within the full range from background level to radiation alert level.

Sparing-Vist Center joined with Bruker of Germany to get the MKS-UM radiation dosimeter tested for conformity to NATO's interoperability standards.

Enhancing capacities of NBC reconnaissance equipment still remains an issue of high relevance for Ukraine's Armed Forces. To address this issue, Sparing-Vist Center has developed a modern-design NBC reconnaissance vehicle project which it offers both to Ukraine's military and to potential export customers. The NBC vehicle could be built on an armored military vehicle platform available in Ukraine or any given foreign country depending on specific customer's preferences.

The broad Sparing-Vist Center product portfolio also includes the military/civilian grade air-filtering gas masks OM-90 and SM-6 that are both designed in conformity to Ukraine's and EU quality standards relating thereto. The military-grade OM-90 mask has been qualified for incorporation into NATO Codification System and assigned NATO Stock Number NSN No.4240-16-0008232. UDR

MKS-UM is the general-purpose multiband radiation dosimeter. The device has IP67 protection level and is suitable to be operated under atmospheric precipitation, in environments with high dust loadings, and with its remote detector unit submerged to a water depth of up to 0.5 m.

Private-sector R&D and Production Company Sparing-Vist Center is the designer and manufacturer of radiological monitoring equipment marketed under the brand name of ECOTEST TM.
The Company employs a strong workforce of over 150 people with multi-year experience in radio engineering. It has produced more than three dozen radiological monitoring technology products over its nearly thirty years on the market. Products bearing the brand name of ECOTEST TM are exported to over 80 country markets worldwide, with an extensive dealer network encompassing the Republic of Korea, USA, Bulgaria, UK, Australia, Argentina, Brazil, Greece, Italy, Egypt, Kazakhstan, Germany, Canada, Turkey, Serbia, and Japan. Ukraine's government agencies and institutions, among them the Defense Ministry, State Service for Emergency Management, State Border Guard Service, Ministry for Ecology and Natural Resources, Security Service, Interior Ministry, Health Ministry, and State Guard Service together with State Border Guard Services of the Republics of Kazakhstan and Uzbekistan are among regular customers for ECOTEST TM products.

[direct speech]

HOLDING THE TARGET

SERHIY FILONENKO

CEO OF THE PUBLIC COMPANY "IZYUM INSTRUMENT FACTORY"

«THE COMPANY'S KEY PRIORITY IS IMPLEMENTATION OF CONTRACTS UNDER GOVERNMENT DEFENSE PROCUREMENT AND ACQUISITION PROGRAM"

Public Company «Izyum Instrument Factory» is one of Europe's leading suppliers of optical flint and color glasses. The Company's optronic instrument product portfolio includes ATGM guidance units and components, naval surveillance equipment, target acquisition components of fire control systems, armored vehicle driver's night vision devices, anti-aircraft sights, and a complete range of vision instruments for applications ranging from armored military vehicles, and anti-tank weapons systems to missile attack warning/missile guidance systems. In an interview conducted by Defense Express, CEO of Izyum Instrument Factory, Serhiy FILONENKO discusses his Company's latest developments and plans for the future.

– What are the Company's results for 2016, and what are its short-term objectives to be achieved?

– The past year was very dynamic and quite successful for us. We were boosting production and putting into production new gadgets that are so desperately needed by our forces in the field. We increased our production by 50 percent, to UAH 133 million. For the first three quarters of 2016, the Company chalked up net income of UAH 109 million, 30 percent up on the same period in 2015.

The Company's current key priority is implementing its contracts and subcontracts awarded under the Government Defense Procurement and Acquisition Program. First of all, I am talking about production of guidance units for the ATGW systems Stugna and Korsar, and about the laser reconnaissance unit that we designed from ground-up after Russia's annexation of the Crimean Peninsula and the resulting loss of the Optics Factory in Feodosia, east Crimea. The unit is intended to be used as part of a PC-based ISR system, and it will do electro-optical reconnaissance and acquisition of targets/objectives along with related direction and range measurements. In 2015, not only did we develop this equipment but we began delivering it to forces in the field; and the deliveries continued in even greater numbers in 2016.

Our second priority is the production of our complete range of vision devices for integration onto the BTR-3, BTR-3E, and BTR-4 APC vehicles.

The Company has also been successful in producing upgraded versions of its TVNE-4BM, TKN-1SM, TKN-3VM, TPN-1-49M, and 1PN22M optoelectronic devices for armored vehicle applications. Substantial capability enhancements have been enabled with this upgrade, achieved through replacing first-generation E-O converters with 2+/3rd generation counterparts.

Among our latest achievements I would like to single out successful completion of the prototype phase and preliminary testing phase of weapon sight projects with thermal imaging capability.

- Is your Company doing some private venture projects (car-

ried out, let us say so, outside the Government Defense Procurement and Acquisition Program) aimed to enhance capabilities of our military equipment?

Certainly yes. Our R&D unit is working on a number of projects that, we believe, hold much promise. Specifically in 2016, we developed a new optoelectronic module with thermal imaging capability, the OEP-VM Optical Sight System, which is intended to be included into the upgrade package to update fire control equipment on the BTR-3E APC vehicle. The OEP-VM consists of a rangefinder, a TV camera with narrow and wide angle fields of view, and a current-generation thermal imager. The new module will compare well with international counterparts in terms of target detection and identification capabilities.

– The use of new processes, technologies and manufacturing equipment is one of key factors of product quality. How are you addressing the issue of your machine-tool fleet renovation in terms of ensuring production rate improvements?

– This issue is truly important, for we won't be able to achieve this goal with old equipment remaining in use. This being said, a program has been enacted to modernize Ukroboronprom's factories, including ours, and a decision has been made to procure a unique four-axis machining center under this program. This will allow us to increase productive capacity and improve the accuracy of metrics in our devices and, thus, to eliminate bottlenecks in production and to undertake new technology development projects. I am talking, in the first place, about a great deal of important works subcontracted from Public Company "State Kyiv Design Bureau Luch". Suffice it to say that the new machining center will enable us to do hull product machining by ourselves (this process, which we have to outsource to other factories, accounts for up to 20 percent of the production process from start to finish). In the end result, this will help produce substantial cost and time reductions, not even considering a huge leap in the final quality.

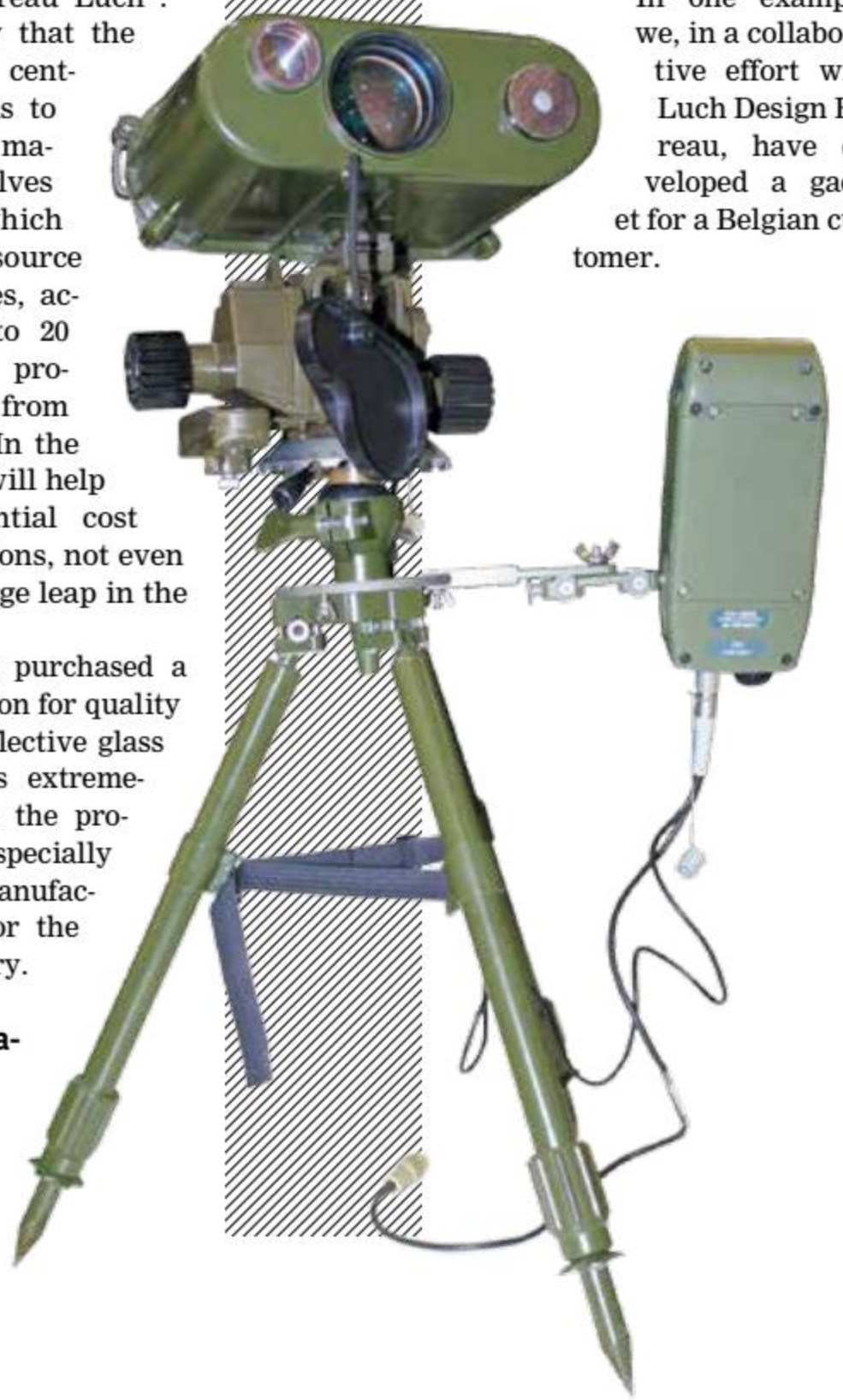
We also have purchased a modern installation for quality control of antireflective glass coatings. This is extremely important for the production of lens, especially those we use in manufacturing devices for the Ukrainian military.

– How is collaboration being developed with international partners at this stage in time?

– We fully appreciate the importance of collaboration, and therefore we are intensively searching for potential partners. Improved and expanded international collaboration is included as a key priority in Ukroboronprom's Corporate Development Concept. This goal, if achieved, could yield qualitative improvements in performance of domestically produced products and equipment in general.

Participation in international exhibitions is one of the tools through which to search for such partners. This is common global practice, and this is where contracts and partnership are stemming from.

In one example, we, in a collaborative effort with Luch Design Bureau, have developed a gadget for a Belgian customer.



Our Company has obtained certification verifying its compliance with ISO 9001:2015 quality management standards replacing ISO 9001:2008 standards we used prior to October 2013. With our Company, these standards apply to processes of product design; development of engineering documentation and manuals; production of high-precision optical, optical-mechanical, and optoelectronic devices and systems; and production of optical glasses. Certification of compliance with ISO 9001:2015 standards is an important recognition of the Company's reliability and efficiency. It opens up the way to international markets, and creates the prerequisites for moving closer towards NATO quality management standards.

– What kind of component technology does your Company utilize for end-product production?

At this stage in time, we source almost all parts and assemblies that we need from EU suppliers, among them Germany, France, Switzerland, Japan and other European and worldwide leaders. Both government-authorized arms dealers and major EU market actors are engaged in this mutually beneficial collaboration. UDR

Interviewed by Serhiy Sghurets, Valery Riabykh, Defense Express

SIX NEW PRODUCTS OF THE SEASON FROM TEMP-3000

TEMP 3000
scientific-production enterprise

In history of any company, there is a period where one hundred or one thousand steps taken toward a goal eventually accomplish real achievements that set directions of development for counterpart industries. This year has seen such accomplishments achieved by Temp-3000 – a company that since 1989 has taken an evolutionary, step-by-step approach in developing its personal protective armor products.

Temp-3000 boasts among its greatest accomplishments recently the launching of production process for ballistic fabrics to be used in the manufacture of protective suits of armored fighting vehicle crewmen.

Teijinconex is a meta-aramid fiber offering excellent resistance to heat and flame exposure. It has been successfully subjected to flame exposure testing under Protect Life From Fire (PLIFF) program conducted in Osaka, Japan. The tests used ThermoMan

– a life-size mannequin system equipped with 60 heat sensors dressed in Teijinconex garments and exposed to flash fire from 20 gas-fired burners placed around the ground. The tests showed the degree of burn involving damage to the epidermis not exceeding 4.2%, far below the level required by the international standard ISO 13506.

The new protective fabric is advantageous for durability and resilience throughout full service life, achieved due to Conex fibers rather than by impregnation soaking process.

Another test, conducted by Temp-3000 in a ballistic laboratory in Wuppertal, Germany, was successful too. A Temp-3000's ballistic helmet that is now supplied as standard issue for Ukraine's military and security forces was subjected to STANAG 2920 ballistic testing, which it passed successfully, proving its V50 rating at 660 m/s – exactly the same result achieved during STANAG 2920 testing procedures the Company was conducting in Ukraine during the past two years.

Ongoing military conflict in East Ukraine has given a strong boost to domestic developments of military-grade personal armor equipment, and especially as it pertains to ballistic helmets. In particular, Temp-3000 has produced about 15 prototype ballistic helmet products for various purposes over the past few years.

Among the latest products developed by Temp-3000 is a ballistic helmet weighing just 950 g, designed to be worn by combat vehicle crewmen and infantry passengers. Despite being ultra-light the helmet provides protection to Ukraine's 1A standard (meaning it withstands an impact of a 9x18 mm bullet fired from APS pistol at 330 m/s).

The experience of using personal armor equipment in real-world combat scenarios has revealed the need for further improving the interior of body armor. To provide better watertight sealing of soft armor panels a technology was initiated for hermetically sealing the panels into a transparent polymer film based on man-made elastomer materials.

Temp-3000 has employed a range of innovative technologies to develop a lineup of bullet resistant vests providing NIJ III+ protection, making them suitable for selection by potential international customers. The ballistic package incorporates a set of ceramic armor plates weighing 1600 g and providing ballistic coverage of 7.5 sq. dm. The lightest body armor in this lineup weighs 6.3 kg while providing Level III protection by the U.S. NIJ Standard 0101.06 Ballistic Resistance of Body Armor.

Textile division of Temp-3000 has launched industrial production process for a high-performance, 100% polyamide fabric that is waterproof at 1000 mm of water column. This, along with enhanced resistance to wear, makes it highly suitable for use in body armor shell vests and personal equipment items.

Continuous growth and technological innovations are what help Temp-3000 be successful both on the domestic and international marketplaces. The Company is always open to partnership and collaboration opportunities in its area of expertise for the sake of preserving human life – the most precious value in the world. UDR

malyuk
AUTOMATIC RIFLE

BORN TO

BEST PRECISE
BEST RELIABLE
BEST ERGONOMIC

The automatic rifle Malyuk, developed and brought into production by the Ukrainian company InterProInvest, provides the optimum solution in terms of the effectiveness of use in various battlefield scenarios. Special operations forces, armed paratroopers, amphibious assault forces, military scouts, combat vehicle crewmen, and dismounted soldiers will be able to appreciate excellent accuracy and reliability performance, and ergonomics of use provided by the automatic rifle Malyuk in harsh battlefield situations. The Malyuk has been successfully put through official trials, accepted for operational use by Ukraine's Armed Forces, and showed itself to be highly effective and reliable weapon of the Special Operations forces fighting separatist rebels in Eastern Ukraine. During testing conducted as part of the Official Trials program, Malyuk proved to far exceed in battlefield effectiveness the counterparts currently operated by Ukraine's military. With the Malyuk rifle – thanks to its improved ergonomic design, optimum weight balancing, and the technological innovations applied – an inexperienced shooter will be able to hit twice as much targets, and experienced shooter – 3.5 times more targets they could otherwise hit in a given period of time with a weapon of conventional configuration.

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

The magazine is mounted within a dedicated shaft, which 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, and it is easy to load into the receiver from whatever position the shooter chooses to take.

The weapon's design makes an optimal use of the energy of the combustion gases. The barrel is cooled by air convection, resulting in a longer barrel life. The Malyuk has had its recoil reduced substantially compared to the Kalashnikov rifle's.

The Malyuk automatic rifle is designed to be ambidextrous for both right-hand and left-hand shooters. The ergonomic bolt handle doesn't move when firing to preclude finger or chin injuries.

Using Malyuk rifle, a dual wield shooting now ceases to be an exclusive privilege of action movie heroes and it can be easily mastered by any well-trained soldier. Also the automatic rifle Maluk can be easily controlled with one hand. It allows the key operations - unlocking, firing, removing and replacing the magazine and reloading that can be lifesaving in dangerous situations.

Trust us that the automatic rifle MALYUK is the most precise, most reliable, and most ergonomic weapon you have ever tried to use.

BE THE BEST

500	10/30/45	900/940 / 715	660
Effective range of fire, *m*	Magazine capacity, *rounds*	Muzzle velocity (5.45/5.56/7.62), *m/s*	Rate of fire, *rd/min*

kg

3,8

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

Physical characteristic/ performance parameter	Malyuk (Ukraine)	TAVOR (TAR-21) (Israel)	Fort 221 (Ukraine)	AUG A2 (Austria)
Mass without magazine, kg	up to 3.8	3.27	3.9	3.8
Full length of the rifle, mm	712	720	645	805
Length of the barrel, mm	415	460	375	508
Caliber of cartridge used	5.45x39 mm/ 7.62x39 mm/ 5.56x45 mm	5.56x45 mm	5.56x45 mm	5.56x45 mm
Firing patterns	Single-shot/ automatic	Single-shot/ automatic	Single-shot/ automatic	Single-shot/ automatic
Rate of fire, rds/min	660	750	500	680
Muzzle velocity, m/s	900 / 715 / 940	850-900	890	970
Effective range of fire, m	500	500	500	300
Magazine capacity, rounds	10/30/45	30	30	30/42
Standard sight	Red-dot 2 MOA	Red-dot	Red-dot	1.5 power optical
Type of sight mounting	Picatinny (length 315)	-	-	
Underbarrel grenade launcher	Not available	Mounting possible	Not available	Mounting possible

ІПІ
ІнтерПроІнвест

An engineering company, InterProInvest was founded in 1998. InterProInvest's key areas of expertise include the design and development of rifle arms.

InterProInvest Ltd

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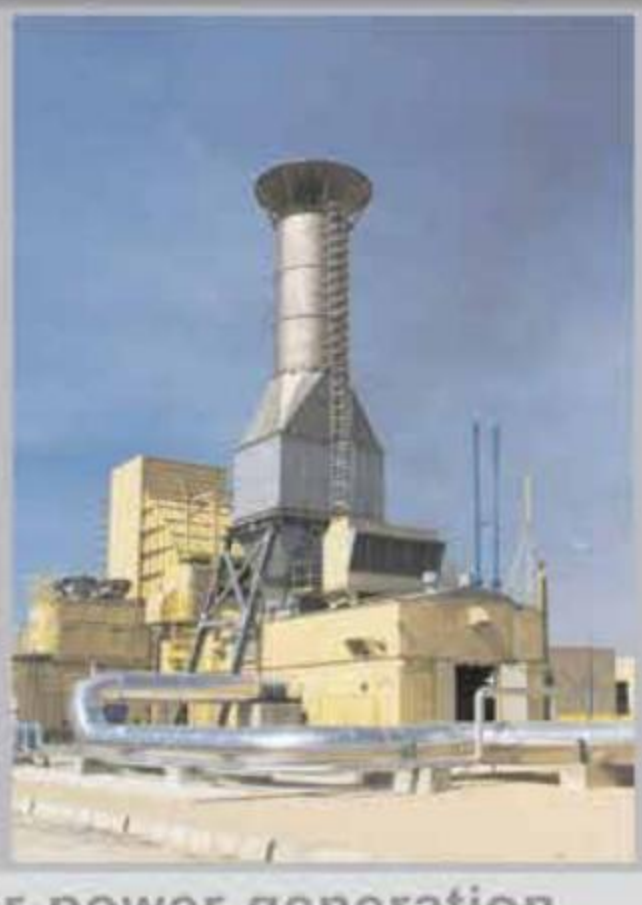

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THE EYES FOR THE ARTILLERY

UAS A1-CM FURIA®. A REVOLUTION IN CAPABILITIES

R&D and Production Company Athlon Avia, Kyiv, is Ukraine's leading developer and producer of Unmanned Arial Systems (UAS). The key product of the Company's portfolio is the A1-CM Furia. It's more than two years now that Athlon Avia-supplied UAS have been deployed in the Anti-Terrorist Operation (ATO) Theater of Operations in East Ukraine. The Company has delivered over four dozen UAS to the country's Armed Forces, National Guard, Security Service, and Volunteer militarized units.

The vehicles have logged a combined total of over 2,500 hours in the air. The A1-CM Furia (translated as "fury"), which is intended to be used primarily in artillery observation and fire adjustment missions, helped Ukrainian government forces engage and destroy hundreds of targets in the ATO Theater.

In 2016, Athlon Avia introduced the A1-CM Furia, a comprehensive upgrade to its battle proven A1-C Furia, to Ukraine's Armed Forces officials. The A1-CM has successfully passed a very demanding MoD testing program, and it underwent multiple tests during artillery training drills. The equipment later won high appraisal by the Armed Forces General Staff and senior leaders of Ukraine's Missile Forces, who said it can help adjust artillery fire "with high effect and without compromises, and it meets the conditions of modern warfare".

The A1-CM Furia is really worthy of this high appraisal, as it compares in functionality and performance with the best international brands. In particular, it is the first – and so far, the only Ukrainian-designed UAS – to provide the capabilities both for automatic target location calculation and for target tracking. Soon A1-CM is to be delivered to Ukrainian Armed Forces in the field.

The A1-CM Furia is designed to perform missions that include target detection and recognition in day and night conditions; target coordinate measurement; providing fire adjustment support to forces on the ground, and perform other missions within its capability range. It is operated by a crew of one or two men depending on the complexity of the mission being performed. Its time of deployment is about 15 minutes.

The following flight modes are available for the A1-CM Furia: autonomous flight with the possibility of altering preprogrammed course in-flight if necessary; flight in radio silence mode; fully human controlled flight; return-to-base flight without the aid of GPS/GLONASS.

The UAS vehicle is controlled via encrypted transmissions through the main AES256 link or a reserve digital link.

Payload is replaceable within seconds

It uses proprietary software on Linux platform.

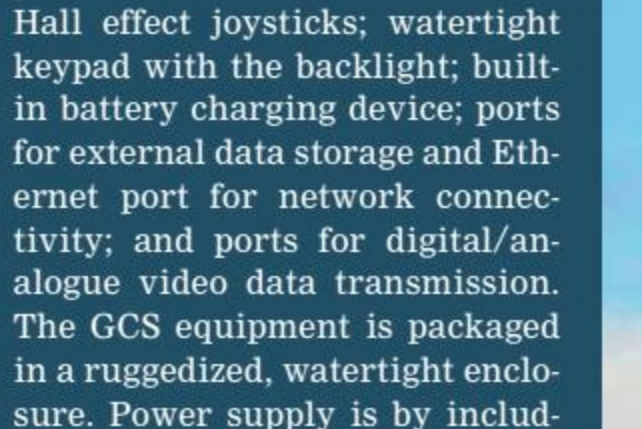
The A1-CM is a flying wing vehicle built of composite materials (fiberglass, carbon fabrics, Kevlar). It has a wingspan of 2,050 mm, length of 900 mm, opertion radius of up to 50 km, operating range of 200 km, in-air endurance of about 3 hours, cruising flight speed of 65 km/h at 2,500 m; it can fly at maximum speed of 130 km/h and endures wing speeds of up to 15 m/s. Its take-off weight is 6.5 kg.

It is propelled by an electric engine fed by a 42,000 mA/h Li-ion battery. The UAV is launched with a simple bungee or mechanical catapult. Landing is by parachute (in normal scenarios) or like an airplane.

The gyro-stabilized payload (gimbal) is replaceable within 30 seconds as needed to meet specific mission requirements. Visual daylight camera is mechanically stabilized in two axes and has digital image stabilization capability. It is a FullHD X10 optical low-light camera system providing 0.1 m resolution, enhanced contrast imagery that is transmitted to memory of the vehicle computer. It can operate at altitudes of up to 1,200 m as needed depending on specific mission requirements.

For night-time operation, the visual daylight camera module is replaceable with a thermal imaging camera module (mechanically stabilized in two axes; digital image stabilization capability; X2, X4, X8 digital zoom). Output imagery is saved in 640x480p resolution in the vehicle's onboard memory. Useful operating altitude is set at 450-550 m.

The UAV is additionally equipped with a non-swappable X12 optical/X24 digital zoom camera with digital image stabilization capability, which is mounted in the wing of the vehicle. It can be used to operate in an automatic mode for capturing video sequences of a preprogrammed frequency rate, or it can be operated manually, with zoom level set manually and output imagery transmitted live to the UAS ground control station.



Daylight camera imagery captured from 400 m altitude (pictured here are military vehicles on a rebel base in Donbas Theater of Operations)

Thermal camera imagery captured from 450 m altitude

Ground control station (GCS) consists of a PC with an Intel i7 processor; two Full HD 22'' super clear screens; remote control Hall effect joysticks; watertight keypad with the backlight; built-in battery charging device; ports for external data storage and Ethernet port for network connectivity; and ports for digital/analogue video data transmission. The GCS equipment is packaged in a ruggedized, watertight enclosure. Power supply is by included, general-purpose batteries or by a 12V/220V mains adapter.

Ground antenna, which covers an operating radius of up to 50 km, can be mounted on a mast with extensions or tripod. The antenna tracker is powered by a stepper motor. The mast is adjustable in height from 2 to 6 meters. The antenna can be mounted on a vehicle to enable the UAV to be controlled while on the move.

In its transport configuration, one UAV fits into a single carrying container (or two can be packed in one container if needed).

The UAV will be ready to be re-launched in 5-7 minutes after landing. UDR

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«АНКЛАВ»

Постановник радіоперешкод «Анклав» призначений для створення завад для прийомних навігаційних систем GLONASS та GPS, системам управління та телеметрії які використовуються БПЛА та іншим високоточним озброєнням. «Анклав» може мати кілька варіантів розміщення - переносний мобільний варіант у вигляді звичайного ранцю, на будівлях і стаціонарних вишках, а також на бронетехніці та автомобілях.

Постановник радіоперешкод «Анклав» виготовляється в переносному та стаціонарному варіанті з використанням антен направленої та ненаправленої дії.

Радіус дії:

з направленими антенами	*до 30 км.*
з ненаправленими антенами	*до 15 км.*

«ANKLAV»

Portable jammer "ANKLAV" is intended to create obstacles for receiving navigation systems GLONASS and GPS, control systems and telemetry used UAVs and other high-precision weapons. "Enclave" can have several accommodation options - portable mobile version in plain bags, on buildings and residential towers, as well as armored vehicles and cars.

Portable jammer "ANKLAV" made in portable and stationary version using directional antennas and omnidirectional action.

Jamming range:

with directional antennas	***up to 30 km.***
with omnidirectional antennas	***up to 15 km.***

ПАТ «Холдингова компанія «Укрспецтехніка», діє на ринку телекомунікацій і електронних технологій з 1989 року. Досвід фахівців, творчий успіх і талант дозволили завоювати провідну позицію в Україні в області розробки, створення і постачання широкого спектру складної радіоелектронної та іншої техніки військового та спеціального призначення.

JSC "Holding company" Ukrspetstechnika" operates in the market of telecommunications and electronic technologies since 1989. Experience professionals, creative success and talent have allowed to win a leading position in Ukraine in the design, creation and delivery of a wide range of sophisticated electronic and other equipment for military and special purpose.

Радіолокаційна станція «МАЛАХІТ»
Radar «MALACHITE»

Цифрова, перешкодозахищена радіолокаційна станція розвідки повітряних і надводних цілей здійснює виявлення, визначення координат і передачу радіолокаційної інформації споживачам в автоматичному режимі.

Digital, Interference-proof radar reconnaissance aircraft and surface targets provides detection, identification of the origin and transmission of radar information consumers automatically.

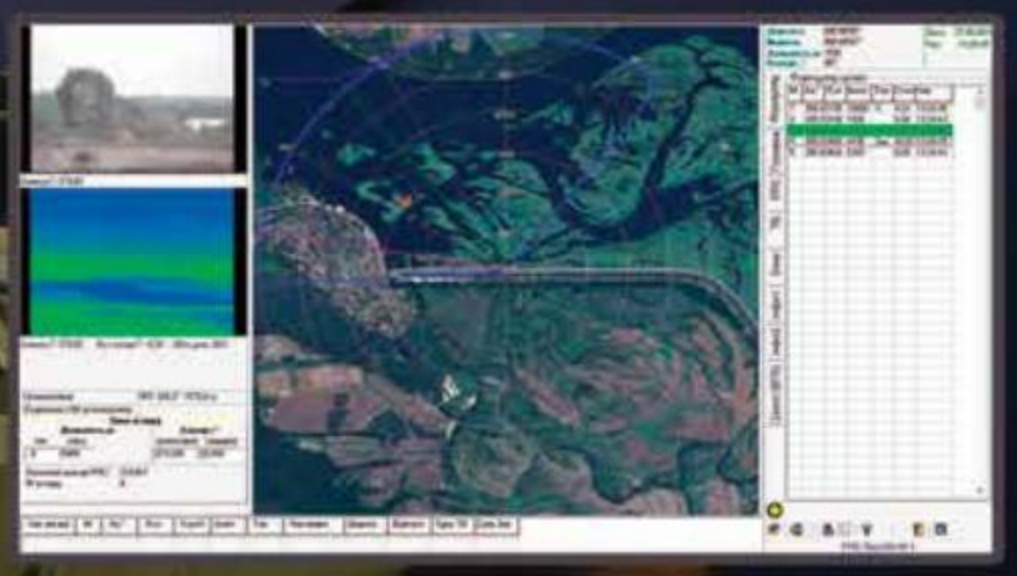
Дальність виявлення цілей:
Range target detection: *400 км/km*

місце оператора станції / place the operator station

«ДЖЕБ»

Мобільний комплекс наземної розвідки "Джеб" призначений для виявлення, класифікації та ідентифікації наземних рухомих цілей, а також низькошвидкісних, низьколітаючих повітряних цілей; , цілевказівки з метою забезпечення виконання завдань з охорони протяжних територій і ведення розвідки.

монітор оператора коплексу «ДЖЕБ»
monitor operator complex "JAB"



«JAB»

Mobile complex of surface recognition "JAB" is intended for detection, classification and identification of surface moving targets as well as low-speed low-flying air targets, target pointingwith the aim to provide performance of tasks on security of wide areas and reconnaissance.

Дальність виявлення:

людини	*4 км.*
техніки	*8 км.*
БПЛА	*6 км.*

Detection range:

person	*4 km.*
vehicle	*8 km.*
UAV	*6 km.*

Anton Mikhnenko, UDR

ANTONOV'S AMBITIOUS PROJECTS

CURRENT STATUS

2016 was a landmark year for the Ukrainian aircraft industry leader, Antonov. The Company unveiled its most recent developments, including the An-178 and An-132 military transport aircraft, which have already found potential customers.

AN-132

The unveiling of the An-132D multipurpose turboprop military transport aircraft marked a landmark achievement for Antonov (which is currently incorporated with the State-run Ukroboronprom defense industries group). The An-132D DEMO aircraft was unveiled to the public in a ceremony on December 20, 2016, at-

tended by Ukraine's President Petro Poroshenko and Prince Turki bin Saud bin Mohammed Al Saud of Saudi Arabia.

"We are confident that this aircraft has a great future. We are confident that the market for this aircraft is 260 to 290 aircraft up to the year 2035. And I am grateful to all aircraft engineers and all our partners for this celebration and for this success", Petro Poroshenko said at the ceremony.

Partnership agreement on the development and production of the An-132 military transport aircraft was signed between Antonov and Taqnia Aeronautics in May 2015.

Under the terms of the agreement, King Abdulaziz City for Science and Technology (KACST), Taqnia Aeronautics Company and Antonov will redevelop the existing An-32 aircraft to produce a new variant with improved payload, range and takeoff characteristics. The program will also encompass the development of a new cockpit with state-of-the-art US- and EU-made navigation systems, which will allow the crew to efficiently operate the aircraft in adverse conditions. The Kingdom owns a 50% share of the intellectual property invested in the design of the An-132.

The An-132 is a light multipurpose, short-to-medium range, all airfield, tail-aft, subsonic turboprop transport aircraft.

It is designed with capabilities to operate in different climatic conditions and especially from high-temperature/high-altitude airfields and from improvised runways. The An-132 is advantageous for its capability to operate from sand runways.

The light transport aircraft is primarily intended to transport cargoes, while its secondary roles will include aerial delivery of cargoes on parachute platforms, airdropping of paratroopers, medical evacuation, reconnaissance, maritime surveillance, and other military and civilian missions.

The An-132 is Ukraine's first indigenous aircraft to have been built without the use of Russian-supplied components.

The Antonov/Taqnia An-132D is powered by two Pratt & Whitney Canada PW150 turboprop engines,

The An-132D DEMO aircraft was unveiled to the public in a ceremony on December 20, 2016

Comparison of aircraft performances

Aircraft	AN-132	C-295	C-27J
Status	Project	In production In service	In production In service
Engine: - type - Max. power (SLS), shp	PW150A 2 x 5071	PW127G 2 x 2920	AE 2100D2 2 x 4640
MTOW, t	28.5	21.0	30.5
Maximum payload, t	9.2	6.8	9.0
Cargo Cabin Volume (without cargo ramp), m³	58	56	74
Cargo Cabin Floor Area (without cargo ramp), m²	32.3	30	23.2
Max. Cruising Speed, km/h	550	480	580
Max. Cruising Altitude, m	8230	7600	9150
Max. Cruising Altitude with one engine (at 90% MTOW), m	3800	700	1800
Flight range, km - with max payload - with 6 t payload - ferry range	1270 3100 4400	1420 2030 5150	1760 3440 5570
Airlift capabilities: - soldiers - paratroopers - wounded on the stretchers	75 46 27	71 50 27	62 46 36

and features Honeywell avionics, Liebherr air management system and a Hamilton Sundstrand supplied Auxiliary Power Unit (APU). The new aircraft is able to deliver payloads of up to 9.2 tons to a range of 3,175 km, at a cruising speed of 550 km/h, and it can be configured for transportation of 71 troops or 41 paratroopers.

AN-178

TThe An-178 military transport aircraft is another program of key priority for Antonov. It was unveiled on 16th April 2015, and made its maiden flight on 7th May the same year. Inauguration ceremony for the An-178 took place at Gostomel airfield, near Kiev; after about an hour in the sky, the aircraft made a successful landing.

On March 31 the An-132D aircraft successfully completed its first flight

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 can find itself in the heavier payload category than the An-74 or Europe's C-27J and C-295.

The cargo compartment floor area of An-178 is amounted to 40 sq. m with loading ramp or 33 sq. m without it. 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 2,440 mm 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.

The cockpit is designed for a crew of two pilots. The An-178,

like each and all of Antonov-series military transport aircraft, can operate both on unpaved and concrete runways no shorter than 915 meters. Cruising speed is set at 825 km/h. The aircraft has 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.

As part of its flight testing program, the An-178, in 2016, successfully completed type certification tests at high angles of attack (HAA), including stall tests at different altitudes and with different positions of flap extension and landing gear.

During Q3 and Q4 2016, and Q1 2017, the An-178 was successfully tested with respect to loading/unloading of various cargo types.

During Q3 and Q4 2016, and Q1 2017, the An-178 was successfully tested with respect to loading/unloading of various cargo types

Three M1097A2 military HMMWVs (High Mobility Multipurpose Wheeled Vehicle) were used in the tests in August 2016, and shipping containers and pallets in February 2017. The tests verified compliance with the specs in terms of loading/unloading, vehicle ingress/egress, and arrangement/fastening of shipping containers and pallets.

As at early 2017, the An-178 logged 194 flight hours in 115 flights, including HAA tests.

Production preparations for the An-178 began in the middle of 2016 at Antonov.

There is a firm order in place for ten An-178 aircraft from Azerbaijan's Silk Way Airlines, and preliminary agreements have been reached to supply 25 aircrafts to China's Beijing A-Star Aerospace Technology Co, 30 to Saudi Arabia's Taqnia Aeronautics, and one to an Iraqi customer.

Ukrainian experts estimate the market for the An-178 at about 800 aircrafts within the next 10 to 12 years. UDR

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SE "Plant 410 CA" – created in 1948 - has its own striking history, its great accomplishments and victories. It has overhauled as many as 7,000 aircraft and 40,000 aircraft engines for the customers from over 50 countries, proving its well-deserved reputation and trustworthiness among the enterprises of the aviation industry.

Powerful production capacities, modern equipment, advanced technologies, valuable experience of engineers and technicians allow the SE "Plant 410 CA" to effectively perform aviation equipment maintenance as a part of the State Concern "Ukroboronprom", holding leading positions in aviation equipment repair.

The plant occupies the territory of 236,000 m2, including 170,000 m2 of production facilities.

The SE "Plant 410 CA" is certified for maintenance, overhaul and modernization of AN-24, AN-26, AN-30, AN-32, AN-72 and AN-74 aircraft, MI-8MSB helicopters and D-36 engines.

Besides, SE "Plant 410 CA" offers the following services:

- accomplishing the work of Antonov aircraft life extension;
- CRW1, CRW2, CRW3 on AN-74 aircraft and CRM on AN-72 aircraft at the flight testing station;
- modernizing and re-equipping aircraft cabins;
- re-equipping AN-26 aircraft cabins, using intensive care units;
- painting aviation equipment with high quality materials in accordance with customer's request; painting commercial aviation aircraft with Akzo Nobel materials;
- supplying aircraft components and spares.

SE "Plant 410 CA" is verified by the National Transport Authority of Hungary to perform AN-26 aircraft overhaul and components repair; the plant is licensed by the Ministry of Economic Development and Trade of Ukraine for military aircraft overhaul and modernization.

Besides, the plant's quality management system is certified by Standard Certification of the BUREAU VERITAS International Technical Society the ISO 9001:2008 and the Certificate of compliance with NATO AQAP 2120.

To facilitate maintenance and overhaul processes, new technologies for parts reconditioning and nondestructive inspection are implemented at the SE "Plant 410 CA".

Director General of SE Plant 410 CA
Viktor Gankevych highlights:

"The plant is a flagship of the Ukrainian aviation industry. Its major objective is to provide qualitative and timely services, as well as cultivate new partner relationships. Our long standing business partners, their loyalty and confidence are the main achievements of the SE "Plant 410 CA".

SE "Plant 410 CA" closely collaborates with leading Ukrainian aviation enterprises and is open for business cooperation with new business partners. The plant is maintaining partnerships with prominent international manufacturers and suppliers of aviation equipment.

In 2016, the plant passed four recertification audits for compliance with ISO-9001, NATO AQAP-2120, PART-145, and Part 145B of the Ministry of Defense of Ukraine.

Domestic, as well as customers from more than 50 countries, employ services of the SE "Plant 410 CA." UKROBORONPROM reform strategy is being implemented: introduction of latest innovations, promotion of the plant's best practices and extension of MRO capacities for foreign-made aviation equipment.

For more details, please, visit SE Plant 410 CA official website: **www.arp410.com.**

Oleksandr Lepetun, deputy director general- chief marketing and foreign economic activity officer, mobile phone: +38 098 085 60 20; tel./fax +38 044 246 99 26, e-mail: aviamark@410.kiev.ua.

We invite you to cooperate with us!

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

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

Key upgrade features:

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

Max. detection range: 75 km

Engagement slant range: 24 km

MTBF: 1500 h

UAS "OBRIY"

Unmanned Aircraft System (UAS) «OBRIY» has been developed by Aerotechnica specially for the Defence Industry as a high performance training solution for a variety of gun and air defence missile system. UAS «OBRIY» can be used as a Decoy Aircraft System to confuse and deceive integrated air defence systems of the enemy.

UAS «OBRIY» consists of:

- common ground control station mounted on a vehicle with off-road capabilities;
- set of UAV's (UAV type, quantity and onboard equipment varies according to the objectives);
- Hardware-In-The-Loop Simulation.

According to the objectives and requirements to the onboard equipment UAS «Obriy» can be supplied in various modifications:

- UAS «OBRIY-M» (modification «aerial target»);
- UAS «OBRIY-L» (modification «flying laboratory»);
- UAS «OBRIY-P» (modification «decoy aircraft»).

"AMBER-1800" mobile VHF radar

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

Transmitter and receiver have solid state design.

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

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

Radar functions:

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

Transmitter: 8 or 30 kW

Frequency band: 140 – 180 MHz

Deployment: 12 min

HEAD OFFICE: 12 Janusz Korczak (Baumana) str., 03190 Kyiv, Ukraine
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BETWEEN SKY AND EARTH

RADIONIX PRODUCT PREMIERS

Ukraine has enough R&D and manufacturing capabilities to boost combat effectiveness of its frontline aircraft units and SAM forces, which is a critical priority in the face of continuing military threat from Russia.

Since its foundation in 2006, Kyiv-based Radionix LLC has been focused on the development of new solutions for upgrading and updating the avionic equipment used on the MiG and Su-series fighter aircraft. Assisted by its international partners, Radionix has developed an upgrade package for the gun-laying radars equipping the Su-27, Su-30, and MiG-29 fighters. The proposed upgrade would provide a 30 percent improvement in the radar's range and detection performances, and would also improve the probability of success performance of its key subsystems. These solutions later formed the basis of a program aimed to upgrade Ukraine's Air Force MiG-29 and Su-27 fleets.

TO DECEIVE AND DEFEND

During the ongoing Donbas Anti-Terrorist Operation (ATO), Ukrainian government forces used their frontline and army aircraft capabilities against Russia-backed separatist and terrorist forces. Many of these aircraft were lost to enemy fire conducted with Russian-supplied weapons systems such as the Igla and Verba MANPADS, and most advanced Pant-

sir SAM and anti-aircraft artillery systems. A significant potential threat to Ukraine's aircraft comes also from the Buk-M1 and Buk-M2 self-propelled medium-range SAM systems that Russia has deployed in numbers in the Crimean Peninsula and locations adjacent to Ukraine's border.

In 2012, Radionix offered Ukraine's Air Force its airborne pod-mounted self-defense jammer designated Omut-K that is intended to protect aircraft from radar-guided AAM and SAM threats. This was later redesigned to produce a more advanced, extended functionality version, the Omut-KM. Its range of capabilities includes interception and analysis of incoming signals from hostile electronic systems; decision-making on adequate countermeasure responses; and spoof jamming of hostile SAM radars and radar-guided missiles operating within its frequency range.

Initially, the frequency range of 8 to 12 GHz was chosen for the Omut-K, but the Omut-KM uses a substantially extended range of frequencies to enable it to counteract SAM threats such as Buk-M1 and Buk-M2. Optionally, the operating frequency range can the extended to include frequencies from 0.8 GHz to 18.0 GHz.

The Omut-KM airborne jammer has the following key specifications: Main frequency range: 5 to 12 GHz; optional frequency range: 12 to 18 GHz; number of frequencies that can be jammed simultaneously: 20; output at P-1 dB: ≥ 20 W; mass of the pod: 71 kg; dimensions of the pod: 2400 x 370 x 260 mm.

In 2012, Radionix offered Ukraine's Air Force its airborne pod-mounted self-defense jammer designated Omut-K

The Omut-25KM variant has been developed specifically for use on the Su-25 fighter aircraft. Structurally, the Omut-25KM consists of two pods mounted on underwing hardpoints of the SU-25, each responsible for guarding its assigned hemisphere (fore or aft). One prototype sample of the equipment has been delivered for full-scale development testing to Azerbaijan's Armed Forces.

Besides the development of airborne countermeasures self-protection complex, the Radionix company also produced the System of radio electronic protection from anti-radar missiles with passive radio technical guidance, which provides protection from anti-radar missiles of different types.

Main tactical characteristics and specifications of the system are following:

1. Number of anti-radar missiles deflected from the defended object is unlimited.
2. The range of defended area from anti-radar missiles is not less than 100…150 m from radar.
3. Jamming parameters correspond to defended radio technical system signal parameters.

In order to protect radar from anti-radar missiles attacks, the remote radiators are proposed. Every of them is placed 250…300 meters out of radar position in different directions.

A different radiators (or different groups of 2-3 radiators) operate at the certain time interval defined by the system control equipment and protected radar operating mode, and the other radiators are silent at this time.

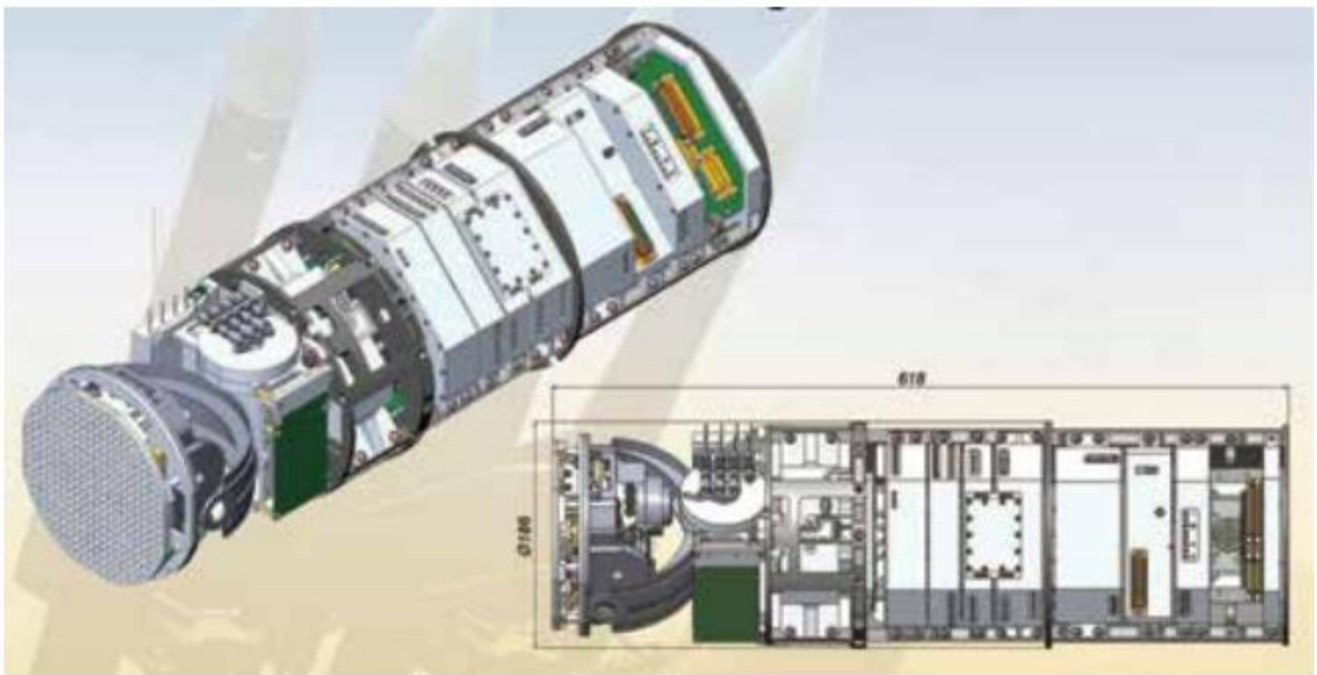
Operating radiators create a radio signal field that imitates radiation from the protected system placed in "wrong" place for the missile seeker comparable to the real protected object location. Power of the radiating signals exceeds signals power of this system that are radiated in the radar antenna side lobes direction which are the most probably missile attack directions. Thus these signals deal with homing head of anti-radar missile by garbling the angular location of the protected object. Anti-radar missile is targeted on energy center group (usually 2-3) of operating radiators and radio electronic system.

The protection system equipment can be made in permanent and mobile variants.

Two-man team is required for the protection system maintenance. They ensure protection equipment deployment, its current maintenance (repair), and setting of the off-the-shelf carried-out radiators by non-operated main radiators.

Also Radionix is developing an innovative airborne X-band radar system which it named Esmeralda. The system is being developed with flexible, open-architecture design, exploiting the building-block concept that enables it to be integrated both with SAM weapons and MiG-29 and

Radionix has developed its active radar guidance unit that relies precisely on this millimeter-wave frequency range



Su-27 aircraft or other suitable platforms, both currently existing and prospective.

The building-block concept employed for this design enables individual components and modules (such as array assemblies, for example) to be swapped in and out as needed, and the system as a whole to be easily reconfigured to suit specific mission requirements. As at this date, Esmeralda radar is at the prototype development stage.

NEW GOALS

Radionix has branched out into a promising technology business such as the development of missile guidance equipment. Among the Company's latest developments in this domain are two innovative radar guidance units to be known as Onyx (active) and Topaz (passive), which it developed in collaboration with domestic stakeholders.

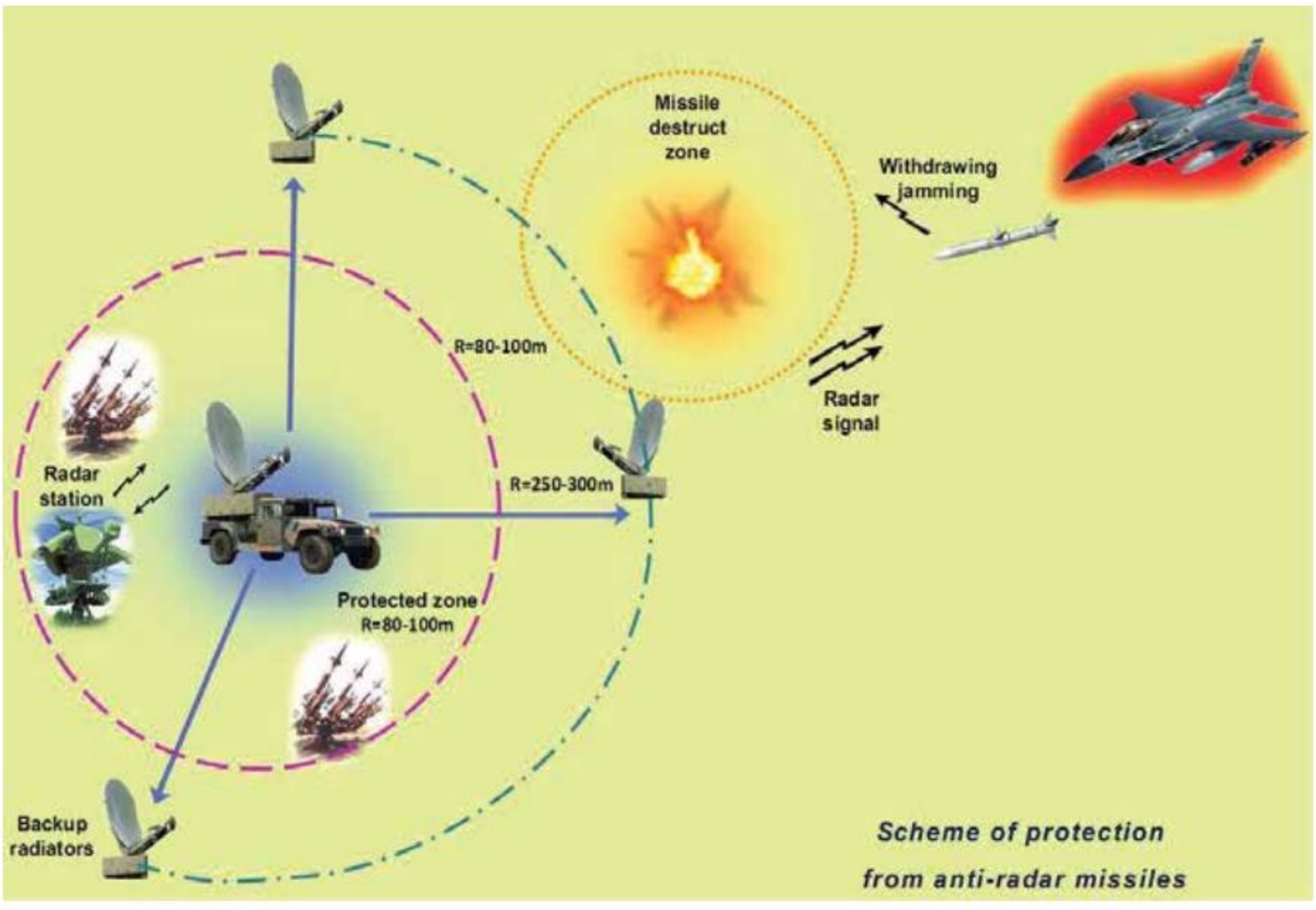
These are the active radar guidance units. It must be appreciated that current-generation airborne electronic warfare systems have learnt too well how to deal with frequencies up to 18 GHz (this, inter alia, encompasses the frequency range exploited by the RVV-AE, R-77 and other AAM weapons designed by Russia). This has made some of the missile guidance technology engineers opt for the frequency range of 27 GHz to 37 GHz. So Radionix has developed its active radar guidance unit that relies precisely on this millimeter-wave frequency range. These units are designed such as to suit application for both SAM and AAM roles.

Scheme of application for System of radio electronic protection from anti-radar missiles with passive radio technical guidance

The two units are designed and built with 60-65 percent electronic parts commonality.

Regarding the missiles that will accommodate these innovative guidance units, it should be noted that Radionix has recently had to shift its focus from the airborne technology domain to the development and production of SAM weapons under export contracts. So these guidance units will initially equip the missiles to be fired from a new SAM launcher that Radionix is developing for an international customer. But the Company is indeed interested that these products should be added also to the military weapons arsenal of Ukraine's Armed Forces. UDR

Serhiy ZGHURETS
Defense Express



Scheme of protection from anti-radar missiles

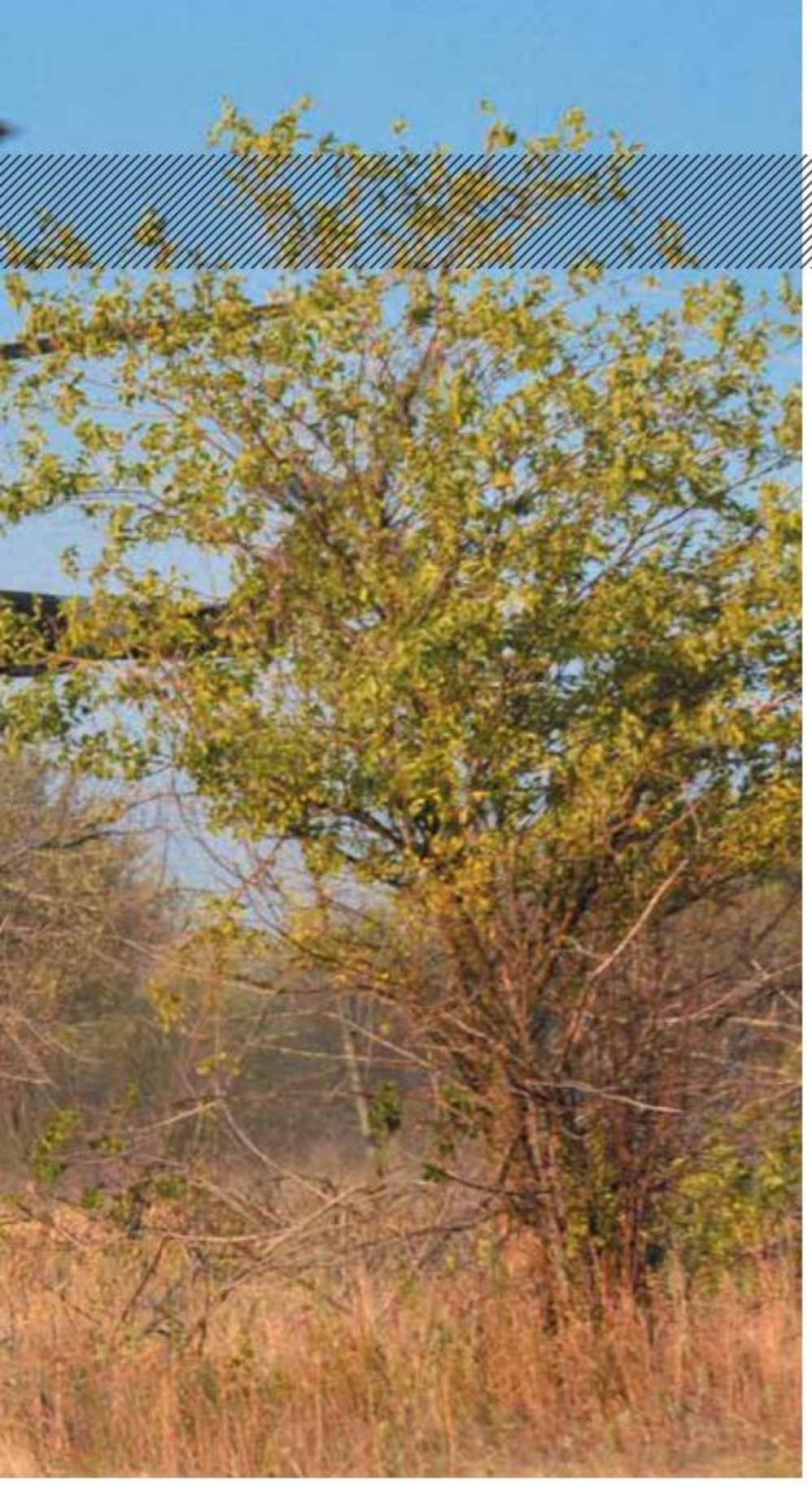
[close-up]

ADRON: NOT ONLY DEFENSE

The private defense technology firm Adron, Kyiv, is widely renowned both in Ukraine and elsewhere for its developments of aircraft self-protection systems. But few people know that the Company has started also the development of more "lethal" products. Here Defense Express introduces its readers with Adron's innovative lethal weapons products and with ongoing upgrade programs for its already proven non-lethal weapons products.

One of Adron's best renowned products is the Electronic-optical Jamming System ADROS KT-

All of Ukraine's Air Force helicopters deployed to the Donbas Theater of operations are now equipped with Adros KT-01AV kits



01AV that is designed to protect rotary-wing aircraft from infrared-homing missile threats. During the active phase of hostilities in the Donbas Theater of operations, the non-availability of IR decoy flare countermeasures on the helicopters used by Ukrainian government forces seriously and adversely affected their ability to perform their assigned missions. The lesson has been learned, and all of Ukraine's Air Force helicopters deployed to the Donbas conflict area are now equipped with Adros KT-01AV kits.

Over 150 kits of the ADROS KT-01AV equipment have been exported to international customers since the system was officially approved for service use in 2005, and these were later used extensively in minor military conflicts worldwide.

For enhanced effectiveness and efficiency, the KT-01AV can be allied to an exhaust infrared suppression system such as Adron's worldwide unique ASh-01V, which is specifically optimized for use on MI-series helicopters. In 2016, the Company successfully put the ASh-01V through official tests.

The Ash-01V's outstanding feature is its dual-mode operation. Actually, any kind of an obstacle, such as an exhaust infrared suppression device put on the way of exhaust gases adversely affects the engine's output on its free turbine shaft, and with it affects the aircraft's capabilities in terms of take-off mass, range and air time endurance. To eliminate this engine power loss, the ASh-01V is designed such that it doesn't affect the engine's work when operating in a stand-by mode, and doesn't come into game until the host helicopter comes under an infrared homing missile attack.

Official tests verified that the use of the ASh-01V exhaust infrared suppression kit reduces a helicopter's IR signature by 8-10 times within the IR frequency range of a given guided munition type

Official tests verified that the use of the device on the Mi-8MSB-V-class helicopter reduces its IR signature by 8-10 times within the IR frequency range of a given guided munition type, and the engine power loss doesn't exceed

3%, not just during standby operation but also during the active mode of operation. The tests also verified that the use of the ASh-01V jamming kit reduces a heat seeking missile's IR lock-on range by three times and detection range by two times.

As at this date, the ASh-01V exhaust infrared suppression device integrated onto the Mi-8MSB-V helicopter's engine has successfully completed validation tests and is scheduled to undergo similar tests on the MI-124 chopper soon. Alongside this, Adron is drawing up blueprints for a similar device optimized specifically for use on the MI-2MSB rotorcraft.

In addition, Adron is developing extensions to its family of IR decoy flare dispensers, especially for use on Antonov-series military transports An-26, An-30 and, probably, An-178, as well as Ilyushin Il-76. As part of its obligations under the Government Defense Procurement and Acquisition Program, the Company started the development of IR flare countermeasures for Su-27, MiG-29 and Su-24 tactical fighter airplanes. These will feature more advanced design and software components compared to counterparts employed on the Su-25 fighter.

Regarding lethal weapons products, Adron has completed development of its Aerodynamic Trajectory Control Module Adros BAU-01KT kit, which is intended to be integrated on bombs weighing 500, 250 and 100 kilograms to provide a precision attack capability against static (primarily pinpoint) targets as well as hard ground targets. The kit utilizes GPS/inertial navigation system for its guidance. Further improvements being developed for this product include infrared homing and laser guidance capabilities. The BAU-01KT equipment is now being put through official tests.

Further improvements being developed for the BAU-01KT include infrared homing and laser guidance capabilities

Another product being developed by Adron is a standoff bomb capable of ranges of up to 30+ km.

In view of the situation in the Donbas Theater of operations, Adron has begun to branch into the development of thermobaric warhead munitions. The Company has already developed several thermobaric mixtures suitable for applications ranging from hand grenades to artillery shells and bombs.

Particularly at the Arms and Security-206 Exhibition in Kyiv, Adron unveiled its thermobaric hand grenade designated RGT-16S. This is intended to be used in assault operations against sheltered personnel, enclosed premises and field fortifications. The weapon is designed such as to prevent it from rolling backward when thrown from an inclined surface. Alternatively, it can be attached to its target object using a magnet or adhesive tape.

The grenade weighs 500 g, including its 300 g warhead. Upon detonation in an enclosed space, it produces a kill zone of 16 m3, heated up to about 3,000 °C in its center.

The munition combines incendiary capability with a high explosive effect, which potentially makes it efficacious against a wide range of targets such as vehicles, both armored and unarmored, various structures, tunnels, trench shelters and other field fortifications. It will be especially effective for destroying explosives storehouses, no matter with or without armor protection.

Also at Arms and Security 2016, the Company showed off its rocket propelled anti-personnel

flamethrower. Targets that can be engaged with this all-weather weapon are timber-and-sand fortifications, pillboxes, hardened structures and other protected emplacements, light armored and unarmored vehicles, and exposed and sheltered personnel. The flamethrower is fitted with an optical sight for enhanced accuracy of fire.

This flamethrower is conventional in that it fires a thermobaric munition that explodes and ignites upon impact at 130m/s. It creates an explosion equivalent to 2.2-2.5 kg of TNT when detonated in the open terrain and 10 kg of TNT in confinement, producing a kill zone exceeding 18 m3.

The Company is already developing a variant firing a jet-powered munition, allowing targets to be engaged at ranges of up to 1,500 m.

As at this date, the flamethrower's munition has been developed and put through testing procedures, and a jet propulsion unit is at the development stage.

In conclusion, it should be noted that Adron, despite financial constraints and internal difficulties relating to the complex process of technology development, continues its growth and work for the benefit of Ukraine's capacity to defend itself. The products offered by Adron are in many aspects unique, not only in Ukraine but also worldwide.

With its incendiary capability combined with a high explosive effect, the RGT-16S will be effective against a wide range of targets such as vehicles, both armored and unarmored, various structures, tunnels, trench shelters and other field fortifications

On the positive side, the Company's work experience reveals high potentialities held by Ukraine's private defense technology sector. But to fulfill this potential to capacity, it needs to be supported with adequate funding and human resources. In absence of this support, a lot of potentially promising defense technology projects will never be able to come to fruition. UDR

Serhiy Radkevych,
Defense Express

[radiolocation]

DIGITAL GENERATION RADAR TECHNOLOGIES

Current long-to-medium range surveillance radar sensors are usually built on the digital Active Electronically Scanned Array (AESA) technology where signal tracks are generated and processed in a digital representation. This enables stable performance in various jamming and background noise environments, and allows software upgrades and updates to be made throughout the technology's full lifecycle. In 2006, NPK Iskra R&D and Production Complex, Zaporizhia, employed the digital AESA technology to develop its 80K6M (2012), 80K6K1 (2014) and 80K6K1V (2015) products – all based on a common digital platform; and also to upgrade data processing capabilities of its most successful and widely used product, the 36D6 surveillance radar.

The hardware and software solutions implemented in the 36D6 radar technology were later used as basic by Iskra to develop and build its advanced 80K6T (2016) and MR-18 (2016) products. Even despite the updates being made with time to the hardware and software components of the common digital platform, the 80K6 and 36D6 are still able to retain a high level of compatibility, enabling new upgrades and updates to be made as they become available.

The 80K6K1 is a three-dimensional 360-degree surveillance radar that is able to function effectively even in the presence of substantial environmental and electronic countermeasures influences. It has an electronic scanning capability and generates 12 independent receiver beams enabling aerial targets to be detected anywhere within a 55-degree angle of elevation.

The 80K6K1 is notable for its capability to emit signals of an average 6 kW power – a level three times that of currently existing transistorized counterparts consuming an equal amount of power -- achieved through the use of a modern multi-beam klystron

transmitter. A highly stable transmitting capability coupled with high repetition frequency of transmitted pulses makes the 80K6K1 extremely highly resistant to passive countermeasures and enables it to detect and track low radial velocity targets with high effectiveness and efficiency.

The 80K6K1 is vehicle carried, ensuring tactical mobility that is so valuable on the modern battlefield. Affordable price tag is another advantage, considering that an advanced klystron transmitter is about ten times cheaper than a solid state counterpart of similar capabilities.

The 80K6T is a next-generation follow-up to Iskra's proven 80K6 technology. The intention was not just to tap into the market for solid state transmitter radar technologies, but to produce a 3D search radar offering the best practicable performance capabilities for radars of its kind, especially in terms of threat detection capability improved to up to 500 km in range, and 70 degrees in elevation.

The 80K6T is a next-generation follow-up to Iskra's proven 80K6 technology

The introduction of transmission elements and a digital control interface unit (to manage the emitted signal phase), combined with the digital beamforming algorithm already implemented in the 80K6 technology, produced a radar sensor that requires no tuning-up and is self-adaptive to the changing electromagnetic environment.

To improve detection capability against extremely low radar cross section (RCS) threats such as UAS vehicles, the radar can slow down its rotation rate from standard 12/6 rpm to 3 rpm. The 80K6T is scheduled to begin its testing program in the latter half of 2017. Subject to successful completion of the testing program, production is expected to begin in Q1 or Q2 of 2018.

The 80K6K1 is vehicle carried, ensuring tactical mobility that is so valuable on the modern battlefield

The MR-18 is especially effective against low RCS targets such as tactical fighter jets, cruise missiles and unmanned aerial vehicles

VEHICLE-CARRIED ISKRA MR-18 VHF RADAR SURVEILLANCE SYSTEM

The MR-18 is vehicle-carried, solid-state VHF digital AESA radar optimized for the detection and tracking of aerial targets, especially low radar signature and stealth targets, at long ranges.

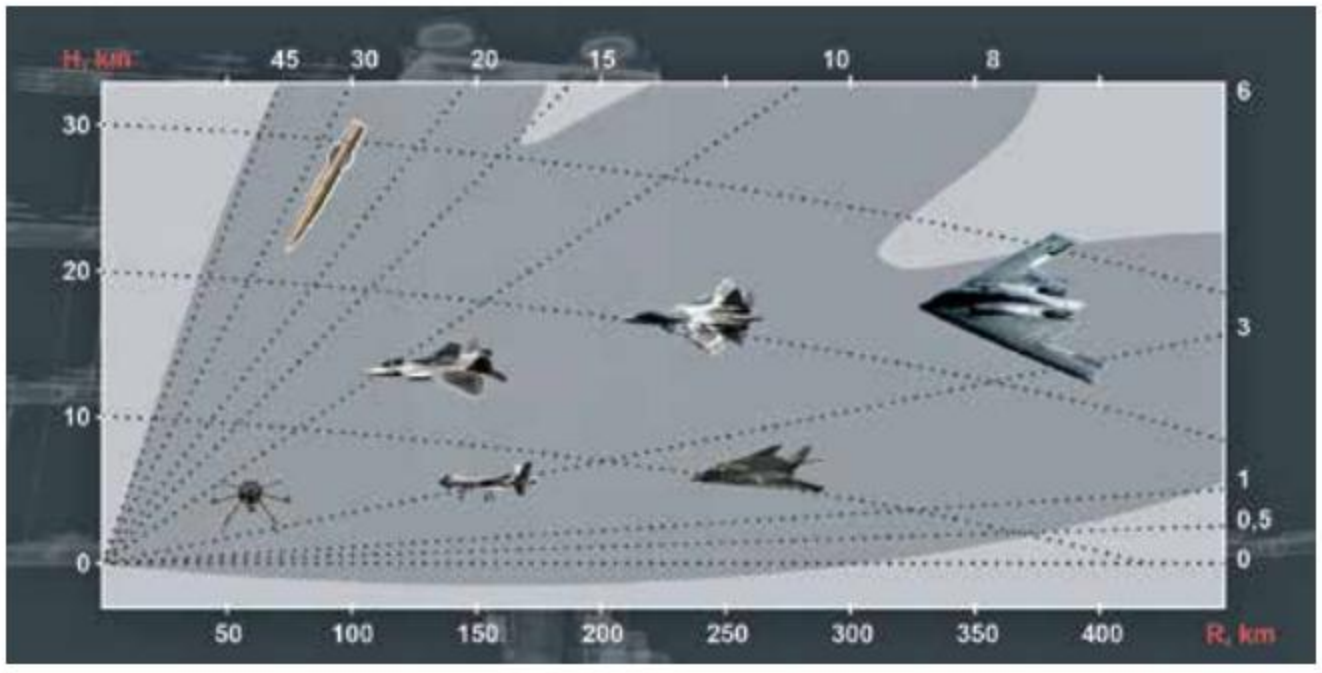
Being a meter-wave radar, the MR-18 is especially effective against low RCS targets such as tactical fighter jets, cruise missiles and unmanned aerial vehicles. It has the capabilities for digital beamforming for reception of echo signals, digital control of transmitted beam shape and direction, digital signal processing and data analysis, and is capable of automatic target detection and tracking. It offers enhanced resistance to environmental and electronic countermeasures influences; spontaneous noise; active/passive interferences, and synchronous/asynchronous pulse jamming.

The MR-18 is beyond compare among other VHF radars in terms of tactical mobility performance. It moves from stowed to ready configuration and backward in 5 min and 3 min, respectively, making it especially valuable for use in scenarios involving an expansion or recovery of lost radar coverage of the battlespace. With its excellent tactical mobility performance and detection/tracking capabilities against low-flying and UAV threats, the MR-18 is particularly suitable for deployment in close vicinity to enemy lines.

The MR-18 will be available in two configurations accommodated respectively in one or two vehicles on the KrAZ-6435N6 truck platform (the operator workstation will be located in the truck's cabin in the single-vehicle configuration).

The MR-18 design combines the benefits of operational mobility and those of the VHF bandwidth and advanced radar output processing algorithms allowing it to be used as part of highly mobile air defense forces for countering low-RCS threats, both currently existing and future.

Iskra's MR-18 radar technology competes in some performance capabilities with its foreign-designed counterparts while surpassing them in terms of some of the capabilities that are truly critical in real-world combat scenarios. UDR



The MR-18 detection ranges for different aerial targets

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