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special focus on airshow china 2016

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Publisher
Evgeny Semenov

Editior-in-Chief
Maxim Pyadushkin

Art Director
Andrey Khorkov

Sales & Marketing Director
Oleg Abdulov

Commercial Director
Sergey Belyaev

Cover Photos
Artyom Anikeev, Fyodor Borisov, Marina Lystseva

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Tel.: +7 (495) 626 5356. E-mail: ato@ato.ru
Correspondence:
P.O. Box 127, Moscow, 119048, Russia

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From direct sales to industrial partnerships

Russia and China have decided to join efforts under two major aircraft development programs

Leonid Faerberg / Transport-Photo.com

Maxim Pyadushkin

Russia and China share a long history of aerospace cooperation. Beijing remains a major customer for Russian combat aircraft and military aviation technology. Some of them are transferable to indigenous programs. These time-honored relations are now moving from direct sales to industrial partnerships. Another milestone was passed this summer, when Moscow and Beijing provided government-level support for the joint development of a new widebody commercial aircraft and a heavy helicopter.

The relevant intergovernmental agreements were signed during Russian President Vladimir Putin's visit to Beijing in June. Although both programs are being promoted as joint efforts, they seem to differ in the way the parties are planning to contribute.

Widebody aircraft

China's COMAC and Russia's United Aircraft Corporation (UAC) launched the development of a new widebody aircraft back in 2014; the parties have now agreed that the program will be managed by a special joint venture, to be set up on a parity basis. According to UAC CEO Yury Slusar, the company, to be registered by the end of 2016, will be responsible for the aircraft development, sales, after-sales support, and also for investment and financing throughout the project. The joint venture will be registered in the Pudong district of the Shanghai free trade zone, COMAC's home region.

The assembly line for the future airliner, which is known in China as C929, will also be located in Shanghai. According to Slyusar, the location choice was caused by the necessity to place the production line closer to the potential markets which, apart from Russia and China, include Southeast Asian countries.

UAC is prepared to perform most of the design work involved in the C929 development. The company's 2015 annual report says its subsidiaries conducted technical research on various aspects of the future widebody long-range aircraft last year. This effort was financed by the Russian government, and included research on the airliner's avionics, aerodynamics, composite wing, fuselage, landing gear, and fuel system. UAC subsidiary Tupolev also studied the feasibility of applying a more electric aircraft concept on the aircraft, while Ilyushin studied the possibility of heavily upgrading its Il-96-300 jetliner.

UAC and COMAC put together engineering teams, which came up with their conceptual designs for the new aircraft family. These designs will now have to be reconciled, an UAC official explained earlier this year: "The results of this will enable us to pass the Gate 2 procedures this year." The Gate 2 milestone usually involves the approval of the preliminary design.

Earlier, UAC estimated the program cost at $13-20 billion. The future widebody aircraft is expected to make its maiden flight in 2021, with deliveries projected to begin after 2025. The airliner will carry about 280 passengers to up to 12,000 km in the baseline configuration. The other two planned versions are to accommodate 250 and 320 passengers.

The partners expect to start selecting suppliers as soon as the preliminary design has been approved. The aircraft will need a modern engine with up to 35 t thrust. According to Slyusar, requests for information had already been sent to Rolls-Royce and General Electric, the only two engine houses capable of supplying powerplants in this thrust class. A Russian engine is also a possibility, but development of the most suitable design, Aviadvigatel's PD-35, has just begun.

As for suppliers of other subsystems, a representative of Russian specialist Technodinamika told *Russia & CIS Observer* his company expected to receive a request for proposals in the second half of 2016. Technodinamika has recently been awarded a contract from the Russian Ministry of Industry and Trade for developing eight subsystems for a widebody long-range aircraft; these could be used by the Russian-Chinese program in the future. The systems are for power supply, air conditioning and pressurization, inert gas generation, fire protection, de-icing, and oxygen supply.

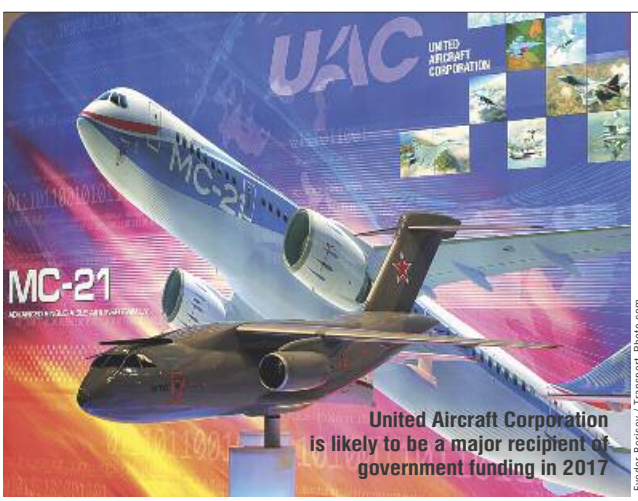
UAC could use the joint program to complement its product range. UAC still runs the assembly line for Ilyushin Il-96 widebody airliners, but production has dropped to several airframes per year under a government contract. Independent development of a new widebody is quite difficult as UAC is concentrating all its resources on the MS-21 single-aisle program. The new aircraft is expected to fly in early 2017.

Advanced Heavy Lifter

The joint program to develop a new heavy helicopter, known as Advanced Heavy Lifter (AHL), does not appear to be offering equal participation terms to Russia. Originally reported as a joint effort by China's Avicopter and Russian Helicopters, the AHL will in fact be Chinese-developed and Chinese-built. The intergovernmental agreement signed in June says the program will be fully managed by Avicopter, including the design, prototype assembly, testing, certification, series production, and marketing.

Russian Helicopters will be contracted to develop certain systems. Representatives of the Russian manufacturer explained to *Russia & CIS Observer* that the company's contribution will be subsequently defined by a general contract and a development subcontract. Russian Helicopters is understood to have hoped to develop the AHL's main gear, tail rotor, and anti-icing system. The intergovernmental agreement does not specify the development schedule, but Russian Helicopters says it expects the new helicopter to be certified by 2025.

The AHL development effort was officially launched in May 2015, with a framework agreement signed between Russian Helicopters and Aviation Industry Corporation of China (AVIC, Avicopter's parent company). The rotorcraft is expected to have a take-off weight of 38 tons, and to be able to carry 10 tons of cargo internally or 15 tons on an external sling. In the fall of 2015, Avicopter reported that the AHL would have a ceiling of 5,700 meters, a range of 630 km, and a maximum speed of 300 km/h.



United Aircraft Corporation is likely to be a major recipient of government funding in 2017

Fyodor Borisov / Transport-Photo.com

Russian government to support aerospace manufacturers

The Russian government plans to allocate 16.5 billion rubles ($262 million at the current exchange rate) for supporting the country's commercial aerospace industry in 2017. According to the draft document specifying next year's federal budget, the country's largest fixed-wing aircraft manufacturer, United Aircraft Corporation (UAC), will likely receive a major part of the planned funding.

Up to 9.6 billion rubles will be allocated for the program to resume production of the 64-seat Ilyushin Il-114 regional turboprop. UAC is planning to transfer Il-114 assembly from Tashkent, Uzbekistan to its facility in Russia's Ulyanovsk. Another 5.3 billion is reserved for upgrading the Ilyushin Il-96 widebody jetliner. The program is facing a lack of commercial orders, but the manufacturer expects specialized versions for government customers to help build its portfolio.

Another project eligible for state support involves production of Czech Let L-410 19-seat turboprops at Ural Works of Civil Aviation (UWCA, part of Rostec Corporation) in Yekaterinburg. Up to 700 million rubles will be allocated for the effort to localize L-410 production under a franchising contract with Aircraft Industries, which itself is owned by Russia's Ural Mining and Metallurgical Company.

The government's aid to the sector in the form of 899.2 million rubles' worth of guarantees for bond-secured loans will be extended to UAC for the new Aviadvigatel PD-14 14-ton turbofan engine, which has been selected to power Irkut's MC-21 narrow-body aircraft. The powerplant is currently being flight-tested on an Il-76LL testbed. Deliveries of PD-14-powered MC-21s are expected to begin in 2019.

The aforementioned sums will be allocated in 2017-2019.

New level of cooperation

Leonid Faerberg / Transport-Photo.com

China is an established customer for Russian military aerospace products; recently, the two countries have also been developing successful cooperation on a number of commercial aircraft programs. Yuri Slyusar, president of the United Aircraft Corporation (UAC), told *Russia & CIS Observer* about the joint projects presented at Arishow China 2016.

– Mr Slyusar, how comfortable does UAC feel on the Chinese market?

— This year we witnessed the signing of an intergovernmental agreement on the joint development of the new widebody long-range aircraft, and the founding documents were finalized for a joint venture to be registered in Shanghai shortly. These were important milestones demonstrating both parties' commitment to long-term cooperation for the benefit of the project. We are also working on military programs and on a number of other commercial and specialized aviation projects, so more news are to come. These developments indicate that the level of cooperation between the two countries is growing, and that Russia is increasingly focusing on the Chinese market and on the Asia-Pacific region in general.

– Could you expand on UAC's civilian programs?

— This year has seen several developments related to our civilian products, including the rolling-out of the first Irkut MC-21 flying prototype, the decision to resume Ilyushin Il-114 production, and the presentation of the first Taganrog-assembled Beriev Be-200ChS amphibious aircraft. The general trend, therefore, is towards boosting the civilian component of our overall output.

UAC plans to diversify the structure of deliveries and considerably increase the share of revenues coming from civilian sales. Our aim is to bring this share up to 40% or more in the future. Our Sukhoi Superjet 100 (SSJ100) aircraft have been performing well with Mexican carrier Interjet, which currently operates 20 of the type. Irish regional airline CityJet has started operating the type on its European flights, including in the interest of major EU carriers. At a recent conference of the European Regions Airline Association in Madrid, CityJet praised the airliner for its high reliability and good performance. Our program to develop the MC-21 airliner is edging towards the first flight. The portfolio for the type is mainly represented by Russian customers, but we also have orders from foreign companies.

– Could you provide more details on UAC's third project, the one to design a widebody airliner?

– This is indeed our third global project; we are implementing it in partnership with COMAC. This way we hope to offer an internationally competitive solution in the most popular civilian airliner segments.

We believe this cooperation to be very important: in order to be successful on the highly competitive market, we are joining intellectual and technological resources with our partner. We will rely on our countries and the primary markets for the aircraft. Both partners have complementing unique competencies to offer, allowing us to share the risks and, not less importantly, the financial costs involved.

We are currently in talks over the distribution of development and production workloads, and certain agreements have already been reached: in particular, Russia could manufacture the wing and empennage with the use of an advanced composite infusion technology, whereas our Chinese colleagues could be responsible for the fuselage and for final assembly.

– What about the future airliner's characteristics?

– It is too early to discuss any precise performance specifications, size, and weight; what is already known at this stage is that the baseline version will seat 280 passengers, and will have a range of around 12,000 km. We are planning to design a family of three airliners; apart from the baseline, there will be an aircraft seating fewer passengers and a stretched version. Deliveries are expected to begin beyond 2025; this will help us ensure the necessary level of competitiveness. The COMAC stand here at Airshow China 2016 features a model of the future airliner.

This interview is prepared by Maxim Pyadushkin

In quest for efficiency

Russia's Sukhoi Superjet 100 is looking for better sales and new markets

Maxim Pyadushkin

The Sukhoi Superjet 100 (SSJ 100) regional jet remains Russia's major commercial aviation program, but low sales are prompting the project partners Sukhoi and Finmeccanica to revise their participation and the current marketing approaches. They are also planning to break into new foreign markets, including China.

At the end of September, the Russian authorities gave a final formal approval to Sukhoi's plan to consolidate 100% of SSJ 100 manufacturer Sukhoi Civil Aircraft Company (SCAC). The country's antitrust body cleared Sukhoi to purchase 25%+1 voting shares in SCAC, noting that the deal would not affect market competition.

The blocking stake was previously held by Finmeccanica (and before that, to Alenia Aeronautica), a strategic partner, which had invested $183 million in the SSJ 100 program back in 2009.

Finmeccanica is also likely to minimize its stake in SuperJet International (SJI), another joint venture with Sukhoi. The Venice-based company provides SSJ 100 maintenance services and personnel training, as well as customizing and delivering aircraft to foreign customers. The Russian media also reported that Finmeccanica could cut its interest in the joint venture from the current 51% to 10%.

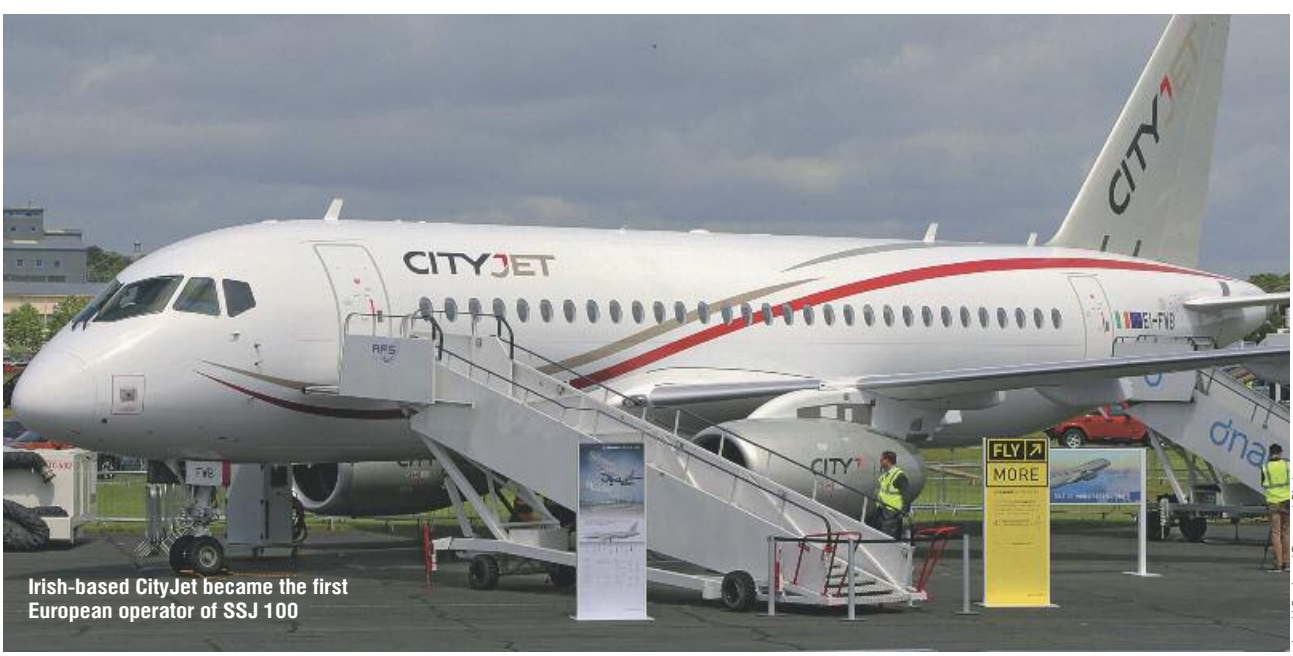
Sukhoi's parent company United Aircraft Corporation (UAC) and SCAC similarly declined to comment, saying the details would be released at a later date. An industry source told *Russia & CIS Observer* that the SCAC consolidation process might be completed before year-end.

Talks to change the format of Finmeccanica's participation in SSJ 100 have been on for about two years now. Finmeccanica is not satisfied with the program's efficiency. SCAC rolled out 35 airframes in 2014, the all-time record since production launch, but output volumes dropped to 17 in 2015, mainly due to a decline in demand from Russian airlines.

In the fall of 2014, the Russian government decided to support SCAC by injecting 36 billion rubles (around $880 million at the time) into its share capital. The additional shares were purchased by Sukhoi, which brought its stake in the company up to 94.47% and left Finmeccanica with just 5.53%. The partners agreed that, despite the share dilution, the Italian company would retain a blocking stake in SCAC until 2017, and then invest at least $390 million to regain its share.

However, Finmeccanica itself is undergoing a restructuring process, in the course of which the group will have its name changed to Leonardo and shed a number of loss-making projects; the SSJ 100 is understood to be one of them.

Despite these complications, the Russian program had made serious progress in 2016 with the first delivery to a European customer. Irish-based



Irish-based CityJet became the first European operator of SSJ 100

Leonid Faerberg / Transport-Photo.com

STATE-OF-THE-ART TECHNOLOGIES /
QUALITY/ RELIABILITY

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CityJet received two aircraft earlier this year, with 13 more on order. The third aircraft is to be delivered in October, with delivery rates projected to speed up over time to one airframe per two months.

CityJet used its SSJ 100s for charter flights and wet-lease operations this summer. The airline also wants to operate the Russian aircraft on its scheduled services from London City as soon as the aircraft is certified for steep approach landings. According to SCAC, certification will require the addition of winglets and certain adjustments to the flight control system. The modified version is to enter production after 2018.

Another new important customer for SCAC, the Royal Thai Air Force, took delivery of two extended-range SSJ 100LRs in VIP-configuration this July. The aircraft will be operated in the interests of the country's leadership, senior officials, and military high command. Their cabin interiors feature three areas: a four-passenger VIP zone, a six-passenger business class, and a standard area seating up to 50 passengers. Both airliners come with multimedia and assorted telecommunications systems, including IFE, which is a first for the SSJ 100.

SSJ 100 VIP configuration is used to carry Russia's high-ranking government officials

Alexander Mishin / Transport-Photo.com

SCAC plans to boost Asian sales, and is particularly eyeing China, which is the region's largest market. The Russian manufacturer announced in July that it was planning to open its first overseas client liaison office in Beijing by the end of the year. The office will report directly to the SCAC Moscow headquarters.

Lee Li, head of the Beijing office, told *Russia & CIS Observer* the Chinese operation will involve SSJ 100 marketing, certification to the Chinese aviation standards, and maintenance, as well as arranging financial support for aircraft deliveries and participation in industrial cooperation projects. Lee identified both Chinese carriers and lessors as potential customers.

SCAC considers China to be a highly promising and consistently growing commercial aviation market. The company estimates local demand for regional aircraft at between 1,000 and 1,300 units for the next several decades. Lee says the Russian airliner could get at least 10% of that market: "It is a long-term strategy for the company involving a lot of work, human resources, investment, and efforts, and it will take time, but we have a very big commitment for this." According to the head of the Beijing office, there are plans to validate the EASA certificates for both the aircraft and its powerplant locally. "We have already launched this work," Lee said.

According to sources in Russia's United Engine Corporation (UEC), PowerJet, a joint venture between UEC subsidiary NPO Saturn and French powerplant specialist Safran Aircraft Engines, has put together a dedicated team that will take part in the Chinese certification of the SSJ 100's SaM146 engine.

The Beijing office's announcement follows SCAC's earlier effort to promote the airliner on the Chinese market. In May 2015, its parent company UAC signed a framework agreement with the Russia-China Investment Fund, the Administrative Committee of Xixian Fendong New Town of Shaanxi Province, and Chinese lessor New Century International Leasing to set up a joint venture that would lease Superjets to operators in China and elsewhere across Southeast Asia. The new entity was expected to purchase up to 100 SSJ 100s within a period of three years, with deliveries to China expected to begin in 2016.

In China, the SSJ 100 will be pitted against both Western rivals and the locally designed Comac ARJ21 passenger jet, which commenced revenue operations in June this year.

Along with the export opportunities, SCAC is looking for more domestic clients. The Russian airframer plans to have built 27 aircraft this year. According to the Russian Minister of Industry and Trade Denis Manturov, SSJ100 production rates are expected to reach 34 airframes in 2017 and 40 in 2018.

The Russian government effectively re-launched the SSJ100 leasing system for Russian operators last year by recapitalizing GTLK State Transport Leasing Company with 30 billion rubles, which will enable the lessor to purchase 32 airframes and lease them to domestic regional carriers.

GTLK has managed to find new operators for already-assembled jets, including Siberia-based IrAero, which opted for four aircraft and has plans to add four more of the type. One of the existing domestic operators, Yakutia, has refinanced its SSJ 100 deal with GTLK and is looking to expand its Superjet fleet.

SCAC also expects another major order from Aeroflot, the Russian flag carrier and the local launch customer for the type. The airline has just taken delivery of the final airframes under the initial contract for 30, and is now in talks with the manufacturer to firm up its option for 20 more.

Another important new customer for the program was Russia's governmental air squadron Rossiya. This company that provides the transportation of the head of the state and other country's high-ranking officials, started the operations of a pair of SSJ 100s this summer.

Russian-assembled Il-114 to fly in 2019


Il-114 may become the first turboprop aircraft in UAC product range

Fyodor Borisov / Transport-Photo.com

Russia's United Aircraft Corporation (UAC) is expanding its commercial product range by way of resuming production of the Ilyushin Il-114, a Soviet-designed passenger turboprop model. The first flight of the Russian-assembled Il-114 is scheduled for 2019; deliveries are expected to start in 2021. Prior to 2012 the aircraft was manufactured at the Chkalov TAPO facility in Tashkent, Uzbekistan.

"The first flight of the renovated Il-114 is scheduled for 2018," Ilyushin CEO Sergey Velmozhkin commented for TASS news agency in October. "We hope to be able to use the existing inventory of the Tashkent factory. A fully Russian-made aircraft is to fly in 2019."

According to Velmozhkin, the Ilyushin Design Bureau has already started accumulating design documentation and readying the terms of reference for the modernization project. The all-new Ilyushin-114 will have to undergo additional certification. "We will make the first commercial delivery in 2021," Velmozhkin says, adding that the aircraft will also be offered in medevac, patrol, and anti-submarine warfare versions.

Production will be arranged at the Sokol aviaton plant in Nizhny Novgorod. UAC CEO Yuri Slyusar explained earlier this year the remaining Il-114 fuselages stored at TAPO had been inspected, and that talks were on over the possibility to use them: "This could speed up the aircraft's first flight."

Sokol will be able to build 12 aircraft per year. UAC puts the estimated program cost at 55 billion rubles (about $820 million). The Il-114, a 64-seat turboprop with a maximum range of 1,500 km, first flew in 1990 and was certified in Russia in 1997. Before going bankrupt in 2012, TAPO assembled 17 of the type. Two Il-114s, powered by 2,500 hp Klimov TV7-117S engines, were operated by Russian regional airline Vyborg in 2002-2010.

Ukrainian manufacturer looking for new partners

Deteriorating relations between Kyiv and Moscow are robbing Antonov of access to the Russian market.

Valentin Makov

The soured relations between Kyiv and Moscow over annexed Crimea and the conflict in the east of Ukraine are affecting bilateral aerospace cooperation. Ukrainian airframer Antonov has lost access to the Russian market, and is now seeking new partners and suppliers for its programs.

China was considered as one of the major options. In August this year, Antonov managed to secure a Chinese investor for reviving production of the An-225 Mriya, the world's heaviest transport aircraft. The Ukrainian manufacturer signed a cooperation agreement with Aerospace Industry Corporation of China (AICC). The initial phase of cooperation calls for completing the second An-225 airframe, which is currently stored at about 70% completion at Antonov's production site. The aircraft is then to be handed over to the Chinese corporation. Subsequently, the partners are planning to organize An-225 production in China. Rather than selling its intellectual rights to the aircraft, Antonov intends to launch fully licensed series production jointly with the Chinese partner.

The first and only example of the six-engined An-225 was built in the mid-1980s as the transport for the Soviet Buran space shuttle and for components of the associated Energia launch vehicle. After the space project fell through, the aircraft was repurposed for transporting outsize and heavy commercial freights. The Mriya is currently operated by the OEM's subsidiary carrier Antonov Airlines, whose fleet also includes seven An-124-100 Ruslan super-heavy freighters.

Antonov is working to minimize its reliance on Russian parts suppliers for both the An-225 and the An-124. The company first announced plans to westernize the two types in late 2015. The first step in this process will involve finding news suppliers for the tires, brakes, and avionics.

New An-124 tires, developed by Dunlop Aircraft Tyres, were trialed at Antonov's testing facility in October. The tests involved an An-124-100M-150 with take-off weights of 340 t, 360 t, and 402 t, and with different CG positions. The take-offs and landings were performed within the limits of expected operational conditions.

Leonid Faerberg / Transport-Photo.com

The assembly of Antonov An-225 freighters may be restored in China

"Our cooperation on the Ruslan's new tires started successfully, as confirmed by the testing results," Antonov President Oleksandr Kotsiuba remarked, adding that the Dunlop product's advantages include an EASA authorization and competitive prices. The new equipment is to be installed on the first An-124 in the course of a heavy maintenance check.

The Ukrainian company has prior positive experience working with Dunlop, whose tires are used on its An-148 and An-158 regional jets. The freezing of cooperation with Russia has critically affected Antonov's production schedule for these two types as well: not a single delivery is planned for 2016. "The two aircraft built in 2015, one An-148 and one An-158, were the last ones to leave the company's assembly facilities," Andriy Khaustov, deputy director of the Antonov advanced development division, said earlier this year in an interview to Ukrainian radio station Vesti. "Several airplanes are still not completed. For the time being, we need to find alternatives to all the Russian components." This also includes avionics, which will most likely be substituted with products by Canadian manufacturer Esterline.

Antonov hopes it will still be able to launch commercial production of its An-148 and An-158 passenger jets in 2017. The manufacturer's ambitions are to commercialize the new An-178 light transport aircraft in 2017, as well as finalizing, by year-end, the first An-132D turboprop (D stands for demonstration aircraft), which was exclusively designed for Saudi Arabia. The company stresses that this aircraft will not contain any Russian-supplied components.

Titanium success

Russian titanium producer VSMPO-AVISMA working to increase share of value-added products

Maria Ivanova

Russia's VSMPO-AVISMA Corporation, the world's largest titanium producer, is successfully increasing the share of machining in its output both within its own projects and jointly with partners. The company's close ties with the international aerospace industry allow it to plan further production growth.

VSMPO-AVISMA and Alcoa Samara, the Russian subsidiary of US manufacturer Alcoa, opened a joint venture in early September. Located in Samara, AlTi Forge will produce large titanium and aluminum forgings to be used in subsequent manufacture of aircraft landing gear beams and wing pylons.

The Russian titanium company sees its strategic goal in increasing the share of value-added processing in overall production volumes. The company's machining shop increased the output of die-forgings by more than 50% in 2015; in five years from now, 40% of all VSMPO-AVISMA produce is expected to come in the form of die-forgings.

By investing in its production capacity and increasing the share of value-added products VSMPO-AVISMA managed to demonstrate solid financial results in Q1 2016; this positive trend is expected to continue. The company's sales structure changed this year, with less products sold on the Russian market and a greater share of export deliveries. The latter has fully compensated the losses incurred on the domestic market thanks to the weak ruble. VSMPO-AVISMA expects to keep this year's output of titanium products at the 2015 level of 28,000 to 29,000 t. By 2020, the corporation plans to bring annual titanium production up to 40,000 tons.

One of the company's largest and most significant investment projects is to set up a die-forging machining facility for Titanium Valley, a special economic zone in Russia's Sverdlovsk Region. The project was launched in 2014; VSMPO-AVISMA is currently the most active of Titanium Valley's 11 residents.

The Titanium Valley facility, known as VSMPO-New Technologies, will be responsible for initial and final machining of die-forgings for new aircraft types. The production building has already been erected; the company invested over 1.6 billion rubles ($25.4 million at the current exchange rate) in its construction. The facility is expected to be launched in 2018 with around 100 highly qualified engineering personnel.

VSMPO-AVISMA plans to bring annual titanium production to 40,000 tons by 2020

VSMPO-AVISMA is closely involved with the global aerospace industry, acting as the main strategic supplier of titanium products for a multitude of manufacturers. In 2015, about 60% of all its titanium produce was exported. Of the total amount of exported products, 46% went to the US, 41% to Europe, 7% to countries in North and South Americas, and 5% to the Middle East and Southeast Asia, including Israel, China, India, Japan, South Korea, Singapore, and Taiwan.

The Russian company is a long-standing partner of the Chinese aerospace industry. Since 2004, it has been supplying China Aviation Supplies Imp. & Exp. Corporation (CASC) with titanium billets used in the manufacture of die-forgings for Airbus programs. The company's cooperation with AVIC International Holding Corporation, one of China's largest aerospace manufacturers, spans over 10 years.

VSMPO-AVISMA acts as a supplier for China's flagship commercial aviation program of the C919 medium-haul jetliner. Under the agreement with the aircraft designer, Commercial Aircraft Corporation of China (COMAC), VSMPO-AVISMA will be supplying 12 different die-forging types through to 2021. The company is already tooling up for the task. Certification of the Chinese die-forgings is expected to be completed in 2017. The company will supply China with more than 20 different die-forging types to be used in the manufacture of aircraft wings, empennage, and pylons.

Guided weapons against aerial and naval targets

Russia's Tactical Missiles Corporation is prepared to offer China new missiles

Alexey Sinisky

China remains an important foreign customer for Russia's Tactical Missiles Corporation (TMC). The Russian missile manufacturer is showcasing some of its latest developments at Airshow China 2016.

Air-launched weapons

TMC works actively to develop new types of air-delivered precision weapons. Over the past few years the Russian manufacturer has renewed its entire range of air-to-air and air-to-surface missile types.

The new short-range (RVV-MD), medium-range (RVV-SD), and long-range (RVV-BD) air-to-air missiles, developed by TMC's subsidiary — Vympel design bureau, feature new, more sensitive and ECM-resistant guidance systems. The new dual-band infrared seeker with a multicell sensor and digital signal processing capability gives the RVV-MD two times longer lock-on distance compared to the R-73E missile, and 1.3 times wider the target designation angles.

The RVV-SD, for its part, has improved aerodynamics; its active radar seeker features a more powerful transmitter and a more sensitive receiver. The missile's software has been completely overhauled, increasing its range by 35% compared to the RVV-AE missile and giving it the ability to engage targets maneuvering at up to +12g. The RVV-BD missile uses an advanced digital active radar seeker, a high-precision inertial navigation system, and a new engine fuel type. These innovations combine to double the missile's maximum range as compared to the predecessor.

The effectiveness of guided bombs in modern warfare has been proven by the results of Russian troops' operations against terrorist groups in Syria

TMC's air-to-surface products include the newest Kh-31PD (TMC's own development) and Kh-58UShKE (developed by Raduga Design Bureau) anti-radiation missiles fitted with broadband seekers. These missiles can successfully engage any existing and future target types. The Kh-31PD's range of up to 180-250 km makes it ideal for stand-off delivery.

The Russian manufacturer also offers the Kh-38ME modular air-to-surface missile, which may be fitted with combined guidance systems comprising an inertial navigation system and a variety of terminal guidance options: laser (the Kh-38MLE), heat-imaging (the Kh-38MTE), or active radar seeking (the Kh-38MAE). Satellite-based navigation is also possible, as is the use of cluster-type multiple warheads (in the Kh-38MKE version).

Another TMC subsidiary, Region Scientific and Production Enterprise, has developed new guided bombs, which follow a gliding trajectory with optimal

New RVV-MD, RVV-SD and RVV-BD air-to-air missiles

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approach angles. The KAB-500S-E bomb is fitted with a satellite guidance system and a HE warhead; the KAB-250LG-E has gyrostabilized laser guidance and a HE fragmentation warhead.

The effectiveness of guided bombs in modern military operations has been proven by the results of Russian troops' operations against terrorist groups in Syria.

Naval weaponry

Naval weapon systems occupy a special niche in the TMC product range. At the core of the company's ship-based and mobile coastal missile systems is the 3M-55E Yakhont supersonic cruise missile. The Bastion anti-ship coastal missile system has a range of 600 km, and can engage naval ships of any class at up to 300 km away under enemy fire and in ECM environments.

The Bal-E coastal missile system is intended against sea-surface warships and sea transports displacing up to 5,000 t. The Bal-E can engage up to 32 targets simultaneously with Kh-35E anti-ship missiles (the naval version of the missile is known as the 3M-24E). The Kh-35E is currently being replaced with the new-generation Kh-35UE version, also developed by TMC. The new missile features an inertial/satellite guidance system and an active/passive seeker, allowing for higher precision and better ECM resistance. The Kh-35UE's software provides flexible, efficient guidance and attack capability. The missile considerably increases the combat potential of the Bal-E system and the Uran-E ship-based missile system. The Kh-35UE's performance is on a par with that of Western equivalents such as the Harpoon and Exocet, and even surpasses them with regard to a number


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Bal-E coastal missile system with Kh-35UE missile system

of parameters. The Bal-E and Bastion systems complement each other to ensure effective coastal defenses.

The corporation's range of naval weaponry products is not confined to anti-ship missiles. The TMC subsidiary Gidropribor develops and manufactures torpedoes, anti-torpedoes, naval mines, mine countermeasures, acoustic countermeasures, and also underwater surveillance and protection systems. Gidropribor's Mayak-2014B sonar is intended for protecting harbor areas against the intrusion of small-sized underwater targets. The system detects targets at up to 800 m away, classifies and tracks them automatically with the help of sonobuoys, positioned at depths of between 2 and 60 m, whose angle of coverage is between 900 and 3600.

Region Enterprise has developed the compact, ship-based Paket-E/NK close-in anti-submarine torpedo system, complete with an anti-torpedo. This all-weather system can provide close-in attack against enemy's submarines and destroy torpedoes targeting the ship. Another product by Region is the Shkval-E high-speed supercavitating anti-ship underwater missile capable of traveling at up to 100 m/sec. The missile is currently undergoing modernization.

The TMC's research, development, and production potential enables the company to offer a variety of advanced guided munition types both to the Russian Armed Forces and to foreign customers.

Innovative electronic technologies from Russia

Radio-Electronic Technologies Concern (abbreviated to KRET in Russian), one of Russia's premier vertically integrated defense holding companies, is showcasing at Airshow China 2016 over 40 military and civilian products based on breakthrough innovative technologies.

The company stand features an advanced helicopter avionics demonstrator emulating real-life operation of a new flight and navigation system. The system presents the crew with information via electronic displays, and also supports radio communications with other aircraft and air traffic control centers in keeping with the modern requirements. Visitors can also familiarize themselves with a demonstrator of an in-built export version of the President-S airborne defense system, one of the most efficient electronic warfare solutions designed for the personal protection of all types of aircraft.

Advanced helicopter avionics demonstrator designed by KRET

KRET

KRET is also demonstrating export versions of the Sukhoi Su-35 fighter's avionics. These new generation radio-electronic solutions are based on an information management system designed to help the pilot control onboard equipment; they include the RSUO weapon management system, the MZBN compact protected airborne recorder, a family of small-sized X- and Ka-band airborne radars, and an integrated IBKO-152 system.

KRET also boasts significant technological advances in other areas. "We have developed and implemented a number of promising projects," says CEO Nikolai Kolesov. "These include mass production of strap-down inertial navigation systems for a variety of aircraft types. The system enables continuous autonomous precision positioning for more accurate navigation and weapons delivery".

KRET is a dynamic business supplying to more than 20 countries worldwide. It ranked 48th in Defense News' 2015 survey of the top 100 global defense companies, ascending from the 52nd position the year before.

KRET will be granted the approval shortly to work directly with foreign defense customers. "After-sales support for our previously delivered military products is a priority for us; this includes repairs and modernization of avionics, friend-or-foe identification, and electronic warfare systems," Kolesov says.

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Russian military to get improved Mi-28NM helicopter

The improved Mi-28NM takes off at the Russian Helicopters' test range near Moscow

Alexander Mishin / Transport-Photo.com

Maxim Pyadushkin

The Russian Aerospace Forces expect to shortly get an improved version of the service's main attack helicopter, the Mil Mi-28N Night Hunter. The first modernized prototype, dubbed Mi-28NM, performed a horizontal flight at the Russian Helicopters test facility outside Moscow in October. The manufacturer reported at the time that hovering tests had begun in early September.

This is the first effort to modernize the rotorcraft, which joined service with the Russian Air Force in 2008. "The upgraded Mi-28N is a highly effective attack helicopter capable of a broad range of tasks, from aerial reconnaissance and target designation to engaging different types of ground and aerial targets," says Russian Helicopters CEO Alexander Mikheev. "Its main advantages include agility, round-the-clock operation, and increased firepower."

The Mi-28NM carries advanced mast-mounted all-around-looking radar with enhanced precision strike capability, including with the use of guided missiles, which significantly reduces times spent in potentially dangerous situations. This improvement allowed the manufacturer to do without the baseline's nose-mounted missile guidance radar. The new radar is manufactured at Ryazan State Instrument-making Enterprise, whose CEO Pavel Budagov was cited by Russian media earlier this year as saying the device would be able to track four targets simultaneously, against the current Mi-28N radar's two.

The helicopter will get a new flight control system and new cockpit equipment. While the original model had no flight controls in the forward gunner's cockpit, the new version can be piloted from both either workstations. Dual flight controls were first implemented in the Mi-28UB combat trainer version in 2013.

Other cockpit improvements include a new armament and navigation system and head-up displays. The avionics suite allows the crew to search, detect, and identify ground and aerial targets, establish their coordinates, and provide target designation for ground and airborne command centers. The cockpit upgrades provide the crew with "more information about the environment and all the helicopter systems in a more accessible format, which will increase the crew's situational awareness, facilitate interaction, and increase decision-making speeds in complex combat situations," says Russian Helicopters.

According to the manufacturer, the Mi-28NM has new composite main rotor blades, which maintain structural integrity if hit by 20-30 mm projectiles. The manufacturing facility, Rostvertol, said in its annual report for 2015 that the new blades also increase the helicopter's cruise speed by 13%, and its maximum speed by 10%. The baseline version has a maximum speed of 340 km/h.

The upgraded rotorcraft has a visibly new movable 30-mm gun mount. The manufacturer says the Mi-28NM can also be armed with guided and unguided missiles and bombs.

The new helicopter is less visible to ground-based air defenses. Its fuel system design now precludes the possibility of a fuel tank explosion or fire.

Although the Russian military placed no orders for the improved helicopter so far, they expect to receive it very soon. The commander of the Russian Aerospace Forces Viktor Bondarev said earlier this summer that Mi-28NM can be taken into service as soon as in 2018.

The deliveries of the baseline model started in 2009 after the military selected this type as a replacement of the ageing fleet of Mi-24s. Mi-28N has a maximum take-off weight of 12 ton, a cruise speed of 270 km/h and a range of 450 km. It has all weather day-and-night operational capabilities and can carry 1,605 kg tons of weapon load. This helicopter in Mi-28NE export modification has been ordered by Iraq and Algeria.

Turbulent times for Russian air transport

Fyodor Borisov

Stagnation of Russian air transport last year has turned into a crisis in 2016, as the industry continues to suffer virtually no growth in all areas. The slump in air transport, caused primarily by shrinking passenger numbers on international routes, has been exacerbated by a sharp domestic slowdown in the summer of this year, with clear indications that the internal air transport market is about to reach its growth limits.

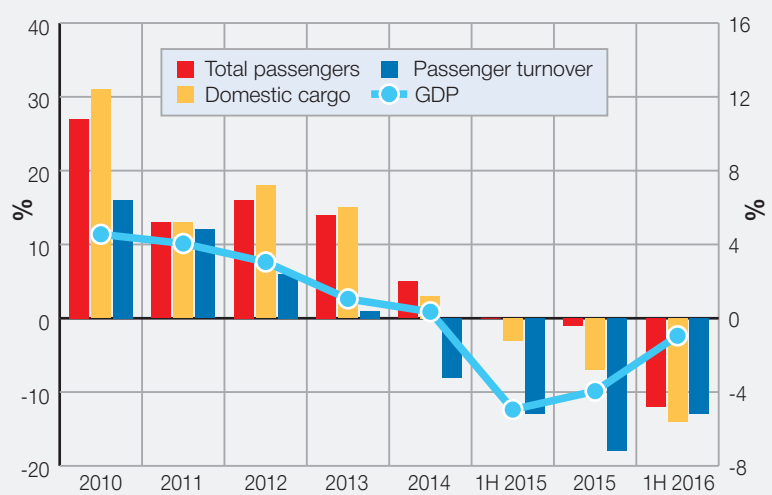
Prior to 2014, the Russian air transport market benefited from the following positive factors:

- a growing GDP, which reflected the general state of the country's economy and business activity;
- increases in real incomes, which drove demand for tourism and ad-hoc air travel;
- the high exchange rate of the ruble, which enhanced demand for international air travel;
- passengers switching from rail to air, partially stimulated by the lifting of state control over passenger rail ticket prices; and
- government subsidies for regional air transport services.

By 2016, four of these five factors had either exhausted their stimulating potential or developed into negative trends. The GDP growth has been slowing since 2015, matched by a decline in business activity. The latter process is particularly noticeable in international economic relations which, apart from macroeconomics, have been seriously affected by adverse political factors.

With the GDP slowdown resulting in lower real incomes and curtailed spending power, the falling ruble exchange rate has further increased the cost of vacationing abroad by as much as 100%. These factors combined to dramatically drive down the number of international air passengers.

RUSSIA'S AIR TRANSPORT STATISTICS 2010 – 1H 2016



Source: Russia's Higher School of Economics

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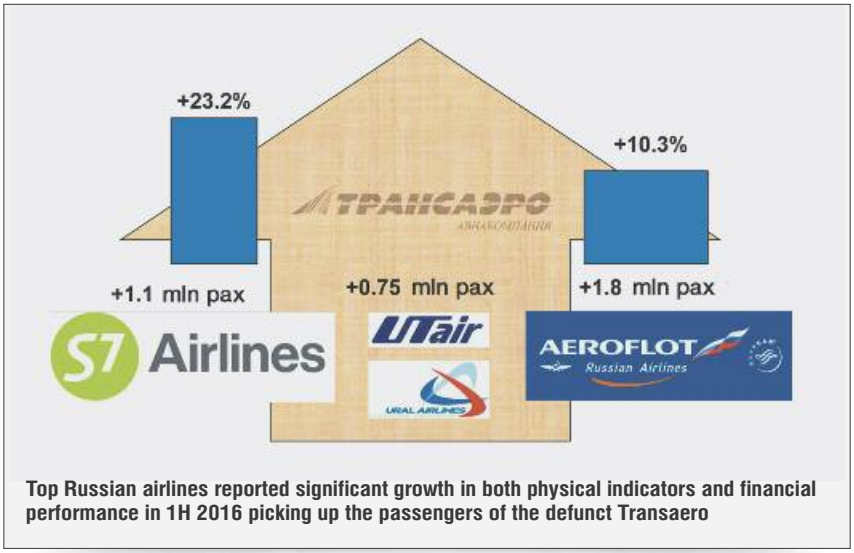


Top Russian airlines reported significant growth in both physical indicators and financial performance in 1H 2016 picking up the passengers of the defunct Transaero

At the same time, the falling ruble proved detrimental to those air carriers whose primary costs are denominated in foreign currencies. This prompted airlines to raise fares, which only exacerbated the already dire demand.

Prior to the first quarter of 2016, continued growth in domestic passenger numbers had played a somewhat stabilising role. But the low-yield domestic routes were merely helping the sector maintain its physical indicators, even though its financial performance was sliding downhill (the sector's combined losses on domestic routes amounted to 44 billion rubles in 2015, or US$699.5 million at the current exchange rate, against 35 billion in 2014).

In spring of this year, analysts first noted that air passengers were starting to migrate back to rail travel, primarily due to the rising cost of airfares on domestic routes. This development is markedly unusual in that, anywhere else in the world, passenger numbers have been growing faster for air than rail, even during recessions.

These negative factors have been further exacerbated by a number of political developments, which resulted in bans on passenger operations to Turkey, Egypt, and Ukraine.

The only growth factor currently left to the sector are regional subsidies to air carriers, but even these have been shrinking due to budget constraints. In 2012, such subsidies were viewed as a way to develop regional air transport infrastructure. Now they are considered to be regional carriers' only means of survival.

The crisis has not been affecting all Russian air carriers in the same way. A number of airlines have been reporting significant growth in both physical indicators and financial performance. According to Russia's Transport Clearing House, Aeroflot Group carried 1.8 million more passengers year-over-

Top 20 Russian airlines (international and domestic flights), January-August 2016

Ranking	Airline	Passengers carried, thous.		Passenger kilometers, mln	
		Jan-Aug 2016	Change to Jan-Aug 2015, %	Jan-Aug 2016	Change to Jan-Aug 2015, %
1	Aeroflot	19,033	+10.2	54,350.4	+10.6
2	S7 Airlines	6,500	+19.2	12,378.7	+18.1
3	Rossiya	5,126	+50.2	11,202.4	+76.8
4	UTAir	4,315	+13.7	7,110.3	+1.2
5	Ural Airlines	4,271	+16.5	10,110,8	+14.7
6	Pobeda	2,882	+58.2	4,503.9	+60.4
7	Globus	2,327	+43.1	5,767.0	+43.3
8	AZUR Air	1,457	-6.5	7,382.7	+35.3
9	VIM-AVIA	1,396	+25.6	3,204.2	+51.0
10	Nord Wind	1,130	-41.4	3,861.8	-33.5
11	Yamal	1,015	-2.4	2,032.9	-8.2
12	Aurora	916	+20.2	1,492.0	+16.3
13	NordStar	884	+16.2	1,910,6	+5.4
14	Red Wings	668	-5.4	1,218.7	+6.2
15	Nordavia	624	+26.1	929.2	137.1
16	Ikar	620	-17.5	3,173.2	-4.3
17	Royal Flight	611	+1.9	2,623.2	+37.7
18	Orenair*	491	-75.2	1,494.3	-65.9
19	Yakutia	442	+1.5	1,185.5	+8.1
20	RusLine	393	+1.6	391.9	+11.1
	Top 20 airlines, total	**55,101**	**+9.0**	**136,323.7**	**+12.0**
	Russian commercial aviation, total	**58,473**	**-8.6**	**141,161.9**	**-10.8**
	Top 20 airlines,%	**94**		**97**	

*Note: *- merged with Rossiya since May 2016*

Source: Russia's Federal Air Transport Agency

year in the first six months of 2016 (up 10.3%), generating 2.5 billion rubles in profit; the figures for S7 Group were 1.1 million more passengers (up 23.2%) and 1 billion rubles. Of the 30 largest Russian carriers, about 50% saw an increase in passenger numbers.

Under the circumstances, these growth figures may appear extraordinary, but are misleading in that they were greatly contributed to by the collapse of Transaero Airlines, the country's second largest carrier, whose passengers then switched to the largest and most active of the remaining market players. This factor is expected to stop playing a role as the crisis continues. To be able to predict the direction in which the market is going requires an assessment of the current competitive environment. At present, Aeroflot Group appears to be the single largest market player. The group controlled 19% of the Russian market in 2006; its share exceeded 50% this past winter, and continues to grow. This is due exclusively to Aeroflot Group's dominant position, as the top player has enough resources to throttle any of its rivals.

Although the Russian government has pledged its commitment to safeguarding market competition, delivering on this promise in the current situation requires active and rather hard measures, each of which would come with significant risks and limitations. Apart from directly regulating the activity of Aeroflot Group, the government may consider a number of other measures to support competition in the sector. It could designate carriers on international routes; improve the existing lease mechanisms (including the introduction of wet-lease schemes); permit airlines to deploy shorter routes if cleared by ATC; force airports to charge airlines lower handling fees; and increase the efficiency of subsidising mechanisms (for example, by extrapolating long-range subsidies to regional routes).

The latter measure could be bolstered by simultaneously developing feeder networks at the existing Russian hub airports of St. Petersburg, Yekaterinburg, and Novosibirsk, thus helping preserve and develop the spread of regional air services.

Key performance indicators for Russian civil aviation, by type of service, January-August 2016

Indicators	Total (scheduled and unscheduled flights)	
	Jan-Aug 2016	Change to Jan-Aug 2015, %
Passenger traffic, mln passenger km	**141,161.9**	**-10.8**
on international routes	71,224.0	-21.1
on domestic routes	69,937.8	+2.9
Freight traffic, mln ton km	**16,791.2**	**-5.7**
on international routes	9,971.2	-10.8
on domestic routes	6,820.0	+2.8
Passengers carried, thous.	**58,472.8**	**-8.6**
on international routes	20,745.5	-26.5
on domestic routes	37,727.3	+5.7
Freight and mail carried, thous. ton	**600.2**	**+1.3**
on international routes	434.8	+0.8
on domestic routes	165.4	+2.6
Passenger load factor, %	**81,6**	**+0.9**
on international routes	82,7	-0.8
on domestic routes	80,6	+3.3

Sources: Russia's Federal Air Transport Agency.


Boryspil International Airport

Centripetal traffic

Passenger numbers at Ukraine's regional airports continue to decline amid the crisis as prosperous Kyiv pulls ahead

Serhiy Khyzhnyak, *Kyiv*

Several Ukrainian regional airports made the news this past summer. Vinnytsya and Chernivtsi reopened for scheduled air traffic. Ukraine International Airlines (UIA) launched services between Kyiv and Chernivtsi, and also from Vinnytsya to Warsaw and Tel Aviv. Rivne airport started serving commercial passengers again after a long break, with Bravo Airlines operating charter flights to Antalya. All these airports had long been used exclusively by bizav operators.

The overall situation, however, remains far from satisfactory. According to the State Aviation Administration of Ukraine, commercial flights currently operate out of 20 Ukrainian airports. Two of these, Boryspil and Zhulyany, serve Kyiv. That leaves 18 regional airports, of which only five handle over 100,000 passengers per year each; all five serve the country's largest regional centers: Odesa, Lviv, Kharkiv, Dnipro, and Zaporizhzhya. The remaining airports are mostly used by business aviation and infrequent charter services. Scheduled flights are only operated from Ivano-Frankivsk, Kherson, Uzhhorod, and now also from Vinnytsya and Chernivtsi.

The combined number of passengers handled by the regional airports last year stood at 2.5 million people, or 23% of the country's total passenger traffic. That was the lowest number since 2008; to compare, the 2013 regional passenger numbers amounted to 4.8 million people, or 36% of overall traffic.

Such a significant decline in the number of regional airline passengers is only logical in times of crisis. In 2008-2010, for example, Kyiv's Boryspil saw its passenger traffic peak similarly compared to the regions. This is mainly due to the fact that the capital city commands higher levels of business activity and purchasing power, so weathers crises better. What are more relevant to the problem at hand though are the market situation and the state of airport infrastructure.

Market forces

Since 2013, the Ukrainian airports have lost a third of passenger traffic to crisis-related shifts in the air transport market. A number of foreign carriers, such as Emirates and Alitalia, left the country's scheduled passenger market. Others, including Flydubai and Austrian Airlines, cut their frequencies. The cessation of air services between Ukraine and Russia saw some Ukrainian airlines, including UTair Ukraine and Windrose, discontinue scheduled operations or downsize their route networks dramatically. Finally, Budapest-headquartered no-frills carrier Wizz Air closed its Kiev office and moved part of the Ukrainian flights to Wizz Air Hungary.

UIA availed of the situation to strengthen its position both in the scheduled and charter market segments. The airline carried 77% of all Ukrainian passenger traffic last year. It currently is the largest carrier not only at its Boryspil base but also at Odesa, Kharkiv, Lviv, Ivano-Frankivsk, Vinnytsya, as well as at Dnipro via the local carrier Dniproavia.

Only two Ukrainian regional airports have home-base carriers: apart from Dnipro-based Driproavia, there is also Motor Sich Airlines at Zaporizhzhya. The rest largely depend for their operating revenues on UIA, and also on a handful of foreign carriers, mostly Turkish ones, including Turkish Airlines, Pegasus, and AtlasGlobal. This shaky business model complicates long-term planning and infrastructure development.

Infrastructure

Apart from Boryspil, only three Ukrainian airports boast modern infrastructure. As part of the preparations for the UEFA Euro 2012 finals, new passenger terminals, runways and aprons were built at Lviv and Kharkiv; Zhulyany received two passenger terminals and had its only runway was reinforced and extended by 150 m. A new

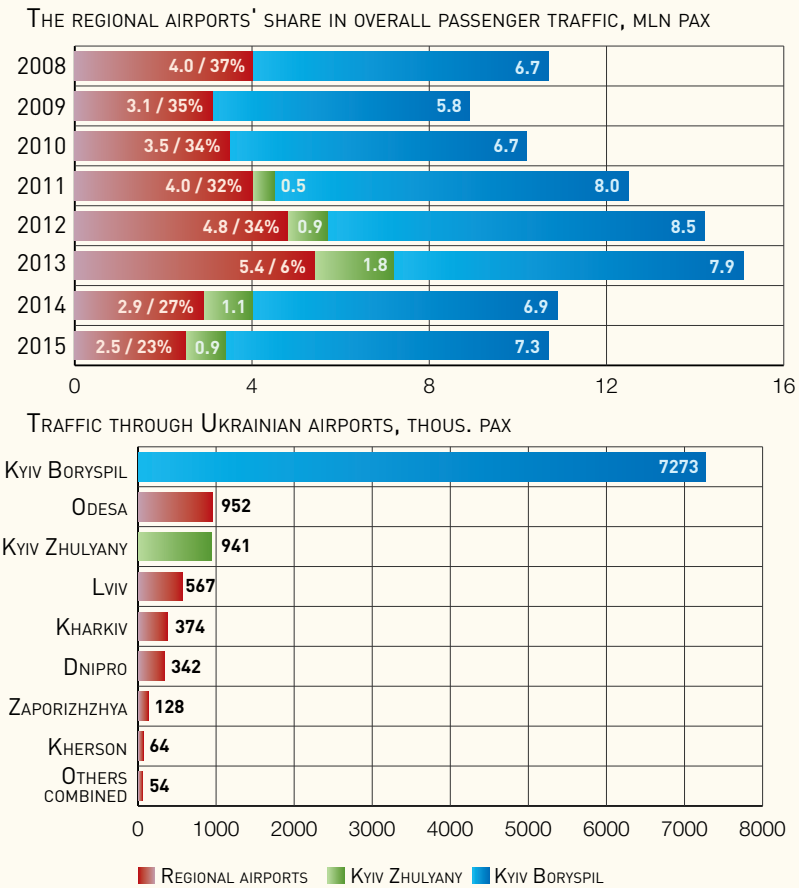
passenger terminal is under construction at Odesa; the completion deadline has been moved forward several times, and is now set for early 2017. The Zhulyany and Kharkiv terminals were built with private funds, and the Odesa project is also a private initiative.

The other regional airports' infrastructure mostly dates from the 1970' and 1980s, is substantially worn, and often restricts the aircraft types that can use the airfields.

The Ukrainian governments in early 2016 adopted a program to develop the country's airport network through 2023. The program calls for refurbishing the existing infrastructure and building new facilities at 15 regional airports. The government expects to fund the effort to the tune of 8.7 billion hryvnyas, or around $335 million at the current exchange rate, over the next eight years, primarily from the state budget.

The program also implies private investments in the construction of passenger terminals under private-public partnership contracts. The question is whether private capital will take an interest in most of the regional airports, given their modest passenger traffic and uncertain prospects. On the other hand, the probability of government subsidies actually being allocated for the program in sufficient amounts is fairly low, given the current state budget shortages and the IMF-imposed restrictions on budget spending.

Operational results of Ukrainian airports



Source: State Aviation Administration of Ukraine

The majority of Ukraine's regional airports are municipally owned; it would, therefore, be in the local authorities' best interest to maintain and develop them. If no funding comes either from the state or from the local budgets, then regional air services in Ukraine may well become history. ■

Ukraine International Airlines carried 77% of all the country's passenger traffic in 2015

Leonid Faerberg / Transport-Photo.com

Wind of change

Artyom Korenyako

The weakening ruble and the introduction of new services are stimulating the Russian aviation MRO sector. The leading providers continue to expand their business despite a nearly 20% shrinkage of the active airliner fleet in 2015. More varieties of maintenance services become available domestically.

Market leader

Setting the trend on the Russian MRO market is Engineering Holding, the parent company of the country's maintenance providers Novosibirsk-based Sibir Technics and S7 Engineering from Moscow. The introduction of new services, such as cabin modifications, and also the falling prices denominated in US dollars, have enabled Engineering to attract a number of new clients, including Aeroflot, VIM Airlines, the Kazakh Defense Ministry, Air Kyrgyzstan, Azur Air, and IFLy, as well as Rossiya Airlines, Ural Airlines, and Air Astana.

Leonid Faerberg / Transport-Photo.com

The weak ruble will motivate Russian MRO providers to localize more maintenance services

Engineering's paint shop at Mineralnye Vody airport was launched in September 2014. In April and May 2016, Engineering repainted several aircraft of Ural Airlines, Air Astana, and Rossiya. For the former two carriers, this was the first time their Western-built airliners had been given a paint job in Russia. Newly merged Rossiya turned to Engineering after having its new livery applied by a number of foreign specialists.

Competition

Other major domestic MRO players include the maintenance arms of Aeroflot Group and Volga-Dnepr Group.

Aeroflot Group's MRO subsidiary A-Technics launched at Vnukovo in the spring of 2016. Its primary customer will initially be the group subsidiary Rossiya, which has seen its fleet grow through the addition of Transaero, Orenair, and Donavia aircraft. The company could also service its sister carrier Pobeda in the future. The combined Rossiya and Pobeda fleet stands at nearly 100 airframes. Then there is Aeroflot: the EASA Part 145 certificate enables A-Technics to work on 120 of the flag carrier's airliners.

Another large domestic carrier Ural Airlines launched its MRO arm in January 2015. In the first year of operation, the service performed nine C-checks, 118 A-checks, and 11 engine replacement jobs, saving the carrier in excess of 100 million rubles. "Our 2016 plans include increasing the volume of in-house MRO work by 60% and starting to do D-checks, the heaviest maintenance form," says Ural Airlines CEO Sergey Skuratov.

Volga-Dnepr Technics Moscow reportedly attempted to land a maintenance contract with Pobeda Airlines, but the latter eventually preferred to have its 737-800 C-checked by Vnukovo-based Vostok Technical Services (VTS). VTS, however, has run into difficulties related to certain changes at Vnukovo: the airport also hosts fast-growing MRO provider UTG maintenance and engineering, which gained the approval in spring 2016 to perform C-checks on Boeing 737 Classics and do certain types of maintenance work on Boeing 777-200/300s.

Best practices

The Russian MRO sector has been working on Western-made aircraft types for about 10 years now. In order to catch up with the international level of services, Russian providers have been doing their best to replicate global best practices.

Engineering Holding signed agreements with Zodiac Aerospace and TAT Technologies this year to set up repair facilities for aircraft toilets and heat exchange units respectively, the first such centers of competence in Russia and the CIS. In June S7 Engineering opened the CIS-only MRO center for CFM56-5B/7B engines in partnership with the European provider SR Technics.

The Russian MRO sector still has a huge growth potential. "We expect the share of local services to grow on the back of the weak ruble," Engineering CFO Roman Fyodorov said earlier this year. "Those carriers whose aircraft are still serviced abroad will switch to domestic providers in the near future. According to our estimates, the share of locally available maintenance services will reach its ceiling shortly. Further growth will largely be dependent on Russian providers' ability to secure international contracts."

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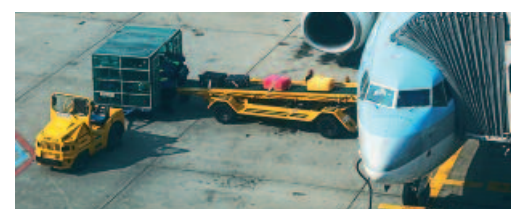

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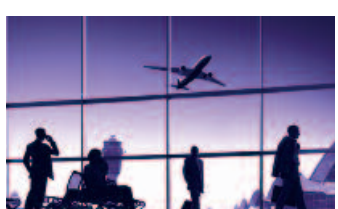

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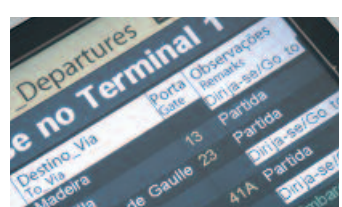

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Russian bizav market shrinks

Local operators are availing of the recession to boost their market presence

Anna Nazarova and
Ekaterina Sorokovaya

For the past two or three years, international analysts have been observing a reduction in Russia's share on the global business aviation market. The trend is being explained, among other factors, by the military aggression in Ukraine, the overall political situation, the strong US dollar as compared to the Russian national currency, and most importantly, the falling oil and gas prices. Russian players are also reporting a decline in bizav passenger numbers, and are using the situation to boost their market presence.

One of the most prominent indicators of a changing global attitude towards Russia and the CIS comes in the form of Bombardier Aerospace's annual forecasts. The Canadian manufacturer is known for its overly positive, sometimes evidently overrated 10-year forecasts for global business jet deliveries. However, when it comes to Russia and the CIS, these predictions have been growing consistently more conservative of late. In 2009, Bombardier projected 600 new business jet deliveries to the region; in 2015, that figure dropped to 510 and this year, to 400.

Even so, Bombardier, whose positions in Russia are historically strong, continues to believe that the market will recover. Jean-Christophe Gallagher, Bombardier Vice-President for Strategy, Marketing and Innovation, says the company's share in the total number of new business-jet deliveries to Russia and the CIS will exceed 50% in the next 10 years, mostly in the most expensive and spacious Large Cabin Jets and Heavy Jets classes. Bombardier hopes that the oil and gas prices will bounce back, but admits that business aviation deliveries to Russia have reached the lowest position across the world, with the market expected to grow by a meager 0.6% this year.

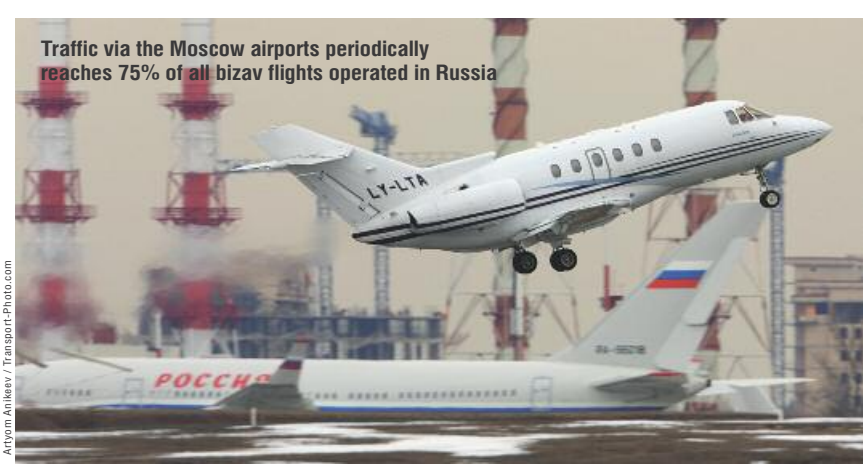
Other experts also hope that the oil prices will start growing again. Says Brian Foley, head of Brian Foley Associates: "Oil-dependent businesses and regions prefer large airplanes, particularly in the developing markets whose geographic location requires super-long-range jet transports. However, this sector has so far been seeing low oil prices."

The slumping oil prices are evidently affecting not just the actual and forecast business jet deliveries to Russia but also the global interest in the country in general: analytical firms like Teal Group, Brifo, and Rolland Vincent have dropped the country from their forecasts altogether. Russian operators have also been concerned about the shrinking bizav market. In early September, the Russian United Business Aviation Association (RUBAA) reported that Russian airports had served 65,138 bizav passengers in the first six months of the year, against 73,692 and 88,052 for the same period in 2015 and 2014, respectively. In August, a total of 5,960 passengers were carried on international bizav flights originating or terminating in Russia, compared to 7,290 in August 2015 and 7,800 in 2014. The domestic figures for the same months stood at 4,362 for 2016 and 4,800 for 2015.

Russian bizav operators are trying to avail of the crisis and increase their market presence, says RUBAA chairman Alexander Kuleshov. A total of 5,062 Russian operators were present at the Moscow airports in the first six months of 2016, or 20% more than in 2015 and 22% more than in 2014. The number of foreign operators is still much greater at 14,169, but the figure has shrunk by 20% compared to 2015 and by 34% compared to 2014.

RUBAA says 80% of all Russian bizav traffic passes through Moscow, Yekaterinburg, Samara, Nizhny Novgorod, Rostov-on-Don, and Sochi, with traffic via the Moscow airports periodically reaching 75% of all bizav flights operated in the country.

Kuleshov says the most popular international destinations for bizav flights from Moscow this year have been Nice (10% of all flights), London (7.3%), and Geneva (2.6%). The top 10 also includes Riga, Paris, Vienna, Homel, Olbia, Minsk, and Zurich. Domestically, the most frequent bizav flights from Moscow are to St. Petersburg (18%), Sochi (7%), Simferopol (2.8%), as well as to Kazan, Kaluga, Yekaterinburg, Anapa, and Krasnodar.



Traffic via the Moscow airports periodically reaches 75% of all bizav flights operated in Russia

Artyom Anikeev / Transport-Photo.com

Second chance for Sea Launch

The owners of Russia's second largest airline invest into a space project

Maxim Pyadushkin

The Sea Launch project has been given a new lease of life with a new investor, Russia's S7 Group, whose subsidiaries include the country's second largest carrier S7 Airlines. "I can't be first in aviation, there is Aeroflot (Russia's largest airline – ed.), so I will become first in space," S7 Group owner Vladislav Filev commented when asked to explain his investment, which appears to be a promising but risky start-up. Nevertheless, S7's success in the Russian airline business could contribute to radical changes in the space launch sector.

Under the agreement signed at the International Astronautical Congress in Guadalajara, Mexico in late September, S7 Group will acquire all of Sea Launch's material assets, including the vessel Sea Launch Commander, the launch platform Odyssey, and the ground equipment in the US port of Long Beach, as well as the Sea Launch trade mark.

The deal is to be closed within six month of obtaining the approval from the US Directorate of Defense Trade Controls and the Committee on Foreign Investment for transferring the command vessel and launch platform under Russian control. Putting the launch pad back into operation and preparing for the first launches will take another 18 months, Filev explained. The project will be managed by S7 Group's newly created subsidiary S7 Space Transport Systems.

According to Filev, the Odyssey still has between 15 and 20 more years of service life left: "We hope we can perform up to 70 more launches without major investments in upgrading the Sea Launch [platform]." The Odyssey can accommodate a maximum of six launches per year.

The Sea Launch new investor Vladislav Filev hopes the platform can perform up to 70 more launches without major investments

Leonid Faerberg / Transport-Photo.com

Sea Launch was founded in 1995 to use mobile a maritime platform for equatorial launches of Ukrainian-made Zenit-3SL rockets. The liquid propellant launch vehicle can deliver 6,160 kilograms of payload to a standard geosynchronous transfer orbit.

The initial partners on the project were Boeing (40%), Energia (25%), Norwegian shipbuilder Aker Kvaerner (20%), and also Ukrainian rocket manufacturers Yuzhmash (10%) and Yuzhnoe Design Bureau. The first demonstration launch was performed in 1999; since then, the company has made a total of 36 launches, 32 of them successfully.

Sea Launch filed for Chapter 11 bankruptcy protection in 2009. As a result, Energia managed to increase its stake to 95%, with Boeing and Aker left to share the remaining 5%. The company resumed launches in 2011, but suspended operations again in 2014.

The program has a spinoff project, Land Launch, with modified Zenit-2SLB and Zenit-3SLB rockets launched from Russia's main spaceport Baikonur in Kazakhstan.

S7 will now partner with Energia Corporation, one of Russia's largest launch vehicle manufacturers, to jointly operate the program. Energia will provide the necessary engineering assistance for the launches and associated integration services. S7 will deal with marketing and sales, Filev noted: "The capability to perform a launch is not a key technology today. What matters is the skill to sell that launch."

Filev plans to offer a new approach to the space launch sector. His company

will sell launch services with the use of those rockets which have already been assembled. "First comes the rocket, and only then the customer," he stresses. The new investor suggests applying a lease mechanism to the space sector, the way it works in the air transport world: "More than 50% of all the aircraft in the world are being operated through leasing, so airlines enjoy low acquisition costs. I believe that in the future, launch vehicles will be purchased through financial institutions, just as it is done with airliners now." Filev is convinced such an approach can help cut launch preparation times significantly. This, in turn, would attract new clients, and the growing backlog of orders would enable the company to bring the launch costs down.

Sea Launch has a small reserve of rockets left over from cancelled launches, Filev says. However, finding new launch vehicles may present a major problem for the Russian investor.

The latest launch from the Odyssey was performed in May 2014, and the Land Launch project was suspended in September 2013. Russian-Ukrainian aerospace cooperation has since been frozen due to the deteriorating relations between Moscow and Kiyv over the Russian annexation of Crimea and the armed conflict in the east of Ukraine. So it is not clear now whether Yuzhmash will be willing to supply more Zenit rockets for future launches.

Nevertheless, the new Sea Launch owner hopes to strike a deal with the Ukrainian manufacturer for new deliveries. "If they (Yuzhmash –ed.) can supply us with a rocket, then we will buy it; if not, then it will be their loss," Filev explains, noting that other launch vehicle types might also be used.

An alternative rocket for the Sea Launch program is likely to come from Russia

An alternative launch vehicle is likely to come from Russia. Energia CEO Vladimir Solntsev says his company could offer a new rocket to the Sea Launch investor. Energia is prepared to design a medium launch vehicle in five years under what is provisionally known as the Phoenix project; this rocket could also be used as a booster for future heavy launch vehicles.

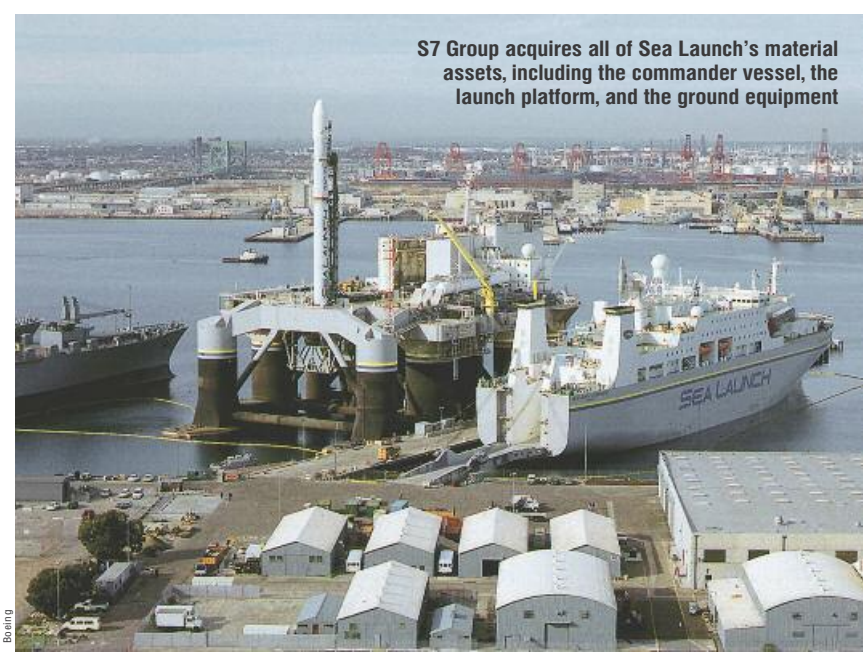
The Phoenix launch vehicle is viewed as a possible replacement for Zenit; its development would be funded under the federal space program through 2025. The design phase is expected to start in 2018.

Another solution would be to use Angara 1.2, the light version of Russia's new Angara launch vehicle, whose trial launch was performed from Russia's Plesetsk spaceport in July 2014. However, in order to be used for Sea Launch the rocker needs to be modified to enable Zenit-like automated launch countdown. Zenit counts down and launches fully automatically after the personnel has been evacuated from the Odyssey to the Sea Launch Commander.

Filev says S7's cooperation with Energia will not be limited to the Sea Launch project, but will also involve the creation of space transportation infrastructure: "The acquisition of a launch platform is our entry ticket for the space industry. Space infrastructure is developing rapidly. From our point of view, this is a very interesting business with good long-term prospects." Filev has a space background: he graduated from Military Space Engineering Academy in St. Petersburg and did his military service in the Russian Strategic Missile Forces in 1985-1993.

Sea Launch is not the first non-core business for S7 Group. Privately-owned S7 Airlines, together with its sister carrier Globus, are facing growing domestic market pressure from the government-owned giant Aeroflot. This is forcing the S7 Group owners to look for other development opportunities. Among their non-core investments are Russian MRO provider Engineering Holding, US-based general aviation manufacturer Epic Aircraft, and a Cypriot start-up, Charlie Airlines, which has recently been granted the right to use the trademarks and brand of bankrupted Cyprus Airways.

All these projects, however, were purely business investments, while the Sea Launch effort could serve as a demonstration to the Russian government that the private company is prepared to share the burden of expanding the country's industrial and technological capabilities.



S7 Group acquires all of Sea Launch's material assets, including the commander vessel, the launch platform, and the ground equipment

Boeing

ShowObserver

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