INTERNATIONAL AEROSPACE & TECHNOLOGY GUIDE

Special analytical export project of the United Industrial Edition

№ 17 (48), November 2019

The Best Innovations for Gulf, Middle East and Global Market

DUBAI AIRSHOW
SPECIAL PARTNERSHIP

UIE UNITED INDUSTRIAL EDITION

'International Aerospace & Technology Guide'
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EDITORIAL

The best world aerospace technologies

DUBAI AIRSHOW 2019 is definitely unique. Show is gathering in UAE obviously the best aerospace innovations that are intended for both Gulf and the entire Asia-Africa region.

Political and economic situation in the world (conflicts, sanctions, threats of war and other) makes nations once again reconsider their technologies possibilities. It has become already obvious and undeniable that security is becoming increasingly important among the various values of civilization. Today, for any state, the ability to reliably and securely protect the territory, residents and values is a priority.

One can predict raise of aerospace means market in times like this. But together with developing of technologies in order to safety, rivalry increases in order to achieve such goals as increasing profits and market share. DUBAI AIRSHOW 2019 presents the best world (Russian also) aerospace innovations for global market, which are the undisputed world leaders on price and quality in their segments.

These exhibition shows that it is not serious about how many planes you have, but quality and possibilities of every single one of them is fact what leads to victory on the global market. Other significant factor is technological independence from seller – modern technologies make it possible to shut down any device from any place of the globe if you have appropriate access. With hitech products, solid aftersales service and proven reliability, Russia is honest and friendly partner for all countries, ready for mutual work. Taking part in DUBAI AIRSHOW 2019 companies from many countries continues the policy of open partnership.

Valeriy Stolnikov

2019-2038 MARKET OUTLOOK

United Aircraft corporation (UAC) has delivered new long range civil aircraft market forecast. The whitepaper document is intended for the mainstream audience and serves for harmonization of the Russian aviation industry opinions as referred to the core markets and also for signification of the Corporation contribution to the international aviation community references coordinates formation.

The 2019-2038 Market Outlook booklet concept differs from the relevant documents which the Corporation has delivered in the previous years, as it contains corporate vision revealing supply and demand ratio pitfalls covering different market segments relative to world regions and key countries comprising Russia, China and India in addition to the vital market statistics.

The civil aircraft quantitative demand appraisal for the forecasted period is executed on the basis of the genuine mathematical imitation model, which considers many parameters, comprising but not limited to macroeconomic and demographic arguments, air transportation dynamic and volume data, current fleet condition, world production capacities, sale, purchase and lease deals as well as state investment programs records and miscellaneous commercial factors.

Narrowbodies of 166-200 seats capacity will be in the main demand stream. The market pull for the such aircraft is forecasted at 20.5 thousand level, which is in excess to all other market segments. The total demand in raw numbers is estimated in amount of 44.3 thousand airliners or 6.35 USD trillion if calculated in the 2019 catalogue prices.

The Russian segment share is equal to 2,9% in monetary and 3,3% in quantitative terms of the world market. 166-200 seater narrowbodies segment will overtake the majority of the local aviation carriers deliveries (630 tails estimate). Maximum quantitative demand geographical location-wise is forecasted in China (9,1 thousand tails), Asia-Pacific (excluding China and India) (7.9 thousand aircraft), European (8.3 thousand liners) and North American (8.2 thousand units) regions.

The 2019-2038 Market Outlook booklet contains detailed quantitative data regarding the global commercial aircraft market segments actual state and development trends, as well as a regional chapter that provides a detailed information on Russia, China, India, countries of the CIS, Asia-Pacific, European, Latin American, Middle East, North American and African regions.

Radar to Detect Miniature Drones

'Ruselectronics' Holding of Rostec state Corporation has developed a radar station to detect small-size drones at a distance up to 7.5 km. The equipment is built entirely on the domestic electronic component base and has no analogues in Russia.

The equipment is a multi-channel Ka-band radar, characterized by small dimensions, equal to 325 × 240×230 mm. The direction finder digital repeater is placed on a rotary device that provides visibility in all directions. The station can be controlled manually from a laptop or automatically.

'The dangers that drones can pose are becoming increasingly obvious. Small-size drones are able to conduct surveillance, reconnaissance, carry explosives or other weapons and serve as a means of attack. Drones can act alone or as part of a 'swarm of drones.' And it is not only about special drones manufactured in industrial conditions. It can be a toy copter from a children's store or a home-made apparatus. Traditional radar methods do not provide reliable detection of unmanned flying vehicles with a small reflective surface. The development of our holding 'Roselectronics' solves this problem successfully. Undoubtedly, the new development will be in demand among both special and civilian customers', - commented the Executive Director of Rostec Oleg Yevtushenko.

Up to date, the first samples of equipment have been manufactured and field tests of the radar station have been carried out.

Russian security products at Interpolitex 2019

Rosoboronexport JSC (part of the Rostec State Corporation) took part in the 23rd International State Security Exhibition, Interpolitex 2019, which was held from October 22 to 25 at the VDNKh All-Russian Exhibition Center (Pavilion No. 75) in Moscow.

At Interpolitex 2019, Rosoboronexport undertook active efforts to promote the entire range of security products for law enforcement agencies, counter-terror units and other security agencies.

'At this year's Interpolitex, we expected to see representatives of a wide range of law enforcement and special agencies of the partner countries from Southeast Asia, Latin America and the CIS. Here they had an excellent opportunity to get a closer look at the armaments, equipment and software/hardware solutions offered by Russian manufacturers. Many of the products presented had been successfully used by Russia's law enforcement services, including the Federal Security Service (FSB), the police, the Russian Guard, the Border Guard, as well as private security companies. Rosoboronexport was ready to negotiate on the supply of military, dual-use and civilian products to interested foreign customers on mutually agreed terms,' said Alexander Mikheev, Director General of Rosoboronexport and Deputy Chairman of the Russian Engineering Union.

The exhibition was held in three halls of Pavilion No. 75 and in an outdoor area, where full-scale special equipment was on display. The total exhibition area exceeded 25,000 square meters. Rosoboronexport's stand was located in Hall 'A'. More than 100 items of weapons and military equipment developed and manufactured by Russian defense enterprises were being exhibited here. At the company's stand, you could test your skills in shooting Kalashnikov assault rifle and MP-446 Viking self-loading pistol mockups on the SKAT shooting simulator.

Today, promotion of the state and infrastructure security tools and services in the world market is a driver of Rosoboronexport's development. Russian industry has excellent competencies in developing and manufacturing products to combat terrorism, extremism and organized crime, protect high-priority and critical infrastructure facilities, extended borders, as well counter-UAV systems, electronic warfare and secure communications equipment.

In addition, Rosoboronexport is actively developing the civilian and service weapons market segment. The partners' security agencies are considering our commercial offers on various versions of Saiga carbines, MP-18, MP-135, MP-156, MP-27 and MP-43 rifles, Viking pistols designed and manufactured by Rostec's Kalashnikov Concern, ORSIS T-5000M rifles, Vepr carbines, cartridges for them and a variety of attachments. Foreign customers' interest in civilian versions of the SVD sniper rifle under the Tiger brand is also noticeable. Most of these models are showcased at Interpolitex 2019 by their manufacturers.

Most of the equipment operational with Russian special forces units has been battle-tested. In addition, the adopted solutions to ensure security in crowded places and in settlements during the 2018 FIFA World Cup proved successful, which was noted in official reports of international organizations and by representatives of the security agencies of the countries that participated in the championship.

During Interpolitex 2019, the Collective Security Treaty Organization (CSTO) held the first International Military-Economic Conference titled 'Military-Economic Cooperation of the CSTO Member States: Development Trends, Problems and Prospects.' Rosoboronexport took an active part in it.

PUTTING THE SOYUZ MS-15 MANNED SPACECRAFT INTO ORBIT

The RD-107A / RD-108A engines manufactured at the Samara enterprise of the United Engine Corporation of the State Corporation Rostec ensured the successful launch of the Soyuz MS-15 transport manned spacecraft with a crew of 61/62 long-term expedition to the International Space Station. The main crew included the cosmonaut of Roscosmos Oleg Skrypochka, NASA astronaut Jessica Meir and a spaceflight participant from the UAE, Hazzaa al-Mansouri.

The launch of the Soyuz MS-15 manned transport spacecraft, which was launched into orbit by the Soyuz-FG integrated launch vehicle (ILV), took place on September 25th at 16:57 Moscow time from platform No. 1 of the Baikonur Cosmodrome. PJSC 'Kuznetsov' manufactured marching engines of the first and second stages of RD-107A/RD-108A, operated faultlessly.

A few hours later, at 22:43 Moscow time, the Soyuz MS-15 spacecraft docked in the normal mode to the docking station of the Zvezda service module of the Russian segment of the International Space Station.

The launch of the Soyuz-FG ILV, designed for manned launches, was the final in the history of this rocket. Starting from next year, expeditions to the ISS will be sent to the Soyuz-2.1a rocket launcher, on which a new Russian digital control system is installed. For launches of launch vehicles of the Soyuz-2 family, site No. 1 will be modernized. 70 launches of Soyuz-FG ILV have been carried out since 2001.

MC-21-300 CERTIFICATION FLIGHTS

Flight test experts of the European Union Aviation Safety Agency (EASA) completed the third flight session of MC-21-300 certification program.

Initially EASA experts worked with their Russian colleagues on the flight simulator. Subsequently the EASA crew and the Yakovlev Design Bureau (a branch of Irkut Corporation) performed a series of flights on the MC-21-300.

Increasing Export Volumes of Non-Military and Service Weapons

On September 17, 2019, in the framework of the research and practice conference, devoted to the 100th anniversary of Mikhail Kalashnikov, JSC Rosoboronexport, part of the Rostec State Corporation, signed an agreement on cooperation and partnership with Non-profit Organization 'M.T. Kalashnikov Union of Russian Gunmakers'.

The signing of the document aims to increase the volume of exports to the external market of non-military and service weapons, as well as cartridges for them. Besides, the agreement shall serve the purpose of better understanding between the main Russian exporter of special products and manufacturing enterprises constituting the Union of Gunmakers on the issues of foreign customers' needs and market trends.

'The market of non-military and service weapons is the new area of our work. Nevertheless, by now Rosoboronexport has already fulfilled one contract on this subject matter and has prepared over 30 commercial offers to partners from 20 countries in the amount of around 2.5 billion roubles. I am confident that by means of our joint efforts with the Union of Russian Gunmakers we will be able to increase considerably the share of Russian products in this fairly concentrated market segment and to support our enterprises,' said Rosoboronexport's Director General Alexander Mikheev, who is also holding position of deputy chairman of the Union of Russia's Machine Builders.

Rosoboronexport undertakes proactive marketing work in the world market on the issue of exporting non-military and service weapons of Russian production. Potential foreign customers are currently considering commercial offers on various modifications of the Saiga carbines, guns MR-18, MR-135, MR-156, MR-27 and MR-43, Viking pistols developed and produced by the Kalashnikov Concern, part of the Rostec Corporation, rifles ORSIS T-5000M, Vepr carbines, cartridges for them and various accessories. Foreign customers are also explicitly interested in civilian modifications of the Dragunov sniper rifle under the trademark of Tigr.

Apart from combat systems, Rosoboronexport was given the right to export non-military weapons in the interests of law-enforcement agencies of partner nations. This happened in 2017 after the amendment of the Russia law 'On Weapons'. This created the most comfortable conditions for concluding integrated contracts on the delivery of products, and gave an opportunity to the company's partners to purchase the whole spectrum of Russian weapons, which they need, from a single reliable exporter.

The practice of the longstanding work of Rosoboronexport shows that the company has all the necessary competencies to export not only military equipment and materiel, but also civilian, as well as dual-use products. The main potential customers for non-military and service weapons are the police and special services of foreign countries, as well as numerous shooting sports and hunting associations.

Rostec Development Strategy

Rostec State Corporation is updating the development strategy until 2025 in connection with the incorporation of the United Aircraft Corporation (UAC). Be reminded that the decree on the transfer of 92.31% of UAC shares to Rostec capital was signed in October 2018. The transfer is carried out in stages and should be fully completed within a year and a half.

The strategy will be updated according to the changes in markets and macroeconomic factors that have occurred since 2015 – from the moment of the adoption of the Corporation's development strategy until 2025. It is planned to clarify the target indicators of the strategy in connection with the accession of the UAC as part of the work.

Updating the development strategy is also associated with the transition of the State Corporation to international financial reporting standards. As a result, the level of transparency and openness of the company will increase, which opens up new opportunities for doing business and developing partnerships in Russia and in the world.

From 2015 to the present, Rostec has been implementing the strategy according to the main parameters (revenue, net profit, share of civilian products, EBITDA and others) within the limits of the risk appetites, as the Corporation notes.

Strategy 2025

According to the strategy approved earlier, by 2025 Rostec plans to enter the top ten largest global industrial corporations in terms of revenue, achieve a growth in the share of civilian products in revenue above 50%, and also increase labor productivity to the level of the best quarter of world players. In addition, the unchanging goal of the Corporation is to unconditionally fulfill the state defense order.

COOPERATION BETWEEN VR-TECHNOLOGIES AND KRASAEROSCAN

During the International Aviation and Space Salon MAKS-2019, VR-Technologies – innovation design office of the Russian Helicopters Holding Company (part of Rostec State Corporation) – signed a cooperation agreement for development and serial production of VRT30 unmanned aerial system (UAS) with KrasAeroScan.

The subject of the agreement is the establishment of partnership and efficient and mutually beneficial cooperation for the development of technologies of unmanned aerial systems use in the energy, oil and gas, construction, forestry, agricultural, machine-building and utility industries of Russia. The agreement provides for the upgrade of VRT30 convertiplane for its effective operation in the climatic conditions of Eastern Siberia, the Far East and the Far North. VR-Technologies, in cooperation with KrasAeroScan, organized serial production of VRT30 UAS, as well as its warranty handling and maintenance.

'The agreement we signed during MAKS-2019 confirms the relevance of promising UAS and UAV developments for improving the quality of operations carried out with the help of drones, as well as for increasing their capacity. We welcome the cooperation with the leader of the Krasnoyarsk Krai in the field of engineering surveys carried out using UAVs so as to consolidate the expertise of two successful companies and create a product that the market definitely needs,' said Director General of VR-Technologies Alexander Okhonko following the contract signing.

'On August 28 there were 18 areas on the UAV operation market. For successful market penetration, the product, first, should have a quality payload for remote sensing of the earth and, second, be a reliable aircraft that can operate in harsh climatic conditions. Very few companies are able to create a vertical take-off and landing UAV with a desired payload that can be used in the turbulent terrain, low temperatures and sudden wind gusts. VR-Technologies has all the resources to create such a UAV. KrasAeroScan, for its part, provides operating experience and request for specific technical conditions. Working with VR-Technologies, we hope to answer all challenges of the market,' said Director General of KrasAeroScan Dmitry Chanchikov.

Under an open-ended agreement, the parties decided that it is possible to organize the experimental operation of the VRT30 convertiplane when implementing KrasAeroScan production programs. The areas of cooperation include engineering and geodetic surveying, control of cadastral land boundaries, forest fire monitoring, archaeological investigations, monitoring of infrastructure elements of different types, search and rescue, and other promising areas.

Security Solutions for Africa

Rosoboronexport actively participated in the Russia-Africa Economic Forum, which took place in Sochi from 23 to 25 October, and coordinated the participation of Russian defense industry enterprises in it.

'Rosoboronexport maintains military-technical cooperation with almost all countries of the continent and we are well aware of their needs. Our twenty African partners account for about a third of our order book, more than $14 billion, and this figure shows a growing trend. In 2019 alone, we held more than 20 meetings with top representatives of African countries and hosted about 30 African delegations at the ARMY and MAKS exhibitions. Their results suggest that Africa is very interested in Russian weapons, and we can offer our products to meet any contemporary challenge to security. Moreover, Rosoboronexport highly appreciates a reserved attitude of its African partners towards various anti-Russian sanctions, which makes the continent open to fair competition,' said Alexander Mikheev, Rosoboronexport's Director General.

On the sidelines of the Russia-Africa Summit, Rosoboronexport held meetings with the senior officials of 15 countries. During the negotiations and within the framework of exhibition activities, the Company demonstrated to its trading partners from Africa the most up-to-date products for the armed forces and other law enforcement agencies of the countries of the continent. In addition, the partners learned about the experience of employing Russian-made equipment during the counter-terrorism operation in Syria.

Currently, many African States are implementing major programs for restructuring their armed forces and equipping them to counter growing threats to security: terrorism, drug trafficking, organized crime, irregular migration. The guests of the Forum could get acquainted with a wide spectrum of advanced high-tech products developed and manufactured by Almaz-Antey Air and Space Defense Corporation, NPK Uralvagonzavod, NPK Techmash and Proekt-Technika Corporation at their stands in Sochi.

Rosoboronexport was showcasing scaled-down models of the most popular Russian military equipment on the African continent: the Yak-130 combat training aircraft, the Pantsir-S1 anti-aircraft gun/missile system, the Tor-M2KM SAM system and the Mi-171SH military transport helicopter.

In addition, equipment for outfitting army and special counter-terror units demanded all over the world was on display at the Company's stand: Kalashnikov assault rifles, including the latest AK-200-series, GP-34 grenade launcher, Vityaz-SN submachine gun and sniper rifles, as well as ORSIS civilian and service weapons popular with police units.

Full-scale models of Russian military hardware were exhibited in the outdoor display area: Tiger, BPK-Ural and Typhoon protected vehicles, Mi-35P helicopter in a renewed configuration, MiG-35 multi-functional frontline fighter, while the Ansat utility helicopter is demonstrated at Sochi Airport.

Highly mobile and effective counter-UAV systems produced by Rostec's Avtomatika Concern and able to intercept and suppress small and micro drones at varying distances were also presented at the Forum: Sapsan-Bekas, Luch-PRO, Pishchal-PRO, Taran-PRO and Rubezh-Avtomatika. These unique assets are capable of effectively defending specially protected areas, airfields and critical infrastructure, including fuel & energy and nuclear facilities.

'Rosoboronexport is now ready to develop cooperation with African partners on unique terms. We offer not only direct supplies of Russian defense products, but also the implementation of various infrastructure projects related to space activities, small arms and ammunition plants, as well as maintenance and repair facilities for all services of the armed forces,' Alexander Mikheev added.

As part of the Forum, the roundtable 'A Safe Africa' was held, where the problems of terrorism, irregular migration, smuggling and crime were discussed. Russia's leading security equipment manufacturers talked about the experience of implementing a set of measures to effectively counter major threats to security and prevent them in the conditions prevailing in African countries.

Rosoboronexport offered its comprehensive solutions to the most pressing problems facing the continent at its stand, where public presentations on the following topics will be delivered: 'Border and critical infrastructure security equipment', 'Russian small arms', 'Russian-made protected vehicles', 'Counter-terrorism equipment', 'Equipment for countering smuggling and irregular migration'.

ANSAT TO GET AUSTRIAN MEDICAL MODULES

The Russian Helicopters Holding Company (part of Rostec State Corporation) and an Austrian company Air Ambulance Technology signed a cooperation agreement. The parties agreed on joint development and Russian certification of the medical module which may be installed on Ansat helicopters.

The document was signed by Director General of Russian Helicopters Holding Company Andrey Boginsky and managing director of Air Ambulance Technology Nicole Kuntner-Hudson during the international aerospace exhibition Paris Air Show 2019.

'We are pleased to announce the start of cooperation with Air Ambulance Technology and we hope that this will be long-term and fruitful work. Creation of the new medical module which meets international standards for medical aviation will allow the holding company to expand the pool of potential customers, including European companies. We expect that installation of such equipment will help Ansat get a certificate of the European Union Aviation Safety Agency', said Director General of Russian Helicopters Andrey Boginsky after the ceremony to mark signing of the agreement.

The light multi-purpose helicopter Ansat, which has the largest cabin within its class, is actively used by the Russian air medical services. This twin-engine helicopter is compact, and it does not require a large landing area. It can also be used for passenger and VIP transport, cargo delivery and environmental monitoring. High-altitude tests of Ansat have been successfully completed, which confirmed the possibility of its operation in mountainous terrain at altitudes up to 3,500 meters. The helicopter can be operated in a temperature range between -45 and +50 degrees Celsius. The possibility of keeping the helicopter out of the hangar and low cost of operation are its significant advantages.

Serbian Minister visited Russian Helicopters

Serbian Defence Minister Alexander Vulin has visited 'Rostvertol' plant of 'Helicopters of Russia' holding of Roctec State Corporation during his working visit to Russia.

The Head of Defence Ministry had inspected the Mi-35M transport and combat helicopters manufactured by the Rostov plant for the Serbian Air Force under the contract signed with Rosoboronexport.

As part of his visit to the company, Alexander Vulin met with Rostvertol management and specialists of flight and engineering personnel being trained at the company.

In addition, the Defense Minister of got acquainted with the production sites for the assembly of Mi-35 helicopters.

Mi-35M is the world's only universal combat helicopter, which, among effective fire missions, is able to transport up to eight soldiers with weapons, up to 1,500 kg of ammunition or other cargo inside the cabin and up to 2,400 kg of cargo on external sling, evacuation of the wounded, delivery of technical staff to the autonomous bases.

Round-the-clock and all-weather combat use of the helicopter provides the ability to perform combat missions of air support units of the ground forces at any time of the day and in all weather conditions.

The helicopter has significant high-altitude characteristics with the ability to perform takeoffs and landings on concreted and unpaved landing sites located at altitudes up to 4,000 m above sea level.

In addition, the successful design solutions used in the Mi-35M, provide the possibility of using the Russian helicopter in a wide range of physical, geographical and climatic conditions.

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.

FLIGHT TEST PROGRAM FOR THE SUKHOI SUPERJET 100

At the aerodrome situated in Zhukovsky the flight test program of the SSJ100 with the horizontal wing tips was successfully completed.

Two SSJ100 with the manufacturer serial numbers 95032 and 95157 with the horizontal wing tips took part in the testing. One of them had ice simulators of special shape on the leading edge and the empennage.

In accordance with the test program there were performed more than 140 flights. The flight program consisted of the examination of the take-off and landing performance, stability and manageability, flight control systems , lights, VNAV. There were the tests for strength, flights for high speeds, critical angles and cat. I, II, IIIa (takeoff-landing) performed and also in modes for the fuel consumption analysis at different stages of flight carried out.

The saber-like configuration of the tips installed on to the Sukhoi Superjet 100 turned out to be the result of a number of research, engineering and experimental activities carried out by the Sukhoi Civil Aircraft Company (UAC subsidiary) with the assistance of Central Aerohydrodynamic Institute (TsAGI).

The geometry of the tips was determined with the implementation of the innovative methods of 3D optimization based on numerical computation called Computational Fluid Dynamics (CFD) – the unique TsAGI know-how used in Russian aviation industry in particular for Sukhoi Superjet 100 program.

'Sukhoi Superjet 100 – is dynamically developing program. The installation of the saberlets allows to simultaneously improve the take-off and landing performance. Moreover, fuel effectiveness will improve. Customers will be able to decrease the fuel consumption for no less than 4%', as noted by Minister for Industry and Trade of Russian Federation Denis Manturov.

'Sukhoi Civil Aircraft Company is consequently implementing the Sukhoi Superjet 100 improvement program aiming at market expansion and the increase of the number of Customers, the current Operators satisfaction level growth and the maintenance of the high competitive level of the product. The wing tips installation being t he part of the improvement program will provide the operators with cost cut up to 10 000 000 rubles per year per one SSJ100', underlined Director General of the Sukhoi Civil Aircraft Company, Ravil Khakimov.

The completion of a full-scale program of ground and flight tests will result in the certification of the SSJ100 with the horizontal tips – saberlets and they will be offered as an option to the Customers and the Operators. The installation of the tips is possible not only to new aircraft but to the already delivered aircraft as well.

Saberlet kits are manufactured by Voronezh aircraft manufacturer (VASO), which belongs to UAC Transport Division. The kits are made of modern composite materials produced and certified in Russia and abroad.

Rostec presented Mi-171A2 and Ka-226T

As part of its joint exposition with the Buryat Republic, Russian Helicopters Holding Company (part of Rostec State Corporation) presented its latest civilian helicopter Mi-171A2 and Ka-226T light-weight multi-purpose helicopter, which are planned to be supplied to India, at the Eastern Economic Forum in Vladivostok.

Earlier, Russian Helicopters and Global Vectra company (India) had signed a contract for the delivery of a Mi-171A2 helicopter, including an option for one more rotorcraft. The helicopter manufactured under this contract and already painted in the livery of the Indian customer was presented at the Eastern Economic Forum. Its delivery to India is scheduled for late 2019 – early 2020.

The Ka-226T helicopter presented at the Forum was a demonstration of the prospects of Russian-Indian industrial cooperation – in accordance with the 2015 intergovernmental agreement, India will be supplied 200 such helicopters, of which 140 will be assembled locally.

'At the Eastern Economic Forum, we showed our Indian colleagues Ka-226T and Mi-171A2 multi-purpose helicopters designed for them. It is worth noting that our partners were well aware of all the advantages of the products of Russian Helicopters Holding Company. In India, Soviet and Russian-made helicopters make up more than 30% of the total fleet of civilian and military rotorcraft registered in the country. Our current projects create a good basis for further development of our cooperation,' said Viktor Kladov, Rostec Director for International Cooperation and Regional Policy.

The EEF also saw the Ka-226T parts and units, which are subject to localized manufacturing in India as part of this project. Last February, Russian Helicopters Holding Company signed agreements on a number of presented units with leading Indian aircraft manufacturers who desired to participate in the project to localize the Ka-226T helicopter production.

'The contract for Mi-171A2 supply to India is a clear demonstration of the fact that our latest civilian rotorcraft is in demand abroad, it is waited for and counted on. The helicopter showcased at the Forum is ready for delivery: we will be able to transfer it to the customer as soon as the certificate for Mi-171A2 is validated in India', noted Andrey Boginsky, Director General of Russian Helicopters Holding Company. 'We also demonstrated the progress of the Russian-Indian Ka-226T project: the Ulan-Ude Aviation Plant has already mastered the manufacture of certain parts and components of the helicopter and is preparing to start its serial production. We are also gradually developing our cooperation with Indian manufacturers in terms of localization, our dialogue with some of them will be continued as part of the Forum. At the Forum, we presented the Ka-226T with folding blades: this model is suitable for operation in marine conditions and for installation on board ships. This option is a good basis for more orders for this rotorcraft.'

Among other products presented at the Forum by the Holding Company was Ka-62 medium transport and passenger helicopter manufactured by Progress AAC named after Nikolai Sazykin. The model was showcased in the Primorsky Krai (Territory) Pavilion as part of 'Streets of the Far East' exhibition. On the verge of the Forum, the Ka-62 prototype took part in the flight program of the MAKS-2019 International Aviation and Space Salon in Zhukovsky.

The Mi-171A2 helicopter is the latest representative of the Mi-8/17 helicopter family. It encapsulates the best features of world famous Mi-8 type rotorcraft. The helicopter is equipped with KBO-17 integrated onboard digital flight and navigation system ('the glass cockpit'), which makes it possible to operate the machine without an engineer on board, thereby reducing its crew to two people. The new engines and supporting system improved the helicopter's flight performance, including its cruising and maximum speed. Depending on the operator needs, Mi-171A2 helicopter can perform search and rescue missions, medical and cargo operations, fight fires or carry passengers day and night, at temperatures from -50°C to + 50°C.

Ka-226T is a twin-engine light class helicopter, designed in coaxial configuration. A unique feature of Ka-226 helicopter is its modular design; it can be assembled with standardized easily removable modules of various configurations carrying special equipment.

The Fifth Eastern Economic Forum was held from September 4 to 6, 2019. During the previous Forum edition, 220 agreements, contracts, memoranda and protocols were signed for the total amount exceeding RUB 3 trillion. The Forum was attended by 6002 delegates and 1357 media representatives from 60 countries.

KA-32 HELICOPTERS FOR FIREFIGHTING

Russian Helicopters Holding Company (part of Rostec State Corporation) has delivered three Ka-32A11BC multipurpose helicopters to Turkey. The machines will be used in firefighting.

In July 2018 contracts were signed with KAAN Air (Turkey) for delivery of three Ka-32A11BC multipurpose helicopters. Currently all three were handed over to the customer. The rotorcraft were purchased primarily for firefighting purposes.

'Ka-32A11BC is the helicopter with the best technical equipment for firefighting missions', noted Andrey Boginskiy, CEO of Russian Helicopters Holding Company. 'This rotorcraft is an admitted leader in its class, and it is capable of solving a wide range of tasks. We are looking forward to further fruitful cooperation with our Turkish partners as far as delivery and after-sales support of helicopters are concerned.'

'Russia has top-tier competence in civil helicopter industry. Depending on the types of tasks and missions, we are ready to deliver a variety of helicopters to our Turkish partners', said Viktor Kladov, Director for International Cooperation and Regional Policy at Rostec. 'Right now Turkey is interested in expanding its fleet of firefighting aircraft, and Rostec intends to continue developing its cooperation with Ankara in this field. We estimate the current Turkish market for this type of helicopters as several dozens of machines.'

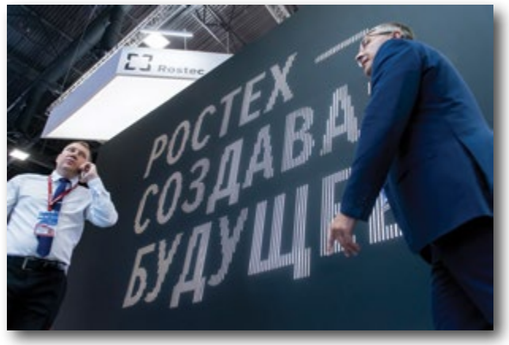
The Ka-32A11BC multipurpose helicopter is designed to perform complex firefighting operations, special search-and-rescue and high altitude construction operations, to transport cargo inside the fuselage and on the external sling, to log forest, transport patients and evacuate injured persons.

The co-axial scheme and absence of the tail rotor ensure compactness, high power-to-weight ratio and maneuverability, as well as exceptional controllability of the helicopter. Ka-32A11BC has a high load lifting capacity up to 5 tons of cargo on the external sling. The assigned service life of Ka-32A11BC is extended to 32,000 hours which guarantees lower operating costs.

The firefighting version of Ka-32A11BC can be equipped with various fire extinguishing systems, including Bambi Bucket and Simplex type, as well as a horizontal firefighting system. The helicopter is capable of extinguishing flames on the highest floors of high rise buildings and on oil-and-gas industrial facilities. The Ka-32A11BC has been acknowledged by experts as one of the world's best firefighting helicopters; it is a symbol of the Global Helicopter Firefighting Initiative (GHFI) – a program intended to improve the operating efficiency of specialized firefighting helicopters.

Civilian Order Portfolio Exceeding 78 Billion

The portfolio of civil orders for the radio-electronic cluster (REC) of the Rostec State Corporation in the first half of 2019 reached 78.6 billion rubles. The share of civilian products in the total revenue structure grew to 25 percent, exceeding the figure for the same period of the previous year by 5 percent.



It is expected that the consolidated civilian revenue of REC enterprises is to exceed the mark of 70 billion rubles, according to the results of 2019, which is confirmed by the current contracting levels for civilian products at the level of 95 percent of the annual plan. The primary growth is achieved through the implementation of complex infrastructural projects that include equipping healthcare facilities with medical equipment, introducing smart city technologies in Russian regions.

'The high-tech electronic products sector is growing faster than the economy as a whole. It is logical that the electronic cluster is becoming one of the main growth drivers of the State Corporation. Sales of our civilian products grew by 55 percent and reached 67 billion rubles in 2018. This positive trend continues, the portfolio of civil orders exceeded 78 billion rubles, including a substantial formulated reserve for 2020. The current share of civilian revenue in the sales structure is 25 percent, our targeted benchmark is 60 percent by 2025', said Sergey Sakhnenko, Rostelech industrial director of the electronic cluster.

The total portfolio of cluster orders in the year's first half amounted to 280 billion rubles, including the contracts in the field of state defense orders and exports. The consolidated revenue for the year is projected at more than 300 billion rubles.

Helicopter Engine for Mi-38

The aircraft engine TV7-117V developed by the St. Petersburg-based enterprise UEC Klimov of the United Engine Corporation, which was designed for Mi-38 helicopters, has successfully proved its operability.

During the tests, the engine worked in continuous and alternating icing conditions in all operating modes, at heights of up to 4000 meters, at temperatures as low as minus 30 degrees Celsius.

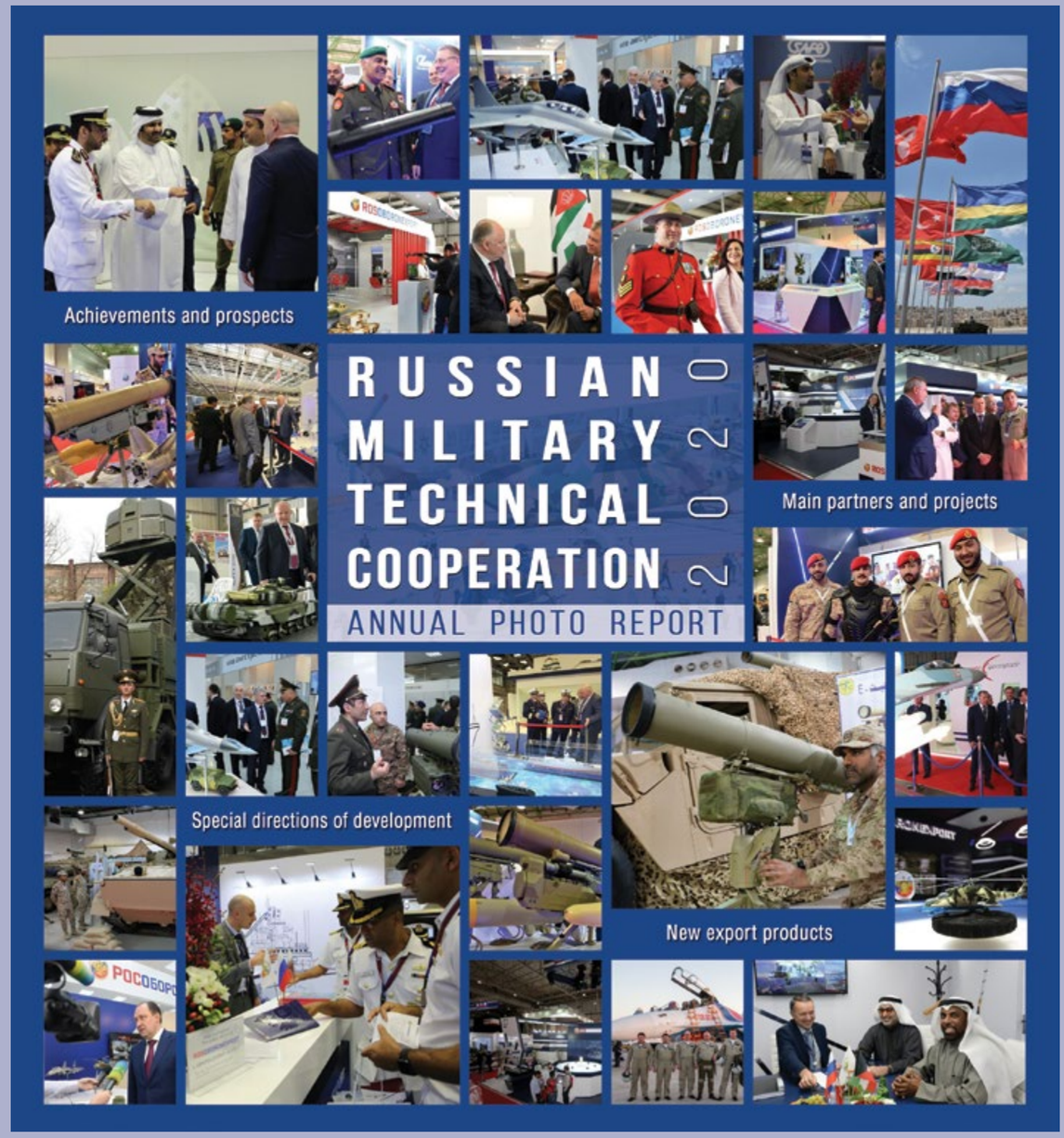
As a result, confirmation of the possibility of efficient engine operation was obtained. This greatly expands the possibilities of operating helicopters. It is planned to obtain approval of the main modification from the Russian Air Register after completing the documents in the third quarter of 2019.

Testing the aircraft to perform operations under icing conditions is a prerequisite from the point of view of aviation regulations. Icing of an aircraft in clouds greatly affects the design characteristics which were formed by the engineering designers.

The TV7-117V turboshaft engine with a free turbine is designed and mass-produced at the UEC Klimov. The constructive design, electronic systems of automatic control and monitoring with full responsibility of the FADEC type provides high power with low fuel consumption and increased flight reliability. There are no analogues in fuel efficiency and take-off power in this class of engines.

The main technical characteristics of the TV7-117V: power on take-off mode – 2800h.p. (in emergency mode – 3140 h.p.), specific fuel consumption – 205 g / h.p. per hour, dry weight – 435 kg, the assigned life span of the main parts according to the resource management system – 2110 flight cycles.

ANNUAL PHOTO ALMANAC
FOR MILITARY-TECHNICAL COOPERATION



The new project of the United Industrial Edition is an annual photo almanac dedicated to the most important and most striking in military-technical cooperation between Russia and foreign countries. The Almanac is an annual supplement to the magazine 'Russian Aviation & Military Guide'.

The almanac includes key partners and supplies, new military products, major contracts and programs, participation in biggest international salons and exhibitions, supplies of dual-use products and much more. The almanac will be released in February 2020.

HISTORICAL STATE VISIT

Vladimir Putin in the United Arab Emirates

This fall, one of the largest political events in the world was the visit of Russian President Vladimir Putin to the United Arab Emirates. In Qasr Al Watan Palace in Aby Dhabi, Vladimir Putin held talks with Crown Prince of Abu Dhabi and Deputy Supreme Commander of the United Arab Emirates Armed Forces Mohammed bin Zayed Al Nahyan.

The official meeting ceremony between the President of Russia and the Crown Prince of Abu Dhabi took place before the talks. Topics on the agenda included the further development of bilateral cooperation in trade, the economy and investment as well as major international and regional issues.

A package of documents was signed following the talks. Memorandums of cooperation in energy and the peaceful use of nuclear energy were signed by the two countries' corresponding agencies. In addition, a concession agreement on the Ghasha oil field between LUKOIL and the Abu Dhabi National Oil Company, a cooperation agreement between the Russian Direct Investment Fund, LUKOIL and the Abu Dhabi National Oil Company and a framework agreement on strategic cooperation between Gazprom and the Abu Dhabi National Oil Company were signed, as well as a cooperation agreement between the Russian Direct Investment Fund and the Mubadala Investment Company, which implements national projects, including projects on artificial intelligence.

Later, Vladimir Putin and Mohammed bin Zayed Al Nahyan toured the exhibition of investment projects dedicated to cooperation between Russia and the UAE. The President of Russia and the Crown Prince of Abu Dhabi also took part in a meeting with representatives of business circles from Russia and the UAE.

In addition, the sides exchanged gifts. Vladimir Putin presented the Crown Prince with a white gyrfalcon and, in return, received a model of the Qasr Al Hosn Palace, former residence of the UAE President.

Crown Prince of the Emirate of Abu Dhabi and Deputy Supreme Commander of the United Arab Emirates Armed Forces Mohammed bin Zayed Al Nahyan said: 'First, I would like to welcome His Excellency Mr President of the Russian Federation. It is a heartfelt welcome to the second country you are visiting – the United Arab Emirates. I would like to extend warm brotherly greetings from President of the United Arab Emirates His Highness Sheikh Al Nahyan.

We very much appreciate the high- and top-level visits that our countries have exchanged in recent years. I would like to emphasise the importance and the scope of strategic relations between the United Arab Emirates and the Russian Federation and also to reaffirm that our country prioritises the efforts to promote a dialogue and relations with Russia. Our countries maintain friendly relations, as well as diverse cooperation in all areas, which has yielded tangible fruit and includes positive economic indicators.

Dear brother and friend, I am happy to meet with you after more than a year since our last meeting in Moscow. I consider Russia to be my second home and I would like to once again thank you for the warm reception.

I would also like to express my gratitude to you for your commitment to strengthen the bonds of friendship and cooperation that we are tied together by – a friendship that exists between the peoples of the two countries and the governments of the two countries, as well as the personal friendship between the leaders of the two countries.

The United Arab Emirates is honoured that you are visiting this country and it is a historical visit. We would also like to reaffirm that our two countries are tied together by deep strategic relations. The United Arab Emirates sees brotherly, friendly and strategic relations with Russia as a priority.

Mr President, we welcome and appreciate our mutual desire to bring bilateral relations to the strategic partnership level. This agrees with our common vision and our common concept and, in keeping with this vision, we are poised to further strengthen this strategic partnership in the interests of our countries and peoples.

'We highly value our achievements in various spheres. We believe that friendship and strategic partnership between our countries serve as reliable guarantees of the successful development and expansion of our cooperation.'

Mohammed bin Zayed Al Nahyan

'We hope that Russian and UAE businesspeople will continue to develop their mutually beneficial trade and economic cooperation. The Russian government will fully support you.'

Vladimir Putin

Russia-UAE relations have been growing significantly and developing in all areas in recent years. We would like to reaffirm our strong wish to strengthen and expand these relations in the interests of our nations.

Mohammed bin Zayed Al Nahyan

Mr President, I would like to praise the outcome of the 9th Russian-UAE Intergovernmental Commission Meeting, which was held ahead of your visit. I would also like to thank the Russian Government for its successful efforts to hold the third edition of Aqdar World Summit in September 2019.

Also, Mr President, I would like to express my gratitude and appreciation for your support for the project that the United Arab Emirates sees as a historical one – the space expedition, in which the first cosmonaut from the United Arab Emirates, Hazza Al Mansouri, took part. Sending the first ever cosmonaut from the United Arab Emirates to the International Space Station is a historical achievement that had long been a dream of the founder of our country Sheikh Zayed and it has come true.

Mr President, dear friend and brother, I would like to yet again welcome you and the high-level delegation that is accompanying you. Hopefully, this visit will leave a deep impression and will be a qualitative breakthrough in developing our strategic partnership and taking it to a new level. I am also looking forward to meeting you again before too long.'

President of Russia Vladimir Putin said: 'First of all, I would like to thank you for this invitation. I am really delighted to be once again in the hospitable land of the United Arab Emirates. I could see from the window of the car I was being driven in for the short journey from the airport how quickly your country is developing and how it is looking better and better.

Relations between Russia and the United Arab Emirates continue to develop successfully in a friendly and constructive manner in accordance with the Declaration on Strategic Partnership signed in Moscow back in 2018. We are expanding ties in the trade, economic, cultural and humanitarian fields and we are maintaining close coordination on major global and regional affairs, primarily regarding Syria, Libya, Yemen and the situation in the Gulf.

Our political dialogue is regular and substantial. Our foreign ministers are in close contact. We have developed cooperation between our security councils, special services and defence ministries. I would like to ask you to convey my best regards and to wish good health to the President of your country, Khalifa bin Zayed Al Nahyan.

We continue developing trade, economic and investment cooperation. Last year our trade amounted to $1.7 billion, having increased by 3.6 percent.

We are grateful for your personal support of the partnership between the Russian Direct Investment Fund and the Mubadala Investment Company that are jointly investing in the Russian economy. These investments have already reached $2.3 billion. Your Russian partners are not letting you down: profits from these investments are much higher than on the markets of other countries.

We continue investing and cooperating in start-ups, in the energy sector and in the peaceful nuclear development. We continue coordinating our efforts and policy on the global hydrocarbon market, in part, owing to the OPEC plus agreement.

We are now working together in the car industry. Our cooperation in space exploration has reached a new level. I would like to congratulate you once again on the successful flight of the first astronaut from the UAE to the International Space Station. This event became possible owing to our friendship and your efforts to promote this idea. We are ready to continue rendering the necessary assistance to the United Arab Emirates in space exploration, including in such fields as satellite navigation and launching space vehicles into space.

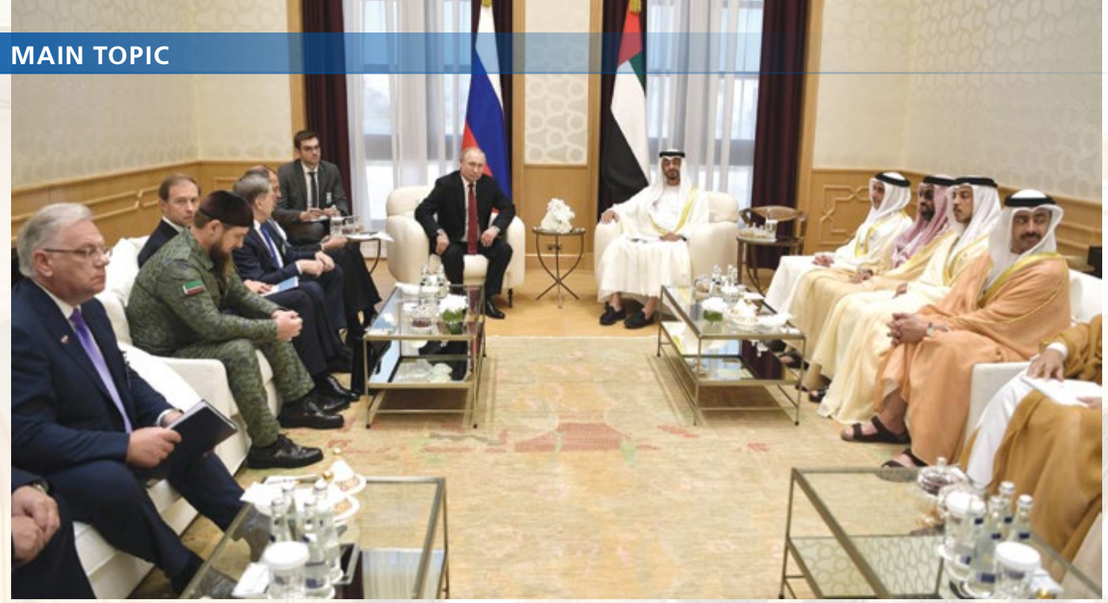
We are developing humanitarian ties. The UAE is a popular destination for Russian tourists. Last year the tourist flow increased by 23 percent. According to the Central Bank of Russia, our tourists spent over $1.3 billion in the Emirates, which is comparable with the scale of our trade. Mutual exemption of visa requirements is designed to expand contacts between our citizens. This intergovernmental agreement was signed at your initiative and entered into force last February. We will continue moving in this direction.'

President of Russia Vladimir Putin and Crown Prince of Abu Dhabi and Deputy Supreme Commander of the United Arab Emirates Armed Forces Mohammed bin Zayed Al Nahyan took part in a meeting with representatives of business circles of Russia and the UAE .

Crown Prince of Abu Dhabi and Deputy Supreme Commander of the UAE Armed Forces Mohammed bin Zayed Al Nahyan said: 'We would like to note that we do our utmost to

'The United Arab Emirates is Russia's key trading partner in the Persian Gulf region and in the Middle East in general. Last year, trade grew almost four percent and reached $1.7 billion. We have also succeeded in the investment sphere. The Mubadala Investment Company was among the first partners of the Russian Direct Investment Fund; over 45 projects worth $2.3 billion in total have already been implemented. The profit from them is significantly higher – sometimes three times as high – than the global standards. Investment is made in petrochemistry, transport and medicine.'

Vladimir Putin



'We very much appreciate the high- and top-level visits that our countries have exchanged in recent years. I would like to emphasise the importance and the scope of strategic relations between the United Arab Emirates and the Russian Federation and also to reaffirm that our country prioritises the efforts to promote a dialogue and relations with Russia. Our countries maintain friendly relations, as well as diverse cooperation in all areas, which has yielded tangible fruit and includes positive economic indicators.'

Mohammed bin Zayed Al Nahyan

develop our bilateral relations. This visit of yours is clear proof of our deep friendship and strategic partnership that connect the Russian Federation and the United Arab Emirates.

We are also glad to welcome representatives of the two countries' largest economic operators, who make their contribution to strengthening and promoting bilateral strategic partnership, here at this table.

Russia-UAE relations have been growing significantly and developing in all areas in recent years. We would like to reaffirm our strong wish to strengthen and expand these relations in the interests of our nations.

During my last visit to Moscow, we discussed issues related to the development and expansion of economic and investment cooperation between Russia and the UAE. Today we will hear reports from several representatives of large businesses who will talk about new trends and new aspects in these relations, as well as new goals and tasks for the future.

I would like to note the high level of cooperation with the Russian Direct Investment Fund, with which we have built a truly strategic investment partnership.

We highly value our achievements in various spheres. We believe that friendship and strategic partnership between our countries serve as reliable guarantees of the successful development and expansion of our cooperation.'

'Relations between Russia and the United Arab Emirates continue to develop successfully in a friendly and constructive manner in accordance with the Declaration on Strategic Partnership signed in Moscow back in 2018. We are expanding ties in the trade, economic, cultural and humanitarian fields and we are maintaining close coordination on major global and regional affairs.'

Vladimir Putin

President of Russia Vladimir Putin said: 'I believe it is very important to discuss Russian-UAE trade, investment and business cooperation. I have just had talks with Crown Prince of Abu Dhabi Mohammed bin Zayed Al Nahyan, where we focused on bilateral economic cooperation.

The United Arab Emirates is Russia's key trading partner in the Persian Gulf region and in the Middle East in general. Last year, trade grew almost four percent and reached $1.7 billion.

We have also succeeded in the investment sphere. The Mubadala Investment Company was among the first partners of the Russian Direct Investment Fund; over 45 projects worth $2.3 billion in total have already been implemented. The profit from them is significantly higher – sometimes three times as high – than the global standards. Investment is made in petrochemistry, transport and medicine.

Today we have made new deals; the projects are worth about $1.4 billion, and cooperation encompasses different areas. We are doing and will do everything necessary to help investors, including from the UAE, feel comfortable on our market.

There are new opportunities in digital technology, telecommunications, logistics, transport, finance, banking and, of course, energy. Let me note the effective work done by the joint enterprise of Gazprom Neft and Mubadala Petroleum to develop fields in the Tomsk and Omsk regions of Russia. LUKOIL is beginning to cooperate with the Abu Dhabi National Oil Company and has joined the oil and gas concession on the UAE shelf.

Our friends in the Emirates can count on Russia's cooperation in developing nuclear power generation. Rosatom offers its unique capacities, experience and advanced technology, which meet the highest standards, including in security.

Industrial cooperation is also expanding. We welcome our UAE friends as shareholders of the company that produces Aurus luxury cars.

We are ready to step up our cooperation in agriculture. Russia can cover the UAE market's demand for agricultural products and food, such as meat, including halal meat, and grains.

We are ready to continue joint work in space exploration.

Colleagues, friends, I have only outlined part of the wide range of opportunities for cooperation. We hope that Russian and UAE businesspeople will continue to develop their mutually beneficial trade and economic cooperation. The Russian government will fully support you.' /IA&TG/

GOVERNMENT REGULATION

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.

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.'

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.

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.

THE BEST FROM RUSSIA

Rosoboronexport: 19 years of the success on the world market

On November 4, 2019 there was the 19th anniversary since the establishment of JSC Rosoboronexport (part of the Rostec Corporation). The company was created in 2000 in line with a decree of the President of the Russian Federation.

'Rosoboronexport continues to strengthen its positions in the world arms market. Irrespective of fierce competition, in the year 2019 we have already managed to supply our products to 43 countries to the amount of 11 billion dollars, signed over 800 contracts for future deliveries. And these are not the final results as we have two more months ahead until the end of the year. Simultaneously, the portfolio of orders of the company keeps at the level of nearly 50 billion dollars, which guarantees the load for Russian defence industry enterprises for several years ahead,' said Rosoboronexport's Director General Alexander Mikheev, who is also holding position of deputy chairman of the Union of Russia's Machine Builders.

Rosoboronexport started to promote for cross-border sales a number of outstanding types of weapons and military equipment, which potentially may become bestsellers in the world market. They include the Su-57E multipurpose fighter of the fifth generation and helicopters Mi-28NE and Mi-171SH, which were modernized with the account of the experience of their engagement in combat operations. For the equipment of personnel of the partners' land forces, special operations and anti-terrorist units, the company has received an opportunity to supply the whole line of the Kalashnikov assault rifles of the newest 'two hundredth' series, including those using NATO standard cartridges.

This year Rosoboronexport offered to foreign customers the new Russian multiple launch rocket sys-

Dear Friends!

On behalf of Rosoboronexport I am pleased to welcome and congratulate you on the opening of Dubai Airshow 2019.

The event has a vibrant history. Held since 1986, it still has everything there is to rank among the most prominent international aerospace exhibitions. Dubai Airshow maintains firm footing among the first five largest aerospace events in the world, including Russia's MAKS, Pairs Air Show, Farnborough International and Air Show China.

Russia has indeed been a very active participant of the show ever since it came here first in 1993. I am particularly pleased to note the ever-growing scale of the show. Today it hosts 1,000-plus participants from all over the world, attracting just short of 100 thousand visitors.

Rosoboronexport is proud to set up here a joint exposition of Russia's largest manufacturers of combat aviation, helicopters, AD systems and other platforms for the aviation and space industries. In 2019, Russia is represented in Dubai by Rostec's facilities, known worldwide for their rich history, enormous experience, and outstanding specialists, namely Russian Helicopters, United Engine Corp., High-Precision Systems, Shvabe, as well as United Aircraft Corp., and Almaz-Antey.

Rosoboronexport feels every new exhibition bring a jolt to the interest in the offered products among AF and AD communities in the Middle East and other regions of the world. Being very well aware of the fact, we jump at every opportunity to justify the attention of our partners and surprise them with Russia's unique products and novel designs.

Dubai Airshow 2019 is very much in line with this trend. This year, Russia's exposition is comprised of the advanced Su-57 multirole fifth-generation fighter, IL-112VE light military transport, numerous Rostec's designs, among them is the Mi-28NE helicopter upgraded based on its performance in real combat, as well as unique AD assets, including the modernized Pantsir-S1M missile and gun system. By no means we have neglected space, bringing alone a state-of-the-art special-purpose space observation radar, dubbed Sula.

Along with new platforms, demonstrating outstanding export potential, Russian companies, keeping up with their tradition, also brought some of its bestsellers, legendary S-400 long-range SAM system, Mi-171Sh and Mi-35M helicopters, Su-35 and MiG-35 aircraft, as well as precision aircraft weapons proven in combat.

We do expect Russia's drone-fighting solutions to gather crowds as well. Unfortunately, the Middle East was the first to learn about how real the threat posed by small and ultra-small UAVs in the hands of terrorists was. Rosoboronexport offers a gamut of assets capable of protecting any installation or area from the threat. They include both solid and substantial AD platforms, the venerable Pantsir-S1M and Tor-E2, and mobile gear, i.e. man- or van-portable equipment.

We keep tabs on trends prevailing on the international arms market, including in the Middle East, the region which matters for Russia more than any other in the world. Though demonstrations of the best pieces of Russian military equipment is by far not all we have up our sleeve at Dubai Airshow 2019 for we are ready to share with our partners information on the whole diversity of options of mutually beneficial cooperation, to include technology transfer and infrastructure projects in the space domain as well.

Alexander Mikheev
Director General, Rosoboronexport

tem (MLRS) Tornado-S with the range of fire of up to 120 kilometers, new projectiles to MLRS and rounds for tank guns, mobile complex of missile weapons 'Club-T', the 'Rubezh-ME' coastal tactical missile system and a number of other types of weapons, which are very much demanded in the market. The majority of them were exhibited at the largest international exhibitions of defence products in Russia and abroad.

In 2019 the company has been carrying out its work in the area of marketing and exhibitions in a proactive manner, i.e. it has taken part in 16 exhibitions, and 5 more are to be attended by the end of the year. As a result of the inaugural exhibition DSE Vietnam 2019 in Hanoi, the organizers acknowledged that the unified Russian exhibit, arranged by Rosoboronexport, was the best one there.

Besides, Rosoboronexport became a participant of the first ever Russia-Africa Summit, where it had productive meetings with high level delegations from the continent's countries.

The special exporter has presented unique products of Russian enterprises at specialized international security fora in Moscow and Ufa. Foreign delegations were shown new sophisticated equipment to counter unmanned aerial vehicles, face recognition assets and other special solutions to fight terrorism and organized crime.

'In 2019 Rosoboronexport continued to strengthen its image of a reliable partner, a dynamic and flexible company, ready to run business effectively even in conditions of immense pressure from the part of competitors. We introduce successfully those financial arrangements, which make our cooperation with partners independent from unfavourable external conditions,' added Alexander Mikheev. 'This brings positive results. Despite sanctions, we have completed supplies of all the components of the S-400 Air Defence Missile Systems to Turkey ahead of time, created and launched the first world's joint venture on production of the Kalashnikov assault rifles of the 'two hundredth' series in India.'

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.

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.

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

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.

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.

EXPORT REGULATION

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Alexander Mikheev

'Rosoboronexport continues to strengthen its positions in the world arms market. Irrespective of fierce competition, in the year 2019 we have already managed to supply our products to 43 countries to the amount of 11 billion dollars, signed over 800 contracts for future deliveries. And these are not the final results as we have two more months ahead until the end of the year. Simultaneously, the portfolio of orders of the company keeps at the level of nearly 50 billion dollars, which guarantees the load for Russian defence industry enterprises for several years ahead.'

Alexander Mikheev

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.

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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.

/IA&TG/

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.

UNDER THE UAC-BRAND

United Aircraft Corporation continues to develop international aviation projects and relies on the civilian segment

The largest company in Russia and one of the largest in the world – aviation holding United Aircraft Corporation (UAC, part of Rostec Corporation) has been a regular participant in the Dubai Airshow. This year in Dubai UAC presents a wide range of his key projects both in military aviation and in the civilian segment, to which the company is paid a lot of attention in recent years. Among the main UAC's projects – MC-21, Superjet 100, Be-200, Be-103, IL-76MD-90A, IL-112V, IL-114-300, Su-57, Su-35, MiG-29K, MiG-35, Su-30SM, Yak-130 and others. The combined UAC's exposition will be located at stand No. 770.

The main participant of the all international aviation projects from the Russian side is the United Aircraft Corporation (UAC), which is the major Russian aircraft manufacturers and one of the biggest in the world. As part of the development of a multi-faceted and mutually beneficial partnership with other countries, UAC is ready to present its new technologies, perspective projects and industrial potential of the well-known aviation plants.

It should be noted that according to experts, it is Russian aircraft which in terms of life-cycle cost appears today as the most attractive in international markets. And this makes the UAC and the Russian aircraft industry very attractive, including for cooperation.

UAC was established in 2006 and its member companies are leading in a wide range of aviation industries: development, production, sales, operational support, warranty and servicing, modernization, repair, and disposal of civil and military aircraft. The main provisions of UAC's Development Strategy through define the principles and directions for dynamic development of the Corporation in order to gain the status of one of the world's largest aircraft-manufacturing centers with a widely-diversified product range.

Now UAC unites all major design and production assets of Russian aircraft industry. It also manages all key and most promising programs of development of the industry. UAC, which under one company represents the most well-known Russian aviation brands such as Sukhoi, MiG, Tupolev, Yakovlev and others, is today one of the world's biggest manufacturers and suppliers of aircraft. Thanks to the success of its products UAC is one of the world's leading aircraft manufacturers. Superjet 100 civil airliners, Su-30 and MiG-29 fighters, Yak-130 operational trainers are among the most popular aircraft exported by UAC. UAC is working to simplify foreign market procedures, which is good news for present-day and future UAC's partners worldwide.

The new capabilities confirm there is a steadily growing demand for UAC aircraft. Moreover, operational reliability and relatively low prices become increasingly significant. In this regard there is a reasonable increase of export of Russian aircraft having better reliability, up-to-dateness and well-balanced prices both for airplanes and further maintenance.

UAC continues to implement a large-scale program to create a new family of MC-21 passenger aircraft. With all the scope of this project, work on it is proceeding as planned and progressively. For example, at the end of last year Irkut Corporation (a UAC member) completed construction of the third MC-21-300, intended for flight tests. The aircraft was transferred from the final assembly shop to the flight test unit.

Testing results of the first MC-21-300 aircraft passing certification tests were taken into account in the production of the new aircraft. The components and units of the fourth flight test aircraft are being assembled at the Irkutsk Aviation Plant. Currently, three MC-21-300 aircraft are taking part in flight certification tests at the airfield of Flight Test Institute named after M.M. Gromov.

President of UAC Yuri Slusar said about MC-21: 'Flight and ground certification tests of aircraft prototype confirmed the main design solutions. UAC enterprises have begun to manufacture parts and units of MC-21-300 aircraft intended for customer's delivery. Joining to the flight tests of new aircraft and production intensification of mass-produced airplanes are the main tasks of 2019.'

Absolutely, UAC has serious plans for the MC-21. This new-generation family of civil aircraft is aimed at the largest segment of the global airliner market. Demand for aircraft of this class in the many regions is very high and expected to increase in the future. The MC-21 has better flying, operating, economic and consumer characteristics than any existing or future equivalents. Four MC-21-300 will take part in the ongoing flight test programme, and production aircraft will be put into operation shortly.

The development programme comprises two models: the MC-21-300 (160 to 211 seats) and the MC-21-200 (130 to 176 seats). Advanced technological solutions as applied to aerodynamics and propulsion, as well as the latest onboard systems and new solutions pertaining to passenger comfort make the airliners objectively competitive over products by other manufacturers. The interest in this programme is huge, we can see it at aerospace exhibitions when demonstrating the project.

The MC-21 is one of the world's most advanced aircraft. It is being developed and manufactured with the comprehensive use of digital technology. Fuselage components are manufactured and assembled on an all-new automated assembly line. The aircraft incorporates many

'The innovative development of the industrial model, increasing production rates of narrow- and wide- body aircraft are paving the way to new market segmentation approaches. The changing competition conditions are leading to further fleets optimization, adjustment of air transportation models, and the demand for new civil aircraft in general.'

Yury Slyusar

composite components, making it more reliable, lightweight, efficient and easy to operate.

'We can confidently say that 2018 turned out to be productive for the aircraft industry. Construction of the new aircraft and certification tests of the first aircraft confirm that the MC-21 program is developing steadily. As part of the program, a deep modernization of aircraft manufacturing enterprises was carried out, new high-tech companies were created, an environment for development of promising civil aviation projects was formed,' – mentioned Denis Manturov, Minister of Industry and Trade of the Russian Federation.

In recent years rather good results have been shown by civil segment for which UAC has been making big plans. Among Russian civil aircraft the Superjet 100 regional aircraft of a new generation is the most popular at foreign markets. The aircraft combines new aircraft engineering technologies, passenger convenience, significant economic advantages for airlines, proper environmental specifications.

Now UAC unites all major design and production assets of Russian aircraft industry. It also manages all key and most promising programs of development of the industry. UAC, which under one company represents the most well-known Russian aviation brands such as Sukhoi, MiG, Tupolev, Yakovlev and others, is today one of the world's biggest manufacturers and suppliers of aircraft. Thanks to the success of its products UAC is one of the world's leading aircraft manufacturers. Superjet 100 civil airliners, Su-30 and MiG-29 fighters, Yak-130 operational trainers are among the most popular aircraft exported by UAC. UAC is working to simplify foreign market procedures, which is good news for present-day and future UAC's partners worldwide.

The key advantage of Superjet 100 is lower operational costs as compared to its 100-seat competitors. Operational costs are minimized due to higher fuel efficiency and lower take-off weight. According to the aircraft operation study, its ownership cost is averagely 15-20% lower than the other similar class aircraft. The highly competitive lease rate supported by a state guarantee of depreciation value is also worth being taken into account.

SSJ100 capable of carrying 98 passengers is the first in its class aircraft featuring five-across seating, with big 32 inch distance between seats. Thanks to a combination of wider seats and higher cabin (over 2 meters) SSJ100 has more cabin space and bigger stowage bin capacity than such of competitors. The airplane has been built with the use of the latest design procedures and technologies by leading manufacturers such as French Snecma (engines) and Thales (avionics), US Goodrich (wheels) and Honeywell (APU). The interior has been designed by Italian office Pininfarina. In February 2012 the aircraft was certified by European Aviation Safety Agency (EASA).

According to UAC President Yuri Slyusar the Corporation has stable rate of mass production of Superjet 100. There are plans that every year more than 30 such aircraft shall be delivered to customers. Today about one hundred fifty SSJ100s are being operated including those in other world regions, from South America to Southeast Asia.

Currently with available manufacturing capacities UAC enterprises are capable of producing up to sixty Superjet 100 per year. The Russian aircraft sparkles profound interest in Southeast Asia and Latin America. Experts confirm that in the context of 70-100-seaters this aircraft is becoming the most attractive for many international airlines. When interviewed Yuri Slyusar said UAC is intended to focus on further development of the Superjet 100 aircraft family to offer customers a range of regional planes.

Yuri Slusar said: 'Among our civil projects, I can mention not only the SSJ100 family, which is now in operation around the world both in the standard and business configuration. The programme continues to develop: we plan to offer the market an upgraded version of the aircraft. The aircraft will have its wing, fuselage, engines and systems modified, including a new wing and a new avionics suite.

The new capabilities confirm there is a steadily growing demand for UAC aircraft. Moreover, operational reliability and relatively low prices become increasingly significant. In this regard there is a reasonable increase of export of Russian aircraft having better reliability, up-to-dateness and well-balanced prices both for airplanes and further maintenance.

We also expect a high interest in the unique Beriev Be-200 amphibian aircraft, whose primary firefighting role is very topical for virtually all the regions of the world. This airplane can operate from water at wave height of up to 1.3 m, and special anti-corrosion measures allow for its operation in the open sea.'

Russian lighter, multirole Be-103 amphibian can transport passengers and freights, serve as an air ambulance, for patrolling and monitoring… All of this facts swoes that Russia has been and remains a great aerospace power capable of manufacturing aircraft in all the market niches. UAC knows what aircraft world market needs, and is prepared to offer them on advantageous conditions.

Russian Corporation intends to seriously compete for the expansion of its share in the global market for civil aviation products. Last autumn UAC presented its annual Market Outlook for the next 20 years. The market outlook is based on UAC proprietary methodology and mathematical models and demonstrates the views of the Corporation on the development of air transportation and the demand for new commercial aircraft.

According to the forecast, UAC estimates the total demand for new passenger aircraft with more than 30 seats in 2018-2037 to exceed 43.6 thousand aircraft worth over US$6 trillion in 2018 catalogue prices. The market outlook is a comprehensive marketing analysis devoted to the civil aircraft segment of the world's aviation that analyses the tendencies and trends in the development of commercial air transportation in the world's regions and the whole world. Most attention is devoted to the passenger transportation segment as the most capacious both in terms of value and delivery numbers. This segment is also very important to UAC as, according to the Corporation's long-term development strategy, UAC's revenue from sales of commercial aircraft should reach 45% from total sales, outgrowing other revenue segments.

UAC President Yury Slyusar noted: 'The innovative development of the industrial model, increasing production rates of narrow- and wide- body aircraft are paving the way to new market segmentation approaches. The changing competition conditions are leading to further fleets optimization, adjustment of air transportation models, and the demand for new civil aircraft in general.'

According to the outlook, the annual passenger turnover rates during 2018-2037 will grow by 4.6% per year. Narrow body aircraft with 110 and more seats will be the most demanded by the airlines, capturing 68% of the whole market in quantity and 56% by value. The total demand for wide body aircraft will amount to almost 8 thousand aircraft, which is by value 40% of the total market in 2018 prices. Demand for new jet aircraft with 30-110 seats will amount to about 4 thousand aircraft – with only 3.1% of the total market value. The demand for turboprop aircraft will is estimated at 2.2 thousand aircraft.

Forecast from the UAC

In this article we would like to bring a few ideas and thoughts from this strategic forecast of the UAC.

The wide-body aircraft traffic share prevailed over that of narrow-body aircraft by 13 p.p. at the beginning of this century (52% and 39% respectively). But the ratio had been changing rapidly: percentage of narrow-body increased and the stake of wide-body aircraft lowered. The traffic volumes for aircraft of both classes equaled to 46% in 2007, but then the changes continued and a share of narrow-body aircraft increased to 52%, and wide-body aircraft – declined to 44% by 2017. The trend will continue within the forecasted period: narrow-body transportation will reach 58%, and a share of wide-body aircraft will decrease to 39% by 2037. This trend is typical for all regions except Africa and CIS (excluding Russia)

The total share of regional transport is declining (the whole world now is at 4.5% (0.9% for regional turboprops and 3.6% for regional jet aircraft), at this it was equal to 8.3% in 2001) and will continue to decline (to 3.1% in 2037). Exceptions are China (growth from 1.4% to 2.0%) and the CIS (without Russia) – from 11.9% to 12.7%.

Rise of the GDP is the main transportation growth driver. GDP gain rate was 2.8% within 2000 – 2017 period. It is expected that GDP will grow by 3% (average) during the first decade of the forecasted period and by 2.6% – in the second.

Global population growth rates are decelerating. This indicator was 1.2% in the retrospective period (2001-2017). It will be 1% within the 2018-2027 and 0.8% during 2028-2037 periods. Average growth will be 0.9% for the 20 years.

Passenger turnover is growing at a faster pace compared to GDP. This 'outstripping' is reduced as the air transport develops. Thus, the growth rate ratio of the passenger turnover to GDP was 2.02 in the retrospective period, it is expected to be 1.70 in the first decade of the forecast period, and 1.54 in the second. It is expected to be at a level of 1.63 times for the total period. In other words the saturation effect is being witnessed: air travel becomes a routine event and people begin to fly as much as they really need (regardless their income level).

The forecast from the UAC presented many interesting observations and conclusions. For example, about changes in transportation patterns and aircraft fleets. Despite the 'standard' seven-year cycle of growth in the profitability of air transport, the market shows no signs of a significant decline in profitability. This circumstance contributes to the inflow of long-term capital into the industry, including non-investment class companies.

Optimistic assessment of aircraft leasing is confirmed by extension of capitalization and impact of leasing companies from the Asian region, where companies based on investment from China take on particular importance. In the period up to 2023, a share of the Chinese leasing companies in the value of the operating fleet is projected to grow steadily from current 18% to 22-25%. China's high GDP growth rates sustaining may lead to the future drastic changes in this segment of the world market.

The dynamics of the aircraft industry development in recent decades have contributed to transition to the mega-associations, being the next stage of the global aircraft manufacturers consolidation. Study of the financial stability of the new industrial configuration and its main players competencies sufficiency requires special attention in the current situation. Modern conditions for aircraft creation and future supply of such products to the market cause special risks for air transport that are yet to be revealed by the decisions on aircraft manufacturers unification of their product lines.

Development of an innovative industrial model, increase of the wide-body and long-haul aircraft serial production rates create reasons for new approaches to market segmentation. Changed conditions of the competition will lead to optimization of aircraft fleets, adjustment of air transportation models, and overall change in demand in aeronautical engineering.

The transformation rate of the previously established vision for the international relations, role of globalization, forms and directions of goods, services, financial and human resources movement takes an outstanding role – in terms of its impact to the world.

Complicated modern processes taking place in the world economy create a real threat of 'trade wars'. Expanding state protectionism in economic matters, non-compliance with WTO rules, refusal to conclude and execute agreements on free trade zones, tariff barriers and differences of views of the world's financial centers on monetary policy form new challenges and obstacles to the development of air transport.

Consistent implementation of 'Industry 4.0' principles in the world economy is naturally and actively reflected in the aircraft building industry. Digitalization as a juggernautic force accompanies the aviation in the air and on the ground.

Transition to product life cycle management based on modern digital technologies contributes to radical organizational transformation of aircraft corporations. This business is becoming more thoughtful, dynamic and efficient.

Competition in the air transport market is a continuous search for new ideas and solutions by players in the globalization environment. A significant number of mergers and acquisitions have formed a new corporate structure of the industry in the recent years.

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The narrow-body aircraft with more than 110 seats are the most numerous on the market with a total amount of 15.4 thousand tails (58.1% of the total fleet). They are being followed by wide-body aircraft whose share equals to 4.6 thousand (17.3%). Regional aircraft are calculated at a level of 6.5 thousand tails (24.6%), of the regional turboprop segment by contrast has the 'elderly' (aged more than 20 years) aircraft share as the most significant.

The global demand for regional turboprop aircraft for the next twenty years will be ≈2,190 tails, of which 78% will be aircraft with more than 60 seats and 22% – aircraft with 30 to 60 seats. The share of regional turboprop aircraft in the total quantitative demand for new aircraft will be 5%.

Existing firm orders cover 16% of the expected demand for this class of aircraft.

which jets are 3.9 thousand (14.9%) and turboprops – 2.6 thousand (9.7%).

Average aircraft calendar service life of the commercial passenger fleet was 10.8 years at the beginning of 2018.

The 'oldest' one is the regional turboprop aircraft fleet (15.8 years of age), it is followed by the regional jets (12.1 years), narrow-body aircraft (10.0 years), with wide-body aircraft being the 'newest' ones (9.9 years) if the average calendar service life estimation is applied.

Age-wise distribution of the aircraft fleet shows that in all classes, except the regional turboprop aircraft, the age structure is relatively even, but the long-haul aircraft have the newest (less-then-five-years) share as the most numerous and

According to UAC's forecast, the demand for non-ramp cargo aircraft in the period 2018-2037 will remain within the range of 2,350 – 2,450 units (new aircraft – 63%, converted – 37%). The main factors affecting freight traffic growth have not changed.

Cargo turnover growth rate is less than the growth rate of passenger turnover. The share of air cargo transportation using passenger aircraft is slowly declining and will decrease to about 50% freight-ton-kilometers (FTK) for all segments by 2037.

In the medium term, air cargo growth rate may be significantly affected by infrastructure constraints, including ability of airports to handle cargo. USA's policy to return the center of world production of goods and services to its territory forms risks of reduction of air cargo traffic on USA-Asian and Asian- European routes. At the same time, emergence of new destinations with relatively high traffic intensity is predicted: China-Central Africa and China-Latin America.

The desire of the leading countries to execute a new stage of the resource base development in Africa creates conditions for subsequent growth of trade turnover and expansion of its directions. Conditions for increasing demand for cargo transport to/from Africa are emerging.

Demand for new passenger wide-body aircraft for the twenty-year period is expected to be at 7,745 aircraft or 18% of total sales.

The ratio of the capacity group's shares within the segment will change: minding the retirement of existing fleet the 325+ seats subgroup share will increase to 35% by the end of the forecast period.

Announced firm orders cover 28% of the total forecasted demand, including 24% and 34% in the subsegments of the 'smaller' and 'larger' capacity groups, respectively.

The total cost of new aircraft in the wide-body segment, which are expected to be delivered in the forecast period, is USD 2,439 billion (2018 catalog prices), which is equivalent to 40% of the total market of new passenger aircraft.

The most profitable will be supplies of the airliners designed for 300, 350 and 250 seats (USD 825, 513 and 481 billion, respectively). Demand for extra-large passenger aircraft with capacity of more than 425 seats is estimated at 615 aircraft, and the cost – at USD 279 billion.

Average annual growth rate of passenger traffic in the forecasted period will be 4.5%, which is 0.1 percentage points less than the world average.

Relatively short flights prevail in the traffic distribution by range. At this Russian airlines generate 75,5% of the turnover at ranges less then four thousand km, which is considerably higher than the world average (61.9%). This trend will generally sustain in the forecasted period even though the Russian airlines share at these distances may reduce

to 69.9% by 2037, unlike the world average that is expected to increase to 62.0%.

Total demand for new aircraft is estimated at 1,290 aircraft, of which 860 (67%) are narrow-body ones, 125 (10%) – wide-body, 200 (16%) are regional jets and 100 (8%) are regional turboprop aircraft. Catalog value of the new aircraft will be USD152 billion.

Available firm orders cover 40% of expected demand in quantitative and 45% in value terms.

Global share of Russian airlines in purchasing of new passenger aircraft within the next 20 years will be 2.9% in quantitative terms and 2.5% in value terms. The modern passenger fleet consists of 359 aircraft, average age of the aircraft is 17.8 years. Of these, only 74 units (21%) will remain airworthy in the world fleet by 2037.

Europe's share of the world population was 8.3% in 2017. Expected rate of population growth in Europe (0.1%) is small compared to the world average (0.9%) and in this regard, Europe's share will be reduced to 7.1% by 2037.

The GDP passenger traffic growth rates (1.8% and 3.5% respectively) in the region are smaller than the world's average (2.8% and 4.6%, respectively), which is quite typical for regions with developed economy and air transportation.

UAC continues to implement a large-scale program to create a new family of MC-21 passenger aircraft. With all the scope of this project, work on it is proceeding as planned and progressively. For example, at the end of last year Irkut Corporation (a UAC member) completed construction of the third MC-21-300, intended for flight tests. The aircraft was transferred from the final assembly shop to the flight test unit of Irkutsk aviation plant.

Europe is the region with one of the highest levels of income per capita (2.85 times the world average in 2017). This allows Europeans to significantly exceed the world average by 3.3 times, which, along with per capita income, is the second indicator in the world after North America.

Traffic distribution by range has a distinctive bimodal form: value of the first mode in the forecast period will grow, and second – will decline. As a result, median of the distribution will significantly reduce from 3,108 to 2,830 km. Comparing the European distribution by range for with the world average, large shares of traffic for range of 6-10 thousand km and relatively small shares of traffic for the longest ranges (>10 thousand km) can be seen.

Europe overtook North America and became the leader of the world ranking in passenger turnover in 2017. It is expected that the region will hold this position until 2032, when Asia-Pacific region (excl China) will move to the first place.

The share of regional traffic of the European companies is decreasing all the time: in 2001 it was 9.2% (regional jets – 7.1% and regional turboprops – 2.1%), by 2017 it decreased to 3.3% (regional jets 2.3% and regional turboprops 1.0%). In the forecast period, reduction in the share of regional transportation will continue, but its pace will decrease: in 2037, share of regional jet transport will account for 1.3%, and share of regional turboprop – 0.6%. The effect of the reduced share of regional air transport in Europe is partly due to the replacement of short-haul air transportation by alternative modes of transport. **/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.

UNIVERSAL BRAHMOS FOR MODERN WARFARE

Supersonic cruise missile BRAHMOS has established its supremacy as the world's deadliest precision strike weapon of modern times. The highly versatile tactical missile incorporating unique features of range, stealth, pin-point accuracy and deadly firepower, has become the ultimate weapon of choice for highly complex and intense military conflict situations.

BrahMos Aerospace, the joint venture (JV) defence entity involving India's DRDO and Russia's NPOM, has successfully designed, developed, produced and tested the formidable BRAHMOS from land, sea, sub-sea and air platforms. No other nation possesses such an unparalleled versatile weapon which can be deployed on multiple platforms for multiple missions.

With unbeatable land attack and anti-ship capability, BRAHMOS flies at three times the speed of sound for a range of 290-km and carries a conventional warhead of up to 300-kg. The terrain-hugging, fire & forget, highly manoeuvrable missile can evade powerful enemy air defence systems.

Indian Navy became the first to deployed BRAHMOS in 2005. A number of India's frontline naval warfare platforms, including frigates and destroyers, have been armed with the weapon's land-attack and anti-ship configurations. The missile has validated its flexibility to be launched in single or salvo mode from a moving or static naval platform in both inclined and vertical configurations. For modern maritime missions, BRAHMOS has emerged as the most powerful weapon capable of undertaking both littoral as well as high sea missions with impeccable accuracy from stand-off ranges.

Additionally, the mobile land-attack BRAHMOS variant has emerged as a potential choice for coastal defence purposes. The surface-to-surface BRAHMOS configurations can be deployed as mobile coastal batteries to effectively neutralise any kind of enemy attacks emanating from land or sea. Indian Defence Ministry, in August 2019, has cleared the acquisition of Next Generation Maritime Mobile Coastal Batteries fitted with supersonic BRAHMOS SSMs for Indian Navy.

BrahMos Aerospace has also successfully tested BRAHMOS from an underwater platform in 2013, thereby validating the missile's adaptability for fitment onto conventional attack submarines in future.

The Indian Army, which became the first land force in the world to possess a supersonic cruise missile system in 2007, has raised several BRAHMOS regiments consisting of the advanced Block-I, Block-II and Block-III configurations to fight divergent land warfare missions.

On 22nd November 2017, the BrahMos JV created a world record feat when the advanced BRAHMOS air-launched cruise missile (ALCM) was successfully test fired from the Indian Air Force's Sukhoi-30MKI air combat platform for the very first time against a ship target in the Bay of Bengal off India's eastern coast.

Following that landmark mission, India became the first and only country in the world to possess a supersonic cruise missile which could be fired from land, sea and air. Once again on 22nd May, 2019, BRAHMOS ALCM created a world record after it was successfully test fired from the IAF's Sukhoi-30 strike fighter against a land target from India's Andaman Islands region.

'With its unparalleled range, lethality and effectiveness, BRAHMOS ALCM has emerged as the most powerful conventional airborne tactical weapon to completely obliterate any kind of ground and sea-based enemy formations from longer distances and stand-off ranges. It has given an unprecedented fillip to the Indian Air Force's air combat capability in 21st century,' says Dr. Sudhir K Mishra, CEO & MD of BrahMos Aerospace.

The 'Universal BRAHMOS' thus holds immense potential to influence the entire spectrum of warfare in modern times, and has become an 'ultimate force multiplier' in network-centric warfare environment.

Owing to its highly successful track record, BRAHMOS has generated a lot of interest in the worldwide arms market with many countries across continents expressing strong desire to acquire the supersonic cruise missile to bolster their military power. Accordingly, India and Russia have agreed in principle to export the weapon to selected friendly nations.

The two nations have also embarked on an ambitious journey to jointly design and develop more advanced, more powerful versions of the weapon including the BRAHMOS-NG and BRAHMOS-II (K) which promise to revolutionise future warfare strategies in a decisive way. /IA&TG/

SPARRING PARTNER FOR SAM SYSTEMS

The Adjutant universal target training system developed by Izhevsk Electromechanical Plant Kupol performed to design specifications in a series of adverse weather trials

How effectively military equipment is used in combat situations depends not just on its performance characteristics but also on the level of personnel training, and that is entirely down to constant practice. This is why Izhevsk Electromechanical Plant Kupol (an Almaz-Antey Corporation company), which manufactures the Tor family of surface-to-air missile (SAM) systems, combines work to improve its products with efforts to create advanced learning and training aids for air defence specialists.

The enterprise has designed the 9F6021 Adjutant universal aerial target training system. Launched at Kupol's own initiative, the project was developed in conjunction with the parent company Almaz-Antey Corporation and in close cooperation with the Russian Defence Ministry. The Adjutant introduces air defence specialists to a broad range of practice targets maximally representative of existing and future aerial threats. The system supplies operators of a broad range of existing and potential air defence systems with complex target scenarios involving combinations of different simulated aerial threats.

The Adjutant's design specifications have been corroborated in a number of trials held in different climates. On 25 September 2018, the system was used at the Kapustin Yar proving ground to provide practice targets for Russia's newest S-300V4 long-range air and missile defence SAM system. The Adjutant's turbojet-powered missile target imitated a single small-sized low-flying airborne object. The tests confirmed both the S-300V4's design characteristics and the Adjutant's ability to generate complex target scenarios for long-range SAM systems.

The Adjutant was also used for creating target situations during tests on the Tor-M2DT SAM system on Novaya Zemlya in the summer of 2019. The target system's organic remote operator station ensured sustained command and control, in all flight phases, of two MV-S fixed-wing targets travelling along preset trajectories. The flawless completion of all the training and combat objectives demonstrated that the Adjutant targets and ground equipment can be operated in the punishing Arctic environment. The trials also confirmed the Arctic Tor version's readiness to protect administrative and military facilities in the north of Russia against contemporary aerial threats.

In August 2019, the Adjutant generated target scenarios in the course of a joint Russo-Belarusian air defence and air force theatre exercise at the Ashuluk training ground. Despite the harsh climate, with outside temperatures exceeding +40°C and high concentrations of dust in the air, the system demonstrated high reliability and successfully completed all its objectives. These included an overflight of enemy air defences by a group of fixed-wing targets and the creation of a complex target situation for the Belarusian army's Tor-M2K SAM systems.

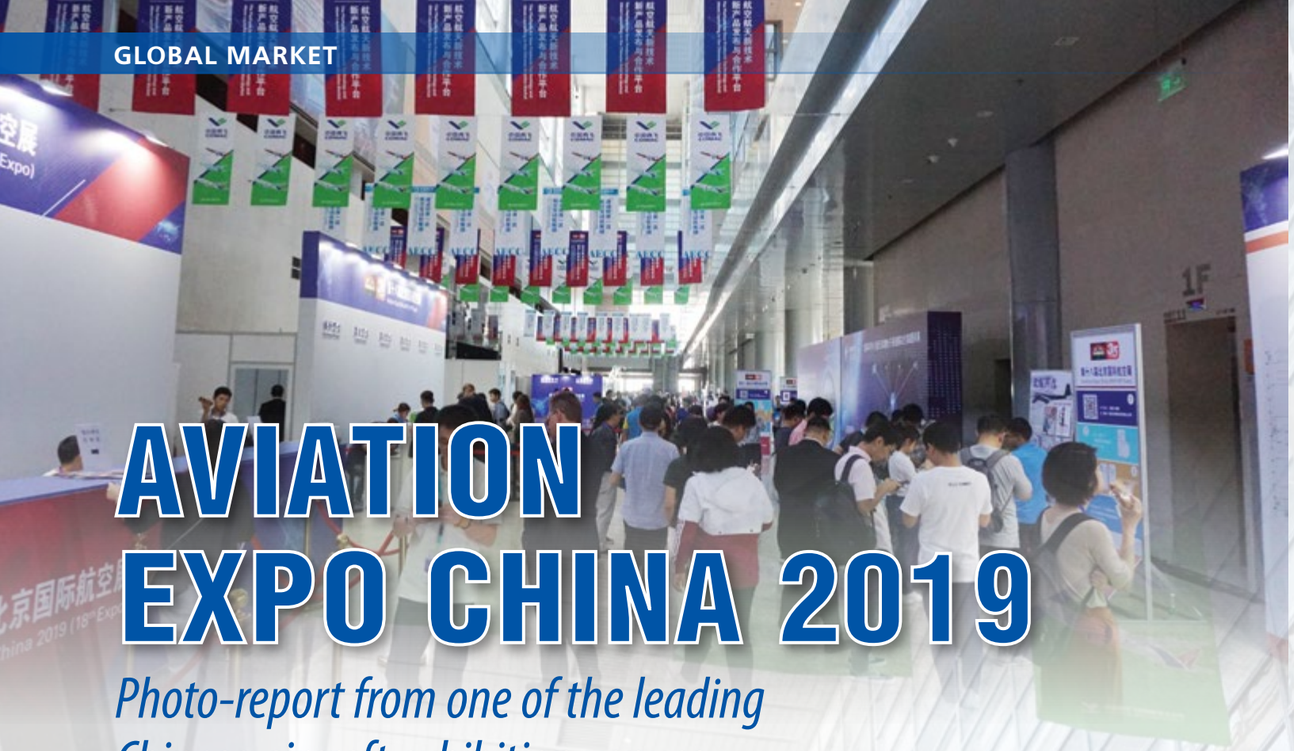
The Adjutant universal training target system is intended as a training solution for crews of all existing air defence assets, from long-range SAM systems to portable missile systems and artillery pieces. The Adjutant can generate variegated target trajectories that are difficult to predict by air defence system operators. Up to six targets of four different types can be deployed simultaneously: turbojet-powered missile targets, turbojet-powered fixed-wing targets, propeller-driven fixed-wing targets and rotary-wing targets. All targets are based on UAV platforms and feature low radar cross-sections. They emulate a broad range of aerial threats, from small-sized high-speed manoeuvring objects to low-hovering and pop-up helicopters.

The targets can be operated both automatically and manually. This allows for generating real-life air combat situations which leave air defence crews unaware of the type, quantity, direction and behaviour of the incoming threats. The Adjutant's perfect operating algorithms significantly complicate target interception, thus increasing the complexity of training scenarios. Depending on their type, the targets can stay in the air for between 30 minutes and 4 hours. In the flyover mode (involving target detection and simulated destruction), targets can be reused multiple times. Launched with a simple elastic bungee catapult, a target's flight is controlled from a mobile ground point. The Adjutant comes complete with remote air situation displays, communications systems and crew life support equipment.

In September 2019 the Adjutant took part in an exercise of the CIS-wide joint air defence system. As part of the drill, under a preliminary agreement between Almaz-Antey Corporation and the Kazakh Defence Ministry, the 9F6021E system was demonstrated in action at the Sary-Shagan training range. This was the Adjutant's first official demonstration outside Russia. The system performed 10 launches of different aerial target types. The presentation included group aerial attacks involving three targets simultaneously. The system demonstrated its ability to plot different target flight paths and amend them en route. The demonstration fully corroborated the system's declared mobility, endurance and mission readiness parameters. Real-time digital information about the current positions of all aerial targets was transmitted by a radio link from the ground command point to a remote display unit installed at the command HQ.

The system had to operate in adverse weather conditions involving variable gusty winds with speeds of between the maximum permissible 8-9 m/sec to 15 m/sec, at which target launches are prohibited and landings are extremely difficult. Despite the windy environment, the system and its crew performed a flawless demonstration. In the course of the air-force and air-defence exercise overseen by the Kazakh defence minister, with numerous foreign observers in attendance, the air defences engaged and successfully destroyed an Adjutant-launched fixed-wing aerial target. The demonstration offered another opportunity for potential foreign customers to familiarise themselves with the Adjutant.

The Adjutant's successful trials demonstrated that Kupol had created an advanced target training system capable of significantly improving the quality of air defence personnel training, bringing it up to the level required for effective counteraction to both current and future aerial threats. **/IA&TG/**

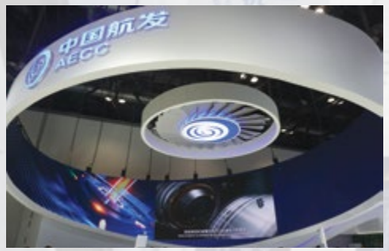


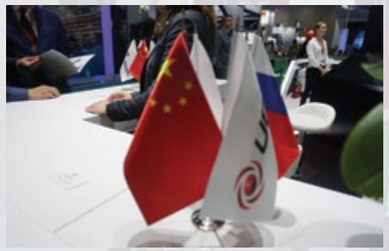
AVIATION EXPO CHINA 2019

Photo-report from one of the leading Chinese aircraft exhibition venues

This autumn an international exhibition of aviation industry products was held in Beijing. The exhibition AVIATION EXPO CHINA 2019 was organized as an optimal platform for the release of new products, technologies, and ideas presented by companies from China and all Asia. This exhibition became an opportunity for high-level dialogue among governmental structures and industry leaders of aviation and space companies from around the world to come together under one roof.

The 18th AVIATION EXPO CHINA was jointly organized by Commercial Aircraft Corporation of China, Ltd. (COMAC), Aero Engine Corporation of China (AECC), Chinese Society of Aeronautics and Astronautics (CSAA) and other organizers, with the theme of 'New Technology, New Material, New Equipment'. The exhibiting scale was 22,000 square meters, and gathering more than 30,000 trade visitors from CAAC, airlines, aircrafts manufacturers, research institutes and other related units.





In addition, there was seven concurrent conferences. These conferences aimed at facilitating interaction, discussion and collaboration amongst the participants. More than 2,000 officials, decision makers, academicians, experts and engineers from CAAC, airlines, aviation and aerospace, MRO companies, airports, solution providers, research and design institutes, manufacturers and related suppliers were attended the conferences. The largest of the Russian exhibitors was the United Engine Corporation.

A representative of United Engine Corporation (UEC) commented for our magazine: 'China is one of the priority markets for UEC. AVIATION EXPO CHINA is important to us as a platform for communication with all our operators, with our Chinese partners and of course with our potential customers. We continue to expand our business in China.

UEC has a long and successful history of cooperation with China on powerplants for military aircraft. We are also developing joint work on the TV-317 and VK-2500 helicopter engines.

The corporation currently focuses on promoting civil aircraft engines to the Chinese market. The most important among these are the PD-14 powerplant, which was certificated in Russia in 2018, the SaM146 engine for the Sukhoi Superjet 100 airliner, and our future PD-35 powerplant for the CR929 widebody aircraft currently under development by Russia's United Aircraft Corporation and China's COMAC. We pin great hopes on our civilian powerplants, seeing as the Chinese air transport market is massive. Even though it is a highly competitive market, we hope our technologies will help China to diversify its suppliers both in terms of aircraft and engines.

Our top priorities in China are to export more production engines, continue work on prospective designs and develop aftersales support for the locally operated fleet of powerplants. We are prepared to offer models and proposals for powerplant aftersales support, parts supplies, engine repair and servicing.'

Recall that two years ago during the China International Business Aviation Show 2017 in Beijing AECC Commercial Aircraft Engine Co., Ltd (AECC CAE) and United Engine Corporation (UEC) signed a memorandum of understanding on cooperation for the development of engines for wide-body aircraft. As it was said in document both sides jointly carry out the research of the engine market of wide-body aircraft, the competitive analysis of available products, and the research on potential customer needs and technical cooperation.

For more information about the results of the AVIATION EXPO CHINA 2019 in Beijing and also about key trends in the Chinese aviation industry, see the next issue of our magazine. /IAATG/

Alexandra Budanova,
Deputy sales director, Metallurgical Plant Electrostal:
'Like in the previous years, Metallurgical Plant Electrostal had its own stand at AVIATION EXPO CHINA 2019. We presented both our traditional product range and high value-added products for the aerospace, propulsion engineering and mechanical engineering sectors. Our enterprise has relatively recently entered the high value-added arena, but such articles are now an organic part of our product range, and are highly valued in the market.

The Beijing exhibition being primarily about aerospace, we mostly focused our exposition on solutions for the sector. Electrostal is a major metals supplier for the Russian propulsion engineering industry, but we also participate in a number of international projects and programmes. In China we have a long history of successful cooperation with AVIC but we are also prepared to expand the list of our partners. We can offer our products for virtually all aerospace projects, including the most ambitious ones.'

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)

Almaz - Antey Corp.

KUPOL

9F6021E ADJUTANT

ADJUTANT

VERSATILE TRAINING TARGET SYSTEM 9F6021E

MISSILE–TYPE AIR TARGET WITH TURBOJET ENGINE

AIRPLANE–TYPE AIR TARGET WITH PROPELLER ENGINE

AIRPLANE–TYPE AIR TARGET WITH TURBOJET ENGINE

HELICOPTER–TYPE AIR TARGET

SETTING

Versatile training target system (VTTS) 9F6021E is a multipurpose target system designed to create a complex air situation:

- when an air defence missile system is checked and tested during combat, training and demonstration firings at a dedicated firing range and training center;
- when a combat crew is trained to operate a short and middle range air defence system regardless of the deployment location;
- when components of an air defence system are to be adjusted and checked at a continuous deployment location of an air defense unit;
- when components of an air defence system are to be adjusted and checked during repair and upgrade within a maintenance center at a foreign customer's place.