INTERNATIONAL AEROSPACE & TECHNOLOGY GUIDE

Special analytical export project of the United Industrial Publishing

№ 01 (54), February 2021

ROSOBORONEXPORT
Exclusive state intermediary agency

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ADJUTANT
New generation of the target system


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POLYANA-D4M1
Control system of anti-aircraft brigade


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TMC JSC, RUSSIA
Reliable long-lasting real partnership


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The best innovations, technologies and solutions for the Asian-Pacific region

AERO INDIA 2021

SPECIAL PARTNERSHIP

UIP UNITED INDUSTRIAL PUBLISHING

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№ 01 (54), February 2021

Special analytical export project
of the United Industrial Edition

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EDITORIAL

AERO INDIA: stronger than COVID

As it happens, the AERO INDIA 2021 was the first major world exhibition in the context of the coronavirus. And the very hosting of this EXPO is already a sign of progress towards victory. Thank you to everyone who believes! Thank you to all those who, against all odds, are working for the future. This exhibition in Bangalore is such a case in point.

It has become already obvious and undeniable that security is becoming increasingly important among the various values of civilization. Today, for any state, the ability to reliably and securely protect the territory, residents and values is a priority.

Political situation in the world (conflicts, sanctions, threats of war and other) makes nations once again reconsider their defense possibilities. Threat of local conflicts to be evolved into global ones, failure of worldwide system of safety and nonending crisis – all of this leads to an unstable and dangerous situation.

One can predict raise of defense means market in times like this. But together with developing of defense technologies in order to safety, rivalry among sellers of weapons and defense systems increases in order to achieve such goals as increasing profits and market share. AERO INDIA 2021 presents in Bangalore the best world (Russian also) aerospace innovations for global market, which are the undisputed world leaders on price and quality in their segments.

These exhibition shows that it is not serious about how many weapons and planes you have, but quality and possibilities of every single one of them is fact what leads to victory on the battlefield and on the global market. Other significant factor is technological independence from seller – modern technologies make it possible to shut down any device from any place of the globe if you have appropriate access. With hitech products, solid aftersales service and proven reliability, Russia is honest and friendly partner for all countries, ready for mutual work.

Taking part in AERO INDIA 2021 Russia continues the policy of open partnership with India and other countries of AsianPacific area. Russia has a wide product line that meets all the needs of this region and ready propose the best technology and the best price offers.

Valeriy Stolnikov

NEW PARACHUTES FOR SPECIAL FORCES

The Technodinamika holding of Rostec State Corporation has started supplying new 'Stayer' tactical parachute systems. The technology is intended for special-purpose units jumping from aircraft speeds of up to 350 km/h and can be used in extreme cold. Stayer is a special-purpose parachute system of the 'wing' type. It allows to jump at altitudes from 700 to 10,000 meters with a maximum flight weight of up to 180kg. In 2020, a group of Russian paratroopers used the new parachutes in harsh Arctic conditions, making a group jump in the Far North for the first time in world history from the lower boundary of the stratosphere – from a height of 10,000 meters above the Franz Josef Land archipelago.

The parachute allows jumping at an aircraft speed of up to 350 km/h with an additional load of up to 50kg. The wing-type system has increased control maneuverability and significantly expands the capabilities of Russian special forces to perform tactical tasks. Stayer was developed by specialists of JSC Polyot of the Ivanovo parachute plant of the Technodinamika holding. The creators of the system were awarded with departmental awards 'For Strengthening the Combat Commonwealth'. 'The development of the Stayer parachutes was carried out in the interests of the Ministry of Defense. The system has no analogues in the Russian market, has unique capabilities and has proved its reliability during exercises. Stayer has been put into service and the first systems have already been sent to the troops', commented Igor Nasenkov, General Director of the Technodinamika holding.

ELECTRIC MOTOR TO PROTECT TROPICAL HELICOPTERS

The Technodinamika Holding of Rostec State Corporation has developed an electric motor for use in a dust protection device for tropical versions of helicopters. The device was developed as part of the import substitution program and the first prototype has already been submitted for testing. The electric motor is designed to operate in a dust protection device that protects the engine from dust and sand when flying at ultra-low altitudes. The device is intended for installation on Mi-38 helicopters and various modifications of the legendary Mi-8, capable of operating in tropical climates and in desert conditions.

'We plan that this technology will replace electric motors of foreign-made dust protection devices. The main customers of such products are African countries, but I am sure that this development will also be in demand in the domestic aviation market and will reduce dependence on imported components', commented Igor Nasenkov, General Director of the Technodinamika holding.

Parachute systems for airborne personnel

The Ivanovo parachute plant 'Polyot' of the Technodinamika holding has ensured the early fulfillment of several state defense contracts for the supply of parachute systems to the Russian Ministry of Defense for airborne personnel. Among them are 'Malva-24' parachutes and the backup system 'Z-5'. The delivery to the end customer was completed ahead of schedule.

One of the technologies supplied to the Ministry of Defense is the Malva-24 parachute system, designed to perform all types of jumps both by individual paratroopers and by groups of parachutists from aircraft and helicopters. Its specifications and quality conform to leading international standards.

The main parachute is rectangular in shape and has seven sections. The 24.2 square meter canopy is suitable for skydivers weighing up to 100 kg. The set consists of the main and spare canopies, a satchel with a harness, a carrying bag, accessories, packing and spare parts. Depending on the configuration, the system is produced with two models of backpacks: 'Malva' (standard) and 'Comfort'.

The design of the Malva-24 parachute system with Comfort knapsack ensures reliable operation when the parachute system is put into action at an altitude of 2000m above sea level at a flight speed of 140 to 225 km/h, both with immediate deployment and with delay in opening the knapsack valves.

In addition, 'Polyot' parachute plant is a reliable supplier of Z-5 reserve parachute systems compatible with almost all types of landing and training parachutes. 'Z-5' is quickly and conveniently mounted to main parachute harnesses.

KAMA-1 Compact City Electric Vehicle

Presentation of the KAMA-1 electric vehicle, developed by PJSC 'KAMAZ' together with the Peter the Great St. Petersburg Polytechnic University (SPbPU), took place in Moscow within the framework of the VII annual national exhibition 'VUZPROMEXPO-2020'.

The advanced driver assistance systems (ADAS) Level 3 electric vehicle, provisionally named KAMA-1, is a three-door, four-seater compact smart crossover designed in line with current trends in the mobility and transportation market.

The crossover's length is 3.4m, width – 1.7m, height – 1.6m, ground clearance – 160 mm. The electric vehicle is equipped with a 33kWh lithium-ion battery and an 80kW electric motor, which allows it to reach speeds of up to 150 km/h and travel 250 km without recharging. Full battery charge in normal mode takes 6 hours, in accelerated mode – 20 minutes. Acceleration to 100 km/h takes 6.7 seconds.

The stylish exterior of the smart crossover comes with full LED front and rear optics, dynamic direction indicators in line with modern trends in headlight design, as well as broad panoramic windshield glass. Fenders, sills and bumper skirts are made as separate elements and are easily replaceable, which ensures the convenience of using the vehicle by car sharing companies. High ground clearance meets consumer requirements and allows it to overcome difficult road sections.

The electric car is currently in the status of an industrial pre-production model, which has been tested and holds all the necessary certifications.

New Regional Passenger Aircraft IL-114-300

On December 16th, 2020, a new regional passenger turboprop aircraft Il-114-300 made its maiden flight at the Zhukovsky airfield. Aircraft developer is Aviation Complex named after S.V. Ilyushin (the main enterprise of the Transport Aviation Division of UAC (United Aircraft Corporation) within the Rostec State Corporation).

The flight was performed by an experienced crew consisting of PJSC 'IL' Chief Pilot, 1st Class Test Pilot, Hero of Russia Nikolai Kuimov, 1st Class Test Pilot Dmitry Komarov, and 1st Class Flight Test Engineer Oleg Gryazev.

During the flight, the flight crew checked power plant operation modes, aircraft stability and controllability, as well as the operation of its systems.

'The first flight of the IL-114-300 is the result of the excellent work of tens of thousands of people – researchers, engineers, specialists – working in the design bureau and at the plants of the United Aircraft Corporation, at the enterprises of our suppliers and partners. The development of the new regional turboprop aircraft opens up new prospects for the Russian civil aircraft industry,' said Yury Slyusar, General Director of United Aircraft Corporation.

Klimov presents design of VK-1600V engine

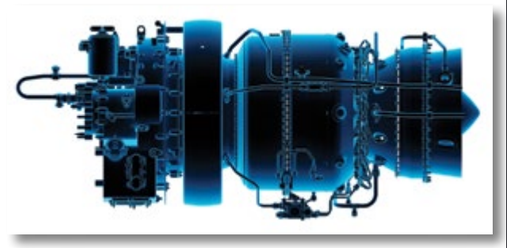
The JSC Klimov Company of the United Engine Corporation has presented the design of the new VK-1600V engine for Ka-62 helicopters. The engine design was presented to a committee which confirmed that the submitted VK-1600V meets the requirements for engine airworthiness and environmental protection.

Consideration of the new engine by the committee is an important stage of development ahead of planning the certification tests. The prototype commission also green-lighted the automatic regulation and control unit for the VK-1600V – the BARK-15V, developed at JSC Klimov.

The task of the commission was to review the design of the products to determine the scope and methods of carrying out certification work and testing in accordance with the current regulatory documents. The engine model was presented in the form of an electronic 3D model.

'We have passed an important stage in the process of creating a new engine. It is noteworthy that in difficult conditions of restrictions we fulfill all obligations and comply with all deadlines. The project has been approved by the aviation authorities and further serious work lies ahead,' said Dmitry Yurchenko, Program Director – Chief Designer of JSC Klimov.

The VK-1600V engine in the 1300-1800 hp power class was designed for the Russian-made Ka-62 helicopter. At the beginning of 2021, it is planned to transfer a demonstration engine for benchmarking tests. Certification of the VK-1600V is scheduled for 2023.



MC-21-310 WITH PD-14 ENGINES

On the 15th of December 2020 the MC-21-310 aircraft equipped with the new Russian PD-14 engines made its maiden flight from the airfield of Irkutsk Aviation Plant, a branch of Irkut Corporation (part of UAC, Rostec State Corporation).

The aircraft was operated by the crew of test pilots Vasily Sevastyanov and Andrey Voropaev and test engineer Alexander Solovyev. The flight task included checks of power plant operation modes, aircraft stability and controllability, as well as the operation of its systems. The flight time was 1 hour and 25 minutes, altitude up to 3500 m and speed up to 450 km/hour.

The pilot Vasily Sevastyanov said after landing: 'The flight task was fully completed. The new engines worked steadily in all modes'.

The General Director of PJSC UAC, Yury Slyusar, noted: 'MC-21-310 heads to the development tests and joining the certification program. The ability for customers to choose the type of aircraft engine expands the aircraft's market potential and reduces the risks of the program.'

The MC-21-300/310 is a new generation medium-range passenger airliner, which is being developed by Irkut Corporation (part of United Aircraft Corporation). The MC-21-300 program is at the stage of certification testing and launching commercial production of MC-21-300 aircraft.

MC-21-300/310 aircraft high performance characteristics are achieved due to advanced aerodynamics, latest generation engines and systems. Improved aerodynamic performance is ensured by the extended wings made of polymer composites. The widest fuselage in its class (4.06 m) allows increasing comfort for passengers and crew. MC-21-300/310 aircraft capacity is from 163 to 211 passengers. The flight range is up to 6,000 km.

The first MC-21-300-300 aircraft are being built at the Irkutsk Aviation Plant for delivery to customers. The PD-14 engine has been created by a broad cooperation of the UEC enterprises and the industry science using the state-of-the-art technologies and materials. It is the first fully Russian turbofan engine for civil aviation since the early 1990s. In 2018, Rosaviation issued a type certificate for the PD-14 engine. The PD-14 meets modern certification requirements for AP-33, FAR-33, CS-E, and ETOPS. The engine thrust at takeoff mode is 14 t, dry mass is 2,870 kg, fan diameter is 1,900 mm. Due to innovative technologies and materials, specific fuel consumption is 10-15% lower than of the previous generation engines.

PRELIMINARY TESTS

The 'Lotos' self-propelled artillery gun developed by the Central Scientific Research Institute of Precision Engineering (TsNIItochmash) is undergoing preliminary tests. The combat vehicle for airborne forces will travel over 600km, fire 300 rounds and overcome various types of obstacles.
The pre-test program includes over 80 items making it possible to determine and evaluate the tactical, technical and operational characteristics of a prototype 120-mm gun and to develop recommendations for conducting state tests. 'Lotos will demonstrate its work in motion, afloat and while landing. Of the 600km test route, 50% will be on dirt roads, 30% on cobblestone and gravel roads, and 10% will be off-road. The tests will make it possible, among other things, to evaluate the capabilities of the self-propelled gun to overcome various obstacles', said Bekkhan Ozdoev, industrial director of Rostec. During the firing tests, checks will be made of the maximum and minimum range and accuracy of fire on the ground, accuracy of direct fire, and rate of fire with various types of ammunition. 'Lotos' has a mass of no more than 18 tons, maximum speed – 70 km/h, engine power – 450 hp, cruising range – not less than 500 km. The combat crew consists of four people. Rate of fire is 6-8 rounds per minute. The firing range is up to 13 km.

SPRUT-SDM1 IN SUBTROPICS AREA

The Sprut-SDM1 light amphibious tank for airborne troops, created by the Volgograd Tractor Plant (VgTZ) and Kurganmashzavod, which are part of the High-Precision Weapons holding of Rostec State Corporation, have successfully passed state tests. During the check, the military equipment demonstrated high navigability in the Black Sea and proved its reliability afloat. Tests have confirmed that the machine is capable of overcoming water obstacles without preparation when the sea rough, to fire afloat and easily mount an unprepared shore. 'Given its purpose, this machine must meet very serious requirements. During state tests, the light tank underwent extreme checks at sea, in central Russia and the subtropics, where the air temperature reached +40 degrees Celsius. All tests were passed successfully. Low temperature tests are scheduled for early 2021. Sprut-SDM1 is primarily intended for Russian paratroopers. It can be expected that the capabilities shown by Sprut will interest foreign customers as well', said Bekkhan Ozdoev, industrial director of the armaments complex of Rostec State Corporation. Each stage of inspections in different conditions also provides for shooting tests which allow to start serial production of the machines.

New Generation Radar

Ruselectronics Holding of Rostec State Corporation has launched production of Miass mobile radars for airfields of light and regional aviation. Prototype tests are scheduled to begin in the second quarter of 2021.

The project is being implemented by the Chelyabinsk Radio Plant 'Polyot' of the Vega Concern of the Ruselectronics Holding jointly with the Industrial Development Fund, which has allocated a loan of 320 million rubles under the Conversion program.

A key feature of the new radar system is the mode of targeted information exchange with a specific aircraft, which facilitates air traffic control and reduces the likelihood of data transmission errors.

Miass radars transmit information about aircraft coordinates to dispatchers around the clock and without the presence of attendants via the primary channel within a radius of at least 100 kilometers and via the secondary channel within a radius of at least 300 kilometers.

Another important advantage is the radar's small size and reduced weight, which simplifies the process of its design, transportation, survey, construction and installation on site.

'The Industrial Development Fund's investments made it possible to quickly launch serial production of these radars and bring to the market a new product that will significantly increase the safety of air traffic and contribute to the expansion of regional traffic. Also, within the framework of the project, it is planned to modernize the production infrastructure of the enterprise, including measuring and testing equipment', said Alexander Nesterov, General Director of Chelyabinsk Radio Plant 'Polyot'.

SSJ100 Airplanes to Domestic Airlines

The Irkut Corporation of United Aircraft Corporation and PSB Leasing group of companies have signed three contracts for supply of eight SSJ100 airplanes for use by Aeroflot, Azimuth and Red Wings Russian airlines.

Under the terms of the contracts, Irkut Corporation will supply the eight aircraft. Five planes will be supplied to Aeroflot, two to Azimuth, and one to Red Wings. The airliners will be produced in two cabin layouts. Aeroflot's aircraft are manufactured in a two-class cabin layout: with 12 business-class and 75 economy-class seats, while Azimuth and Red Wings have a single-class cabin.

The contracts are financed under a Promsvyazbank credit line opened for PSB Leasing group of companies with the aim of acquiring and leasing aircraft in 2020 and 2021. The source of repayment of the loan obligations will be lease payments received from the airlines during the period of aircraft operation.

The SSJ100 is a regional airliner with a cabin capacity of up to 103 passenger seats. The aircraft has demonstrated economic efficiency during the pandemic due to its optimal combination of flight range and cabin capacity. The airplane is currently operated by fourteen carriers. In March 2020, the first contract was signed with the United Nations for the use of SSJ100 aircraft to provide services to UN peacekeeping missions.

ROSOBORONEXPORT: Russian solutions for aviation, air defence, ECM

Rosoboronexport, a Rostec State Corporation company, is hosting a broad exposition of Russian industrial enterprises at Aero India 2021, to be hosted by Yelahanka Air Force Station outside Bangalore, India on 3-5 February.

'For decades Russia and India have maintained and bolstered mutually beneficial strategic ties,' says General Director of Rosoboronexport Alexander Mikheev. 'Bilateral military-technical cooperation is growing stronger from year to year. We appreciate India as a solid and reliable international partner. Rosoboronexport is open to any formats of cooperation with India. We are currently pursuing over 100 joint research and development projects, including those related to aviation, thus laying a foundation for future evolvement of both countries' hi-tech industrial sectors. We avail of the unique level of bilateral cooperation in working on joint projects in the interest of the Indian armed forces.'

Dear friends,

On behalf of Rosoboronexport, the Russian state exporter of military, civilian and dual-use products, technologies and services, allow me to welcome you and wish you a very happy Republic Day!

For decades Russia and India have maintained and bolstered mutually beneficial strategic ties. Bilateral military-technical cooperation is growing stronger from year to year. We appreciate India as a solid and reliable international partner.

Rosoboronexport in 2020 was among the first to react to the spread of Covid-19 in India by donating to the Prime Minister's Citizen Assistance and Relief in Emergency Situations Fund founded by Indian Prime Minister Narendra Modi. It is my sincere hope that our contribution enabled the Indian people to avoid losses from this new invisible adversary.

Rosoboronexport and its parent company, Rostec State Corporation, are open to any formats of cooperation with India. We are currently pursuing over 100 joint research and development projects, thus laying a foundation for future evolvment of both countries' hi-tech industrial sectors.

We avail of the unique level of bilateral cooperation in working on joint projects in the interest of the Indian armed forces. Rosoboronexport maintains its long-standing partnership with HAL Corporation involving licence production of Sukhoi Su-30MKI fighter jets, the mainstay of the Indian Air Force. Indian production of Kamov Ka-226 helicopters is expected to be launched shortly. The HVF factory manufactures T-90 tanks for the Indian Army, while the Indian Defence Minstry's artillery plants are involved in the manufacture of associated Mango anti-tank shells. Rosoboronexport, Kalashnikov Concern and India's Ordnance Factory Board are planning to launch licence production of Kalashnikov assault rifles with subsequent 100% localisation. Goa Shipyard Ltd is gearing up for production of Project 11356 frigates for the Indian Navy.

I am convinced that our countries are jointly contributing to the welfare of the Russian and Indian peoples. Our cooperation rests on unprecedented bilateral trust at all levels, long-standing ties and mutual respect.

My dear Indian friends, let I avail of this opportunity to extend my greetings to you on this important national holiday!

Alexander Mikheev
Director General of Rosoboronexport

The joint Russian exposition in Hall A includes Rosoboronexport, Schvabe and Almaz-Antey Corporation. Delegations representing leading Russian aircraft and aero-engine subsidiaries of United Aircraft Corporation, Russian Helicopters and United Engine Corporation.

Rosoboronexport's Stand A 8.5 showcases over 200 military exhibits, including the mock-ups of the Su-57E fifth-generation multirole fighter, the Su-35 multirole superagile fighter, the MiG-35D twin-seat multirole front-line fighter, the Il-76MD-90A(E) military transport, the Il-78MK-90A aerial tanker, the Ka-226T light multirole helicopter and the Pantsir-S1 SAM/anti-aircraft artillery system. Rosoboronexport is also displaying the Typhoon K-63968 and Typhoon K-53949 armoured MRAP vehicles and the Linza armoured medical vehicle (see p. 9).

Rosoboronexport is expecting particular interest in the novel P-18-2 Prizma radar, which is making its international debut at Aero India 2021. The system is capable of detecting existing and future low-observable targets, including those incorporating stealth technology.

Other products demonstrated by Rosoboronexport at Aero India 2021 which will certainly to be of interest to Asia-Pacific customers are the upgraded Mi-28NE strike helicopter, the Mi-171Sh and Mi-17V-5 military rotary-wing transports, the Ka-52 combat/reconaissance rotorcraft, the Ka-31 AEW&C helicopter, the Orion-E and Orlan-10E UAS and also a range of air-launched munitions.

Asia is historically interested in Russian-made air-defence and electronic countermeasures solutions. Rosoboronexport is proud to present its Viking, Buk-M2E and Tor-M2E SAM systems in various modifications, the Igla-S MANPADS and various anti-UAV solutions, including the Repellent system intended against small-sized UAVs.

Rosoboronexport will use Aero India 2021 as the platform for presenting its all-new anti-UAV solution, which comprises UAV detection, ECM and missile retaliation components.

'Rosoboronexport in 2020 was among the first to react to the spread of Covid-19 in India by donating to the Prime Minister's Citizen Assistance and Relief in Emergency Situations Fund founded by Indian Prime Minister Narendra Modi,' Mikheev notes. 'It is my sincere hope that our contribution enabled the Indian people to avoid losses from this new invisible adversary and to celebrate Aero India 2021 as the first milestone in the new global year of defence exhibitions in the face of the shared challenges.' /IA&TG/

IL-78MK-90A. TANKER AIRCRAFT

Versatile platform – inflight and on the ground refuelling or transportation of cargoes

Simultaneous inflight refueling of one heavy or up to 2 tactical aircraft and up to 4 aircraft on the ground. Apart from its main mission it can be converted into a transport aircraft or for execution of other missions.

IL-78MK-90A tanker is intended for in-flight refueling of different types of aircraft by means of three aerial refueling pods and can perform fuel distribution on-ground. The aircraft may perform the take-off and landing from/on the paved and unpaved airfields.

In operation conditions during few hours the IL-78MK-90A can be converted and be employed as a transport aircraft for transportation and airdropping of vehicles, cargoes and paratroopers.

Main characteristics

Max takeoff weight, t	210
Transferable fuel inflight at a distance of 1000 km, t	78
Inflight refueling speed, km/h	450-600
Refueling pod transfer capacity inflight, l/min:	up to 2.500
Maximum payload in transport version, t	60
Flight range (with 60 t payload), km	4.000
Number of transported troops / in a double deck version (in a transport variant):	145/225

Learn more about IL-78MK-90A aircraft
e-mail: roe@roe.ru
www.roe.ru

MEDIA REVIEW

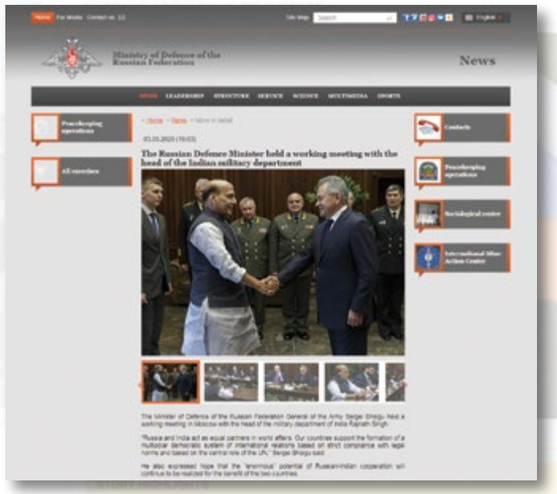
RUSSIA-INDIA DEFENSE AEROSPACE COOPERATION THROUGH THE EYES OF THE INDIAN MEDIA

Major Indian defense exhibition Aero India 2021 will become the first top global defense expo (outside Russia which held ARMY 2020) opening its gates to the visitors after the 2020 overall lockdown of the expo world due to the COVID 19 pandemic. It will focus the media attention on the latest achievements and developments in the Indian domestic military industry, but also – on the important issues of the military cooperation between Delhi and its partners. Russia is the major defense partner of India with large-scale military projects (unequalled by other countries) unleashed by Moscow and Delhi in the past years. The prospects and developments in Russia-India military cooperation are being constantly assessed and analyzed by both mainstream and specialized military media and expert community of India. Here is an overview of the coverage.

General outline

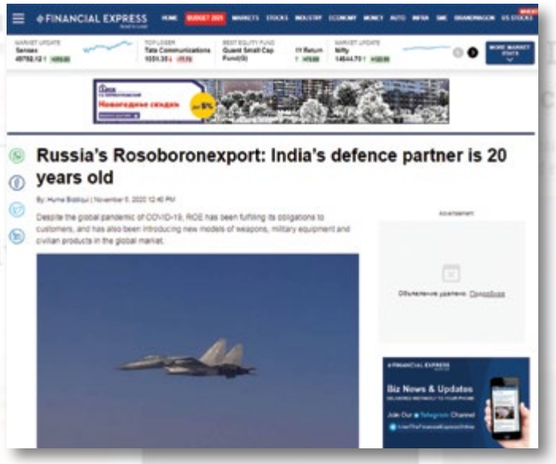
Since the early 1960s when the Indian Air Force introduced the Soviet MiG-21 fighter jet (which also was produced in batches by HAL), Russia has been the major arms supplier for India. In the past decades Delhi started a turn towards the diversification of the weapons procurement sources. Nevertheless Russia remains the principal defense partner of India and aside from delivering products is strongly engaged in Make in India projects.

Russia has repeatedly reiterated its readiness to offer to India not only the state-of-the-art military equipment, but also the technologies of production, i.e. the expertise, which can be shared in the framework of a wide industrial partnership in line with the Make in India policy. As Rosoboronexport officially underlined at Aero India 2019, Russia was the first country to support the Make in India policy – more than two hundred Su-30MKI aircraft were assembled in India in cooperation with the HAL under a contract with Rosoboronexport.



Financial Express's Huma Siddiqui in November article stressed, that despite the global pandemic of COVID-19, Rosoboronexport was fulfilling its obligations to customers and was introducing new models of weapons, military equipment and civilian products to the global market.

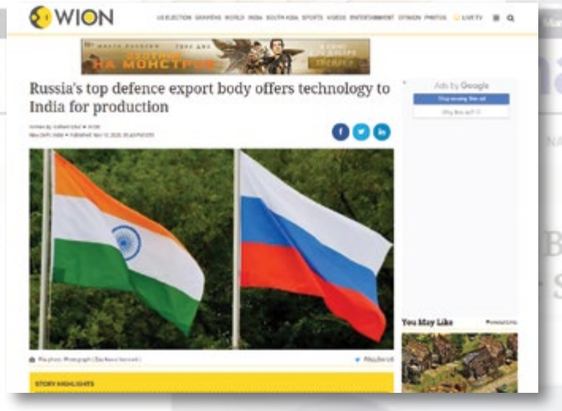
'The new advanced weapons including the 59N6-TE radar which has the capability of detecting hypersonic targets, the Boomerang wheeled combat platform, new equipment which can help in combating epidemiological threats have also been launched in the market. As part of its expansion plans, the company has now started Security equipment segment which is good for Homeland security as well as for other law enforcement authorities… Among the new platforms, the T-90MS main battle tank with incomparable firepower, the Sprut-SDM1 light amphibious tank with unique combat capabilities, the Mi-38T medium-class multipurpose helicopter, Project 12701 Alexandrit-E mine countermeasures ship, the Tornado-S long-range multiple launch rocket system, Project



21980E Grachonok special purpose boat, coastal missile systems, work has been started', – wrote the **Financial Express**.

'All the bilateral projects are implemented on the basis of a long-term program of military-technical cooperation and are in line with the Make in India program. The Russian company has been working closely with companies – HAL, OFB, Bharat Forge, Bharat Dynamics, and others.

In order to coordinate the military-technical cooperation, the Indian-Russian Intergovernmental Commission on Military-Technical Cooperation (IRIGC-MTC) was established in 2000, headed by the Defense Ministers of Russia and India', – stressed the author.



Covering the Russia-India joint military projects, **WION's Siddhant Sibal** exemplified.

'The company has worked together with Indian authorities for licensed production of multirole Su-30MKI fighter jets in India, the modernization and transfer of the Vikramaditya aircraft carrier to the Indian Navy. India and Russia share a close defense partnership, something that has been the pillar of the much-celebrated relationship', – reported **WION** in its November story.

In September 2020 Russia and India held talks in Moscow at the defense minister level. The Minister of Defence of the Russian Federation General of the Army Sergei Shoigu discussed the bilateral issues in Moscow with the head of the Indian Ministry of Defense Rajnath Singh.

'Russia and India act as equal partners in world affairs. Our countries support the formation of a multipolar democratic system of international relations based on strict compliance with legal norms and based on the central role of the UN,' Sergei Shoigu said.

He also expressed hope that the 'enormous' potential of Russian-Indian cooperation will continue to be realized for the benefit of the two countries. The Russian Defense Minister thanked his Indian counterpart for his personal participation in the events dedicated to the 75th anniversary of Victory in the Great Patriotic war, which took place on June 24 2020.

In turn, Rajnath Singh said that he admired the Victory parade on June 24 at the Red Square in Moscow. He called Russia a 'long-standing privileged partner', whose relations are based on a common interest in global peace, prosperity and mutual understanding.

'India is committed to closer and stronger cooperation in defence, security and technology, as well as economic activities commensurate with our huge potential,' Rajnath Singh added.

During the meeting, the heads of military departments of Russia and India also discussed issues of military and military-technical cooperation and expressed their intention to 'further strengthen multifaceted ties in the spirit of a particularly privileged strategic partnership'.

Russia in Lucknow

DefExpo 2020, an International Land, Naval and Internal Homeland Security Systems Exhibition, that was held from in February 2020 in Lucknow, India, saw heavy Russian participation. Russia showcased around 1,000 pieces of military hardware, including

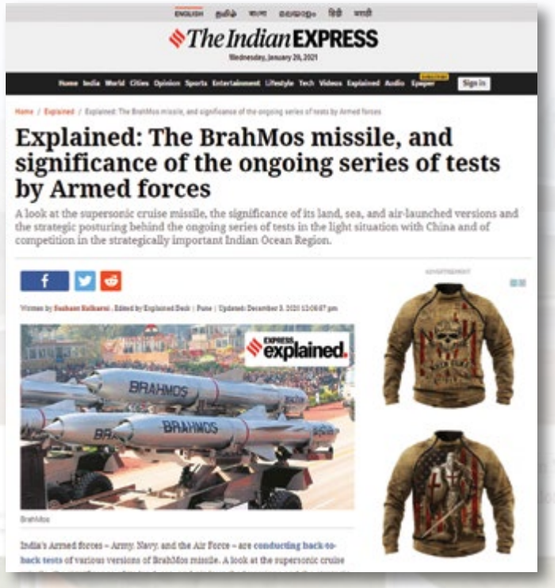
Club-T mobile missile system, 300-mm 9K515 multiple rocket launcher, Kalashnikov AK-200 series assault rifles, T-90MS MBT, Alexandrit-E mine countermeasures ship, upgraded Mi-28NE and Mi-171SH helicopters etc.

Defenseworld.net in its overview of the Russian exposition focused on the Viking, the latest multi-missile mobile medium-range air defence missile system (ADMS). In Lucknow it was presented for the first time in India.

'Viking is the next generation the Buk ADMS line. In comparison with Buk-M2E, its range of fire has increased nearly by 1.5 times – up to 65 kilometers. Besides, the number of simultaneously engaged targets has also increased by 1.5 times, and the number of ready-for-launch air defence guided missiles in one firing position made of two combat units has grown up from 8 to 18', – reported **Defenseworld.net**.

BrahMos – supersonic cooperation

BrahMos supersonic missile system developed and produced by the Russian-Indian BrahMos Aerospace joint venture has become an important part of the striking potential of the Indian Armed Forces. Naval, land and aerial applications have been created. The program is being successfully implemented, and the JV speaks of the plans to create a hypersonic version of the missile in the future. Media reported on the possible export of BrahMos missiles to the third countries.



'BrahMos is a two-stage missile with solid propellant booster as first stage and liquid ramjet as the second stage. The cruise missiles like BrahMos are a type of systems known as the 'standoff range weapons' which are fired from a range sufficient to allow the attacker to evade defensive fire from the adversary. These weapons are in the arsenal of most major militaries in the world. The versions of the BrahMos that are being tested have an extended range of around 400 kilometers, as compared to its initial range of 290 kilometers, with more versions of higher ranges currently under development', – explains the capabilities of BrahMos **Sushant Kulkarni** in December analysis published by the **Indian Express**.

On November 22, 2017, Brahmos was successfully flight-tested for the first time from the IAF frontline fighter aircraft Sukhoi-30MKI against a sea-based target in the Bay of Bengal and has since been successfully tested multiple times.

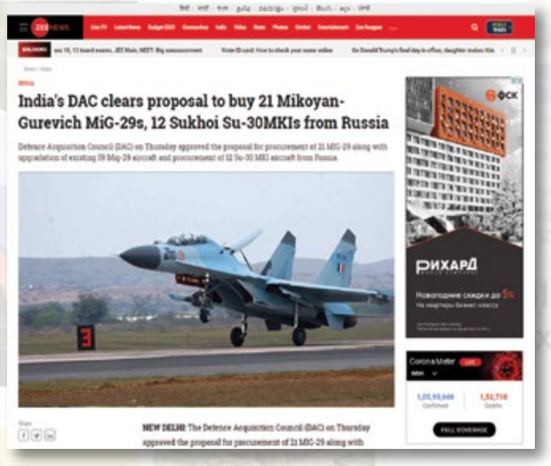
'BrahMos equipped Sukhoi-30s – which have a range of 1,500 kilometers at a stretch without mid-air refuelling – are considered as key strategic deterrence for the adversaries both along the land borders and in the strategically important Indian Ocean Region. IAF is said to be integrating BrahMos with 40 Sukhoi-30 fighter jets across the various bases', – goes on with his analysis the **Indian Express's** author.

Onmanorama, a Kerala-based online media, interviewed Dr Sudhir Kumar Mishra, the CEO & MD of BrahMos Aerospace.

'I am inspired to see how BrahMos missile has found a place in the hearts of many Indians. Success breeds success and BrahMos will spring many more surprises in future... As most of you already know, a Sukhoi embedded with BrahMos is the most lethal combination one can think of in today's scenario', – said Dr. Mishra.

Su-30MKI program

The assembly of Su-30MKI multirole fighter jets by HAL in India is one of the major joint projects with Russia. Currently the fleet of Su-30MKI represents a significant part of the Indian Air Force. In the summer 2020 the Indian Defence Acquisition Council (DAC), according to the official report of the Ministry of Defense, approved the proposal for procurement of 21 MIG-29 and of 12 Su-30 MKI aircraft from Russia.



'The first contract to deliver Su-30MKI jets to the IAF was signed on November 30, 1996, in Irkutsk, Russia, between Rosvooruzhenie state intermediary company and the Indian Defence Ministry. It envisaged the delivery of 32 Su-30s, all of which were produced in 2002-2004. Satisfied with the performance of the aircraft, the Indian Defence Ministry placed additional orders. In December 2000, both countries signed a contract for organising the licensed production of Su-30MKIs in India at the Hindustan Aeronautics Limited facilities. Then in

2012, another contract for technological kits of Su-30MKIs was signed as the Sukhois have proved to be a reliable and effective multirole heavy aerial combat platform for the IAF. The Su-30MKI project has become one of the largest in the history of military cooperation of India with a foreign country and also has contributed to the sales of Su-30MK family aircraft to other countries', – analyzed the **Zee News** the Su-30MKI program.

In 2019 Indian Air Force Vice Chief Air Marshal RKS Bhadauria called French-made Rafale fighter and Russian-made Sukhoi Su-30MKI a 'deadly combination'.

'The result of the Su-30MKI program was the induction into the Indian Air Force of a new aircraft, which has become the world's first super-maneuverable combat aircraft in serial production', – said **WION** in its November 2020 story.

'The Sukhoi Su-30MKI is the most advanced fighter jet in operation with the Indian Air Force and is the primary air to air and air to ground strike machine… India's Su-30MKI multi-role fighter-bomber is one of the best 4 generation aircraft currently available', – reported **Zee News** in July.

The TV channel especially emphasized the feature of super-maneuverability, meaning that the airplane 'can aim at any direction within seconds to fire an air-to-air missile without changing its bearing'. Super-maneuverability can be used in many situations during a mission, noted the **Zee News**.

New MiGs out of old ones

The Indian media has also covered in details the program of upgrading of IAF's MiG-29 fighter jets to the MiG-29UPG modification.

'The far more capable MiG-29UPG is a 'multi-role fighter' that is also equipped and armed to strike ground targets.In addition, with the addition of large capacity fuel tanks and mid-air refuelling capability, the IAF regards its MiG-29UPGs as long-range, multi-role fighters', reported in Ajai Shukla from the **Business Standard**.

'These are without question the most capable MiG-29s flying anywhere in the world,' quoted the newspaper the IAF air marshal.

Aeromag last year covered the issue of the overall development of MiG-29/35 fighter jet family.

'The new innovations include the patent received by MiG Corporation for the landing approach aircraft automatic control system and another patent for an intelligent system for highly maneuverable combat aircraft protection against going beyond critical g-loads', – wrote the **Aeromag**.

Ka-226T light utility helicopters

In 2015 Russia and India have established a joint venture to manufacture Ka-226T light utility helicopters. The project envisages to replace the obsolete helicopters used by the Indian Armed Forces with 200 Kamov coaxial scheme 'workhorses'.

'Coaxial rotors give a helicopter improvements in lift and payload capacity over conventional choppers. This is especially advantageous in high-altitude environments such as the Himalayas where

an aircraft's performance at take-off tends to diminish due to the lower air density. The Indian Navy has been using the Ka-25 and Ka-27 and also the Ka-31 airborne early-warning helicopter for several years. The Ka-226T also has a unique, detachable 'mission' compartment instead of a conventional cabin. This allows the helicopter to be adapted for different roles such as surveillance and cargo delivery', – reported the **Week** magazine on the advantages of the Ka-226T.

The **Week** reiterates, that the Ka-226T deal is considered vital for the Indian Army and Air Force as the aircraft is slated to replace the ageing Chetak and Cheetah light helicopters, which are based on 1960s-era French designs. **/IA&TG/**

VTTS 9F6021E ADJUTANT

VERSATILE TRAINING TARGET SYSTEM OF THE NEW GENERATION

Over the last two years, various publications and articles about trials and live fire exercises of army air defense facilities frequently mentioned the application of Russian versatile training target system VTTS 9F6021E Adjutant for establishment of training target layout. We will discuss the features of this item, that makes it a training target system of the new generation and work that is done for its further improvement with Igor Ivanov the Director of the Training Target Systems project of IEMP Kupol (a member of Almaz-Antey ASD Corporation).

- Before the type classification of VTTS Adjutant, this system had participated in many trials and military exercises. Thereby, it completely proven that there is a demand for such system in our days. Which factors caused this demand?

- Yes, indeed, almost all Russian air defense facilities practiced with training targets of our system. And not only Russian equipment – our system participated in several demonstrations and trials abroad.

Since we have decades of experience in manufacturing of combat and technical facilities of Tor SAM systems, we are no strangers to the tasks to be solved during the training of combat crews. Largely thanks to that experience the VTTS 9F6021E Adjutant was designed and developed, its birth was driven by several factors.

Firstly, modern military conflicts shown the notable growth of UAV role in warfare tactics. Meanwhile, not so long ago they were not taken seriously, and the training of combat crews involved training target systems that simulated completely different air assault weapons, first of all – strike aircrafts and high speed cruise missiles. Engagement of UAVs were left unattended for a long time and there were practically no training targets to simulate the attack of small-sized low-speed AAWs.

Secondly, training target fleet became obsolete, and not just morally, but also physically. For example, during the last decades the training missile-type targets Saman were one of the main training target facilities used by the army air defense. Those systems were established by reequipment of combat vehicles of SAM system Osa, and they had several advantages, the first among them – high speed of target. But this system is more than forty years old, and SAMs 9M33 have not been produced for about 20 years. In other words, they have reached the limit after which their application will be ineffective and unsafe, and soon after that it will be simply impossible. Restoration of production of training targets based on SAM 9M33 of SAM system Osa had no economic sense. Even if we will assume, that production process would be successfully restored (which is highly questionable), the idea of manufacturing of one-shot missile that will cost several millions of rubles is a dead end. And with respect to all difficulties related with maintaining the serviceability of equipment and chassis of combat vehicle that launches the training targets, the average cost of the each launch significantly increases.

And, finally, the third factor: during implementation of the State Armament Programme 2011-2020, the Army received great numbers of modern weapons, including air defense facilities. Development of modern training target systems started with a great time lag. And as a fact, currently, during training and combat firings it is very difficult to simulate the real characteristics and maneuvers of modern and future air assault weapons.

The combination of those and some other factors caused the demand for development of the Adjutant system by IEMP Kupol, JSC, and as a result, significant interest of the Armed Forces of Russian Federation.

- What are the main features of the Adjutant? What makes it a training target system of the new generation?

- It should be mentioned, that VTTS 9F6021E Adjutant implements the philosophy that is completely different from previous training target systems. In the combination of words 'training target' the main word is training. Targets of Adjutant may (and should) be used multiple times, their main purpose – primary training and constant maintaining of combat efficiency of SAM system's crews that perform acquisition, tracking and simulate launches against various types of targets. Only in the end of their service life the targets are used for live fire exercises. Due to significant decreasing of the average cost of the training target, we were able to exponentially increase the training activity period and, consequently, to get the crew training to a new level.

Targets of Adjutant may (and should) be used multiple times, their main purpose – primary training and constant maintaining of combat efficiency of SAM system's crews that perform acquisition, tracking and simulate launches against various types of targets.

Training targets of the system simulate modern air assault weapons and their tactics. In our days many types of AAW are capable to perform evasive maneuvers, like pitch-up, diving, zigzag, flight at extremely low altitude – all of these maneuvers are available for training targets of VTTS Adjutant, the flight path of each target could be very complex. Basic modern tactic of air assault is a massive attack and Adjutant is capable to simulate it: one mobile ground control can create a complex air situation with simultaneous operation of six training targets of different types.

Air assault weapons are continuously evolving – so the air defense equipment should evolve

too, together with training facilities. In general we may say that VTTS 9F6021E Adjutant – is a holistic solution for establishment of complex air situation, that allows to simulate a wide spectrum of modern and future AAWs and continuously changing tactics of their application.

- How much the Adjutant demands from the operator?

- This system is fairly simple in operation. And that idea was one of the most important during its development. There are no explosive elements used in the system, like gunpowder, compressed air, etc. Launch is performed by means of elastic slingshot with electric tensioner. Deployment of VTTS on the ground takes less than two hours, trained crew will do it in less than one hour. Crew consists of eight persons and only the commander is an officer, others are contract and regular soldiers. Primary training of technical specialists from system's crew takes two months of theory and two weeks of flight practice. This is a typical army system – mobile, autonomous, safe and available for operation and training to any soldier.

- Are there any other fields of application of VTTS Adjutant beyond training of air defense combat crews?

- Certainly. For example: a particular manufacturing plant or research institute often requires a training target system or just a UAV to test their newly developed equipment with live air target. In that case, for a couple of tests they will have to buy a training target system or UAV, then this equipment will stuck on the balance sheets and will take its place in the company's storage. But we provide a set of services with facilities of VTTS Adjutant that has a wide spectrum of targets and ways of their application. Which means that customer will pay the cost of the training target only if it will be destroyed during operation. If not – only the cost of provided services will be paid. This approach was highly appreciated by our customers.

- IEMP Kupol traditionally starts to improve its products even before they brought into service. Perhaps VTTS Adjutant didn't break with that tradition. Which aspects of this product are subjected for improvement?

- Of course, the improvement process for VTTS 9F6021E Adjutant flows continuously. This process is driven not just by the traditions of the company, but also by the market of arms and combat equipment that dictates a rapid rate of constant development new products and modernization of the ones that already exist. And beyond that, by demonstrating a new interesting product for the market, we shown a future way of development of the training target systems. Other companies already follow that path and they will simply try to copy our solutions. To consolidate our positions on that segment of the market we have to improve our products constantly, put forward the new ideas and expand the fields and methods of application.

- What are the current tendencies of system development?

- First of all, we plan to expand the variety of training target types. Currently, our system operates with five types of training targets, but in the nearest future another two types will join them. There will be a small-sized jet airplane-type air target, that will have several curious features, that will be unavailable for the other types of targets. And second one – high-speed target with flight velocity about 250-300 m/sec. This is a very extensive work, the main goal is to integrate that high speed training target into the system, including slingshot launch and reusability. Research and development works for new training targets are making much headway. In 2021 we plan to conduct a full cycle of flight tests and rework our products in accordance with their results, in 2022 our training targets will be judged by military specialists.

Another direction of development – integration of VTTS Adjutant into modern and future automated control systems. Today, we have an active tendency for digitalization, transition to modern methods of data display and transmission, and also improvement of jamming resistance of equipment. VTTS Adjutant should not be an isolated facility for training of air defense crews, it should be integrated into united information ecosystem

with modern command and control systems, like, for example, Polyana-D4M1. In addition, our system has to obtain the capability to work in pair, which means that two systems will operate as one and the number of simultaneously controlled targets will increase from six to twelve. All of that will allow to increase the speed of operation and to expand the range of simulated group flight scenarios. This is the future for any king of training target system. And we have certain achievements in that field, that allow us to be sure, that the tasks to integrate VTTS Adjutant into united information ecosystem with various surveillance and control facilities and to establish real-time air target data exchange will be successfully solved.

We also test different types of training target payloads that are included into VTTS. For example, in this year, during the army exercises of the armored infantry units, the helicopter-type training target was towing a dummy that simulated a quadcopter. The fire was aimed towards the dummy instead of helicopter target. This method massively decreased the cost of live fire exercises, because towed dummy is much cheaper than the training target.

And finally, the most important goal is a transformation of VTTS into cross-branch training target system, that will be capable of the widest spectrum of tasks, including the ones that serve the interests of Navy and Aerospace Defense Forces.

- Is it difficult to develop a VTTS, for example, for Navy? What engineering changes may be required?

- This task is quite difficult. The first issue is the operation in corrosive environment. Ingress of salt solution (which is actually a sea water) may lead to rapid corrosion and malfunction of certain assemblies. This problem tends to be crucial if we are considering a training target that simulates ASCM and should fly at minimum altitude, only several meters above the water surface. It brings up specific requirements for selection of construction materials for naval VTTS, and for the structure of the training target itself, that should provide protection of operating assemblies against moisture and water drops. Second issue – reusability. It would not be a problem if the ships are located several miles away from the shore and will operate with training targets that are launched and landed at the coast. But training in the high seas will require the training target to land on the ship's deck or on the water. In general, I don't think that we will be able to solve all the tasks at once to make a naval VTTS. That is why we are aiming to move Adjutant towards the sea step by step. We are already working in that direction, this summer we presented our system to the Pacific Fleet command, Adjutant found the receptive audience. We are planning very interesting meetings and consultations for this December, and we hope that they will become one of the first steps towards a naval version of versatile training target system.

- How many training targets per year are required to provide training for air defense crews of the Russian Army? What is the capacity of this market? At which level the VTTS Adjutant is capable to satisfy the current demands of such training targets?

- These days, mass media provides different values that may greatly vary from one another. By our estimation, the amount of 800-1000 training targets is the average annual demand for the Army Air Defense Forces that includes all types of targets used for training and live fire exercises. We consider these numbers as a reference point for our production and marketing policy in the coming years. But I should underline, that we never had ambitions to become the only supplier who will satisfy the demands of the army related with training air targets. Because our main goals are the real needs of our army, that require the most wide spectrum of training targets. Beyond our ideas there are other interesting Russian projects, that may and should take their rightful place in the air defense crews training programs. And from the very beginning we focused on joint operation in that direction. Actually, that is how VTTS was designed, as an open source system, which means that system is ready to work not only with its own training targets, but also allows integration of training targets from other developers and manufacturers into VTTS 9F6021E Adjutant. /IA&TG/

To consolidate our positions on that segment of the market we have to improve our products constantly, put forward the new ideas and expand the fields and methods of application.

ACS ‘POLYANA-D4M1’

Automated control system of anti-aircraft brigade (mixed grouping) of AD forces ‘Polyana-D4M1‘ (index 9C52M1) is designed for automated control of anti-aircraft systems (AAS), anti-aircraft complexes (AAC) of the ‘C-300‘, ‘Buk‘ types and a mixed grouping of AAS (AAC) ‘C-300‘, ‘Buk‘, ‘Tor‘, ‘Tunguska‘ via the appropriate command posts.

ACS ‘Polyana-D4M1‘ provides collection, processing of radar information (RI), information on air situation; control of standby forces; flight safety of proper aviation; receipt, collection and processing of information on ground situation; preparation of recommendations for control of subordinate units and subunits, support of interaction via automated solution of target allocation problems, distribution of efforts, coordination of combat actions.

Besides, the article provides automated exchange of operational-tactical and command-signal information with the higher and interacting objects with the use of data transmission equipment and securing equipment; solution of calculation problems with documentation of the results.

In case of failure of the means of automation, a transition to a non-automated control with the use of stationary communication means is provided.

Composition of the article:

- combat control post (CCP) (article МП06РПМ);
- command staff vehicle (CSV) (article МП02РПМ);
- power plant ЭД2х30-Т400-1РАМ7 (2 pcs.);
- autonomous automated working place (AAWP) – article 9С929 (supplied by separate order)

Articles МП06РПМ and МП02РПМ are autonomous complexes of the means of automation, communication, power supply and life support built up in the body box on the transport base of the vehicle KAMAZ.

Autonomous automated working place (article 9С929) is designed for stationary AD posts of the AAS (AAC) grouping when ensuring combat alert in peace-time, control from the secured command posts in a transition phase from peacetime to wartime and in wartime. It is an autonomous complex of means of automation, communication and power supply.

AAWP fully provides the solution of functional tasks of the article 9С52М1 with fewer mate objects.

At the regiment/division/battery levels, the AD grouping control system can use the unified battery control posts Ranzhir-M1 mounted on KAMAZ vehicle chassis and PU-12M7 mounted on K1SH1 (BTR-80) chassis, which provide for the command of the combat actions of subdivisions armed with anti-aircraft missile and artillery short range systems Tor-M1 (M2E), Osa-AK (AKM), Strela-10M2 (10M3), Tunguska-M1, Shilka, PAAMS Igla-S and storage device ZU-23 using automated control equipment.

In combination with Ranzhir-M1 and PU-12M7, Russian anti-aircraft missile systems can be integrated with one another or with anti-aircraft missile (radio) systems of other countries.

The main functions of the unified battery command posts are:

- coordination of combat actions of controlled systems in their interaction area;
- simultaneous reception, processing, identification and display of aerial situation information from all sources;
- reception, processing and display of target commands, general type commands and commands from the superior command post;
- determining the priority and mapping of targets, target designation;
- performing operational/tactical and information computing functions utilizing a digital terrain map;
- assessment of combat vehicle condition and battle readiness. /IAATG/

For over 45 years, JSC ‘Radiozavod’ has been developing control systems and suits for Land Forces air defense units at all levels of command. This unique combination allows to create a fully functional vertical structure of automated AD control at minimal cost, enabling actual integration with operational and strategic level automated control systems, continuity of system, software and interface solutions, as well as control using a single end-to-end path (from the operational and strategic command post to the weapon inclusive).

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TACTICAL MISSILES CORPORATION

Reliable long-lasting partnership

Tactical Missiles Corporation JSC (TMC), the parent company to around 40 leading enterprises of the Russian defence industry, is a global leader in the development and manufacture of precision weapons intended for a variety of platforms. The Corporation consistently stays in the top 50 of the largest global arms manufacturers, controlling some 10% of the world's market for precision air-launched weaponry and up to 20% of the naval precision armament market.

The Corporation conducts military-technical cooperation with more than 10 countries, with India being one of its key partners. TMC greatly appreciates the decades-long history of mutually beneficial cooperation with India and intends to actively develop joint projects in the future.

The Corporation works to create new-generation precision weapons that meet the highest requirements of its customers. Apart from supplying India with tactical armament, TMC runs associated after-sales support programmes. It also provides universal assistance to Indian specialists involved in the operation and maintenance of its equipment and conducts training of maintenance personnel.

The Corporation's export products include the Kh-35UE anti-ship missile with a new combined guidance system using an inertial system, satellite navigation and an active-passive radar seeker. This significantly increases the missile's precision and jamming immunity. It has twice the range of the Kh-35E predecessor (260 km against 130 km). The missile is fitted with advanced digital equipment supporting various guidance programmes, attack profiles and flight routes. The Kh-35UE can be launched both from aircraft, warships and Bal-E and Rubezh-ME mobile coastal missile systems. Apart from sea-surface

The corporation works to create new-generation precision weapons that meet the highest requirements of its customers. Apart from supplying India with tactical armament, TMC runs associated after-sales support programmes. It also provides universal assistance to Indian specialists involved in the operation and maintenance of its equipment and conducts training of maintenance personnel.

The modular design allows for the creation of various air-launched weapons with required specification through the use of dedicated systems and warheads without the need to alter the baseline munition's layout and aerodynamic configuration. The Grom-E is fitted with a folding wing for increased range. The combined inertial/satellite guidance system ensures all-weather, round-the-clock capability and fully autonomous guidance. The Grom-E's all-aspect capability allows for engaging targets both in the forward and rear hemispheres.

The munition's maximum range allows for stand-off release. Apart from the high precision the weapon features impressive firepower: in the Grom-E2 version, the combined payload weighs around 500 kg with a launch weight of under 600 kg. Thanks to the combination of high precision and a powerful payload, the munition can be used against hardened targets in immediate proximity to friendly troops and on urban terrain. The munition can be ships, the missile can be used against fixed ground targets.

The Corporation also offers dedicated highly effective weapons against ground targets.

In particular, the Kh-38ME family of multipurpose missiles is based on the proven modular design principle, which brings the product price down, offers a significant modernisation potential and allows for manufacturing a range of missiles with different combat characteristics.

The Kh-38ME family missiles are fitted with combined guidance systems, including the baseline strap-down inertial navigation system and different terminal guidance solutions based on laser (for the Kh-38MLE variant) and heat-seeker (for the Kh-38MTE) homing devices. Owing to the fact that the warhead accounts for around half the missile's launch weight, the family offers increased firepower and is capable of replacing virtually the entire previous generation of short-range air-to-surface missiles.

One of the Corporation's latest developments is the Grom-E family of modular precision munitions.

Grom-E2 air-launched guided gliding munition

One of the Corporation's latest developments is the Grom-E family of modular precision munitions. The modular design allows for the creation of various air-launched weapons with required specification through the use of dedicated systems and warheads without the need to alter the baseline munition's layout and aerodynamic configuration.

New air-to-air missile family

released from all current types of tactical warplanes.

In the air-to-air segment, TMC offers short-range (RVV-MD), medium-range (RVV-SD) and long-range (RVV-BD) missiles. Thanks to the improved sensitivity and jamming immunity of their new guidance systems, the missiles can be used at any time of day and night, in jamming environments, against ground and water clutter, based on the fire-and-forget principle. They are intended against both manned and unmanned aircraft.

The RVV-BD missile has an effective range of 200 km. It can be used against any aerial targets, including those manoeuvring at up to 8 g, within a wide altitude envelope of between 15 m and 25 km.

The RVV-SD, a further development of the previous generation of medium-range missiles, significantly surpasses them in terms of many parameters. The new propulsion system extends its maximum range to 110 km. The missile can be used against aerial targets manoeuvring at up to 12 g.

The RVV-MD short-range missile, just like its predecessor the R-73E, can be locked on the target with the use of a helmet-mounted target acquisition system, but its off-boresight angle has been expanded from ±45° to ±60°. Thanks to the new two-band IR seeker the missile features significantly higher jamming immunity, and its range has been extended from 30 to 40 km. The RVV-MDL is fitted with a laser non-contact target sensor.

The Kh-38ME and Grom-E modular munitions and the air-to-air missiles can be carried by both fifth-generation platforms and aircraft currently in service.

Tactical Missiles Corporation works incessantly to create superior, longer-range, higher-speed designs of precision weaponry with higher payload capacity, better jamming immunity, all-weather, round-the-clock operational capability and control systems incorporating artificial intelligence elements. The Corporation expands the range of aftersales support offers for previously exported systems.

The Corporation's development strategy is aimed at further strengthening its positions in the international arms market and at productive, mutually beneficial cooperation with foreign partners. **/IA&TG/**

MOTOR SICH at the AERO INDIA 2021

MOTOR SICH JSC is the company specializing in designing, manufacturing and the after-sales servicing of gas turbine aero engines, industrial gas turbine drives, and gas turbine power stations equipped with these drives. Recently, the company has been actively taking efforts to build the helicopter industry in Ukraine. The quality and reliability of aero engines manufactured by this company have been proven by their long-term operation on the aircraft and helicopters in more than 100 countries globally. The Republic of India is an important partner for this company, with the country accounting for a significant part of the supply of engines of various types and modifications; their overhauls and light overhauls, as well as supply of spare parts.

Vyacheslav A. Boguslayev, President, Motor Sich JSC

Today, the list of our engines (we commercially produce and have at various stages of development for passenger, cargo and military transport aircraft and helicopters) includes turboprop and turbopropfan engines of 400 to 14,000 hp, as well as by-pass engines of 1,500 to 23,400 kgf thrust including D-18T engines for Ruslan and Mriya, the two world's largest cargo aircraft.

We can outline D-436-148 aero engine from the propulsion engine family for An-148 family passenger aircraft. The engine meets up-to-date ICAO requirements, whereas its performance is on par with similar foreign engines. The specialists of Ivchenko-Progress SE and MOTOR SICH JSC are now developing D-436-148FM engine for An-178 cargo aircraft with the lifting capacity 16 to 18 tons (An-178 is to replace An-12 cargo aircraft). D-436-148FM aero engine is a modification of D-436-148 with the take-off thrust increased to 7,900 kg, and the maximum emergency thrust of 8,790 kgf due to more efficient engine components.

Mi-8MSB helicopter

More than 3,000 trainers and combat trainers powered by gas turbine engines manufactured by this company are in service with 45 countries over the world.

This company maintains this tradition and, together with Ivchenko-Progress SE, is taking part in developing aero engines of AI-322 family (and commercially produces them). The aero engines can provide a maximum thrust from 2,500 to 3,000 kgf, and up to 5000 kgf if an afterburner is installed.

MOTOR SICH JSC has been manufacturing engines for various unmanned aerial vehicles (UAVs) and cruise missiles for more than 50 years; this list includes (inter alia) the engines for X-55 (Kh-55) strategic missiles and X-35 (Kh-35) anti-ship missiles that are in service with the Indian Ministry of Defense. The designers of MOTOR SICH JSC have developed MS-400 engine of similar application (which is operated in several countries of the world).

MOTOR SICH JSC is now developing MS-340 aero engine family with the maximum thrust of 340-350 kgf; as well as a new generation MS-450 engine with a thrust of 398 kgf with significantly improved mass-dimensional characteristics. Several countries are in the process of installing special modifications of turboprop and turbojet bypass engines, produced by MOTOR SICH JSC, on their UAVs, which makes it possible to develop UAVs of the MALE, HALE and UCAV classes.

MOTOR SICH JSC developed TV3-117VMA-SBM1V aero engine aimed at further improving flight performances of helicopters and their efficiency during operation in high-mountainous regions of countries with hot climates. The company developed a modification of the aero engine above for the use in projects of designing new helicopters. This modification (TV3-117VMA-SBM1V Series 1) is equipped with an electronic-digital automatic control system. The use of a new automatic control system will make it possible to improve the performance of engines and helicopters. As promising one can consider the use of TV3-117VMA-SBM1V aero engine family in the project planned by Hindustan Aeronautics Limited (HAL) to develop MRH helicopter with a take-off weight of 10-12 tons.

The program of re-engining Mil and Kamov helicopters operated in India by installing TV3-117VMA-SBM1V engines jointly with HAL or any other company can be beneficial both for India and Ukraine as well as efficient for Ministry of Defense of India.

The company has a new project – TV3-117VMA-SBM1V Series 5. It is developed jointly with Ivchenko-Progress SE. The aero engine has a capacity of 2,800 hp. in a takeoff mode and 3,200 hp. In a 2.5-minute power mode with one engine off. Its rating was ensured due to changes introduced in its design. Two modifications of this aero engine are planned: a turboshaft one for helicopters with a takeoff weight of 15-16 tons (such as the Mi-38), and a turboprop one for passenger and cargo aircraft.

Today, small aircrafts are in high demand in the world, and, MOTOR SICH JSC, thus, is actively participating in works carried out by the Ivchenko-Progress SE to develop small-sized aero engines of AI-450 family. A turboshaft modification of AI-450M engine with a takeoff power of 400hp, 430hp or 465 hp (depending on the configuration of the ACS) was awarded with a Type Certificate.

At the same time, the company is working on AI-450C and AI-450C-2 turboprop modifications with a take-off power of 495 and 750 hp. respectively, with the modifications designed for general-purpose aviation and trainers, including the aerobatic category (AI-450CP and AI-450CP-2 modifications).

The company is undertaking efforts to design a new generation of turboshaft aero engine family – MS-500V in the take-off power class of 600-1100 hp, intended to power helicopters for various roles with a take-off weight of 3.5-6 tons. Modifications of MS-500V with a takeoff power of 630hp. and MS-500V-01 with a takeoff power of 810 hp were awarded with Type Certificates. The work is underway to design MS-500V-02 and MS-500V-03 aero engines with a takeoff power of 1,100 hp. (the output of the power take shaft forward and backward, respectively).

MOTOR SICH JSC is developing turboprop modifications of MS-500V-S aero engine family with a takeoff power of 750-1,050 hp (for general-purpose aviation, trainers and passenger aircraft). MS-500V-02S aero engine with a takeoff power of 950 hp. was certified in late 2020. Two more modifications are under development: MS-500V-04S / SE with a takeoff power of 750-950 hp and MS-500V-05S / SE with a takeoff power of 950 ... 1050 hp (the one designed for UAVs). The zest of 'SE' series is the ability to install an additional alternator with a capacity of up to 40 kVA. MOTOR SICH JSC is developing, producing and repairing helicopter gearboxes. At the moment, the company has commercialized the repair of VR-8A, VR-14 and VR-24 main gearboxes for helicopters of Mi-8, Mi-17 and Mi-24 families.

Together with Ivchenko-Progress SE, the company is developing VR-17MS main gearbox (an upgraded version of VR-14 gearbox) for helicopters of Mi-17 type with a take-off weight increased to 14 tons. VR-14MS gearbox is developed on the basis of the VR-24 gearbox and is intended for installation on Mi-8MT (MTV) helicopters and when upgrading Mi-8T helicopters. The steps above allow MOTOR SICH JSC to arrange the overhaul of Mi-8, Mi-17 and Mi-24 helicopters with their simultaneous re-engining and upgrading their onboard systems.

MOTOR SICH JSC is actively developing its own helicopter production program. It has established an 'Experimental Design Bureau' (more than 300 specialists) that was certified by the aviation authorities of Ukraine as a developer.

The helicopter production at MOTOR SICH JSC includes mechanical and assembly shops – all with modern equipment; a section for removing and applying paint and varnish coatings; a flight test complex; a training center for training crews of all types of helicopters produced. There is also a universal full-scale stand as a part of the flight test complex, which was designed to test structural elements of the airframe and helicopter systems, as well as to conduct various types of ground tests.

The company had accumulated its own solid scientific and technological infrastructure necessary to design, produce, test and certify helicopters. Mi-8MSB (a medium multipurpose helicopter with the maximum takeoff weight of 12,000 kg) was the first project implemented as a part of the helicopter production program of Motor Sich JSC. The helicopter is equipped with a power plant of two TV3-117VMA-SBM1V 4E series gas turbine engines with electric start. Mi-8MSB helicopter has already proven itself as the optimal solution for aviation operations in high altitude conditions. The outstanding altitude characteristics of TV3-117VMA-SBM1V 4E series aero engines ensure the ability to locate the helicopter on sites at an altitude of up to 4,200 meters. Mi-8MSB helicopter with TV3-117VMA-SBM1V 4E series engines set a number of world records, including an absolute record for a level flight altitude in E1 class (9,155 m), which is 300 m higher than the altitude of Everest, the highest mountain on Earth.

TV3-117VMA-SBM1V 4E Series engine

A service-friendliness combined with a high maintainability and reliability make Mi-8MSB helicopter stand out from similar types of helicopters. The helicopter design ensures the installation of a wide range of specialized equipment to perform various operations. The helicopter is equipped with a modern navigation system that meets the requirements of EASA and ICAO; the helicopter can also be equipped with an external suspension system specially designed to minimize the loading of the helicopter fuselage with a carrying capacity of up to 4 tons. The system is designed to transport a bulky cargo, extinguishing fires using Bambi Bucket system, and perform installation works. MOTOR SICH JSC can produce Mi-8MSB helicopters in a number of modifications: transport, passenger (including a VIP version), search and rescue, medical, firefighter, military (Mi-8MSB-V). The following are the accessories that Mi-8MSB-V helicopter can be equipped with: an external cable suspension; a parachute and non-parachute landing equipment; a rescue winch; a search light; optoelectronic and radar equipment; an airborne defense system; a weapon system that includes gun armament, bomb, controlled and unguided missile armament.

To expand the range of operating a Mi-8MTV-type helicopter (Mi-8MT, Mi-8MTV-1, Mi-17, etc.) in high

temperatures and at high altitudes (with the ability to perform flights as per Category A and Category B), the team of experts at MOTOR SICH JSC carried out a set of certification works, and eventually additional Type Certificates were awarded. Powered by TV3-117VMA-SBM1V-03 engines, Mi-8MTV helicopter (models Mi-8MT, Mi-8MTV-1, Mi-17, etc.) can perform search and rescue operations using a winch, with one engine being inoperative. The installation of new TV3-117VMA-SBM1V-03 engines also made it possible to increase the maximum flight weight of the helicopter with two engines running.

Motor Sich JSC is focused on another aspect of its helicopter production program, namely, developing and producing light helicopters, with Mi-2MSB being the first light-class certified helicopter developed by the company. The main design change is in replacing GTD-350 engines (outdated and discontinued) with new AI-450M-B engines developed by Ivchenko-Progress SE and manufactured by MOTOR SICH JSC.

The multipurpose Mi-2MSB helicopter differs from other light-class helicopters due to its spacious cargo-passenger cabin and a twin-engine power plant. The change in the shape of hoods gave the helicopter an upgraded and more dynamic look. Hoods are made of modern composite materials, which made it possible to reduce the structure weight. Changes have been also introduced into the fuel, oil systems and engine cooling systems. The instrument equipment of the helicopter is supplemented with digital indicators to display engine parameters. There is a possibility to install a new set of onboard equipment of the 'glass cockpit' type. Mi-2MSB helicopter has the key advantage, the altitude, which opens up its export potential for countries with mountainous terrain.

Mi-2MSB helicopter

On 18 April, 2016, Mi-2MSB set a new record – it reached the height of more than 7,000 meters. Also, a hangar-free storage is the indisputable advantage of the helicopter, which is impossible for the vast majority of the similar type helicopters. Despite the fact that Mi-2MSB belongs to light-class helicopters, its transport capabilities are quite high. E.g., the helicopter cabin is designed to room 8 passengers (excluding the pilot).

MOTOR SICH JSC is endeavoring to expand commercial capabilities of the helicopter by integrating new target equipment. One of the fruits of the endeavors is a new original external suspension system developed for the helicopter, for which an additional type certificate was obtained. Mi-2MSB helicopters successfully participate in helicopter sport championships. The helicopter is also famous for its excellent aerobatic qualities. This multipurpose helicopter of MSB-2 type is built according to the classic single-rotor design with a tail rotor. The helicopter is powered with AI-450M-P engines (with a capacity of 465 hp each) and is equipped with a new transmission developed and manufactured by MOTOR SICH JSC.

The full-size model of the helicopter was demonstrated at specialized aviation shows and exhibitions. The industrial prototype of MSB-2 helicopter is currently undergoing tests. The following are the main features of the helicopter: a spacious cargo-passenger cabin; the external placement of fuel tanks equipped with fuel-measuring system sensors; a cargo-passenger door in the rear of the fuselage with an automatic drive and an emergency escape hatch; a modern set of onboard flight-navigation and radio-electronic equipment; the ideal aerodynamic forms.

Despite all the hurdles and hardships of the formation of the national economy, the aviation industry of Ukraine managed to preserve its scientific, design and production potential. Ukraine is ready to offer the Republic of India a wide range of possible areas of cooperation – from the production of individual parts, assemblies, components and aero engines (for aircraft developed or commercially produced in India), to works carried out together with HAL, NAL, DRDO and other public and private companies and organizations to develop and the produce new models of aircraft or modifications of existing aircraft and aero engines adapted to the specific operating conditions in India.

AI-450M engine

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INTERNATIONAL AEROSPACE, MILITARY, NAVY AND TECHNOLOGY GUIDES

ISSUE	RELEASE DATES	ADDITIONAL DISTRIBUTION
'GUIDE' №01 (54)	January 20th	**AERO INDIA 2021** (03-07.02.2021, India, Bangalore)
'GUIDE' №02 (55)	February 10th	**IDEX 2021 / NAVDEX 2021** (21-25.02.2021, UAE, Abu Dhabi)
'GUIDE' №03 (56)	February 25th	**CSTO, special project** (March 2021, Moscow – CSTO countries)
'GUIDE' №04 (57)	March 15th	**ArmHiTec 2021** (25-27.03.2021, Armenia, Yerevan)
'GUIDE' №05 (58)	March 20th	**INDO DEFENCE 2021** (07-10.04.2021, Indonesia, Jakarta)
'GUIDE' №06 (59)	April 20th	**ADAS 2021** (05-07.05.2021, Philippines, Manila)
'GUIDE' №07 (60)	May 01th	**DEFEA 2021** (11-13.05.2021, Greece, Athens)
'GUIDE' №08 (61)	May 04th	**SITDEF 2021** (13-16.05.2021, Peru, Lima)
'GUIDE' №09 (62)	May 10th	**HELIRUSSIA 2021** (20-22.05.2021, Russia, Moscow)
'GUIDE' №10 (63)	May 15th	**IDEF 2021** (25-28.05.2021, Turkey, Istanbul)
'GUIDE' №11 (64)	June 01th	**KADEX 2021** (10-13.06.2021, Kazakhstan, Nursultan)
'GUIDE' №12 (65)	June 13th	**IMDS-2021** (23-27.06.2021, Russia, Saint Petersburg)
'GUIDE' №13 (66)	July 08th	**MAKS-2021** (20-25.07.2021, Russia, Moscow)
'GUIDE' №14 (67)	July 10th	**IMDEX ASIA** 2021 (27-29.07.2021, Singapore)
'GUIDE' №15 (68)	August 15th	ARMY 2021 (22-28.08.2021, Russia, Moscow)
'GUIDE' №16 (69)	September 06th	**AVIATION EXPO CHINA 2021** (16-18.09.2021, China, Beijing)
'GUIDE' №17 (70)	September 13th	**FAMEX 2021** (25-27.09.2021, Mexico, Mexico)
'GUIDE' №18 (71)	October 01th	**DSE Vietnam 2021** (October, 2020, Vietnam, Hanoi)
'GUIDE' №19 (72)	October 01th	**INMEX SMM India** 2021(11-13.10.2021, India, Mumbai)
'GUIDE' №20 (73)	October 08th	**SEOUL ADEX 2021** (19-24.10.2021, Korea, Seoul)
'GUIDE' №21 (74)	October 12th	**BIDEC 2021** (25-27.10.2021, Bahrain, Manama)
'GUIDE' №22 (75)	October 20th	**Defense & Security 2021** (01-04.11.2021, Thailand, Bangkok)
'GUIDE' №23 (76)	November 01th	**Dubai Airshow 2021** (14-18.11.2021, UAE, Dubai)
'GUIDE' №24 (77)	November 07th	**Vietnam International Defence Expo 2021** (18-20.11.2021, Vietnam, Hanoi)
'GUIDE' №25 (78)	November 15th	**Expodefensa 2021** (29.11-01.12.2021, Colombia, Bogota)
'GUIDE' №26 (79)	November 19th	**EDEX 2021** (29.11-02.12.2021, Egypt, Cairo)
'GUIDE' №27 (80)	November 27th	**Gulf Defense & Aerospace 2021** (07-09.12.2021, Kuwait, Al Kuwait)

P-18-2 'PRIMA'

HIGHLY MOBILE TWO-COORDINATE SURVEILLANCE AND TARGET DESIGNATION RADAR

Highly mobile two-coordinate surveillance and target designation meter wave band Radar P-18-2 'PRIMA' is a result of joint work of 'Nizhny Novgorod Television Plant named after V.I. Lenin' (PJSC 'NITEL') and 'Lianozovo Electromechanical Plant' (PJSC 'ALMAZ R&P Corp.' LEMZ Division).

The Radar P-18-2 'PRIMA' is intended for surveillance and target designation of aerial objects including those made by STEALTH technology, its coordinate determination in range and azimuth and direction finding of active noise jammers. The Radar is accommodated on a cross-country chassis and offers increased mobility due to arrangement of equipment, antenna – feed system and power supply source on a single transport unit.
The Radar can be operated at ambient temperature from minus forty to plus fifty degrees Celsius.

The power supply of the Radar can be provided by the built-in primary power supply sources such as power take-off generator or its own generating set as well as by industrial network.
The Radar unrolling by combat crew of two persons takes not more than five minutes including time of automatic leveling.
The Radar orientating takes place automatically with the aid of the satellite navigation systems.
The Radar employs three scan rates of 3, 6 and 12 rpm as well as mechanical sector target search (sector mode of antenna rotation). The Radar can detect and automatically track low speed and low observable unmanned aerial vehicles in the zones of local interference and airborne moisture targets. Reliable acquisition and tracking of targets under heavy interference environment is implemented by dual-frequency probing mode.

The Radar detection range limits of aerial objects is 1 to 400 km. The Radar performance specifications are favorably distinguished by high accuracy of coordinates measurement, high resolution and high jamming immunity.
To protect combat crew the Radar is equipped with remote operator's work stations that allow remote control of the Radar at a distance of 1000 meters. P-18-2 'PRIMA' is capable to coact with modern digital Automated Control Systems, Air Defense Missile Systems and exchange data with them and that includes radio link. To identify friend-or-foe of aerial objects, the Radar is equipped with the Secondary Radar.
The Radar possesses maximum automation at all stages of radar operation modes from the moment of unrolling /rolling up, combat performance, data output to consumer as well as high reliability and capability of survival.

NITEL

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