INTERNATIONAL AEROSPACE & TECHNOLOGY GUIDE

Special analytical export project of Industrial Weekly

№07 (25) September, 2018

RUSSIAN NAVY DAY
V. Putin marked the main summer's holiday

DIFFERENT MISSIONS
UAC shows a wide range of its products

INDIA + RUSSIA
New breakthroughs in BRAHMOS programme

WORLD EXCLUSIVE
Unique system for rescue from any height

Aviation innovations for marine areas

Авиационные инновации для морских акваторий

Russian Aviation Military Guide

№ 07 (25) September, 2018

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General director
Editor-in-chief
Valeriy STOLNIKOV

Chief editor's deputy
Elena SOKOLOVA

Commercial director
Oleg DEINEKO

Managers
Tatiana VALEEVA
Natalia MOZHAEVA
Andrey PARAMONOV

Designed by
Svetlana SELIVERSTOVA

Editorial manager
Marina GROMOVA

There are materials from the information agencies and from the press services of the federal authorities of the Russian Federation used in the project.

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Editorial office:
Malaya Gruzinskaya St., 39
Moscow, 123557
Tel.: +7-495-690-3108, 778-14-47, 729-39-77

Media postal address:
Moscow, Russia, 123104, mailbox 29

doc@promweekly.ru
promweekly@promweekly.ru
www.promweekly.ru

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EDITORIAL

Specific aviation forum

Russian HYDROAVIASALON looks something special and specific in the context of international aviation exhibitions. It is traditional that salon is held in the beautiful city of Gelendzhik and becomes the number one event in the life of not only the aviation industry, but the whole coastline. The 12th International Exhibition and Scientific Conference on Hydroaviation HYDROAVIASALON-2018 shall be held in Gelendzhik too, in conformity with the Russian Federation Government Order № 2403-p. The event is organized by the Ministry of Industry and Trade of the Russian Federation and is hosted by UAC (United Aircraft Corporation) with Aviasalon company as the operator.

The objective of the exhibition is to demonstrate sea- and ship-based aviation, to show its development prospects and operation options for passengers and cargo carriage, tourism, patrol and rescue operations at sea, rendering assistance in emergency situations and environmental disasters, but also exhibition shows other sectors - oil and gas extraction on the continental shelf, aquatic bio-resources and aquaculture, underwater technology and equipment, oceanology and the World Ocean resources, hydro-meteorological support of human activities in the World Ocean, Maritime law, water sports and recreation. Within the framework of the exhibition, the business program includes conferences, presentations and press conferences of corporate exhibition members, as well as seminars and round tables dedicated to pressing challenges in all areas of the event: aviation, hydroaviation and marine activities.

The Minister of Industry and Trade of the Russian Federation Denis Manturov said before exhibition: 'We are justifiably proud of the history and achievements of Russian developers of sea-based aircraft. For decades, Russia has been a leader in this segment. Our aircraft manufacturers' products, often unique and unparalleled in the world, arouse consumers' natural interest.' Welcome all of us to HYDROAVIASALON-2018!

Let's try to work in Gelendzhik!

Valeriy Stolnikov

MODERNIZED NIGHT HUNTER HELICOPTER

Russian Helicopters (part of Rostec State Corporation) has presented a new version of the Mi-28NE attack helicopter at the International Military-Technical Forum ARMY-2018 which is being held from August 21 through August 26 in Kubinka in the Moscow Region. The attack helicopter can interact with drones and operate them remotely. The modernized Mi-28NE helicopter is presented at the static exposition of the forum. Improvements were primarily related to armaments. The 'Night Hunter' has the new Khrizantema-M anti-tank missile with a dual guidance system. Using this missile will increase the tank-type target engagement range to 10 km. The helicopter is also fitted with the modernized Ataka guided missiles with laser guidance. It can also use aerial bombs weighing up to 500 kg.

'Modernization involved engine power and blades, which improved aircraft performance in highland regions and in hot climates, increased the cruising speed of the machine and its capabilities in terms of advanced aerobatics. A larger tailplane improved the controllability of the helicopter. New armaments installed on the machine will increase its firepower, and the fact that the aircraft can be used in more fields will mean that it will be in greater demand on the market,' said Anatoly Serdyukov, Industrial Director, Aviation Cluster of Rostec State Corporation.

In addition, the new Mi-28NE helicopter can interact with drones and operate them remotely, as it has special means of communication.

'We are constantly improving military helicopters because the requirements of our customers change, and we always aim to meet them. Due to the experience of using Mi-28 machines during military operations we knew how to further develop this project. The modernization considerably increased the capabilities of Mi-28NE helicopters and offered us new prospects in terms of exports,' noted Andrey Boginsky, CEO of Russian Helicopters.

The Mi-28N attack helicopter (the export version is Mi-28NE) is designed for fire support of forward ground troops, motorized infantry and tanks. The 'Night Hunter' helicopter has enhanced armor and greater combat survivability. It also has a complex of modern high-precision guided and unguided weapons.

The advantages of the helicopter include resistance to battle damage due to the use of the most modern materials and design solutions. The blades of the Mi-28N main rotor are made of composite materials, which means that a flight can still be completed safely if they are hit by shells of 20 to 30 mm. The fuel system is designed in such a way that fuel can neither explode nor burn. The Mi-28N helicopter is one of the first Russian helicopters to be fitted with modern means of communication and digital avionics.

'City of the Future'

The Rostec State Corporation presened a wide range of advanced developments for the 'city of the future' at the 9th international industrial fair, Innoprom 2018. The State Corporation's exhibition stand demonstrated technologically advanced samples of urban transport, digital systems of the 'smart' urban infrastructure, the newest solutions in the field of healthcare and medical equipment.

At a 429 square metres' stand Rostec showcased its developments designed for transformation of the urban environment and creation of the 'smart' infrastructure in such fields as security, transport, housing and public utilities, healthcare, etc. It included smart traffic lights developed by the Shvabe holding company that can be automatically adjusted depending on the road traffic load. The Ruselectronics holding company presented electronic components for the Angara high-speed communication network for supercomputer computations, a new system for photo- and video-recording of traffic violations, and a non-contact system for microprocessor-based synchronisation of switches and traffic lights for the subway.

The Mechanical Engineering Concern demonstrated an automated diagnostics and therapeutic system for human life support to be used in intensive care units and during transportation of patients. The Shvabe holding company's developments also include the AND A15 automatic external defibrillator to be installed at airports, subway stations, shopping malls and stadiums.

Avia Solutions Group

In June 2018, the Zhukovsky international airport's passenger flow grew by 390% as compared to the similar period of the previous year and exceeded 100 thousand passengers per month for the first time ever. The airport complex is being developed by Ramport Aero, a joint venture of Rostec State Corporation and an international aviation holding Avia Solutions Group.

While commenting upon this result, Tomas Vaisvila, CEO of Ramport Aero noted: 'One hundred thousand passengers is an important psychological landmark for us. To a large extent it means that we have reached a brand new level that allows us to state with assurance that the airport is being developed in the right direction. To some extent, the current growth was caused by an increasing passenger flow during the FIFA World Cup. Nevertheless, this result was expected even despite the football championship. To a greater degree it was caused by the extending route network and growing flight rate of the current regular flights. We have been steadily moving towards this goal, and our short-term plans are to consolidate and improve this result.'

The current year is quite successful for Zhukovsky – 472,877 passengers have been carried during the first six month which is more than during the entire 2017. The growth of the passenger flow is ensured by the activity of partner airline carriers and the growing flight rate along the regular routes. The most popular are flights to Minsk, Tel Aviv and Simferopol. Significant progress has also been achieved in developing the flight services between Russia and China: today, Zhukovsky has regular flights to Guangzhou, Xian, Fuzhou, Haikou and Jinan.

The Zhukovsky Airport is still busy developing the international and domestic route network and attracting new airline carriers.

The Zhukovsky Airport that was opened in spring 2016 is located on the Ramenskoe Airfield 23 km from the capital and has the longest (5,500 m) runway in Europe that allows to operate passenger-carrying and cargo aircraft of any type. The Zhukovsky Airport supports airline operations with the airports of Tajikistan, Kyrgyzstan, Belarus, Turkey, Israel, China, Georgia and Italy. At the end of 2017, Zhukovsky won the Russia's Air Gate award in the 'International airport with a passenger flow of up to 0.5 million people' category.

UNIQUE NAVAL UNDERWATER WEAPONS AND SHIPS

ROSOBORONEXPORT

JSC Rosoboronexport (part of the Rostec State Corporation), in conjunction with JSC Sea Underwater Weapons – Gidropribor Concern, has launched a program to promote naval materiel and special equipment to the external market.

'A wide range of missions carried out by the navies of maritime powers necessitates equipping them with various types of naval hardware and special equipment. The foreign navies include 225 Russian-built ships. Of them, more than 100 surface ships and submarines are the carriers of naval underwater weapons. Rosoboronexport is offering its partners unique solutions to equip and upgrade the armament of these ships,' said Alexander Mikheev, Director General of Rosoboronexport.

Naval underwater weapons are in service with the world's major navies. However, as few as 5 to 7 countries, including Russia, are capable of designing and manufacturing these weapons independently, due to the high complexity and cost of these efforts. A number of weapons produced by JSC Sea Underwater Weapons – Gidropribor Concern, offered by Rosoboronexport, are unrivalled in the world.

Foreign customers are offered a wide range of naval hardware and special equipment. Among them are torpedoes, mines, antimine and underwater anti-sabotage weapons, as well as means of ship's self-defense against underwater weapons.

In the segment of torpedo weapons, the TE-2 universal electric remote-control homing torpedo is offered. It is designed to destroy submarines, surface ships and fixed targets. In addition, a number of newly developed torpedoes, including 533 mm torpedoes and 324 mm small torpedoes, are promising for promotion on the world market.

The MDM-1 and MDM-2 bottom mines are designed to create a mine threat and destroy surface ships and submarines in surface and submerged conditions when used in minefields. The Shelf naval shelf mine offered has no counterparts in the world. It can be placed from delivery aircraft, submarines, and surface ships. The Shelf mine has a hydroacoustic passive/active detection and targeting system protected from triggering when exposed to natural disturbances and influence sweeps that can detect any submarines and surface ships regardless of the level of their noise and speed. Its unique design makes it difficult for the target to use countermeasures and conduct an evasive action.

For Eurasia Largest Telescope

Shvabe Holding affiliated to Rostec State Corporation, has completed installation of a mirror on the Large Altazimuth Telescope (BTA) in the Special Astrophysical Observatory belonging to the Russian Academy of Sciences in Karachay-Cherkessia. Operation of the telescope with the new astronomy-dedicated optics will commence this autumn. The observation distance will increase by 1.5 times. The 6-meters diameter mirror installed by Rostec experts is a key component of BTA.

'Our technologies allow us to build a mirror with a weight of up to several dozens of tons and carry out its nanometric machining. The combination of the large size of the mirror and the unique light-reflecting optical properties will allow Russian scientists to work with the one of the most advanced telescopes in the world in the nearest decades to come. The new optics will augment the observation distance by 1.5 times, so the research horizon will be significantly increased,' commented Oleg Evtushenko, Rostec State Corporation Executive Director.

The telescope's history began with the production of two mirrors in 1970s. The first one was used during the first four years of work, and then it was replaced with an improved one. For more than 40 years of operation the surface quality materially deteriorated, and it was decided to deliver the first mirror to Lytkarino Optical Glass Factory for an upgrade. Today, adjusted in accordance with the new weight, it has been successfully installed on BTA, A regular surface shape evaluation has been carried out. The Russian Academy of Sciences has already received the first test images. The next task is to improve the mirror surface and further adjustment to complete the preparatory stage. The upgrade procedures will guarantee 40-50 years of further telescope's uninterrupted operation,' said Alexey Patrikeev, Shvabe CEO. Until 1993, BTA was the world's largest telescope. Today, it is the largest telescope in Eurasia.

Mi-35M and Mi-35P at ARMY 2018

At the International Military-Technical Forum ARMY 2018 Russian Helicopters has presented modernized Mi-35M and Mi-35P attack helicopters for the first time.

Guests and participants of the forum will be able to see the machines at the static exposition of the forum. The helicopters have avionics which have undergone a considerable upgrade, and new military equipment.

'The multi-purpose Mi-24 military-transport helicopter (Mi-35 is its version for export) is the first Russian helicopter designed especially for military operations. Its design is so good that now it is one of the most sought-after machines on the international market, and it has proved its high performance during military operations many times. We expect that the demand for new versions of the helicopter with increased combat capability will be high in many countries,' said Anatoly Serdyukov, Industrial Director, Aviation Cluster of Rostec State Corporation.

The modernized Mi-35P helicopter has the OPS-24N-1L observation-sight system with a third generation matrix long wavelength thermal imager, a TV camera and a laser rangefinder. The new digital flight simulator based on the PKV-8 automatic flight control system will increase the helicopter's steadiness, and automate piloting to assist a pilot. In addition, a modernized sight and computing system will increase the accuracy of target engagement.

The new Mi-35M helicopter has much more options in terms of equipment. The helicopter can be further upgraded for using Igla-S air-to-air guided missiles and the President-S onboard defense system with a laser station for suppression of infra-red homing heads of man-portable air-defense system missiles. Additional equipment may include VOR/ILS systems and a radio rangefinder for measuring the distance between a helicopter and ground-based beacons.

'The Mi-24/35 helicopters are among the machines most frequently used in military operations all over the world. They have been used during more than 30 wars and military conflicts. With such wide experience, we have managed to perfect this platform, and now we are consistently equipping it with state-of-the-art armaments and avionics. Serial production of the upgraded machines will commence when all the modifications have been tested,' said Andrey Boginsky, CEO, Russian Helicopters.

The Mi-35 military-transport helicopter is designed for destroying armored fighting vehicles and providing fire support for ground troops. It is equipped with modern high-precision weapons and can perform combat missions at any time of day and in all weather conditions. The most important features of the Mi-35 helicopter include its ability to carry personnel with armaments and transport up to three wounded persons from the battlefield, as well as cargo inside the cabin or on an external sling.

HOUSE OF FRIENDSHIP

Before the Tank Biathlon finals, Minister of Defence General of the Army Sergei Shoigu visited the House of Friendship at the Alabino training ground showcasing national expositions about history and culture of the participating countries. Sergei Shoigu played some music instruments of Myanmar, Uganda and Jordan. He was also treated with Chinese tea, Kyrgyz mineral water and oriental sweets. An Uzbek foldable wooden bookholder, Syrian folk craftwork items and copperware attracted Sergei Shoigu at most. Participants of the Games made national expositions about their culture and history at the House on the opening day of the Games. Concerts of national ensembles, lectures, expositions and other events took place in the House of Friendship on a daily basis.

FIRST VISIT TO ERA TECHNOPOLIS

Specialists from more than 40 leading industry enterprises, scientific and educational organisations visited the Era military innovative technopolis to learn about its capabilities. They saw options for housing joint laboratories for researches in the interests of the Defence Ministry. During the meeting, the Main Department of the Research Activities and Technological Support of Advanced Technologies (innovative research) of the Defence Ministry with the Office of Advanced Research and Special Projects held a working meeting to discuss main vectors of scientific research, relations with enterprises and organizations, as well as logistical base. The Era shall start functioning in September 2018 to house 18 specialized laboratories at the first stage equipped with over 800 pieces of experimental and test hardware.

EUROSATORY-2018

The international Land and Air-Land Defence and Security Exhibition EUROSATORY is one of the world's largest exhibitions of land and air defence weaponry. It has been held biennially under the patronage of the Ministry of Defence of France since 1992. The year of 2018 marked the 12th time Russia has participated in EUROSATORY. FSMTC of Russia has decreed that responsibility for the organization of the Russia's joint display at the exhibition should be vested in Rosoboronexport. The exhibition's main focus is the land and air defence weaponry, as well as communications assets, computer technologies, simulators and logistics support. It has also placed special emphasis on the upgraded versions of current military equipment. Manufacturers of dual-purpose, crisis management, humanitarian aid, peacekeeping, security and counterterrorist products have enjoyed an increasingly broader representation at the exhibition in recent years.

Run Tests in Mountainous Areas

Helicopters of Russia specialists have started the trials of Mi-171A2 and Ansat helicopters. Mi-171A2 will perform a series of flights in the Astrakhan region, and their results will be used to prove this model's operability at ambient temperatures up to +50°C.

The next step will be trials in Nalchik: onboard equipment will be tested in mountainous terrain. Meanwhile Ansat will be tested on Elbrus. Trial results are supposed to confirm the helicopter's operability in mountainous areas at altitudes up to 2,500 meters.

'As the Holding plans to certify Ansat and Mi-171A2 in a number of countries, at the moment it is important for us to check and document the maximum capacity of these helicopters,' said Andrey Boginsky, CEO of Helicopters of Russia.

He also noted that the results of helicopter trials will be used in presentations for potential customers. In particular, they will be demonstrated at Airshow China, an international aerospace salon to be held in Zhuhai in November 2018.

The multifunctional helicopter Mi-171A2 is the result of an in-depth overhaul of the Mi-8/17 family. More than 80 modifications were introduced to the Mi-171A2 design. The helicopter is equipped with VK-2500PS-03 engines (civilian version of engines installed on MI-28 combat helicopters) with a digital control system. Ansat is a light twin-engine multifunctional helicopter. According to the certificate, the helicopter design allows for its quick transformation into both cargo and passenger versions with the transportation capacity up to seven persons.

Product Range for SSJ-100 and MC-21

Technodinamika (a Rostec State Corporation affiliate) extends the product range for SSJ-100 and MC-21 advanced Russian aircraft. The statement was made by Igor Nasenkov, the Holding CEO, during the new production line opening ceremony.

Science-cum-Production company Respirator, affiliated to Technodinamika Holding, is developing smart units and fire protection systems designed for SSJ-100 aircraft. Besides, affiliated to the holding UAP Gidravlika Publ.Corp is carrying out R&D aimed at components production for MC-21 aircraft. It has already worked out relevant detailed and engineering designs, as well as the working design documentation for fire resistant flexible piping with a protective coating and for hydraulic filter modules.

Nowadays, company specialists are busy preparing for the production of prototypes to be subjected to preliminary and interdepartmental trials. According to the holding company's media relations service, commercial supplies of components are expected to start in 2019. Most likely, the holding company will become a supplier of the fire suppression system not only for SSJ-100, but for MC-21, too.

Acting in conformity to the MC-21-dedicated programme, Technodinamika Holding has already been chosen as the supplier of electrically-driven devices for the aircraft's fuselage cargo doors and certain parts for the advanced PD-14 engine, as well as equipment for installing and dismantling batteries found in the fuselage section.

МОДЕРНИЗИРОВАННЫЙ МИ-26Т2В

Холдинг «Вертолеты России» (входит в Госкорпорацию «Ростех») в ходе Международного военно-технического форума «Армия-2018» впервые представил новейший тяжелый вертолет Ми-26Т2В, разработанный в интересах Минобороны РФ. Опытный образец машины изготовлен на предприятии «Роствертол».

«Ми-26 как крупнейший из серийно производимых в мире вертолетов используется для выполнения экстраординарных задач, недоступных для других машин. Каждый агрегат новой машины должен обеспечивать максимальную производительность. Бортовое оборудование Ми-26Т2В сделает этот вертолет еще более эффективным и надежным даже при применении в условиях непогоды и сложного рельефа», – заявил генеральный директор холдинга «Вертолеты России» Андрей Богинский.

Согласно пожеланиям заказчика, вертолет Ми-26Т2В должен обеспечивать выполнение задач даже в регионах со сложными физико-географическими и неблагоприятными климатическими условиями, в любое время суток, по оборудованным и необорудованным трассам, а также по маршрутам вне трасс и над безориентирной местностью, в условиях огневого и информационного противодействия противника.

От базовой модели Ми-26 новый вертолет отличается современным интегрированным комплексом бортового радиоэлектронного оборудования НПК90-2В, который значительно упрощает пилотирование вертолета. Новейший комплекс БРЭО позволяет в автоматическом режиме выполнять полет по маршруту, выход в заранее заданную точку, заход на посадку, а также предпосадочное маневрирование и возврат на основной или запасной аэродром. В дополнение к этому на вертолете установлен цифровой пилотажный комплекс, а в кабине экипажа появились цветные жидкокристаллические многофункциональные индикаторы, значительно снизившие нагрузку на летный экипаж. Кроме того, Ми-26Т2В получил новый бортовой комплекс обороны «Витебск», не только обнаруживающий факт угрозы вертолету, но и противодействующий атакующим средствам.

Светосигнальное оборудование Ми-26Т2 теперь адаптировано под использование очков ночного видения, а в кабине вертолета установлены новые энергопоглощающие кресла экипажа. Улучшения также коснулись системы навигации и спутниковых средств связи вертолета.

«Гражданская дочка» ОАК

Президент ПАО «Объединенная авиастроительная корпорация» Юрий Слюсарь рассказал, что ОАК планирует к концу 2019 года перейти на единую акцию и что все производители гражданской авиапродукции будут объединены в одну «дочку».

По словам руководителя Корпорации, ОАК будет состоять из нескольких дивизионов. Дивизион военной авиации (КБ Сухого, новосибирский и комсомольский заводы, МиГ с его площадками и КБ, а также авиаремонтные заводы, которые по тематике относятся к военной авиации). Дивизион транспортной авиации создан на базе Ильюшина, в него входят КБ Ильюшина, КБ Мясищева, воронежский и ульяновский заводы. В дивизион специальной авиации вошли КБ Туполева и казанский завод.

Компании гражданского дивизиона будут объединены в виде отдельной «дочки» ОАК. Это будет объединение КБ Яковлева, Корпорации «Иркут», «Гражданских самолетов Сухого», а также компаний, которые технологически близки к гражданской тематике, – это «Аэрокомпозит», «ОАК – центр комплексирования», который занимается интеграцией бортового оборудования, и «ОАК-капитал», созданный для обеспечения гарантии остаточной стоимости по гражданским судам.

Кроме того, под управлением ОАК будет 50% в СП с китайской корпорацией COMAC. Это также будет «дочка» ОАК, но в единую компанию она входить не будет. Создатели такой модели руководствовались в том числе международным опытом: военное и гражданское авиастроение разделены и у китайцев, и у американцев… «Все-таки это достаточно специфичные истории, – говорит Юрий Слюсарь, – от технической приемки самолетов (через военную приемку или независимых представителей) до практик рыночного продвижения. Это технологически, маркетингово, где-то даже культурно – разные истории, разные клиенты.

При этом ОАК заинтересована в том, чтобы в гражданский сектор приходили стратегические инвесторы, однако контроль должен остаться за российскими государственными компаниями.

Новый цех

На Комсомольском-на-Амуре авиационном заводе им. Ю.А. Гагарина – Филиале ПАО «Компания «Сухой» ведутся пусконаладочные работы на четырех из девяти участков и производственных линий нового автоматизированного цеха гальванических покрытий. Компания «Сухой» входит в состав ПАО «Объединенная авиастроительная корпорация».

Запуск в эксплуатацию важного для Компании объекта позволит значительно улучшить экономические и экологические показатели производства. По расчетам специалистов, энергопотребление снизится на треть, а расход воды уменьшится более чем в 36 раз. Процесс нанесения покрытий будет выполняться по замкнутому циклу, исключающему выбросы вредных веществ в окружающую среду. Использование автоматизированного оборудования позволит увеличить производительность труда и повысить качество продукции. В технологическом процессе предусмотрено использование инновационных разработок в области защитных покрытий.

Общая площадь цеха – 16,2 тыс. кв. м. К настоящему времени полностью завершен монтаж технологического оборудования на линиях анодирования, химического травления титана, а также на очистных сооружениях, участках водоподготовки и очистки воздуха. Параллельно идет отладка роботизированного оборудования.

Завершается монтаж системы вентиляции и теплоснабжения. Идет сборка камеры окраски на линии нанесения изоляции, продолжается трубная обвязка и электротехнические работы на линии размерного технического травления алюминия. На 90% готовы участки дожига и окраски крупногабаритных деталей авиатехники. На предприятие поступило необходимое оборудование для участка окраски мелких деталей. Завершается сборка металлоконструкций, выполнен монтаж монорельсов и манипуляторов на автоматизированном складе.

Строительство на КнААЗ современного цеха гальванических покрытий ведется в рамках Федеральной целевой программы «Развитие оборонно-промышленного комплекса РФ». В текущем году новый цех войдет в строй действующих.

CITY OF THE FUTURE

The Rostec State Corporation presented a wide range of advanced developments for the 'city of the future' at the 9th international industrial fair, INNOPROM 2018. The State Corporation's exhibition stand demonstrated technologically advanced samples of urban transport, digital systems of the 'smart' urban infrastructure, the newest solutions in the field of healthcare and medical equipment. Rostec showcased its developments designed for transformation of the urban environment and creation of the 'smart' infrastructure in such fields as security, transport, housing and public utilities, healthcare, etc. It also include smart traffic lights developed by the Shvabe holding company that can be automatically adjusted depending on the road traffic load. The Ruselectronics holding company presented electronic components for the Angara high-speed communication network for supercomputer computations, a new system for photo- and video-recording of traffic violations.

RUSSIAN DELEGATION IN THE USA

In the United States of America, on the Day of Military Glory of Russia – Victory at Cape Gangut – the Russian Defence Ministry delegation joined by Russian representatives of the U.S.–Russia Joint Commission on POW/MIAs laid wreaths to graves of seamen of the Imperial Russian Navy in the USA. Sailors Nikolay Pavlov and Timothy Cheparinov, members of the crews of the cruiser Varyag and the battleship Retvizan, were buried in the cemetery Glenwood Memorial Gardens, near Philadelphia, where these ships were built by the order of the Russian government. The graves are dated 1900 and 1901. In late May 2018, memorial stones were installed at the graves. These are the first memorials erected by the Russian Federation for its servicemen on the Atlantic coast line of the USA.

SYSTEM NAMED CHANCE

Rostec premiered a unique design for people evacuation from high-rise buildings – an individual special-purpose parachute system called Chance. The novel solution was unveiled at the Kirzhach airfield when opening a new production complex of the Scientific Research Institute of Parachute Construction, part of Technodinamika Holding affiliated to the State Corporation. Unlike conventional parachute systems, Chance makes it possible to land a person from extremely low altitudes – as low as 30 meters (the height of a nine-storey building) and higher. Its structure includes an anchor line used to close side valves and pull canopies, three parachutes maintaining a specified landing speed, as well as a pack with harness. At the same time, the parachute opens at a required height by itself, and no special training is required for its operation.

NtechLab Face Recognition System

The FindFace Security solution created by NtechLab and implemented by Rostec in several cities during the FIFA World Cup made it possible to detain more than 180 persons included in the database of offenders. Some of them were on the federal wanted list. In the capital, the system introduction project was implemented in conjunction with the Department of Information Technology of Moscow. The system introduced in all regions of the Russian Federation will significantly improve the safety of citizens and reduce the crime rate.

'About 500 cameras monitoring the city, metro, stadiums and fan zones as well as mobile biometric complexes for the mass events were connected to the face recognition system in several regions just for the World Cup period. Even within such a short timeframe, the system has shown its high efficiency. It could not be deceived by any tricks. For instance, one of the fans who was banned from sports events by the court decision tried to penetrate the fan zone five times using his glasses, hood and finally the cap for masking, but it did not help! Another striking example is a theft of the sponsor's trophy (one to be awarded to the best player of each match) from the fan zone. Video cameras were used to restore the events: it was possible to identify the persons involved and find their profiles in social media. Thanks to the face recognition system, one of the thieves was located in the fan zone the next day, and the trophy was returned,' said Sergey Chemezov, CEO of Rostec State Corporation.

In 2018, Rostec State Corporation signed a deal for the acquisition of a minority stake in NtechLab, the Russian developer of a unique face detection algorithm based on artificial neural networks and machine learning. NDF became the third party to the deal.

As for now, the NtechLab algorithm is considered the fastest and most accurate face recognition technology in the world. This is proved by numerous victories in the international competitions held by the US Intelligence Advanced Research Projects Activity, US National Institute of Standards and Technology, as well as Ohio and Washington State Universities.

The algorithm recognizes faces with an accuracy up to 99%. Finding a specific person among 1 billion people takes less than half a second. The NtechLab algorithm can also determine the emotional state, sex and age of a person.

The technology can be used in monitoring and security systems operating on the streets, in yards, house entrances, public spaces, offices, metro, stadiums and other facilities.

The high efficiency of the algorithm was confirmed during the 2018 FIFA World Cup: FindFace Security helped to detain over 180 offenders, some of which were on the federal wanted list.

Rostec was responsible for the implementation and operation of a wide range of digital solutions in the field of security and civil IT services during the 2018 World Cup. In particular, it ensured the smooth operation of the information and telecommunications infrastructure in 30 Russian cities. This infrastructure provided 2.8 million phone calls for fans, 262 TB of Internet data transmitted and Ultra HD game broadcasts for 220 countries during the World Cup.

KUZNETSOV ENGINES

Serially-built RD-107A/RD-108A engines by Kuznetsov PJSC, Samara-based enterprise of the United Engine Corporation, were used to perform the seventh launch of the Soyuz-type space launch vehicle this year. The Soyuz-2.1a medium-lift space launch vehicle with the Progress MS-09 Cargo Spacecraft was launched at 12:51 Moscow time on 10 July from the launching site No. 31 of the Baikonur Cosmodrome. Launch of RD-107A/RD-108A rocket engines installed on the first and second stages was conducted normally.

As expected, the cargo spacecraft will approach the station and the Pirs docking compartment of the Russian segment of the International Space Station in the automatic mode under control of the ISS Russian segment's Chief Operational Crew located in MCC, and Russian cosmonauts Oleg Artemyev and Sergey Prokopyev. This will be the second cargo spacecraft to be placed into orbit by serially-built Kuznetsov engines this year. In total, this year saw seven launches of Soyuz-type space launch vehicles with RD-107A/RD-108A engines from four cosmodromes – Baikonur, Vostochny, Plesetsk and Guiana Space Centre. The spacecraft will deliver to ISS about 2.5 tons of various cargoes, including fuel, compressed gases, water, scientific equipment and components.

SELF-LOADING RIFLE TG1

Kalashnikov Concern, affiliated to Rostec State Corporation, launched a new smooth-bore self-loading shotgun TG1. The weapon is meant for training and live practicing, law enforcement and personal property protection. The product can be purchased under a usual license for smooth-bore weapons, making an online order on the official website of the concern or through a proprietary network of brand-zones.

The 12 m gun is constructed on the basis of the popular MR-155 model and features a modern gas venting system, chrome plated chamber and bore. The 12/70 and 12/76 caliber cartridges are fed out from a detachable box magazine, the design provides an automatic shutter delay. The handle with a pistol grip and fore-end are made of impact-resistant plastic. The rifle is furnished with a Picatinny rail, on which a detachable carrying handle with a fully integrated iron sight is mounted. The length of the gun is 1040 mm, while the of barrel length is 510 mm. The weight of the weapon with an empty magazine does not exceed 3.5 kg. the of the magazine case capacity is 5 cartridges.

Support from the Russian Foreign Ministry

At the conference of Russian ambassadors and permanent representatives which took place on the premises of the Russian Foreign Ministry, the Director General of JSC Rosoboronexport (part of the Rostec State Corporation) Alexander Mikheev said about military-technical cooperation and about help from Russian diplomats.

The conference was attended by representatives of the Russian Presidential Executive Office and the Government, the heads of the two houses of the Federal Assembly (Parliament), ministries and agencies involved in the implementation of Russia's foreign policy, subordinate and voluntary organizations of the Ministry of Foreign Affairs, as well as veteran diplomats.

'Today, Rosoboronexport carries out military-technical cooperation with more than 100 foreign countries, and the role of the Russian Foreign Ministry in establishing and strengthening our relations with partners cannot be overestimated. Thanks largely to support from diplomats, we have made a breakthrough to the markets in Latin America and the Middle East in the past decade, and now we are successfully returning to sub-Saharan Africa,' said Alexander Mikheev, Director General of Rosoboronexport.

Rosoboronexport is working closely with dedicated units of the Russian Foreign Ministry in the implementation of Russia's state policy in the field of military-technical cooperation in virtually all regions of the world. In addition, Russian diplomats provide support to Rosoboronexport employees at more than 50 Rostec's representative offices abroad. Russia's ambassadors are involved in the promotion of military products in regional markets, marketing efforts and assist in fulfilling contracts with foreign customers.

The official status of exclusive state-controlled special exporter provides Rosoboronexport with unique opportunities to expand long-term mutually beneficial cooperation with foreign partners, strengthen Russia's leading positions in the world arms market. Rosoboronexport always receives the necessary diplomatic support from the Russian Foreign Ministry in implementing large-scale projects aimed to enhance the defense capabilities of partner countries. This contributes to creating a climate of cooperation and good neighbourly relations with other countries.

'In a dynamic and changing industrial and political landscape, our joint task set by the nation's leadership is to enhance the impact of economic diplomacy efforts, actually help domestic businesses promote advanced Russian developments abroad, and bring high-tech products to regional and global markets. I am sure that together we are able to accomplish it,' added Alexander Mikheev.

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.

Engineering Machines to Vietnam

ChTZ-URALTRAC, a member of Uralvagonzavod Group of Rostec State Corporation, and a Vietnamese company NGA PHAT have signed a B10M.0100E bulldozer supply contract. The tractor manufacturer's dealer has won the state tender for supply of the bulldozer designed for repair and recovery of roads in mountainous villages of South Vietnam.

Tu Hong Hung, CEO of NGA PHAT, explained that local budgets do not allow the territories to independently procure the machinery, so the government helps the highland regions and covers a portion of the infrastructure investments, including the purchase of B10M.0100E. The Vietnamese party shall consider buying two more bulldozers of the same type should the operating experience of the Chelyabinsk-manufactured earth mover be successful.

The machine will be assembled, tested, painted and prepared for dispatch to the customer as early as this August. The vehicle will be delivered non-assembled to Vietnam in a 40' shipping container. The dealer possesses the required production facilities and qualified mechanical engineers to independently assemble the bulldozer on-site. It will then transfer the machine for operation and carry out its aftersales service and maintenance.

RUSSIAN NAVY DAY

Vladimir Putin and Sergey Shoigu marked the main military holiday of summer

In the last Sunday of July in Russia, traditionally celebrated the Navy Day. This holiday has always been a special celebration of Russian honor, pride and military power of the navy. This year the holiday was especially powerful. An official reception to mark Russia's Navy Day was held at the Admiralty in St Petersburg – Navy capital of Russia. Also in this city there was the Main Naval Parade, and the Supreme Commander-in-Chief Vladimir Putin reviewed it on the Neva River.

During official reception Vladimir Putin said: 'The profession of a navy man in our country has always been an honourable one that personified courage, valour and dedication. Such respect is well-deserved: everyone knows that the naval profession is a difficult and important work. It means service in the most difficult and rough environments, often involving long separations from the family and loved ones. But for a navy man, the noble goal of serving the Fatherland has always been a top priority.

The high combat readiness and effectiveness of the naval forces is a major component of ensuring the country's military capability and its security, as well as the security of its citizens. And, of course, we will continue to implement measures aimed at strengthening and developing the Navy and better equipping its fleet.

This year, the Navy has already received four surface vessels, one anti-terror boat, and three support ships. Overall, in 2018 the Navy will receive 26 new ships, cutters and vessels, including four ships with the Kalibr missile system.

Rearmament and modernisation is making good progress largely due to the workers of our shipbuilding industry and their professionalism and responsible attitude. The Navy infrastructure, including ship base infrastructure, has also been developing to meet the latest requirements.

The Navy has always been among the first to master scientific, technical, engineering and design achievements. Meeting the Navy's current and prospective needs should further stimulate the development and introduction of advanced and innovative technologies and serve as one of the drivers for the technological breakthrough. And this, as experience shows, will be inevitably followed by the flow of breakthrough knowledge into the civilian sector.

I am confident that every person who serves in the Navy knows that they have the entire great history of the Russian Navy behind them, all the outstanding achievements of our predecessors and the valour of our respected veterans. I hope the current generation of navy men will honourably continue this great history.

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Honour and valour, being true to one's duty and oath have always been and will remain the underpinnings of the spectacular victories won by our Navy. For more than three centuries now, the Russian fleet has enabled Russia to affirm its status as a great naval power, capable of standing up for its national interests and protecting its shores.

The Main Naval Parade that took place on the Neva River this year, united more than four thousand Navy personnel from the Baltic, Northern and Black Sea fleets and the Caspian Flotilla, as well as more than 40 ships and motor boats of various kinds, along with a Navy aviation group all took part in the parade.

Before the main part of the parade, the President sailed round the combat ships, which were lined up for the parade in the inner harbor of Kronstadt, and welcomed their crews. The President also visited the Peter and Paul Fortress and the Cathedral of Saints Peter and Paul.

At the Main Naval Parade Vladimir Putin said: 'I congratulate all those who guard the maritime boundaries of our Motherland, take part in long-distance expeditions, and all those who have dedicated their lives to the surface and submarine forces, naval aviation, coastal defence troops, and who are committed to serving to the glory of the Russian Navy.

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The fleet's history is personified by the courage, valour and spirit of its sailors and officers. Their devotion to the Fatherland served as a guiding light for bold pioneers, and inspired ship builders to reach new heights by developing engineering marvels. These glorious traditions cannot fail to inspire current generations.

The celebration of Navy Day emphasises the power of the sacred maritime brotherhood that unites all Navy bases and units of the Baltic, Northern, Pacific, Black Sea fleets and the Caspian Flotilla.

The Russian Navy has been successful in ensuring our national defence capability, and continues to make a substantial contribution to the fight against international terrorism, while also playing a vital role in guaranteeing strategic parity. Every day dozens of ships and submarines ensure the defence of Russia's interests in any part of the World Ocean.

We have every right to be proud of our Navy, our Naval forces, their high-class combat readiness, strategic, tactical and operational capabilities, as well as the power and beauty of the Russian fleet.

Our people have always admired the sailors of our Navy, since only the brave and resilient can shoulder maritime service, and understand the value of military readiness, strict discipline, unity and chivalry. Together with having the latest knowledge and irreproachable skills in mastering the latest advances in military hardware, these qualities enable our Navy to deliver on even the most complex missions.' **/IA&TG/**

DIFFERENT MISSIONS OF UAC

Russian aviation equipment for a wide range of applications

The 12th International Exhibition and Scientific Conference on Hydroaviation – HYDROAVIASALON-2018 is another additional platform where the United Aircraft Corporation (UAC) shows a wide range of its aviation products, its projects and developments. The products of this leading Russian aircraft building corporation are always of particular interest in any aviation salons in the world. At the exhibition in Gelendzhik, the UAC represents primarily its civilian products, which are becoming increasingly important in the business of the corporation. HYDROAVIASALON-2018 is organized by the Ministry of Industry and Trade of the Russian Federation and hosted by UAC with Aviasalon company as the operator.

The United Aircraft Corporation (UAC) is the major Russian aircraft manufacturers and one of the biggest in the world. This Corporation unites more than 80 per cent of 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. UAC's revenues have been lately growing on average more than 20% per year. 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.

Moreover, one year ago as part of an effort to expand foreign presence UAC was given a military-dedicated foreign trade license to be implemented on a direct basis. The military-dedicated foreign trade license has been issued by Federal Service for Military and Technical cooperation. This helps UAC improve maintenance and repairs of equipment previously delivered abroad, which includes every Su, MiG, Il, Yak and Tu airplanes.

Alongside with the right for direct maintenance and repairs of the equipment previously delivered abroad, the document also specifies UAC's capabilities to update

Dear colleagues!

On behalf of United Aircraft Corporation, I welcome the participants and visitors of HYDROAVIASALON-2018!

This year, Gelendzhik will for the twelfth time host the International Exhibition and Scientific Conference dedicated to the challenges of hydroaviation. The participants of the event will focus their attention on water-based and ship-based aircraft, however the unique format of HYDROAVIASALON will allow to acquaint the industrial community with new approaches to the creation of high-tech engineering products and new scenarios for using technical means to solve a wide range of tasks, as well.

The connecting link will be digital technologies whose development is essential for achieving advanced positions in any field of activity today. United Aircraft Corporation is actively implementing digital solutions at the stages of aircraft design, production launch and after sale services. In our view, this allows to maintain the competitiveness of existing products and to guarantee their leading positions in various market segments in the future.

The agenda of HYDROAVIASALON will put great emphasis on UAC's initiatives related to staffing and personnel training. We are planning to work actively within the framework of our youth-oriented platform Aviation of the Future. The educational program will include a forum of young specialists of the company, and the final of a scientific and technical contest Aviation of the Future in the discipline Innovative Aircraft: wide use of digital technologies and the latest technological solutions.

There is no doubt that HYDROAVIASALON-2018 will serve as a catalyst for implementing new projects, will give impetus to the development of cooperation in high-tech industrial sectors and, above all, in aircraft engineering. I express the hope that all the objectives sought will be attained thanks to a convenient exhibition infrastructure created at the testing and experimental base of the Beriev Aircraft Company, and a friendly atmosphere of the resort town of Gelendzhik.

I wish you all fruitful work!

President of PJSC United Aircraft Corporation
Yury Slyusar

According to experts, it is Russian aircraft which in terms of life-cycle cost appear today as the most attractive in international markets. In recent years civil segment of Russian aviation export showed rather good results. 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.

such equipment and train foreign personnel to maintain and repair UAC products. Besides, the license authorizes UAC to establish joint ventures abroad which can maintain and repair aircraft.

The license enables UAC to proceed to coordinated efforts in this area, develop a single enterprise after-sale service system based on current experience and ensure the most efficient activities at markets with several brands available.

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.

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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.

Superjet 100 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) Superjet 100 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 more than hundred Superjet 100 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 says UAC is intended to focus on further development of the Superjet 100 aircraft family to offer customers a range of regional planes.

It is worth noting that today a business jet version of the SSJ100s is also available. Following the results a number of measures, including auxiliary fuel tanks installation and other engineering solutions the range of the business version of the SSJ100 is increased to about 7,000 km-long nonstop flight.

At the several international airshows the United Aircraft Corporation demonstrated its Superjet 100 aircraft with a VIP interior and very high comfort standards. The Superjet 100 aircraft as well as the new Russian MC-21 aircraft family from UAC both demonstrate an optimal combination of commercial effectiveness and maximum passenger comfort. The Superjet 100 in its VIP configuration enjoys high demand. After a number of enhancements such as installation of additional fuel tanks and other system improvements the flight range of the VIP-version of the Superjet 100 was increased to 7,000 km that should satisfy the needs of most demanding customers.

The international authority of the UAC is also growing, thanks to the success of its international and domestic aviation projects. For example, a great deal of attention is shown around the world is to company CRAIC – the joint venture of United Aircraft Corporation (UAC) and Commercial Aircraft Corporation of China (COMAC). This year CRAIC has officially announced the commencement of Joint Concept Definition Phase (JCDP) within the program of CR929 aircraft development.

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CRAIC General Manager Mr. Guo Bozhi emphasized that the formal commencement of JCDP is of great significance to promote the deep participation of potential suppliers in product definition, optimize airborne systems and aircraft technical concepts. JCDP stage shall allow China and Russia joint team, together with key worldwide potential suppliers within JCDP phase of CR929 program, to perform a more thorough review of requirements to the main airborne systems: Propulsion System, Landing

The UAC-participation program in the HYDROAVIASALON-2018 is very extensive and interesting. However, perhaps the most interesting – career-oriented event 'Aviation of the Future', a youth-oriented demonstration platform, which organized by UAC and is showed the cutting-edge developments and new technologies. The central element of the platform is the 'Aviation of the Future' exposition, where the works of schoolchildren who took part in the career guidance programs of UAC in 2018 are exhibited.

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The project creators present their works themselves. Besides, the final of the 'Future of the Aviation', a contest of engineering works of students and graduates organized by UAC, will take place on September 8. The Contest platform gathered more than two thousand students and graduates of the aviation industry, students and post-graduates of the relevant higher educational institutions who presented their projects in 9 nominations in the line 'Innovative aircraft – wide application of digital technologies and the newest technological solutions'. 20 projects that reached the semi-final were presented at the 'Army-2018' Forum, and the contest winners will be determined in Gelendzhik.

United Aircraft Corporation will also hold a forum for the talent pool. 70 best young professionals of the corporation's subsidiaries will get to know various areas of activities reflected in the innovative development program, will discuss the issues of application of digital technologies, and will gain the skills of application of the key management technologies. /IA&TG/

Gear, Environmental Control System, Avionics and others.

Chief CR929 Program Designer from Russian side Maxim Litvinov explained that this stage shall foresee more detailed analysis of technical aspect with regards to RFP Working Packages that are planned to be released by the end of 2018. JCDP includes RFP stage during which airframer requests proposals from potential suppliers of the systems and equipments. JCDP stage within CR929 Program doesn't include interaction in relation to the power propulsion system. As for this system, RFPs to the potential suppliers of long range wide body aircraft program were sent in December 2017 and the answer to such requests was received.Completion of RFP-related procedures within the Chinese-Russian long range wide body aircraft program is expected at the end of 2019.

ПЕРСПЕКТИВНАЯ КООПЕРАЦИЯ

В Москве на площадке Международного военно-технического форума «АРМИЯ-2018» состоялось подписание Соглашения о сотрудничестве между Объединенной авиастроительной корпорацией и Ярославской областью. Подписи под документом поставили президент ПАО «ОАК» Юрий Слюсарь и губернатор Ярославской области Дмитрий Миронов.

Соглашение предполагает развитие кооперации между ОАК и промышленными предприятиями региона, проведение совместных исследований с разработчиками и производителями авиационных компонентов в Ярославской области, а также проведение на территории региона совместной работы по поиску и продвижению молодых команд и стартапов.

«Перечень технологий ярославских предприятий, которые могут быть использованы в интересах авиационных программ ОАК, достаточно широк. В первую очередь это «ОДК-Сатурн», технологии и разработки, которыми коллеги пользуются в производстве авиационных двигателей, являются на сегодняшний день непревзойденными. В Ярославской области большое количество потенциальных партнеров, например предприятие «Русские краски». Мы рады, что появляются российские производители, выпускающие продукцию, которую мы раньше покупали за рубежом. Еще одна область нашего сотрудничества – молодежные стартапы. Во время недавнего визита в Ярославскую область мы знакомились с инновационными стартапами молодых команд. Надеюсь, некоторые из них вырастут в полноценные проекты, которые мы сможем использовать в наших авиационных программах», – заявил по итогам подписания соглашения президент ПАО «ОАК» Юрий Слюсарь.

«Целый ряд предприятий Ярославской области благодаря этому соглашению получат новый импульс к развитию. Это «ОДК-Сатурн», Ярославской радиозавод, Рыбинский завод приборостроения, «Русские краски» и многие другие. Документ предусматривает не только сохранение и наращивание промышленного и экономического потенциала Объединенной авиастроительной корпорации, но и создание благоприятных условий для привлечения инвестиций в наш регион. Мы будем содействовать развитию областной сети поставщиков для предприятий корпорации», – сказал губернатор Ярославской области Дмитрий Миронов.

Подписанное соглашение стало продолжением деловых контактов корпорации и региона. В июле текущего года специалисты ОАК посетили более десятка предприятий Ярославской области, сформировали дорожную карту и определили приоритетные направления сотрудничества. /IA&TG/

Су-30СМ

Фигуры высшего пилотажа в рамках демонстрационной программы Международного военно-технического форума «Армия-2018»

Фото Владимира Карнозова

ВТОРОЙ ПЕРЕЛЕТ

Корпорация «Иркут» продолжает программу летных испытаний МС-21-300

Юрий Нитчук

ПАО «Корпорация «Иркут» (входит в ПАО «Объединенная авиастроительная корпорация») продолжает реализацию масштабной программы создания нового семейства пассажирских самолетов МС-21. В конце июля уже второй опытный самолет МС-21-300, участвующий в программе летных испытаний, совершил перелет из Иркутска на аэродром ЛИИ им. М.М. Громова «Раменское» (г. Жуковский Московской области). Полет продолжался шесть часов и прошел штатно. Реализация программы МС-21 является одной из ключевых в программе развития отечественного гражданского авиастроения.

Испытания must go on

На Иркутском авиационном заводе – филиале ПАО «Корпорация «Иркут» – еще в начале весны была завершена постройка и передача в летно-испытательное подразделение предприятия уже второго опытного самолета МС-21-300. Параллельно этому в ЦАГИ по заказу Корпорации «Иркут» проводили очередные испытания в рамках программы МС-21. Испытывали в том числе натурные фюзеляжные панели самолета для подтверждения акустических характеристик нового воздушного судна.

И вот 20 июля второй опытный самолет МС-21-300 совершил перелет из Иркутска на аэродром ЛИИ им. М.М. Громова «Раменское» (г. Жуковский Московской области). Полет продолжался шесть часов. Самолет пилотировал экипаж в составе: командир воздушного судна – летчик-испытатель 1-го класса ОКБ им. А.С. Яковлева Василий Севастьянов, второй пилот – летчик-испытатель 1-го класса ОКБ им. А.С. Яковлева Андрей Воропаев. По прибытии в Жуковский Василий Севастьянов сообщил: «Перелет прошел в штатном режиме, все системы работали без сбоев».

Примечательно, что второй летный самолет МС-21-300 продолжает испытания в новой окраске. Для окраски выбран белый цвет, позволяющий наглядно продемонстрировать высокое качество поверхности планера и точность стыковки отсеков фюзеляжа.

Летные испытания второго самолета МС-21-300 стартовали 12 мая 2018 года на аэродроме Иркутского авиационного завода – филиала ПАО «Корпорация «Иркут». В ходе полетов с заводского аэродрома суммарной продолжительностью около 14 часов самолет достиг высоты 12 000 м, скорости M=0,8, истинной скорости 850 км/час. В рамках летных испытаний выполнены следующие работы:

- подтверждены характеристики устойчивости и управляемости самолета в различных конфигурациях механизации крыла с выпущенными и убранными шасси;
- проведена калибровка системы измерения высотно-скоростных параметров на соответствие их реальным значениям в полете;
- проверены различные режимы работы силовой установки, в том числе отключение и запуск двигателя в воздухе;
- проверена работоспособность самолетных систем.

Дальнейшие испытания двух опытных самолетов МС-21-300 будут проводиться на базе Летно-испытательного и доводочного комплекса (ЛИиДК) ОАО «ОКБ им. А.С. Яковлева».

Для обеспечения испытательных работ в ЛИиДК построен новый ангар, развернуты средства наземного обслуживания, создан высокопроизводительный комплекс сбора, обработки и анализа полетной информации. Новые технологии обработки результатов летных испытаний обеспечивают высокую информативность полетов, в каждом из которых система бортовых измерений позволяет регистрировать более 30 000 параметров.

Напомним, что первый опытный самолет МС-21-300 совершил перелет с аэродрома Иркутского авиазавода (филиал Корпорации «Иркут») на аэродром ЛИИ им. М.М. Громова в конце октября прошлого года. Самолет за 6 часов преодолел около 4,5 тыс. км без посадки. Полет проходил на высоте около 10 000 м.

Президент ПАО «Объединенная авиастроительная корпорация» (ОАК) и ПАО «Корпорация «Иркут» Юрий Слюсарь заявил тогда, что день перелета самолета в Подмосковье «открывает новый этап в истории создания МС-21. Впереди продолжение летных и наземных испытаний самоле-

Высокие требования к комфорту и экономической эффективности самолета потребовали внедрения передовых технических решений в области аэродинамики, двигателестроения и самолетных систем. По своим летно-техническим данным и экономичности самолет МС-21 превосходит существующие аналоги.

ПАО «Научно-производственная корпорация «Иркут» (входит в состав Объединенной авиастроительной корпорации) занимает лидирующие позиции среди российских авиастроительных предприятий и представляет собой вертикально интегрированный холдинг, деятельность которого направлена на проектирование, производство, реализацию и послепродажное обслуживание авиационной техники военного и гражданского назначения. На предприятиях Корпорации «Иркут» трудятся свыше 14 тыс. человек, которые разрабатывают и выпускают широкий спектр высокотехнологичной продукции. В настоящее время портфель заказов составляет свыше $6 млрд. Выручка компании за последние пять лет увеличилась вдвое. На долю Корпорации приходится свыше 15% рынка российского оружейного экспорта. Основным продуктом Корпорации «Иркут» являются боевые самолеты семейства Су-30. Компания является головным исполнителем программы производства Су-30МКИ для ВВС Индии. В рамках диверсификации своего продуктового ряда Корпорация также разрабатывает и производит учебно-боевые самолеты Як-130, беспилотные летательные аппараты.

В последнее время Корпорация активно ведет работу по созданию нового пассажирского самолета МС-21. В течение последних семи лет Корпорация входит в рейтинг 100 мировых лидеров ВПК: по версии авторитетного американского издания Defense News «Иркут» неоднократно признавался «Компанией года» в номинации «Промышленность. ВПК». Несколько лет подряд Минпромторг России признает Корпорацию «Иркут» победителем конкурса на звание «Лучший российский экспортер года» в номинации «Авиастроение (самолетостроение)». Иркутский авиационный завод (филиал Корпорации «Иркут») стал первым предприятием в России, получившим сертификаты соответствия стандартам Airbus и EN 9100.

та, подключение к этому процессу новых машин, сертификация и разворачивание серийного производства». Юрий Слюсарь напомнил, что «в программе МС-21, наряду с «Иркутом», принимают участие целый ряд предприятий Объединенной авиастроительной корпорации, партнеры из Ростеха и ведущие зарубежные компании. Эта программа вывела наши предприятия на новый технологический уровень и обеспечила профессиональный рост специалистов».

Первый вице-президент – генеральный конструктор ПАО «Корпорация «Иркут» Олег Демченко в свою очередь прокомментировал: «Проведенные на Иркутском заводе летные испытания МС-21 и длительный перелет самолета подтверждают заявленные характеристики машины. С сегодняшнего дня испытания будут продолжены на базе Летно-испытательного и доводочного комплекса ОКБ им. А.С. Яковлева. Специально для базирования самолетов МС-21 построен новый ангар, в котором создан современный комплекс сбора, обработки и хранения полетной информации, регистрируемой в процессе проведения летных и наземных испытаний».

Самолет нового поколения

МС-21-300 – пассажирский самолет нового поколения вместимостью от 163 до 211 пассажиров, ориентированный на самый массовый сегмент рынка авиаперевозок. Самолет обеспечит пассажирам качественно новый уровень комфорта благодаря самому большому в классе узкофюзеляжных самолетов диаметру фюзеляжа. Такое решение существенно расширит личное пространство каждого пассажира, позволит разминуться с тележкой обслуживания и обеспечит авиакомпаниям сокращение времени оборота в аэропортах. Благодаря установке больших иллюминаторов увеличена естественная освещенность пассажирского салона. В самолете будет поддерживаться комфортное для пассажиров давление воздуха и улучшенный микроклимат. Для пилотов самолетов МС-21 разработана инновационная эргономичная кабина.

МС-21-300 – пассажирский самолет нового поколения вместимостью от 163 до 211 пассажиров, ориентированный на самый массовый сегмент рынка авиаперевозок. Самолет обеспечит пассажирам качественно новый уровень комфорта благодаря самому большому в классе узкофюзеляжных самолетов диаметру фюзеляжа.

Высокие требования к комфорту и экономической эффективности самолета потребовали внедрения передовых технических решений в области аэродинамики, двигателестроения и самолетных систем. По своим летно-техническим данным и экономичности самолет МС-21 превосходит существующие аналоги.

Основной вклад в улучшение летно-технических характеристик самолета внесет крыло из полимерных композиционных материалов, впервые в мире созданное для узкофюзеляжных самолетов вместимостью свыше 130 пассажиров. Доля композитов в конструкции самолета МС-21 – свыше 30% – уникальна для этого класса лайнеров.

МС-21 – первый в нашей стране магистральный пассажирский самолет, который изначально разрабатывался исключительно на базе цифровых технологий. Учитывая масштаб программы МС-21, впервые в отечественном авиастроении была построена распределенная информационная среда, объединяющая конструкторские и производственные площадки.

Ядро этой среды – единая для всех участников программы база данных, содержащая конструкторскую, технологическую и иную документацию по самолетам семейства МС-21. База данных содержит полную информацию о самолете, его точную электронную модель.

Обмен информацией с базой данных осуществляется по высокоскоростным защищенным каналам связи. Все ключевые элементы дублированы и сохраняют работоспособность даже при отключении электропитания. К базе данных подключены основные участники кооперации, включая Инженерный центр им. А.С. Яковлева, ИАЗ, Ульяновский и Воронежский филиалы ПАО «Корпорация «Иркут», заводы «Авиастар-СП» и ВАСО, «АэроКомпозит».

Единая информационная среда обеспечивает защищенный обмен информацией с другими участниками программы МС-21 в России и за рубежом. Созданная аппаратная и программная инфраструктура, а также опыт ее построения и эксплуатации могут быть использованы в новых авиационных проектах.

Впервые в истории отечественного самолетостроения лайнер предлагается заказчикам с двумя типами двигателей – PW1400G компании Pratt & Whitney (США) и ПД-14 Объединенной двигателестроительной корпорации (Россия). Двигатели нового поколения обладают уменьшенным расходом топлива и низким уровнем шума и эмиссии вредных веществ. Самолет МС-21 отвечает перспективным требованиям по защите окружающей среды.

Первый опытный самолет МС-21-300 совершил перелет с аэродрома Иркутского авиазавода (филиал Корпорации «Иркут») на аэродром ЛИИ им. М.М. Громова в конце октября прошлого года. Самолет за 6 часов преодолел около 4,5 тыс. км без посадки. Полет проходил на высоте около 10 000 м.

Интеграторы основных систем самолета МС-21 – российские предприятия. В ходе реализации программы МС-21 в России созданы центры компетенций в области разработки и производства изделий из композиционных материалов. В целях внедрения новых технологий проведена кардинальная модернизация производственных мощностей Иркутского авиационного завода – филиала ПАО «Корпорация «Иркут» и ряда предприятий авиастроения и смежных отраслей промышленности.

/IAATG/

SUPERJET 100: PROGRAM STATUS

At the moment about 117 the Superjet 100 aircraft are operated around the world. In total aircraft have performed more than 395 000 flight hours for more than 260 000 commercial flights since entering into service in 2011. The following Russian airlines and governmental agencies are among SSJ100 operators: Aeroflot, Gazpromavia, Yakutia, Yamal, IrAero, Ministry of Internal Affairs of the Russian Federation, EMERCOM of Russia, "Russia" Special Flight Squadron, RusJet. Interjet (Mexico), CityJet (Ireland) and the Royal Thai Air Force make the list of foreign customers.

Aftersales. Spares Distribution Program is supported by two services packages. The first is Basic SuperCare Plan including exchange parts pool access, guaranteed availability and LRU-off wing maintenance and SuperCare Plan Option implying on-site stock, Landing Gear/APU maintenance, engineering services. Spare parts warehouses for SSJ100 operation support are located in Russia and abroad, particularly in Fort Lauderdale (USA) and Munich (Germany). The partner of the project, engine manufacturing company PowerJet, has opened its own warehouse in Moscow Region for SSJ100 in-service support. SCAC is considering optimization of spares distribution network and increase of part numbers in stock thus ensuring 24/7 support of operators of this aircraft type around the world.

Market Overview. SSJ100 modifications created on the basis of the current platform, such as SSJ100 with 2960 km and 4320 km flight range and Business Jet (SBJ), certified by Russian and European aviation authorities, as well as particular national aviation authorities, can take up to 10% of the market share in 100-seat segment. During next five years it is planned to deliver about 170-180 aircraft, including business configurations, with the aim to deliver 35-40 SSJ100 per year.

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Saberlets. On the 21st of December, 2017 Superjet 100 performed its first flight with the installed saberlets in Zhukovsky. The results of research and experiments showed that the installation of the saber-like tips allows to simultaneously improve the take-off and landing performance and decrease the fuel consumption for not less than 3%. The expected improvement of the take-off and landing characteristics will be obvious for the carriers operating the aircraft at regional runways and in hot weather conditions as well as on mountain aerodromes

SCAC is consequently implementing the 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 installation of the wing tips has become the part of the improvement program. The SSJ100 winglets are called 'saberlets' for their saber-like shape. This configuration turned out to be the result of a number of research, engineering and experimental activities.

(Hot&High). SCAC is consequently implementing the 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 the part of the improvement program will provide the operators with cost cut up to $70000 per year per one SSJ100.

SBJ. Built on SSJ100 platform, Business Jet (SBJ) can boast the cabin with enhanced comfort. The aircraft can carry from 8 up to 60 passengers depending on the configuration. SSJ100 aircraft also can give origin for the special-purpose aircraft with increased interior comfort equipped with multi-media systems, SATCOM and with provisions for internal and external videoconference. The aircraft can also be modified in medical-evacuation configuration for transportation of injured and newborns. Within the period from 2015 till 2034 the demand in the corporate jets segment built on passenger airliners platform (Liners), SBJ being the part of this segment, can reach up to 400 aircraft, at that, share of SBJ can make up to 10%. Implemented auxiliary fuel tanks resulted in introduction of extended range version of Business Jet capable to perform flights at the distance of 6000 km. SCAC will continue the activities targeted on flight range increase of SSJ100 business configuration up to 7000 km, this option can also feature built-in stairs, high-speed SATCOM and other business-aviation attributes at customer's request. As of today SBJ fleet operated mostly by governmental agencies and commercial entities from different countries consists of nine airliners. **/IA&TG/**

Implemented auxiliary fuel tanks resulted in introduction of extended range version of Business Jet capable to perform flights at the distance of 6000 km. SCAC will continue the activities targeted on flight range increase of SSJ100 business configuration up to 7000 km, this option can also feature built-in stairs, high-speed SATCOM and other business-aviation attributes at customer's request.

India, Russia aim for new breakthroughs in BRAHMOS missile programme

The world-class BRAHMOS supersonic cruise missile system, produced by BrahMos Aerospace, has expanded the realm of India-Russia strategic partnership and elevated bilateral defence ties to a higher level. The joint venture (JV) military programme involving two scientific institutions of eminence – India's DRDO and Russia's NPOM – has produced a powerful tactical weapon with no parallels in the world. The project, which started in 1998 with an initial investment of $250 million having a 50.5% Indian share and 49.5% Russian share, today has become the most successful Defence JV programme in the world.

As a new-age precision strike missile with land, sea/sub-sea and air deployability and operability, the formidable BRAHMOS has redefined and influenced warfare tactics and strategies in the 21st century. Initially developed in anti-ship configuration, BRAHMOS has evolved over the years to establish its impeccable land-attack capability. Presently, it is the only weapon system which can be fired in land-to-land, land-to-sea, sea-to-land, sea-to-sea, sub-sea-to-land and air-to-sea configurations. No other country in the world has been able to develop such a highly versatile, multi-role modern weapon for its military.

Flying at a top speed of Mach 2.8 and carrying a powerful warhead of up to 300 kg, the two-stage BRAHMOS has been designed to annihilate high-value land and sea-based enemy targets with impeccable accuracy, high speed and deadly firepower.

While the Russian scientists and engineers contributed in developing the critical propulsion system, including the ramjet engine and booster for the missile along with the warhead, the Indian scientists and technology experts played an equally important role by designing and developing the fire control system, electronic system, guidance system, avionics and materials for airframe among other components for the missile. In the initial phase, NPOM provided its facilities to test all the technologies needed to develop and configure the new weapon system.

Today, the Indian Navy has deployed the powerful BRAHMOS on all frontline surface warships while the Indian Army is the only land force in the world which has operationalised the land-attack variant of the tactical missile.

A major technological breakthrough in the BRAHMOS project came on 22nd November 2017 when BrahMos Aerospace for the first time successfully test fired the advanced air-to-surface variant of the missile from the Indian Air Force's Sukhoi-30MKI combat aircraft against a sea target. It became a world record feat for India which showed the country's exclusive capability to launch a supersonic cruise missile from land, sea, sub-sea and air.

The air-launched BRAHMOS project faced many challenges as it involved the integration of a very powerful, high-speed missile onboard a heavy, long-range air superiority fighter platform. The Russian-origin Sukhoi-30 combat aircraft underwent structural modifications to carry the BRAHMOS-A whose weight was also reduced by 500-kg in order to fit it onto the heavy strike fighter. The missile also featured other design refinements, including redesigned fins and nose cap, for aerodynamic stability in the early stages of its flight from the supersonic air platform.

The highly intricate mission, backed by the Russian and Indian Governments and the scientific experts of both sides, once again brought together all major defence-sector entities, including DRDO, NPOM, Sukhoi and HAL, to synergise all their resources and successfully realise the BRAHMOS ALCM programme.

Today, the BRAHMOS air-launched cruise missile (ALCM) has become an unparalled precision strike weapon in terms of range, lethality, and effectiveness among world-wide conventional airborne weapons. It has given an unprecedented fillip to the Indian Air Force's air combat capability.

As India and Russia now intend to export BRAHMOS in the international market, it is the advanced BRAHMOS-A which has gained maximum attention. Russia's Irkutsk Aviation Plant in particular, has been keen on modifying and integrating the airborne missile on the Sukhoi-30 fighter platforms operational in all the friendly countries of India and Russia.

Moreover, with the Russian military presently equipping itself with a large number of modern land, sea and air platforms, the prospects for BRAHMOS getting inducted into the Russian Armed Forces in near future has certainly brightened.

India, with the necessary support and backing from Russia, has also started indigenising the BRAHMOS Weapon System. 'Of course, given that the Indian economy and Indian infrastructure and technology have improved over the last many decades, what we are now focusing on along with Russian partners is to manufacture and produce more in India using technology that is available in Russia to upgrade our equipment, to manufacture new equipment and to build upon the successes of the past,' says Dr. Sudhir K Mishra, CEO & MD of BrahMos Aerospace.

Consequently, BrahMos Aerospace has successfully tested land-attack BRAHMOS with an indigenous seeker and has also carried out 'life extension technology' tests successfully in recent past with indigenous components.

Additionally, India and Russia have also initiated work on more advanced variants of BRAHMOS, including the BRAHMOS-NG (next-generation) and a hypersonic BRAHMOS-II (K), paving the way for the 'world's best and fastest cruise missile project' to continue retaining its legacy position of 'market leader' well into the distant future. /IA&TG/

Today, the BRAHMOS air-launched cruise missile (ALCM) has become an unparalled precision strike weapon in terms of range, lethality, and effectiveness among world-wide conventional airborne weapons. It has given an unprecedented fillip to the Indian Air Force's air combat capability.

Sergey Kulik

SECURE RESCUE AT ANY HEIGHT

Unique autonomous rescue parachuting back-pack system for emergency escape

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

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

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

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

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

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

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

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

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

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

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

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

New SPARS® escape solution provides the following advantages:

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

The SPARS® General Specifications

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

Actual Landing Impact Loads:

Acceleration directions:

'chest-to-back' – up to 8÷10 g

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

Acceleration Exposition Time – less than 0.5 s

Acceleration Growth Velocity – less than 500 1/s

User's age – 18÷70 years

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

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

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

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

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

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

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

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

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

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

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

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

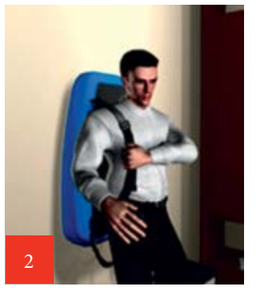
- thin coated/laminated fabric manufacturing;
- assembly from these fabrics a complex air-beam-frame air-proof inflatable structures;
- parachute canopy manufacturing;
- air-aspirator gas filling manufacturing;
- plastics (carbon) manufacturing and forming
- human field (air-borne) tests plastic forming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

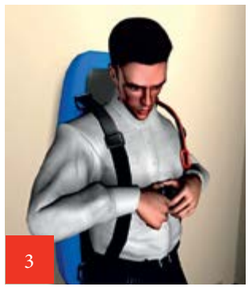
A Partner sought may be expected to undertake part of those activities or provide financing for already SRS Ltd. Company existing outsourcing manufacturing solution in Russia on a mutually beneficial basis.

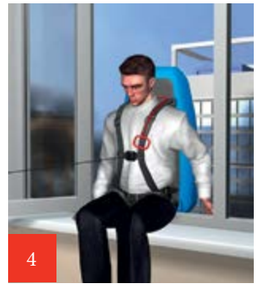
As for the SPARS® solution operation such a potential entity sought (hotels, profitable houses; skyscraper's management company; offshore platform management; air-borne attractions & entertainment companies etc.) should only require a free window exit sized 1000x500 mm at the appropriate height to use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

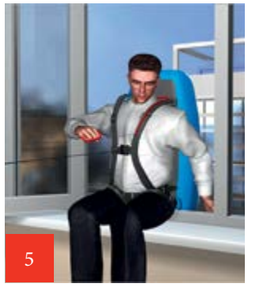
General market estimations shows there are over 7,303 finished and 2,500 under construction skyscrapers worldwide with the heights of 100÷828m, over 100,000 buildings having height of 50÷100m and more than 800 offshore platforms. Taking that analysis into account the SPARS® may have potential market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

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









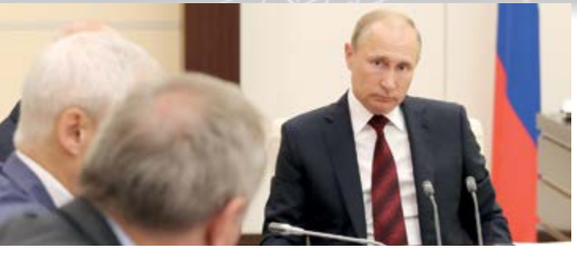
SRS Ltd. (OOO 'KCC')
25A Leningradskoe HWY
Khimky, Moscow Region,
The Russian Federation, 141400
t.+7(495) 617-1731
f.+7(495) 617-1732
E-mail: info@cosmic-rs.com
www.cosmic-rs.com

There are following innovations in the proposed SPARS® technology:

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

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

MEETING ON SPACE SECTOR DEVELOPMENT



In Novo-Ogaryovo (Moscow Region) Vladimir Putin held a business meeting on space sector development. The meeting participants discussed the implementation of the programmes to develop the space sector and measures to ensure its stable growth. The meeting was attended by First Deputy Prime Minister – Finance Minister Anton Siluanov, Deputy Prime Minister Yury Borisov, Presidential Aide Andrei Belousov, Deputy Commander-in-Chief of the Aerospace Forces and Commander of the Russian Space Forces Alexander Golovko, and General Director of the Roscosmos State Corporation for Space Activities Dmitry Rogozin.

President of Russia Vladimir Putin marked: 'As you know, a few weeks ago we met with the new leadership of Roscosmos corporation. Today we will continue analysing the situation in the space sector. This sector is of strategic importance for the country. Its steady and progressive development is essential for building up Russia's defence capability and national security, for enhancing the country's scientific potential and for creating innovative commercial technology.

Space exploration and making use of the opportunities it offers to serve the interests of the economy and social sphere are major areas for Russia's technological breakthrough. Today I suggest discussing the implementation of the programmes for the development of the rocket and space industry and additional measures to ensure its stabile and balanced growth.

Instructions were issued to the Government and Roscosmos in this connection, primarily to increase the orbital group, create a super heavy-lift launch vehicle, implement a manned flight programme and complete the construction of the Vostochny Space Launch Centre. I hope to hear reports on the implementation of these instructions today.

It should be noted that Russia has the necessary design, engineering and technical capabilities to successfully implement all of these projects, as well as the experience of designing complex space equipment and unique space exploration competences.

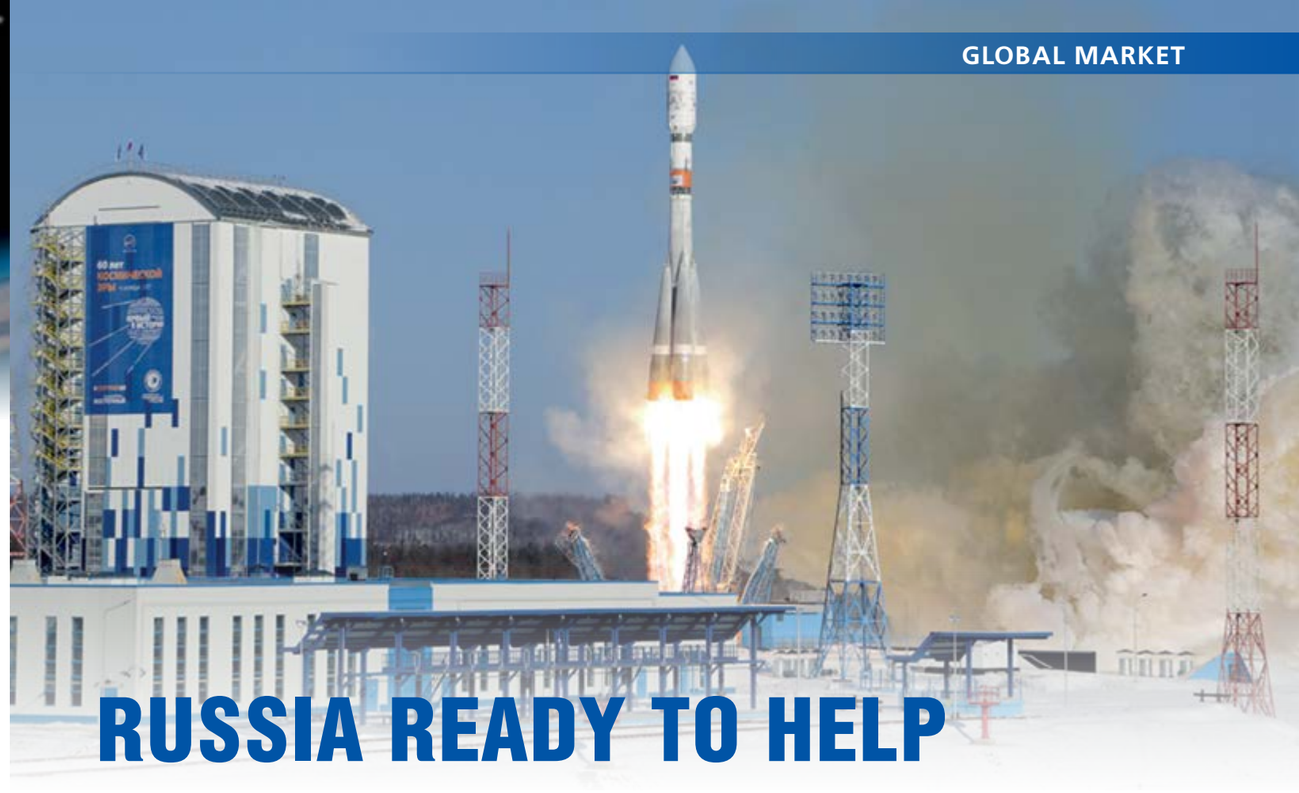
At the same time, our space industry must consistently improve the quality of its products and works, which should come at globally competitive prices. This is the key condition for increasing the industry's commercial potential to ensure its successful operation on the global market, where competition, or even rivalry, continues to increase.

We must create conditions for fruitful and coordinated work of all space industry companies and their personnel, including designers, engineers and workers. We must also enhance the financial stability of these companies and provide additional social guarantees and incentives for improving the professional skills of their personnel and for attracting young talented professionals.'

After President speech General Director of the Roscosmos State Corporation for Space Activities Dmitry Rogozin said: 'Based on your instructions, starting from January 1, 2017, we introduced a new procedure requiring all vehicles produced in Russia or supplied to Russia to be equipped with ERA-GLONASS units. This has already saved hundreds of lives. We are even ahead of European practice here. We propose to introduce a similar practice when Russian airlines buy or lease foreign-made aircraft and even more so, aircraft made in Russia. They should all be equipped the same way – and we propose making it a legal requirement – with GLONASS or GLONASS-GPS modules in some cases. This will enable more accurate navigation for the crews. We have airports equipped with this system, but the planes, which are still mostly foreign-made, do not have these units. I would ask you to support my proposal. I have prepared a report and will submit it to you today.

And the second question. I would like to show you an album today after the meeting. Since April 2014, we have been photographing the Crimean Bridge, while it was being built. From the first step on each autoshot path, 240 paths in all, were shot monthly by our satellite-based remote sensing devices. Now we have a group of 10 satellites; in a few years, there will be 23. This is also a very important area for the commercialisation of space activities. At present we can remotely monitor how objects change, observe changes in the landscape, changes in the natural environment, illegal logging and many other things.

Before the end of this month we will be presenting the latest capabilities of Roscosmos and its orbital group to the federal districts and the regional governors. These new capabilities need to be commercialised and promptly introduced into the national economy.' /IA&TG/



RUSSIA READY TO HELP

Rostec is ready to expand its cooperation with Turkey in creating and developing the republic's space agency. Earlier, the Turkish satellite Turksat-4A was launched in cooperation with Rosoboronexport (part of Rostec).

Rostec is actively developing the space industry and introducing advanced technologies in various areas of space exploration. The engines manufactured by UEC put Soyuz carrier rockets into orbit. Technodinamika produces life support systems for pilots and astronauts, including the Orlan-MKS space suit and the latest 'space' parachute system. Optical devices designed by Shvabe sense the earth's surface from satellites and are also used in the largest observatories in the world. RT-Chemcomposite creates unique composite materials that can withstand ultra-high temperatures and heavy loads.

'Rostec and its Turkish partners have had a mutually beneficial relationship in various industries for a long time. We certainly welcome our partners' intent to develop the space industry,' said Viktor Kladov, Director for International Cooperation and Regional Policy Department of the State Corporation. 'Rostec has a wide range of competences and extensive expertise in developing the space industry, and we are ready to expand and strengthen cooperation in this sphere.'

In addition, through Rosoboronexport and in the interests of foreign customers, Russian aerospace industry enterprises create and launch spacecraft for various purposes, make ground control complexes, complexes for receiving and processing data from satellites, and provide foreign partners with maps created based on space images. Specialists from partner countries learn how to carry out thematic processing and analysis of data obtained by remote sensing of Earth, with support from Rosoboronexport.

Rosoboronexport may suggest unique comprehensive projects to partners, as in the case when the first Malaysian astronaut Sheikh Muszaphar Shukor was sent to the ISS as part of an offset agreement to the contract for supplying Su-30MKM fighters.

Overall, Rosoboronexport has assisted in putting over 30 spacecraft from 14 countries into relevant orbits, including in the interests of the UK, Germany, Italy, China, Norway, Sweden, and the European Space Agency. /IA&TG/

АВИАЦИЯ ОБЩЕГО НАЗНАЧЕНИЯ НА МАКС-2019

ОАО «Авиасалон», устроитель Международных авиационно-космических салонов МАКС, в ходе первого этапа XIII Всероссийского слета любителей авиации представил тематический салон «Авиация общего назначения», который пройдет на полях МАКС-2019.

«Тематический салон «Авиация общего назначения» – уникальный проект, который позволит людям, летающим на легкомоторной технике, компаниям, производящим сверхлегкие воздушные суда, не затеряться на фоне магистральных лайнеров и сверхзвуковых истребителей. Он станет обособленной площадкой со своей деловой и летной программой, с собственной экспозицией, которая расположится на специально оборудованном пространстве», – рассказал заместитель генерального директора ОАО «Авиасалон» Владимир Советкин.

Воздушные суда авиации общего назначения традиционно экспонируются на МАКС, однако в 2019 году будут созданы максимально комфортные условия для плодотворной работы. Специально возводимые павильоны позволят расположить стенды аэроклубов и объединений, производителей авиатехники и оборудования, в выделенных зонах пройдут деловые встречи, семинары и презентации новинок. Оборудованные места стоянок для легких воздушных судов и новая рулежная дорожка позволят разместить большое количество натурных экспонатов с максимальной взлетной массой до 1 тонны.

ОАО «Авиасалон» предложит участникам тематического салона специальные условия. К примеру, профильные объединения, общества и клубы вправе рассчитывать на льготы при аренде мест на площадке для воздушных судов. Смогут принять участие в мероприятии и частные владельцы воздушных судов со своей авиатехникой.

Программа тематического салона в настоящее время формируется, однако уже сегодня устроитель отмечает заинтересованность предприятий отрасли в проведении презентаций воздушных судов и их комплектующих, проведении обучающих семинаров, в том числе по авиационному законодательству, организации круглых столов и конференций.

В свою очередь, посетителей МАКС заинтересуют и воздушные суда, которые будут представлены на тематическом салоне, и специальная летная программа, в рамках которой состоятся показательные выступления пилотажных групп, индивидуальные и групповые выступления частных пилотов. Украшением салона станет спортивная программа, в ходе которой запланированы финал Чемпионата по высшему пилотажу «Кубок МАКС» и показательные выступления победителей соревнований «Кубок симпатий МАКС» по воздушному фристайлу на сверхлегких летательных аппаратах.

Международный авиационно-космический салон МАКС-2019 включен в перечень международных выставок продукции военного назначения, проводимых в 2019 году на территории Российской Федерации (Распоряжение Правительства Российской Федерации № 2403-р от 30 октября 2017 года). Местом проведения авиационно-космического салона станет город Жуковский Московской области. Организаторами мероприятия назначены Министерство промышленности и торговли Российской Федерации и Государственная корпорация по содействию разработке, производству и экспорту высокотехнологичной промышленной продукции Ростеха. /IA&TG/

ИСПЫТАНИЯ VRT500

Специалисты конструкторского бюро «ВР-Технологии» холдинга «Вертолеты России» приступили к аэродинамическим испытаниям легкого многоцелевого вертолета VRT500 на базе Центрального аэрогидродинамического института (ЦАГИ).

Впервые этот вертолет был представлен публике во время Международной выставки вертолетной индустрии HeliRussia-2018, которая прошла в конце мая в подмосковном Красногорске. VRT500 стал первым вертолетом холдинга в сегменте легких машин взлетной массой до 2 тонн. Воздушные суда такого типа в настоящее время составляют 18% мирового парка вертолетов.

Легкие вертолеты – одни из самых востребованных: именно такие машины чаще всего эксплуатируют частные покупатели. VRT500 обладает прекрасными летно-техническими характеристиками, что вкупе с привлекательной ценой должно обеспечить успех машины не только на внутреннем, но и на зарубежных рынках. По прогнозам, до 2035 года российские машины могут занять до 15% мирового рынка таких вертолетов.

VRT500 – легкий однодвигательный вертолет соосной схемы расположения винтов со взлетной массой 1600 кг. Машина обладает самой объемной в своем классе грузопассажирской кабиной общей вместимостью до 5 человек и оснащается современным комплексом интерактивной авионики. Закладываемые в вертолет летно-технические характеристики позволят ему развивать скорость до 250 км/ч, совершать полеты на дальность до 860 км, брать на борт до 730 кг полезной нагрузки.

«Аэродинамические испытания являются важным этапом развития проекта, их успешное завершение еще на один шаг приблизит нас к созданию летного образца. Кроме того, на сегодняшний день продолжаются прочностные испытания несущей системы вертолета – предварительные результаты показывают хорошее соответствие характеристик расчетам и высокую стабильность технологии производства», – подчеркнул генеральный директор «ВР-Технологий» Александр Охонько.

Вертолет предполагается в пассажирской, многоцелевой, грузовой, учебной, VIP и медико-эвакуационной конфигурациях. При этом в сегменте со взлетной массой до двух тонн VRT500 станет первым в мире медико-эвакуационным вертолетом с возможностью погрузки-выгрузки унифицированной тележки-каталки через задние створки кабины, что упрощает сам процесс и позволяет значительно сэкономить время. /IA&TG/

СИСТЕМА «СУХОЙ»

В этом году исполняется десять лет со дня создания на Новосибирском авиационном заводе им. В.П. Чкалова (НАЗ) и Комсомольском-на-Амуре авиационном заводе им. Ю.А. Гагарина (КнААЗ) Управлений развития производственной системы. За это время сотрудникам компании удалось реализовать около 250 проектов, направленных на улучшение производственных процессов и повышение эффективности работы предприятий.

Действующая на заводах Производственная система «Сухой» основана на философии бережливого производства. Компания «Сухой» стала пионером среди российских авиастроительных предприятий в области применения бережливых принципов.

Созданные на предприятиях Управления развития производственной системы ведут работу по развитию бережливого производства, организации рабочих мест по системе 5S, а именно оптимизации рабочего места в целях повышения эффективности и снижения затрат. Кроме того, Управления ведут деятельность по реализации рационализаторских (Кайдзен) предложений, обучению сотрудников инструментариям бережливого (Lean) производства. Важной частью деятельности данных подразделений является вовлечение всех работников филиалов в процессы непрерывных улучшений.

Суть внедряемых технологий состоит в том, чтобы имеющиеся ресурсы использовать максимально эффективно и с минимальными затратами, а также в вовлечении всех без исключения сотрудников предприятия в улучшение условий производства.

В филиалах компании достигнуты весомые результаты проводимой работы. Так, на Новосибирском авиационном заводе только в период с 2014 по 2018 год заводчане подали более 5300 рационализаторских предложений, около 3000 из которых внедрено в производство. Экономический эффект от их внедрения за 5 лет составил более 7,6 миллиона рублей.

За десять лет работы УРПС на предприятии реализовано 126 проектов из плана развития Производственной системы «Сухой», общий экономический эффект которых составил более 100 млн рублей. За этот же период в рамках реализации программы по эффективной организации рабочих мест и визуализации 5S основам бережливого производства обучились 6800 человек – то есть почти каждый сотрудник завода. На сегодняшний день 2276 рабочих мест на производстве НАЗ оформлено по системе 5S.

На заводе в Комсомольске-на-Амуре за десять лет реализовано 117 проектов в области бережливого производства. Их общий экономический эффект превысил 440 млн руб. В период 2016-2017 гг. основам бережливого производства обучены 1740 работников, то есть каждый седьмой работник предприятия. По итогам 2018 года обучение пройдут уже 2032 сотрудника филиала Компании. На сегодняшний день на КнААЗ идет активная работа по внедрению и продвижению 16 проектов Производственной системы «Сухой».

Реализуемые на заводах Компании «Сухой» проекты в области бережливого производства касаются многих подразделений и направлений, в частности, визуализации информации в цехах, сокращения времени простоя производства и транспортировки, раздельного сбора отходов, эффективного использования производственных площадей, оптимизации складских запасов и многого другого.

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РОССИЙСКО-ТУРЕЦКИЙ ДЕЛОВОЙ ЖУРНАЛ
TÜRK-RUS IŞLETME DERGISI
№ 01 (01) Октябрь / Ekim 2018

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РОССИЙСКО-ТУРЕЦКИЙ ДЕЛОВОЙ ЖУРНАЛ
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ЖУРНАЛ ДЕЛОВОГО СОТРУДНИЧЕСТВА ДВУХ ДЕРЖАВ

Объединенная промышленная редакция реализует проект по выпуску «Российско-Турецкого делового журнала», который выступает в роли информационно-аналитическое сопровождения по развитию взаимовыгодных деловых связей между российскими и турецкими предпринимателями.

Материалы в журнале публикуются параллельно на русском и турецком языках. Журнал поступает по адресной целевой рассылке в структуры государственной власти России и Турции, связанные с реализацией промышленной и экспортной политики, в союзы международного сотрудничества, торгово-промышленные палаты, международные и национальные инвестиционные фонды, крупнейшим игрокам взаимного делового сотрудничества между Россией и Турцией.

Ключевые темы «Российско-Турецкого делового журнала»:
– динамика и тенденции торгово-экономических отношений;
– меры государственной поддержки и содействия международному бизнесу обеих стран;
– инвестиционные проекты, программы, предложения;
– совместные предприятия;
– опыт реализованных проектов российско-турецкого делового сотрудничества;
– межрегиональные программы и проекты;
– изменения в законодательстве двух стран;
– вопросы финансирования международных индустриальных проектов;
– сотрудничество в области высоких технологий;
– развитие культурных, туристических, молодежных программ;
– предложения по проектам сотрудничества, отраслевой консолидации, совместным разработкам;
– презентация новой продукции высокого экспортного потенциала.

Выход первого номера «Российско-Турецкого делового журнала» – 08 октября 201 года. Среди главных тем: «Инвестиции», «Безопасность», «Энергетика», «Строительство», «Туризм».

Выход первого номера приурочен к проведению в Стамбуле 22-й международной выставки средств и технологий индустрии безопасности и защиты ISAF 2018 (11-14 октября 2018, Istanbul Expo Center).

İKI YETKILI İŞ İŞBIRLIĞI DERGISI

«Türk-Rus Işletme Dergisi», Rus ve Türk girişimcileri arasında karşılıklı yarar sağlayan iş ilişkilerinin geliştirilmesine yönelik bilgi ve analitik bir destektir.

Dergide materyaller Rusça ve Türkçe olarak paralel olarak yayınlanmaktadır. Dernek, Rusya ve Türkiye arasında, sanayi ve ihracat politikasının, uluslararası işbirliği birliklerinin, ticaret ve sanayi odalarının, uluslararası ve ulusal yatırım fonlarının, Rusya ve Türkiye arasındaki karşılıklı ticari işbirliğinin en büyük oyuncularına uygulanmasına ilişkin devlet yetkililerine gönderilmektedir.

Anahtar konular:
– ticaret ve ekonomik ilişkilerin dinamikleri ve eğilimleri;
– her iki ülkenin uluslararası ticaretine devlet destek ve yardım önlemleri;
– yatırım projeleri, programlar, teklifler;
– ortak girişimler;
– Rus-Türk iş işbirliğinin uygulanmış projelerinin deneyimi;
– bölgelerarası programlar ve projeler;
– İki ülkenin mevzuatındaki değişiklikler;
– uluslararası endüstriyel projelerin finansmanı;
– Yüksek teknolojiler alanında işbirliği;
– Kültürel, turistik ve gençlik programlarının geliştirilmesi;
– işbirliği projeleri, sektörel konsolidasyon, ortak kalkınma önerileri;
– Yüksek ihracat potansiyeli olan yeni ürünlerin sunumu.

«Türk-Rus Işletme Dergisi» nin ilk sayısı 8 Ekim 2014'te. Başlıca konular şunlardır: Yatırımlar, Güvenlik, Enerji, İnşaat, Turizm.

İlk sayının yayınlanması, güvenlik ve savunma sanayii ISAF 2018 (11-14 Ekim 2018, İstanbul Fuar Merkezi) 22 uluslararası araç ve teknolojinin İstanbul'daki holdingine zamanlandı.

INTERNATIONAL AEROSPACE, MILITARY, NAVY AND TECHNOLOGY GUIDES IN 2018-2019

In 2018

ISSUE	RELEASE DATES	ADDITIONAL DISTRIBUTION
'RA&MG'№07 (25)	August 04th	**Gidroaviasalon 2018** (06-09.09.2018, Russia, Gelendzhik)
'RA&MG'№08 (26)	September 17th	**Africa Aerospace and Defence 2018** (19-23.09.2018, South Africa, Pretoria)
'RA&MG'№09 (27)	September 24th	**ADEX 2018** (26-29.09.2018, Azerbaijan, Baku)
'RA&MG'№10 (28)	November 05th	**Airshow China 2018** (06-11.11.2018, Zhuhai, China)
'RA&MG'№11 (29)	November 07th	**INDO DEFENCE 2018** (07-10.11.2018, Indonesia, Jakarta)
'RA&MG'№12 (30)	November 26th	**IDEAS 2018** (27-30.11.2018, Pakistan, Karachi)
'RA&MG'№13 (31)	December 01th	**EDEX 2018** (03-05.12.2018, Egypt, Cairo)

In 2019

ISSUE	RELEASE DATES	ADDITIONAL DISTRIBUTION
'RA&MG'№01 (32)	February 12th	**AERO INDIA 2019** (14-18.02.2019, India, Bangalore)
'RA&MG'№02 (33)	February 15th	**IDEX 2019 / NAVDEX 2019** (17-21.02.2019, UAE, Abu Dhabi)
'RA&MG'№03 (34)	March 24th	**LIMA 2019** (26-30.03.2019, Malaysia, Langkawi)
'RA&MG'№04 (35)	April 01th	**LAAD 2019** (02-05.04.2019, Brazil, Rio de Janeiro)
'RA&MG'№05 (36)	May 12th	**IMDEX ASIA 2019** (14-16.05.2019, Singapore)
'RA&MG'№06 (37)	May 14th	**SITDEF 2019** (16-19.05.2019, Peru, Lima)
'RA&MG'№07 (38)	June 16th	**Paris Air Show 2019 Le Bourget** (17-23.06.2019, France, Paris)
'RA&MG'№08 (39)	June 24th	**IMDS-2019** (26-30.06.2019, Russia, Saint Petersburg)
'RA&MG'№9 (40)	July 20th	**MAKS-2019** (23-28.07.2019, Russia, Moscow)
'RA&MG'№10 (41)	September 16th	**AVIATION EXPO CHINA 2019** (18-20.09.2019, China, Beijing)
'RA&MG'№11 (42)	October 01th	**INMEX SMM India 2019** (03-05.10.2019, India, Mumbai)
'RA&MG'№12 (43)	October 13th	**SEOUL ADEX 2019** (15-20.10.2019, Korea, Seoul)
'RA&MG'№13 (44)	October 28th	**BIDEC 2019** (28-30.10.2019, Bahrain, Manama)
'RA&MG'№14 (45)	November 02th	**Defense & Security 2019** (04-07.11.2019, Thailand, Bangkok)
'RA&MG'№15 (46)	November 16th	**Dubai Airshow 2019** (17-21.11.2019, UAE, Dubai)
'RA&MG'№16 (47)	December	**Gulf Defense & Aerospace 2019** (December, 2019, Kuwait, Al Kuwait)

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doc@promweekly.ru
promweekly@promweekly.ru
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MAKS 2019

«Industrial Daily МАКС-2019»

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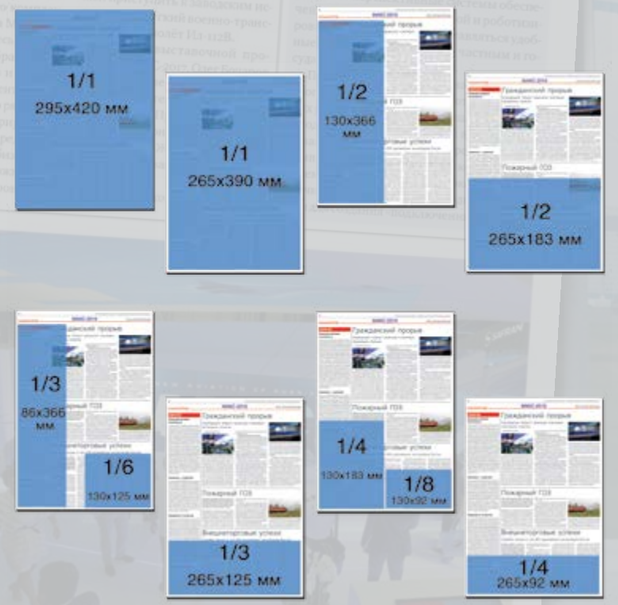

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16, Cariappa Marg, Kirby Place, Delhi Cantt., New Delhi - 110010 INDIA
Tel.: +91-11-33123000 **Fax**: +91-11-25684827
Website: www.brahmos.com **Mail**: mail@brahmos.com

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www.brahmos.com