INTERNATIONAL AEROSPACE & TECHNOLOGY GUIDE

Special analytical export project of the United Industrial Edition

№ 11 (42), August 2019

Best Innovations for the Global Market and Cooperation

MAKS 2019
SPECIAL PARTNERSHIP

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'International Aerospace & Technology Guide'
№ 11 (42), August 2019

Special analytical export project
of the United Industrial Edition

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CONTENTS

EDITORIAL

Hello, MAKS-2019!

This year, from August 27 to September 1 in Zhukovsky near Moscow, one of the world's largest aviation forums – International aviation and space salon MAKS – will take place for the 14th time. The event is organized by the Rostec State Corporation and the Ministry of industry and trade of the Russian Federation. This year, the People's Republic of China will become a partner-country of the aviation and space salon.

Currently, the International aviation and space salon MAKS deservedly occupies a leading place among the most important aviation forums in the world. The main purpose of MAKS is to demonstrate Russian high technologies and openness of the Russian domestic market for joint projects with foreign partners.

'Within the framework of MAKS-2019, the Rostec State Corporation will traditionally present an extensive exposition of commercial, military and dual-use products, announce the most promising projects, products and technologies. I invite you to take part in the International aviation and space salon MAKS-2019. I am convinced that the exhibition will be held in a constructive and meaningful way,' – says Sergey Chemezov, CEO of Rostec.

We remind that the first MAKS forum was held in 1993, and since then it has been held every second year. The forum of 2017 had surpassed the indicators of 2015 in terms of the scale of the exhibition and business program, the volume of transactions and the number of visitors. The volume of contracts and letters of intent reached 394 billion Rubles, and the business potential of MAKS-2017 exceeded 600 billion Rubles. The event was attended by 452 thousand 300 participants and guests who watched the flights of eight aerobatic teams and 90 aircraft.

May all of us be successful at the air show MAKS-2019!

Valeriy Stolnikov

INTERNATIONAL FESTIVAL OF DRONE RACING

The second international festival of drone racing Rostec Drone Festival will be held in Moscow on August 24 and 25. The event is organized by the All-Russia society of Sports and Physical Training 'Trudivye Reservy'(Labor reserves) together with Drone Sports Global and with the support of 'Technodinamika' holding of the Rostec. State Corporation.

The drone racing festival of will gather the best aces of aerobatics on its site. This year, 32 professional pilots, including from the USA, China, Korea, Germany, Italy, France, Great Britain, Latvia and Poland, will participate in the competition.

'Drone racing is a high-tech sport, it is rapidly gaining popularity all over the world, – commented the event 'Technodinamika' General Director of Igor Nasenkov. – For the 'Technodinamika'' the development of unmanned aerial vehicles (UAV) is one of the most important areas for us. We are pleased that young people are showing great interest in this area. After all, new technologies are the future, and even now UAV control specialists are in demand in many industries.'

By the beginning of the festival a two-level race track with suspended structures and a tunnel for the spectators, along which everyone will be able to pass and see the race from its epicenter, will be constructed in Gorky Park.

In addition, guests will have the opportunity to try themselves as professional pilots and master drone control on a computer simulator, as well as listen at master classes from professional pilots about the trends and innovations in the world of unmanned aerial vehicles.

The program of the event will consist of a qualification race, in which both professionals and amateurs will be able to try their hand at passing the race track and objectively assess their own level of piloting, as well as competitions of the strongest Russian and foreign professional racers.

The best Russian pilots are going to compete for the title of the winner: they are 2018 Russia champion Kirill Fedukovich and sixteen-year-old Drone Sports Global team leader Platon Maximov.

Technologies for Arctic

Concern Radioelectronic Technologies of Rostec State Corporation began a research and development of a microwave installation of a new generation for high-quality pasteurization and disinfection of food and agricultural crops for storage and processing in the Arctic region.

Today, the state is tasked with the effective use and development of the potential of the Arctic zone of the Russian Federation. The implementation of projects in the energy, transport and other spheres in the Arctic will inevitably require the reliable functioning of life support systems, including the creation of food reserves for the population. Currently, imported food products dominate the territories of the Arctic zone. The most acute question is about fresh, biologically high-grade dairy products. Traditional pasteurization of milk even under the most severe conditions does not produce complete disinfection of the product and does not allow to obtain guaranteed quality and purity.

In order to supply biologically safe products from the southern to the northern regions, it is necessary to use effective methods of processing agricultural products. One of the promising innovations is the use of microwave energy as one of the most relevant areas in agriculture.

Microwave processing technology has a number of positive qualities. Among its main advantages – a significant saving of time and energy. It allows to save all nutrients, vitamins and minerals in raw materials. Microwave technology can be successfully used for processing milk, bakery products, dry wines, beer, ham, soft drinks and pre-cooked products.

Export Version of the Wearable Radio Station

'Roselectronics' holding of the Rostec State Corporation has presented for the first time an export version of a small-size wearable radio reconnaissance station during the IX International naval salon, which took place in St. Petersburg from 10 to 14 July. The instrument for radio-electronic monitoring is designed to equip the personnel of special forces and allows to detect and locate radio emission sources at a distance of up to 30 km.

The station 1L65E, developed by the scientific research institute 'Vector' of 'Roselectronics' holding, allows to determine in a combat situation whether in the area of operation there is a radar (tactical, mobile or strategic) and where it is located.

The instrument analyzes automatically parameters of radio emission sources, determines their type and independently maintains a database of detected signatures, including up to 900 different signal samples. At the same time, the station weighs only 6 kg, is resistant to physical impacts and can be used even by assault units. A set of three batteries allows the instrument to work autonomously during the 24 hours.

'The use of radio reconnaissance station increases the viability of the special forces during any kind of special operations by discovering the radio-electronic tracking system of the enemy. The technical characteristics and layout of the product can be adapted to the needs of specific customers. Due to these qualities, the station has great potential in the framework of military-technical cooperation,' says Sergey Skorykh, Director General of 'Vector' scientific research Institute.

The station is able to detect sources of radio signals and record their parameters in a wide frequency range from 0.15 to 18.0 GHz, as well as determine the direction to them with an accuracy of 5 degrees. An important feature of the product is the ability to combine three operating stations into a single information network, which increases the accuracy of determining the coordinates of the enemy radiation sources.

REPAIR CENTER IN VIETNAM

Integrated logistics support center for repairing helicopter engines created by UEC-Klimov (subsidiary of the United Engine Corporation, part of Rostec) has begun operations in the Vietnamese city of Vũng Tàu. Pilot repair project of the first engine in the new center has been successfully completed. The center is equipped with all necessary equpment, spare parts and assemblies to provide repairs for engines designed by UEC-Klimov. By the end of April four more engines in use in Vietnam went through repairs in the center.

Specialists from UEC-Klimov performed medium repairs of TVZ-117 and VK-2500 engines operated in Vietnam. The Russian side provided the details and spare parts, and trains the personnel for engine and gearbox maintenance. The Vietnamese side provided support personnel to accompany the working process. The Vietnamese specialists had already received certificates from UEC-Klimov on successful familiarization with the medium repair process of the first engine: TV3-117VM series 02 used by the Mi-17-1V. A foreign object damaged this particular engine during operation by the Vietnamese civil aviation.

'Till the end of April, we were going to repair four more engines operated in Vietnam. We planed to actively expand the geography of our cooperation and start providing repair and support services of helicopter engines in India, China, Indonesia, Malaysia, Cambodia, Thailand, Vietnam, Myanmar, Laos, Australia, Bangladesh and Sri Lanka. Our partners in the region are highly satisfied with the approach and quality of services provided by Rostec, which included after-sale support for the whole life cycle of our products', said the Director for International Cooperation and Regional Policy of Rostec, Viktor Kladov.

The Aviation Administration of the Socialist Republic of Vietnam certified the new center. Certifying the support personnel was a mandatory procedure for ensuring the operation and repair process made by the center. Vietnamese specialists familiarized themselves with all the steps concerning medium repairs of the TV3-117 engines and their different models during a technological procedure of the certification.

In October 2018 UEC-Klimov and the Vietnamese company Helicopter Technical Service Company signed a distribution contract concerning service maintenance of engines.

Helicopter Technical Service Company, on the territory of which the new center is located, provided service maintenance for Russian-made helicopters. It also operated as the distributor of TB3-117 and VK-2500 engines.

'Soyuz MS-13' Spacecraft

Serial rocket engines RD-107A/RD-108A, produced by the Samara enterprise 'Kuznetsov' of the United Engine Corporation, part of the Rostec State Corporation , have worked successfully during the launch of a space rocket 'Soyuz-FG' with a manned transport spacecraft 'Soyuz MS-13' and the crew of a long-duration expedition to the International space station (ISS).

The crew of 60-th/61-st long-term expedition including Roskosmos astronaut Alexander Skvortsov (the commander), astronauts Luka Parmitano (on-board engineer-1) and Andrew Morgan (on-board engineer-2) went to ISS.

The manned launch took place on July 20 at 19:28 Moscow time from the site No. 1 ('Gagarin launch site') of the Baikonur space launch complex. The main engines of the first and second stages RD-107A/RD-108A, produced in PJSC 'Kuznetsov', worked faultlessly.

At 19:37 Moscow time the 'Soyuz MS-13' spacecraft had separated successfully from the third stage of the launch vehicle on the target orbit, and at 01:48 Moscow time on July 21 docked in the normal mode to the docking node of the 'Zvezda' service module of the International space station Russian segment.

The program of the another long-term expedition of the ISS includes scientific and applied research and experiments, routine maintenance work related to the maintenance of the station, and equipping ISS with additional equipment delivered by cargo spacecraft.

Propulsion systems RD-107A/RD-108A power I-st and II-nd stages of all 'Soyuz' type launch vehicles, the coefficient of statistical reliability is 99.99%. Work to increase the reliability and improve the engines is continuously carried out by its developers (JSC 'NPO Energomash named after academician V. P. Glushko') and specialists of 'Kuznetsov' enterprise engaged in the mass production of these products.

Current status and prospects for arms exports

Rosoboronexport (part of the Rostec State Corporation) discussed the current status and prospects for arms exports during the St. Petersburg International Economic Forum (SPIEF) 2019, which was held from 6 to 8 June in the Expoforum Convention and Exhibition Centre.

'Rosoboronexport's financial indicators suggest that our chosen development strategy is the right one: we have delivered $5.7 billion worth of products to foreign customers since the beginning of the year. As one of the world's leading arms exporters, we are not only tracking and following global trends, but also introducing new areas of work that are unique for the market, including financial mechanisms for foreign trade activities. The St. Petersburg Forum is an ideal platform for us to present our competencies to opinion leaders of the Russian and world economies. These days we are going to discuss with them the current ongoing efforts and business development in new economic realities,' said Rosoboronexport's Director General Alexander Mikheev.

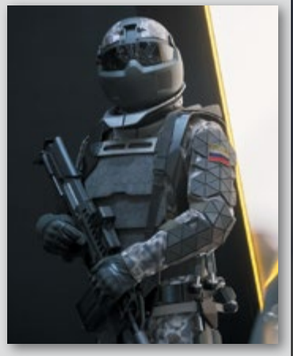
The St. Petersburg International Economic Forum has been held since 1997. Over this time, it has become the leading global platform for communication between business representatives and discussion of key economic issues facing Russia, emerging markets and the world as a whole.

At SPIEF 2019, Rosoboronexport's top management had meetings with leading Russian state financial organizations and business entities, as well as with representatives of the Company's partner countries in military-technical cooperation. It was intended to discuss the growth prospects for Russian arms exports, the strategic development of its financial mechanisms, and state support measures for manufacturers and military-technical cooperation (MTC) actors.

The Company focused on seeking new horizons and discussing specific prospects for cooperation with countries in Asia, Africa, the Middle East and Latin America, and expanding cooperation in the SCO region. The adaptation of the MTC actors and defense industry enterprises to new challenges of our time and sanctions pressure is certainly be a key issue.

'For five years, Russia and Rosoboronexport have been facing serious restrictions from a number of international financial institutions, which turned out to be heavily dependent on the political will of some players on the world arms market. We can only perceive them as unfair competition and attempts to put pressure on us and our partners,' added Alexander Mikheev.

THIRD GENERATION COMBAT GEAR SOTNIK



JSC TsNIITochMash (part of Rostec) plans to start R&D work of new third generation combat gear for the military in 2020. This new equipment, replacing the Ratnik combat gear, will be called Sotnik.

The new gear will include anti-mine boots, an anti-thermal suit hiding the soldier from infrared sensors and anti-radar camouflage suit. Other plans include introducing a tactical system using micro UAVs, where the camera stream from the UAV will be projected to the helmet's visor or separate goggles. The electric goggles can also be used to display tactical orders, maps of the area, etc.

'According to our plans, the third generation gear Sotnik will replace Ratnik already in 2025. This will be fundamentally new kind of equipment integrating the best high-tech designs of Russian enterprises, including those of Rostec. Thanks to the use of innovative materials and combining the functions of individual elements, the weight of the set will be reduced by 20%, amounting to about 20 kilograms', said Rostec CEO Sergey Chemezov.

Sotnik will use a 'chameleon' material that can be controlled with voltage – a joint design by TsNIITochMash and the Roselectronics holding company. This electrochromic material can change its color depending on the masked surface and its environment. A helmet with this kind of unique coating was demonstrated for the first time at the ARMY-2018 forum.

Rostec has been supplying the Russian army with a 2nd generation Ratnik combat gear since 2014. This gear consists of five integrated systems: life-support, control and communications, combat, protection and energy supply. It is designed for operations in varying climatic conditions at any time of the day. The equipment is being developed during operations and upgraded components are constantly supplied to the troops.

Monitoring the State of Runway Strips

Ruselectronics holding of Rostec State Corporation began preliminary tests of the complex for measuring the adhesion coefficient of the airfield pavement to aircraft chassis. The equipment facilitates quick preparation of the airfield for operation and prevents the aircraft from rolling out of the runway strip. The cost of the complex is several times lower than of its foreign analogues currently used at Russian civilian airports.

The automated complex is a two-wheeled device with a control unit that is towed along the runway at different speeds. The device measures the braking force of the wheels and registers the adhesion coefficient to the surface. Data on the state of surface is transmitted to the operator in automatic mode.

'Mass production of the complex is scheduled to start on the fourth quarter of 2019. The equipment enables responding to changes in timely manner to the runway strip conditions, which then ensures the safety of aircraft takeoff and landing. Such equipment is essential for safe operation of all aerodromes. Nowadays for these purposes, civilian airports mainly use foreign technological equipment or domestic equipment from the 1970-s. The development of our specialists from Ruselectronics is about 5 times cheaper than their foreign counterparts, and provides higher reading accuracy', commented Rostekh's executive director Oleg Evtushenko.

It was recalled that Rostec created earlier a modern airfield complex SP-2010 for landing an aircraft in adverse weather conditions at any time of the day. Resonator antennas and other know-hows were used in the newest digital complex, thanks to which moisture, precipitation and icing no longer affect its operation. SP-2010 is the best in the world for a number of characteristics.

Line of Semi-Automatic Udav Pistols

TsNIITochMash research institute (part of Rostec) has for the first time presented four modifications of the new semi-automatic Udav pistol at the International Military-Technical Forum ARMY-2019, held on June 25-30 near Moscow.

The demonstration included special purpose pistols using the 9x21mm military cartridge as well as new tactical and sport modifications using the 9x19mm cartridge. The civilian version of Udav is designed for professional sportsmen in the field of shooting and its tactical and technical characteristics allow competing with foreign counterparts of famous brands.

'We have prepared a special dynamic demonstration for the new modifications of the Udav pistol at the ARMY-2019', pointed out Sergey Abramov, the Industrial Director of Rostec's firearms cluster. 'The new Udav pistol, designed to replace the Makarov pistol currently used by the army, has passed federal testing and received recommendations for mass production. The first batch of Udavs has already been delivered to the troops for trial operations. As for the civilian version, we have already begun preparing for its certification, which will subsequently allow us to export the gun. We intend to promote it to foreign markets, including in Latin America, the Middle East, India, China and Southeast Asia.'

The design of the semi-automatic 9mm caliber Udav pistol is completely Russian. The interdepartmental commission, which decides on the admission of the Udav pistols to mass production, has completed its work, and the pistol received the classification letter '01'. Its magazine capacity is 18 rounds, which is 10 more than the Makarov.

Udav can use a full range of 9x21mm cartridges, including tracer, armor piercing and hollow-point rounds. In addition, two completely new cartridges were developed specifically for the pistol: subsonic and increased penetration. The pistol grip is made of modern composite materials, the strength of which allow it to be operated in temperatures from -50 to +70 degrees Celsius.

CONTRACT WITH CUBA – TO IZHMASH MUSEUM

Alexander Mikheev, Director General of Rosoboronexport (part of the Rostec State Corporation), took part in a meeting with the Director and the employees of Kalashnikov Concern's Izhmash Museum held at the Army 2019 International Military and Technical Forum. In a solemn ceremony, a copy of the contract for the supply of a batch of AK-103 assault rifles of the AK-100 series to Cuba, signed personally by Mikhail Kalashnikov in Havana, was handed over to the Museum.

'Today, Rosoboronexport is handing over a copy of the contract document as a museum piece for the first time in history. This occurs in the year when we are celebrating the 100th anniversary of the birth of the great small arms designer. Mikhail Timofeyevich worked for Rosoboronexport for many years as chief adviser to the Director General on small arms and personally brought the company hundreds of contracts with foreign customers for the supply of weapons of his own design,' Alexander Mikheev said.

Lieutenant General Mikhail Kalashnikov, Doctor of Technical Sciences, twice Hero of Socialist Labor, and Hero of Russia, invented about 30 different weapons. Many of them became most popular in their market segments. The legendary AK-47 assault rifle turns 72 this year. Kalashnikov assault rifles are now used by the armed forces of almost 100 countries around the world, and this number is steadily growing. The AK-100 and AK-200 series, AK-12 and AK-15 assault rifles have been developed and are being promoted abroad, new weapons are under development.

'More than a million Kalashnikov assault rifles of various designs have been delivered abroad by Rosoboronexport. Of all Russian-made small arms, Kalashnikov assault rifles enjoy the greatest demand among foreign customers. In addition, the production of Kalashnikov rifles has been established in several countries with our assistance. In 2019, an Indo-Russian joint venture started manufacturing AK-203 assault rifles of the newest 200 series in India,' Alexander Mikheev added.

Fairuza Burganova, the curator of the Izhmash Museum, initiated the placement of this unusual item in the Museum exhibition, which will add another facet to the bright biography of the famous designer – his role in and contribution to the military-technical cooperation between the Russian Federation and foreign States.

Mobile Anti-Drone System Sapsan-Bekas

Avtomatika Concern (part of Rostec) has presented the Sapsan-Bekas mobile system for detecting and disabling unmanned aerial vehicles (UAVs) at the International Military-Technical Forum ARMY-2019.

The system can detect an UAV at a distance of 10 km, track its movement and disable it at a distance of over 6 km by suppressing communications and control of the UAV. The design has much better tactical and technical characteristics compared to all similar Russian and foreign systems that are currently available.

The device consists of three subsystems: signals detection and direction finding of drones, active radar, video and optoelectronic tracking, as well as a subsystem of radio suppression. Sapsan-Bekas is capable of round-the-clock monitoring of the airspace and recognizing airborne objects using video and thermal imaging tools.

'One of the main advantages of the Sapsan-Bekas is its versatility and flexibility. The functionality of the system is easy to adapt to the needs of customers. For example, civilian companies, including energy companies, are mostly interested in signals intelligence equipment, and often don't need radiolocation capabilities – the concern is ready to make a product for them in the required configuration', said Vladimir Kabanov, CEO of the Avtomatika Concern.

The company is already prepared to deliver Sapsan-Bekas to civilian customers. Before supplying to security agencies is possible, the system must first pass the testing scheduled for autumn 2019.

Over 1000 Pieces at ARMY-2019

Rostec State Corporation presented over 1000 pieces of weapons, military and special equipment at the ARMY-2019 forum, which has been in Kubinka, near Moscow. These included tanks, IFVs, helicopters, UAVs, artillery systems and ammunition, advanced firearms, communications equipment, EW systems and many more.

Rostec's products were presented to the visitors at the pavilions of the Patriot congress and exhibition center and the open-air exhibition stands. Representatives of the State Corporation and its holding companies were negotiations with potential partners and took an active part in the activities of the business program. Signing of contracts for supply of military equipment were planned at the Forum.

'This year we've invited delegations from over 100 countries to take part in ARMY-2019, official meetings will be held with 70 of them on the sidelines of the Forum. I would like to point out, that the level of representation of partner countries is quite high this year: over 30 of them are headed by defense ministers, their deputies and chiefs of the general staff. We will present them over 1000 pieces of advanced weapons, armor, helicopter, artillery and other technology. We will also demonstrate modern ammunition, domestic firearms, communication, electronic warfare and intelligence systems. Russia confidently continues to occupy second place in the world by the volume of arms exports. In 2018, Rosoboronexport's deliveries amounted to $13.7 billion and export portfolio exceeded $50 billion, which are a new record for us. In many ways, these numbers are achieved via active marketing through such platforms as the Army Forum', said the CEO of Rostec Sergey Chemezov.

All key holding companies of the corporation, such as High Precision Weapons, UralVagonZavod, Tecmash, TsNIITochMash, Russian Helicopters, United Engine Corporation, KRET, Ruselectronics, Shvabe and Avtomatika, were presented at the Forum.

Among the new products presented at the Rostec's exhibition were the unmanned 57 mm autocannon module AU-220M for land and naval platforms, POST-ZM signals intelligence station, Sosna missile system on the tracked BMP-3 chassis, Typhoon-K armored vehicle with Kornet-EM ATGM, military robot system Paladin, new 125 mm tank ammunition, Korsar UAV and new firearms, including several modifications of the Udav pistol.

The International Military-Technical Forum ARMY-2019 was held on June 25-30 at the Patriot congress and exhibition center of the Russian armed forces located in Kubinka, near Moscow. This year, around 1500 companies and over 1 million people were participated in the Forum.

NEW RUSSIAN HELICOPTER

The VR-Technologies design bureau of the Russian Helicopters holding company (part of Rostec State Corporation) presented a model of a light multipurpose helicopter VRT500 at Fuorisalone exhibition, which was taking place during Milan Design Week from April 8 to 14. The model was demonstrated at the exposition of the ItalDesign company, which was one of the developers of the VRT500 design. This engineering company was mainly known as an automotive designer. Since it had been found in 1968, ItalDesign has been involved in the development of a wide range of concept cars and the production of automobiles, among them international giants such as Alfa Romeo, BMW, Ferrari, Lamborghini, Maserati.

'VRT500 became a competitive product in the market of light single-engine helicopters and allowed the holding to enter the segment in which it was not yet represented. 'Helicopters of Russia' was considering Europe as a potential market, and therefore we planed to apply for helicopter certification to the European Aviation Safety Agency (EASA) this year, and to begin testing the first prototype in 2020', said Alexander Okhonko the CEO of VR-Technologies.

To this date, specialists of Russian Helicopters have begun developing the working design documentation of VRT500. The release of the first production VRT500 helicopter is scheduled for the end of 2021.

The VRT500 is a lightweight single-engine helicopter with a coaxial propeller layout and a take-off weight of 1600 kg. The machine has the most spacious passenger class cabin in its class with a total passenger capacity of up to five people and is equipped with a modern complex of interactive avionics. The helicopter can reach speeds of up to 250 km/h, have a flying range of up to 860 km, and take up to 730 kg of payload on board.

Breakthrough Products Presentation

Rosoboronexport (part of the Rostec State Corporation) is providing support to the largest international exhibitions of armaments and military equipment, which are to be held in Russia in 2019. The company is sponsoring the International Maritime Defence Show 'IMDS-2019', the International Aviation and Space Salon 'MAKS-2019', as well as the International Military-Technical Forum 'ARMY-2019'.

'The Maritime Defence Show, ARMY and MAKS are always memorable and meaningful events, which are attended by practically all our foreign partners and potential customers from the majority of the world regions. Here one can see all the trends of the Russian defence industry, assess the highest level of the development of technologies and design ideas. Rosoboronexport is an inherent participant and a traditional supporter of these exhibitions, which consistently enter the TOP-5 of the largest world shows in their respective segments. They constantly give us the maximum monetization out of all the exhibition events in the world,' said Rosoboronexport's Director General Alexander Mikheev.

The International Military-Technical Forum 'ARMY-2019', which will be held on June 25-30, presents the key newly-designed export products and bestsellers of the Russian defence industry for all the services and branches of the armed forces, as well as for special operations and anti-terrorist units.

This year the visitors of the ARMY will have an opportunity to see in the 'Patriot' park a number of newly-designed products, which are of a potentially breakthrough character for the world market, i.e. the Kalashnikov assault rifles of the newest 200th series, new generation special vehicle 'Tigr-2', the 'Viking' and 'Tor-E2' air defence missile systems, combat vehicle of a squad equipped with the 'Gibka-S' MANPADs, means to counter unmanned aerial systems, as well as new solutions in the area of electronic countermeasures.

For sure, the guests' attention will be drawn by the world famous brands, e.g. air defence missile system S-400 'Triumph', air defence missile and cannon complex 'Pantsir-S1', anti-tank missile systems of the 'Kornet' family, the 'Terminator' fire support combat vehicle and many other new products in the area of fire arms and close combat assets.

A number of newly-designed products are also prepared for the representatives of the naval forces of foreign states, who will visit the International Maritime Defence Show in Saint-Petersburg on July 10-14. The manufacturers will display the full-scale specimen of the 'Rubezh-ME' coastal missile system, multi-purpose integrated radar system 'Zaslon', air defence missile system 'Redut', different ships of Russian production, including the 'Karakurt-E' small missile ship of project 22800E.

For the delegations representing air force and for all the guests of the International Aviation and Space Salon 'MAKS-2019' in the Moscow region's town of Zhukovsky on August 27 – September 1, the following pieces of equipment will be presented: the newest Su-57 fighters of the fifth generation, light military transport aircraft Il-112V, multipurpose supermanoeuverable fighters Su-35 and Su-30SM, training aircraft (combat trainers) Yak-130, combat helicopters Mi-28NE and Ka-52, military transport helicopters Mi-171SH and Mi-17V5, and other aviation systems.

'For Rosoboronexport, the International Maritime Defence Show, MAKS and ARMY are an important marketing tool. We invite to them the maximum number of foreign delegations, which have a perfect opportunity to satisfy the needs of their defence and law-enforcement agencies in the sophisticated Russian materiel, to receive as much detailed consultations as possible, related to the distinctive technical features of the weapons, as well as to the modalities and particularities of their combat use,' added Alexander Mikheev.

HIGHLY MOBILE TWO-COORDINATE SURVEILLANCE AND TARGET DESIGNATION RADAR P-18-2 ('PRIMA')

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.

/IA&TG/

MILITARY TECHNICAL COOPERATION

In the Kremlin, Moscow, Vladimir Putin chaired a meeting of the Commission for Military Technical Cooperation with Foreign States.

The meeting was attended by Chief of Staff of the Presidential Executive Office Anton Vaino, Presidential Aide Yury Ushakov, Deputy Prime Minister Yury Borisov, Foreign Minister Sergei Lavrov, Minister of Industry and Trade Denis Manturov, Defence Minister Sergei Shoigu, Director of the Federal Security Service Alexander Bortnikov, Director of the Foreign Intelligence Service Sergei Naryshkin, Director of the Federal Service for Military Technical Cooperation Dmitry Shugayev, Rostec State Corporation CEO Sergei Chemezov, Deputy Head of the Presidential Foreign Policy Directorate Igor Nagorny and Deputy Finance Minister Leonid Gornin.

In the beginning of the meeting President of Russia Vladimir Putin said: 'I would like to note from the very beginning that we exceeded the target for 2018 military goods deliveries abroad by two percent; this was made possible by consistently implementing the decisions we adopted at our previous meetings.

Financial indicators of military technical exports have been growing for over three years in a row now and have almost reached $16 billion. At the same time, we retained positive dynamics in the first five months of 2019.

Foreign currency revenues from the export of military goods soared by 45 percent, while the overall portfolio of contracts reached almost $54 billion, hitting an all-time high. Russia confidently takes second place on the global arms market.

Speaking of our tasks, I would like to note that the streamlining of financial, economic, organisational and other mechanisms of military technical cooperation is our key objective.

> ***'We exceeded the target for 2018 military goods deliveries abroad by two percent; this was made possible by consistently implementing the decisions we adopted at our previous meetings.'***
>
> *Vladimir Putin*

Apart from arms exports, including those of the most advanced models, we need to more actively upgrade previously delivered equipment, set up service centres on the territory of customer states, and reduce repair-service deadlines.

It is important to expand the successful cooperation experience in the field of manufacturing arms and military equipment. We need to continue implementing joint R&D projects and transferring Russian technology to customers wherever this meets mutual interests. We realise that many of our partners are seriously interested in this. We need to pay more attention to our partners' wishes to establish their own defence industry.

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>
> *Vladimir Putin*

It goes without saying that matters linked with strengthening the military technical potential of the Collective Security Treaty Organisation and helping its member countries strengthen their defence capability require high-priority attention.

We need to consider new factors complicating our work with partners in the military technical cooperation sphere, including a tougher competition struggle and the increasingly aggressive use of unfair methods of political blackmail and sanctions, plus we need to respond adequately to them.

Therefore a new military technical cooperation strategy stipulating well-coordinated political and diplomatic, financial economic and technical measures has been drafted in order to more effectively organise our entire activities in the field of military technical cooperation with foreign states.

We have to do everything possible to preserve Russia's leading positions on the global arms market. I suggest that we conduct a detailed discussion of this document today in precisely this context and specify various priorities and guidelines of further expanding military technical cooperation with foreign states. /IA&TG/

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>
> *Vladimir Putin*

MAIN TOPICS

FSMTC OF RUSSIA

Dmitry Shugaev: 'Our military equipment is highly efficient, quite easy to maintain and is much better than its competitors in terms of its unsurpassed ability to operate in severe geographical and weather conditions'

In accordance with the law of the Russian Federation, activities in the field of military-technical cooperation (MTC) with foreign countries shall be controlled and supervised by the Federal Service for Military-Technical Cooperation (FSMTC of Russia) that, among other things, shall ensure implementation of basic principles of the Russian government policy in the field of MTC. Dmitry Evgenyevich Shugaev, the Director of FSMTC, discusses main directions and tendencies in development of military-technical cooperation between the Russian Federation and foreign countries, the peculiarities of Russian military purpose product exporters' activities at the present stage in his interview to our magazine.

– Mister Shugaev, many countries need defense exports to capitalize on the economy of scale effect and make their systems more affordable. At the same time there is a considerable political component to arms trade. As for Russia is it more of a political or a commercial issue today?

– Well, the military-technical cooperation (MTC) is in essence a special area where economic and political interests of a country intertwine. It is the same for the majority of the countries no matter whether they export or import military purpose products (MPP). The economic aspect of MTC is certainly extremely important. Along with the scale effect, which you have aptly mentioned, for any country, not excluding Russia, successful military-technical cooperation contributes to the federal budget and helps us modernize the national industry. It is no secret that export contracts ensure work-load for domestic industrial enterprises all over our country increasing production and creating jobs. Importantly, global competition of defense producers forces them to analyze success stories of rivals as well as the requirements of their partners so that they can better understand global industrial and technological trends.

At the same time even from the economic point of view the military purpose products' market is substantially different from other global markets such as raw materials, end-goods and services. First, fluctuations are quite rare in global arms trade while military purpose products are traditionally in high demand. However, the demand for arms is usually subject to the influence of such factors as national armies' modernization programs, importer states' overall economic stability and, in particular, funds allocated to purchase arms. So, evidently, even in economic terms arms market is influenced by both economic and political factors.

And, of course, MTC is an extremely 'sensitive' area. Both for the Russian Federation and for any other leading exporter of military purpose products it remains an important foreign policy tool.

Therefore, it will be correct to say that in pursuing our military-technical cooperation with foreign states Russia proceeds from its strategic interests that have both an economic and a political component.

– What are the principles, the system of cooperation in the field of MTC is based on today?

– Today the system of military-technical cooperation of Russia is built as a vertical relationship where Rosoboronexport is the only exporter of final military purpose products. Concurrently, there is also a number of entities in the field of military-technical cooperation of Russia that are authorized to provide service of the equipment previously purchased by customers, to upgrade it and to supply spare parts for this equipment. These, in particular, include such integrated structures of the defense industry as the United Aircraft Corporation, the United Shipbuilding Corporation, Almaz – Antey Air and Space Defense Corporation and others. They obtained this right to service their equipment supplied to foreign customers as they represent defense industry itself, they embrace the factories that manufacture spare parts, components, etc.

Federal Service for Military-Technical Cooperation is an agency that controls and supervises all the activities related to military-technical cooperation and issues licenses. From strategic point of view the FSMTC of Russia plays the role of government policy 'conductor' in the field of military-technical cooperation and acts as a controlling and licensing agency at the same time.

Major areas of FSMTC of Russia activities shall be:

To perform control and supervision functions in the area of military-technical cooperation in compliance with laws of the Russian Federation; efficient functioning of the MTS system; implementation of MTC related international treaties;level of foreign trade prices for military purpose products.

Decision making on MPP import and export; issue of licenses for MPP import and export; authorizing MPP developers and manufactures to conduct foreign trade operations to supply spare parts and support materiel to MPP, their repair, certification, etc.;

Consideration of applications from foreign customers, their registration, record and control over their implementation;

Record and registration of foreign trade contracts;

Maintenance of the register of MTC entities and issue of appropriate certificates to them.

'Russo-Turkish military-technical cooperation is fairly dynamic: the Turkish Armed Forces currently operate Russian-made APCs, helicopters, anti-tank missile systems and small arms of different designs. We also have joint projects in various phases of implementation and discussion.'

However, all decisions regarding final supplies anyway are made at the highest level in Russia. That is, either an appropriate ordinance or instruction of the President or the Russian government should be issued. That's why I call it a 'vertical type of relationship.'

– How can you describe the development and dynamics of Russian activities in the field of MTC?

– First of all, I'd like to note that Russia is second in the list of world top exporters of military purpose products. It is not a secret that part of our export is made up by aviation equipment; export of the equipment related to aviation varies in the range of 40-50% of the total volume. Of course, we positively appreciate this fact, and we wish exporters of other weapon types to achieve these figures as well.

At the same time we understand, that the market of military purpose products (MPP) is a very specific market having cyclic nature. A number of factors should be taken into account, including rearmament programs of armies, financial solvency of countries depending on their general economic health. Therefore, we do not expect any abrupt jumps, we are building long-term relationships that allow us to speak with confidence about stable growth of export supplies.

It is important to participate in long-term programs, providing technical support to our clients and creating maintenance stations with an understanding that many of our clients aspire to improve their own industry, for example.

– What trends currently drive the development of Russian arms exports?

– Russia is a world-leading arms exporter. If we are to analyse Russian military exports over the past several years, the country has reached a steady level of weaponry and hardware exports at some 15 billion dollars per year.

Despite the sanctions which the USA and its allies keep piling up on Russia's defence companies and banking sector, and the threat of similar sanctions being introduced against our foreign partners, Russia continues successful military-technical cooperation with foreign countries in keeping with national norms, in strict adherence to the rule of international law, and in full conformity with its contractual obligations.

– Which classes of weapons and military hardware are particularly popular with foreign customers?

– Historically, or air force, air-defence and army equipment enjoys the greatest international demand. These three segments used to account for some 90% of Russia's entire arms export portfolio. We predict further growth in the military aviation segment, including as regards rotorcraft. We also expect an increase in orders for air defence systems. There is also good reason to expect the naval market to grow as the leading world powers are demonstrating an increasing interest in upgrading and bolstering their navies.

– You have mentioned the projected growth in demand for air defence systems. Which objective advantages make Russian systems particularly appealing in this segment?

– The experience of contemporary local conflicts demonstrates that the side which commands the more powerful air defences usually has an edge over the adversary. It is, therefore, only natural for Russia, which is a world-leading manufacturer of advanced air defence systems, to be looking to capitalise on this advantage in the global arms market.

This market segment is highly competitive. There are a number of countries that used to import air defence systems but are now entering the international market with indigenous products. These include India, South Korea, Turkey and South Africa, which could become our rivals in the future.

Despite the broad choice of air defence systems available in the global arms market, Russian products enjoy a steady demand. They surpass foreign equivalents in a number of important technical parameters, and their price is also more appealing. The optimal combination of these characteristics is what ensures the steady global popularity of our products, as conceded by US and West European military experts.

Foreign customers note that Russian air defence systems meet the highest contemporary requirements. They appreciate the reliability, low maintenance and excellent repairability of Russian products. In addition, Russia offers a broad range of air defence equipment, from complex solutions to more affordable but nevertheless equally effective options for those governments which require protection of their airspace while not commanding significant financial resources.

The greatest international demand is currently observed for the Kub, Buk, Tor-M2E and S-300PMU SAM systems; for the Pantsir-S1 gun-and-missile system; and also for the S-400 and S-300VM Antey-2500 SAM systems. The S-300PMU Favorit and the S-400 Triumf are worthy of special mention. They have performed excellently in actual combat environments in Syria.

'We do not differentiate between countries that are members of military blocs and the rest of our customers. Russia sets no additional politico-military conditions in its bilateral relations when it comes to military-technical cooperation. Our country is open to mutually beneficial cooperation with all countries, irrespective of their affiliation with any military alliances.'

– How difficult is it for Russia to export weaponry and military hardware to countries that are members of military blocs (such as NATO)? Is politico-military affiliation a serious obstacle for those countries interested in procuring Russian weapons?

– We do not differentiate between countries that are members of military blocs and the rest of our customers. Russia sets no additional politico-military conditions in its bilateral relations when it comes to military-technical cooperation. Our country is open to mutually beneficial cooperation with all countries, irrespective of their affiliation with any military alliances.

That said, the global arms market generally remains highly politicised. Quite illustrative in this respect was the introduction of sanctions against Russian defence enterprises by the NATO member states and their allies. The sanctions have caused direct economic damage to many hi-tech manufacturers in NATO countries. This is why the political component and bloc mentality should not be disregarded.

Nevertheless, Russia is prepared to continue dialogue on military-technical cooperation with all interested partners. We continue such cooperation with Bulgaria, Greece, Slovakia and Turkey, all of which are NATO member states, and we discuss further prospects of this cooperation with the respective governments.

/IAATG/

The Federal Service for Military-Technical Cooperation (MTS) is a key element of the power vertical managing the MNS system. As federal executive authority. Federal Service for Military-Technical Cooperation (FSMTC of Russia) performs MTS control and supervision functions. FSMTC of Russia reports to the Russian Federation President. FSMTC of Russia is subject to jurisdiction of the Russian Federation Defense Ministry.

ROSOBORONEXPORT at MAKS-2019

Newest Russian Military Aircraft for Foreign Partners

Rosoboronexport (part of the Rostec State Corporation) will make presentations of the Russia's latest combat and transport aircraft at the MAKS 2019 International Air Show. The Su-57E fighter (manufactured by KoAAP named after Yuri Gagarin) and the Il-112VE military transport (built by VACM) will be the centerpieces of the military part of Russia's display at MAKS-2019.

'MAKS is a traditional platform for aviation premieres. This year, Rostec's display includes 250+ new models of aircraft, avionics, aircraft engines and airfield equipment, including over 40 items that are being showcased at MAKS for the first time. I am sure these products will attract a lot of attention of our foreign partners,' said Rostec CEO Sergey Chemezov.

'At MAKS-2019, Russian manufacturers will be unveiling the fifth-generation Su-57E multi-role fighter jet and the Il-112VE light military transport aircraft, the hottest and most anticipated new products of recent years. Rosoboronexport is ready, at the request of foreign partners, to present these aircraft and turn a new page in promoting state-of-the-art aircraft systems in the world market. I'm sure the interest in them will be massive,' said Alexander Mikheev, Rosoboronexport's Director General and Deputy Chairman of the Russian Engineering Union.

The advanced Su-57E fifth-generation fighter jet from Sukhoi (a subsidiary of the United Aircraft Corporation) and the Il-112VE light military transport aircraft from Ilyushin (a subsidiary of the United Aircraft Corporation) have received the necessary export permits and Rosoboronexport has the right to offer them to foreign customers.

The Su-57E is a fifth-generation multi-role aircraft system designed to accomplish a wide range of missions against air, ground and surface targets. It can be used in any weather, day or night, and in a severe jamming environment.

Its main advantages compared with 4th generation aircraft systems are stealth due to a reduced radar and infrared signature, high immunity of both avionics and aircraft armament system, as well as a strong supersonic cruise capability.

At the same time, the latest Russian fighter surpasses 4++ generation aircraft in terms of key properties:

- multi-mission capability;
- automation and AI technologies incorporated into target engagement processes;
- all-azimuth and multiple target capability, the use of long-range precision-guided weapons;
- super-maneuverability.

The set of features of the Su-57E fighter gives it superiority over the fifth generation aircraft available on the market today at a lower life cycle cost. This fact has been recognized by many world experts in weapons and military equipment.

The Il-112VE light military transport aircraft is the export version of the Il-112V developed for the Russian Air Force and intended for the transportation and airdropping of cargo, vehicles, equipment, ammunition and personnel.

The major competitive advantages of the Russian Il-112VE light military transport aircraft are:

- versatility enabling a wide range of transport missions, including airdropping of cargo and special forces groups, transportation of personnel with organic weapons, delivery of weapons, ammunition and materiel, casualty evacuation, etc.;
- state-of-the-art avionics that makes it possible to perform combat missions day or night, in any weather and in different climatic conditions;
- the dimensions of the cargo compartment of the Il-112VE expand the capabilities for transporting cargo, including self-propelled and non-self-propelled equipment;
- the Il-112VE is equipped with two new higher-power and more fuel-effi-

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Rosoboronexport is the only state-owned arms trade company in the Russian Federation authorized to export the full range of military and dual-purpose products, technologies and services. It is a subsidiary of the Rostec Corporation. Founded on 4 November, 2000, now Rosoboronexport is one of the leading world arms exporters to the international market. Its share in Russia's military exports exceeds 85 percent. Rosoboronexport cooperates with more than 700 enterprises and organizations in the Russian defence industrial complex. Russia maintains military technical cooperation with more than 100 countries around the world.

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cient engines, the TV7-117ST, and AV112 propellers controlled by a single automatic control system which increases flight safety and provides high take-off and landing performance allowing the aircraft to be operated from short runways, including unprepared fields;

- on-condition maintenance of the Il-112VE obviates the need for major overhauls, which ensures that the required level of equipment operational readiness is maintained at minimum operating costs within the service life limit of 30,000 flight hours or for 30 years;

- the presence of advanced handling and drop equipment on board the aircraft that allows loading and unloading without the use of additional special equipment;

- compliance with ICAO flight accuracy and safety;

- capability to operate independently, including from unimproved airfields.

It is important to remember that only Rosoboronexport has the right to supply the world market with a full range of arms and military equipment manufactured by Russia's defense industrial complex and approved to be exported. Rosoboronexport accounts for more than 85% of Russia's arms exports. Rosoboronexport is among the major operators in the world market for arms and military equipment. Last year Rosoboronexport marked its 18th anniversary.

Rosoboronexport was set up by RF President's Decree as a federal state unitary enterprise tasked to implement the national policy in the area of military-technical cooperation between Russia and foreign countries. Since 1 July 2011 Rosoboronexport has been operating as an open joint stock company. Rosoboronexport operates under the strict supervision of the Russian President, the Russian Government and in full conformity with the UN arms control treaties and the relevant international agreements.

The official status of the exclusive state intermediary agency gives Rosoboronexport unique opportunities to expand long-term mutually beneficial cooperation with foreign partners, provide guaranteed state support of all export-import operations, and strengthen Russia's leadership in the world arms market.

Core areas of activities of Rosoboronexport

- **Export / import of all types of conventional weapons, military and dual-use equipment and services.**
- **Organization of licensed production of armaments and military equipment abroad, joint R&D efforts with foreign partners.**
- **Maintenance and repair of earlier supplied weaponry and military equipment.**
- **Modernization of Russian-made weapons and military equipment.**
- **Training foreign specialists in Russia and customer countries in the operation and maintenance of supplied military equipment.**
- **Technical assistance in the construction of military infrastructure facilities: defense plants, airfields, depots, ranges, training centers.**

The main result of biography of Rosoboronexport, despite the difficult economic conditions and fierce, often unfair, competition in the global arms market, that company have managed not only to carry its sales, but also significantly enlarge its footprint in the traditional and new arms markets. Through integrated marketing strategies, company have ensured that order book today exceeds US$ 46 billion.

The special exporter makes painstaking efforts on a daily basis to increase Russian arms exports resulting in more than a thousand contract documents signed with foreign customers every year. Over the period of its operation in the international market, Rosoboronexport has delivered hundreds of thousands of units of military equipment and weapons worth more than US$ 120 billion to 115 countries.

Rosoboronexport pays great attention to both major billion dollars contracts and small deals. The company seeks to operate flexibly and efficiently by using modern and advanced marketing and customer settlement methods. The special exporter cooperates with more than 700 Russian defense-industrial enterprises and organizations, which enables it to offer partner countries the comprehensive and cost-effective solutions for strengthening their defense capability and national security.

By concluding export contracts, Rosoboronexport supports the Russian defense industry, which is especially important under difficult conditions in the global market. High-tech products are in increased demand in the world arms market today and thus the company is interested in developing smart manufacturing in Russia. In addition, Rosoboronexport is actively involved in a number of charitable and sponsorship projects. The company provides assistance to military hospitals, military historical museums, and children's educational institutions. Rosoboronexport supports major sporting events and various sports federations, acts as sponsor and partner of the largest industrial exhibitions and cultural events held in Russia and abroad.

Rosoboronexport pursues a marketing strategy targeted to expand the geography, range and volume of export deliveries. A number of special programs and projects for exporting products to specific countries have been developed based on a comprehensive analysis of the arms markets and foreign partners' needs. Rosoboronexport seeks to operate flexibly and efficiently in the market, using modern and advanced marketing and customers' settlement methods.

Foreign customers are offered package solutions for national systems intended to defend land, air and seaside borders, which feature the optimal trade-off between cost and performance. These solutions may include both the supply of military products and services and organization of licensed production in customer countries, the setting-up of joint ventures to manufacture and maintain equipment, as well as joint R&D efforts. Rosoboronexport widely uses the optimal offset programs. With regard to foreign customers' interests and the opportunities of the Russian defense industrial complex to increase its exports, Rosoboronexport pays much attention both to major billion-dollar contracts and small deals worth the hundreds of thousands to several millions of dollars.

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MAJOR CONTRACTS

Rosoboronexport Delivers the First Batch of the S-400 Package to Turkey

The first batch of the S-400 Triumph long-range SAM system, designed by the Almaz-Antey Air and Space Defense Corp., was delivered to Turkey. The contract for the delivery of the S-400 Triumph was signed by Rosoboronexport in Moscow in April 2017. By far it is the largest ever export contract signed with a NATO member.

'Rosoboronexport met the first part of its obligations to the Turkish partners. Since July 12, a total of 30-plus special flights have been provided to carry the first batch of the package to Turkey. Part of Turkey's specialists have already received training in Russia. The rest will be delivered according to the schedule approved by the parties. While we are at this, most of the customer's group of specialists will receive training in maintenance and operation of the system. Today we are negotiating further cooperation in this line to include the option of setting up licensed production of specific elements of the S-400 in Turkey,' – says Rosoboronexport's Director General and cochair of the Russian Engineering Union Alexander Mikheev.

'The S-400 deal has gone a long way in strengthening not only Turkey's air defense, but the strategic partnership between our countries as well. Both countries enjoy full-fledged mutual confidence. Rosoboronexport is resolved to pursue every possible line of cooperation to broaden contacts with Turkey, implementing mutually-beneficial projects in several spheres to include helicopter-building, combat aviation, and air defense,' added the company's head.

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>
> *Alexander Mikheev*

> ***'Rosoboronexport already has concrete results of its efforts to promote civilian and service weapons: in 2018, we signed the first export contract for the supply of Russian hunting sniper rifles and ammunition. Today we have new serious customers from the countries of the Asia-Pacific region and the Arab East, there are requisitions from them. Moreover, Rosoboronexport is ready not only to supply finished products to the world market, but also to assist foreign partners in the joint development and production of Russian weapons. For example, in March 2019, a joint venture to produce Kalashnikov assault rifles of the latest AK-200 series was launched in India.'***
>
> *Alexander Mikheev*

The major advantage of the S-400 is its versatility. The system has everything there is to fight all types of aerodynamic threats, as well as ballistic missiles, even mid-range ones. The Triumph is superior to its foreign counterparts in major features several times over. Besides, the system can be integrated into global national AD systems, incorporating elements and components originated in other counties, without compromising its performance.

Besides it during the Army 2019 International Military and Technical Forum being held in Kubinka near Moscow, JSC has signed a number of contracts with foreign customers for the supply of Russian small arms and close combat weapons.

'The Russian industry produces the entire range of close combat weapons, which have proved indispensable in real combat situations, earning excellent reputation and respect around the world. The new contracts not only demonstrate consistently high demand for small arms and grenade launchers and their ammunition being developed by Russian arms makers, but also indicate a global trend towards a growing demand for effective means to counter terrorism and crime. Rosoboronexport is ready to meet this demand fully,' said Alexander Mikheev, Director General of Rosoboronexport.

In addition, Rosoboronexport has been conducting active marketing efforts to export Russian-made civilian and service weapons: dozens of commercial proposals related to the ORSIS T-5000 rifles, Saiga-9, Saiga-12 carbines, many other designs and their ammunition are under consideration by potential foreign buyers. There is also interest among foreign customers in the Vepr carbines and civilian versions of the Tigr sniper rifles. It's because of the high demand that a new section on Russian-made civilian and service weapons has started to be set up by Rosoboronexport on its website.

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/IAATG/

The TOR – UNIFIED and MANY-FACED

IEMP Kupol being the heading enterprise on development and production of short range surface-to-air missile systems of the TOR family makes great efforts to create the SAM systems unified in the most of assemblies and devices, but ready to effective application in various fields.

The TOR – UNIFIED and MANY-FACED

One of the most critical goals for the defense industry is creation of unified weapons. Unification enables raising serial production that decreases the manufacturing cost of products. But development of weapons dedicated for Army and Naval forces leads to rising in the cost of them. Therefore the weapon manufacturers face regularly the task of unification. However as military equipment and its missions is becoming more complicated it becomes increasingly difficult to achieve equally successful functioning of weapons in various fields of application. Nevertheless the existing examples prove that the task can be solved. One of this kind of examples is the work of Izhevsk electromechanical plant Kupol (included into Almaz – Antey ASD Corporation).

IEMP Kupol being the heading enterprise on development and production of short range surface-to-air missile systems of the TOR family makes great efforts to create the SAM systems unified in the most of assemblies and devices, but ready to effective application in various fields.

Thus, in 2017 the Tor-M2DT SAM system was adopted by the Army. This system is significantly unified with the basic version of the Kupol-made SAMS Tor-M2, but intended for use in different climate and terrain features: in High North, under conditions of low temperatures and total lack of roads. Arctic Tor has all the properties of the basic version but it is ready to demonstrate them under much more severe conditions. First batteries of the Tor-M2DT have been sent already to the units of Northern naval, deliveries are continued in the current and next years.

Other representative of the IEMP Kupol main products range – the Tor-M2K SAMS – on the contrary is intended for use in areas with well developed network of paved roads. Its detection and combat facilities are mounted on the wheeled chassis making over 80 km/h. In recent trials this system has proved its ability to fire on the move.

Another SAMS of the Tor family, Tor-M2KM, does not have chassiss at all, that makes it lighter, lower in production cost and more convinient for transportation. This is self-contained combat module which is intended particularly for defense of on-site facilities and use in hard-to-reach places. Also due to the convenient placement on the railway plartform the Tor-M2KM SAMS combat module can provide air defense for the Railway troops. And in 2016 unique tests of the 'ground' SAM system took place on the high sea. Self-contained combat module Tor-M2KM was mounted on deck of frigate Admiral Grigorovich moving at a speed of 7-8 knots. Two types of training targets created the air situation. Target-missile Saman simulated an anti-radar missile. The second training target simulated an anti-ship missile of Harpoon type, flying at an extremely low altitude (4.5 – 5 meters) above the sea level. The system completed work on two targets successfully. Commission for the holding of the system fire tests assigned by Captain General of the Naval Forces recommended using the Tor-M2KM SAMS for organization of air defense of the NF most important facilities (air-and-naval bases, ports, maritime convoys etc.) to reinforce air defense of ships being in operation.

Thanks to continuous modernization of SAM systems of the Tor family they have been remaining the best in the world in their class for the past three decades already. The up-to-day Tor-M2 SAMS is capable of acquisition of air-attack means at range of 32 km and hit them at range of 16 km at altitude of to 12 km when cruise parameter is ±9.5 km. In the most dangerous close zone – up to 7 km in range and to 6 km in altitude – the SAMS can hit the targets with scattering cross-section of 0.1 m2 flying at speed of up to 700 m/s. Maximum number of target marks processed simultaneously is 144, reaction time of the system is 5 – 10 s, time interval between launches of SAM guided missiles is 3 seconds. Four air targets (within the sector 30x30o) can be fired at the same time. Ammunition equipment is 16 surface-to-air guided missiles 9K338.

Hitting probability is close to 100%, that prompted to refuse the practice of simultaneous fire on one AAW (air assault weapon) by two SAMs, nowadays the Tor systems work on principle: 'one target – one missile'.

Unsurpassed performances of these systems were confirmed during many tests and exercises as well as in combat situation. The Tor family SAMS are in service with the Russian Army and Armies of a number of foreign countries. In the course of current technical reequipping of armed forces for purposes of GPR-2011-2020 (government program of re-equipment) Izhevsk Electromechanical plant Kupol delivered to military forces great amount of its systems. All shipments were carried out on time or ahead of schedule, that demonstrates dramatically the reliability of the plant and its production stability.

IEMP Kupol traditionally displays its products at the first-rate defense shows. This year the military products range of Izhevsk plant can be seen at international aerospace show MAKS-2019.

/IAATG/

DEFENSE MASTERPIECES

Russian High-Precision Weapons Holding

In February of this year, the High-Precision Weapons Holding (a part of the Rostec Corporation) was celebrated the 10th anniversary of its work on the global market. Years by years Holding plays an increasingly important role on the world arms market. The holding is the Russian largest developer and manufacturer of the most modern and innovative high-precision weapons. The importance and potential of the Russian holding increase worldwide as well: On a scale of the top 100 weapons manufacturers in the world, the Stockholm International Peace Research Institute (SIPRI) rates the 'High-Precision Weapons Holding' from Russia at 39.

Also every year Holding is increasing deliveries both to the Armed Forces of the Russian Federation and to the foreign market. According to an SIPRI expert, 'the Russian companies ride the ground-swell of boosts in military spending and arms export. Eleven companies from the top 100 list are Russian ones. Their income has increased by a total of 48.4%'. It also can be noted that the 'High-Precision Weapons Holding' belongs to the top 10 world's defensive rankings by an overall production and supply increase rate.

The High-Precision Weapons Holding was founded in 2009. The holding consists of a number of largest leading defense enterprises that are well known on the world arms market. It is sufficient only to mention such brands as the Shipunov KBP Instrument Design Bureau, the Tula Arms Plant, The Tulatochmash, the Nudelman Precision Engineering Design Bureau, the Kovrov Electromechanical Plant, the V.A.Degtyaryov Plant, the VNII 'Signal' and others. Most of them are national and international leaders in their segments.

The products of the holding's companies are well known on all continents and much sought after on international arms markets. Interest in the products of the 'High-Precision Weapons Holding' grows due to the objective situation.

The exports of the holding are based on warfare systems well known on the international market such as Pantsir-S1, Palma, Kornet-E/EM, Konkurs, Metis-M1, Igla-S, Arkan, Verba, Shmel, Kapustnik, and others as well as on training systems, armored vehicles upgrade, and so on.

The holding's products are well known and much sought after on the markets in the Middle East, the Gulf, Northern Africa, Latin America, India, Central and Southern Africa. The holding is constantly expanding the geography of its exports. This is due to product line extension, development of new models and upgrade of products in demand as well as well thought-out service policy.

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It is evident that the demand for high-precision weapons only increases around the world. They do not miss. They are mobile, fast, maintenance-friendly, reliable, and the most modern.

The newest technological solutions are used. 20 years ago, the proportion of high-precision weapons used in local conflicts amounted to up to 7%. In recent years, this share has increased by up to 90-95%. The most designs of the 'High-Precision Weapons Holding' are the best in the world and determine the technological vectors of development in their segments.

There is no doubt that the main task of the 'High-Precision Weapons Holding' is to strengthen the defense capability of Russia and to supply the Russian Army with the most modern and the most reliable high-precision weapons. Within the scope of the contract, the holding regularly transmits to the Russian Ministry of Defense the corresponding quantity of planned weapons. Due to the holding, the Russian Army is armed with the best weapons in the world. At the same time, it is important that the holding itself also supplies the same weapon to the world market, where it enjoys consistent success.

Middle East states are always been and remains the most important strategic partner of the High-Precision Weapons Holding. The participation of the holding's enterprises in IDEX-2019 is an important stage of friendly and mutually beneficial cooperation in defence area.

/IA&TG/

RUSSIA WILL BE THE STAR OF EURASIA AIRSHOW 2020

Eurasia Airshow 2020 will be held at Antalya International Airport on 22-26 April 2020. The aim of the event is to develop an extremely substantial business volume in commercial and military aviation industries. Furthermore, it is the only aerospace trade show to include flight demonstrations in Turkey.

It is important to underline that Eurasia Airshow has fully targeted the Eurasian market in terms of participants and achieved success in this regard. The Eurasia Airshow 2018 was attended by visitors from 67 countries, from Russia to Qatar, from Iran to UK, from Ukraine to Poland. Worldwide leading companies such as Boeing, Rolls-Royce, Sukhoi, UAC, Antonov, BAE Systems, Rostec, Saab, Qatar Airways, Thales, Honeywell, GE Aviation, Pratt Whitney, Dassault Systems, Goodrich, IRKUT have participated in the Eurasia Airshow 2018. And Turkish Local Industry has been successfully represented by Turkish Airlines, Turkish Aerospace, Aselsan, Havelsan, Alp Havacılık etc. In total 343 companies has contributed.

The Chairman of Capital Exhibition who organize the Eurasia Airshow Hakan Kurt said: 'We had an very succesful edition of Eurasia Airshow in 2018. Also Russian companies got really good deals. Especially for this year. Russia will be the star of the Eurasia Airshow 2020. Depends on the S-400 air defence systems deal and the upcoming fighter deal there will be very efficient deals on the ground (According to the S-400 air defence systems deal and the upcoming fighter deal we can say that there will be very efficient deals settled on the ground)'. Kurt continued: 'Eurasia Airshow will have more innovation, decision maker, delegation and business for their participants'.

Key Figures	Numbers
Countries	67
Company	343
Trade Visitor	27000
Public Visitor	106000
Trade Volume	$15 Billion
Delegation	163
Aircraft on static	81
Flight Demonstration	104
Accredited Media	253
Exhibition Area	410 000 sqm

Source: Eurasia Airshow 2018 Final Report

/IA&TG/

CIVIL AVIATION

SUPERJET 100

Sukhoi Civil Aircraft Company presents Russia's new-generation airliner

Russian company Sukhoi Civil Aircraft Company (SCAC) is engaged in promotion in the world market Russia's new-generation regional airliner Superjet 100 (SSJ100). Despite the fierce and often underhanded competition on the regional airliner market, 100-seater SSJ100 has undoubtedly carved itself a niche. SSJ100 commercial operation started in 2011 and as for May 2019 total flight hours surpass 570 000. More than 40 million passengers were transported by the SSJ100. There are more than 130 aircraft under operation. Interested potential customers are everywhere around the world, from Asia to Latin America. The global SSJ100 fleet grows steadily, including in the VIP configuration, and more carriers come to value the aircraft for its objective economic and technological advantages.

Objective advantages

The SSJ100 was developed, and is manufactured and marketed, by Russia's Sukhoi Civil Aircraft Company (SCAC). The airliner represents a successful blend of the national aviation industry's decades-long experience and the latest achievements in the broader aerospace domain. The SSJ100 offers unsurpassed passenger comfort, significant cost benefits for carriers, a highly ergonomic cockpit and maximum environmental friendliness.

The SSJ100 incorporates a number of innovative solutions that combine to make it one of the most convenient, comfortable and economical airliners in the world. The philosophy behind the SSJ100 comprises such principles as maximum passenger comfort, maximum revenue for the operators, the best onboard systems, high environmental friendliness, and maximally convenient maintenance for carriers.

The SSJ100 is the first 100-seat airliner to feature a full-fledged fly-by-wire system, which optimises control of the aircraft, reduces crew workloads and helps save fuel. The cockpit features intuitive control systems whose design is based on crew feedback and recommendations.

Passengers appreciate the spacious cabin, which offers the same level of comfort as the cabins of mainline aircraft. The SSJ100 has improved take-off and landing performance and can be operated in all weather conditions. All these factors enable operators to inaugurate new destinations and optimise their route networks and schedules.

The SSJ100 exceeds the ICAO noise and emissions requirements, resulting in a quieter and more comfortable cabin experience. Low fuel burn and low emissions are the key parameters making the SSJ100 one of the most environmentally friendly airliners.

The SSJ100 first flew in May 2008. Its maximum cruise speed stands at 0.81 M, and its cruise altitude is 12,200 m. The airliner's range is 2,960 m for the baseline version and 4,320 for the extended-range modification. The SSJ100 is powered by two SaM 146 turbofan engines. It features 1.5 tonnes lower CO2 emissions than the competition. The aircraft has been certified by AR IAC, EASA, and a number of national aviation authorities. The first production SSJ100 was put into operation in 2011.

The plane SSJ100 has a wide range of objective advantages.

Certification from IAC AR and EASA

The certification campaign was accomplished with four prototypes for flight testing and two prototypes for static and fatigue trials. The experimental flying jets have accumulated 2.594 flight hours in 1.087 flights. The number of testing programs totaled 200.

In February 2011 the Russian Certification Authority IAC AR presented Superjet 100 Type Certificate to Sukhoi Civil Aircraft Company. The Type Certificate confirmed compliance of the SSJ100 with the airworthiness regulations and it authorizes the commercial operation of the airplane.

SSJ100 is the first Russian aircraft to accomplish the full scope of the certification HIRF testing program. These tests were required to demonstrate that the aircraft's on-board systems, as well as electric and electronic equipments are not influenced by any external electromagnetic fields.

During the certification campaign the aircraft has completed the stringent program of certification which checked all the aircraft systems and the airframe well beyond the operational limits to be sure the passenger airplane meets all the airworthiness directives.

A year later, in February 2012, the European Aviation Safety Agency (EASA) issued its Type Certificate A-176 for the Superjet 100. This certificate recognizes that the SSJ100 aircraft demonstrated compliance with the EASA airworthiness and environmental requirements. The recognition allowed the European airlines, as well as those airlines operating in countries which use EASA regulations as a reference standard, to accept and operate the SSJ100 aircraft.

SSJ100 has become the first ever Russian passenger 'Large Airplane' to achieve the EASA CS-25 Certification.

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The EASA certificate, which is a validation of the certificate issued by the Interstate Aviation Committee Aviation Register (IAC AR), is the result of the vast certification campaign performed by EASA, IAC AR and SCAC in association with Certification centers and key aircraft systems suppliers.

The European validation started after IAC AR certification application in 2004 and went through in parallel with the Russia Certification process. The overall process allowed to assess the compliance with the strict European Airworthiness Code, resulting in the issue of the Type Certificate.

The European validation program included several dedicated flight and ground tests.

In particular the EASA pilots went through many sessions on the 'electronics bird' (SCAC integrated simulator and RIG for the SSJ100) and participated in 45 certification flights (total duration about 70 flight hours) in order to prove the safety and in-flight performance of the SSJ100 aircraft in any situation.

The ground tests covered, among others, the ultimate pressure load of the fuselage, the bird strike of the front upper cockpit panel, the broken-tire strike of the lower hatch cover of the wing fuel tank and the fire-resistance of the composite flap. In the frame of ten working groups ('Panels') 84 Certification Review Items and 60 Certification Action Items were analyzed, substantiated and agreed while more than 500 actions and questions received from the Authorities were timely and satisfactory closed.

Thanks to the experience and dedication of the fully integrated multicultural SSJ100 Team, the EASA Certificate has been granted only one year after the achievement of the IAC AR Type Certificate.

SSJ100 Systems Functioning

Since the very beginning there were toughest safety standards since the initial stages of the design applied towards every stage of the SSJ100 design, tests, production and certification. As the result, SSJ100 is certified not only by Russian but also by European aviation authorities. The tests showed that the impact of the lightning and the magnetic fields of high intensity do not bring to the onboard systems shut down – and this fully complies with the requirements of both Russian and European aviation authorities.

SSJ100 avionics informs the crew about entering the wind shear, and one of the functions allows foresee it during take-off and landing. Flight operation manual in both cases prescribes that the crew in case of wind shear should perform go-around flight manoeuvre.

The SSJ100 is equipped with the weather radar of the latest generation showing the pilots the real-time meteorological situation along the route. It provides the crew with the detailed information about the thunderstorm activity for the precise altitudes requested by the pilots. The lightning strike impact is both complex and dangerous, that is why IATA and ICAO strongly recommend to avoid entering the thunderstorm front.

The radio contact is secured by three independent VHFs. They guarantee the robust communication with the ground services. The location of the VHFs, antennas and the cable network is made in such a manner that in case of the lightning strike, bird strike or hail strike to one of the antennas two other would not run out of service. In case of all three VHFs failure the crew sets 7600 squawk code that means 'radio failure' and it is transmitted to the ground services, and proceeds with the flight procedure according to the national rules of flight. Depending on the situation, the crew might also transmit the code 7700 'Emergency' and 7500 for 'Hijack'. The terms of the usage are also given in the Flight operation manual.

At the aircraft control system transition to the 'direct mode' all the required flight characteristics from the point of view of safety are preserved. The transition from the 'normal mode' to the 'direct mode' is not registered as a failure. In this case, the precise elaborated and tested procedure of the Flight operation manual provides the pilots with detailed recommendations about the required flying technique (the approach speed, the increase of the landing distance, the additional restrictions). Flying in direct mode is included into the training program recommended to the Operator by the manufacturer of the SSJ100.

Besides, the aircraft is equipped with both visual and sound signalization alerts about the dangerous glidescope errors during the approach.

SSJ100 series design is constantly developing under permanent control of Russian and European aviation authorities. All the design, testing, certification and operation processes are strictly governed and are consistent with the requirements of airworthiness regulations AP-25 and CS-25. Inter alia the emergency landing situation with exceeding airframe calculated load was modelled for all cases: with withdrawn, with extended gear. According to the results of this scope of actions there are structural components added to the design (so-called 'weak spots') aimed at minimizing the consequences of the effects of the extreme loads to the airframe.

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Business versions

One of the factors increasing the airliner's appeal to potential customers is the deliberate expansion of the range of its applications and the number of available versions. As part of this process, VEB Leasing, United Aircraft Corporation (UAC), Vnukovo Airport's business aviation centre, Azimuth Airlines and National Reserve Corporation came together in Sochi in February 2019 to sign a letter of intent for the implementation of a domestic corporate charter project using SSJ100 aircraft.

Under the project, business-configured airliners seating up to 56 passengers will be utilised for ad-hoc, on-demand flights in the interests of major corporations, athletic teams, touring musicians and other entities interested in corporate transportation.

'UAC sees one of its key priorities in forming and promoting its range of civil aircraft products,' UAC President Yuriy Slyusar noted. 'The corporate charter niche is particularly appealing to us given its growth potential. Creating a corporate transportation platform with the use of the SSJ100 business variant is an important step in the development of our business. We believe this version of the aircraft can become a unique product that will provide for an optimal balance between the required comfort and economic effectiveness.'

The SSJ100 business variant is well known in the world: it has been promoted both in Asia and in Europe, and many potential customers have expressed their interest. One important factor here is that the aircraft's cabin is larger and more spacious than those of the comparable airliners in this class, providing for exceptionally high comfort and unrestricted possibilities (including as concerns cabin design and outfitting).

Industry expert believe the SSJ100 business version is currently one of the most advanced corporate jets. It combines ultramodern technology with a high level of passenger comfort, and its price tag is comparable to equivalent corporate jets. /IA&TG/

SCAC (www.scac.ru) was founded in 2000 specifically to develop and promote new civil aircraft models. The company is currently focused on further developing the SSJ100 in all possible modifications. SCAC is primarily engaged in the development, manufacture, marketing and maintenance of SSJ100 airliners. Its head office is situated in Moscow, and the production facility is in Komsomolsk-on-Amur.

MC-21: BETTING ON TECHNICAL SUPERIORITY

New jetliner from Irkut Corporation undergoes testing

Certification of the innovative passenger airplane MC-21-300 is to be completed in 2020, stated Yury Slyusar, President of the United Aircraft Corporation (UAC) and Irkut Corporation. Irkut acts as the prime contractor in the MC-21 Program. The plane is being developed by the Engineering Center located in Moscow. MC-21 is manufactured at the factory in Irkutsk, which also produces Su-30 family fighters and Yak-130 combat-capable trainer aircraft.

The MC-21-300 next-generation narrowbody jet shall win type certificate in 2020, says Yury Slyusar, President of the United Aircraft Corporation (UAC), who also heads Irkut Corporation, a member in UAC.

Irkut acts as the prime contractor for the MC-21 program. The Corporation's Engineering Center in Moscow is responsible for the design of the airplane, while the type's production line is set up at the factory in Irkutsk, which also makes the Sukhoi Su-30 family fighters and Yakovelev Yak-130 combat trainers.

The MC-21 manufacturer is well known in India. It supplied the Indian Air Force with an initial batch of the Su-30MKI fighters and assisted the Hindustan Aeronautics Limited (HAL) in mastering production of that type under license. In frame of the long-term Su-30MKI program, Irkut provides assistance to local maintainers in carrying out overhaul on Indian air force aircraft.

Today, certification trials involve two MC-21-300 operable prototypes, while a third, completed in the late 2018, is about to join in. The flight test program shall ultimately involve four aircraft.

Besides, two more MC-21-300 airframes have been built for ground testing at the Central Aerohydrodynamic Institute named after N.E. Zhukovsky (TsAGI). One of those has been under static tests since 2017. The other is being prepared for fatigue trials.

During flight trials, the operable prototypes climbed up to altitude of 12,500 m and accelerated to the speed corresponding to Mach number M=0.85. So far, the maximum duration of a test sortie has been 6.2 hours. The prototype aircraft successfully accomplished flight tests at high angles of attack, demonstrating safe recovery from 'stall' regimes.

Successful completion of flight tests and various trials on the ground in a volume required by the aviation authorities made it possible for the manufacturer to commence production of parts and assemblies for deliverable airplanes.

First shipments to customers are planned for 2020. The sales campaign passed a major milestone in 2018, when a contract with Aeroflot was signed. According to it, the national flag carrier and the leader of the Russian air transportation system shall receive fifty MC-21-300s by 2026. Initially, deliverable airplanes will come with a cabin configured for 16 business-class and 153 economy-class passengers. A high density layout also available for the MC-21-300 has a seating capacity of 211.

Airlines of various business models shall benefit from the MC-21 entering the air transportation market. The airplane offers the largest cross section among all contemporary narrow body jets and, therefore, makes it possible to better meet the specific requirements of airline customers. For instance, low-cost carriers (LCCs) will appreciate a cabin layout with a wide central aisle between the seat rows that can substantially reduce time for embarkation and disembarkation of passengers. Irkut hopes that the specious cabin and high comfort of the MC-21 will help airline customers win hearts and minds of the traveling public.

Low fuel consumption insured by a modern power plant of either U.S. or Russian origin is another MC-21's winning point. Customers can choose between the PW1400G-JM or PD-14, both being contemporary turbofans designed for highest fuel efficiency. For that same purpose, the MC-21 comes with a high aspect wing made of composite materials, the most advanced one for the given class of aircraft.

Simultaneously with flight testing and streamlining MC-21 serial production, the Russian aviation industry is striving to set up an aftersales support system to ensure seamless operation of modern jetliner types. Yury Borisov, deputy chairman of the Russian government, has said that this system shall commence functioning upon the MC-21-300 entry into service. Mindful of the MC-21 export potential, Irkut is looking for foreign partners to support aircraft operations in their region of the world.

Superb performance, specious high-comfort cabin, sales promotion measures (coming with special conditions for early customers) and a comprehensive customer care system make it possible for the MC-21 to capture a sizeable portion of the global market for medium range passenger jetliners. Plans call for a production run between nine and ten hundred MC-21s in the course of the next twenty years.

/IA&TG/

Sergey Kulik

SECURE RESCUE AT ANY HEIGHT

Unique autonomous rescue parachuting back-pack system for emergency escape

The innovative Russian private Space Rescue Systems Ltd. (SRS Ltd.) company (www.cosmic-rs.com) proposes a unique and unrivalled emergency rescue vehicle SPARS® – an Autonomous Rescue Pneumo Transformable Chute Back-pack System – a validated forefront rescue solution for guaranteed secure individual emergency escape from nearly any high elevation structure (skyscrapers, offshore platforms etc.). The SPARS® project is resulted in a creation of a brand new pneumo-framed aerodynamic devices technology. There is no doubt in the near future this solution is going to be a must-have in skyscrapers construction all over the world.

The SRS Ltd. proposes a SPARS® high rise escape technology that has a global nature. It is uncovered market niche with an obvious but unrealized human requirement to be and to feel safe while living or working in high elevation buildings. In case of emergency than traditional evacuation is impossible or ineffective those people all over the world have practically no means of urgent secure rescue from the height and need an alternative solution.

Actually the technical reviews shows that at present there are practically no means for secure alternative escape starting from 60÷80 m height and higher available on the market. But according to the said firefighter's statistics about 3÷5% of people being caught in alarm situation on the high-rise building used to try escaping from the windows and usually perished. On the other side homeland security analytics says that in average an every skyscraper in the world is expected to be subjected to a fire case (terroristic attack or other emergency) once in every 47 years.

So the SRS Ltd. has decided to resolve the problem in finding an alternative to traditional evacuation methods technical solution. It takes about eight years of R&D to resolve the task. Finally it is resulted in creation a brand new escape technology – an Autonomous Rescue Pneumo Transformable Chute Back-pack Solution for secure personal rescue from high-elevation structure in case of emergency than traditional evacuation methods are impossible.

The SRS. Ltd company in outsourcing cooperation with 18 leading Russian and foreign aerospace companies has fulfilled full-scale research and development activities to develop the project from conceptual proposal stage to releasing operating prototypes unparalleled anywhere in the world.

The SPARS® escape technology is based on a synergy of sophisticated aerospace technologies such as Air-Aspirator Rapid Inflation; Elastic Pneumo-Frame Catapult Ejection; Air-Drag Deceleration; Air-Bag Shock Absorbing and others. Such technologies were invented for space probes deceleration during descent in atmospheres of Solar system planets and its landings on surfaces.

The SPARS® device provides a secure individual escape of untrained person or valuables cargos with weights 45÷120 kg. from about any of existing high-rise (50÷1000m) facilities (skyscrapers; towers; offshore platforms etc.) with guaranteed safe landing on any underlying surface in urban terrain or water in case of emergencies than traditional evacuation methods are impossible.

The SPARS® solution meets the Russian Ministry of Emergency Situations (EMERCOM) requirements for high-rise emergency escape apparatus (GOST R 22.9.08–2005; GOST R 12.4.206–99) and provides for the following unique capabilities, never implemented before:

1. Alternative of emergency escape (so-called 'last resort rescue')
2. Emergency evacuation of an untrained person having weight of 45÷120 kg, from heights of 50÷1,000 m;
3. Ready-for-use in 45÷60 sec;
4. Self-sustained operation and independently selected escape route;
5. User-friendly operation for untrained persons and fully automated rescue procedure right from start;
6. Personal protection against external hazards during evacuation;
7. Appropriate weight of a back-pack-type carried device;
8. Secure injury-free landing on any underlying surface.

The SPARS® unit for individual use had required a special certificate basis. In this regard the National Standard (GOST) 4240-001-2012 specifying medical and technical requirements for injury-free operation by untrained persons rescued by means of new type SPARS® shock-absorbing systems entered into force in 2013.

To have certification tests performed a special Hybrid-III (USA) crush test dummy-based anthropomorphous (bionic-like) instrumentation station has been developed and created by the SRS Ltd., which has no equals in Russia.

A full cycle of comprehensive calculations and testing to validate design properties and performance has been performed. Up to now the SPARS® device technical operational reliability is 98.7% but further testing is under way.

New SPARS® escape solution provides the following advantages:

1. Alternative (a 'last resort') escape mean for ordinary person in case of emergency in the high-rise structure;
2. Secure rescue of untrained personnel (18÷70 years old) from high elevations from 5 till 1000m (no practical means available starting from 50 m height);
3. Off-line capability of the system provides mobility that helps to find optimal self-escape way of out from emergency situation;
4. Smooth automated ejection from the emergency object after manual initialization of the system;
5. Guaranteed deploy of the canopy with 3÷5 m loss of height irrespective of air flow speed pressure;
6. Protection from dangerous external factors (fire, hits, smoke) during descent;
7. Safe landing on any underlying surface in urban terrain;
8. Reusable and does not sink.

The SPARS® General Specifications

1. Total Assembly Weight – 25 kg
2. Rescue Payload Weight – 45÷120 kg
3. Descent Elevations – 5÷1000 m
4. Landing Velocity – 5÷7 m/s
5. Landing Angle – < 30°
6. Footboard Barrier Elevation – 1.5 m
7. Descent Time – 3÷150 s
8. Ready-to-use Time – 45÷60 s
9. Launch Initialization Time – 15÷20 s
10. Inflating Gas – Air;
11. General Dimensions:
    a. Aassembled – 900x450x300 mm
    b. In Descent mode – 6,500x2,700mm *(without conopy)*

Actual Landing Impact Loads:

Acceleration directions:

'chest-to-back' – up to 8÷10 g

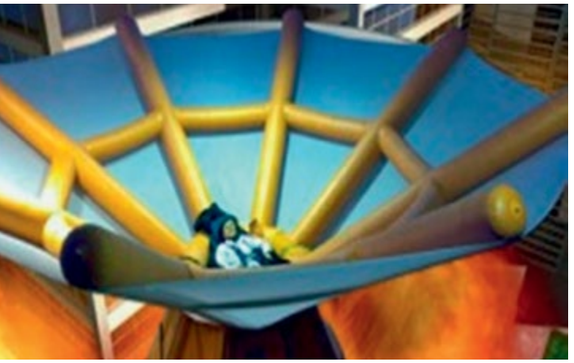
'side-to-side', 'head-to-pelvis' – up to ± 6 g

Acceleration Exposition Time – less than 0.5 s

Acceleration Growth Velocity – less than 500 1/s

User's age – 18÷70 years

In packed and assembly complete mode the SPARS® system weights 25 kg with back-pack dimensions



850x450x350mm and has easy – to-use suspension system.

The SPARS® has its Technical Data Sheet (TU 801130–5047075064–01–10) and working design documents issued. Under the SRS Ltd requirements Russian gas-filling systems (GFS) manufacturing company has mastered Autonomous Two-Stage GFS for SPARS® (TU 8042–017–45307693–2013).

The SRS Ltd. Intellectual Property Rights on SPARS® and its 'know-hows' have been completely protected within Russia (9 Patens, 3 Trade Marks) and abroad under PCT (Patent Cooperation Treaty) procedures 2 'umbrella' requests for SPARS® have entered national level in 15 countries and covered 78% skyscrapers and 95% potential SPARS® manufacturers. 13 Patents of the US, China, Japan, Canada, South Korea, Singapore, the Ukraine, Indonesia, Malasia and Australia have been already received.

Three Russian EMERCOM Certificates of Conformity were received for the SPARS®. 'Aerospace medicine and military ergonomics' R&D Institute of the Russian Air Force has granted an official approval for the SPARS® physical adaptability.

The SRS Ltd. company now is looking for cooperation with a strategic Partner and/or investor in order to industrialize the brand new SPARS® product; to make it commercial; to prepare and set up its production and to enter with it into a global commercial market having all necessary intellectually property rights protected.

An accurate assessment of the terms, timeframes and investments required for the SPARS® industrialization it is foreseen that a Partner from the region where product itself (or its production) could be demanded (Middle East, China, US, Europe, Asia-Pacific etc.) could formulate and provide the SRS Ltd. Company with the regional authority technical requirements to upgrade the product specifications and also could determine the necessary level of licensing.

At the same time in order to reduce production costs it is desirable to find and select a local manufacturer taking into account its technical capabilities and possibility to use appropriate production process technologies.

Upon receiving necessary information from a Partner the SRS Ltd. Company could finalize the design documentation, to fabricate a prototype with specifications meeting local needs and to determine expected investments and timeframes necessary to prepare and to run mass production of the product in the region.

Shares and Conditions in the business organization is a matter of further negotiations. The SRS Ltd. Company would be ready to demonstrate its good willing approach and to meet a Partner in negotiations halfway with necessary flexibility in some critical questions aiming to achieve mutually beneficial cooperation.

Such forms of cooperation as Joint Venture, Technical, Manufacturing or License Agreements are feasible.

For a strategic industrial Partner sought who would be interested to run mass production of the SPARS® in the region and enter an empty market with protected rights it would be necessary to have production technology experience in the fields of:

- thin coated/laminated fabric manufacturing;
- assembly from these fabrics a complex air-beam-frame air-proof inflatable structures;
- parachute canopy manufacturing;
- air-aspirator gas filling manufacturing;
- plastics (carbon) manufacturing and forming
- human field (air-borne) tests plastic forming and others.

A Partner sought may be expected to undertake part of those activities or provide financing for already SRS Ltd. Company existing outsourcing manufacturing solution in Russia on a mutually beneficial basis.

As for the SPARS® solution operation such a potential entity sought (hotels, profitable houses; sky-scraper's management company; offshore platform management; air-borne attractions & entertainment companies etc.) should only require a free window exit sized 1000x500 mm at the appropriate height to use Autonomous Pneumo Transformable Escape Chute and propose to its clients an additional exceptional secure service with limited warranty.

General market estimations shows there are over 7,303 finished and 2,500 under construction skyscrapers worldwide with the heights of 100÷828m, over 100,000 buildings having height of 50÷100m and more than 800 offshore platforms. Taking that analysis into account the SPARS® may have potential market capacity of up to $700-850 million annually.

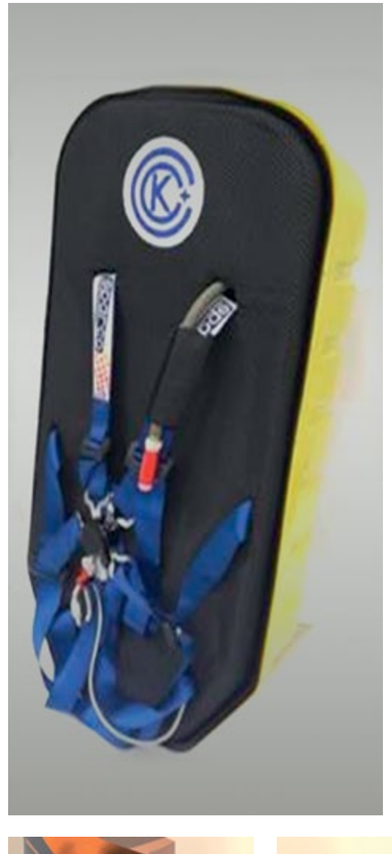
Furthermore, the SPARS® estimated potential market capacity is worth over $3.5 billion in commercial sector alone. The Governments market is bigger but for accepting that new technology implementation it may require some updates of the appropriate local norms and regulations.

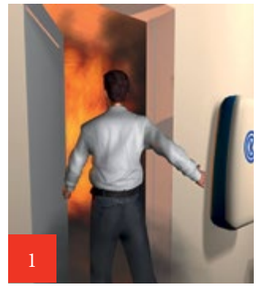
/IA&TG/

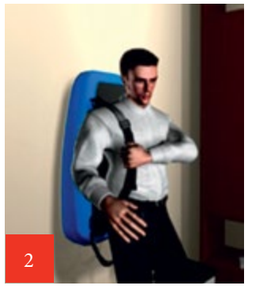
There are following innovations in the proposed SPARS® technology:

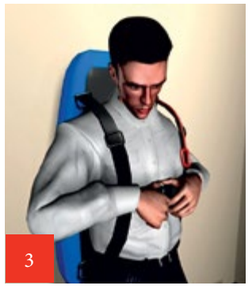
1. A brand new free parachuting technology (means and escape method) was created for emergency escape from heights higher than 50 m where practical methods for safe evacuation of a person are not available on the market.
2. Sinergy solution based on specially designed and produced from film-laminated fabric a rapid inflatable air-beam single volume frame structure for:
   - Elastic catapult ejection of a human from a window of an emergency object;
   - Forced deploy of the canopy with only 3÷5 m loss of height and irrespective of air flow speed pressure for deployment (usual parachute requires of 25÷100 m free fall and/or 250÷350 km/h speed of airplane to be deployed);
   - Guaranteed safe landing with 5÷6 m/s vertical velocity on any underlying surface in urban terrain using integrated air-frame shock absorbing pneumo dumper.
3. Fully automatic mode of usage (after manual initialisation of the apparatus) and all the descend envelope accelerations bearable for an ordinary person make the escape solution available for use by untrained people from 18 till 70 years old;
4. New type of light weight air-proof film coated fabric for air-beam inflatable frame structure was created.

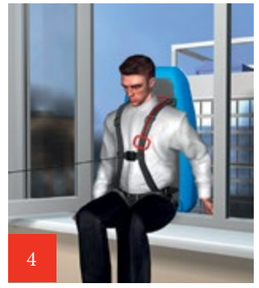
The Special National Standard (GOST) for shock acceleration limits for untrained human using new type of lodgment Rescue Parachuting Systems was issued.
The Crash test dummy Hybrid-III 50% percentile was instrumented, calibrated with the help of centrifuge, certified and used as anthropomorphic instrument for human acceleration checking during field tests and validation of the Autonomous Pneumo Transformable Escape Chute.

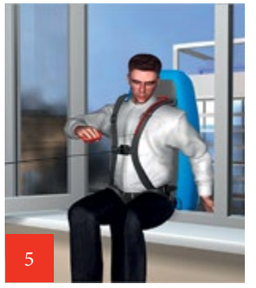












RUSSIA-BELARUS COOPERATION

Rosoboronexport, Rostec's member, had been named the organizer of Russia's joint exposition at the International Military Equipment Exhibition MILEX 2019 which had taken place in Minsk, Belarus, on May 15-18.

'Russia and Belarus are strategic partners in military and technical cooperation. Since 2001, the volume of cooperation between Rosoboronexport and Belarus has exceeded $1 bln. The scope is unbelievable covering almost every line from the supply of end products and components to joint researches and defense projects,' said Rosoboronexport's Director General Alexander Mikheev.

The company's exposition occupied 500 m2 at MILEX 2019. It accommodated products of Russia's eight largest defense enterprises, including Almaz-Antey, Uralvagonzavod, and Tecmash.

Rosoboronexport's booth housed 220 pieces of military equipment – Yak-130 combat trainer, T-90S tank, BMPT tank support vehicle, Buk-M2E and TOR-M2KM SAM system to name just a few.

'Being one of the most representative and attended event, the exhibition in Belarus piqued our special interest. We saw a great opportunity to promote Russian equipment to Europe, Middle and Central Asia, and Transcaucasia,' added Alexander Mikheev.

Rosoboronexport also expected foreign delegates to show a keen interest in Russia's equipment, designed for army, aviation and AD units, as well as special gear and systems. Top of the list of products attracting our partners included the Mi-171Sh military transport helicopter, T-90MS tank, BTR-82A personnel carrier, Khrizantema-S SP anti-tank system, Kornet-EM anti-tank missile system, Typhoon-K and Tigr-M vehicles, Smerch multiple-launched rocket system, Iskander-E tactical missile system, and various types of Kalashnikov assault rifles.

The special arms exporter planed a rather extensive business program at the exhibitions, expecting to meet representatives of the Armed Forces and other security agencies of the Republic of Belarus and other states coming to the event. Besides, Rosoboronexport's delegation took part in the 8th International Conference on Military and Technical Issues, Defense and Security, and Dual-use Technology Employment.

Repairing Helicopter Engines

The Center for Integrated Logistics Support for the UEC in Vietnam repaired five helicopter engines. The new center, certified this year by the aeronautical authorities of the Socialist Republic of Vietnam, is equipped with all the necessary equipment, spare parts and assembly units for repairing engines developed by UEC-Klimov.

The intermediate level maintenance and repair of engines as TV3-117 and VK-2500, which are operated in Vietnam, is carried out by specialists from UEC-Klimov.

The Russian side supplies parts and assemblies, spare parts, trains personnel to maintain engines and main gearboxes.

The Vietnamese side provided supporting staff to accompany the maintenance works.

Vietnamese experts have already received certificates of UEC-Klimov on successful familiarization with the process of intermediate engines repair.

With their help, Russian employees successfully carried out a pilot repair of the first TV3-117VM series 02 engine for the Mi-17-1V helicopter, which is in service in Vietnamese civil aviation for passenger traffic.

The engine received damage due to intrusion of a foreign object.

The UEC-Klimov company and the Vietnamese company Helicopter Technical Service Company signed a distribution agreement for the maintenance of engines in October of last year.

Helicopter Technical Service Company, on the territory of which the integrated logistic support center is located, is engaged in servicing Russian-made helicopters. It serves as a distributor of TV3-117 and VK-2500 engines.

Promising MTC Projects

Rosoboronexport (part of the Rostec State Corporation) was showcasing the best selling and promising new products from the Russian defense industry at the IDEF 2019 International Defense Industry Fair, which was held from April 30 to May 3, 2019 in Istanbul.

'Military-technical cooperation (MTC) between Russia and Turkey shows a positive trend. We successfully deal with competitors' attempts to interfere with our relations,' said Rosoboronexport's Director General Alexander Mikheev. 'We have a number of joint projects for the development of advanced aircraft and helicopter systems, armored vehicle components, after-sales support of supplied weaponry. In addition, Turkey is interested in Russia's latest remote weapon stations, air defense assets of varying ranges, as well as ATGM systems.'

The exhibit profile of the exhibition was: Army, Navy, and Air Force military equipment, defense technology, space technology, onboard systems, helicopters, ships, electronics, security systems, transportation and logistics equipment and systems.

'Turkey is among the key partners of Rostec and Russia. The level of bilateral relations, including in industry, is growing rapidly. At the moment, we are discussing with Turkish partners the implementation of a number of critical projects in both military-technical cooperation and civil industry fields,' said Sergey Chemezov, Director General of the Rostec State Corporation. 'Of course, we are ready for various formats of technology cooperation, including in such high-tech areas as the aerospace, helicopter and power industries.'

Rosoboronexport was the organizer of a joint Russian display at IDEF 2019, which included over 450 pieces of weaponry and military equipment from more than ten domestic defense manufacturers. Almaz-Antey Air and Space Defense Corporation, Shvabe Holding Company and Tehmash Holding Company were among the exhibitors.

Rosoboronexport's Stand 232 (Pavilion 2) provided information on more than 300 pieces of military equipment that had the best prospects in Turkey and the Middle East region, including new products from the Company's export catalog: the newest Kalashnikov AK-200 series assault rifles, 30-mm 32V01 remote weapon station, Viking SAM system and the 76.2-mm AK-176MA automatic naval gun.

The mock-ups of the BT-3F armored personnel carrier, KAMAZ-53949Typhoon-K vehicle, Su-35 multi-role super-maneuverable fighter and the Project 12061E Murena-E-class air-cushion landing craft were on display at the Company's stand.

Numerous meetings and talks were expected to take place at the event with representatives of the Turkish armed forces and other security agencies of the country, as well as with partners from other countries in the region. Rosoboronexport planed to discuss the implementation of current contractual obligations and promising MTC projects.

'IDEF is among the world's top ten largest defense industry exhibitions and, along with Russia's ARMY, MAKS and International Maritime Defense Show (IMDS), is one of the most significant arms exhibitions in Europe. The event provided an excellent opportunity to study the trends in the world arms market, while foreign customers can see the best Russian weapons, known for their impeccable fighting qualities,' added Alexander Mikheev.

BRAINREADER NEURO INTERFACE

The 'Avtomatika' Concern of Rostec State Corporation will bring to the international market the BrainReader universal neural interface, which enables the 'exchange' of information between the human brain and any external device that has the required interaction interfaces (home appliances, computer, exoskeleton, artificial sense organs, wheelchair). The Concern has already begun obtaining permits for entering Asian markets.

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Proposals from Asian companies, from Indonesia and Malaysia in particular, on distribution of BrainReader resulted from participation in the Medlab AsiaPacific & Asia Health 2019 exhibition, where the capabilities of the device generated great interest.

The development of the device as part of the Rostec is the Institute of Electronic Control Machines (INEUM) named after. I.S. Brook (a part of the concern 'Automation').

'Breakthrough neurotechnology solutions, such as BrainReader, are the technologies of the future that change lives and open up new opportunities for the development of science and technology.

Neuro headset can be used to control 'smart' systems and robotics, in medicine – for the rehabilitation of people with disabilities, in studies of the human brain, mental activity, sleep, and in many other areas.

It is important to note that the device has a good export potential.

The closest competitor in terms of characteristics, the American neuroheader, is priced about three times as much', said Oleg Evtushenko, the executive director of Rostec.

Neuro headset allows registration of the surface electroencephalogram in vivo, without limiting the user's motion activity.

The data is received using a non-invasive method via specially designed 'dry' electrodes that do not require the application of an electrically conductive gel.

Due to the high quality of the recorded signal processing, the device operates stably even in places of large crowds of people, in transport, surrounded by a large number of transmitters and other interference.

According to the study of Allied Market research, the brain-computer interface market is growing at an accelerating pace and in 2020 it will amount to an approximate of $ 1.46 billion.

New Radio Stations

Ruselectronics holding of Rostec State Corporation is launching a new line of civil radio equipment for the European market. The European Union's Intellectual Property Office (EUIPO) issued registration certificates for six DMR standard devices: automotive, base, wearable and portable radio stations, as well as two antennas for a portable radio station.

A portable radio station provides high-quality communications at a distance of up to 10 km, and a base station – within a radius of up to 30 km.

The devices are resistant to external factors, such as vibration, shock, extreme temperatures, ingress of moisture.

In addition, they have increased noise interference immunity and protection against unauthorized listening.

Such radio stations can be used in railway transport, in the agricultural sector, by emergency and medical services, logistics companies, tourists and hunters.

The developers note that the devices are compatible with all existing domestic and foreign civil systems of DMR standard professional mobile radio. The obtained certificates give the right to the equipment developer the

'Constellation' Concern (a part in 'Ruselectronics') to sell equipment in the European Union.

Certification also guarantees the enterprise that there will be no analogues from other manufacturers prior to the actual beginning of sales of radio stations in the European market.

VK-2500 in China

The type certificate of the helicopter turboshaft engine VK-2500, designed and produced by the Saint Petersburg company UEC-Klimov (part of the United Engine Corporation (UEC) of the Rostec State Corporation), was validated in China. After that the powerplant could be used in Russian-made civilian helicopters in China, which allowed to geographically expand the sales and operation of Russian Mi and Ka helicopters.

The validation process of the VK-2500 engine was carried out in close cooperation between the Chinese aviation authorities and the Russian Mil Moscow Helicopter Plant (part of the Russian Helicopters holding company of Rostec) and the Russian Federal Air Transport Agency. This was the first occasion in 19 years when The Civil Aviation Administration of China has certified a Russian helicopter engine. UEC's next step was to certify the VK-2500PS-03 engine for helicopters in China as well as to validate the type certificate of VK-2500PS-03 in India, South Korea, Brazil and Mexico.

'China is one of Rostec's traditional cooperation partners in the fields of both military and civilian technology, and helicopters are one of the most important parts of this cooperation. In 2017, UEC presented a modernization project of Chinese helicopters aimed at replacing the TVZ-117 engine to the more advanced VK-2500, which sparked significant interest of the helicopter operators.

Last year, demonstration flights of the Mi-171 helicopter equipped with VK-2500 engines were held in the Chinese city of Lijiang. The Ministry of Emergency Situations and Civil Aviation Administration of China highly appreciated the capabilities of the helicopter for cargo transportation and extinguishing high altitude fires. The successful validation of the VK-2500 type certificate allowed us to start the modernization project of Russian helicopters in China', noted the Aviation Cluster Industrial Director of the Rostec, Anatoly Serdyukov.

VK-2500 has been designed to replace the TVZ-117 helicopter engine. It has three different modifications within the takeoff power range of 2000 – 2400 hp. The powerplant introduces a digital integrated automatic control system (ACS) instead of analog one, advanced sensors, operating hours and monitoring counter and better construction materials. This provides better performance indicators, such as increased power in emergency flight modes, temperature control in a wider range of outdoor conditions and higher service life. VK-2500 gives fundamentally new possibilities for helicopter operations in high-mountain regions and regions with hot climate.

Today, UEC is increasing production rates of VK-2500 engines to meet the needs of state and export contractors. The engines are exclusively assembled from Russian components.

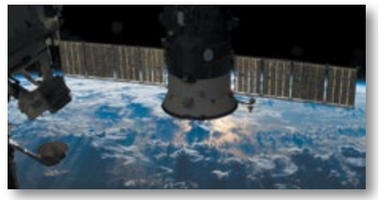
Equipment Supply

Rostec Electronics holding of Rostec State Corporation had created a matrix of high-speed switches with a control driver for the European Space Agency. The equipment was intended for use in near-earth orbit space radars. The new development was one and a half times cheaper than foreign analogues and surpasses them in a number of technical specifications.

The matrix allowed the radar to switch to either transmitting or receiving a signal. The device was designed on request of the Italian supplier of the European Space Agency. Customers had the need to create a new version of radar – cheaper than existing versions with equal technical parameters.

The development of Rostec was one and a half times cheaper than its foreign counterparts, and surpassed them in some characteristics. Thus, the total loss was not more than 0.3 dB, and the total isolation (signal suppression between certain inputs or outputs of the device) was not less than 60 dB. At the same time, the device was more compact and weighs less.

'Rostec State Corporation created a wide range of high-technology science-intensive products, which were in demand not only in Russia, but also abroad. The interest of the European Space Agency once again confirmed that our developments met the highest international standards. Deliveries of a new matrix for space radars were



carried out within the framework of the national project 'International cooperation and export'. In the new radar model, our production matrix will replace expensive foreign analogues. Devices with such characteristics will be used in the civilian field for the first time', said Oleg Evtushenko, executive director of the Rostec State Corporation.

Earlier, Ruselectronics holding supplied ferrite products to the Center for space applications of government of India. The materials supplied were used as part of ultra high frequency devices for space satellites.

Shvabe Revived Telescopes

Novosibirsk located factory of Shvabe holding of Rostec State Corporation was preparing for a serial production of Newton's telescopes. These were the exact replicas of the original reflector created by the great scientist in 1668.

The idea of recreating the classic Isaac Newton's reflecting telescope originated in 2008, when thousands of scientists and amateur astronomers came to the capital of Siberia aiming to see the total solar eclipse on August the 1st. Then the specialists of the Novosibirsk Instrument-Making Plant (IMP), which is part of the Shvabe Holding, released a limited batch of optical instruments for observing stars as memorable souvenirs.

TAL-35 – is the exact copy of the historical original. The only difference is in the image quality. If Newton used a polished bronze plate for reflection, the replica is equipped with an optical mirror processed by aluminium plating. Thus, despite being a purpose made souvenir, these telescopes can be used for observations.

'The souvenirs turned out to be so popular that the first batch was sold

out almost immediately, and from 2010 the IMP continued production of its occasional copies – on individual order. At the end of last year, we decided to start full-scale production, which we planed to launch in spring. In doing so, we were guided not only by the popularity of TAL-35 as souvenir products, but also by the fact that teaching in astronomy was resumed in schools of Russia, the homeland of space explorers and great astronomical discoveries, a discipline that forms the mindset of creators and winners. We are confident that Newton's telescopes were the first step in big science for many young people', said Vasily Rassokhin, general director of the IMP.

The first telescope lens was created by Galileo Galilei in 1609 which is considered to be a refractor telescope. Poor image quality encouraged astronomers to constantly modify the device. They found that the image quality increased with increase of focal length of the eyepiece, which led, in turn, to an increase in the size of telescopes – some reached a length of 50-60 meters. In the mid-1660s, Isaac Newton proved that the cause of poor image quality is chromatism, which can be eliminated if a spherical mirror is used instead of convex lenses. Newton introduced his telescope in 1668, which was only 15 cm long and earned him worldwide fame.

ATTACK AND MULTI-PURPOSE HELICOPTERS

Rosoboronexport, a member of Rostec, was expecting the interest in Russia's military helicopters to spike in the wake of the International Helicopter Industry Exhibition HeliRussia 2019 which was taking place at Crocus Expo, Moscow, on May 16-18.

'We were facing a growing demand for attack helicopters in the helicopter market on a global scale. Rosoboronexport responded to this in a timely manner, figured out its major parameters and now offers to the customers the most advanced designs proven in combat, Ka-52 and Mi-28NE. Besides the dynamic was on the rise in the utility sector, where we had the Ansat and Ka-226T to offer. For production of the latter we had set up a joint venture with India's HAL,' noted Director General of Rosoboronexport Alexander Mikheev.

At the exhibition, Rosoboronexport offered its customers Russian helicopters suitable for any task regardless of weather conditions. The company's booth advertised helicopters of all classes, required in the world market, as well as UAV systems.

Apart from attack and utility helicopters, other types boasting high export potential included combat-transport, military transport and transport Mi-35P, Mi-35M, Mi-17V-5, Mi-171Sh, and Mi-26T2. They owed their popularity to the outstanding combat and operational performance, demonstrated in combat during anti-terrorist operations conducted by the Russian military.

Combat and transport capabilities of Russian helicopters made them unique in many ways. Deployed in almost all regions of the world, they had proven to be suitable for operation in hard-to-access mountainous zones notorious for height variation and temperature fluctuation, as well as tropics and dusty environs.

Rosoboronexport's list of partners included 70-plus states in the Middle East, Asia Pacific, Latin America, Africa, the CIS, and Europe. The company delivered helicopters to army, anti-terrorist, and special purpose units, as well as law enforcement and emergency agencies in foreign countries.

Direct supplies to the customers being Rosoboronexport's major activity, the company also offered technological partnership options, construction of service centers and facilities for training of pilots and maintainers. Similar infrastructure projects had already been commissioned in a number of countries.

INTERNATIONAL AEROSPACE, MILITARY, NAVY AND TECHNOLOGY GUIDES

In 2019

ISSUE	RELEASE DATES	ADDITIONAL DISTRIBUTION
'RA&MG' №11 (42)	August 27th	**MAKS-2019** (27.08-01.09.2019, Russia, Moscow)
'RA&MG' №12 (43)	September 16th	**AVIATION EXPO CHINA 2019** (18-20.09.2019, China, Beijing)
'RA&MG' №13 (44)	October 01th	**CHINA HELICOPTER EXPO 2019** (10-13.10.2019, China, Tianjin) **SEOUL ADEX 2019** (15-20.10.2019, Korea, Seoul)
'RA&MG' №14 (45)	September 23th	**DSE Vietnam** (02-04.10.2019, Vietnam, Hanoi)
'RA&MG' №15 (46)	October 28th	**BIDEC 2019** (28-30.10.2019, Bahrain, Manama)
'RA&MG' №16 (47)	November 02th	**Defense & Security 2019** (04-07.11.2019, Thailand, Bangkok)
'RA&MG' №17 (48)	November 16th	**Dubai Airshow 2019** (17-21.11.2019, UAE, Dubai)
'RA&MG' №18 (49)	December 08th	**Gulf Defense & Aerospace 2019** (10-12.12.2019, Kuwait, Al Kuwait)

In 2020

ISSUE	RELEASE DATES	ADDITIONAL DISTRIBUTION
'RA&MG' №01 (50)	January 20th	**DEFEXPO INDIA 2020** (05-08.02.2020, India)
'RA&MG' №02 (51)	January 30th	**SINGAPORE AIRSHOW 2020** (11-16.02.2020, Singapore)
'RA&MG' №03 (52)	February 20th	**IADE Tunisia 2020** (04-08.03.2020, Tunisia, Ariana)
'RA&MG' №04 (53)	February 20th	**VIDSE 2020** (04-06.03.2020, Vietnam, Hanoi)
'RA&MG' №05 (54)	March 01th	**DIMDEX 2020** (16-18.03.2020, Qatar, Doha)
'RA&MG' №06 (55)	March 10th	**ArmHiTec 2020** (26-28.03.2020, Armenia, Yerevan)
'RA&MG' №07 (56)	March 15th	**FIDAE 2020** (31.03-05.04.2020, Chile, Santiago)
'RA&MG' №08 (57)	March 15th	**SOFEX 2020** (31.03-02.04.2020, Jordan, Amman)
'RA&MG' №09 (58)	April 05th	**DSA 2020** (20-23.04.2020, Malaysia, K.Lumpur)
'RA&MG' №10 (59)	April 08th	**Eurasia Airshow 2020** (22-26.04.2020, Turkey, Antalya)
'RA&MG' №11 (60)	April 25th	**ILA Berlin Air Show 2020** (13-17.05.2020, Germany, Berlin)
'RA&MG' №12 (61)	May 10th	**HELIRUSSIA 2020** (21-23.05.2020, Russia, Moscow)
'RA&MG' №13 (62)	May 12th	**KADEX-2020** (28-31.05.2020, Kazakhstan, Astana)
'RA&MG' №14 (63)	May 20th	**EUROSATORY-2020** (08-12.06.2020, France, Paris)
'RA&MG' №15 (64)	July 05th	**FARNBOROUGH Airshow 2020** (20-24.07.2020, Great Britain, London)
'RA&MG' №16 (65)	August 10th	**ARMY-2020** (25-30.08.2020, Russia, Moscow)
'RA&MG' №17 (66)	August 20th	**GIDROAVIASALON 2020** (September 2020, Russia, Gelendzhik)
'RA&MG' №18 (67)	August 30th	**ADEX 2020** (08-10.09.2020, Azerbaijan, Baku)
'RA&MG' №19 (68)	September 01th	**Africa Aerospace and Defence 2020** (16-20.09.2020, South Africa, Pretoria)
'RA&MG' №20 (69)	September 10th	**ADAS 2020** (23-25.09.2020, Philippines, Manila)
'RA&MG' №21 (70)	September 15th	**Istanbul Airshow 2020** (24-27.09.2020, Turkey, Istanbul)
'RA&MG' №22 (71)	October 05th	**EURONAVAL 2020** (20-23.10.2020, France, Paris)
'RA&MG' №23 (72)	October 20th	**INDO DEFENCE 2020** (04-07.11.2020, Indonesia, Jakarta)
'RA&MG' №24 (73)	October 25th	**Airshow China 2020** (10-15.11.2020, Zhuhai, China)
'RA&MG' №25 (74)	November 02th	**BIAS 2020** (18-20.11.2020, Bahrain, Manama)
'RA&MG' №26 (75)	November 10th	**IDEAS 2020** (24-27.11.2020, Pakistan, Karachi)
'RA&MG' №27 (76)	November 25th	**EDEX 2020** (07-10.12.2020, Egypt, Cairo)
'RA&MG' №28 (77)	November 30th	**Expo Naval 2020** (December 2020, Chile, Valparaiso)


Международный военно-технический форум
ARMY 2020
OFFICIAL SHOW-DAILY
№01, 25 августа 2020 года
ДЕНЬ ПЕРВЫЙ
ОФИЦИАЛЬНОЕ ЕЖЕДНЕВНОЕ ИЗДАНИЕ ФОРУМА
Главный форум
Инновационный союз ОПК России и Вооруженных сил РФ
«С 22 по 27 августа Министерство обороны Российской Федерации проводит Международный военно-технический форум «АРМИЯ-2017». Это третье по счету масштабное мероприятие, в котором примут участие крупные отечественные и зарубежные предприятия оборонно-промышленного комплекса, ведущие конструкторские бюро и научно-исследовательские институты.
Основные мероприятия Форума пройдут в Конгрессно-выставочном центре «Патриот». Общая площадь экспозиции в павильонах и на открытых площадках превысит 300 тыс. кв. м. Динамические показы ходовых, летных и огневых возможностей вооружения, военной и специальной техники состоятся на аэродроме Кубинка, полигоне Алабино, а также в военных округах и на Северном флоте.
Научно-деловая программа пройдет в формате пленарных заседаний, конференций, круглых столов и брифингов, что позволит обсудить актуальные вопросы обороны и безопасности, дальнейшие направления совершенствования способов производства продукции военного назначения.
Тысячи посетителей смогут ознакомиться с последними достижениями в области высоких технологий и перспективными разработками, которые реализуются в военной сфере.

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