Take-off

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Dear reader,

I am offering you a new issue of the Take-Off magazine, the supplement to Russian national monthly Vzlet. This issue has been timed with another Aero India air show in the “capital city” of India’s aviation – Bangalore. The principal Indian air show is always crowded by Russian exhibitors and business people. Small wonder, since India has long been among the main partners of our country in the field of arms trade, specifically, in aircraft making.

Latest Russian combat aircraft have been delivered to India for the past 45 years. Since the late 1960s, the bulk of the Indian Air Force’s fighter and fighter-bomber fleets has been made up by MiG and Sukhoi warplanes, with a large number of the MiGs made by India under Soviet licence and assembly of one of the world’s best fighters, the Su-30MKI, having kicked off in India recently.

Licence production of the Russian combat aircraft is only one of the signs of the surging military technical cooperation between the two countries. It soon is going to be 10 years since Indo-Russian joint venture BrahMos, a developer and manufacturer of cutting-edge missile systems, has launched its operations. Right on the verge of the air show in Bangalore, a range of other important agreements concerning joint aircraft programmes have been signed during Russian President Vladimir Putin’s and Vice-Premier/Defence Minister Sergey Ivanov’s visits to India.

At present, Russia is fulfilling the contract on developing, manufacturing and delivering a number of MiG-29K carrierborne fighters to the Indian Navy. The customer’s representatives have been immediately engaged in the programme. Next key steps along the path of the Russian-Indian military-technical cooperation may be the acquisition of advanced MiG-35 fighters. This time, the Generation 4++ fighter’s technology demonstrator is to make its foreign debut in Bangalore. The central article of the issue is dedicated to it.

You also will find other materials focussing on the Russian-Indian cooperation in the issue, as well as a brief rundown on the recent developments in the Russian aerospace industry over past several months.

I wish the exhibitors and visitors of Aero India 2007 interesting meetings, useful contacts and lucrative contracts! See you again at new air shows!

Sincerely,

Andrey Fomin,
Editor-in-chief
Take-Off magazine
CIVIL AVIATION

- First Tu-214 built for Transaero
- Vladivostok Avia to receive two more Tu-204-300s
- First An-148s to be sold to Kazakhstan
- Uzbek carrier to receive two more Il-114-100s
- SuperJet gearing up for trials
- First Russian low-cost carrier emerged

In the run-up to growth
Russian airliner industry in 2006
According to official stats of the Russian Federal Agency for Industry, the national aircraft industry made 33 commercial planes in 2006. It is almost as many as the year before when the output totalled 34 aircraft, but it is mentioned as a 26-percent increase in financials. However, some other thing is more important: 2006 saw a number of developments indicating that Russian commercial aircraft have begun to come back to the global market while domestic operators have started placing new orders. This is proven by several new deals cut, in the first place, with major Russian aircraft leasing company, Ilyushin Finance Co. (IFC), during the year. The deals enabled IFC to contract manufacturers and launched financing of the production of advanced Russian airplanes. Actually, construction of more than two dozen new airliners has been launched by the plants in Voronezh and Ulyanovsk for the first time in the past decade and a half. Until then, they had completed the backlog dating back to the 1990s. The things started looking up at Gorbunov KAPO in Kazan, too. Several aircraft were delivered by Aviakor in Samara. What kind of success did the Russian commercial aircraft manufacturers achieve in 2006 and what are they facing this year and in a bit longer future? Andrey Fomin and Andrey Yurgenson try to answer the questions

INDUSTRY

Sokol gaining height
Report from Nizhny Novgorod
The Sokol Aircraft Building Plant in Nizhny Novgorod, the oldest Russian aircraft manufacturer, turns 75 in February this year. The plant set up in 1932 as Plant No 21 (then Gorky-based Sergei Ordzhonikidze Aircraft Plant, Gorky (Nizhny Novgorod) Aircraft Production Association) participated in production of numerous types of aircraft developed by N.N. Polikarpov, S.A. Lavochkin, A.I. Mikoyan and other outstanding Soviet designers. Today, the Sokol plant has advanced production facilities ensuring the complete production cycle and enabling international requirements-compliant cutting-edge aircraft to be made. In the run-up to the 75th anniversary of the company, our correspondents paid a visit to Sokol, were received by the management and pilots, and were shown the production lines and in-house flight-test facility

- UAC registered

Ivchenko-Progress engines for trainers and light combat aircraft

MILITARY AVIATION

- First two Su-34s delivered to RusAF
- Air Force took delivery of six Su-25SMs
- Russian Long-Range Aviation to get new Tu-160s
- Il-76MD kicks off official trials
- Another Ka-50 built in Arsenyev

MiG-35: future of Fulcrum family
The representative of the new generation of the popular MiG-29 light tactical fighter versions – its heavily upgraded MiG-35 multirole derivative – is to make its debut at the upcoming Aero India 2007 air show in Bangalore. Referred to as a Generation 4++ aircraft, the fighter may succeed the current MiG-29 and MiG-29SMT on the global arms market a few years further down the road. Unveiling the MiG-35 demonstrator at Bangalore pursues a definite goal: it is the model that the MiG Corp. and Rosoboronexport intend to submit for the Medium MultiRole Combat Aircraft (MMRCA) tender the Indian Air Force (IAF) is to announce in the near future. Under the MMRCA programme, IAF plans to get 126 advanced fighters, the bulk of which is to be assembled by the Indian
aircraft factories. Competitors of the MiG-35 under the upcoming tender are to be the US F-18E/F and F-16 Block 70, French Mirage 2000-5 and Rafale, West European Typhoon and Swedish Gripen. Most of them are very stiff competitors, and for this reason, minor modifications to the existing MiG-29 will not be enough for the MiG-35’s developer to come on top in the tender. Therefore, the MiG-35’s design, albeit outwardly similar to the production MiG-29, embodies a number of radical innovations that qualify it as a Gen. 4++ warplane. Andrey Fomin reviews the main peculiarities of the advanced MiG programme

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COSMONAUTICS

- Advanced Soyuz orbited planetary scout
- GLONASS constellation growing
- Third launch of the “second” Soyuz
- Proton – Arabsat: take 2
- Angara to fly in four years
- Mars ’flight’ as early as this year
- First Soyuz to launch from Kourou in two years
- Space tourism gets pricier

CONTRACTS AND DELIVERIES

Brahmos Aerospace’s managing co-director Alexander Maksichev: “The priority is the air-launched missile”

The development and manufacture of the BrahMos supersonic antiship missile system has been among the key joint Russian-Indian arms development programmes recently. The missile has been under joint development by Russian and Indian as a derivative of the Yakhont antiship missile from NPOMash in Reutov, Moscow Region. The derivative is to have land-based, air-to-surface and sea-launched versions. A joint venture under the same name was set up to run the programme, with the acronym BrahMos standing for the rivers Brahmaputra and Moscow. The joint venture is manned by staff from Russia’s NPOMash and India’s Defence Research & Development Organisation (DRDO). The programme’s kick-off was authorised by the intergovernmental agreement made in February 1998. The contract for developing the BrahMos was signed in July 1999. Since then, the Russian-Indian weapon has passed the design, prototyping and test phases, having entered full-rate production and started entering service. The BrahMos Aerospace joint venture’s Russian managing co-director Alexander Maksichev spoke with Take-Off’s columnist Vladimir Scherbakov on the recent developments under the BrahMos programme and the future it faces

- Russia offers to upgrade Indian MiG-29s
- Algeria accepts new MiGs
- China still to buy Su-33?
- Indonesia to get more Sukhois
- Il-76 deliveries to China slip behind schedule
- Be-103 and Su-80 to be assembled in PRC?
- Tupolev offers its freighters to China
- Mi-26 comes to PRC

Heading for Venezuela!

First Su-30s arrive to Latin America

Sukhoi’s division KnAAPO shipped the first four Su-30MK2 fighters to Venezuela in December last year. This is the first Flanker-family aircraft delivery to a Latin American country. On 10 December the pair of the Su-30MK2s flew during the air parade on the Venezuelan Air Force Day at Libertador air base, attended by President Hugo Chavez who had been re-elected as president just five days before. The contract for 24 Su-30MK2 multirole fighters and a batch of advanced Mi-35M attack, Mi-17V-5 utility and Mi-26T heavy-lifter helicopters was signed last summer in the course of Chavez’s visit to Russia. The smooth beginning of fulfilling the contract under so tight a schedule, which ensured the Su-30MKs’ participation in the air parade on 10 December 2006, gave powerful impetus to the Russo-Venezuelan cooperation in arms trade and to crafting new lucrative agreements on deliveries of Russian combat aircraft and other material to Venezuela and some other Latin American countries
First Tu-214 built for Transaero

The Kazan Aircraft Production Association (KAPO) named after S.P. Gorbunov has completed another new Tupolev Tu-214 long-range airliner (No 64509). On 17 November 2006, it made its maiden flight, crewed by test pilots A.A. Ryabov and M.S. Bobrov. The aircraft is designed for the Transaero air carrier entitled to ten Tu-214s in 2006–2008 under its financial leasing deal with FLC leasing company dated 14 February 2005. Until now, Transaero has operated only foreign-made airliners. Thus, the KAPO-built No 64509 has become the first of the ten, having been delivered to the customer in January 2007. One more Tu-214 (No 64513) is to be completed and delivered to Transaero this year.

Vladivostok Avia to receive two more Tu-204-300s

A firm contract was signed on 27 November by the IFC leasing company and Far Eastern airline Vladivostok Avia on the latter leasing of two Tu-204-300 medium/long-haul airliners for 15 years. Under the contract, the aircraft are to be delivered in the second quarter of 2008. These aircraft will feature improved seats in the business class cabin and an interactive entertainment system enabling passengers to control the cabin audio and video gadgets in flight without leaving their seats. At present, Vladivostok Avia has been operating four Tu-204-300s leased from IFC between May and December 2005. The monthly flying hours per aircraft logged since the delivery of the first batch of the planes have averaged 400 hr, which is an excellent showing on a par with the international standards.

First An-148s to be sold to Kazakhstan

Two Kazakh carriers are to become the launch customers for the advanced Antonov An-148-100 regional jets whose full-rate production has been launched by the Aviant plant in Kiev. Under the current contract, Aviant shall deliver seven such aircraft to Kazakh company SCAT and one to the Berkut airline, with the latter’s contract having an option for one more plane. An-148 deliveries are to start as soon as the plane has been issued with the type certificate, which is slated for early this year (the flight tests under the certification test programme became a success in December 2006). The first two An-148-100s are to be delivered to SCAT in 2007, with the remaining five to follow suit during 2008.

Uzbek carrier to receive two more Il-114-100s

The Tashkent Aircraft Production Corporation named after Valery Chkalov (TAPC) has furnished a new 64-seat Ilyushin Il-114-100 regional airliner for delivery to Uzbek national carrier Uzbekistan Airways. The aircraft is powered by turboprop engines from Pratt&Whitney Canada and fitted with Rockwell Collins avionics. It kicked off its trials in August last year, having become the second Il-114-100 TAPC built under the 2001 contract with Uzbekistan Airways on three Il-114-100s worth a total of $21.5 million. The third airliner is to be completed this year. The Uzbek national airline took delivery of the lead Il-114-100 in 2002, with the plane entering commercial operation on local routes in 2003. The company intends to have replaced its fleet of obsolete Yak-40 and An-24 regional planes with advanced aircraft. The Il-114-100 version was derived by Ilyushin from its production Il-114 powered by TV7-117S turboprops. It features Canadian PW-127H turboprops rated at 2,750 hp and fitted with Hamilton Sunstrand propellers and foreign avionics. TAPC made the first such airliner in 1998 and first flew it on 26 January 1999. IAC’s Aircraft Registry issued it with the type certificate on 29 December 1999.
SuperJet gearing up for trials

The Komsomolsk-on-Amur Aircraft Production Association (KnAAPO) had completed the first airframe (c/n 95002) of the advanced Sukhoi SuperJet-100 regional airliner which was airlifted by an An-124 Russian transport to Zhukovsky in the Moscow Region on 28 January for static tests in the Central Hydroaerodynamic Institute (TsAGI). The plane’s static tests by TsAGI are to begin in April this year. KnAAPO will make three more SuperJet-100 prototypes in 2007.

The assembly of the first flying prototype is slated to be completed in September this year. Under the current schedule, the certification tests are to last just over a year to have been completed by 2008 year-end when deliveries of early production aircraft are to start to the launch customer, Aeroflot.

The SuperJet-100’s production is to be launched in 2008 with the rollout of the first six aircraft. The output is to increase up to 30 in 2009 and up to 40 in 2010. According to Vladimir Priyazhnyuk, Sukhoi’s Deputy Director General for corporate relations and support, speaking in late November at the enlarged session of the Khabarovsk Region administration, KnAAPO’s SuperJet-100 production plan for 2008–10 is to account for 100 aircraft, which, along with production of Su-30MK2s, Su-35s and, possibly, Su-33s for export and work on the Su-27SM under the governmental procurement programme, will keep the factory’s hands full.

At present, the Sukhoi’s Civil Aircraft Corporation’s SuperJet-100 orderbook is 169, including 61 firm orders (30 by Aeroflot, 10 by the FLC leasing company, 15 by AirUnion (the contract signed on 9 December 2006) and six by Dalavia (the contract signed on 19 December 2006 with an option for four more aircraft).

The world’s regional aircraft market until 2023 is estimated at 5,400–5,600 planes worth up $100 billion. Sukhoi expects that around 800 of them will be SuperJet-family aircraft. According to the company’s forecast, 35 percent of regional airliners may be sold in North America, 25 percent in Europe, 10 percent in Latin America and the remaining 30 percent will be sold domestically.

Construction of prototype and production of SuperJets will be handled by KnAAPO in cooperation with another Sukhoi division – the Novosibirsk Aircraft Production Association named after Valery Chkalov (NAPO). February 2006 saw NAPO launching manufacture of three sections of the SuperJet’s fuselage – the nose (F-1) and tail sections (F-5 and F-6). Ready sections are shipped to Komsomolsk-on-Amur where the rest of the fuselage (F-2, F-3 and F-4) and the wing are made and final assembly takes place. In addition, another Russian aircraft manufacturer – Voronezh-based VASO – joined the SuperJet-100 production programme in 2006. VASO has started making the aircraft’s composite accessories, e.g. wing high-lift devices, elevators, various fairings, access doors, etc.

Concurrently with construction of the early SuperJets, the Rybinsk-based Saturn company continues manufacture and testing of the early examples of the SaM146 engine. Early in November, Saturn completed the second of the eight engines stipulated by the certification programme. It entered its rig tests on 13 November and had completed its takeoff-mode tests by the end of the month. The first SaM146 prototype underwent its FETT trials, having logged 112 hours during 97 start-ups from July to September. The engine’s maximum continuous operating time per start-up totalled 5.5 hr.

Soon, the third prototype is to join the rig tests of the first two SaM146s, with the fourth one to commence its flight trials on the II-76LL flying testbed in the coming spring.

First Russian low-cost carrier emerged

On 29 January, the first Russian low-cost airline for the mass consumer, Sky Express, launched its first service from Vnukovo Airport in Moscow to Sochi. In December, the company started seat reservation at its Web site at www.skyexpress.ru, and by phone. All those registered will have access to tickets to go to any Russian city covered by Sky Express’s route network at a special price of only 500 rubles (about $19).

The company’s next services will be launched from Vnukovo Airport to Rostov-on-Don and Murmansk in February and to Chelyabinsk, Perm, Yekaterinburg, Ufa and Anapa later this year. Sky Express is expected to have 11 destinations 800–3,000 km from Moscow by 2007 year-end.

The Sky Express carrier was established in March 2006. Its business approach features an efficient destination network, uniform aircraft fleet (Boeing 737-300), predominantly direct sale of tickets (including selling them on the Internet) and lack of free meals on board. This is to allow a considerable reduction in operating costs and, hence, the fare.

In November, the flying testbed flew several check flights at LII, crewed by leading test-pilot Vladimir Biryukov and two Frenchmen as co-pilots. The SaM146 prototype is to be shipped to LII in February or March 2007, after which it is to be mounted on the II-76LL. The flying testbed then will fly two series of flight tests totalling 200 flight hours. One of the series is to take place at LII in Zhukovsky and the other in Istre in the south of France where one of Snecma’s specialist flight test centres is situated. The SaM146’s certification tests are slated for completion in March 2008 and those of the SaM146-powered SuperJet-100 in November 2008.
Late in December 2006, the Rosprom’s Aircraft Industry Department published preliminary showings of the Russian aircraft industry in 2006. According to the agency’s news release, the 2006 aircraft production rate stood at 120 percent compared with that in 2005, with eight manufacturers having made 33 aircraft. Of them, Russian carriers received only three: two Aviakor-built medium-haul Tu-154Ms (RA-85123 and RA-85975) went to Kuban Airlines and one KAPO-made long-range Tu-214 (RA-64512) went to Dalavia. In addition, the Yakutia airline in September took delivery of the first An-140 (RA-41250) regional turboprop from Aviakor. Another Tu-214 (RA-64509) was completed by KAPO in 2006, but its delivery has been put off until early in 2007.

All newly-built Russian airliners were leased. Kuban Airlines received two Tu-154Ms under a contract with the Municipal Investment Company in the city of Krasnodar and the Finance Leasing Company (FLC) funded the construction of the Tu-214s for Dalavia and Transaero as well as the An-140 for Yakutia. Early last year, the Russian aircraft leasing leader, the Ilyushin Finance Company (IFC), fulfilled the first contract with Vladivostok Avia on four Tu-204-300s (officially, the fourth aircraft was received by the carrier in late 2005) and exploited the success in exporting Russian commercial aircraft. In February, it delivered the second II-96-300 long-haul airliner to Cuba under the 2004 deal, with one more following suit in December under a new contract.

Actually, 2006 became a sort of milestone for Russian commercial aircraft returning to the global market. Aviastar built the first two Tu-204-120CE freighters for China under a contract made in 2001 and the first Tu-204CE for Cuba. IFC signed the new contract with Cuba in April 2006 and is to deliver as many as five aircraft – two II-96-300 long-haulers, a Tu-204CE freighter and two Tu-204-100 airliners. Two planes have already been built and one of them (II-96-300) was delivered. The other last-year export success of IFC is the contracts for five long-range Il-96-400Ts and Il-96-400Ms in cargo and passenger configurations for Zimbabwe and five medium-range Tu-204-100s for Iran. A certain progress was made in negotiations on delivering three II-96-400s and four Tu-204s to
Syria and five Il-96-400Ts to China. IFC is poised to land the firm orders this year.

In 2006, IFC also carried on with its earlier made contracts and started implementing new deals on airliner construction made with domestic carriers. Among those deals are deliveries of an Il-96-300 to the Rossiya airline, two Tu-204-300s to Vladivostok Avia (the order was placed in November 2006, the delivery is slated for 2008), two Il-96-400Ts to Atlant-Soyuz, six Tu-204Cs to Volga-Dnepr, etc. Rossiya and Atlant-Soyuz are to get their new Ilyushin plane each as early as 2007.

Due to landing new orders for a considerable number of Tu-204 and Il-96 aircraft and virtual exhaustion of Aviastar’s and VASO’s 1990s backlog of these aircraft, resumption of their production has come to the fore. For this purpose, the manufacturers needed to buy metal and components. Therefore, IFC made deals with them in 2006 and began to pay for constructing new planes of the types from scratch. As a result, construction of as many as 23 airliners was launched for the first time since the dissolution of the Soviet Union, those being 10 Il-96s in various variants to be built by VASO and 13 passenger and cargo Tu-204s by Aviastar, with their total worth exceeding $1 billion and the aircraft slated for delivery in 2007–09. In all, IFC’s orderbook exceeds 100 orders for a tune of about $3.5 billion. In addition to various Il-96 and Tu-204 versions, it includes orders for the advanced An-148 regional jet that is to be issued its type certificate early this year. IFC also plans to fund construction and deliveries of prospective Russian regional jet SuperJet-100 as well as An-140 and Il-114 regional turboprops, An-38 commuter planes, etc. Owing to IFC’s efforts to promote Russian civil aircraft on both domestic and global markets, Aviastar’s and VASO’s production lines have been busy for several years to come (mind you, VASO is getting more and more engaged in production of SuperJet regional aircraft, while Aviastar is gearing up for productionising the Il-76 upgraded transports).

The third major Russian airliner manufacturer, Gorbunov KAPO, is going to continue to fulfill its contracts with FLC and the government in the coming years. The company is to complete, test and deliver two Tu-214s (RA-64509 and RA-64513) to Transaero and two Tu-214SRs (RA-64514 and RA-64515) for Rossiya airline. In addition, KAPO is poised to delivery the first two short-haul Tu-334s (RA-94005 and RA-94003) this year. Construction of at least five more Tu-214 (RA-64516 through RA-64520) have been launched (Transaero and Rossiya are to take two each, with the fifth aircraft intended for KrasAir or Dalavia). Further down the road, KAPO is to build six more Tu-214s for Transaero and, possibly, several more of those for other Russian carriers and to launch full-rate production of the Tu-334-100 short-haulers in case the financing is no longer an issue.

Another manufacturer, Aviakor in Samara, has plans for 2007 to make and deliver from one to three Tu-154Ms and carry on with the contract it signed with FLC on three An-140s for Yakutia. In the coming years, Aviakor may continue to build Tu-154Ms and An-140-100s, but the production rate is hardly to go into dozens of units due to the lack of demand for new Tu-154Ms, on the one hand (overhaul and upgrade of the existing aircraft of the type looks more likely), and the complicated situation its Ukrainian partner KSAMC (Kharkov) is in now, on the other, since the An-140 production by Aviakor does not look feasible without cooperating with KSAMC.

In conclusion, a few words on a Russian airliner programme promising to become central within the framework of the recently established United Aircraft Corporation (UAC). It is Sukhoi’s breakthrough endeavour – the advanced regional aircraft dubbed SuperJet being productionised by KnAAPO teamed up with NAPo in Novosibirsk with participation by VASO. The plan teams to build early SuperJet prototypes and submit for tests in 2007, having launched construction of the airframes of future production aircraft. KnAAPO is going to start full-rate production and deliveries in 2008. By the way, production of the other Sukhoi commercial aircraft by KnAAPO – the Su-80GP regional/commuter turboprop – is slated for the same time. KnAAPO may begin to assemble early production Su-80GPs as early as this year, with the deliveries planned to start in 2008. However, whether the company is to stick to the schedule or not is hinged – as with the SuperJet – on whether the developer completes the planes’ certification in full or not.

Summing up the results of the Russian airliner industry in 2006 and plans of domestic aircraft manufacturers for the future, it is worth mentioning that the situation, alas, has not changed radically, judging by the number of new airliners delivered to operators. Of the 33 civil aircraft built, only three (!) were delivered to domestic airlines and two were exported (several more aircraft were
made for Russian and foreign users, but their deliveries were postponed until 2007, with the remaining two dozens-plus mentioned by Rosprom’s stats being light planes (M-101T, SM-92T, An-3) and a Be-200ChS delivered to the Emergencies Ministry. Compare that with the 34 civil aircraft made in 2005 (re: Rosprom’s 2005 annual report). At the time, Russian carriers took delivery of six airliners 

Regional and short-haul airliners production could give a real impetus for Russia’s commercial aircraft industry growth in the nearest future. Top: Antonov An-148 assembling at VASO plant, June 2006. Bottom: the first SuperJet-100 prototype (95002) for static tests arrival to Moscow, 28 January 2006

(four Tu-204-300s and two Tu-214s), with one more aircraft (Il-96-300) sold abroad.

Nonetheless, the developments in 2006 – IFC’s new orders for both domestic and global markets – serve a reason to believe that the Russian civil aircraft industry may experience its long-awaited revival in the coming years. UAC’s organisation provides for IFC aircraft leasing as its speciality, and the company is intent on assuming leadership in restarting and boosting airliner production in Russia.

“We suggest the aircraft production be increased sharply,” IFC’s Director General Alexander Rubtsov said during the meeting with the media on the company’s 2006 performance. “We have taken stock of all Russian aircraft manufacturers making commercial planes and identified the principal problems. The problem of personnel is very complicated, for one. Secondly, the leasing model should be modified to beef up its loan component. Hence, we asked the government for its guarantees on the same terms applied to funding the export deliveries. At issue is acquisition of 200–250 aircraft within five years for a total of about $6 billion. If the government goes with us, we will be able to place a major order with the industry indeed,” Alexander Rubtsov concluded.

Regional and short-haul aircraft may take the central place in this order. The need of Russian and some foreign carriers for such aircraft is driven by the gradual expiry of the service life and approaching termination of the operation of the An-24, Yak-40 and Tu-134 fleets. Aircraft in the class are in high demand worldwide as well. Russian developers have come with several advanced planes in the class. The Il-114 and An-140 50-seat turboprops have passed the tests and been productionised a long time ago, but their production rate remains negligible for a number of reasons. The An-140 70-seater completed its certification flight tests last late year and will be ready for delivery any time soon, once it has received its type certificate. The Tu-334 102-seater has been certified and may enter full-rate production this year. The 95-seat SuperJet-100 is gearing up for trials, with its delivery slated for late next year.

A possible production rate of these aircraft in the near future is hinted at by the number of the firm orders landed. For instance, during last year’s air show in Farnborough, the Ilyushin Finance Co. signed agreements with the Aviakor and Ilyushin companies on delivering 30 Il-114s and 25 An-140-100s to Russian carriers within the coming five years. As far back as 2005, IFC clinched deal on supplying three Russian air companies with 39 brand-new An-140s in various configurations, whose production is to be launched by VASO in 2007. By late last year, the Tu-334-100 orderbook had comprised 52 orders from four Russian carriers and a Ukrainian one, with the Tu-334-100 slated to enter production at KAPO in 2007 in line with the government’s resolution. However, while these agreements have not resulted in firm orders yet and some remain rather hazy, the developer of the SuperJet-100 can boast firm orders for 61 aircraft, even though the aircraft, which is supported by the federal authorities, has not started its trials yet. In all, the above orders total 168 regional and short-haul aircraft that could be delivered by 2010.

The aircraft are promoted on the global market as well. Although potential buyers of the An-140 regional aircraft as well as An-148 and Tu-334 short-haul airliners, most likely, be several Middle East, Asia Pacific and African countries, traditional operators of Soviet/Russian planes, the SuperJet’s developer’s ambitions are not limited to these regions. Sukhoi eyes the Western market, whose capacity in the coming decade and a half, it believes, may number up to 560 Sukhoi regionals, including about 280 aircraft in North America and about 200 in Europe. In whole, the Russia’s United Aircraft Corporation plans to deliver not less than 500 regional and short-haul airliners in the next 8 years, since 2008 till 2015. Time will show if marketing experts are right or wrong, however, it is clear even now that the future of the Russian airliner industry is going to be heavily hinged specifically on pursuing the production of regional and short-range airliners.
2006 airliner production by Russian manufacturers and plans for 2007–08
(passenger aircraft with a capacity of at least 30 seats and freighters)

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Type</th>
<th>Customer</th>
<th>Qty</th>
<th>Leasing company</th>
<th>Contract (agreement of intent) date</th>
<th>Registration or c/n</th>
<th>Maiden flight date</th>
<th>Date of delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td>VASO (Voronezh)</td>
<td>Il-96-300</td>
<td>Cubana Aviation (Cuba)</td>
<td>1</td>
<td>IFC</td>
<td>9.07.2004*</td>
<td>016 (CU-T1251)</td>
<td>14.01.2006</td>
<td>02.2006</td>
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<td></td>
<td>Il-96-400T</td>
<td>Atlant-Soyuz</td>
<td>2</td>
<td>IFC</td>
<td>27.06.2005</td>
<td>RA-96102</td>
<td>2007</td>
<td>2007</td>
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<td></td>
<td>Il-96-400T</td>
<td>SyrianAir (Syria)</td>
<td>3</td>
<td>IFC</td>
<td>(06.2006)***</td>
<td>2007–2008</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Il-96-400T</td>
<td>Silk Route Cargo (China)</td>
<td>2</td>
<td>IFC</td>
<td>(04.2006)***</td>
<td>2007–2008</td>
<td></td>
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</tr>
<tr>
<td>Aviastar (Ulyanovsk)</td>
<td>Tu-204-120CE</td>
<td>Air China Cargo (China)</td>
<td>5</td>
<td>–</td>
<td>8.09.2001</td>
<td>64030(B-2871)</td>
<td>14.05.2006</td>
<td>2007</td>
</tr>
<tr>
<td></td>
<td>Tu-204-300</td>
<td>Air Korya (PDRK)</td>
<td>1</td>
<td>IFC</td>
<td>04.2006</td>
<td>64036</td>
<td>19.12.2006</td>
<td>2007</td>
</tr>
<tr>
<td></td>
<td>Tu-204-100</td>
<td>Iran Aftour (Iran)</td>
<td>5</td>
<td>IFC</td>
<td>2006</td>
<td>64036</td>
<td>19.12.2006</td>
<td>2007</td>
</tr>
<tr>
<td></td>
<td>Tu-204-100</td>
<td>SyrianAir (Syria)</td>
<td>4</td>
<td>IFC</td>
<td>(06.2006)***</td>
<td>2007–2008</td>
<td></td>
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<tr>
<td>KAPO (Kazan)</td>
<td>Tu-214</td>
<td>Dalavia</td>
<td>1</td>
<td>FLC</td>
<td>29.05.2003**</td>
<td>RA-64512</td>
<td>11.07.2006</td>
<td>30.08.2006</td>
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<tr>
<td></td>
<td>Tu-214</td>
<td>Transaero</td>
<td>2</td>
<td>FLC</td>
<td>02.2005</td>
<td>RA-64509</td>
<td>17.11.2006</td>
<td>2007</td>
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<td>Tu-214</td>
<td>2</td>
<td></td>
<td>02.2005</td>
<td>RA-64513</td>
<td>2007</td>
<td></td>
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<td></td>
<td>Tu-214</td>
<td>6</td>
<td></td>
<td>02.2005</td>
<td>RA-64513</td>
<td>2007</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Tu-334</td>
<td>****</td>
<td>1</td>
<td>–</td>
<td>21.11.2003</td>
<td>RA-94003</td>
<td>2007</td>
<td></td>
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<tr>
<td>Aviakor (Samara)</td>
<td>Tu-154M</td>
<td>Kuban Airlines</td>
<td>2</td>
<td>MIC</td>
<td>16.08.2005</td>
<td>RA-85123</td>
<td>5.05.2006</td>
<td>6.06.2006</td>
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<tr>
<td></td>
<td>An-140</td>
<td>Yakutiya</td>
<td>1</td>
<td>FLC</td>
<td>16.08.2005</td>
<td>RA-85795</td>
<td>7.08.2006</td>
<td>22.08.2006</td>
</tr>
<tr>
<td></td>
<td>An-140-100</td>
<td>****</td>
<td>2</td>
<td>–</td>
<td>2006</td>
<td>RA-41250</td>
<td>2.08.2005</td>
<td>6.09.2006</td>
</tr>
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<td></td>
<td>An-140-100</td>
<td>****</td>
<td>2</td>
<td>–</td>
<td>2006</td>
<td>RA-41250</td>
<td>2.08.2005</td>
<td>6.09.2006</td>
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<tr>
<td>KoAAPO (Komsomolsk-on-Amur)</td>
<td>SuperJet-100</td>
<td>Aeroflot</td>
<td>30</td>
<td>FLC</td>
<td>7.12.2005</td>
<td>RA-85123</td>
<td>5.05.2006</td>
<td>6.06.2006</td>
</tr>
</tbody>
</table>

* The first aircraft under the contract (CU-T1251) was delivered in December 2005.
** The first four aircraft under the contract (RA-64502, RA-64503, RA-64507, RA-64510) were delivered in 2001–05.
*** A firm order has not been awarded yet.
**** The end user has not been determined yet.

The aircraft made and/or delivered in 2006 are in bold letters.
Export contracts are highlighted in yellow.

* The first aircraft under the contract (CU-T1251) was delivered in December 2005.
** The first four aircraft under the contract (RA-64502, RA-64503, RA-64507, RA-64510) were delivered in 2001–05.
*** A firm order has not been awarded yet.
**** The end user has not been determined yet.

The aircraft made and/or delivered in 2006 are in bold letters.
Export contracts are highlighted in yellow.

www.take-off.ru
Watershed

2005 and 2006 proved to be the watershed to the Sokol plant. The company finished the two years in the black at a level high enough for the Russian aircraft industry. It has never produced such a wide range of products as now — not even during the Soviet times. Under the current contracts, the plant’s production programme covers full-rate production of as many as five aircraft at the same time, of which two are made from scratch (Yak-130 and M-101T), two are upgraded (MiG-29UB and MiG-31) and separate airframe parts are made for MiG-29K/KUB. The five programmes were run concurrently each at its own pace and have gathered momentum recently.

So far, the volume of work under the governmental defence procurement programme is not the backbone of the company’s total output. For instance, it equalled only 7 per cent in 2005, but this year it is to grow roughly to 10 per cent and 2008 is to see the beginning of its considerable increase mostly through launching the full-rate production of the Yak-130 combat trainer and MiG-31 upgrade.

Key developments in Sokol’s last years operation included the export deliveries of the MiG-29UBT combat trainer fighters and continuation of the works under the contract with MiG Corp. on the MiG-29K/KUB shipborne fighters ordered by the Indian Navy. The Yak-130 third flying prototype in the production configuration was delivered for the joint official tests, and the aircraft was productionised for the Russian Air Force. A 10-ship M-101T batch was delivered for use as air taxi under the Dexter programme and as a trainer by Russian civil aviation flight schools. In addition, the plant plans to productionise the MiG-35 fighter, kick off the MiG-31 upgrade for RusAF and foreign customers and launch a number of other programmes.

Sokol’s 2006 production rate growth over 2005

<table>
<thead>
<tr>
<th>Output Measure</th>
<th>Growth 2006 (per cent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales growth</td>
<td>292 per cent (3.7 billion rubles)</td>
</tr>
<tr>
<td>Commodity output</td>
<td>260 per cent</td>
</tr>
<tr>
<td>GDP</td>
<td>126 per cent</td>
</tr>
<tr>
<td>Staff on the payroll</td>
<td>105 per cent</td>
</tr>
<tr>
<td>Average salary</td>
<td>121 per cent</td>
</tr>
<tr>
<td>Labour productivity</td>
<td>122 per cent</td>
</tr>
<tr>
<td>Salary schedule</td>
<td>127 per cent</td>
</tr>
<tr>
<td>Sales volume per worker</td>
<td>278 per cent</td>
</tr>
</tbody>
</table>

Production and personnel

To hit such ambitious targets, the plant has up-to-date production facilities, including its own design bureau, blank stamping, forg-
ing, casting, machining, tooling, assembling, galvanic and painting ones. It also has a flight test facility of its own, an aviation training centre and a commercial aircraft maintenance, repair and overhaul (MRO) centre.

One of the problems being faced by the plant is some shortage of skilled personnel. The thing is that the personnel on payroll have dropped by several times since the collapse of the Soviet Union. In 2006 the payroll equalled 6,700 personnel. Now that the production has surged, it is not that easy to beef up the personnel, since the company is lacking skilled, seasoned specialists who are well versed in the finer points of aircraft manufacture. The corporate development plan makes provision for beefing up the payroll up to 11,000–12,000 personnel by 2010. Today, this is Sokol’s principal objective and one of the most difficult ones to boot. The payroll should swell to 7,000 personnel as early as this year mostly through hiring more operators of numerically-controlled machines and milling machines, etc.

The company has worked out a corporate development plan for 2006–10 based on the current contracts and most promising preliminary agreements. The contracts made recently (first of all on the MiG-29K/KUB, Yak-130 and M-101T) have contributed to the increase in the output and the considerable workload for the company. In this connection, Sokol’s management has taken a decision to set up a new machine shop to process airframe structural parts.

Living MiG

A number of measures to be taken due to Sokol joining the United Aircraft Corporation (UAC). In line with Presidential Decree No 140 dated 20 February 2006, Sokol was included into emerging UAC. But establishing the struc-
The main activities of the Sokol plant under the MiG “theme” had been connected with production and upgrade of MiG-29UB twin-seaters: another MiG-29UB assembling is shown above; MiG-29UBT is ready for delivery to its customer (bottom).

Alexei Fyodorov, Director General/Designer General of the MiG Corp., president of the UAC, chairman of the board of the Sokol plant JSC:

“The Nizhny Novgorod Aircraft Building Plant Sokol plans to invest about $700 million into its production capabilities in 2006 through 2010. The bulk of the money is to be paid for modernising and technical re-equipment and advanced technology introduction as well. Sokol is to become the mainstay company in MiG aircraft production in five years.”

The main activities of the UAC and relations within it as well as distribution of roles of individual companies within the corporation has just begun.

In 2005 MiG Corp. Director General (now UAC President) Alexey Fyodorov became chairman of the board of the Sokol plant JSC and this has beefed up company’s cooperative links with the MiG Corp. Its striving to get buddy-buddy with Sokol is owing to Sokol retaining many skilled production specialists and unique technologies, which is in many respects due to the MiG-21bis modernisation programme for the Indian Air Force, production and upgrade of the MiG-29UB, MiG-31, etc.

The cooperation has resulted in several major contracts for supplying the MiG Corp. with rigging and components to build MiG-29K/KUB fighters ordered by the Indian Navy. Sokol is assembling airframe components for the advanced Indian carrierborne fighters (under the deal struck three years ago, the Indian Navy is to take delivery of 12 MiG-29K single-seaters and four MiG-29KUB twin-seaters, with an option for 30 more aircraft like that). In addition, Sokol and the MiG Corp. have been running some other major programmes.

One of them concerns the production and upgrade of MiG-29UB twin-seat combat trainers under contracts with foreign customers. Sokol’s leaders believe that large-scale production of the aircraft of the type is hardly realistic, though the modernisation of the existing MiG-29UBs will continue as long as new orders are awarded.

“We have got such contracts that we are fulfilling,” Mikhail Shibayev told our correspondents.

Sokol sees the future for the MiG programmes in productionising the future MiG-35 multirole fighter – a heavily upgraded derivative of the existing MiG-29, which could be rated as a Generation 4++ aircraft. “The MiG-35, shipborne MiG-29K and Yak-130 are going to secure our basic future for the coming decades,” Mikhail Shibayev opined. The plant is to take part in the MiG-35 programme under long-term contracts to be made with the MiG Corp. in a manner similar to how the contracts struck under the MiG-29K/KUB programme are being fulfilled. Digital technologies will be widely used when productionising the MiG-35.

Second to none

Another export-oriented programme that has gathered momentum at Sokol concerns the production of an export variant of the MiG-31 long-range high-altitude intercep-
tor, the MiG-31E, to which keen interest has been shown by several Middle East and North Africa countries that have long operated Sokol-built MiG-25P interceptors.

The MiG-31E was derived by Sokol plant at its own expense. Sokol and the MiG Corp. determined its specifications. It has been displayed at air shows repeatedly, continuing to fly now. The MiG-31E’s export permit has been issued, and the advertising and export configuration descriptors have been completed.

There have been preliminary requests for the MiG-31E, with orders being negotiated.

Another important MiG-31-related programme run jointly with the MiG Corp. on order from the Defence Ministry is the long-term programme on upgrading the MiG-31 fleet in service with the Russian Air Force. At present upgraded MiG-31 prototypes are at the final stage of their official trials.

Sokol has been selected as prime contractor under the MiG-31 upgrade programme and, therefore, has readied a production line. To cut costs, the plant is going to combine the upgrade with complete scheduled overhaul to extend TBO, service life, warranties, etc. A number of suppliers and subcontractors have been selected to this end.

Gen. Vladimir Mikhailov, commander-in-chief, Russian Air Force:
“The MiG-31 interceptor, embodying numerous unique technologies, has been the backbone of the interceptor fleet of the air defence arm of the Russian Air Force. Its high speed and altitude serve the base for enhancing its combat capabilities further with emphasis on its multitrole capability. The unique flight characteristics of the aircraft and its radar can be improved further. In November 2006, we signed a preliminary agreement on the official trials of the upgraded MiG-31, and now the Air Force is facing bright vistas in large-scale upgrade of its interceptor fleet.”

However, the MiG Corp. is not the only developer Sokol plant cooperates with. The plant is bullish on the progress of the Yakovlev Yak-130 new-generation combat trainer production programme to be run in support of the Russian Defence Ministry.

Sokol plant made two Yak-130 production configuration prototypes in 2004–05, with the third aircraft completed and submitted

21st-century ‘flying school bench’

Gen. Vladimir Mikhailov, commander-in-chief, RusAF, speaking in the wake of his February 2005 flight on the Yak-130 from Sokol plant’s airfield:
“I flew in the rear seat of trainers for 25 years, training cadets, but I have not seen such an excellent aircraft like this. It is easy to fly and meets up-to-date requirements. Having completed a training course on this aircraft, rookies will feel confident in the cockpits of cutting-edge combat aircraft. The service needs about 200 planes like that, and we will be buying them gradually.”
for tests in 2006. To date, Sokol and Yakovlev have struck a deal for the fourth Yak-130 to be delivered in July 2007 for use under the official test programme. The aircraft is under construction.

In addition, the plant receives funding under a contract with Yakovlev for another Yak-130 airframe for fatigue tests to be delivered in August 2007.

The plant also landed a long-term Defence Ministry contract for building the Yak-130 for the Air Force. Sokol started construction of the 12-ship preproduction batch as far back as 2005. The production line has been completed.

A year ago, the Yak-130 was awarded the first export order. The planes will be built by Irkut corporation.

Sergey Chemezov, Director General, Rosoboronexport, speaking on the Yak-130’s export prospects on his June 2006 visit to Sokol plant:

“This is a very promising aircraft for promoting on the global market. It is the only aircraft in the world, combining the characteristics of the trainer and the fighter. We know real well that military experts of several countries have very keen interest in it.”

Air taxi

Sokol plant found itself to be central to the cooperative efforts to produce the M-101T Gzhel light multirole plane developed by the Myasishchev design bureau. The M-101T is new on the Russian market. Its turboprop engine, long range, high speed, sealed cabin and comfortable seats make the aircraft comfortable for business trips. For this reason, the M-101T Gzhel has been selected by the Avia Management Group (AMG), which runs the first national air taxi programme dubbed Dexter, to make up its air taxi fleet. Recently, the plane was given another very important role to play, with it having been selected the airliners future pilots training aircraft.

The Air Transport Systems company (Russian acronym VTS) leases M-101Ts for use as Dexter air taxi cabs. The first Gzhel was delivered to Dexter on 3 March 2006, and AMG has been operating as many as eight air taxis to date. Several more aircraft are slated for delivery this year. The M-101T is made in PAX and VIP configurations (six and four seats, respectively). The number of aircraft used under the Dexter air taxi programme is to have been 45 in the following years. The total number of aircraft to be made by Sokol plant to complete the programme is about 200.

In addition to the planes delivered to AMG, three more M-101Ts are in service in Nizhny Novgorod. They are owned by Sokol plant that flies them on special passenger and cargo missions in support of the company.

Air taxi commander-in-chief Gen. Vladimir Mikhailov after familiarisation flight in the first Yak-130 built by the Sokol plant, February 2005 (top) 6-seat M-101T turboprop comfortable passenger planes are in service with the first Russia’s air taxi company since last spring

Sergey Nederoslev, chairman of the board, Kaskol Group, speaking in December 2005 on IFC’s granting Dexter a $8 million loan to be spent on developing the first Russian air taxi system:

“The first tranche of IFC’s credit has served another proof that the decision to select Russian M-101T aircraft from Sokol plant for launching the Dexter programme was right.”
**UAC registered**

On 2 November 2006, the session of the governmental commission on integrating the companies of the Russian aircraft industry, chaired by Industry and Energy Minister Victor Khristenko, approved the establishing of the United Aircraft Corporation (UAC) being set up under Presidential Decree No 140 dated 20 February 2006.

Opening the session of the governmental commission, which was set up by Resolution No 223 dated 20 April 2006, Victor Khristenko reminded those present that “the future of the aircraft industry lies in the deliberate integration with the global market, in international cooperation with concurrent preservation and furthering of core aircraft-making competencies in the Russian Federation, in reasonable concentration of assets and in large-scale involvement of private capital and private initiative”.

Currently, there is a proactive assets consolidation within the industry – the stage the Western aircraft manufacturers have passed already. The gist of the consolidation is the establishing of UAC. According to the minister, the asset consolidation is a difficult, long-term and unavoidable process comprising the conduct of technical auditing, determining specialties of individual companies, devising and implementing a restructuring plan and fulfilling corporate procedures required.

Victor Khristenko noted that all relevant steps were been made to set up the new corporation, e.g. the commission have completed evaluation of the stock the companies submit to UAC’s authorised capital stock as the payment and has worked out the terms of privatising those companies. The Deloitte & Touche CIS company handled the auditing of the companies’ market value.

UAC’s founder, the Russian Federation, contributes the following stock as its share in UAC’s authorised capital stock: 100 percent of the stock of the Sukhoi Aviation Holding Company, 15% of the Aviaexport Foreign Trade Association, 38 percent of the Ilyushin Finance Co., 25.5 percent of the Komsomolsk-on-Amur Aircraft Production Association, 86 percent of the Ilyushin interstate aircraft-making company, 38 percent of the Nizhny Novgorod-based Sokol aircraft-making plant, 25.5 percent of the Novosibirsk Aircraft Production Association, 90.8 percent of the Tupolev joint stock company and 58 percent of the Financial Leasing Company.

The commission authorised the feasibility of introducing 38.2 percent of the total worth of the Irkut Corp.’s stock as contribution of private stockholders to UAC’s authorised capital stock. Since Sukhoi that is becoming part of UAC owns 11.89 percent of Irkut, the newly established corporation will get Irkut’s controlling stock of 50.09 percent. Given that Sukhoi also owns 74.5 percent of stock of its major aircraft manufacturers KnAAPO and NAPO, it turns out that UAC is to own these companies lock, stock and barrel. The control stock of two leading commercial aircraft manufacturers, Aviastar in Ulyanovsk and VASO in Voronezh, are taken over by UAC as well, even though the two are not apparently on the current list (since more than 73 percent of Aviastar’s stock are owned by Tupolev and over 56 percent of VASO’s stock belongs to Ilyushin).

As a result, the bulk of the Russian military and commercial aircraft developers and manufacturers are to be consolidated under UAC at the first stage. Stage II is to see two remaining Russian aircraft-making majors, the MiG Corp. and KAPO (both are federal state companies so far), as well as a number of private stockholders operating in the aircraft industry, joining UAC by 1 April 2007 following their privatisation. So far, the government’s share in UAC is much higher than planned, totalling 90.1 percent, while private stockholders account only for 9.9 percent of UAC’s stock (these are the shares of Irkut’s co-owners, which are being transferred to UAC).

By the time of UAC’s registration, the Federal Agency for Federal Property Management had considered the evaluated shares of joint stock companies included into UAC’s authorised stock and provided the data used by the governmental commission to form the policy of the Russian Federation as to the size of UAC’s authorised capital stock and the size of the Russian Federation’s share in it. At the first stage, UAC’s authorised capital stock is to be about 96.7 billion rubles, or slightly over $3.6 billion, with the Russian Federation’s share in it standing at about 87 billion rubles, or about $3.3 billion.

Members of the commissioned came to an agreement on the draft charter of UAC and set forth provisions on the composition of the corporation’s board of directors and auditing committee. The board includes Deputy Prime Minister/Defence Minister Sergey Ivanov as chairman; Igor Putilin, First Deputy Chairman of the Military Industrial Commission under the auspices of the Russian government; Deputy Industry and Energy Minister Andrey Reus; Air Force Commander-in-Chief Vladimir Mikhailov; presidential aide Igor Shuvalov; head of the Federal Agency for Industry Boris Alyoshin; head of the Federal Agency for Federal Property Management Valery Nazarov; head of the Federal Military Technical Cooperation Commission Mikhail Dmitriyev; MiG Corp. Director General Alexey Fyodorov; Rosoboronexport Director General Sergey Chemezov, Transport Minister Igor Levitin, Deputy Economic Development and Trade Minister Andrey Belousov; Sberbank’s Chairman of the Board Andrey Kazmin and VTB’s President and Chairman of the Board Andrey Kostin. Alexey Fyodorov was recommended as president and chairman of the board.

UAC’s registration was completed on 20 November 2006, when the corporation was issued with its registration certificate and registered with the tax authorities. The UAC joint stock company is registered at 22 Ulansky Lane, Moscow.

The first session of the United Aircraft Corporation’s board of directors took place in mid-December. Among other things, it approved Alexey Fyodorov as president and chairman of the board of UAC. Other personnel and organisational matter were tackled as well.

### Company List

<table>
<thead>
<tr>
<th>Company</th>
<th>Capitalisation, billion rubles ($)</th>
<th>Stock submitted to UAC, %</th>
<th>Asset’s share in UAC’s value, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sukhoi</td>
<td>52.4 (2.0)</td>
<td>100</td>
<td>54.2</td>
</tr>
<tr>
<td>KnAAPO</td>
<td>38.0 (1.4)</td>
<td>25.5</td>
<td>10.0</td>
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<td>NAPO</td>
<td>2.7 (0.1)</td>
<td>25.5</td>
<td>0.7</td>
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<tr>
<td>Irkut</td>
<td>25.0 (0.95)</td>
<td>38.2</td>
<td>9.9</td>
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<tr>
<td>Sokol</td>
<td>3.1 (0.12)</td>
<td>38</td>
<td>1.2</td>
</tr>
<tr>
<td>Ilyushin Finance Co.</td>
<td>11.7 (0.44)</td>
<td>38</td>
<td>4.6</td>
</tr>
<tr>
<td>Ilyushin</td>
<td>11.9 (0.45)</td>
<td>86</td>
<td>10.6</td>
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<tr>
<td>Tupolev</td>
<td>4.0 (0.15)</td>
<td>90.8</td>
<td>3.8</td>
</tr>
<tr>
<td>Financial Leasing Company</td>
<td>8.0 (0.3)</td>
<td>58</td>
<td>4.8</td>
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<tr>
<td>Aviaexport</td>
<td>2.0 (0.08)</td>
<td>15</td>
<td>0.2</td>
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</table>
For more than 60 years the Zaporozhye Machine-Building Design Bureau Progress State Enterprise named after Academician A.G. Ivchenko (SE IVCHENKO-PROGRESS) is involved in design of engines to power aircraft and helicopters of various types and industrial drives and special equipment as well. For this period of time the engine-manufacturing plants produced over 70000 units of piston and gas turbine aeroengines, industrial turbine starters and drives. The aeroengines designed by SE IVCHENKO-PROGRESS power 57 types of aircraft operated in 109 countries of the world.

The sphere of SE IVCHENKO-PROGRESS activities is as follows: design, manufacture, certification, overhaul, test, development, putting into series production and further improvement of consumer’s characteristics of aviation and industrial gas turbine engines.

More than 60 certificates of Bureau Veritas, AR MAK and GosAviaSluzhba of Ukraine confirm the quality, reliability and the right to produce and upgrade engines.

Currently there is a demand in trainers of improved combat training featuring stability and flight qualities of updated and prospective fighters and a high “cost-effectiveness” factor, as well as in a development of light attack airplanes and fighters based on the trainers. Such aircraft required a new engine having the performance of the best in the world turbofans designed for combat aircraft.

**AI-25TLSh**

The modified AI-25TL engine version with a thrust of 1850 kgf at a maximum power rating. The main AI-25TLSh advantages as compared with the basic engine are as follows: a higher maximum thrust, acceleration time is two times lower. The flight tests showed a substantial improvement in the aircraft dynamic characteristics (acceleration, rate of climb), reduced takeoff and maneuver time. The engine has passed interstate tests and is mounted in the L-39U airplane, its installing in the JL-8 trainer is possible.

The updated engine when installed in the L-39 airplane extends its lifetime by 10-15 years.

**Operational power rating**

<table>
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<tr>
<th></th>
<th>Combat</th>
<th>Training</th>
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<tr>
<td><strong>Maximum power (S/L static; ISA)</strong></td>
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<td>1,720</td>
</tr>
<tr>
<td>Thrust, kgf</td>
<td></td>
<td></td>
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<tr>
<td>Specific fuel consumption, kg/kgf·h</td>
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<tr>
<td><strong>Maximum power (S/L; М 0.6; ISA+15°C)</strong></td>
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<td>1,100</td>
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<tr>
<td>Thrust, kgf</td>
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<td>Acceleration time, sec, max</td>
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**Dimensions, mm**

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<td>Length (with exhaust pipe)</td>
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<tr>
<td>Width</td>
<td>985</td>
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<tr>
<td>Height</td>
<td>958</td>
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<tr>
<td>Weight, dry, kg</td>
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<tr>
<td>Assigned service life, h</td>
<td>4,000</td>
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The SE IVCHENKO-PROGRESS has designed the AI-222 engine featuring the performance of the best in the world turbofans designed for combat aircraft.

**AI-222-25**

The basic engine with a takeoff thrust of 2500kgf. It is currently passing a program of official tests as installed in the Yak-130 training combat aircraft (Russia).

The materials of parts and special coatings offer an all-climate engine operation.

The engine modular design allows a quick line-replacement of modules, which served out their service life or damaged in combat operations. The engine consists of 12 modules.

**AI-222-22**

The modified AI-222-25 engine version with a thrust of 2200 kgf under maximum power rating at takeoff. This engine was designed with a fan of varied diameter and reduced engine total air flow rate. The engine core is fully unified with that of the basic AI-222-25 bypass turbofan.

**AI-222-25 UVT**

The modified AI-222-25 engine version with a vectored thrust (VT). A swiveling jet pipe, which is an individual module, installed on the rear turbine bearing support flange was developed. To increase the aircraft maneuverability and takeoff and landing characteristics the all engines of the AI-222 engine family can be equipped with the vectored thrust systems which provide an all-aspect deviation of a jet stream up to 20° from the engine axis.

**AI-222K-25F**

The modified AI-222-25 engine version with a thrust of 4200 kgf under a full afterburning at takeoff. The turbine compressor section is completely unified with the basic AI-222-25 engine.

The experimental batch of the AI-222K-25F engines is under manufacturing now to power advanced trainers. Preliminary bench tests have been already started.

**AI-222-28**

This modified engine version will be developed by introducing a turbine with an improved cooling system in the basic engine. This turbine type is designed as based on the experience of the D-18T and D-27 turbine development which allows a significant increase in a gas temperature while ensuring a thrust increased up to 2800 kgf at takeoff and up to 3000 kgf at combat rating. The compressor and combustion chamber sections of the AI-222-25 and AI-222-28 engines are completely unified.

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Due to optimum thrust and fuel efficiency values, low noise and emission levels, high service life and low operating cost which meet the requirements of the XXI century the AI-222 family engines will allow to develop highly competitive manned airplanes and UAVs.
15 December 2006 saw the handover ceremony of two production Sukhoi Su-34 multirole tactical strike aircraft at the Novosibirsk Aircraft Production Association’s (NAPO) airfield. The acceptance report was signed by Russian Air Force Commander Gen. Vladimir Mikhailov, Sukhoi Director General Mikhail Pogosyan and NAPO Director General Fyodor Zhdanov. Mention should be made that this has been, essentially, the first delivery of new production warplanes to RusAF over almost decade and a half. Until then, the manufacturers had been only overhauled and upgraded Soviet-built aircraft.

The two newly painted Su-34s were given side numbers 01 and 02. The first of them was assembled by NAPO last summer and first flown by the plant’s test pilots on 12 October 2006. Now, it has been taken over by military test pilots; the crew of the Defence Ministry’s Chkalov GLITs State Flight Test Centre – Col. Igor Mallikov (leading Su-34 test pilot, Hero of Russia) and Col. Alexander Oschepkov (test navigator) – was to ferry it to Akhtubinsk. Early this year, the first production Su-34 and a preproduction aircraft of the type (side number 48) will fly to Lipetsk following a brief test programme and conversion of combat pilots to it. In Lipetsk, RusAF’s Combat and Conversion Training Centre (CCTC) pilots and technicians will start learning to fly and maintain it and devising methodological recommendations and combat training for flight and ground crews of combat units. Once fitted with additional avionics systems and having completed a number of tests, the second production aircraft that the military accepted officially in Novosibirsk in December will join them.

NAPO’s full-rate Su-34 production for the Russian Air Force is under way in line with the Defence Ministry’s resolution signed in 2005 based on the preliminary conclusion as to the aircraft’s compliance with the Service’s requirements, drawn from the results of the first stage of the official trials completed in June 2003. The first stage of the official joint tests of the Su-34 modified in line with RusAF’s specified specifications requirements was over with success on 30 September 2006. In December, the next, three-year stage of Su-34 tests commenced to integrate advanced weapons within its weapons suite, which is intended to beef up the plane’s combat capabilities.

Under a three-year contract with the Defence Ministry, NAPO is to make and deliver 18 Su-34s to RusAF in order to have converted a bomber air regiment to the Su-34 by 2010. According to Mikhail Pogosyan, advanced bombers’ production rate at NAPO is to be eight to ten aircraft a year by then. According to Deputy Prime Minister – Defence Minister Sergey Ivanov, the state armament programme provides for delivery of 58 Su-34s to the Air Force until 2015. According to the Service’s chief, Gen. Vladimir Mikhailov, RusAF needs about 200 Su-34 aircraft to oust the current Su-24M bomber fleet gradually. So far, concurrently with making Su-34s, NAPO overhauls and upgrades Su-24Ms, the latest of which was built by NAPO in 1993. The attendees of the early production Su-34 acceptance ceremony were shown some of the Su-24M2s overhauled and upgraded by NAPO for the RusAF.
Air Force took delivery of six Su-25SMs

Six upgraded Sukhoi Su-25SM ground attack aircraft were accepted by the Russian Air Force at the Defence Ministry’s 121st Aircraft Repair Plant (121 ARZ) at Kubinka AFB (Moscow Region) on 28 December 2006. Those were the first Su-25s returned to RusAF following their upgrade being handled by the 121 ARZ plant that is prime contractor for the upgrade programme. The warplanes were accepted by RusAF Commander-in-Chief Gen. Vladimir Mikhailov in the presence of 121 ARZ chief Yakov Kazhdan, Sukhoi Attack Aircraft Scientific Production Concern Chief Designer/Director General Vladimir Babak, personnel of the plant and RusAF officers. Once the first six upgraded aircraft complete their trials, they are to be ferried to the Combat and Conversion Training Centre (CCTC) in Lipetsk where, according to Gen. Mikhailov, “the best instructor pilots will teach these aircraft to fight and refine their combat techniques”, and then they will enter the inventory of the attack aircraft regiment garrisoned at Budyonnovsk (Stavropol Region) and organic to the 4th Air Force/Air Defence Army operating in the North Caucasus Military District.

The 121 ARZ plant and the Sukhoi Attack Aircraft concern have been running the Su-25 upgrade programme for the Russian Defence Ministry since 2001. The basic upgrades include enhanced precision, a wide weapons employment envelope and a service life extension. According to Sukhoi, “the Su-25SM is fitted with the totally renovated weapons and avionics suites allowing the use of TV-guided and laser beam-riding precision-guided munitions. The attack aircraft’s upgraded targeting/navigation suite enhances the accuracy of navigation by far and, coupled with the latest weapons management system, increases the accuracy of both ‘dumb’ and ‘smart’ air-to-ground weapons, including that during complicated manoeuvres and increased maximum combat employment altitude. The hostile aircraft kill probability has grown by several times.”

The improvements of the avionics suite include the PrNK-25SM upgraded targeting/navigation system with the A-737 satnav receiver and a colour multipurpose LCD in at the pilot’s combat station, SUO-39 fire control system, Banker-2 radio, ARK-M radio direction-finder, advanced video cameras and flight recorders as well as L-150 ELINT station replacing the obsolete radar warning receiver. The weapons suite features the more sophisticated R-73 missiles instead of the R-60 air-to-air missile. The operating envelope of the organic dumb and smart air-to-surface weapons, including the Kh-25ML and Kh-29L laser beam-riding homing missiles, has been expanded, with the weapons suite being beefed up with the KAB-500Kr TV-guided smart bombs.

The fly-out of the first 121 ARZ-upgraded Su-25SM (side number 33) took place on 5 March 2002, with the aircraft unveiled as a static display during the MAKS 2001 air show. It was followed into the trials by the second upgraded aircraft (side number 19) in 2003. The joint official testing programme was wrapped up in 2005. Once the report was submitted, the 121 ARZ plant launched the so-called series upgrade of the Russian Air Force’s Su-25 fleet. “Essentially, the new aircraft has been developed in less than four years,” Gen. Mikhailov said at the acceptance ceremony. “The aircraft have been tested and then improved even more, and here they are.” Once the six upgraded aircraft have been given new paintjobs, they received new side numbers (01 through 06) as well.

At present, the plant is upgrading another batch of the Air Force’s attack aircraft. According to the Service chief speaking at Kubinka AFB, six more newly upgraded Su-25SMs are slated for acceptance by RusAF in 2007, with eight more to follow suit in 2008. Gen. Mikhailov said two attack aircraft regiments in all are to convert to the Su-25SM in the near future.
Russian Long-Range Aviation to get new Tu-160s

The Kazan Aircraft Production Association (KAPO) is completing another new Tu-160 strategic bomber intended to beef up the Tu-160 fleet operated as part of the 121st Guards Heavy-Bomber Air Regiment of the 37th Air Army at Engels AFB in the vicinity of Saratov. Now, the regiment flies 15 Tu-160s, with the 15th one delivered in July 2006 following its overhaul and upgrade by KAPO. The new bomber is to become the first heavily upgraded aircraft of the type, capable of using both advanced precision-guided munitions (e.g. cutting-edge cruise missiles) and ordinary ordnance. According to Defence Minister Sergey Ivanov speaking during the July 2006 acceptance ceremony of the overhauled Tu-160 c/n 202 (now it has side number 19 and was named after its chief designer Valentin Bliznyuk), the new Tu-160 was planned to have been completed by year-end. It may be followed by another aircraft of the type – one of the backlog dating back to the 1990s. In addition, two more of the Air Force’s Tu-160s have arrived to KAPO for overhaul.

II-76MD-90 kicks off official trials

In October last year, the first upgraded Il'ushin II-76MD-90 airlifter in service with RusAF's 61st Air Army started its official test programme. It is powered by advanced Perm Motors PS-90A-76 turbofan engines. Compared with the D-30KP-2 that use to power the II-76MDs in combat units, the PS-90A-76 features a 20-percent increase in thrust and a 17–19-percent hike in efficiency, which enabled the II-76MD-90’s carrying capacity to grow up to 50 t and allows the airlifter’s operation from shorter runways. In addition, the II-76MD-90 powered by PS-90A-76 engines is compliant with ICAO’s Chapter IV noise standards, which enables the aircraft of the type to operate throughout the world in the wake of the international rules becoming more stringent.

The airlifter was upgraded by VASO plant in Voronezh, which airfield was used by the first II-76MD-90 (RA-78854) for its first flight on 27 December 2005. The aircraft has been flown to the LII Flight Research Institute in Zhukovsky for the main stage of its test programme that is expected to be short enough, because the commercial variant of the re-engined airlifter, the II-76TD-90D built by Tashkent aircraft production Corp. (TAPC) on order from Volga-Dnepr airline in 2005, has completed its tests and been operated actively since last summer. Volga-Dnepr is going to take delivery of the second aircraft like that in 2007, and this year the first of the two re-engined II-76TD-90s ordered by Azerbaijan’s Silk Way Airlines will be delivered to the customer.

According to repeated statements by RusAF commander-in-chief Gen. Vladimir Mikhailov, the Service’s military transport arm will have received 12 upgraded II-76MD-90s until 2010. VASO will re-engine them under the current governmental arms procurement programme.

Another Ka-50 built in Arsenyev

In late December 2006, tests of another production Kamov Ka-50 helicopter started at the airfield of the Progress aircraft plant in the town of Arsenyev in the Primorsky Region. The machine with c/n 03-03 completed its first flight with the plant’s test pilot Vladimir Utval. The Ka-50 he flew out is the second aircraft of the type completed by Progress last year on order from the Russian Defence Ministry. The first machine, which was made there as far back as in late 1990s but sat idle for six years for want of engines and other components in the wake of the termination of the Ka-50’s full-rate production and acquisition in 1998, kicked off its trials in August last year.

The Progress factory made 12 Ka-50s in 1991–98, with five prototypes built by Kamov company out of Moscow in 1982–90. Some of them were given to the military and the remainder to the developer for tests, further upgrade and deriving new versions. The 12th production aircraft turned to be unlucky, having got stuck at the plant since then. Once the funding resumed in 2006, it was first to be prepared for flights last August. It was followed by the Ka-50 c/n 03-03 on its first flight.

According to an official news release by the Federal Agency for Industry, both machines had been delivered to the customer before the end of 2006. In addition, the next Ka-50 (c/n 03-04) has virtually been completed. It is to join the tests soon. According to the RIA Novosti news agency, Progress is intent on making four Ka-50s for the Defence Ministry in 2007. Their construction began as far back as the ‘90s. In addition, airframes and assemblies of several more aircraft are being worked on. As is known, during his visit to the Russian Far East in August 2006, Deputy Prime Minister and Defence Minister Sergey Ivanov told the press that 12 Ka-50s were planned to be bought before 2015 under the governmental defence procurement programme. Prior to that, he had said: “Under the governmental defence procurement programme, 12 such aircraft will be acquired. All of them are designed for service with the Main Intelligence Directorate and for accomplishing special missions, including counterterrorist ones.”

By the way, the Arsentyev-based Progress plant pins its hopes on the feasibility of exporting Ka-50s and Ka-52s. Talks on that became more high-profile last year.
The representative of the new versions generation of the popular MiG-29 light tactical fighter – its heavily upgraded MiG-35 multirole derivative – is to make its debut at the upcoming Aero India 2007 air show in Bangalore. Referred to as a Generation 4++ aircraft, the fighter may succeed the current MiG-29 and MiG-29SMT on the global arms market a few years further down the road. Unveiling the MiG-35 demonstrator at Bangalore pursues a definite goal: it is the model that the MiG Corp. and Rosoboronexport intend to submit for the Medium MultiRole Combat Aircraft (MMRCA) tender the Indian Air Force (IAF) is to announce in the near future. Under the MMRCA programme, IAF plans to get 126 advanced fighters, the bulk of which is to be assembled by the Indian aircraft factories. Competitors of the MiG-35 under the upcoming tender are to be the US F-18E/F and F-16 Block 70, French Mirage 2000-5 and Rafale, West European Typhoon and Swedish Gripen. Most of them are very stiff competitors, and for this reason, minor modifications to the existing MiG-29 will not be enough for the MiG-35’s developer to come on top in the tender. Therefore, the MiG-35’s design, albeit outwardly similar to the production MiG-29, embodies a number of radical innovations that qualify it as a Gen. 4++ warplane.
The MiG-35 multirole tactical combat aircraft is designed for round-the-clock elimination of aerial and surface threats in any weather in the face of the enemy’s active and passive electronic countermeasures (ECM). Its objectives include aerial threat interception, air superiority, interdiction, suppression of enemy air defences, close air support and naval threat elimination.

The MiG-35 is being derived from the MiG-29K multirole carrierborne fighter developed on order from the Indian Navy and, together with it, will make up the family of MiG-29 tactical fighter new-generation derivatives, which entered production in 2006. The family is expected to be made up of by at least four commonised variants — the MiG-29K and MiG-29KUB multirole shipborne fighters in the single-seat and two-seat configurations (they might be re-designated as MiG-33 and MiG-33D in the future) and the single-seat MiG-35 and twin-seat MiG-35D multirole tactical fighters carrying the new-generation avionics and weapons suites. In addition, to meet the requirements of some of the customers, there will be production of the MiG-29M and MiG-29M2 multirole tactical fighters commonised with the MiG-35 and MiG-35D in terms of airframe and basic aircraft systems, but featuring somewhat more modest capabilities in terms of avionics and weapons that are to be commonised with the MiG-29SMT and MiG-29K/KUB.

Each pair of the fighters features a 90-per cent or more degree of commonality, with the single-seater and twin-seater having the same design of their fuselage forward sections and cockpit canopy and the single-seater’s rear combat station occupied by an extra fuel tank or additional avionics units, if the customer wishes so.

Compared to the existing MiG-29, the basic new features of the MiG-35 and MiG-35D are going to be the following:
- supermanoeuvrability through the use of the reduced longitudinal stability aerodynamic configuration, fly-by-wire control system and powerful engines, especially if the latter are fitted with the thrust vector control system;
- extended range by means of a larger internal and external fuel capacity and the in-flight refuelling capability;
- high survivability due to reduced observability, up-to-date self-defence suite, aircraft system redundancy, etc.;
- enhanced reliability owing to time-proven technical and design solutions, integral systems ‘health’ monitoring and failure forecasting.

In terms of design, the MiG-35 and MiG-35D are derivatives of the upgraded two-seat MiG-29M2 fighter that was, in turn, derived in 2001 from the MiG-29M prototype (side number 154) made in 1990. It has an upgraded sharp-LERX aerodynamic configuration and a quadruple-redundant 3D digital fly-by-wire control system ensuring good stability and controllability in the manual and automatic flight modes, including automated mid-air refuelling and supermanoeuvrability at post-stall angles of attack.

At the same time, the MiG-35 will be radically different from both the production MiG-29 and MiG-29SMT, on the one hand, and the MiG-29M and MiG-29M2 prototypes, on the other, in terms of
MiG-35 multirole fighter general layout

Drawing by Alexey Mikheev

Pilots cockpit new information management system
with three multifunctional colour liquid crystal displays and wide-angle head-up display in the forward cockpit and four multifunctional colour LCDs in the second one

Unified forward fuselage section
for both single-seat and two-seat aircraft
(in the single-seat version the second pilot’s cockpit is replaced with an additional fuel tank/optional equipment units)

OLS-UEM forward-looking optronic search-and-track system
with IR, TV and laser range-finder/target illumination channels

Integrated in-flight refueling system

Elimination of upper air intakes
(foreign objects damage protection grills introduced in main air ducts)

Strengthened undercarriage
providing take-off at max T/O weight of 23,500 kg and landing with max landing weight of 16,800 kg

Integrated GSh-301 cannon
of 30 mm caliber
with ammo load of 150 rounds

Zhuk-AE multimode active phased array radar
providing target detection range not less than 130–140 km and possibility of simultaneous tracking of up to 30 aerial targets in track-while-scan mode, featuring greater ground mapping resolution and higher jamming resistance and survivability
Increased internal fuel tanks of approx. 1.5 times higher fuel capacity if compared with production MiG-29 fighters

Wing of greater span and area featuring 10 hardpoints for different weapons

RD-33MK upgraded turbofans with 9,000 kgf thrust in full afterburner mode, BARK-42 digital automatic monitoring and control system and extended life (assigned life 4,000 hours, time before first overhaul 1,000 hours). Under the customers request, MiG-35 could be fitted with RD-33MKV thrust vector control engines whose nozzles can swivel ±20° all-aspect

KSA-33M advanced double accessory gearbox with enhanced reliability and advanced VK-100 turbine starter

Kh-31A anti-ship active radar-guided missile

RVV-AE medium range active radar-guided air-to-air missile

Kh-31P anti-radiation passive radar-guided missile

KAB-500Kr TV-guided bomb

Ka-35 anti-ship active radar-guided missile

Kh-29T/TE TV-guided air-to-surface missile

Quadruple-redundant three-axis digital fly-by-wire control system ensuring good stability and controllability in the manual and automatic flight modes, including automated in-flight refuelling and supermanoeuvrability at poststall angles of attack
manufacturability. It will embody large welded structures of the basic airframe load-bearing elements and feature a radically increased use of composites. On the one hand, this will allow a hike in its assigned life and service life (up to 6,000 flight hours and 40 years) and, on the other, this will facilitate the reduction in its radar signature.

A larger wing is to be designed for the MiG-35, making its wingspan as long as that of the one on the MiG-29K/KUB. The new wing will have two extra hardpoints. As a result, the MiG-35 will be able to carry various payloads weighing a total of 6,500 kg and attached to 11 hardpoints—10 under the wing and one under the belly. In the future, the plane is going to ditch its dorsal air brake, whose job will be handled by differentially deflected rudders.

**Powerplant**

The MiG-35 will be powered by upgraded Klimov RD-33MK engines featuring a far extended life (assigned life – 4,000 hours, time before first overhaul – 1,000 hours) and an afterburning thrust of 9,000 kgf each (5,400 kgf each at maximum rating). At the customer’s request, the fighter can be fitted with RD-33MKV thrust vector control engines whose nozzles can swivel ±20° all-aspect. Thrust vector control engines have been refined on the MiG-29M-OVT prototype (side number 156). The RD-33MK differs from the production RD-33 Series 3 in both an extended service life and the BARK-42 digital automatic monitoring and control system usage, and are fitted with so-called smokeless combustors as well. The RD-33MK was developed by the Klimov company in St. Petersburg and has been in full-rate production by Chernyshev MMP since 2006 to fit the MiG-29K/KUB carrierborne fighters under construction on order from the Indian Navy. Klimov works to hone the engine still further, which could yield a version boasting even better characteristics.

The MiG-35 is to be fitted with the advanced KSA-33M double accessory gearbox with sharply enhanced reliability equipped with advanced VK-100 turbine starters. The accessory gearbox was developed by Klimov and manufactured by Krasny Octiabr.
The fighter’s internal fuel capacity is to increase by about 1.5 times over that of the standard MiG-29 through reconfiguring the existing fuel cells within the airframe and introducing new ones. In addition, the aircraft will have an integral in-flight refuelling system and larger drop tanks. The single-seat variant has an extra fuel cell of about 620 litres in place of the backseater’s combat station.

**New-generation avionics suite**

The new-generation avionics suite is an open-architecture design using a MIL-STD-1553B-compliant multiplex data bus. This provides the aircraft with multirole combat capability and simplifies integration of new Russian and foreign avionics and weapons, including podded ones. The HOTAS capability is designed to control weapons.

The MiG-35’s fire control system is wrapped around the promising Zhuk-AE active phased-array radar, OLS-UEM forward-looking IRST system, OLS-K 360-deg. lookdown IRST in a conformal pod under the straboard air duct and a helmet-mounted target designation and indication system. The Phazotron-NIIR corporation is developing the Zhuk-AE AESA radar and the NIIPP Semiconductor Device Research Institute is handling the development of the OLS-UEM and OLS-K optronic systems and a number of optronic self-defence sensors as well. At the customer’s request, the upper mentioned optronics set can be replaced with the upgraded KOLS-13SM IRST and podded Sapsan-E IR/laser targeting system from the UOMZ Ursals Optical and Mechanical Plant.

The PrNK-35 targeting/navigation suite from the Ramenskoye Instrument Design Bureau (RPKB) comprises up-to-date inertial and satellite navigation aids. In terms of the cockpit management system layout, the MiG-35 and MiG-35D are similar enough to the MIG-29K and MiG-29UB (the singleseater’s pilot is provided with three large multifunction liquid-crystal displays and a wide-angle head-up display; the rear seat of the twinseater is furnished with four LCDs), but its LCDs’ resolution and operating speed is to be enhanced somewhat. The self-defence suite includes the L-150 ELINT station, missile launch warning and laser illumination warning receivers, SAP-518 and KS-418 active ECM stations (both integral and podded ones) and a chaff/flare dispenser.

To enhance pilot training and flight safety, the MiG-35 will be outfitted with the Kart-23-B-35 flight data recorder, SVR-23M1K video recorder and Trenazh-29 weapon simulation and effectiveness control system.

The MiG-35’s avionics suite may incorporate foreign-made systems, should the customer wishes so.

**Weapons options**

On air-to-air missions, the MiG-35 relies on the RVV-AE medium-range active radar-guided missiles and R-73E dogfight IR-guided missiles. To deal with ground targets, it uses the Kh-29TE TV-guided missiles, KAB-500Kr (OD) and KAB-1500Kr TV-guided bombs or KAB-500L and KAB-1500L-F laser-guided bombs, as well as 3M14-AE long-range active radar-guided missiles along with such ‘dumb’ weapons as 80mm and 122mm rockets and 100–1,500 kg gravity bombs.

Elimination of naval threats is achieved by means of Kh-31A and Kh-35E antiship missiles. Hostile radars are dealt with by using Kh-31P antiradiation missiles. In

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**MiG-35 basic specifications (with MiG-35D data in brackets)**

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20 January saw the first prototype of the MiG-29KUB multirole carrierborne fighter complete its maiden flight at Gromov LII’s airfield in Zhukovsky. The aircraft was built under the contract with the Indian Navy. It was flown by Mikhail Belyayev, senior test pilot under the programme, and Pavel Vlasov, MiG Corp. chief test pilot and flight-test programme manager. Interestingly, the new fighter first flew three years sharp on that day after the deal on the MiG-29K and MiG-29KUB for the Indian Navy had been clinched. The contract was signed on 20 January 2004. It provides for delivery 12 MiG-29K singleseaters and four MiG-29KUB twinseaters in 2007–09 and an option for 30 more fighters to be delivered until 2015. The first shipborne fighter prototype for the Indian Navy was built in the two-seat configuration and is soon to be followed by a singleseater whose construction is being completed by the MiG Corp. Both versions feature a very high degree of commonality, even more so that their nose sections are virtually identical and have the same ‘twin-seat’ cockpit canopy, with the single-seat MiG-29K featuring an extra fuel cell instead of the rear seat.

The MiG-29/KUB’s avionics suites comprises Russian, French, Israeli and Indian-made systems. Their weapons suites are all-Russian and generally similar to those of the upgraded MiG-29SMT fighters.

Flight testing of separate technical solutions, aircraft systems, new avionics and weapons for MiG-29K/KUB aircraft started in 2002. Eight MiG-29 family prototypes and flying testbeds, including two MiG-29K prototypes vintage 1988 (No 311 and 312), the MiG-29M2 (No 154), three MiG-29SMT and two MiG-29UB fighters, were involved in the programme with more than 700 test sorties performed in 2002–06. The second prototype under the programme, the single-seat MiG-29K, is
in 2002–06 to hone the design and aerodynamics of the new forward fuselage section, advanced cockpit management system and a number of avionics systems. All of these are to be embodied in the future production MiG-35 and MiG-35D fighters. In 2006, the advanced OLS-UEM IRST was fitted to and tested on the plane, followed by the OLS-K pod-mounted optronic targeting system. Late 2006 saw the aircraft fitted with a Zhuk-AE AESA radar demonstrator featuring an array about 500 mm in diameter. This March, after the technology demonstrator returns from the air show in Bangalore, it is to start flight testing of its AESA radar.

Given the high degree of commonality between the MiG-35 and MiG-29K, a large part of the test flights completed under the carrierborne fighter’s test programme, including those involving the MiG-29M2 prototype, MiG-29SMT and MiG-29UB flying testbeds as well as MiG-29M-OVT supermanoeuvrable prototype, could be taken into account.

The design study of the MiG-35’s production model is set to be completed in November this year, with that of the whole avionics suite in February 2008. The first MiG-35 prototype in the production configuration is to be made and submitted for tests in the end of the next year.

Production of the MiG-35 and MiG-35D is to be run by the team that is manufacturing the MiG-29K/KUB fighters ordered by the Indian Navy. Some large airframe parts are to be made by the Sokol plant in Nizhny Novgorod, with the rest of parts and the final assembly to be handled by the MiG Corp.’s Production Centre in the town of Lukhovitsy out of Moscow.

Once relevant deals are clinched, the delivery of the first MiG-35 and MiG-35D fighters may kick off until the end of the decade.

MiG-29KUB prototype flown on 20 January became the first flying aircraft in the new family of MiG-29 next generation versions that will include MiG-35 and MiG-35D multirole combat aircraft as well.

now being preparing for flight tests and will be taken into the sky later this year.

At the same time with kicking off the MiG-29KUB flight test programme, the MiG Corp. launched series production of the MiG-29K and MiG-29KUB fighters for the customer. The first series-production aircraft are now under construction at the MiG Corp.’s plant in Lukhovitsy out of Moscow. The production programme heavily relies on the Sokol plant in Nizhny Novgorod, which makes large airframe parts for them.
Zhuk-AE
first Russian AESA radar for fighters

A feature of the MIg-35 multirole combat aircraft setting it apart from the previous members of the MIg-29 family is its Russia-first multinode active phased-array radar – the Zhuk-AE. The radar was developed by the Phazotron-NIIR corporation, with its first example fitted to the MIg-35 technology demonstrator in late 2006.

The Zhuk-AE AESA radar’s basic strengths over the exiting slotted-array radars (e.g. the Zhuk-ME of the MIg-29SMT and MIg-29K/KUB fighter) is an expanded waveband, a greater number of acquired and tracked threats, simultaneous lookups/lookdown capability, an extended acquisition range, enhanced terrain-mapping resolution, just to name a few. The principal advantage of the AESA (including that over the existing passive phased-array radars installed on several types of fighters now) is a quantum leap in survivability and reliability, which is due to the very philosophy of AESA. Unlike all other types of airborne radars, AESA consists of about 1,000 self-contained transmit/receive modules (TR). Therefore, failure of several dozens or even hundred of TRs due to a technical glitch or combat damage entails no failure of the whole radar.

At the same time, developing an AESA is very difficult thing to do in terms of technology due to the need of developing relatively inexpensive reliable miniature TRs. Phazotron-NIIR, whose radars fit all MIg-29s took up the development of such a radar to equip the MIg-35. Tomsk-based Micran company and Semiconductor Instrument Research Institute were contracted to develop and manufacture the TRs (at the picture on the right).

Having pondered several designs of the AESA, Phazotron-NIIR Corp. decided to reduce the technical risk and speed up the development by borrowing some technical solutions and systems proven in the Zhuk-family radars, e.g. the computing system comprising the data processor and signal processor, exciter with the synchroniser, etc. The main radically novel and the most sophisticated module of the radar is the phased array proper, which includes the radiating field of radiating elements, up to thousand TRs connected with them, cooling system, power distribution and TR control system, microwave energy TR distribution system used of subsequent amplification and phasing, backup power supply and beam control unit. Based on an extensive research into the phased array design for the Zhuk-AE radar, a choice was made of the equidistant hexagonal radiating module distribution, with a decision taken to make TRs in groups of four.

The first Zhuk-family AESA radar mockup with the 700mm-diameter phased array tilted 20 deg. upwards was unveiled at the MAKS 2005 air show in August 2005. The data sheet indicated that the radar would be able to track up to 30 threats while maintaining surveillance of the airspace, as well as engage eight of them simultaneously. Its max target acquisition range in air-to-air mode is 200 km in the front hemisphere and 80 km in the rear hemisphere and that in the lookdown mode is up to 300 km. The maximum beam deflection angle was to equal ±70 deg. in azimuth and elevation. Further design work showed that the radar was too heavy (about 400 kg). In this connection, a decision was taken to try and develop a lighter radar with fewer TRs, reduced power consumption and weight within 220–240 kg.

Such a variant of the Zhuk-AE, designated also as FGA-29, measuring 600 mm in diameter (array diameter – about 500 mm) and having a reduced number of TRs (680), was made in 2006, completed the test programme at Phazotron-NIIR’s test bench and was fitted to the MIg-35 demonstrator in the end of the year. It is slated to enter its flight trials in this March. Its air target acquisition range is expected to measure 130–140 km, and the rest of the AESA radar design’s characteristics are to be retained, e.g. beam swivel by 70 deg. in all directions, multiple-target capability, combined operating modes, precision terrain-mapping with a resolution of up to 1x1 m, etc.

Operating in the air-to-air mode, the Zhuk-AE will be able to automatically acquire and track at least 30 threats, while being able to simultaneously engage 2–6 of them with dogfight and medium-range missiles, keeping an eye on the airspace at the same time. The radar will also be able to cue radar homing missiles on to the targets, feed target designation to the helmet-mounted sighting and indication system, etc. In the air-to-ground mode, it will be able to pinpoint moving and static surface threats, generate firing solutions for air-to-ground missiles and guided bombs with various guidance systems and map the terrain in several modes.

There are plans to later get back to a larger-diameter AESA (about 700 mm), with the number of TRs to slightly exceed 1,000 and the acquisition range to extend to 200 km. Concurrently, the computer system and wide-band exciter are to be improved. The modified version of the Zhuk-AE (FGA-35) will be fitted to the production MIg-35s further down the road. So far, parallel with this work and preparations for flight-testing the first prototype, Phazotron-NIIR is completing the second FGA-29 for its full-scale rig tests. Based on the outcome of the trials, two full-size Zhuk-AE radars are to be made as early as next year to mount MIg-35s.
Towards greater heights.
The 558th Aircraft Repair Plant (558 ARP) — a government-owned company in the Belarus city of Baranovichi — is among the oldest aircraft MRO providers in the Commonwealth of Independent States. It turns 66 this year. The plant is a specialist in aircraft overhaul and one of the best companies supervised by the Belarus State Military Industrial Committee.

For over 15 years, the 558 ARP has been an independent player on the world’s market, holding a complete package of governmental licences to run R&D, manufacture, overhaul, upgrade and sell military fixed-wing and rotary-wing aircraft and their components.

The company is a known stickler to convention when it comes to overhauling aircraft in line with the current standards. The 558 ARP’s quality management system complies with the current international standards, with the company having been certified as compliant with the ISO 9001:2000 standard by Bureau Veritas Quality International. The certification of its quality management system as meeting international aerospace standard IAQS 9100-2000 is slated for 2007. In addition, the company has been working on having its repair and overhaul work certificated. In 2004–05, it learnt to overhaul helicopters and then was certified by the Interstate Aviation Committee in 2006 as a MRO organisation, which entitles it to overhaul the Mi-8 and Mi-17 helicopters and their components.

The company’s success rests on its close cooperation with aircraft developers and manufacturers for the sake of technical support.

Today, few aircraft repair plants can handle such a wide range as the 558 ARP can. It is a specialist in overhauling and upgrading the Su-27, Su-25, MiG-29 and An-2 planes and Mi-8, Mi-17, Mi-24 and Mi-35 helicopters, learning the ropes in modernising the L-39 trainer.

Over the past years, the company has made a true breakthrough in overhauling the aircraft operated by the Belarus Air Force and got the experience in upgrading the Su-27, Su-25, MiG-29 and Mi-8. The Belarus Air Force was the first to take delivery in 2004–05 of the upgraded MiG-29BM and Su-27UBM1 multirole aircraft capable of using virtually all existing air-launched weapons, including precision-guided munitions. The service also was the first to accept upgraded Mi-8s outfitted with an effective navigation suite making them night-capable. The warplanes carry advanced fire control, navigation, targeting, integral test and real-time datalink systems, improved radars and upgraded cockpit management system, with the MiG-29BM also fitted with the mid-air refuelling system.

Test and demonstration flights involving live fires proved the novelties to be very effective. During the 3rd international arms show MILEX 2005 in the Belarus capital city of Minsk, the Su-27UBM1 was unveiled at a firing range where it employed KAB-500L precision-guided bombs and S-8 rockets. Foreign experts present at the firing range praised the quality of the upgrade, since all targets had been wiped out on the first pass.

The upgrade of the above aircraft provided the 588 ARP with a priceless expertise in comprehensive modernisation, including the design, development, official testing and maintenance stages. The company offers its services in aircraft modernisation to potential customers.

Introducing latest technologies in the course of overhaul has always been among the 558 ARP’s priorities. Application of advanced technologies and development of production and check equipment, which used to be the preserve of work-improvement suggestion fans, is an independent sphere of the company’s activities. The plant has been proactive in devising and applying innovative production techniques and equipment, thus slashing overhaul costs and enhancing its quality by far. Experts know the company’s advances made in cooperation with research institutes and organisations of Belarus. Particularly, the company has developed unique automated workplaces enabling personnel to detect faulty elements of aircraft avionics in only several minutes. Four Russian and Belarus patents have been taken for the aircraft engine remanufacturing technology by means of laser welding during overhaul. In addition to be used in house, these and many other developments are commercial products being offered for sale.

The company is prepared to provide top-notch plane and helicopter overhaul and upgrade services owing to its wealth of experience in dealing with aircraft of various types and sophisticated facilities.

The 558th Aircraft Repair Plant offers the following services:

• overhaul and upgrade of the Su-27, Su-25, Su-17, MiG-29 and An-2 fixed-wing and Mi-8 and Mi-24 rotary-wing aircraft;
• aircraft overhaul in cooperation with the customer at the latter’s facilities; setting up an MRO facility for the customer;
• repair of instruments and checkout gear for aircraft operation and repair;
• overhaul of plane and helicopter components;
• warranty and routine maintenance of overhauled aircraft, including spares supply;
• development, manufacture and delivery of maintenance equipment;
• manufacture and delivery of aircraft spares;
• manufacture and delivery of integrated simulators for training flying crews;
• training and conversion of the customer’s flying and ground crews in operating aircraft and their equipment as well as training aircraft MRO specialists and production of training aids.

The 558th Aircraft Repair Plant is always open to cooperation and will certainly respond to business proposals.
COMBINING TECHNOLOGIES AND EXPERIENCE
Advanced Soyuz orbited planetary scout

On 27 December 2006, a Soyuz-2.1b launch vehicle with a Fregat transfer orbit stage lifted off from the Baikonur launch centre, carrying European research satellite Corot. The satellite is to operate in the polar orbit with an apogee of 915 km, a perigee of 896 km and an inclination of 90 deg. for three years. Scientists are going to use it to research the deeper inner structure of stars and search for new telluric planets (i.e. those similar to the Earth, having rock structure and able of contribute to the origin of life).

The launch was the first one for the new Soyuz-2 carrier of the so-called 1b stage (Soyuz-2.1b). A spokesperson for the Progress design bureau, the maker of the LV, stressed that the third stage is powered by an advanced rocket motor from the KBKhA Chemical Automatics Design Bureau in Voronezh. The company maintains the motor boasts the best specific characteristics among the motors in the class and allows a 900 kg hike in the weight of the payload. However, in case with the Corot, there was no need in that, since the satellite weighs only 630 kg. However, the Russian Space Agency was unable to find a heavier payload for the Soyuz-2.1b’s test launch, and launching a rocket to haul a full-scale mockup is uneconomical because lobbing a Soyuz-2.1b into space costs at least $35 million. As a result, the rocket had to be tested with the minimum payload on board. It was a risky affair for the customer, given the Corot’s price of $225 million and ESA’s refusal of insuring its research spacecraft. Nonetheless, the customer saved a pile, having paid only about $10.7 million ($17,000 per kilogram of the payload) for the launch.

The risk proved to be justified. The Soyuz-2.1b easily lofted the satellite into the intended orbit. The launch was somewhat clouded by fragments of the launch vehicle (probably, those of the third stage or transfer orbit stage) entered the atmosphere over the United States (intended coordinates of the entry point – 9.93 deg. N., 177.58 deg. W.) and sank. NORAD abstained from joining the dispute, all the more so that no rocket fragments were found in the United States as of mid-January. Meanwhile, the Corot continued on its mission with smoothly. According to ESA, its onboard systems were turned on and tests started on 2 January 2007. The satellite is expected to become fully operational by early February and start researching the first of the sky’s areas selected.

The Corot is facing two tasks: first of all, it will look for new planets outside of the Solar System. Scientists know about as many as 200 such bodies, most of which are the so-called gas giants. Academics hope that the Corot will spot hundreds or maybe thousands of such huge planets by gauging the fluctuation of stellar radiation. Still, astronomers expect that the bird will manage to find 10 to 40 medium-sized planets similar to the Earth among hundreds of new extrasolar planets. According to the Corot’s designers, it has a feeling for ‘stone’ planets, whose year totals 50 or less terrestrial days.

In addition, the Corot mission is to help scientists to investigate the inner structure of stars by means of astroseismic techniques, i.e. by observing orbital oscillations allowing one to judge on the structure of a star’s core. The Satellite is to measure the mass, age and chemical composition of selected stars. This will enhance scientists’ understanding of the general structure of the universe. Every 150 days, the Corot will be reoriented towards a new sector of outer space and will begin a new cycle of research.

The satellite was developed by France’s National Space Research Centre in cooperation with French national laboratories and scientists from Austria, Spain, Germany, Belgium and Brazil. Almost half of its mass falls on the payload, such as an optical telescope, two cameras and a computer. The main parabolic mirrors of the telescope measure 30 cm in diameter and the focal range is 1.1 m. to enhance the telescope’s sensitivity, European experts developed a dedicated screen preventing excessive light from getting to the mirrors.
GLONASS constellation growing

On 25 December 2006, a Proton-K launch vehicle with a DM upper stage and three GLONASS-M satellites blasted off from the Baikonur launch centre at 23.18 Moscow time. Three and a half hours later, the satellites separated from the upper stage smoothly and went to an orbit close enough to the intended one. Following the Titov Main Spacecraft Test and Control Centre assuming control of the birds, they were dubbed Cosmos-2423, 2425 and 2426.

According to a spokesperson of the Reshetnev Applied Mechanics Association (NPO PM), the three satellites had had their onboard systems checked and had been oriented towards the Earth by mid-January. They enjoy glitch-free operation, noted the spokesperson of Reshetnev that made them. According to the GLONASS Applied Consumer Centre, the satellites are in slots 10, 14 and 15 of Plane 2 that remained unused for a long time. Now they are at the service-entry stage. Once fully operational, they will beef the GLONASS constellation up to 16 satellites: three of the 19 birds now in orbit will be deactivated (Cosmos-2382 has been inoperable since July 2006 while Cosmos-2375 and Cosmos-2396 since September 2006).

The December insertion became another launch under the Global Navigation System federal programme. However, it has not so much expanded the constellation, as replaced the losses. Nonetheless, Reshetnev maintains that the mission of speedy reinforcement of the constellation will be accomplished in the near future. The Defence Ministry and Russian Space Agency are to have reinstated the GLONASS fleet to its minimum strength of 18 satellites by the end of the year, with the stated federal allocation under the programme standing at 11 billion rubles (just over $400 million). This strength is sufficient for continuous positioning in Russia. Since that moment, GLONASS will be fully operational for users in Russia – both military and commercial ones – and by 2009, when the constellation will have its organic strength of 24 satellites (six in three planes), foreign subscribers will have an opportunity to use GLONASS as well after signing relevant agreements with Russia.

The Defence Ministry also has worked out the legal guidelines for operating GLONASS in support of non-military users. It cancelled its restrictions on precision positioning on 1 January 2007 (there have been no official documents published yet, but Defence Minister Sergey Ivanov has said repeatedly that the restrictions were to be scrapped on that date). Secrecy posed problem for GLONASS for a long time. Over past years, civilian agencies demanded the Defence Ministry lift the restrictions on the precision of positioning (precision within 30 m and higher was considered as secret) but the cancellation dragged its feet. In the autumn 2005, Ivanov said during a governmental meeting: “We have taken the necessary decision on lifting the secrecy”. However, approving all the paperwork kicked off only in early 2006, and it looks like it has been completed only recently. Truth be told, GLONASS still faces another unresolved problem that is just as serious. Russia lacks full-rate production of GLONASS receivers for a wide range of users as well as topographic and digital maps to ensure the full use of GLONASS throughout the country. The Russian Space Agency plans to take on the problem with governmental support this year.

Third launch of the ‘second’ Soyuz

At 11.34 hrs Moscow time on 25 December, an upgraded Soyuz-2.1a launch vehicle was launched from the Plesetsk launching facility, carrying a Fregat transfer orbit stage and a Meridian communications satellite. The satellite was inserted into its desired orbit at 18.32 hrs Moscow time.

At first, the launch was slated for 23 December, but it had been delayed by a day due to a software glitch suffered by the Fregat and then by another day. The successful insertion on 25 December was the second one under the flight test programme of the new Soyuz-2.1a LV featuring an advanced control system, a Russian Space Force spokesman noted. The first launch of the carrier took place in Plesetsk on 8 November 2004.

The Meridian satellite was made by the Reshetnev Applied Mechanics Association (NPO PM) and, according to the manufacturer’s spokesperson, was designed for communication between ships and ice surveillance aircraft in the vicinity of the Northern Sea Route and land-based stations as well as for expanding the sitcom station network throughout the Arctic areas of Siberia and the Russian Far East.

According to NPO PM, Meridian satellites operating in highly elliptical orbit have improved performance, an extended service life and a higher degree of reliability. In addition, they operate in an expanded frequency range. The birds of the series carry multigroup repeater gear. In the future, Meridians are to oust the existing communications system wrapped around Gorizont and Express-A satellites.
Proton – ArabSat: take 2

At 23.01 Moscow time on 8 November 2006, the Russian Space Agency lofted a Proton-M launch vehicle carrying a Briz-M transfer orbit stage and the BADR-4 (ArabSat-4B) telecom satellite owned by a Saudi organisation of the same name – ARABSAT (Arab Satellite Communication Organisation). The launch took place at Pad 39 of Site 200 at the Baikonur space launch facility. 10 min later, the satellite riding on the Briz-M transfer orbit stage separated from the last stage of the Proton-M launch vehicle and went into the transfer orbit en route to its geostationary orbit. The rocket’s stages followed the established pattern, with the first stage coming down to the Earth in the Karaganda Region of Kazakhstan, the second stage and the fairing dropping in the Altai Region of Russia and the third stage splashing down somewhere in the Pacific. 4 hrs sharp after the blast-off, the ArabSat-4B separated from the transfer orbit stage, with the customer assuming control over it.

The ArabSat-4B was made by EADS Astrium. It measures 1.8 m by 2.5 m and weighs 3,304 kg. Once in its geostationary orbit, it occupied the slot above 26 deg. E. and can perform TV broadcasting, telephone communications and data-linking for users in North Africa, the Middle East and part of Western Europe. The satellite’s service life is estimated at 15 years.

This ArabSat launch is the second one last year. The first launch from Baikonur on 28 February failed. After lofting by a similar Proton-M booster, a malfunction of the Briz-M transfer orbit stage prevented the ArabSat-4A from reaching its calculated orbit, causing the termination of the mission on 24 March. The Briz-M righted itself during the 5 August 2006 launch of the Hotbird-8 on a Proton-M. Until then, only a Proton-K fitted with the DM-3 transfer orbit stage had flown on 18 June to insert Kazakhstan’s KazSat into orbit. The latest insertion of the new ArabSat proved to be a success. Another Briz-M-fitted Proton-M launched on 12 December 2006, orbiting Malaysian telecom satellite MiaSat-3.

Angara to fly in four years

The new-generation Angara-5 launch vehicle may fly for the first time in 2011, said Vladimir Nesterov, head of Khrunichev State Space Research and Production Center. “The philosophy of the new-generation launch vehicle development has been somewhat altered,” he stressed. This means that the smaller Angara-1.1 or Angra-1.2 may be launched first in 2010 depending on how the programme evolves. 2011 is to see the first experimental launch of the Angara-5 ‘heavy’ rocket.

“We have made a long-term contract on this programme with the Defence Ministry, and the work on the Angara launch vehicle is on schedule,” Nesterov said. In early November, the news came that the Omsk-based Polyot company was joining the Angara programme. Polyot is going to make components and individual compartments of the new LV. The company has been making components for the Proton LVs and Briz upper stages ordered by Khrunichev, with production of early units for the Angara to begin this year.

Mars ‘flight’ as early as this year

Volunteers are sought within the framework of the preparations for the unique 500-day Mars manned mission simulation experiment (Mars-500 programme) slated to begin in the fourth quarter of 2007. More than 120 people, including 16 women, from 21 countries (Australia, Argentina, Brazil, Belarus, Colombia, Estonia, India, Italy, Mexico, Portugal, Russia, Spain, the UK, the United States, Ukraine, etc.) have volunteered so far. A selection board has been set up, with cosmonaut-physician Boris Morukov, M.D., Medical and Biological Problems Institute deputy director, appointed to chair it. The selection board includes doctors, psychologists and lawyers.

Based on analysis of the volunteers’ questionnaires, applicants will be informed of the terms of medical and psychological selection to be conducted by the Medical and Biological Problems Institute’s medical commission in two stages. At Stage I, applicants will have to submit their medical records on the state of their health, with the records to be issued less than month before the selection. Those who pass Stage I will take Stage II selection at the Medical and Biological Problems Institute.

Two vacancies have been reserved for ESA personnel to participate in the Mars-500 programme. In addition, a decision has been taken that ESA representatives would participate in space flight simulation experiments up to 105 days long.

During the preparations for the Mars-500 experiment, a new 250 cu.m module had been built in the institute’s mockup hall, and work on refurbishing the interior of the EU-150 experimental facility’s 150 cu.m module is nearing completion.
First Soyuz to launch from Kourou in two years

On 16 November, the Russian government submitted a bill on ratification the Russian-French agreement on cooperation in developing and manufacturing Soyuz launch vehicles for operations from the space launch facility in French Guiana. The agreement was achieved as far back as November 2003, but the parties had been unable to come to terms for three years. Now, representatives of the Russian and European space industries finally stated that the difficulties had been ironed out and Russian specialists would go to Guiana in early 2007 to implement the project.

At first, construction of the launch pad for Russian Soyuz rockets was to begin in 2004, but the preparatory period dragged on, because Europe faced the problem of financing. The total cost of the programme is valued at 344 million euros, half of which is to be paid by Arianespace at the expense of a European Investment Bank loan guaranteed by the French government. The remainder is being shouldered by the European Space Agency. From the outset, Russia viewed its participation in the programme only as the seller of technology and intellectual labour without any financial injections.

For a year and a half, Europeans tried to persuade their Russian colleagues to reconsider but gave up in the end. In March 2005, a package of agreements was signed, unleashing the funding in full. 121 million euros have been allocated from the basic sum to Russia’s Progress design bureau (the maker of the Soyuz-ST launch vehicle), General Engineering Design Bureau (launching facility) and Lavochkin Scientific Production Association (Fregat transfer orbit stage), with 8.5 million euros more for developing and making the launch pad’s maintenance tower. The tower is needed to protect the facility from the elements (downpours and high humidity as a whole). “We are not investing any money of our own,” Victor Remishevsky, deputy chief of the Russian Space Agency, confirmed during a news conference on 17 November 2006.

At the same time, Russia has automatically relinquished the profit to be generated by Soyuz launches from Kourou. According to Arianespace President Jean-Ives Le Gall, the first launch is planned for late 2008 or early 2009. The company plans to start fulfilling a whole range of commercial contracts, 2–4 launches a year. A launch will go at $50 million. Thus, the programme’s annual turnover may total $200 million. About 85 percent of the sum will be the preparation and launch costs, and the remainder will be the profit of Arianespace that is the launch operator (in other joint programmes, operators are joint ventures, as a rule, e.g. Russo-French Starsem that launches Soyuzes at Baikonur).

Operating at such a pace, the Guiana Space Centre project is supposed to be repaid in seven to nine years. Once Arianespace pays off via launches the 130 million euros that have been paid to the Russian companies, the company will start buying launch vehicles, equipment and services directly from the Russian manufacturers. “Russia will see its companies being shouldered by the European government. The remainder is loan guaranteed by the French Investment Bank, and the profit may total $200 million. Thus, the programme’s annual turnover may total $200 million. About 85 percent of the sum will be the preparation and launch costs, and the remainder will be the profit of Arianespace that is the launch operator (in other joint programmes, operators are joint ventures, as a rule, e.g. Russo-French Starsem that launches Soyuzes at Baikonur).” Remishevsky said. Besides, Europeans admit that manned Soyuz craft may be launched from Kourou in the future.

According to the Russian Space Agency, work on the launching facility and LV is on schedule. Receiving the design records is nearing the end and construction of the underground facility is beginning. Europeans have been working on the pad by building roads and laying service lines, and are to start constructing buildings on the ground. Meanwhile, the Soyuz-2 launch vehicle is nearing the completion of its flight tests in Russia to serve the base for deriving the Soyuz-ST. Under the test programme, two rockets carrying Fregat transfer orbit stages were flown in late December: a Soyuz-2.1a orbited a Meridian communications satellite from Plesetsk and a Soyuz-2.1b lobbed into orbit ESA’s Corot research satellite from Baikonur.

Space tourism gets pricier

The fare to the ISS a space tourist will have to pay has grown from $20 million to $21 million, Korolev Energia Rocket and Space Corp.’s Designer General Nikolay Sevastyanov said during the Moscow-Beijing video conference in November 2006. According to Mr. Sevastyanov, this is due to the growing prices for materials and components used in construction of spacecraft. He believes space tourism will grow fast, especially in the West.

“Such cosmonauts should not be called tourists, rather commercial cosmonauts, because their flights are paid by private investment and they conduct a lot of research on board the ISS,” he said. “When we launch a Soyuz with a crew of three, two of the three pay for flying. As a rule, one is an astronaut whose fare is paid for by NASA. The second one is a commercial cosmonaut whose fare is paid for by private investment. The mission commander is always a Russian cosmonaut whose fare is paid by the government under the federal space exploration programme,” Sevastyanov said.
Mr. Maksichev, could you outline the current status of the BrahMos programme?

First of all a few words about what has been done. To date, the naval version of the missile has been developed. The Indian Navy command placed an order for it with us. Mind you, the order is big enough and covers both ships in the inventory and those under construction or being designed.

For instance, three Project 15A ships have been ordered and are being built now. A recent development is the Indian Navy’s decision to fit our missiles to the ships of the second series made up of three Project 11356 guided-missile frigates. In the future, BrahMos missiles may equip Project 17A ships as well.

It is also important that the Indian Navy has had its crews and support personnel trained in handling and firing BrahMos cruise missiles, with our company’s staff acting as instructors. The complements of the first several ships to mount the BrahMos (the INS Rajput, etc.) were the first to receive the training, as were the technicians who would maintain missiles.

In retrospect, one can see that early under the BrahMos programme, the missile was conceived as a self-propelled weapon that the Indian Navy, we believed, would be interested in. However, with the programme under way, the Indian Navy reconsidered its priorities and placed emphasis on the shipborne missile system. Still, we carried on with developing and testing the mobile variant on our own. Naturally, other Indian armed services kept an eye on the programme.

As a result, the Indian Army became the next customer of ours, having placed an order for the BrahMos missile system. The Indian Army’s order was firm and big enough to outfit the first BrahMos battalion. We are to launch deliveries in 2007. We expect a follow-on order further down the road.

Which version of the missile is going to equip the battalion?

Out missile is, essentially, versatile. All the tests we have conducted involved the versatile missile fired on targets of different types. Simply put, the BrahMos missile is effective against various radiocontrast targets that can be either land-based or seaborne. The existing homing featuring an improved software package call for no modification of the hardware when engaging threats on land or at sea.

Who developed the software?

The Russian side remains responsible for the missile itself. The Indian side is in charge of the matters pertinent to developing or refining the software for different versions of the weapon. Naturally, the efforts are not isolated from each other. They are a single whole.

Were there any trials of the mobile system in 2006?

Right, for instance, we conducted firing tests against radiocontrast targets in support of the Indian Army on 30 May. The tests were conducted in a very tough environment — in a desert. The ambient temperature was as high as +55°C. A special target had been built at the firing range for the tests.

The tests were as realistic as possible. Target designation data were fed in the command vehicle, and a standard-issue mobile launcher was used. The missile hit the target smoothly — smack the bull’s eye. Its warhead had been detached; hence, it punched through the target and continued on its way.

We achieved our objectives, and the Indian Army’s command got a proof of the mobile system’s combat readiness and wasted no time to order the systems to outfit its first battalion.

How was the order divided between the BrahMos programme’s participants?

Half of the work is being handled in India, specifically launchers, command vehicles, transport-loader vehicles and a number of other components of the system. Russia is handling the missile side of the deal, though some missile parts are made by the Indian industry as well.
The final assembly of missiles will take place both in Russia and in India. For instance, there is an assembly facility in Hyderabad, where Indian workers assembly missiles. We launched two Hyderabad-assembled missiles during the test firings.

In addition, individual missile elements have been productionised in Mumbai (the former Bombay) by two major companies Larsen & Turbo and Godridge selected by the Indians to make BrahMos’s units. The latter include compartments, wings, empennage and non-metal elements, e.g. such sophisticated items as the transport-launch tube and non-metal compartments.

Farther down the road, the Indian side is to supply such domestically developed and made components, as the navigation system and onboard computer. To date, the homer has been made by the Russian side. India may take on the task some time in the future.

What other key events of 2006 would you mention?

A decision has been taken to increase the authorised capital stock of our company not so long ago. Russia has transferred a relevant sum very early in 2006, with India doing the same. Now, we have launched additional work, for which we pay with that money – about $50 million.

A trilateral agreement has been signed by BrahMos Aerospace Ltd., NPOMash and DRDO on distributing the workload in various segments of the programme, among which are air-launched missile development and a number of steps to further refine the weapon.

What is the status of the submarine-launched missile version of the BrahMos?

Again, the missile is versatile. Therefore, we envision no special problem with deriving a submarine-launched variant from it whatsoever. NPOMash, the Russian prime contractor on the sub-launched BrahMos, has a wealth of experience in developing underwater-launched missiles. Prototypes have been tested — launched from under water, from a vertical test rig, even from a submarine. Therefore, we believe the matter has been resolved, and if the customer places an order, we will fulfil it quickly, ensuring top quality.

Now, we have reached, probably, the subject most interesting to our readers — development of an air-launched version of the BrahMos.

Developing an air-launched BrahMos derivative is a key activity for us today. Money has been allocated to fund the effort.

What is going to be done in the first place? We have selected the Sukhoi Su-30MKI fighter as the carrier of our missile. This does not mean that we will be unable to mount the BrahMos on some other aircraft. We can do that. However, the Su-30MKI has become the priority platform to carry our cruise missile.

We expect we will have completed the effort in two years. Modification of the missile proper has begun, and several structural elements that have to be upgraded have been tested. For example, the air-launched variant will feature a different nose section and a somewhat modified attachment fixtures. Something has been proven and something still has to be proven, but the process has got going, as they say.

As far as the system’s elements are concerned, the Indian side has been responsible for their development by tradition, i.e. the aircraft launcher will be developed and tested by Indian engineers. Although we will turn, naturally, to other Russian developers, say, the Sukhoi design bureau, for example.

What matters is the desire of the customer, the Indian Air Force in this case, to have an air-launched missile to be part of the Su-30MKI’s weapons suite. The customer is very helpful to us in tackling all issues.

Farther down the road, we expect the air-launched variant of the BrahMos missile to become of interest to third parties whose air forces operate the Su-30 or Su-27 fighters.

How many BrahMos missiles are to be carried by the Su-30MKI?

To date, a decision has been taken to fit the Su-30MKI with one BrahMos missile, because we want to reduce the amount of modifications and expedite the air-launched variant’s fielding with the IAF.

However, such a missile will fit heavy aircraft such as the Tupolev Tu-142ME or Ilyushin Il-38SD easily as well and do so in a far greater number. Equipping the maritime patrol aircraft from Embraer is a possibility as well.

Today, our key objective is to prove the feasibility of the air-launched version of the missile. If all goes well, the weapon will spread to other types of aircraft.

Thank you for an interesting interview. Hopefully, the Russian-Indian cooperation under the BrahMos programme will remain as productive as it is today.

www.take-off.ru
Russia offers to upgrade Indian MiG-29s

The MiG Russian Aircraft Corporation offers the Indian Air Force a comprehensive programme to upgrade the IAF’s MiG-29 fighter fleet. The talks have been under way for quite a while, with the Indians expected finally to make up their mind in the nearest future. If the Russian offer is accepted, the prime contractor will lead a host of Russian subcontractors developing and manufacturing advanced systems to fit the IAF MiG-29 fighters. By tradition, part of the new avionics to upgrade the fighters may be supplied by French, Israeli and Indian companies. Some details of the MiG Corp.’s programme were released in Zhukovsky during the 22 January presentation of the first MiG-29KUB carrierborne fighter prototype, built under the contract with Indian Navy.

At present, three IAF air squadrons operate 74 MiG-29s, including eight MiG-29UB twin-seat combat trainers, with the rest being MiG-29 ‘Variant B’ (’9-12B’) single-seaters. They were delivered during 1986–95 and have retained a considerable service life to be extended even more in the course of the upgrade. In all, India has taken delivery of 84 Soviet- and Russian-made fighter jets of the type (48 in 1986–87, 24 in 1989 and 10 in 1995) but some of them have been lost to air accidents.

64 IAF MiG-29s are supposed to be subject to upgrade, of which 56 are single-seaters and eight are twin-seaters. The per-unit cost of modernisation to Gen. 4+ standard is estimated at about $10 million, with roughly half of the sum to be spent on latest avionics and the rest on upgrading the airframe and powerplant. The latter will extend the fighters’ service lives and ensure transition to on-condition maintenance.

Overall, the IAF MiG-29 upgrade concept is similar to that of the MiG-29SMT fighters sold to Yemen and the ones being exported to Algeria. There are, however, some differences as far as specific systems are concerned. At the same time, the avionics and weapons suites produce a high degree of commonality with the MiG-29K and MiG-29KUB carrierborne fighters, which deliveries India may commence as early as this year. The so-called ‘international avionics suite’ integrates systems from various foreign manufacturers. Such an experience was drawn from the Russian-Indian programmes on upgrading Indian MiG-21bis fighters to MiG-21bis UPG Bison standard, developing and producing the Su-30MKI fighters, etc.

The fire control suite of the upgraded IAF MiG-29s that could be designated as MiG-29UPG is to be wrapped around the advanced Zhuk-ME slotted-array radar developed by Phazotron-NIIR Corp., and the advanced OLS-UEM integrated optronic sighting system with the laser, IR and TV capabilities, developed by NIIPP institute (the same radar and optronic system are to be fitted to the MiG-29K/KUB). The cockpit management suite is reported to be based on multifunction LCDs from the Russian Avionics company and a HUD from Phazotron-NIIR Corp. The foreign-made avionics might be the Thales Topsight helmet-mounted target designator, Sagem Sigma INS/satnav system, Indian Tarang ELINT station and an Israeli electronic countermeasures system (the same are going to fit the MiG-29K/KUB).

The upgraded MiG-29UPG’s weapons suite is to be similar to those of the MiG-29SMT and MiG-29K/KUB, i.e. the organic weapons are to be beefed up with RVV-AE active radar homing medium-range air-to-air missiles and air-to-surface precision-guided munitions, such as Kh-29T, Kh-31A and Kh-31P missiles, KAB-500Kr guided bombs, etc.

The first six IAF MiG-29s, including four single-seaters and two twin-seaters, are supposed to be upgraded and tested in Russia, with the rest of the fleet to be modernised at the customer’s production facilities in India.

Algeria accepts new MiGs

The Algerian Air Force accepted the first batch of the advanced MiG-29SMT and MiG-29UBT fighters from Russia in December last year. According to the 8 December message by the Interfax-AVN news agency, “the first two MiG-29SMT fighters were shipped to Algeria last week.” The delivery was handled by the MiG Corporation. The first two MiG-29UBT upgraded combat trainers followed suit late in the month. They had been built by the Sokol plant in Nizhny Novgorod. The fighters were airlifted by An-124 Ruslan transports. In addition, An-124 Ruslan and An-22 Antey transports flew associated equipment to Algeria.

The first MiG deliveries to Algeria were conducted under the contract signed by Rosoboronexport in early 2006 and finally approved as part of a larger package of Russian-Algerian arms trade agreements during the visit of Russian President Vladimir Putin to Algeria in early March 2006. According to the MiG Corp.’s spokesperson, a total of 34 fighters are slated to delivery, of which 28 MiG-29SMTs and six MiG-29UBTs worth in excess of 1.5 billion, with the option for 30 more of those being an possibility.

On 6 January, a prototype of the Algerian MiG-29SMT version (side number 919), equipped with an upgraded avionics suite (including the Zhuk-ME slotted-array radar and advanced cockpit management system), expanded weapons options, additional dorsal fuel tank and a mid-air refuelling system, was displayed among other advanced MiG fighters to Russian Vice-Premier/Defence Minister Sergey Ivanov on his visit to the MiG Corp.’s production facility in Lukhovitsy, Moscow Region (see the pictures). Algeria has become the third country to get the MiG-29SMT into its inventory.

It had been preceded by Yemen that bought 18 such aircraft with slightly different avionics suite and with no dorsal fuel tank as well as two MiG-29UBT twinseaters in 2004–05, and by Ethiopia that had two of its MiG-29s upgraded to MiG-29SMT standard in 2005.
China still to buy Su-33?

The feasibility of a sale of Russian-made Sukhoi Su-33 carrier-borne fighters to the PLA’s naval air arm was in the foreground of the recent Airshow China 2006 in Zhuhai. Although the Russian delegation in its official answers to numerous questions by Chinese reporters was rather tight-lipped (for instance, head of the delegation Alexander Denisov, chief of the Federal Military Cooperation Service, said: “The Chinese side is interested in it, but the talks are still at the preliminary stage.”), it became known on the sidelines of the air show that the signing of early agreements are not too far away.

Earlier, China had pondered the feasibility of launching independent Su-33 production at its Shenyang plant, leaning on its experience in licence production and modernisation of Russian Su-27SK fighters (Chinese designation J-11). The Su-27K (T10K-7) prototype aircraft abandoned at the former Soviet Air Force Research Institute’s Kirovskoye airfield in the Crimea. Then, the training is to shift to the real McCoy: the Varyag aircraft carrier bought from Ukraine in 1999 and having been at a shipyard in Dalian since the summer 2005 is believed to be completed and commissioned as a training carrier.

Further down the road as full-fledged aircraft carriers are built and commissioned with the PLA’s Navy (they are slated for launching between 2007 and 2014), China will need more ship-borne fighters to activate combat carrier air groups. It is believed that China would like to commonise the weapons and avionics suites of Su-33Ks and Chinese Su-30MK2s to enable them to employ a wide range of air-to-air and air-to-ground guided weapons (today’s Su-33 cannot do that so far). Later on, the carrier-borne Sukhois might be outfitted with systems and weapons under development for the advanced land-based Su-35 derivative, particularly, the Irbis-E phased-array radar, cutting-edge long-range missiles, etc. In addition, acquisition is being mulled over of the twin-seat combat trainer/multirole aircraft that could be derived from the Su-27KUB combat trainer undergoing tests since 1999. The Chinese Navy’s total requirement for naval fighters in the Su-33 class for the coming decade is estimated at about 100.

Indonesia to get more Sukhois

In October, the Indonesian government approved accepting a five-year $1 billion Russian loan for procuring new arms, including Sukhoi Su-27/Su-30 aircraft to beef up the first four Sukhoi fighters shipped to Indonesia in 2003. The Russian-Indonesian middle-term military technical cooperation programme was initialised as far back as three years ago. Under the programme, Jakarta planned an acquisition of 12 Sukhoi fighters and a batch of helicopters and naval armament to the tune of over $1 billion. However, the 2004 disastrous tsunami and the ensuing financial crisis made Indonesia limit itself to four Su-27SKs and Su-30MKs and three Mi-35 helicopters as well.

The parties resumed their military technical cooperation last summer when Russia offered Indonesia a loan to buy a batch of materiel. Setting the terms of the loan took several months. In October 2006, the Indonesian Defence Ministry’s Secretary General Lt.-Gen. Shafri Shamsuddin said: “The government has given the green light, and the only thing remaining is signing the contracts.” The decision was taken late in November last year during the meeting of the two countries’ presidents – Vladimir Putin and Susilo Bambang Yudhoyono – on the latter’s visit to Russia. The first instalment of the loan is planned to be spent on buying six latest fighters from KnAAPO – three Su-30MKs and three Su-27SKMs – and weapons to fit them. This was announced officially during the IndoDefence 2006 arms show in the Indonesian capital city of Jakarta last December.

In addition, Indonesia is going to purchase five Mi-17 utility and four Mi-35 attack helicopters as well as other army and naval materiel within the framework of the loan. The contract for six advanced Sukhoi fighters may be signed any time soon.
contracts and deliveries | in brief

**II-76 deliveries to China slip behind schedule**

One of last year’s problems of the Russian-Chinese military technical cooperation was caused by the way the contract for a large batch of Ilyushin II-76 airlifters and II-78 tanker planes was being fulfilled. The deal was clinched on 8 September 2005 in Sochi during the 12th session of the Russian-Chinese inter-governmental military technical cooperation commission co-chaired by Russian Defence Minister Sergey Ivanov and Chinese Defence Minister Cao Gangchuan. The deal provides for Russia to sell China 38 aircraft during 2006–10 – 34 II-76MD airlifters and four II-78MK tankers powered by Saturn D-30KP-2 engines. The aircraft were to be made by the Tashkent Aircraft Production Corp. named after Valery Chkalov (TAPC), but Russia’s Rosoboronexport company was appointed prime contractor in line with a Russian-Uzbek agreement.

At present, the PLA operates more than a dozen II-76MD transports bought in Russia in the 1990s, but lacks tankers so far despite the protracted negotiations. The need for them came into the foreground in the wake of China’s 2000-04 acquisition of 100 Sukhoi Su-30MKK and Su-30MK2 multirole fighters with mid-air refuelling capability. To date, Chinese B-6H aircraft derived from the B-6 bomber itself a derivative of the Russian-made Tu-16 have acted as tankers.

Deliveries of the II-76s and II-78s to China under the new contract were supposed to begin as early as 2006, but the customer has not taken delivery of a single plane. Moreover, it is known that TAPC has not even launched the construction, which could not but cause serious concern in China.

Experts believe that the cause of the slippage is the keen contractual price of the aircraft, due to which Russia and Uzbekistan cannot come to terms on the financial aspects of building new II-76s. In addition, the dire economic standing of TAPC has resulted in a personnel drain, with the plant having a difficult time in fulfilling the avalanche of orders. This puts transfer of II-76 production to a Russian plant high on the agenda (to date, TAPC has been the sole manufacturer of aircraft of the type), all the more so that the bulk of components and structural materials for the new II-76s is supplied by Russia.

Head of the Russian delegation to the Zhuhai air show Alexander Denisov, deputy chief of the Federal Military Technical Cooperation Service, officially stated in Zhumai: “The contract will be fulfilled.” He admitted that “there are certain problems but they are irrelevant to the Chinese side”. “The problems concern the third party – Uzbekistan. Proactive talks are under way. The contract will be fulfilled,” Alexander Denisov stressed.

The news has come that very late last year, Rosoboronexport decided to replace the main contractor under the Chinese deal. The Ulyanovsk regional office of Rosoboronexport informed the Rosbalt news agency on 28 December that Russian company Ilyushin would be the prime contractor for building the II-76s for China instead of TAPC. The latter will make the airframes of 15 of the 38 aircraft that are slated for delivery in 2008–10. The remainder shall be made by the Aviastar plant in Ulyanovsk, Russia. The Russian government will have allocated over 6 billion rubles (about $230 million) before 2009 to this end. The II-76 production in Ulyanovsk is planned to kick off in 2010, with Aviastar to be able to roll out 10 II-76MDs and 10 II-76MFs annually starting since 2012. In such a case, the contract for 38 II-76s and II-78s could be completed in 2013.

**Be-103 and Su-80 to be assembled in PRC?**

Important news during the Zhuhai air show in November was the successful talks with CATIC on Sukhoi issuing a licence to assemble Beriev Be-103 light multipurpose amphibians and Sukhoi Su-80GP multipurpose regional cargo/passenger aircraft manufactured by its division KnAAPO in Komsomolsk-on-Amur. While China’s interest in getting the Be-103 production licence was expressed in the context of developing the Gidroaviasion company’s air show in Gelendzhik last September, the information on a similar intent of the Chinese for Su-80GP came as a true surprise.

Sergey Drobyshev, KnAAPO’s head of the Be-103, SA-20P and Su-80 programme directorate, told Take-Off that the parties had made a good headway during the talks, with preliminary agreements being a possibility before year-end. The agreements might cover the initial stage of assembling up to 50 Be-103 amphibians at a yet-to-be-built factory in Zhuhai from KnAAPO-supplied kits. Launching the production in the free economic zone will allow a sharp reduction in prime cost via exempting the amphibians from customs duties on US-made engines and systems intended to fit the amphibians. Currently, KnAAPO has to pay these customs dues, which affects the price of the Be-103s made in Komsomolsk-on-Amur.

As far as assembling Su-80GP regional transports in China is concerned, there are indications that it might be launched at the aircraft plant in Shenyang – the company enjoying long-term links with KnAAPO since it was productionising the Su-27SK fighters licence-produced of aircraft kits provided by KnAAPO and with KnAAPO’s assistance. Sergey Drobyshev estimated the possible amount of work on the Su-80GP in China at “more than 100 aircraft”. Considering China’s growing need of regional planes, the Su-80GP market in China may total “up to 100 aircraft” within the coming 15–20 years. Chinese investors into the programme are major banks, in which the governmental has a share. “If the talks succeed, a governmental agreement will be required to further optimise the programme, i.e. to obtain preferences,” Drobyshev said.

However, the contract on Su-80GP licence production in China will be feasible only after the aircraft has been issued its type certificate, which is planned for 2008. So far, the first pre-production Su-80GP c/n 01-05 (registration number 82912) built by KnAAPO last summer is being prepared for its certification tests. Soon, it will be joined by two more aircraft (c/n 01-06 and 01-07) virtually ready for their maiden flights. In addition, KnAAPO in 2007 is to launch assembly of the first eight production Su-80GPs, with deliveries slated for mid-2008. According to the plane’s chief designer Gennady Litvinov, a number of Russian governmental agencies have placed orders for 31 aircraft. A contract was awarded by an airline in Petropavlovsk-Kamatskaya, with other Russian Far Eastern air companies displaying their interest in the Su-80GP.
**Tupolev offers its freighters to China**

Resumption of a kind of return of Russian commercial aircraft to the Chinese market is to be manifested by the delivery of five Tupolev Tu-204-120CE cargo aircraft that could be followed by more orders for this and other Russian planes. Unfortunately, at the recent Zhuhai air show last autumn, Tupolev failed to showcase its first ‘Chinese’ Tu-204-120CE (No 64030) that had completed its tests and been ready for delivery to the customer, Air China Cargo, whose paintjob it had been sporting since the early autumn when it got Chinese registration B-2671. Due to the red tape, the certification paperwork relevant to the aircraft had not been completed. Therefore, Tupolev brought to China its prototype Tu-204C (RA-64024) powered by Russian-made PS-90A engines and operated by the Aviastar-Tu airline (ATu). The prototype was a hit with the Chinese public (see the picture).

According to Tupolev’s Director General Igor Shevchuk speaking at a news conference during Airshow China on 1 November, the first Chinese Tu-204-120CE’s certification paperwork was expected “some day soon”, after which the plane could be shipped to the customer. Shevchuk also highlighted that the second China-ordered Tu-204-120CE (No 64031) had been completed by Aviastar by the date of the air show. The remaining three aircraft under the 8 September 2001 contract are to be built in Ulyanovsk in 2007. Shevchuk also reminded that the contract makes provision of the option for 10 more Tu-204-120CEs.

A rather unexpected display at the show was another Tupolev plane – the 102-seat short-haul Tu-334 represented by the second flying example (No 94005) that was made in 2003 by the Aviant plant in Kiev. Tupolev’s official stance on why they brought the Tu-334 to Zhuhai boils down to offering its future cargo derivative to the Chinese, because according to Tupolev’s leaders, it is this version that the Chinese may need. For this purpose, a large door similar to those on the Tu-204C and Tu-204-120CE is to be cut in the Tu-334’s fuselage, enabling the modified aircraft to haul up to seven standard cargo containers, with their total weight to be 12–14 t (the Tu-204’s cargo versions carry 13 containers weighing a total of 30 t). One of the strengths of the offer is seen by Tupolev in heavy commonalisation of the Tu-334 and Tu-204, particularly, full commonality of the cockpits, which is to greatly simplify Tu-334 crew training and the plane’s operation in China that is to have had five Tu-204-120CEs by then. The Tu-334’s chief designer Igor Kalygin told Take-Off that the first Tu-334 prototype (RA-94001), which is at Tupolev’s flight test facility in Zhukovsky, was planned for refurbishing as the cargo version’s prototype.

As is known, the Kazan Aircraft Production Association (KAPO) is to launch full-rate production of the aircraft of the type under the governmental resolution dated 15 April 2005. However, KAPO lacks money to productionise the Tu-334, and Tupolev decided to use the air show in Zhuhai to try and resolve the problem by calling the aircraft industry’s leaders to help KAPO to get the money it lacks from the national budget. Tupolev and Tatarstan’s administration are ready to shoulder the rest of the money needed to finance the productionising of the Tu-334.

However that may be, it was reported in late November that KAPO would make the first two Tu-334s in 2007. Actually, this would hardly be called ‘production’, since the plant would just brush up the 94005 shown in Zhuhai and complete the third aircraft (94003) sitting incomplete at the MiG Corp.’s factory in Lukhovitsy for quite a while. To this end, the unfinished third bird had been taken by road to Kazan before the New Year holidays. If the plans come true, the first two Tu-334s will have entered service before the end of this year. According to Igor Shevchuk, at least five airlines are salivating over them. Igor Kalygin said that the Tu-334’s orderbook had had at least 50 orders by the time the Zhuhai air show kicked off. Kavминводы had ordered 25 aircraft, Rusline – 10, Rossiya – seven while Tatarstan and Motor Sich – five each. Another 10 aircraft are to be ordered by a Kazakhstan carrier. In all, 24 carriers have voiced their willingness to buy Tu-334s and signed agreements and MoU for a total of almost 300 planes.

**Mi-26 comes to PRC**

The Russian-made Mil Mi-26T helicopter that features the largest lifting capacity in the world is to go to China soon. During a visit to China in April last year, the joint delegation of the Mi-26 developer and manufacturer (Mil Helicopter Plant and Rostvertol company respectively) reached an agreement with Civil Aviation Administration of China (CAAC) on the Mi-26’s certification in China. The news came on 23 October 2006, on the verge of Airshow China 2006, that Rostvertol and the Hong Kong-based company Lectarion Aviation made an agreement to set up Russian-Hong Kong joint venture Rostvertol Helicopters China Ltd. to promote the Mi-26T (Mi-26TC) on the Chinese market. By the time the air show kicked off, the first contract on Mi-26T leasing and Chinese crew training at Rostvertol’s premises had been clinched. Under the deal, Rostvertol shall lease a Mi-26T fire-fighting machine to Harbin company Feilong for three years. Talks are under way on selling or leasing two more Mi-26TC helicopters to Feilong in 2007 and the fourth machine to the China Eastern Company.
New partner

Venezuela is soon expected to turn into a closest buyer of Russian aircraft and other materiel. This stage of cooperation was kicked off by the visit of Venezuelan leader Hugo Chavez to Moscow in November 2004 when the two parties agreed on a sale of a large batch of helicopters and small arms. Later, the agreement turned into a deal that Russia would deliver 33 helicopters to field with a rapid reaction battalion, namely 20 Mi-17V-5s, 10 Mi-35s and three Mi-26Ts. In line with the deal, a contract was signed in 2005 for delivery of the first batch of six Mi-17V-5s, eight Mi-35s and a Mi-26T. Deliveries of the Kazan-made Mi-17V-5 helicopters to Venezuela began in February last year and those of the Rostvertol-made Mi-35s in July 2006.

The Russo-Venezuelan cooperation got new impetus from an unexpected early-May 2006 statement by President Hugo Chavez on Venezuelan radio. The Venezuelan president said the nation was intent on buying “a batch of Sukhoi fighters”. His statement came on the heels of the US official refusal to supply spares for the Venezuelan F-16 fighters bought from the United States over 20 years ago. To cap it all, citing Venezuela’s links with the Iranian and Cuban intelligence services, the Bush administration put the country on the list of ‘nations of concern’ within the framework of fighting terrorism and banned arms exports to Venezuela, including third-country arms comprising US-made components.

Hugo Chavez was quick to react: “They do not want to sell us spares. Well. We will buy very good Russian planes; they are better than the F-16. Russian aircraft are among the world’s top-notch warplanes, I saw them in Algeria.” Chavez also offered the Venezuelan F-16s to any country willing to buy, i.e. Iran. Later, the news came that he, probably, meant Venezuela would buy 24 Sukhoi Su-30MK fighters from KnAAPO, with buying future Su-35s as a possibility. A decision was to be taken during Hugo Chavez’s visit to Russia, slated for late July 2006.

The meat of the matter is that the United States voiced in May 2006 its concern caused by the Venezuelan intention to acquire latest Russian-made fighters. However, Deputy Prime Minister, Russia’s defence minister Sergey Ivanov drove it home in response to media reports: “There are no international legal restrictions on selling Russian weapons to Venezuela. Venezuela is not subject to any prohibitive or discriminative action and is entitled to turn to any state to buy any materiel that is not banned.”

First Flankers in Latin America

First Su-30s arrive to Latin America

Sukhoi’s division KnAAPO shipped the first four Su-30MK2 fighters to Venezuela in December last year. This is the first Flanker-family aircraft delivery to a Latin American country. On 10 December the pair of the Su-30MK2s flew during the air parade on the Venezuelan Air Force Day at Libertador air base, attended by President Hugo Chavez who had been re-elected as president just five days before. The contract for 24 Su-30MK2 multirole fighters and a batch of advanced Mi-35M attack, Mi-17V-5 utility and Mi-26T heavy-lifters was signed last summer in the course of Chavez’s visit to Russia. The smooth beginning of fulfilling the contract under so tight a schedule, which ensured the Su-30MKs’ participation in the air parade on 10 December 2006, gave powerful impetus to the Russo-Venezuelan cooperation in arms trade and to crafting new lucrative agreements on deliveries of Russian combat aircraft and other material to Venezuela and some other Latin American countries.
Defence Minister Raul Isaías Baduel. Given that, the estimated deal is worth almost $1.5 billion.

The Venezuela–destined Su–30MK2 fighters are in production at Komsomolsk-on-Amur Aircraft Production Association. The Venezuelan fighters, which sometimes are referred to as Su–30MK2V, are virtually identical to the 24 Su–30MK2s delivered to the Chinese Navy’s air arm (PLANAF) and four Su–30MK2Vs delivered to the Vietnamese Air Force. Unlike the Su–30MKI, Su–30MKM and Su–30MKA aircraft in production in Irkutsk for the Indian, Malaysian and Algerian air forces respectively, the Venezuelan fighters carry Russian-only avionics and weapons like the Chinese and Vietnamese aircraft do.

The Venezuelan military had had an opportunity to see the capabilities of the Su–30MK2 before the contract had been signed. On its invitation, Rosoboronexport quickly arranged a hop of two Su–30MK prototypes to Venezuela to participate in the military parade on the country’s Independence Day on 5 July last year. The aircraft with side numbers 501 and 502, which were the prototypes of the Su–30MKK and Su–30MK2 built by KnAAPO for China, were selected for display to the potential customer. The unique 14,629km hop from Moscow’s Vnukovo Airport to Venezuelan air base El Libertador vic. Caracas with stopovers at Varna (Bulgaria), Malta, Casablanca (Morocco), Sal island (Cabo Verde), Recife and Paramaribo (Surinam) lasted from 29 June to 2 July. Sukhoi’s test pilots Vyacheslav Averyanov and Sergey Bogdan who later displayed the aircraft during the parade flew the fighters. The extra-long-range flight and impressive display of the fighters at the parade left quite an imprint on the Venezuelan authorities.

Right after the signing of the contract in July, KnAAPO kicked off assembly of the first batch production fighters that at Hugo Chavez’s request were to be delivered before the end of the year. The requirement for them to be on time for the 10 December air parade was specified. The date determined the implementation of the first stage of the deal. Despite so tight a schedule, KnAAPO has done its best to do the job on time, and the first two Su–30MK2s entered flight trials as early back as October. By the end of the month, they had been painted the way the customer wanted them to, with the first aircraft sporting the bright Venezuelan flag on its tails. The Venezuelan acceptance team accepted the first two Su–30MK2s in Komsomolsk-on-Amur in early November, with the planes having been airlifted by an An–124 Ruslan transport to Luis del Valle Garcia air base in Barcelona, 230 km east of Caracas by 1 December.

On-site assembly and flight preparations of both aircraft that were given Venezuelan Air Force side numbers 1259 and 0460 was finished in the record-breaking time. Just several days after unloading the Ruslan, KnAAPO’s test pilots Alexander Pulenko

Left: the first pair of Sukhoi/KnAAPO Su-30MK2 fighters delivered to Venezuela last year – at the air parade on 10 December 2006
Top: Venezuela became the first country to receive Mil/Rostvertol Mi-35M modernised combat/transport helicopters, the first delivery took place in July 2006
Bottom: Mil/Kazan Helicopters Mi-17V-5 multirole transport helicopters are in service with Venezuelan Air Force since February 2006
and Pavel Tarakanov flew them out in the Venezuelan skies. 6 December witnessed the first two Venezuelan Su-30MK2s flown by the Russian pilots as an escort of the presidential Aircraft 0001, the Airbus A319CJ, from which Hugo Chavez was watching his new gain with pleasure. The news coverage of the event was shown by all Venezuelan TV channels.

The public demonstration of the two Su-30MK2s during the parade in commemoration of the Day of the Venezuelan Air Force was vested in Sukhoi’s test pilots Vyacheslav Averyanov and Sergey Bogdan, last summer’s heroes of the Venezuelan skies. Venezuelan pilots occupied rear seats in the process. The aerobatics of the Venezuelan Sukhois during the 10 December parade left a huge impression on those present. Hugo Chavez, who reviewed the parade, and other Venezuelan military leaders and Air Force brass did not conceal their satisfaction.

The holiday is over, and the time has come for Venezuelan pilots to learn flying their new aircraft. According to the Venezuelan Air Force commander, General Cordero Lara, the first team of Venezuelan pilots and technicians had been trained in Russia by the time the first Su-30MK2s arrived. “The Russian-made Su-30 will oust the current fleet of US-made F-16s,” he said. The aircraft are to be deployed with the 13th Fighter Air Group stationed in the vicinity of Barcelona.

Meanwhile, KnAAPO furnished next two fighters for delivery. They were flown into Venezuela by an An-124 in the middle of December. Thus, the first phase of the deal was fulfilled. Next ten aircraft will be shipped to Venezuela this year, once KnAAPO has completed them. The remaining ten Su-30MK2s are to be built and delivered in 2008.

An agreement for 24 more aircraft could be made in the future. The parties have agreed that the additional Su-30MK2s might be replaced with even more advanced Su-35 fighters, should they be ready for delivery by then.

In addition to the fighter contract signed by Hugo Chavez on his visit to Moscow last summer, the parties agreed on new helicopter deliveries. The option for 14 Mi-17V-5 utility, two Mi-35 attack and two
Mi-26T heavylift helicopters was turned into a firm order. Earlier, Venezuela had issued a firm order for 15 military helicopters (six Mi-17V-5s, eight Mi-35Ms and a Mi-26T). The six Kazan Helicopters-made Mi-17V-5s were delivered earlier in 2006 (three in February and three more in June). The first four Mi-35Ms were shipped to Venezuela on 5 July last year, with one of them being shown in flight to the Venezuelan military leaders as early back as 13 July. Next four Rostvertol-made Mi-35Ms and the first Mi-26T were shipped to Venezuela in late December. Under a separate agreement, Kazan Helicopters early in July last year delivered three civil Mi-172s fitted with Israeli search-and-rescue equipment to the Venezuelan natural and man-made disaster relief service.

Although Kazan Helicopters delivered its brand-new Mi-17V-5s only a year ago, Venezuelan crews have mastered them in no time and operate them in various exercises. Interestingly, Venezuela has become the first country to field the Mi-35M attack helicopter — a heavily upgraded machine differing from the production Mi-24V and Mi-35 in a number of key improvements. To complete the existing contracts, Russian helicopter manufacturers will have to ship 14 more Mi-17V-5 multirole, two Mi-35M attack and two Mi-26T transport helicopters in the coming year or two.

Late in November 2006, it became known of Venezuela clinching another deal for two Mi-17 helicopters in VIP version designed for the president (one machine was main and the other a backup). The order was awarded to Kazan Helicopters. Both machines will feature cutting-edge navigation and communication aids and self-defence suite to protect from shoulder-launched SAMs. The two VIP Mi-17s are slated for delivery in 2008.

US response

A hike in the Russo-Venezuelan arms trade could not pass unnoticed by the United States that had repeatedly expressed its concern about it. Small wonder, America is losing another of its arms markets. However, Russian Vice-Premier Sergey Ivanov, dual-hatted as defence minister, told the media on 26 July 2006: “The Russo-Venezuelan contract for Sukhoi-family fighters and helicopters is not to be reconsidered.”

“Revision of the contract is absolutely inadmissible,” stressed he, adding: “24 aircraft are not too many for such a big country as Venezuela. In addition, Venezuela is not subject to any international sanctions and there are no restrictions whatsoever on the contract.”

The Russian Foreign Ministry’s spokesman Mikhail Kamynin touched upon the US statements, saying on the same day: “Russia’s military and technical cooperation with Venezuela as well as other countries is conducted in compliance with the international and Russian laws.”

In such a situation, the US State Department decided to try another approach. Many experts believe that the State Dept.’s sanctions slapped on Rosoboronexport and Sukhoi late in July stemmed from the Russian success in Venezuela. On the face of it, the two companies were accused of alleged deals with Iran, “violating the US law”, particularly, an
alleged late-July 2006 deal on upgrading the Iranian Su-24MK bomber fleet. However, Sukhoi officially informed a Take-Off correspondent that no such contract had been made. Moreover, neither Rosoboronexport, nor Sukhoi, nor the Federal Military Technical Cooperation Service were even asked by Iran to discuss the issue. In all probability, the US intelligence ‘erred’. However, a hollow pretext was served to kick Rosoboronexport and Sukhoi that had put up stiff competition for US defence manufacturers. Well, who may benefit from the sanctions? Maybe, the US companies cooperating with Sukhoi under a purely commercial SuperJet 100 regional airliner programme and having to ponder what they have to do in this situation?

Fortunately, the common sense prevailed, and Russian Foreign Minister Sergey Lavrov said on 20 November 2006 that the United States had lifted the sanctions slapped on Sukhoi. The decision was taken following “the relevant investigation”, US President George Bush told his Russian counterpart Vladimir Putin personally during their meeting in Vietnam. The sanctions imposed on Rosoboronexport “under the Iran and Syria Non-proliferation Act” on 28 July 2006 along with five Indian and North Korean companies remained. They ban financial operations of the sanctions-stricken companies in the United States, prosecution of US companies caught in cooperating with them, etc.

**Future orders**

Speaking at the Venezuelan Air Force School, President Hugo Chavez made several statements about future orders for Russian aircraft. In particular, he said his country planned to buy a number of Russian-made Antonov transport planes in the near future. Earlier, Venezuela had wanted to acquire eight EADS C-295 transports and two CN-235MPA maritime patrol aircraft, but the acquisition had been derailed by the United States that vetoed sales of aircraft containing US-made parts to Venezuela.

According to the Kommersant daily, the Rosoboronexport company and Venezuelan government are working out a contract for six Antonov An-74 transport aircraft to be sold to Venezuela. The planes are to be made by the Polyt plant in Omsk (Russia) out of units to be made in cooperation with the primary An-74 manufacturer, the Kharkov State Aircraft Manufacturing Company (KSAMC), Ukraine. Another Ukrainian enterprise, Motor Sich, will supply D-36 turbofan engines to power the future Venezuelan An-74s.

Polyot kicked off assembling An-74s from KSAMC-made components in 1993. However, the plant has delivered only five such aircraft by now. Two Polyt-built An-74s were bought by the Russian Emergencies Ministry and the Federal Security Service with the other ones by commercial carriers.

The An-74 with a carrying capacity of 10 t can haul cargo, vehicles and passengers, be used in humanitarian relief operations, patrol land and maritime borders and airland and airdrop operations in adverse climes and on austere airfields. The aircraft was heavily used in Latin America, e.g. several such planes have been operated successfully in Peru and Columbia.

The Omsk-based Polyt plant is expected to assemble the first An-74 for Venezuela in as early as late 2007. The six An-74s are estimated to cost about $72 million. Experts believe that in future Venezuela might need up to 12 An-74s and up to 8 heavier Ilyushin Il-76 transports.

Another subject Hugo Chavez touched on in his speech was acquisition of advanced light attack aircraft. Last year, the Venezuelan Air Force selected Brazilian EMB-314 Super Tucano as its light attack/advanced combat trainer aircraft but the United States put a squeeze on the Brazilians, torpedoing the deal as with the C-295 transport. Chavez said his government was mulling over importing Russian-made Sukhoi Su-25 or Su-39 (Su-25TM) ground attack aircraft instead. The first batch might number 20–30 warplanes. In addition, Venezuela is eying advanced Russian combat trainer, the Yakovlev Yak-130.