

www.take-off.ru

RUSSIA'S NATIONAL AEROSPACE MAGAZINE

Take-off

June 2007 • special edition for 47th Paris Air Show

Sukhoi SuperJet

getting ready for take-off

[p.10]



Su-35

A step away
from the fifth generation

[p.46]

More Russian airliners for Cuba

[p.14]

Mi-26 heavy-lifter finds new customers

[p.26]



First Su-30MKM fighters delivered! [p.38]



Sukhoi Company
23B, Polikarpov str.,
Moscow, 125284, Russia, p/b 604
Phone: +7 (495) 940-26-63
Fax: +7 (495) 945-68-06
www.sukhoi.org



SUKHOI

June 2007

Editor-in-Chief
Andrey Fomin

Editors
Yevgeny Yerokhin
Andrey Yurgenson

Columnists
Alexander Velovich
Vladimir Shcherbakov

Special correspondents
Vladimir Karnozov, Mikhail Kuznetsov,
Victor Drushlyakov, Andrey Zinchuk, Valery Ageyev,
Alina Chernovanova, Natalya Pechorina,
Dmirty Pichugin, Sergey Krivchikov,
Sergey Popsuyevich, Piotr Butowski,
Alexander Mladenov, Miroslav Gyurosi

Design and pre-press
Grigory Butrin

Web support
Georgy Fedoseyev

Translation
Yevgeny Ozhogin

Cover picture
SCAC and Mikhail Kuznetsov

Publisher

AER MEDIA

Director General
Andrey Fomin

Deputy Director General
Nadezhda Kashirina

Marketing Director
George Smirnov

Executive Director
Yury Zheltonogin

Published with support from
Russian Knights foundation

News items for "In Brief" columns are prepared by editorial staff based on reports of our special correspondents, press releases of production companies as well as by using information distributed by ITAR-TASS, ARMS-TASS, Interfax-AVN, RIA Novosti, RBC news agencies and published at www.aviaport.ru, www.avia.ru, www.gazeta.ru, www.cosmoworld.ru web sites

Items in the magazine placed on this colour background or supplied with a note "Commercial" are published on a commercial basis. Editorial staff does not bear responsibility for the contents of such items.

The magazine is registered by the Federal Service for supervision of observation of legislation in the sphere of mass media and protection of cultural heritage of the Russian Federation. Registration certificate PI FS77-19017 dated 29 November 2004

Print-run: 5600 copies

© Aeromedia, 2007

P.O. Box 7, Moscow, 125475, Russia
Tel. +7 (495) 644-17-33, 798-81-19
Fax +7 (495) 644-17-33
E-mail: info@take-off.ru
<http://www.take-off.ru>



Dear reader,

You are holding another issue of the Take-Off magazine, the special supplement to Russian monthly aerospace magazine Vzlet, timed to the air show in Le Bourget. This time, the show is to take place for the 47th time. The event is considered the most authoritative and prestigious display of the advances of the world's aerospace industry, with virtually all aircraft manufacturers being eager to participate in the show. By tradition, the Le Bourget air show has been held in high esteem by Russian aerospace companies. It is here that advanced Russian planes and helicopters are often shown abroad for the first time. Russia has been displaying its combat aircraft in Le Bourget since 1989. This year, it is to unveil the MiG-29M-OVT experimental supermanoeuvrable fighter, whose technologies are to be embodied in the MiG-35 Gen. 4++ upgraded multirole aircraft

The Le Bourget air show is regarded as an excellent place to bolster international cooperation in aviation and space exploration. A graphic example of the cooperation is the Sukhoi SuperJet regional airliner development programme pursued by a close-knot team of Russian, French, US and several other foreign companies. Very soon, in only several months, the first SuperJet is to kick off its flight trials, with its deliveries to launch customers to follow late next year. The latest news of the SuperJet programme are covered in this issue.

Other subjects of the issue touch upon the export success of Mil Mi-26T heavylift helicopter, deliveries of Tupolev Tu-204 airliners to Cuba and Sukhoi Su-30MKM fighters to Malaysia – the events capable of a heavy influence on the future of the Russian aircraft industry. While the Su-30 family's fighters make up the backbone of Sukhoi's export sales now, the comprehensively upgraded Generation 4++ Su-35 fighter could oust them in this capacity in the nearest future. Its first prototype is gearing up for flight trials that are to begin this summer. A central article of the issue is dedicated to the Su-35 programme.

As usual Take-Off offers you a brief review of the recent important events in the Russian and CIS aerospace industries, information about new deliveries of Russian fixed-wing and rotary-wing aircraft, Russia's space exploration news, etc.

I wish the participants and visitors of the 47th air show in Le Bourget interesting meetings, useful contacts and lucrative deals and, of course, the pleasure of unforgettable demonstration flights of planes and helicopters from all over the world in the Paris skies.

Sincerely,

Andrey Fomin,
Editor-in-Chief,
Take-Off magazine



4

CIVIL AVIATION **4**

- First Tu-214 delivered to Transaero
- Red Wings for Tu-204
- Il-96-400T gets new orders
- Aeroflot did opt for Airbus
- S7 gets more Western airliners
- Russia's cargo traffic leader expands its fleet
- Sky Express extends its operations



10

Sukhoi SuperJet getting ready for take-off

Sukhoi Civil Aircraft Company and its partners carry on with the preparations for launching the trials of the SuperJet 100 regional airliner. The Novosibirsk Aircraft Production Association made the nose and tail sections of the fuselage and shipped them to KnAAPO for assembly of the SuperJet's first flying prototype (aircraft No 95001). NAAPO is completing the manufacture of one more section slated to go to Komsomolsk-on-Amur soon, where the main fuselage sections and the wing are being made and where the airliner is to undergo final assembly. Rollout of the aircraft No 95001 is scheduled for September this year, with the flight tests to follow.

Meanwhile, in Zhukovskiy, TsAGI is finalising the assembly and static test preparations of the first SuperJet 100 static airframe (aircraft 95001) built by KnAAPO in cooperation with NAAPO by the beginning of this year and flown to Zhukovskiy by a Ruslan An-124 transport on 28 January.

Engine makers are gearing up for the SuperJet-100's tests too. A unique open test bench – the only bench like that in Europe – was commissioned at Saturn's pad in Poluyevo near the city of Rybinsk. It will be used for conducting the whole range of certification and acceptance tests of the SaM146 engine under joint development by Russia's NPO Saturn and Snecma (Safran group, France), including such complicated tests as side wind simulation, water, hail and ice ingestion, etc. Soon, the SaM146 is to begin its flight tests on board the Il-76LL flying testbed being prepared by Gromov LII. The first flight of the testbed fitted with the SaM146 is expected in July. Vladimir Karnozov covers the newest events in SuperJet programme



14

Cuban vector of Russian aircraft industry

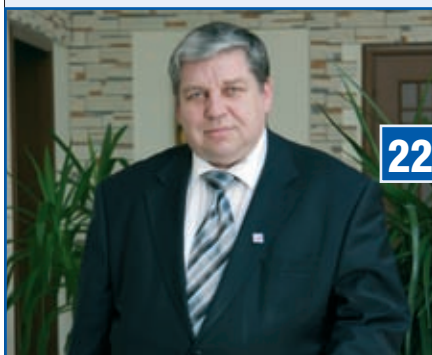
The delivery of the first two Ilyushin Il-96-300 long-haul airliners to Cuba in December 2005 and February 2006 was followed by Russian leasing company Ilyushin Finance Co.'s making a new deal with the Cuban government last year for new Il-96 and Tu-204 family aircraft to be built by Russian manufacturing plants for the Cubana Aviacion airline. The third Il-96-300 intended for Cuba was shipped to the customer very late last year – on 30 December. Not long before that, the Aviastar-SP plant in Ulyanovsk had completed the lead Cuban Tupolev Tu-204 built in the Tu-204CE cargo version. It has conducted its maiden flight on 19 December 2006. Late in May, it completed the full set of certification tests and now is being prepared for shipping to the customer. Andrey Fomin reviews the recent Russo-Cuban contracts and tells about peculiarities of the Russian airliners service with Cubana Aviacion



16

INDUSTRY **16**

- UAC's production plans until 2012 set
- Il-112V to fly in two years
- An-148 gets Type Certificate
- Il-76 to be built in Russia
- Yak-130 tests go on
- NK-93 kicks off flight trials
- Ka-52 upgrade



22

Aleksandr Novikov: "We know what we've got to do"

An important event this year has been the testing of the MiG-29K(KUB) shipborne fighter prototypes developed by the MiG Corp. on ordered from the Indian Navy, as well as the unveiling of and launch of practical work on the deeply upgraded Generation 4++ MiG-35 fighter. The aircraft are powered by modified RD-33MK engines featuring enhanced power and reliability. Full-scale production of the RD-33MK engine has been launched by the Chernyshev Machine-Building Enterprise in Moscow, the only Russian plant producing the RD-33 family engines to power the MiG-29 fighters in service with more than 30 air forces worldwide. In the run-up to the 75th anniversary to be celebrated by Chernyshev, Take-Off met Director General Aleksandr Novikov and asked him to shed light on his company today's activities



26

CONTRACTS AND DELIVERIES 26

The heaviest helicopter for the easiest life

Mi-26T heavy-lifter finds new customers

This year marks the 30th anniversary of the maiden flight of the largest and most capable heavy-lift helicopter in the world – the Mi-26 developed by the Mil Moscow Helicopter Plant. For over a quarter of the century, it has been in production by the Rostvertol plant in Rostov-on-Don in both military and civil (Mi-26T) versions, remaining unrivalled and in high demand on the global market owing to its unique characteristics, high reliability and continuous refinement of its design. Another country, Venezuela, has launched operation of the Mi-26T recently, and this summer the helicopter’s ‘fan club’ is to gain another member – China – with the first aircraft of the type to be shipped to the country late in June. Vadim Nekrasov tells about recent news in Mi-26T’s export career and experience of its employment for fire-fighting and special transport operations all over the world



30

- Another record set by Russian arms export
- More Su-30MK2s delivered to Venezuela
- India steps up Su-30MKI assembly
- UUAZ boosts Mi-171 exports
- Ka-32 to go to Japan
- Jordan debuts as Russian helicopter buyer
- MTA: from intentions to intergovernmental agreement
- Indian Navy to get two more Il-38SDs
- Brahmos boards Il-38
- Azerbaijan gets its first MiG-29s



38

First Su-30MKM delivered

New Flanker derivative for Malaysia unveiled in Irkutsk

The first two Sukhoi Su-30MKM multirole fighters have been accepted by the customer on 24 May. The acceptance ceremony took place at the airfield of the Irkutsk plant, a member of the Irkut corporation. The delegation of the Royal Malaysian Air Force (RMAF) was led by the service’s chief, General Dato’ Sri Azizan bin Ariffin. Malaysia and Russia signed the contract for 18 Su-30MKMs worth about \$900 million in August 2003. The first two aircraft are to be delivered in June by an An-124 Ruslan heavy-lifter, with two more fighters to follow in June and July. Six more warplanes are to be shipped in October and November. Thus, the customer will have taken delivery of 12 Su-30MKMs before year-end, with the remaining six to arrive in Malaysia in 2008. Vladimir Karnozov reports from the first two Su-30MKMs handing-over ceremony



42

MILITARY AVIATION 42

- Russian and Belarusian Air Forces held combined exercise
- Lipetsk Centre receives two Su-25SMs
- Two more Mi-28N production helicopters built
- Ukrainian MiG-29 upgrade kicks off
- Preparations for MiG-31 fleet upgrade under way
- Attack aircraft land on motorway



46

Su-35: a step away from the fifth generation

The Sukhoi company pins its near future at the global fighter market on the advent of the Su-35 super-maneuvrable multirole fighter – a heavily upgraded Flanker-family member intended to fill the gap between various today’s versions of the Su-30MK fighter and a fifth-generation aircraft whose deliveries might kick off in the later 2010s. “The Su-35 is a Generation 4++ aircraft embodying numerous Gen. 5 technologies. They ensure the Su-35’s superiority over all other Gen. 4 fighters under development throughout the world. During 2009–2015, the cutting-edge technologies will make the Su-35 superior to all future multifunction fighters on the global market”, Sukhoi officials say. The plant in Komsomolsk-on-Amur is now building three Su-35 prototypes the first of which is due to kick off its flight trials as early as this summer. What kind of aircraft is the latest fighter and how does it differ from the Su-27 and Su-30 that are all the rage nowadays? Andrey Fomin tries to answer these questions

COSMONAUTICS 54

- Khrunichev Centre grows into holding company
- Dnepr launches resume
- Soyuz-Kourou launch site construction begins

First Tu-214 delivered to Transaero

On 23 April, Kazan hosted the ceremony of acceptance by Transaero airline of the first Tupolev Tu-214 built for it by the Kazan Aircraft Production Association (KAPO) on order by the Financial Leasing Company (FLC). The ceremony was attended by UAC's President Alexey Fyodorov, which highlighted the importance and long-awaitedness of the event. Fyodorov called very important the fact that private Russian carrier Transaero, which had flown only foreign-made planes, had bought a new Russian-made Tu-214 airliner.

Under the financial leasing contract with FLC dated 14 February 2005, KAPO is to make a total of 10 Tu-214s for Transaero. The first of them, RA-64509, was made and completed its maiden flight in Kazan on



17 November 2006, but its debugging slipped behind schedule by almost half a year. It had been prepared for delivery only by April and had flown to Moscow right after the handover ceremony. The Transaero Tu-214's

first passenger operations began in mid-May on the route from Moscow to Dubai. This autumn, Transaero is going to receive the second Tu-214 (RA-64513) from KAPO. The aircraft is now in final assembly.

The Tu-214 long-haul aircraft in production by KAPO for the Transaero airline have the two-class layout, mount Perm Engine Company PS-90A engines and have a range of 7,200 km.

Red Wings for Tu-204

On 28 April, the Red Wings air carrier earlier known as Airlines 400 signed several agreements with the Ilyushin Finance leasing company (IFC), under which about twenty Tupolev Tu-204 aircraft are to be delivered to it gradually. At the first stage, Red Wings is to receive three Tu-204-100s previously flown by KrasAir airline.

Two of them (RA-64018 and RA-64019) were bought by KrasAir in 2000 and 2001 right from the Aviastar production plant in Ulyanovsk and named after Vassily Surikov and Ivan Yarygin. The third aircraft (RA-64020, Aleksandr Lebed) was built by Aviastar at IFC expense and leased to KrasAir in December 2003 until 2018. The Krasnoyarsk-based carrier had flown these three airliners until earlier this year when IFC decided to revoke the lease on the airliner with registration number RA-64020. According to RBC, KrasAir had accumulated a considerable debt on its leasing payments to IFC with no clear prospect of repaying it in sight. Under both parties' agreement, IFC took over the other two Tu-204-100s (RA-64018

and RA-64019) as well. Red Wings is to start flying all of them as early as this summer 2007.

The Airlines 400 carrier was set up in 1999 on the premises of the Aircraft repair Plant No 400 in Vnukovo, hence the unusual name of the company. It was a specialist in charter traffic in support of Russian tourist companies. In February this year, new owners took over Airlines 400. According to RBC, 80 per cent of its stock became controlled by the National Reserve Corporation (NRC) co-owned by Aleksandr Lebedev, a member of the lower house of the State Duma. The new owners launched a top-to-bottom reshuffle that is to result in Tu-204s making up the backbone of its fleet in the near future. Rebranding is running at the same time. Now, the carrier will have the trademark of Red Wings, having partnered with Russo-German Blue Wings company, with the latter's 49 per cent of the stock owned by NRC as well.

However, the delivery of three ex-KrasAir Tu-204-100s to Red Wings is only the beginning of a large-scale campaign of the charter



carrier's conversion to the aircraft of the type. Concurrently with the contract for these airliners, IFC signed an agreement with Red Wings on four more brand-new Tu-204-100s to be made by Aviastar. There is also an option for 12 more aircraft, including the IFC-promoted Tu-204SM prospective upgraded version powered by Western engines.

Given that newly-built Tu-204s are not to be delivered this year (the agreement with Red Wings was signed after UAC's production plan had been approved, hence the order had not been included in the plan) and three aircraft are not enough for implementing its ambitions, the company is in talks on leasing two more second-hand Tu-204-100s. These are the aircraft No 64011 and 641017, which were built in 1993 and 1996 respectively and operated by

the Siberia (S7) airline until last year. Now they are flown by Avistar-TU. By the way, the Tu-204-100 (RA-64011) was used by Airlines 400 last year, and the company got a useful experience in cooperating with Aviastar-TU that handled the technical side of its operations at the time.

The two ex-S7 airliners are expected to be handed over to Red Wings for temporary operation this summer. Thus, in several months, the rebranded charter carrier with its five Tu-204-100s could own the largest fleet of such aircraft in Russia (Kavminvody operates two Tu-204-100s, Aviastar-TU three Tu-204Cs, Vladivostok-Avia four Tu-204-300s, Rossiya three Tu-214s and Dalavia five Tu-214s), and fulfilling the long-term contracts concluded with IFC will turn Red Wings the uncontested leader in this field.

Il-96-400T gets new orders

Aeroflot's Director General Valery Okulov and UAC's President Alexey Fyodorov signed the protocol of understanding on the financial leasing of six new Ilyushin Il-96-400T widebody freighters on 30 March. Under the MoU, the parties are drafting a contract for UAC's Ilyushin Finance Co. to provide Aeroflot's subsidiary Aeroflot Cargo with six Il-96-400Ts within three years starting next year. The carrier is to take delivery of two aircraft in 2008, one in 2009 and the remaining three in 2010. The freighters are to be leased to Aeroflot for 15 years. Once the term of leasing and mutual payments have been over, the lessee will be entitled to the property rights to the aircraft, but it also will be entitled to buying them at any time throughout the term of leasing.

The Il-96-400T is the cargo variant of the upgraded Il-96-400 airlin-



er. It has a maximum take-off weight of 265 t, a maximum payload of 92 t and a maximum payload range of 5,700 km. The powerplant includes upgraded PS-90A1 engines with thrust increased to 17,400 kgf, with the cockpit designed to seat only two crewmen featuring an up-to-date cockpit management system.

The lead Il-96-400T (RA-96101) being completed by VASO will kick off its trials this summer, initially powered by production PS-90A engines. By autumn, once Perm Engine Company has delivered a set of advanced PS-90A1s, it will

have been re-engined and delivered to the buyer, the Atlant-Soyuz airline. Under the leasing contract with IFC, Atlant-Soyuz shall receive two Il-96-400Ts, with the second aircraft being able to be completed before 2007 year-end too.

The next buyer of advanced transports will be Aeroflot-Cargo. VASO has launched construction of components of nine Il-96-400s and Il-96-400Ts designed for Russian and foreign customers. Until 2015, the plant will have been building three Il-96-family aircraft every year. This year, VASO will make one more Il-96-300 for the Rossiya state trans-

port company in addition to the two freighters for Atlant-Soyuz. Further down the road, VASO will switch to the production of the upgraded Il-96-400-series aircraft only.

According to a number of experts, Aeroflot's decision to buy six Il-96-400Ts may be regarded as a result of the foot-dragging on the contract for six new Il-96-300 airliners. As is known, following the protracted haggling, Aeroflot operating six aircraft like that contracted Ilyushin Finance Co. in July 2005 to lease six Il-96-300 long-haul airliners in 2006-07 for a term of 15 years. Although the deal as approved by the general meeting of Aeroflot's stockholders on 19 September 2005, it became clear with the passage of time that the flag carrier was in no hurry to have new Il-96s in its fleet. In such a situation, a year ago, IFC offered the customer more efficient Il-96-400s instead of the Il-96-300s, towards which Aeroflot had grown cold. It looks like that further talks resulted in the new deal.

The current situation is best characterised by the saying that

the cake was eaten and kept at the same time. Aeroflot, which had banked on the gradual discarding of Russian and Soviet-built aircraft from its fleet, retained the Il-96 contract, having supported a domestic manufacturer at the expense of its subsidiary, Aeroflot-Cargo. The latter will get – quickly and cheaply enough – quite efficient new cargo planes that would complement its second-hand foreign makes. To date, Aeroflot-Cargo has operated only three DC-10-40Fs given by the parent company (the fourth one still carries Aeroflot's logo). However, Aeroflot-Cargo, which launched operations under its own flag in December 2006, will begin to replace its DC-10-40Fs with more sophisticated MD-11s. The first aircraft of the type is to arrive in July, and the company will have taken delivery of three MD-11s out of the six ordered. All of them are to be flown under the operational leasing arrangement with Boeing Capital. Earlier, those 1992-built planes were operated as airliners by the Varig company.

Aeroflot did opt for Airbus

On 22 March, Aeroflot Director General Valery Okulov and Airbus COO Fabrice Bregier signed a memorandum of understanding on the Russian flag carrier to buy 22 Airbus A350XWB long-haul wide-body aircraft. Thus, Aeroflot finally made up its mind as to the mainstay of its long-haul airliner fleet after 18-plus months of fence sitting. There had been two contenders in the tender issued in July 2005 – the Airbus A350 and the Boeing 787. Despite many in the airline favoured the Boeing 787 expected on the market a few years earlier than the A350, the latter did come on top. It is possible that the scales were tipped by political considerations, rather than technical or economic ones.

Under the 22 March MoU, the advanced airliners are to be delivered between 2014 and 2017. Finer points of the deal are to be touched upon in the contract that the parties are drafting yet. The protocol does not even specify the variant of the airliner, which is provisionally dubbed A350-xxx XWB. The family of the A350XWB long-haul aircraft with a range of 15,700 km under development by Airbus now will have three basic versions (-800, -900 and -1000) with different seating capacities ranging from 270 to 350 passengers. The maiden flight of the first prototype is scheduled for 2011, and deliveries of the A350-900 baseline model are to begin in 2012 (the Boeing 787 prototype is to fly this summer and



Airbus

the customers will start receiving its baseline model, the 787-8, in 2008, i.e. four years earlier than its European rival).

To bridge the gap in its long-range airliner fleet, Aeroflot came to terms with Airbus that, until then, the latter would supply it with a stopgap solution – previous-generation A330-200 long-haul aircraft. Aeroflot and the AerCap leasing company signed

the relevant MoU, under which the Russian carrier is to lease 10 brand-new A330-200s. The first two of them are to arrive in 2008, five more in 2009 and the rest in 2010. It is emphasised that the aircraft will be brand-new and shipped right from the assembly plant of Airbus. Aeroflot will have operated them until the delivery of the 22 A350s under the earlier agreement.

S7 gets more Western airliners

The Siberia airline (trademark S7) announced on 2 April that it had signed a contract with the ILFC leasing company for four new Airbus A320-200 medium-range airliners. The aircraft are subject to operating lease for six years with the right to further prolongation of the lease. The list price of the four planes is \$264 million. Under the contract, the A320s will have been delivered within the earlier six months of 2008.

The airliners will become the first brand-new foreign-made planes bought by S7 from the manufacturer. Until recently, the airline had had to operate only used foreign-made planes, with its fleet including seven A310s made in the late '80s, six A319s made in 1999 and 12 Boeing 737-400s and -500s made in the early '90s in addition to nine Il-86s and 28 Tu-154Ms.

"The four A320s are brand-new. We will receive them right from the assembly line of the manufacturer," said S7's Director General Vladislav Filyov, "It means a new stage of development to us. We realise that if we have to remain one of the two major airlines of Russia, we need to

buy at least 70 new long-haul aircraft in five to seven years, and we have started down that road."

The strategy has been bolstered by another deal struck by S7 in April. Under the contract with Cramington leasing company, it will acquire 10 new-generation Boeing 737-800s for a tune of about \$700 million. The aircraft will have the single tourist-class layout to seat 189 passengers and will be powered by CFM56 engines (CFM56s will also power the four A320s mentioned above). Delivery

of the first four Boeings to S7 is slated for 2010, with the remaining six to come in 2011. There is an option for 10 more Boeing 737-800s.

The new Boeings will be operated by airline's subsidiary S7 Charter established in January this year. So far, it provides air brokerage services and arranges flights to tourist destinations, sharing the fleet with the parent company, S7 Airlines. To this end, S7 Charter uses 15 of S7's planes – two Boeing-737-400s, four A310s, six

Il-86s and three Tu-154s. Further down the road, it plans to obtain the operator's certificate and launch an independent operation of aircraft, taking over all charter operations of S7.

The latest news about S7 new orders came on 29 May when it announced its deal with the Boeing company to buy 15 brand-new Boeing 787 airliners for \$2.4 billion in catalogue prices. The deliveries should begin in 2014 with S7 to become the first Russia's customer of the new Boeing's model.



Boeing

Ilyushin Finance Co.
United Aircraft Corporation



- *Financial and operating leasing of modern Russian-made aircraft*
- *Aircraft export financing*
- *After-Sale support*

Hall 4
stand E 16

Russia's cargo traffic leader expands its fleet

Having come first in Russia in 2006 in terms of freight traffic volume, the Volga-Dnepr group have made several major deals to expand its fleet of aircraft. On 12 March, Volga-Dnepr's President Alexey Isaikin and Boeing's Executive Vice-President Scott Carson signed two contracts in Moscow. One provided for delivery of five new Boeing 747-8Fs with a list price of \$1.4 billion in 2010–2013, with an option for five such aircraft more. Until the deliveries begin, Volga-Dnepr since November 2007 will have been operating the Boeing 747-400ERF, whose 12-year leasing was negotiated with the GECAS leasing company. Now, Volga-Dnepr's stable has four older Boeing 747 versions. The other contract makes provision for reserve operation of Volga-Dnepr's Antonov An-124s for logistic support of the Boeing 787 production.

In 2006, Volga-Dnepr's volume of sales hiked by 55 per cent totalling \$725 million. The group's



income growth was due to the successful development of its charter operations using ramp-fitted An-124-100 and Il-76 transports and the dynamic development of scheduled cargo traffic by Boeing 747 airliners.

98 per cent of the cargo hauled by Volga-Dnepr is made up by international traffic. In 2006, the group claimed 52.4 per cent of the global market of unique outsized cargo operations. Today, the company serves over 900 destinations in 150 countries. Volga-Dnepr handles An-124 and Il-76 charter

services, and scheduled haulage of general cargo by Boeing 747s is handled by the Air Bridge Cargo company, a member of the group. In October last year, the company was issued its operator's certificate and the status of an independent company.

An important event last year was the beginning of commercial operation of Volga-Dnepr's first upgraded Ilyushin Il-76TD-90VD freighter meeting the latest ICAO requirements, which allowed an expansion of the company's network of routes. This year, the aircraft plant in

Tashkent is to complete the second aircraft of the type for the company, with Volga-Dnepr planning to buy at least 15 such aircraft.

In addition, it became known in late March that Air Bridge Cargo was finalising a contract with the IFC leasing company for five new Tu-204C freighters. The customer plans to receive the first two of the aircraft as early as the first quarter of 2008, but their actual in-service date will depend on the production capabilities of the manufacturer, the Aviastar-SP plant in Ulyanovsk.

Sky Express extends its operations

In spite of the distrust of sceptics, the first Russian low-cost airline, SkyExpress, has been increasing its traffic and expanding the number of destinations it serves. On 9 May it launched another – and the longest awaited – service from Moscow to St. Petersburg. The minimal fare for a flight from Moscow's Vnukovo to Pulkovo in St. Petersburg will be upwards of 1,400 rubles (just above \$50) as it is on other SkyExpress routes. Registered customers buying tickets via the corporate website by means of the so-called promo-code will pay mere 500 rubles (less than \$20) – the same as the fare in a train carriage with numbered reserved seats. Paying for tickets has become much simpler on 20 April. Now one can do it at virtually any of the 4,000 Euroset mobile communications shops throughout Russia.

The service to St. Petersburg has become the sixth of SkyExpress's operations that kicked off with the first flight to Sochi on 29 January 2007 (SkyExpress got its scheduled and charter services licence on 16 January 2007 and the operator's certificate on 5 December 2006). However, about 50,000 passengers resorted to the company's services since then, with about 1,000 flights conducted and over 120,000 tickets sold. There are now services to Sochi, Rostov-on-Don (since 9 February), Murmansk (since 14 February), Kaliningrad (since 19 March), Tyumen (since 12 April) and St. Petersburg (since 9 May). In the near future, the company is going to launch operations to Perm in June, Yekaterinburg in July, Ufa and Volgograd in October and Kazan and Chelyabinsk in November or December. The carrier will have



flown its airliners to 20 Russian destinations out at 600–3,000 km away from Moscow by late 2008.

For the sake of such a sharp increase in its traffic, Sky Express has been sparing no effort to beef up its fleet made up exclusively by 133-seat Boeing 737s. In the wake of the delivery of a 1986-made Boeing 737-330 (VP-BBN) and a 1992-made Boeing 737-5Y0

(VP-BFB) in November last year and January this year respectively, SkyExpress receives two more Boeing 737-53As in March (VP-BFM and VP-BFN built in 1990). 21 April saw the fifth aircraft with registration number VP-BFJ arrive to Vnukovo Airport in Moscow. The company is to buy three more Boeing 737s by early summer, driving their strength up to eight.

PERFECT 10

THE DUBAI INTERNATIONAL
AEROSPACE EXHIBITION 2007
CELEBRATING THE 10TH ANNIVERSARY SHOW



**VISITORS FROM
106 COUNTRIES
AND EXHIBITORS
FROM 46 COUNTRIES.**

THIS IS NO REGIONAL SHOW. COME TO
THE DUBAI AIRSHOW AND FIND OUT WHY.

**OR COME AND VISIT US AT THE
PARIS AIRSHOW IN HALL 3 STAND C7
FOR MORE INFORMATION.**



11-15 November 2007
Airport Expo Dubai
United Arab Emirates
www.dubaiairshow.org



SCAC

Sukhoi Civil Aircraft Company and its partners carry on with the preparations for launching the trials of the SuperJet 100 regional airliner. The Novosibirsk Aircraft Production Association (NAPO) made the nose and tail sections of the fuselage (F-1 and F-5) and shipped them to KnAAPO for assembly of the SuperJet's first flying prototype (aircraft No 95001). NAPO is completing the manufacture of the fuselage F-6 section slated to go to Komsomolsk-on-Amur soon, where the main fuselage sections – F-2, F-3 and F-4 – and the wing are being made and where the airliner is to undergo final assembly. Rollout of the aircraft No 95001 is scheduled for September this year, with the flight tests to follow.

Meanwhile, in Zhukovsky, TsAGI is finalising the assembly and static test preparations of the first SuperJet-100 static airframe (aircraft 95001) built by KnAAPO in cooperation with NAPO by the beginning of this year and flown to Zhukovsky by a Ruslan An-124 transport on 28 January.

Engine makers are gearing up for the SuperJet-100's tests too. A unique open test bench – the only bench like that in Europe – was commissioned at Saturn's pad in Poluyevo near the city of Rybinsk. It will be used for conducting the whole range of certification and acceptance tests of the SaM146 engine under joint development by Russia's NPO Saturn and Snecma (Safran group, France), including such complicated tests as side wind simulation, water, hail and ice ingestion, etc. Soon, the SaM146 is to begin its flight tests on board the Il-76LL flying testbed being prepared by Gromov LII. The first flight of the testbed fitted with the SaM146 is expected in July.

Aeroflot vision of SuperJet future

Aeroflot grabbed an opportunity to present its own vision of the Sukhoi SuperJet 100 project development on 22 May. That day Sergey Ivanov, first deputy chairman of the Russian government, visited the Moscow site of Sukhoi Company.

Ivanov came there with a purpose to chair the session of the Military Industrial Commission (MIC) to the Russian government that addressed issues of development and production phases of Russian Air Force next generation fighter programme. But Ivanov took this opportunity to inspect Sukhoi Civil Aircraft Company (SCAC) facilities and take a close look at recent developments of the SuperJet 100 project.

"The place for holding this session of the Military Industrial Commission was chosen taking account of the leading role Sukhoi company plays in development of next generation aircraft. We already have some evidence that allows us to draw some preliminary conclusions on how these projects

have been progressing", Ivanov told the press during his visit.

The top state official inspected SuperJet 100 Electronic Bird being created by SCAC with help from international programme participants including Thales and Liebherr, as well as Russian CSTS Dinamika. Installation of the Electronic Bird commenced in April. It shall attain full readiness in October this year.

After inspecting the Electronic Bird, Sergey Ivanov listened to the presentation of Valery Okulov, Director General, Aeroflot, the SuperJet's launch customer. Valery Okulov said the airline started withdrawal of its long-serving Tupolev jets. "We are withdrawing Tu-134A airliners. All of those shall quit active service next year. Then, in 2010, we will have all Tu-154M narrow body medium-haul airliners withdrawn".

The old Tu-134s are to be replaced by Sukhoi SuperJets. Aeroflot is to take delivery of its first Sukhoi aircraft at the end of 2008. Sukhoi twin jets will supersede Tu-134s. "But we also need a suitable replacement

for the larger Tu-154M", Okulov carried on. Aeroflot has an idea to focus not just itself, but also other Russian airlines in the direction of accepting the SuperJet as their main aircraft type. To be up to this role, the SuperJet should have an extended family, made up of several shortened and stretched fuselage versions.

Okulov explained his vision: "We offer to increase the seating capacity of the SuperJet so that its largest model grows to some 130 seats. This shall considerably boost SuperJet competitiveness in the global marketplace". The central piece of the Aeroflot idea is to create a family of SuperJet aircraft around the baseline 95-seat model, the SuperJet 100-95B. "The family would have a stretched and a shrunk versions."

"We are an active participant in the dialogue that SCAC has been maintaining with the airlines. Discussions show that the airlines demonstrate highest interest in stretched versions. If the stretched versions emerges, the SuperJet will become a complete aircraft

SUKHOI SUPERJET GETTING READY FOR TAKE-OFF

Vladimir KARNOZOV



Vladimir Karnozov

family, which shall give the project additional competitive advantages”, Okulov stated.

Following the presentation to the first deputy chairman of the Russian government, Valery Okulov and Sukhoi Director General Mikhail Pogosyan applied their signatures on a new agreement. It calls for additional 15 firm and five conditional orders for the baseline SuperJet 100-95 “and its family members”. Deliveries are set for 2011. The deal is worth \$400 million by catalogue prices. But Aeroflot is understood to have received a considerable discount as the launch customer for the type. In December 2005 the airline fielded a firm order for 30 SuperJets in baseline version.

Speaking to the media, Okulov said that Aeroflot is “deeply integrated into the project”. Seven joint working groups between the manufacturer and the airline see to technical issues, such as maintenance, as well as ground and flight crew training, shaping of the passenger cabin and the crew station. “Our joint working groups have a common goal, to ensure success of the whole project”, he stated.

With the new order for 15+5 aircraft, which shall be firmed up later this year, the total order book for the SuperJet is nearing a hundred units. “This is a milestone. We estimate that, to ensure commercial success of the whole project, there must be at least 90-100 firm orders a year before a type’s entry-into-service. It seems that Sukhoi is well on track to achieve this target”. Aeroflot sees it as one of the many preconditions for success of the project.

The Russian flag-carrier continues working with Russian and foreign structures on the aircraft financing market to raise the required funding for its SuperJet acquisitions. The airline has wired first prepayment to SCAC in 2006, Okulov said, and continues paying due amounts this year. Okulov said that the grand total of all prepayments comes to 10.5% of the contract sum. So far the money for these payments

came from Aeroflot’s own resources, but the airline has held few rounds of negotiations with Russian and foreign banks. “The banks have given us their approval for funding of our aircraft acquisitions. Negotiations continue on credit terms”, Okulov concluded.

VTB ready to fund SuperJet sales

On 17 May Sukhoi Civil Aircraft Company (SCAC) and leasing arm of Russia’s major national bank VTB (formerly VneshTorgBank, the Bank for Foreign Trade) signed the agreement that enables sales of Sukhoi SuperJet 100 aircraft via VTB-Leasing. “I do not exclude further steps that will see other lessors joining up. This creates a competitive environment, which is beneficial to airline customers”, SCAC president Victor Subbotin told Take-off. Availability of several leasing

options is a new development in the history of Russian aviation projects.

Western airlines are likely to be seeking western capital for funding of their possible acquisitions of the SuperJet, Subbotin anticipates. But respective offers from Russian banks knowing well the western aircraft financing market, such as VTB, can be attractive and quite competitive, he believes. "If that is the case, why should western airlines refrain from this new option?!" he asked polemically. "I believe that the Russian banks are now in a position to work on same terms as their western counterparts, including offering similar interest rates".

Speaking about SCAC's need in banking capital, Subbotin said: "We have two issues that require financial support. The first is aircraft sales to airlines. The second is technical renovation of Sukhoi manufacturing plants. This renovation shall enable them to produce up to a hundred of new airframes per year. We are happy that VTB believes in Sukhoi and our products."

As of Le Bourget 2007 time, SCAC holds 61 orders for the SuperJet. They were won in 2005 and 2006. "We expect to sell a minimum of 40 more aircraft this year, including some to a first foreign customer", Subbotin said.

Touching on the delivery schedule, Subbotin said that first shipment to Aeroflot planned for

late 2008 is "on track". During earlier months of 2007 the RA-95002, a first SSSJ airframe built for test purposes, was prepared for static testing in TsAGI, the Central Aerohydrodynamics Institute named after Zhukovsky. In parallel, a test bed for testing of PowerJet SaM146 engine (selected to power the SuperJet100), has been prepared. The test-bed is one of the Ilyushin Il-76LL heavily instrumented "flying laboratories" of Gromov LII Flight Research Institute. SaM146 shall fly on an Il-76LL later this summer and achieve certification in 2008.

"Aircraft financing is one of top priorities for the whole of VTB group and its leasing arm as a group member", - says VTB-Leasing Director General Anton Borisevich. "So far we have been focusing on financing Russian aircraft manufacturers; now we are making steps to get involved in funding of airlines wishing to purchase SuperJets. Our agreement with SCAC on this matter marks a turning point for the Russian aviation industry. We believe that the Russian industry is able to produce high-quality, state-of-the-art airplanes for both domestic and global markets."

He further stated that VTB is supportive of the SuperJet effort. "We will invest that much money that is actually needed for a successful completion of the project". Unlike other financiers already involved or getting involved with the SuperJet, VTB is ready

to fund the whole cycle, from design and manufacturing to sales and after sales support. "It is very important for us to support the whole project and the whole of Russian aircraft manufacturing industry in general". At the same time, Borisevich went on, there are very few Russian manufacturers who can produce aircraft competitive on the international market. "We are present in every project which has a strong business case. But the SuperJet is most important; it is the most attractive in terms of total value and customer base. In our view, SuperJet is the most promising of all Russian civilian aircraft projects".

Oleg Demidov, VTB vice-president, large corporate clients, adds that VTB was the first Russian bank to have supported the SuperJet. In 2005 the bank opened a credit line to SCAC worth approx \$370 million. "Today, our funds are being spent in many directions, including everyday needs of the manufacturer and technical renovation of its manufacturing facilities. As of May, we provided about \$200 million for the SuperJet project". Sukhoi's plant KnAAPO in Komsomolsk-on-Amur, where SuperJet assembly line is being set, has purchased a number of advanced western machine tools on VTB's money.

Besides, VTB signed agreement with Aeroflot on support of its purchase of 30 SuperJets. "We are already participating in materialisation of



this deal. Separately, we are talking to AirUnion on their SuperJet acquisition plan. If new airlines come up with orders for the airplane, we will work with them as well”.

More money for SuperJet

Sukhoi Civil Aircraft has issued 10-year debt bonds worth \$192 million and placed all of them on the market for public funding. The coupon is 7.85% for a 2.5 year term. The raised funding will be spent on Sukhoi SuperJet 100 project.

Investors fielded 40 requests for the bonds. “Almost half” of the requests came from outside Russia. Most of the buyers are investment funds and banks. Maxim Grishanin, SCAC senior vice-president for economics and finance, said this was the first step SCAC made into the market of public funding. The company is planning a second issue within the next two years. “Further steps will depend on how the project goes. They shall be definitely taken after SSJ makes its maiden flight as planned in the second half of 2007. Most likely at a time of entry-into-service”, he said. “Before taking additional public funding, we need to build our credit history, and, of course, to demonstrate the merits of our product in real airline operation”. SCAC tentatively targets Eurobonds sometime in 2009–2010.



Andrey Fomin

Grishanin gave the following figures for SCAC financial results. According to Russian national accounting system, in 2005 SCAC had an income of Ruble 0.108 billion (approx \$4 million). In 2006 the figure was 2.074 billion (approx \$77 million). The income was made up of prepayments made by four SSJ airline customers, non-refundable state investments and the income generated by services to other aircraft manufacturers. The latter included

Sukhoi engineers making digital drawings for other OEM's aircraft.

In 2005 SCAC registered a loss of 94 million (\$3.5 million). The year of 2006 brought a positive result, with 31.2 million rubles (\$1.2 million) net profit. Assets rose from 4 billion (\$0.14 million) in 2005 to 8.9 billion rubles (\$0.33 million) last year.

Today, SCAC holds 61 firm orders, all for the basic 95-seat model SuperJet 100. These came from four customers: Aeroflot (30), Financial Lease Company (10), AirUnion (15) and Dalavia (6). In May Aeroflot added LoI for 15 more SuperJets, which shall be made into a firm order later this year.

Touching on the initial Aeroflot order for 30 SSJs, which took the project off the ground, Grishanin said that, although the December 2005 contract “is very difficult for us, with very tough financial and delivery obligations... we are selling aircraft profitably even within our first major deal”. He estimated the profitability of the so-far made sales at 2% (by Russian accounting standards). Grishanin said all four customers have actually made prepayments. He further estimated that in 2007 the sales profitability will rise to 4%. The income is expected to rise by 2.5 times as airline customers are to continue making payments for the ordered aircraft.

Major sources of SSJ funding have been state investments, Sukhoi own funds and contribution of risk-sharing partners (Sukhoi lists 18 western companies selected as industrial partners on SuperJet program). The Russian government provided 1.8 billion rubles (approx \$67 million) last year. The government shall add 3.8 billion (\$150 million) in the following years. SSJ research and development costs are estimated at \$800 million. “So far we have been going without budget overruns; we even expect some saving”, Grishanin said.





CUBAN VECTOR OF RUSSIAN AIRCRAFT INDUSTRY

IFC delivers Tu-204s to Cuba

The delivery of the first Tu-204CE (No 64036, CU-C1700) to the Cubana Aviacion company will have taken place until the end of June this year. Additional certification trials were needed because the aircraft slightly differs from the baseline model that has obtained its type certificate (e.g., it is fitted with a Russian-made inertial navigation system instead of the US one).

Under the 10 April 2006 contract, the second Cuban Tu-204 – the Tu-204-100E airliner (No 64035, CU-T1701) – had been built by early June and has been undergoing ground tests. It is slated to fly in June and to be delivered in July following a brief flight test programme. August will see the completion of the third Cuba-destined Tu-204 (another -100E passenger aircraft) that will be displayed at the MAKS 2007 air show and head for Cuba in September. A small number of test flights of the airliners are needed for them to meet the international requirements to precise navigation in the vicinity of European, Canadian and US airports.

The Russian airliners delivered by IFC to Cuba – both Il-96s and Tu-204s – are powered by the Perm Engine Company PS-90A engines compliant with the up-to-date world standards and being just the thing for the Cuban customer. The Tu-204-100E airliners exported to Cuba feature a number of differences from the earlier built aircraft of the type. For instance, special efforts were taken to make them more comfortable for passengers to fly on; therefore,

the delivery of the first two Ilyushin Il-96-300 long-haul airliners to Cuba in December 2005 and February 2006 was followed by Russian leasing company Ilyushin Finance Co.'s making a new deal with the Cuban government last year for new Il-96 and Tu-204 family aircraft to be built by Russian manufacturing plants for the Cubana Aviacion airline. The third Il-96-300 intended for Cuba (CU-T1254) was shipped on 30 December last year. Not long before that, the Aviastar-SP plant in Ulyanovsk had completed the first Cuban Tu-204 assembled in the Tu-204CE cargo version. It was conducted its maiden flight on 19 December 2006. Late in May, it completed the full set of certification tests and has been completing preparations for shipping to the customer.

they are fitted with a digital entertainment system (in the business class, the system includes videogames and enables passengers to choose a movie to watch or music to listen to independently). In addition, the aircraft have pioneered a full set of measures to deny interference in the flying crew's operation.

Since the Cuban company decided that three Il-96-300s it has would do so far, the delivery of one more Il-96 under last year's contract did not happen by mutual agreement. Instead, talks are under way and new deal may be clinched any time soon for at least two more Tu-204s for Cubana Aviacion (a freighter and an airliner), with the An-148 regional jets being an option further down the road. The next Tu-204, which is likely to be a freighter, could be completed by Aviastar-SP before year-end.

How Cuba uses the Il-96-300s delivered and what routes the Tu-204s are to fly was learnt by Take-Off from IFC's technical director Yuri Ostrovsky.

"Now, Cuba uses three IL-96s that operate rather well," says Yuri Ostrovsky, "The time

of learning the ropes has been over, and the Cubans now realise how the aircraft should be operated. A key element of aircraft operation is maintenance. Last year, the Cuban Il-96s were ferried to Russia for scheduled maintenance, which is expensive and time consuming. Now, a maintenance base has been set up right in Havana. Since April, maintenance is exercised on site, which has slashed the cost of operation and reduced the maintenance time."

A similar arrangement is to be used for the Tu-204 as well. According to IFC's technical director, the new aircraft are likely to be maintained on site from the outset, since gear to maintain them is exported to Havana under the contract. At the first stage, maintenance will be done by Russian technicians for a short time, and then Cubans will take over completely.

"Actually, we have plans to set up a Russian-made aircraft maintenance centre in Cuba," says Yuri Ostrovsky. The centre would maintain both Cuban-operated aircraft and the ones that might be exported to other nations in the region. And those countries are keen enough on such aircraft, with talks under



Andrey FOMIN



Vladimir Karnozov



Tupolev JSC



Tupolev JSC

way. Ostrovsky singled out Venezuela, Peru and Nicaragua as potential Latin American importers of Russian commercial planes.

Touching on the routes to be covered by the Cuban Il-96-300s and future Tu-204s, Yuri Ostrovsky stressed that the Il-96s delivered had a special status in Cuba: "They are not just some planes of an airline; rather they are aircraft Cuba uses for its governmental purposes, e.g. carrying patients and medics and running the famous Cuban programme on ophthalmologic disease treatment. In addition, the Il-96s flew to Pakistan on humanitarian assistance missions in the wake of the formidable earthquake." At the same time, the Cuban Il-96-300s fly scheduled passenger services to Argentina, Venezuela, Canada (Toronto) and Spain (Madrid). Cubana Aviacion plans to

use them on the Havana-Moscow line, since it is known that going on leave to Cuba has been all the rage with Russian tourists.

Cubana Aviacion is going to operate its new Tu-204-100Es on the routes it deems to be too short for the Il-96-300s to fly – three to four hours – and, therefore, uneconomical. Thus, their main job will be flying to Venezuela and some other countries in the region.

As regards to Tu-204CE freighters, the Cubans plan to fly them to Venezuela, Ecuador, Mexico, Bolivia, Canada, etc. These are routes now served by obsolescent Boeing 727 transports. It is them that Cubana Aviacion is about to replace. Yuri Ostrovsky noted that at the Cuban request, the Il-96-300 was tested and issued with an addendum to its type certificate, allowing its operation from airports situated at

up to 3,000 m above sea level. IFC plans to do the same to the first Cuba-destined Tu-204CE: a team of Russian test personnel are to come to Havana in July and then to go to Ecuador for trials and obtaining a permit for the aircraft to operate from such high-level airports. After that, the Tu-204 will be able to operate in mountainous terrain, in which the airports of Quito (about 3,000 m above sea level), Mexico-City (2,400 m), Bogot (2,600 m), etc. are situated.

Cuban flying and ground crews have learnt how to operate the Il-96-300 (there is only a small Russian warranty service team in Cuba, comprising a dozen personnel with the VASO and Perm Engine Company). Relevant Cuban personnel were trained under the delivery contract. Initially, Russian instructor pilots accompanied Cuban crews, naturally, but now Cubans operate the aircraft all by themselves.

The same approach will be used as far as the Tu-204s are concerned. According to Yuri Ostrovsky, there are nine Cuban crews and a group of engineers and technicians in Russia. Soon, they will be qualified to operate the Tu-204s and will fly the aircraft independently following a brief probation period as part of mixed Russo-Cuban crews.

Cuba has become the first foreign country to buy Russian civil aircraft in the past decade and a half. Ilyushin Finance Co., which handles these contracts, considers the Island of freedom as sort of a benchmark of Russian airliners comeback to the global market. The company has signed contracts for delivering new aircraft of the Il-96 and Tu-204 families to Zimbabwe, Iran and China, with talks being under way with Syria and several Latin American countries. Thus, the experience in doing business with Cuba is very important to the Russian aircraft industry that, hopefully, is soon to be able to switch over to truly full-scale production of its airliners and long-haul transports, using orders from foreign customers as stepping stones.

UAC's production plans until 2012 set

Early in April, the results of the 28 March session of the Interdepartmental Aviation Development Workgroup, chaired by First Vice-Premier Sergey Ivanov, were released. The session approved the commercial aircraft production plan for the United Aircraft Corporation (UAC) until 2012. The session reviewed and approved the 2008-12 civil aircraft production plan presented by Alexey Fyodorov, UAC's President and Chairman of the board. The plan provides for making 431 aircraft in the five coming years. VASO is to build 15 Ilyushin Il-96 long-range airliners and freighters, Aviastar and KAPO are to manufacture 84 Tupolev Tu-204 and Tu-214 medium-haul airplanes, KnAAPO and KAPO are to roll out 236 short-haul and regional Sukhoi SuperJet-100s and Tupolev Tu-334 while VASO is to assemble 96 Antonov An-148 regional jets.

Overall, the figures comply with the first variant of the production plan, drafted earlier this year. For instance, the Il-96 and An-148 production plans remained the same (three aircraft a year as far as the Il-96s are concerned, and eight An-148s in 2008, 16 in 2009 and then 24 aircraft a year). The planned number of Tu-204s and Tu-214s dropped a little, from 92 to 84, with their output to total 20 planes a year in 2010. The SuperJet-100 and Tu-334's projected output dropped from 269 to 236 aircraft, with both still being listed in the plan in the same line. The Russian aircraft industry is supposed to be able to make about 70 such aircraft every year starting from 2010.

To implement so big-time plans (e.g. in 2006, the Russian aircraft



Marina Lystseva

industry made only eight new airliners – two Il-96-300s, two Tu-204s, two Tu-214s, one Tu-154M and one Be-200 – and delivered also an An-140 and Il-76TD-90VD built a year before), the industry will need a hefty governmental assistance. The meeting considered UAC's proposals as to the ways and extent of the assistance that could provide for subsidising the interest rates of long-term loans to fund investment production facilities renovation programmes, governmental subsidies of leasing payments, governmental guarantees of funding the Russian aircraft exports and funding an increase in UAC's authorised capital stock.

"The choice was made from several options. The first one boiled down to the government's guarantees, another to pumping up leasing companies and UAC with capital en masse and subsidising the interest rates. In the end, we opted for the variant, in which interest rate subsidies serve the main impetus

for aircraft production and production facilities refurbishment," said Aleksandr Rubtsov, UAC's member of the board and IFC's Director General. He regards the choice made as "the most market-wise approach", since the aircraft will be built at the expense of private investors, with banks and investors to share the risk. Meanwhile, manufacturers are not supposed to 'mainline' on the governmental money, rather they will borrow money on the market, with the budgetary funds only stimulating the process.

As a result, the Finance, Economic Development and Industry and Energy Ministries were tasked with having the 2008-10 federal budget to allocate the following monies:

- 1.945 billion rubles (about \$75 million) for governmental subsidies of the interest rates of long-term UAC technological renovation contracts, including 387 million rubles in 2008, 679 million rubles in 2009 and 879 million rubles in 2010;

- 15.1 billion rubles (about \$580 million) for the governmental subsidies of leasing payments, including 1.6 billion rubles in 2008, 5.1 billion rubles in 2009 and 8.4 billion rubles in 2010;

- 6 billion rubles (about \$230 million) for increasing UAC's authorised stock in 2010.

Soon after the session of the Interdepartmental Workgroup, the commercial aircraft production plant for this year became known as well. Vyacheslav Rybakov, chief of the Aircraft Industry Department of the Federal Agency for Industry, said in April, "The 2007 production plan stands at 24 civil aircraft". He added that the number included four Tu-154Ms to be completed by Avikor in Samara and construction of four new An-140s there. Aviastar-SP in Ulyanovsk is to build seven Tu-204s, KAPO in Kazan five Tu-214s and VASO two Il-96s. In addition, Irkut is to build two last Be-200 amphibians under its contract with the EMERCOM.

Il-112V to fly in two years

According to Ilyushin's Director General Victor Livanov who spoke with Take-Off, the maiden flight of the prototype of the future Il-112V tactical airlifter having the 6-tonne carrying capacity and designed as a replacement for the Antonov An-26, whose service life is running out, can take place in late

2008 or early 2009. Last year, Ilyushin completed the development of the detailed design documentation covering the airframe of the advanced aircraft. Now, design work on the wing is under way. The documentation in the digital form is provided to VASO plant (Voronezh) contracted as the

prime manufacturer of all Il-112V prototype and production aircraft.

Under the test programme, VASO is going to make five prototypes, with three earmarked for flight trials, one for static tests and one for endurance ones. VASO is expected to launch the Il-112V full-rate production as early as 2010. According to Victor Livanov,

the Air Force has plans to have taken delivery of the first 18 production aircraft until 2015. The Il-112Vs are to be powered by Klimov TV7-117ST turboprops with a take-off power of 3,000 hp and an emergency rating of 3,500 hp. Chernyshev MME is to kick off their full-scale production in 2008.

An-148 gets Type Certificate

26 February witnessed a long-awaited event in Kiev: the advanced Antonov An-148-100 was issued its type certificate by IAC's Aircraft Registry. The certificate confirms its compliance with the requirements of the CIS's AP-25 air rules adapted to the EU's CS-25. The importance of the event was highlighted by the fact that Ukrainian Premier Victor Yanukovich, parliamentary speaker Alexander Moroz and ambassadors of Russia, Kazakhstan, Uzbekistan and other countries attended the ceremony.

Type Certificate CT264-An-148 dated 26 February 2007 was presented to Antonov's Designer General Dmitry Kiva by IAC's Chairwoman Tatyana Anodina. The airliner's powerplant and basic components were certificated at the same time. The addendum to the D-436 engine's type certificate No. CT194-AMD/D03 dated 20 February 2007 was presented to the Ivchenko-Progress Designer General Fyodor Muravchenko to confirm the certification of the engine's D-436-148 derivative for use on the An-148. Motor Sich's Chairman of the Board Vyacheslav Boguslayev got the type certificate for the AI-450-MS auxiliary power unit. In February, the Aircraft Registry also certificated the airworthiness of several components of the An-148, including the Buran-A weather radar, fire-sup-

pressant system's and engine control system's units, etc. At the same time, Ukrainian Transport and Communications Minister Nikolay Rudkovsky presented the Ukrainian State Aviation Administration's certificates to the developers of the aircraft and its systems.

According to the IAC's Chairwoman Tatyana Anodina, the certification resulted from a great deal of work done by a large team of the Ukrainian and Russian aircraft makers, with companies from 10 other countries participating in the programme. "The aircraft has been certificated under the latest CIS and EU airworthiness standards and meets the latest ICAO noise and environment friendliness requirements – Chapter IV," Anodina said. The An-148's certification tests had been completed in two years since the maiden flight of the first example on 17 December 2004 before the flight and ground test segments of the certification programme were completed on 22 December 2006. Two flying prototypes and a static-test one were used in the trials. In all, 682 flights, totalling more than 1,200 flight hours across the whole operational envelope within the -52...+45°C ambient temperature bracket, were conducted under the certification flight-test programme.

The certification of the An-148 paved it the way towards the customers in Russia, Ukraine and other



Andrey Fomin

members of the Commonwealth of Independent States. To date, 41 aircraft of the type have been ordered by Russian, Kazakh and Ukrainian carriers. The cooperative production of the An-148 has been under way by the Aviant plant in Kiev and VASO in Voronezh. According to Ilyushin Finance Company Director General Aleksandr Rubtsov addressing the ceremony, Russian manufacturers hold a 60–65% share in the An-148 programme and Ukrainian aircraft makers hold 25–30%, taking into account the supply of materials and components. Both Aviant and VASO are to handle final assembly.

Early Aviant-built airliners may be delivered to their Kazakh customers as early as this year, with the SKAT and Berkut airlines having placed firm orders for seven An-148-100Vs. The second An-148 prototype was unveiled to the mem-

bers of Kazakhstan's parliament and airline leaders. In addition, Aviant is to deliver at least one plane to the Ukraine state air carrier.

The first firm orders for Russian-built An-148s were placed by KrasAir and Pulkovo (10 and 8 respectively). Despite the known stance of the government on KrasAir's acquisition of An-148s, the airline's managers stick to their contract that is to be taken over by the Sibaviatrans carrier, a member of the AirUnion. Pulkovo's contract remains in force as well, with its legal successor, the Rossiya state transportation company, to receive the aircraft ordered. A firm order is about to be signed with another Russian carrier, Polyot operating from Voronezh, any time soon. Right in the wake of the certificate ceremony, the leaders of IFC and Polyot signed a contract for 10 An-148-100Vs in Kiev. The first three are to be delivered in 2008.

The An-148-100V baseline model, which is on offer now, is designed to carry 68–80 passengers at a distance of 3,300–3,870 km at a speed of 780–850 km/h. Its two-class layout is to seat 68 passengers (including eight in the business class) and the single-class configuration is to accommodate 75 passengers (80 if the configuration is the tourist one with the seat pitch reduced from 810 mm to 760 mm). The An-148-100A shorter-range and An-148-100E extended-range versions were certificated along with the baseline model.



Antonov company

Il-76 to be built in Russia

As was reported by Take-Off, a decision was taken late last year on productionising the Ilyushin Il-76 transports by Russian manufacturers. To date, the Il-76 has been in production in Uzbekistan's capital city of Tashkent. The programme of Il-76 production transfer to Russia was dubbed '476'. Ilyushin Director General Victor Livanov shared some details with a Take-Off correspondent.

The programme is to involve several Russian aircraft manufacturers at once. The wings and empennage for future Russian Il-76s are to be made by VASO (Voronezh), landing gear by Aviaagregat (Samara) while airframe construction and

final assembly to be handled by Aviastar-SP in Ulyanovsk. The first Russian-made Il-76 is to be ready in 2009, Victor Livanov believes. Starting from the beginning of next decade, Russian companies will be able to make 10 aircraft of the type a year. The Il-76 variant to be made in Russia has not been specified yet. "It depends on the preference of the customer's requirements," Livanov told Take-Off. Today, Il-76s powered by both D-30KP-2 and PS-90A-76 engines, and once flight tests are completed, Il-76s may be powered by NPO Saturn-upgraded D-30KP-3 Burlak engines. According to Victor Livanov, Ilyushin is now looking into the Burlak-powered Il-76 version.



Mikhail Kuznetsov

Speaking of re-engining the Il-76MD fleet of the Russian Military Transport Aviation, Livanov mentioned that the prime contractor had not been selected yet. The first modernised Il-76MD-90 (see the picture above) was re-engined by VASO, and the rest of the Air Force fleet's re-engining may be vested in the Defence Ministry's aircraft repair plants – the 123rd one in Staraya Russa, Novgorod Region, and the 360th one in Ryazan. The two plants have a wealth of experience in overhauling the Il-76. VASO will carry on with making new engine nacelles and pylons to fit all PS-90A-76-powered Il-76s. In all, the Air Force is to have received 14 updated Il-76MD-90

airlifters and four brand-new early Il-76MFs until 2015.

Several Il-76MF airframes in different stages of completion have been sitting on the premises of the Tashkent Aircraft Production Association. Two of them will be completed and exported to Jordan in 2008 under the contract made at the highest level on 17 August 2005, during the MAKS 2005 air show. This year, TAPC plans to build the second Il-76TD-90VD ordered by the Volga-Dnepr group and already delivered the first of the three Il-76TD-90s ordered to Azeri carrier Silk Way Airlines (left picture). The Russian-Chinese deal on 38 Il-76MDs and Il-78s is finally to crank up as well.



Vivion Mulcahy

Yak-130 tests go on

The Yakovlev design bureau and the Russian Air Force continue the official tests of the advanced Yak-130 combat trainer. As is known, the flight test segment of the Yak-130's official trials was suspended following the crash of the third pre-production Yak-130 in the Ryazan Region on 26 July 2006. Investigation found out then that "the reason for the incident with the Yak-130 (No 132) was loss of control due to a malfunction of the KSU-130 fly-by-wire control system". A control system fail safety programme was devised quickly. Then during autumn 2006, the two remaining Yak-130s were modified accordingly and rigorous ground tests of the KSU-130 provided with the final software version were run.

This allowed the official flight tests to resume early this year.

Following the virtually six-month lull, the first flight on the improved Yak-130 (No 01) was conducted by the Yakovlev design bureau's test pilot Roman Taskayev from the Gromov LII flight test centre in Zhukovsky. The flight was a success, and the refined control system was tested in all modes. The second preproduction Yak-130 (No 02) resumed the flight tests under the official test programme soon afterwards.

A preliminary report on the first stage of the Yak-130's official trials is expected in the summer. The document will serve the official reason for launching the series production of the aircraft for the Air Force. As is known, the service has ordered the first 12 aircraft of the type, and the Sokol plant in Nizhny Novgorod (by the way, the manufacturer of all preproduction Yak-130s for the



Mikhail Kuznetsov

trials) kicked off preparations for production as far back as 2005. The assembly line had been ready by the beginning of this year and manufacture of components of future warplanes had begun.

In addition, Sokol under a contract with Yakovlev is to deliver the fourth Yak-130 flying example intended, in the first place, for testing its combat capabilities during the second stage of the official trials. This August is to see Sokol delivers Yak-130 airframe to Yakovlev for endurance tests.

According to the statements of RusAF leaders, the service's need

for the Yak-130 totals 200–300 aircraft that will be procured gradually as the money is allocated. The first 60 Yak-130s are slated for delivery until 2015. In addition, the aircraft faces bright export vistas. The first export deal was clinched a year ago with Algeria for 16 Yak-130s in 2008–09. The Irkutsk plant, a member of the Irkut corporation, will handle the assembly of aircraft under export contracts. Other countries, e.g. Indonesia, Malaysia, Venezuela, etc., have displayed keen interest in the Yak-130 combat trainer.

CHERNYSHEV



MOSCOW MACHINE-BUILDING ENTERPRISE jsc

Manufacturing, after-sale service, aero engines overhaul

- **RD-33** (MiG-29, MiG-29UB, MiG-29SMT fighters)
- **RD-33MK** (MiG-29K, MiG-29M/M2 fighters)
- **TV7-117SM** (IL-114 regional airplane)
- **TV7-117ST** (IL-112V light transport aircraft)
- **RD-1700** (MiG-AT trainer)



Overhaul, spare parts delivery

- **R27F2M-300** (MiG-23UB fighter)
- **R29-300** (MiG-23M, MiG-23MS, MiG-23MF fighters)
- **R-35** (MiG-23ML, MiG-23MLD, MiG-23P fighters)

TBO and TTL expansion of the overhauled engines

**reliable engine
reliable partner!**



7, Vishnevaya Str.,
Moscow 125362, Russia
Phone: (7 495) 491-58-74
Fax: (7 495) 490-56-00

NK-93 kicks off flight trials

The Gromov LII Flight Research Institute (Zhukovsky) has launched flight tests of the advanced 18,000 kgf NK-93 turbopropfan engine featuring the unique shrouded propfan design (in fact, it is a super-high-bypass-ratio turbofan with the reduction gear-driven fan). The engine has been under development since 1990 by the Kuznetsov Scientific and Technical Complex in Samara for use on future derivatives of the Ilyushin Il-96 and Tupolev Tu-204 (Tu-214) airliners and Tu-330 (Tu-204-330) freighter. The NK-93 was conceived to differ from production turbofans of the same thrust class in the cruising-mode fuel consumption reduced by 10–20%. The calculations suggest that it could equal 0.49 kg/kgf/hr (compare that with the 0.595 kg/kgf/hr of the production PS-90A with the 16,000 kg in the same mode or with 0.546 kg/kgf/hr of the more powerful D-18T with its 23,400 kgf).

The NK-93 has stemmed from the NK-92 super-high-bypass-ratio turbofan programme pursued by Kuznetsov to power the future Ilyushin Il-106 heavy-lifter with a carrying capacity of 80 t. However, the Il-106 programme stalled at the preliminary design stage in the early 1990s, with the NK-92 grinding to a halt as a result as well. However, a number of its design solutions were used in developing the 'civilian'

NK-93. The latter was derived from the engine core of the NK-110 pusher-type propfan engine prototype that had been rig-tested since 1989.

The NK-93 comprises the 2,900 mm diameter SV-92 double-row propfan with rotating blades in the annular channel (contrarotating eight-blade first and 10-blade second rows); seven-stage axial low-pressure compressor; eight-stage high-pressure compressor; annular combustor; single-stage high- and low-pressure turbines, three-stage propfan turbine and non-variable jet nozzle. The engine has the electronic control system backed up by the hydraulic-mechanic redundancy.

To date, Kuznetsov has made as many as 11 full-scale NK-93 engines, most of which have passed the full cycle of rig tests. The NK-93's flight tests on Gromov LII's Il-76-based flying testbed were to begin several years ago, but the lack of funding has delayed the tests until late last year. A NK-93 prototype (No 10) was prepared for test flights. It had been brought to Gromov LII as far back as 2005 and displayed at the MAKS 2005 air show. Engine No 9 was prepared as the backup.

For the trials, Gromov LII provided the Il-76LL (c/n 3908, registration No 76492). The aircraft used to fly test mission in support of the PS-90A now powering the Il-96,



Kuznetsov SNTK

Tu-204 and Tu-214. The testbed first flew with the PS-90A on board on 26 December 1986, and logged a total of 188 sorties and about 400 flight hours. The PS-90A test programme over, the Il-76LL was mothballed in 1994. Its adaptation to the NK-93 began last year and was completed in December. The NK-93 first flew on its left inboard station on 29 December 2006. The NK-93 was not supposed to start during its first flight, autorotating instead. The next test flight took place on 3 May 2007 with the engine running.

The NK-93's flying testbed trials slated for about 50 flying hours and aimed at gauging the basic characteristics and testing several modes that cannot be achieved on the test rig. In addition, the flight tests are to shed light on the NK-93's future. It is known that its development has slipped well behind the schedule, and its large weight and

size make it difficult to mount it on low-wing aircraft. The diameter of the NK-93's nacelle measures about 3 m – twice as large as the production D-30KP powering the Il-76, 1.5 times larger than the PS-90A's diameter and 25% larger than the diameter of the most powerful engine in Russia and Ukraine, the D-18T, whose thrust is 30% higher, by the way. In addition, the NK-93 prototype and its nacelle weigh 7.5 t, so the designers and production engineers will have to do a lot to slash its weight (e.g. through composites introduction) to enable the engine to rival other designs in the class. Ensuring an acceptable service life of its powerful reduction gearbox driving its huge propfan is a problem too.

The NK-93's designers still have their hands full, but they have to complete the first stage of the flight trials first. Let us wait and see...

Ka-52 upgrade

On his visit to the Progress JSC in Arsenyev, Primorsky Territory, in early April 2007, First Vice-Premier Sergey Ivanov confirmed that 12 Kamov Ka-50 and Ka-52 helicopters would have been ordered from Progress until 2015. The Black Shark will become one of the main machines for the Russian Spetsnaz," he told the media in the wake of his conference with the leaders of the defence manufacturers of the region.

As was reported by Take-Off, the production of the Ka-50 helicopters in Arsenyev resumed last year fol-

lowing the almost eight-year lull. The first two new Ka-50s had been demothballed, completed, tested and prepared for delivery before 2006 year-end. This year, three more Ka-50s are to be made in Arsenyev, as well as the first LRIP Ka-52 twinseater slated for the official trials.

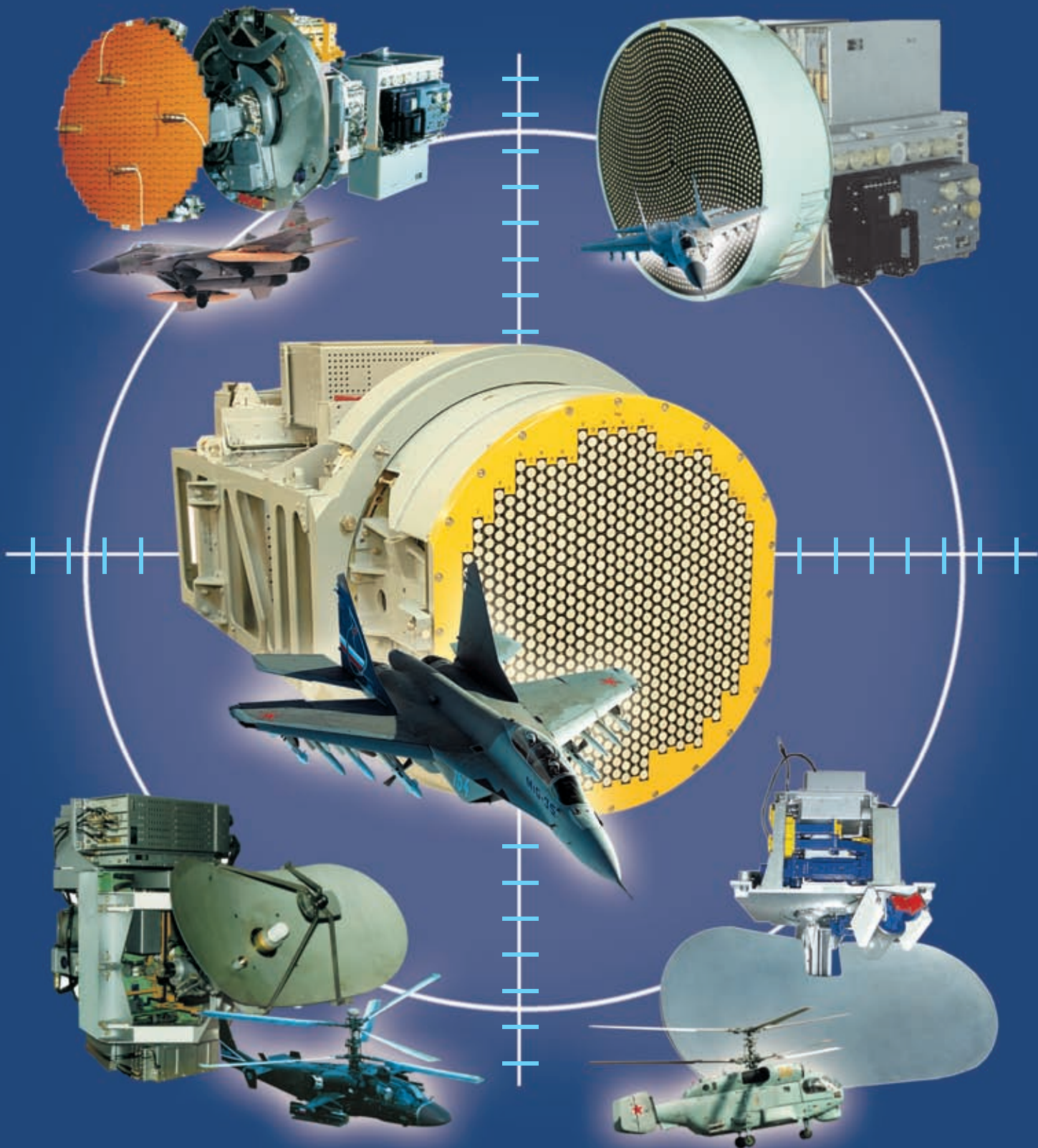
Meanwhile, the Kamov company has completed the upgrade of the first Ka-52 prototype (No 061). The aircraft has got equipped with improved avionics; in particular, its cockpit management system is now wrapped around the sophisticated



Andrey Zinichuk

colour multifunction liquid-crystal displays (LCDs) numbering a total of six plus the HUD. The first Ka-52

prototype was given a new paint-job following the upgrade (see the photo).



Phazotron NIIR Corporation

Open Joint Stock Company

1 Elektrichesky Pereulok, Moscow 123557

Phone: +7 495 253 56 13.

E-mail: phaza@aha.ru

Fax: +7 495 253 04 95

Web: www.phazotron.com



Chernyshev, MME

An important event this year has been the testing of MiG-29K and MiG-29KUB shipborne fighter prototypes developed by the MiG Corp. on order from the Indian Navy, as well as the unveiling of and launch of practical work on the deeply upgraded Generation 4++ MiG-35 fighter. These aircraft are powered by modified RD-33MK engines featuring enhanced power and reliability. Full-scale production of the RD-33MK engines has been launched by the Chernyshev Machine-Building Enterprise in Moscow, the only Russian plant producing the RD-33 family engines to power the MiG-29 fighters in service with more than 30 air forces worldwide. In the run-up to the 75th anniversary to be celebrated by Chernyshev this year, Take-Off met Director General Aleksandr Novikov and asked him to shed light on the plant today's activities.

Aleksandr Novikov was born in Alma-Ata in 1949, graduated from the Rybinsk Aircraft Technology College in 1972, started his career as a fitter at the Rybinsk Engine Plant (today NPO Saturn scientific and production association) where he climbed all the rungs of the career ladder all the way to Designer General of the Rybinsk Engine Design Bureau. In 2000, Mr. Novikov was offered job with the MiG Corp. as deputy Director General for strategic planning and development. He assumed the position of Director General of the Chernyshev Machine-Building Enterprise in 2001.

Aleksandr Novikov is a Ph.D., professor and a member of the Russian Academy of Transport. He authored numerous scientific works and inventions.

ALEKSANDR NOVIKOV: “We Know What We’ve Got to Do”

Mr. Novikov, what are the results chalked up by your company last year and what objective the company pursues now?

Last year was very productive to Chernyshev. We made and delivered about 120 engines. The volume of sales exceeded 5.6 billion rubles (over \$215 million). Our current orderbook allows us to have our hands full this year and in the near future. We know what we have got to do. The orders drive the main efforts of the plant. Work is being done in several fields. First and foremost it is a full-rate production of the RD-33 Series 3 engines powering the MiG-29 exported to many countries. However, this year, we have launched production of a new improved-performance variant of the

engine, the RD-33MK, to fit the MiG-29K and MiG-29KUB under construction by the MiG Corp. on order from the Indian Navy. The deliveries is about to begin, which necessitates that we ensure uninterrupted supply of RD-33MK engines to equip them. In addition, last year, we started production of the modified RD-93 engine derived from the RD-33 on order from abroad. A 12-engine batch is undergoing the acceptance and is to be shipped to the customer soon.

The second main effort for us is a whole range of programmes we pursue in cooperation with the Klimov company for the sake of further development of the RD-33 family and TV7-117 turboprop

family. The third field is the cooperation with the TMKB Soyuz design bureau on honing the RD-1700 light turbojet engine to power the MiG-AT trainer. This year, we are intent on launching its flight tests. Productionising the VK-2500 helicopter engine is a new thing for us to do. The documentation handover is under way for Chernyshev to productionise the engines. Finally, a field of work, which is rather important to us, is overhaul of earlier made engines, both the RD-33 and older R29-300 and R-35. Annually, we overhaul over 100 RD-33s and about 25 R29-300s and R-35s. This provides a nice addition to our gains.

A few words on the development of new RD-33 derivatives?

Let us start with the RD-33MK. Until recently, we have participated in production of a prototype batch of such engines, which documentation was worked out by the Klimov company. Assembled RD-33MKs were shipped to Klimov for debugging and testing. Then, we started conducting the bulk of the tests, e.g. cyclic and long-term ones, ourselves. A dozen RD-33MKs were made for such trials and debugging and five such engines were built to equip MiG-29K and MiG-29KUB prototypes. Compared with the production RD-33, the RD-33MK features a 700kgf increase in thrust, extended service life and a digital control system while retaining the same dimensions and virtually same weight. The engine is designed for on-condition maintenance. This is, no doubt, a great leap forward. This year, we have launched

In addition, we have launched development of another RD-33 version – the so-called RD-33 Series 4. Retaining the thrust, it will have a longer service life and a higher reliability and fitted with the so-called smokeless combustor. We are going to have the effort wrapped up within two years for the RD-33 Series 4 to oust the RD-33 Series 3 from our assembly lines.

What turboprop engines are you working with now?

Work is under way on three products. Firstly, we are producing the TV7-117SM turboprop, an improved TV7-117S derivative to power the Ilyushin Il-114 regional airliner. The engine's design has been improved by far, which resulted in a higher reliability and a longer service life. Several TV7-117SMs have been built and operated on Il-114s with success. This year, we are to make a small batch of such engines, and

A very important programme is the TV7-117ST – a heavily modified turboprop to power the future Ilyushin Il-112V light airlifter. Last year, we made four prototypes for Klimov that fitted them with advanced units (particularly, a new centrifugal compressor stage) and are testing and debugging them now. The TV7-117ST's development schedule is closely linked with that of the Il-112V, and we remain on schedule.

When do you think the RD-1700 is going to start its flight tests and what prospects does it face?

The ninth example of the engine is being manufactured. RD-1700 prototypes have undergone numerous rig tests that gauged the margin of its gas dynamic stability and oil deficiency, conducted strain gauge and thermal metering and debugged the automatics, with the engine 'tried' in the MiG-AT's engine nacelle to see how it fits it. The seventh RD-1700 is undergoing endurance tests. Engine No 5 has been made and rig-tested and will be mounted on the MiG-AT in July. Thus, its flight trials may begin this summer. At first, the other engine of the aircraft will remain (the MiG-AT is now powered by a pair of French-made Larzacs), but then it is to be replaced with an RD-1700 as well. We will supply the MiG Corp. with RD-1700 No 8 to this end, which is slated for completion in August. So, the MiG-AT will be powered by two RD-1700s, meeting the Russian Air Force's requirement for having the aircraft powered by a Russian-made powerplant and Russian-made avionics.

To complete the RD-1700's trials, we believe we will need up to a year and a half. However, if the need for such engines emerges before that, we are ready to step up to the work. Still, we have been paying for the programme ourselves so far and, hence, see the schedule as optimal for now.

We think that the RD-1700's future lies in powering the MiG-AT, in the first place. The RD-1700 is superior to the currently used Larzac in virtually all respects – it produces higher thrust while being lighter and more economical. We hope for the MiG-AT powered by our engines to be in demand with the Russian Air Force, all the more so that there have been an idea voiced repeatedly that up to 30 per cent of the RusAF's trainer fleet could be made up by MiG-ATs powered by Russian engines and fitted with Russian avionics. Another very promising application for the RD-1700 is the field of unmanned aerial vehicles (UAV).

Thank you for a detailed conversation and congratulation on the 75th anniversary of the company you run!



Mikhail Kuznetsov

the RD-33MK production, with 21 engines to be made under the annual plan to power production carrierborne fighters ordered by the Indian Navy. In the longer run, we will make them also to fit the MiG-35 multirole fighter under development by the MiG Corp. now.

Last year, we began to produce another RD-33 derivative, the RD-93, developed to equip single-engine fighters. It is a rather heavily modified derivative that features a bottom-mounted accessory gearbox, different outer plumbing and wiring and modified automatics. Earlier, we and Klimov made a pilot batch of RD-93s and recently have switched to independent production. The first batch of 12 production RD-93s is to be delivered this year.

further plans will depend on the number of orders for the Il-114 available. Talks are under way on the plane's sales to several airlines. We guess that about 60 Il-114s could be ordered, and we will make TV7-117SMs to fit them. Anyway, we are working on extending the engine's service life and enhance its reliability further, paying for the programme out of our own pocket.

The second programme is the TV7-117V derivative to power the helicopters like Mi-38. An updated performance specification is being worked out. Its approbation will take some time. This done, we will be able to produce the helicopter variant of the TV7-117, should there be order for it.

under the leadership of A.G. Ivchenko. It was followed by such auxiliary engines as AI-8, AI-9, AI-9V and AI9-3B. Eleven thousand engines of this class were manufactured by our plant in all.

Nowadays our Company makes an intensive preparation for series production of aircraft engines AI-222-25, D-36 series 4A, D-27, AI-25TLSh, VK-1500, AI-450, VK-1500VK, VK-1500VM to be installed on Yak-130, An-74TK-300, L-39, An-3, An-38, An-70 and Be-132MK airplanes as well as Ka-226, Ka-60, Mi-8T helicopters.

The production of the D-436-148 built by SE Ivchenko-Progress and the AI-450-MS

the new engine ensuring higher flight performance of the helicopters in hot mountainous regions and smaller cost of the life cycle. It will be completely interchangeable with the TV3-117-family engines and able to be installed in the earlier-manufactured helicopters virtually without any reworks.

Our Company has got great expectations of a new engine – AI-450, which is being successfully bench-tested. The AI-450 engine is designed for powering the Ka-226, Ansat and Mi-2 helicopters. The perspective work provides for building a turboprop version of the AI-450 engine that can be used to power the light aircraft such as Yak-58, trainers Yak-152 and unmanned air vehicles.

The main advantages of all engines can be identified as follows: high reliability, low specific fuel consumption, low specific weight, ecological compatibility, simple maintenance, high efficiency of control and diagnostics system, low operating costs.

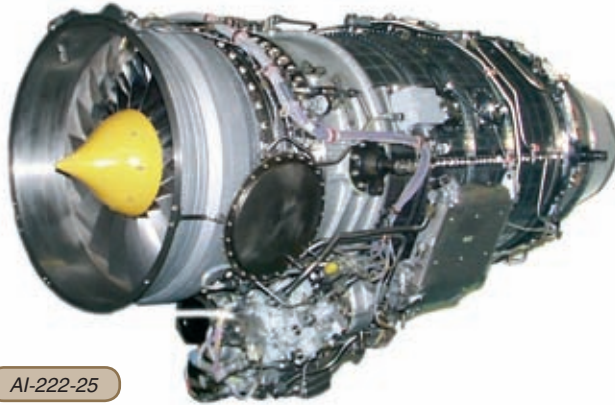
The “social face” of our Company looks quite attractive. Alongside with resolving production tasks and mastering new types of the engines, one of the main directions of the Company strategy is social protection of the employees, namely: health protection, education, recreation, sports, housing problems. The personnel policy of our joint stock company is aimed at realizing a new conception of the personnel management, which will allow to preserve and additionally invite the highly-qualified personnel to the Company.

Owing to the initiative of Mr. V.A. Boguslayev, the President and the Chairman of the Board of Motor Sich JSC, and the support of the Company staff, St. Andrew the First-Called cathedral church and the monument to Apostle Andrew were built in Zaporozhye.

The plans of our Company include continuation of sponsoring and charitable activity, organization of the events aimed at supporting and developing the social infrastructure of our



Yak-130



AI-222-25



D-436-148

auxiliary gas-turbine engine developed by the Motor Sich JSC design engineers is being productionized with the purpose of installing in the An-148 passenger aircraft and its transport modifications.

A tangible achievement of Motor Sich JSC was putting into production the D-436T1/TP-family turbofan engines used for powering the short-haul 100 to 120-seat Tu-334 planes and unsurpassed versatile Be-200 amphibian.

The D-27 turboprop engine (the unique engine all over the world) featuring power of 14000 hp is being commercialized. As compared with the modern engines its fuel consumption is less by 25-30%. The D-27 engine is intended to be installed on the An-70 military transport aircraft, which does not have any alternative for the present day and for the next decade.

One of the last modifications of the TV3-117VMA engine is the VK-2500 engine featuring the takeoff power increased by 200 hp (up to 2400 hp).

Based on the TV3-117VMA-SBM1 engine gas generator, nowadays our Company builds

Alongside with production and supervision of the aircraft gas-turbine engines, our Company has built and manufactures the gas-turbine drives for gas-pumping, gas-lifting, oil-transferring units featuring power of 1; 2.5; 6.3; 8; 10 MW, gas-pumping units of new generation as well as gas-turbine power generating sets featuring power of 1; 2.5; 6 MW.

Production of modern engines as well as overhaul of all earlier-manufactured engines have been certified by Aviation Register of Interstate Aviation Committee and State Department of Aviation Transport of Ukraine.

The quality system of Motor Sich JSC has been certified by BUREAU VERITAS QUALITY INTERNATIONAL (BVQI) transnational agency for compliance with the requirements of International Standard 001:2000 (also accredited in the USA, Great Britain and Germany) regarding production, overhaul and maintenance of aeroengines, gas-turbine drives and development of the gas-turbine power generating sets.



An-148

region, and contribution to spiritual resurgence of the country.

The centennial history of Motor Sich JSC is inseparably linked with aviation development and improvement. This is the history of struggle for reliability and high quality of aircraft equipment, step-by-step commercialization of new engines that brought into sky the airplanes and helicopters, which entered the history of the world aviation forever.

Motor Sich JSC
15, 8th of March St.,
Zaporozhye 69068, Ukraine
Tel.: +38 (061) 720-48-14
Fax: +38 (061) 720-50-05
E-mail: eo.vtf@motorsich.com
www.motorsich.com



This year marks the 30th anniversary of the maiden flight of the largest and most capable heavy-lift helicopter in the world – the Mi-26 developed by the Mil Moscow Helicopter Plant. For over a quarter of the century, it has been in production by the Rostvertol plant in Rostov-on-Don in both military and civil (Mi-26T) versions, remaining unrivalled and in high demand on the global market owing to its unique characteristics, high reliability and continuous refinement of its design. Another country, Venezuela, has launched operation of the Mi-26T recently, and this summer the helicopter's 'fan club' is to gain another member – China – with the first aircraft of the type to be shipped to the country late in June.



Rostvertol

THE HEAVIEST HELICOPTER FOR THE EASIEST LIFE

Mi-26T heavy-lifter finds new customers

The foreign experience in operating Mi-26 heavy-lifters dated back two decades – Rostvertol exported its first Mi-26s to India during 1986–88. Four Indian Mi-26s have been used successfully in support of the country's armed services and to handle other special transport tasks. However, time takes its toll, and any aircraft needs scheduled repair and overhaul to remain airworthy. Since 2001, three Indian Mi-26s have undergone scheduled overhaul and have had their service life extended to enable them to remain in service for years to come. The manufacturer plant in Rostov has done the work. Another Indian Air Force heavy-lifter has followed suit recently,

returning to base on 25 May following overhaul and service life extension.

India was the first foreign customer for the Mi-26 that afterwards was exported to a host of countries on various continents. Over the past 20 years, these helicopters had been sold to North and South Korea, Malaysia, Peru, Mexico, Greece and Cyprus. Actually, the machine is operated almost all over the world. The UN uses Mi-26Ts in Somalia, Cambodia, Indonesia and the Congo. They have put out fires, hauled cargo and maintained peace in East Timor. Mi-26Ts hauled heavy oversized cargo, assembled power lines and antennas, built and rebuilt industrial installations and put out forest and urban fires

in Germany and other European countries. The operational experience has proven that the Mi-26T is 70 per cent more effective in suppressing fires than small and medium helicopters.

Since 1999, a Russia's EMERCOM air group comprising Mi-26T helicopters have been participating in extinguishing fires in Greece. Work has been done in mountainous terrain in adverse weather conditions and in heavy smoke. Under such difficult conditions, the machine has proven its reliability and effectiveness, operating away from its MRO base to boot. The Russian helicopter makes wonders in suppressing fires in many other countries as well, e.g. France, Italy,



Rostvertol



Rostvertol

Georgia, Cyprus, etc. Owing to professionalism of Mi-26T crews, the damage the fires could have inflicted on these nations has been reduced drastically.

The experience in using the Mi-26T in fire-fighting in France is obvious. The situation was especially grave in France in summer and autumn 2003. Forest fires accompanied the unusually persistent heat on an unheard-of scale. The south of the country took the most of the damage, with fire approaching several large cities. In 2003, the French government requested assistance in fighting forest fires from their Russian counterparts. Following thorough preparations, two Mi-26Ts fitted with VSU-15 fire extinguishing system headed for Marseille where the team of Russian specialists were to work for a month and a half.

The Mi-26T crews operated under the most difficult conditions, logging 10–12 flight hours daily and dropping water on fires 18–20 times per sortie. The team completed all missions assigned to it. The French were very pleased with the job done and with the helicopters themselves. The Mi-26Ts'

ability to drop 15 t of water in a single pass earned them the 'water bombers' moniker in France.

The unique capabilities of the Mi-26T enable it to operate as part of mobile joint fire-fighting teams. A wide range of detachable equipment allows the heavy-lifter to carry large vehicles, specially-trained personnel, to refuel vehicles on site during rescue operations, to render first aid on board and medevac casualties to hospitals. Mi-26T heavy-lifters facilitate handling the full range of natural and man-made disaster relief missions, including airlifting rescue personnel and their gear, medicine, temporary living quarters and food to disaster-stricken areas.

The Mi-26's proactive use all over the globe stokes the demand for such aircraft on the part of potential buyers. New customers appeared last year. 2005 saw the first major contract signed with Venezuela that, in addition to six Mi-17V-5s made in the city of Kazan, ordered eight upgraded Mi-35M attack helicopters and a Mi-26T heavy-lifter from Rostvertol. Late in December last year, the customer accepted the first Venezuelan Mi-26T along with the second batch of four Mi-35Ms (the first four-ship Mi-35M consignment was delivered in July 2006). Visiting Russia last summer, Venezuelan President Hugo Chavez signed more contracts. Options for two more Mi-26Ts, a pair of Mi-35Ms and 14 more Mi-17V-5 utility helicopters became firm orders. Venezuelan air and rear crews have fully learnt to operate and maintain the Russian helicopters and want more to come from Russia. Next two Mi-26Ts and two more Mi-35Ms are slated for delivery from Rostov to Venezuela this autumn.

In the near future, the Mi-26T is to come to China as well. Rostvertol and Hong Kong-based Lectern Aviation went into an agreement last April to set up Russian-Hong Kong joint venture Rostvertol Helicopters

China Ltd. At the same time, China's Main Directorate of Civil Aviation decided to certify the Mi-26TC as compliant with the PRC's airworthiness standard. The first several contracts were signed with the Lectern Aviation Supplies Company Ltd. on leasing a Mi-26TC for three years and training Chinese personnel at Rostvertol's training centre. The Feilong (Chinese for 'flying dragon') company headquartered in Harbin has shown interest in the fire-fighting version of the machine. To date, Rostvertol has trained the PRC's air and rear crews in flying and maintaining the Mi-26TC. The delivery of the helicopter is slated for late June.

The Mi-26T's international success prompts its developer and manufacturer to avoid resting on their laurels. Rostvertol and Mil are running a Mi-26T upgrade programme to enable the machine to operate round the clock. Under the programme, the Mi-26T is to get an advanced avionics suite, its crew is to shrink to two persons (pilot and co-pilot/navigator) and its instruments and lighting equipment is to be adapted for night-vision goggles usage.

Owing to the wealth of experience in flying the Mi-26T on fire-fighting and special transport missions that other machines are unable to handle, as well as its unique carrying capacity, high reliability, continuous honing of its design and systems, the aircraft of the type have been used ever more heavily in fire-fighting and transport operations in various countries, including those in Western Europe. The number of Mi-26T operators has been on the rise all over the world as well, with new talks on such machines' deliveries to several countries in Europe and on other continents having been under way. As is known, the EU is pondering the development of a European heavy-lift helicopter, and the Mi-26T's proven design could serve the base for a joint development of such a helicopter in the future.

SUPERJET

THE WORLD'S FIRST



You are looking at the future. A future that holds no place for dated, conventional 'Regional Jets'. Enter the new aircraft that has helped create, and will define, the new Super Regional sector of tomorrow. The purpose-built Sukhoi Superjet 100 family of 75 and 95 seat aircraft. Aircraft built in the 21st Century, to meet the demands of the 21st Century.

Utilising state-of-the-art technology. Reducing weight. Giving airlines unprecedented reliability, lower maintenance costs, lower operating costs. And 10% lower fuel consumption than their rivals. Offering airlines choice. In flexibility of range and fleet.

In capacity optimization. Delivering improved passenger comfort. With wider seats and wider aisles. More headroom, and 27% more bin capacity. The Sukhoi Superjet 100 family.

Built in collaboration with the finest aviation companies in Europe and America, with Boeing as consultant. If rivals aren't developing an inferiority complex by now, they will after visiting www.sukhoi.superjet100.com

R JET

SUPER REGIONAL JET

SUKHOI SUPERJET 100



SUKHOI SUPERJET 100

The World's First Super Regional Jet.

BOEING · GOODRICH · HAMILTON SUNDSTRAND · HONEYWELL · INTERTECHNIQUE · LIEBHERR · MESSIER DOWTY · PARKER

Another record set by Russian arms exports

Last year, Russia achieved a record-breaking result in terms of arms exports, according to Mikhail Dmitriyev, chief of the Federal Military Technical Cooperation Service. In 2006, the country exported a total of \$6.46 billion worth of weapons and associated gear, having surpassed the 2005 indexes (\$6.126 billion) by over 5 per cent. About \$5.3 billion of the earnings fell on the governmental intermediary, Rosoboronexport, and \$1.16 billion were earned by other arms exporters that had been entitled to export their end products prior to the presidential decree dated 18 January 2007. Following the fulfilment of the

contracts made, which may take three to four years, the independent exporters will retain the right to sell spares and MRO services only. Russia's total hard currency proceeds in 2006 stood at \$8 billion taking into account the advance payments for forthcoming deliveries, Mikhail Dmitriyev said. The orderbook hiked by as many as \$14 billion dollars, having amounted to \$30 billion, of which the \$20 billion worth of orders were snagged by Rosoboronexport and the remaining \$10 billion by other Russian exporters and MRO/spares suppliers.

The aircraft makers with their 57 per cent of the exports

made the heaviest contribution to the governmental coffers in 2006. Among the top aircraft export contracts, there were the deliveries of the first two Il-38SD upgraded aircraft and 13 Su-30MKI licence-production kits to India, four Su-30MK2s, six Mi-17V-5s, eight Mi-35s and a Mi-26T shipped to Venezuela, another batch of Mi-171s for China and commencement of the MiG-29SMT deliveries to Algeria.

According to Mikhail Dmitriyev, 2007 is going to be even a greater success, with the arms exports to total \$8 billion. This is to be ensured through Russia's proactive penetration of new markets

(Venezuela, Algeria and other Arab countries) to make up for the dwindling orders by China and India (Dmitriyev highlighted that the share of these traditional importers of Russian materiel dropped from 74 per cent to 62 per cent in 2006). The aircraft component of the Russian materiel export sales is expected to grow. In addition to continuing shipments of the Su-30MK2 fighters to Venezuela and the MiG-29SMTs to Algeria, Russia will launch deliveries of Su-30MKMs to Malaysia, Su-30MKAs to Algeria and MiG-29Ks to India in 2007, with the export of helicopters worldwide to increase as well.

More Su-30MK2s delivered to Venezuela

Four more Su-30MK2 multirole fighters were delivered to Venezuela by Sukhoi's division KnAAPO in late March and early April. Like the first four aircraft delivered in December last year, they were flown in by An-124 Ruslan heavylifters. By mid-April, they had been assembled, flown out and fielded with the Venezuelan Air Force that now operates eight Su-30MK2 fighters.

Last month, Venezuelan President Hugo Chavez demonstrated the Russian-made Su-30MK2s to Brazilian President Luiz Ignacio da Silva, Bolivian President Evo Morales and Paraguayan President Nicanor Duarte Frutos. Chavez broke the news on 17 April during a press conference on the outcome of the first South American energy summit meeting. The demonstration took place in the Venezuelan state of Anzoategui. "Morales even wanted to fly the plane, and I would be a co-pilot, but we lacked time for that," Chavez joked, adding that the Brazilian, Bolivian and Paraguayan presidents talked to the Russian military and civil specialists working in Venezuela. "Two Russian-made fighters have



arrived in Venezuela recently and joined the fleet of six such aircraft in service with the Venezuelan Air Force," Hugo Chavez told the news conference, stressing that Sukhoi fighters were "the most advanced ones in the world".

"We are not going to attack anyone, but let nobody make a

mistake as to us. This combat aircraft is the most advanced one in the world," the Venezuelan president said.

This year, the Venezuelan Air Force is to receive six more Su-30MK2s, with 10 more to follow in 2008 to crown the deal struck last July and estimated at

\$1.5 billion. However, Chavez is not about to stop at that. He has voiced the feasibility of another contract for 24 more Sukhoi warplanes. Instead of the Su-30MK2, Venezuela may buy even more sophisticated Su-35s, whose first prototype is to kick off its trials in the summer.

India steps up Su-30MKI assembly

This year, the Indian Air Force (IAF) plans to operate over two dozen Sukhoi Su-30MKI multirole supermanoeuvrable fighters assembled by the HAL plant in Nasik from the kits supplied by Russian corporation Irkut under the licence production contract dated 28 December 2000. Under the deal estimated at \$3.3 billion, India was to licence-produce 140 Su-30MKI aircraft from 2004 to 2017, with the aircraft to join the 32 Su-30MKIs Irkut delivered in 2002–04 under the 30 December 1996 contract.

In addition to the current Su-30MKIs, IAF took delivery of 18 Su-30K aircraft from Irkutsk in 1997 and 1999. Initially, they were to be upgraded to Su-30MKI standard, once the Su-30MKI deliveries were completed. However, further down the road, the parties decided against that and opted for an agreement on returning the Su-30Ks to Russia, with Irkut to reciprocate with 18 complete Su-30MKIs more.

In May last year, Irkut's President Oleg Demchenko told the media that the first 12 Su-30MKIs were slated for delivery to India in as early as 2006 instead of the Su-30Ks returned, with the Su-30MKIs being assembled in Irkutsk. Irkut's 2005 annual report published at its Web site reads that as far back as October 2005 "during the 5th session of the Russian-Belarus Intergovernmental Military Technical Cooperation



Commission, the Belarusian side voiced its interest in acquiring the 18 Su-30K aircraft, having studied the proposal by the Irkut Corp. made in April 2005".

However, the implementation of the agreements has not begun yet. In spite of the Russo-Indian talks on the subject completed in February 2006 and the relevant contracts worked out, the Su-30Ks remain in India, and Irkut has not started shipping brand-new Su-30MKIs there yet.

Meanwhile, IAF's Su-30MKI fleet kept on growing: in a ceremony in 2004, IAF accepted the first two aircraft of the type assembled by the plant in Nasik from the Russian kits. They were given side numbers SB-101 and SB-102. In the same year, India completed

another fighter, and Irkut supplied the Nasik plant with eight more kits for licence production. By early October 2006, as many as eight locally-assembled Su-30MKIs (side numbers from SB-101 to SB-108) had been accepted by IAF, and two more aircraft (SB-109 and SB-110 – see the picture) had been undergoing their acceptance tests. Given Irkut's shipping 13 next kits to India in 2006, IAF could operate 21

simple assembly to manufacturing assemblies, units, parts, etc.). To cap it all, the programme's duration has been reduced: now the last, 140th Su-30MKI is to be rolled out in 2014, rather than 2017, due to the Indian leadership's decision to free up HAL's production lines that will be needed in the coming decade for licence production of the future multirole combat aircraft under the MMRCA programme.



locally-assembled Su-30MKIs by the mid-2007.

The rate of the licence production in India has been on the rise. The productionising has moved to Stage 2, and the factory in Nasik will soon launch the Su-30MKI manufacture under Stage 3 of the licence agreement (each subsequent stage implies a gradual increase in the customer's involvement in the production – from

At the same time, HAL's plant in Nasik will in mid-2007 launch the programme on upgrading 22 Su-30MKI fighters exported by Russia in 2002–03 to the level of Batch 3 delivered in 2004. The Batch 3 standard meets the final set of characteristics of the Su-30MKI, as do the licence-produced aircraft. The upgrade programme is to wrap up by 2010. As a result, IAF will have had 190 Su-30MKI multirole aircraft by 2015.



UUAZ boosts Mi-171 exports

The Ulan-Ude Aircraft Plant has fulfilled the contract for 24 Mi-171 helicopters for China, signed on 19 January 2006. The first four machines were delivered in July last year and the final four in April this year. Two Mi-171s are passenger versions, with the rest being transports. At the same time with exporting new helicopters to China, UUAZ started the scheduled overhaul of the Mil machines exported to China before.

The Chinese and other export orders are keeping the plant busy. "This is the first so large an order-book over the past two decades. Although not all of the contracts have entered force, we are to make more than 50 machines this year for sure," said Director General Leonid Belykh.

Belykh noted 'a good trend' in the growing number of orders for UUAZ-made helicopters by domes-



tic operators. In 2006, the company delivered two advanced Mi-171s (Mi-8AMTs) to UTair for its subsidiary UTair-Europe that has been operating them in Slovakia since late last year (see the photo). In

addition, the plant carries on with the contract for 14 helicopters for Gazprom and is in talks with the military on two 'VIP wagons' for the defence minister. However, the mainstay of UUAZ's orderbook is

made up so far by orders from foreign customers, some of which have not operated UUAZ-made machines yet. Leonid Belykh named Pakistan, Brazil and Peru as potential foreign customers.

Ka-32 to go to Japan

The Kamov company – a member of the Oboronprom helicopter holding company – landed a contract for a Ka-32A11BC medium multirole helicopter for Japan in late March 2007. It will be the first Russian helicopter exported to Japan following the dissolution of the Soviet Union. In their day, Kamov's Ka-26 light multirole machines were the first Russian helicopters procured by Japan. Now, they are going to be succeeded by the heavier and more efficient Ka-32.

The contract was signed by Kamov and Morikava Shoji Kaisha Ltd., with the machine to be flown by Akagi Helicopter Co Ltd. Operating a fleet of about 30 helicopters of various types and being the third-largest Japanese helicopter operator. Under the contract, the Ka-32A11BC is to be delivered late in June 2007 for use as a cargo and passenger aircraft. The Kumertau Aircraft Production Company (KumAPP) is manufacturing it.

The Ka-32A11BC was certificated for compliance with FAR-29

in Canada in 1998. In December 2006, it was issued the type-certificate addendum authorising its non-commercial passenger operations. The machine is undergoing certification in the EU for compliance with the EASA requirements.

The Ka-32 is exported to 10 countries, including South Korea operating the largest Ka-32 fleet outside Russia, as well as Canada, Switzerland, Spain, Portugal, etc. More than 15 Ka-32A11BC machines have been made to date.

In addition to the Japanese contract, Kamov has great plans for this year. Kamov's Director General Igor Pshenichny said on 11 April that EU countries would receive nine upgraded Ka-32A11BC machines this year. "Today, the mainstay of our exports is the Ka-32A11BC helicopter, the leader in its class," Pshenichny said, "We deliver nine such aircraft to Europe this year."

As is known, such helicopters will have been shipped to Portugal until mid-2007.

Jordan debuts as Russian helicopter buyer



A contract for six Kamov Ka-226 light multirole helicopters worth \$25 million was signed during President Vladimir Putin's visit to Jordan. The deal was clinched by Russian company Oboronprom and Jordan's King Abdullah II Design and Development Bureau, with Russo-Jordanian joint venture Oboronprom Middle East established last year participating in drafting the contract.

This is the first contract Jordan made for Russian helicopters. The

deal provides for partial assembly of the machines in Jordan by Oboronprom Middle East headquartered in the vicinity of the Amman international airport.

"The contract turns a new page in the relations between Russia and Jordan. The Ka-226 operated by the Russian law enforcement structures has proven its high flight performance, ease of control and multirole capability," said Oboronprom Director General Denis Manturov.



THREE
WHALES OF
HELICOPTER
AVIATION

MI-35M

MI-26T

MI-28NE



ROSTVERTOL

WWW.ROSTVERTOLPLC.RU

MTA: from intentions to intergovernmental agreement

During the Russian-Indian Intergovernmental Military Technical Cooperation Commission's 24 January session in New Delhi, which was attended by 1st Vice-Premier Sergey Ivanov, a memorandum of understanding was signed with the intent to come into an intergovernmental agreement on cooperation in development and production of the multipurpose transport aircraft (MTA). Such an agreement will give a boost to the several-year programme on the transport designed to carry a 20-tonne payload. Details of the programme have become known during the recent air show in Bangalore.

Principal Russian participants in the MTA programme are Rosoboronexport and UAC's members Ilyushin and Irkut and the Indian one is HAL. Ilyushin's Director General Victor Livanov told Take-Off that the specification requirement had been approved by both RusAF and IAF. In 2006, the MTA's conceptual design was completed and now is undergoing an expert examination by research institutes of the Russian Defence Ministry and aircraft industry. Once it has been approved, development of the preliminary design is to kick off within the earlier this year. Once the intergovernmental agreement has been signed, a Russian-Indian 50:50 joint venture will be set up to develop and manufacture the MTA. Advanced CAD technologies will simplify the designing by the international team by far. Victor



Livanov estimated the R&D costs under the programme at about \$600 million.

The bulk of the MTA design documentation is to be issued in 2008–09 so that construction of the prototype batch of three flying and two static test aircraft begins in January 2010. The first MTA prototype is slated to fly in December 2011. The bulk of the tests are to be completed in 2013, and early production aircraft deliveries to both customers could commence in the middle of the year as well. The production is to be run in Russia by Irkut's plant and in India by HAL's plants. According to Victor Livanov, the total MTA requirements of RusAF

and IAF are 150 aircraft (the programme has been included into the Russian Governmental Armament Programme until 2015 and a similar programme of the Indian government), and the MTA's general market capacity until 2025 is estimated at 350 aircraft, taking into account possible exports. Potential MTA importers remain unnamed so far. In Livanov's opinion, they are "the countries operating the An-12 and C-130 now".

The MTA's conceptual design was devised by Ilyushin based on the preliminary research it had done on the Il-214 medium transport (looks like the Russian version of the MTA will get this designation). The aircraft is going to be

a high-wing monoplane with the T-shaped tail and a pair of underwing turboprops. The latter may be the PS-12 under development by Perm Engine Company (take-off thrust 11,800 kqf, emergency rating 13,500 kqf) or a modified variant of the PS-90A. According to Victor Livanov, the conceptual design provides for fitting the MTA "with a whole range of Western-made engines", with the final choice to be made by the customers.

The MTA is to have the 20 t carrying capacity, 68 t maximum takeoff weight, 38.29 m length, 35.5 m wingspan, 12.95 m height and 13.85x3.45x3.4 m cargo cabin. It will be capable of cruising at an altitude up to 13,000 m at 870 km/h. Its range with a 4.5 t cargo will be at least 6,000 km and that with a maximum payload of 20 t over 2,500 km. The MTA's takeoff run will measure 1,600 m and landing run will be 1,350 m. The aircraft's assigned life is going to be 30,000 hr. Further down the road, the MTA could serve the base for a non-military derivative, including an airliner and a patrol aircraft.



Indian Navy to get two more Il-38SDs

Ilyushin's flight test and development base in Zhukovskiy, Moscow Region, has launched overhaul and upgrade of two more Il-38 ASW aircraft on order by the Indian Navy. They are to be the fourth and fifth of the five upgraded Il-38SD maritime patrol aircraft to be delivered to India under the contract between Rosoboronexport and the Indian Defence Ministry made in September 2001. The first three aircraft (IN305, IN303 and IN301) were overhauled and upgraded in Russia during 2002–06, having got the advanced Sea Dragon system and other latest avionics and weapons. The first of the five, IN305, was returned to the customer in January 2006 following the full set of improvements and tests. It was followed by IN303, and the third Il-38SD (IN301) was given a new paintjob in Bykovo prior to the handover in October 2006.

Under the 2001 contract, all five Il-38SDs in service with the Indian Navy were to be upgraded, but two of them (IN302 and IN304) were lost to an accident in the vicinity of their air base on 1

October 2002. Russia offered to replenish the lost planes with two aircraft of its own. In November 2006, two Il-38s previously in the inventory of the Russian Navy's Northern Fleet were fer-

ried from their naval air base in Severomorsk to Zhukovskiy. Once they have been overhauled and upgraded to Il-38SD standard, the aircraft are to be delivered to the Indian Navy.



Sergey Krivchikov

BrahMos boards Il-38

At the recent arms shows, Russo-Indian joint venture BrahMos has been placing emphasis on the air-launched derivative of the BrahMos antiship cruise missile. In addition to demonstrating a mock-up of such a missile on an IAF Su-30MKI fighter, the feasibility of attaching two BrahMos missiles on the upgraded IAF Il-38SD ASW aircraft has been announced recently. BrahMos Co-director Aleksandr Maxichev has told Take-Off that the Indian Navy's command has been keen on fitting their Il-38SD fleet with such missiles, and the BrahMos venture has entered negotiations with Ilyushin on adapting the missile to the aircraft.

As was reported by Take-Off, the aviation branch of the Indian Navy received the first two Il-38SDs last year in the wake of their upgrade in Russia. This year, the third upgraded aircraft is to be delivered, with two more to go. In addition to the



Andrey Fomin

advanced Sea Dragon radar system, the upgraded Il-38SDs are getting advanced weapons, particularly, the Kh-35E subsonic antiship missiles from the Tactical Missile Corp. Beefing up their weapons suite with the BrahMos is to expand the combat capabilities of the upgraded patrol aircraft that are supposed to mount a pair of BrahMos on the underbelly launchers just like the Kh-35Es.

The BrahMos supersonic antiship missile system has entered service with the Indian Navy as the shipborne variant, with its land-based mobile derivative on the wheeled chassis to enter inventory of the Indian Army. According to Aleksandr Maxichev, the air-launched variant's development and adaptation to the Su-30MKI fighter (a single missile on the underbelly station) can be completed late next year. It will differ from the existing shipborne and land-based mobile variants in a

lighter booster motor, a modified nose fairing, modified hardpoints, etc. The air-launched version of the BrahMos, powered by a ramjet sustainer, will weight 2,500 kg at launch and pack a 300 kg warhead. The missile will measure 8.1 m with a diameter of 670 mm. When launched by a Su-30MKI aircraft, the missile will have a maximum range of 290 km and skim the sea towards its targets at 10 m at a speed of Mach 2.8.

The BrahMos joint venture is looking into the feasibility of fitting the missile on the Indian Navy's Tu-142ME long-range ASW aircraft, each of which being able to carry six missiles like that. However, since the Indian Navy's command does not have plans to upgrade its Tu-142ME fleet, limiting itself to having them overhauled and their service life extended, the Indian Su-30MKI fighters will be the first BrahMos carriers. The Il-38SD could become the next.



Andrey Fomin

Azerbaijan gets its first MiG-29s

The recent acquisition of the Azeri Air Force, MiG-29 fighters, has been unveiled officially at an air base in the vicinity of Baku on 29 March 2007. The planes had been bought from Ukraine where they had been overhauled, and upgraded by the Lviv Aircraft Repair Plant before delivery.

There have been no fighters of the type in Azerbaijan until recently. After the Soviet Union collapsed, Azerbaijan in addition to helicopters inherited four regiments of combat aircraft: an attack air regiment on Su-25s in Sital Chai, a regiment on MiG-25PD interceptors in Nasosnaya, a regiment on Su-24s in Kurdamir and a recon regiment on MiG-25RBs and Su-24MRs in Dalliar – 120 combat aircraft in total. However, most of the operational aircraft were pulled out to Russia in June 1992 against the backdrop of deteriorating Armenian-Azeri relations.

Nonetheless, the Azerbaijanis managed to retain almost all of the MiG-25PDs of the disbanded 82nd Fighter Air Regiment in Nasosnaya AFB, about 15 MiG-25RB and Su-24MR reconnaissance aircraft and several Su-25 attack aircraft. The warplanes along with almost 20 Mi-24 and Mi-8 helicopters served the mainstay of the Azeri Air Force. Some of them were lost to armed clashes with Armenia. In accordance with official data submitted by Azerbaijan to the United

Nations under the CFE Treaty, its Air Force operated 48 combat fixed-wing and 15 combat rotary-wing aircraft in early 1998. In essence, the MiG-25PD remained the only fighter type in the Azeri Air Force's inventory, with its fleet numbering about 30. However, it is very probable that far from all Azeri MiG-25PDs can fly now despite a MiG-25 MRO plant being in Nasosnaya during the Soviet times. According to British almanac Military Balance's 2000 issue referring to the protocols of the CFE Treaty, the Azeri Air Force by then had had 34 MiG-25s, five Su-24s, five MiG-21s, four Su-17s and two Su-25s. It looks like the latter three types were bought after the dissolution of the Soviet Union, but the sellers remain unknown.

The radical renovation of the Azeri Air Force began 10 years after its inception with the acquisition of six Su-25 attack aircraft in 2002. Six more Su-25s and a Su-25UB were bought in 2005. All of the planes were bought from Georgia that, in turn, bought them from the Czech Republic (the data have been quoted from the UN Register of Conventional Armament at <http://www.disarmament2.un.org>). Interestingly, Armenia got 10 former Slovak Su-25s in 2004. Armenia lacks fighters of its own, but a Russian Air Force group on MiG-29 fighters



militaryphotos.net

has been on alert duty at Erebuni air base since late 1998 within the framework of the CIS's Combined Air Defence System. Possibly, Azerbaijan wanted to buy similar fighters to offset the 'misbalance'.

The Azerbaijanis found the seller in the shape of Ukraine that retained over 200 such aircraft from the now defunct Soviet Union. However, the customer did not merely want to buy second-hand fighters made 15–20 years before and heavily used by the Ukrainian Air Force. Instead, it wanted them overhauled, their service life extended for a rather long term and their combat performance expanded over the baseline model. As was learnt by Take-Off, this resulted in the parties late in 2005 making a contract via the Ukrspetsexport company for 12 upgraded MiG-29 fighters and two MiG-29UB combat trainers earlier operated by UAF. The Lviv State Aircraft Repair Plant (LGARZ) was to overhaul and upgrade them before the delivery.

The programme on upgrading the MiG-29s for the Azeri Air Force was devised and implemented by Ukrainian defence contractors, including LGARZ, Orizon-Navigatsiya (Smela, Cherkassy Region), Phazotron-Ukraine (Kiev), etc. Orizon-Navigatsiya supplied satnav receivers to fit the Azeri Fulcrums. Phazotron-Ukraine refined their organic N019 radars and upgraded their fire control systems. It is possible that some of the work on the Azeri aircraft was handled by the Kiev-based Arsenal plant (improvement of

the optronic sighting system, helmet-mounted target designator, etc.), Kiev-based Artyom company (air-to-air guided missiles), and others.

In addition, the Azeri MiG-29s were reportedly made capable of using precision-guided air-to-surface weapons – most likely the Kh-29T television-homing missiles. TV homers are in production by Electron corporation in Lviv, Ukraine, with the concept of adapting the Kh-29T to the Ukrainian MiG-29s offered by LGARZ, Electron and Arsenal as far back as 2002.

By the way, the only Kh-29T manufacturer in the Soviet Union was the Baku Aggregate Production Association (BAPO) of the Soviet Aircraft Industry Ministry, now known as the Iglim Aircraft Production Association (it has been a 40-year specialist in aircraft and other air conditioning systems). Therefore, the Kh-29T is well known in Azerbaijan, and it is possible that the customer wanted them as part of the weapons suite of the MiG-29s it was about to buy.

The two MiG-29UBs were delivered to Azerbaijan late in 2006. This spring, Ukraine shipped the first five upgraded MiG-29 single-seaters. Azeri Air Force flying and ground crews are learning to fly and fix the new aircraft, having gotten fighters of a quite up-to-date type, capable of expanding the combat capabilities of the Azeri Air Force. Ukraine has gained a wealth of experience in MiG-29 improvement that, no doubt, will be put to use in upgrading its own aircraft of the type.



militaryphotos.net



THE LANGKAWI AIRSHOW
4-8 December 2007

" ASIA PACIFIC'S AEROSPACE & DEFENCE SHOWCASE "

over 40 countries
over 600 delegates

over 800 exhibitors
26,000 square metres

over 100 islands

38,000 trade visitors
25,000 public visitors

AEROSPACE

DEFENCE

MRO
Business Matchmaking

Government Delegations
(Head of States,
Government Officials)

Military Delegations
(Head of Armed Forces, Air Force
& Other Senior Military Officers)

Business Leaders &
Captains of Industries

Fully Supported by
Malaysian Government

"in conjunction with our 50th anniversary national independence celebration"



For bookings and further information:
Tel : +603 2691 2484 Fax : +603 2691 2486 Email : info@lima2007.com
www.lima2007.com



FIRST SU-30MKM DELIVERED

New Flanker derivative for Malaysia unveiled in Irkutsk

At present, the Malaysian derivative of the Su-30MK fighter is the most sophisticated member of the Sukhoi Su-27/30 family, Aleksandr Barkovsky, 1st deputy Designer General/Chief Designer, Sukhoi design bureau, emphasised during the ceremony in Irkutsk. "The MKM is another stepping stone to further development of the Su-30 platform," he said. The Malaysian version is wrapped around the Indian Su-30MKI, which deliveries kicked off in 2002. The Su-30MKM differs from it, mostly, in a modified avionics suite while the airframe, AL-31FP TVC engines and fly-by-wire control system remain the same.

At the same time, according to Aleksandr Barkovsky, "there has been a range of radical innovations introduced to the Malaysian aircraft". They included, first and foremost, modifications to the IFF transponder, self-defence suite, display system and podded electro-optical systems. For instance, the Su-30MKM mounts an advanced French-made IFF system, with its 'plates' situated on top the nose section fore of the cockpit.

However, the main visual difference featured by the Malaysian variant is its laser warning systems and missile approach sensors. They were developed by South African company Avitronics, a member of the SAAB group, and are placed in various parts of the airframe. Two front-hemisphere laser-illumination sensor

The first two Sukhoi Su-30MKM multirole fighters have been accepted by the customer on 24 May. The acceptance ceremony took place at the airfield of the Irkutsk Plant (IAPO), a member of the Irkut corporation. The delegation of the Royal Malaysian Air Force (RMAF) was led by the service's chief, General Dato' Sri Azizan bin Ariffin. Malaysia and Russia signed the contract for 18 Su-30MKMs worth about \$900 million in August 2003. The first two aircraft are to be delivered in June by an An-124 Ruslan heavy-lifter, with four more fighters to follow in June and July. Six more warplanes are to be shipped in October and November. Thus, the customer will have taken delivery of 12 Su-30MKMs before year-end, with the remaining six to arrive in Malaysia in 2008.

sets are under the nose section and the other two, which keep an eye on the rear hemisphere, sit on the sides of the air intakes. Between the former, there is a three-sensor set to spot incoming missiles in the lookdown mode. The second such set of sensors is on top the spine fairing aft of the air brake. It operates in the lookout mode.

In addition to the South African systems, the Su-30MKM's self-defence suite comprises an upgraded Russian radar-warning receiver, Russian electronic countermeasures (ECM) system in two pods mounted on wingtips, and Russian passive IR dispensers in the tail section (98 cartridges with chaff and flares).

Actually, the share of Russian-made components is larger than that on the Indian variant due to Russian components replacing some of the Indian and Israeli ones. Particularly, the Su-30MKI has two different digital computers (the main one is Russian and the backup

is Indian), while both of the Su-30MKM's computers are Russian-made.

In addition, the Su-30MKM has more French-made systems. The Thales wide-angle HUD has ousted the Israeli EIOp HUD mounted by the Su-30MKI. The Su-30MKM's colour multifunction LCDs are French-made as well. Like the Indian fighter, its Malaysian counterpart houses three 5x5" MFD55 displays at each combat station in the cockpit, with the rear station also fitted with the fourth, larger display – the 6x6" MFD66.

Another novelty implemented in the Malaysian version is the Thales podded optronic systems (the Su-30MKI can carry the Israeli-made Litening electro-optical pod). There are two such systems: the LDP Damocles pod ensures round-the-clock air-to-surface attack while day and night flight and navigation is ensured by the NAVFLIR system housed by the pylon dual-hatted as the hardpoint for the Damocles.



Vladimir KARNOZOV
Andrey FOMIN
Photos by Vladimir Karnozov



According to the official data at the Thales website, the Damocles podded optronic system (the pod weighs 265 kg and is 2.5 m long) handles the surface search, target acquisition, identification and tracking, laser spot detection and target ranging and designation for laser-guided weapons, including smart bombs. To this end, it has the thermal imaging capability with the 3–5-micron wavelength as well as two laser channels: a 1.5-micron eye-safe ranging laser and a target illumination laser. The thermal

imager's extra-wide field of vision in the navigation mode measures 24°x18°, wide one – 4°x3° and narrow one – 1°x0.75°. The twofold electronic magnification (zoom) is possible.

The 3–5-micron infrared NAVFLIR navigation system has the front-hemisphere look-down/lookup capability with the 24°x18° optical field of view (the electronic zoom feature 12°x9° angle of view) and shows the resultant imagery on the HUD and/or MFDs. The 20x20 m object identification range stands at



Handing-over ceremony. RMAF commander-in-chief General Dato' Sri Azizan bin Ariffin in the centre



10 km, with 100x100 m objects identified out at 50 km. The system, except the pod and cooling system, weighs mere 20 kg.

The rest of the Su-30MKM's search and targeting systems are Russian-made and mostly similar to those on the Su-30MKI. They include, first and foremost, the Tikhomirov NIIP Bars phased-array radar (PAR) capable of simultaneously tracking at least 15 aerial threats at a high spatial angle and engaging four of them at a time, effectively attacking ground targets and operating in the air-to-air and air-to-surface modes concurrently. The above systems also include the OLS-301 IRST from the Yalamov Urals Optical Mechanical Plant (UOMZ) and Sura helmet-mounted target designator from the Arsenal plant in Kiev.

"The Su-30MKM is close to the Indian version in terms of combat capabilities,"



RMAF commander-in-chief General Dato' Sri Azizan bin Ariffin is satisfied with the first Su-30MKM fighters



says Aleksandr Barkovsky. Its weapons suite remained virtually unchanged and comprises RV-AEE medium-range air-to-air missiles, R-27ER1 (R1) and R-27ET1 (T1) missiles, R-73E dogfight AAMs as well as Kh-59ME, Kh-31A/P and Kh-29TE/L air-to-surface missiles. Smart bombs include KAB-500Kr (OD) and KAB-1500Kr television-guided and advanced laser-guided KAB-1500LG bombs. The Sukhoi fighters might be outfitted with the advanced French air-to-air missile MICA, which feasibility is being mulled over by Sukhoi at the Malaysians' requests. However, there has been no decision taken on introducing it into the weapons suite yet, according to Aleksandr Barkovsky.

The Indian and Malaysian aircraft have the same service lives, with those of the airframes totalling 6,000 flying hours or



RMAF working group supervising Su-30MKM programme

25 years of operation. Heavy servicing is required once 1,500 flight hours have been logged or after 10 years in service. The AL-31FP engines built by UMPO in the city of Ufa have an assigned life of 2,000 flight hours and a life before the first overhaul of 1,000 flight hours, and their TVC nozzles are dismantled after 500 flying hours.

The aircraft is equipped with the oxygen generator from NPP Zvezda company in Tomilino led by Designer General Guy Severin – the very Zvezda that developed the unique K-36D-3.5E ejection seats fitted to the fighter.

To streamline the Su-30MKM's new systems (mostly to integrate them into the avionics suite), the Sukhoi design bureau has furnished two aircraft – two converted pre-production Su-30MKI fighters (side numbers 05 and 04) that at the same time served

the prototypes for the two first Su-30MKMs. One of them was flown out by the Sukhoi design bureau's test pilots Sergey Kostin and Vyacheslav Averyanov in Zhukovsky on 23 May 2006. The other Su-30MKM prototype completed its maiden flight in Irkutsk on 9 June 2006 with Vyacheslav Averyanov and Yevgeny Averyanov. The bulk of the tests conducted at LII's base in Zhukovsky and at the Defence Ministry's GLITs flight-test centre in Akhtubinsk had been complete by late spring this year, as the construction of the early production Su-30MKMs was in full swing in Irkutsk. Now the first pair of Su-30MKMs has been given a new camouflage paintjob with the customer's national markings and shipped to Malaysia where they will be used for training RMAF pilots earmarked to fly the advanced Malaysian Sukhoi fighters further down the road.

With the Su-30MKM entering its inventory, the Royal Malaysian Air Force becomes the second air force in the world operating supersonic multirole supermanoeuvrable fighters powered by thrust vector controlled engines and the second foreign air force using Russian fighters fitted with phased-array radars. All countries neighbouring Malaysia are content with less advanced aircraft carrying radars with mechanically steered arrays. The Bars radar enables the Su-30MKM to attack four threats simultaneously with missiles at a high spatial angle. In addition, given the relevant software, the aircraft featuring such a radar can use advanced missile cueing techniques. As a result, the Su-30MKM's combat capabilities can surpass those of the fighters delivered to the countries adjacent to Malaysia.



Russian and Belarusian Air Forces held combined exercise

On 19 April, the command and control elements and alert-duty forces of the Combined Air Defence System of the CIS member states conducted a command-post exercise designated as Command and Control of the Combined Air Defence System Forces in the Course of Alert Duty. The Republic's of Belarus assistant to the chief of the CPX was Maj.-Gen. I.P. Azaryonok, commander of the Belarusian Air Force and Air Defence Force.

During the CPX, the Belarusian AD forces on alert duty were tested by flights of targets simu-



Dmitry Dyakov



Dmitry Dyakov



Dmitry Dyakov



Dmitry Dyakov

lated by RusAF Tu-95MS, Tu-22M3 and Su-24M bombers as well as BelAF's Su-27, Su-24M and Su-25 warplanes and Mi-24P helicopters. BelAF's MiG-29s, Su-27s and

Mi-24Ps on duty were scrambled to intercept the notional intruders.

In addition, RusAF's Su-27UBs from Lodeinoye Pole AFB and Su-24Ms from Siverskoye AFB

were redeployed to airfields in Belarus, with BelAF's Su-27UBM1s from the 61st Fighter Air Base and Su-24Ms from the 116th Bomber Air Base redeployed to

airfields in Russia. During the exercise, there was the evaluation of operations by the parties' command and control elements to counter the notional violators of the air traffic rules, foreign intruders and hijacked planes and assist the crews of notional aircraft in distress. A Su-27UB from RusAF's Lodeinoye Pole AFB simulated a plane in distress and a Su-27UBM1 from BelAF's Baranovichi AFB simulated the hijacked aircraft.

Data were fed to automated control systems by the RusAF A-50 AWACS plane that flew to Belarus from Ivanovo AFB.

In all, 25 Russian and Belarus aircraft of various types as well as SAM and radar crews were involved in the exercise

Lipetsk Centre receives two Su-25SMs

As was earlier reported by Take-Off, the Defence Ministry's 121st aircraft repair plant in Kubinka, Moscow Region, hosted the ceremony of RusAF's acceptance of the first six series-upgraded Su-25SM attack aircraft in late December 2006. The aircraft were given side numbers from 01 to 06. However, only now with the development and flight tests over, it is a safe bet to say that the way to combat units for the upgraded attack plane has been paved. The first Su-25SM landed at the air-

field of RusAF's 4th Combat and Conversion Training Centre (CCTC) in Lipetsk on 18 April 2007, followed by the second aircraft of the type on 26 April. The two prototype planes had finished the five-year stage of flight, official and special tests. They arrived in Lipetsk from the Chkalov flight test centre in Akhtubinsk, with test pilots handing them over to research pilot who will use them in flight methodology work. The first Su-25SM was ferried to the air base in Lipetsk by the Sukhoi

design bureau's test pilot Yevgeny Frolov, a Hero of Russia and a merited test pilot of the Russian Federation.

The Su-25SM is a derivative of the proven Su-25 attack aircraft. It mounts an advanced digital targeting/navigation suite giving a considerable boost to the plane's combat effectiveness and making the Su-25SM capable of all-weather operation.

CCTC had waited for the aircraft for a long time. It had set up a computerised classroom and launched

ground school for personnel. The centre will study the combat characteristics of the attack aircraft and devise methodological recommendations for its combat employment throughout the whole of its operational envelope. According to the chief of 4th CCTC, Maj. Gen. Aleksandr Kharchevsky, after that, the centre will launch conversion of flight and ground crews of RusAF combat units which are to start taking deliveries of series-upgraded Su-25SMs from the 121st aircraft repair plant in Kubinka this year.

Two more Mi-28N production helicopters built

Early this year, the Russian Defence Ministry accepted another two production Mil Mi-28N helicopters at the Rostvertol plant in Rostov-on-Don. By then, as many as five machines of the type had entered the official test programme.

Rostvertol built the first production Mi-28N (c/n 01-01, side number 32) in late 2005 and delivered it to the Defence Ministry on 29 May last year. The machine joined two other Mi-28Ns in the official trials. The first of them, the OP-1 (No 014) was made by Mil MHP in 1996 and the OP-2 (No 024) by Rostvertol in 2004. The preliminary report on the first stage

of the official Mi-28N trials was released on 4 March 2006, paving the way to the construction of the low-rate initial production (LRIP) batch by Rostvertol. Rostvertol's production plan provided for five production-configuration Mi-28Ns to be made in 2006, according to Director General Boris Slyusar quoted by the Red Star daily in January 2006. In his interview with Take-Off in June 2006, Mil's Director General Andrey Shubitov said that the second production Mi-28N (c/n 01-02) was to be completed by Rostvertol and handed over for the tests in July and the third one in autumn 2006. In its official report on the Russian aircraft industry performance in 2006,

the Federal Agency for Industry's Aircraft Industry Department noted: "The Rostvertol joint stock company in Rostov-on-Don made five Mi-28N helicopters." In all probability, it is the fourth and fifth production aircraft that the Defence Ministry accepted earlier this year.

Unfortunately, last year's test flight programme of the existing Mi-28Ns slipped behind schedule. At the same time, the report stated that "very many test flights were successful" – as many as 94 per cent. The developer and customer agreed that the remaining approximately 180 of the 478 flights required for the official test programme will have been

completed this year, and then the Mi-28N can enter service and start deliveries to combat units. The military pilots with the Army Aviation's Combat and Conversion Training Centre (CCTC) in Torzhok will be the first to start learning the ropes on new aircraft, with combat pilots with the 55th Independent Helicopter Regiment in Korenovsk, the Krasnodar Territory. According to repeated statements by Defence Ministry leaders, the Air Force, of which the Army Aviation is a branch, are going to have taken delivery of 50 Mi-28Ns until 2010. Two helicopter regiments are to be fully furnished with these machines.



Mil Moscow Helicopter Plant

Ukrainian MiG-29 upgrade kicks off

Several years of discussions have resulted in the Ukrainian Air Force (UAF) coming to grips with upgrading its MiG-29 fighter fleet – 7.7 million hryvnas (\$1.5 million) are to be allocated to this end in 2007. However, only 700,000 hryvnas (\$140,000) are to be provided from the national budget, while the remaining 7 million hryvnas are to come from a “special fund”, according to Vladimir Grek, director, Armament Development and Procurement Department, Ukrainian MoD. The money will be spent on developing the final variant of the MiG-29’s upgrade programme, and the first six to 12 MiG-29s might be upgraded for the Ukrainian military next year, if the relevant funding is provided.

In late February, the Ukrainian Armed Forces Command in Vinnitsa hosted a MiG-29 upgrade programme conference attended by Defence Minister Anatoly Gritsenko. Prior to the conference, he told the media that the Lviv State Aircraft Repair Plant Factory (LGARZ) had been selected as prime contractor under the Ukrainian MiG-29 upgrade programme. “We mostly intend to rely on our own technological base. What we cannot do ourselves will be done in cooperation with other countries,” the defence minister said. However, possible foreign contractors “have to be selected yet”, according to Gritsenko.



Andrey Fomin

To date, LGARZ has learnt “minor upgrade” of the MiG-29 owing to the 2005 contract with Azerbaijan for a batch of such fighters. In addition to overhaul and service life extension, the MiG-29 upgrade under this programme provides for fitting them with an improved navigation system with the satnav capability, enhancing the characteristics of the organic radar and introducing advanced integral test and flight data recording capabilities. Orizon-Navigatsiya, Phazotron-Ukraina and several other companies have been contracted to modernise the MiG-29s’ systems.

Throughout this year, a larger-scale Ukrainian MiG-29 modernisation variant is to be mulled over. The MiG Corp. has shown its interest in taking part in the endeavour. In addition to the above

steps to be taken, the fighter’s fire control system is to be improved and advanced data display equipment and air-to-ground TV-homing weapons introduced. The Electron company in Lviv has been the traditional Ukrainian developer of TV homers. It is its homers that fit the Russian Kh-29T and Kh-59M missiles. The Arsenal plant in Kiev has proposed an upgrade option for the MiG-29s’ targeting and navigation suite. Arsenal’s sights, helmet-mounted target designators and other optronic gear are installed in many Soviet- and Russian-made fixed-wing and rotary-wing aircraft.

Which Ukrainian MiG-29 upgrade option is to be opted for by the Ukrainian Defence Ministry will depend on the funding the national

budget can afford. However, it is clear even now that the modernisation programme has cranked up in the end. According to the official statement by the commander of the Ukrainian Armed Forces, Col.-Gen. Anatoly Toropchin, the 2006–2011 Ukrainian Armed Forces Development Programme makes provision for upgrading 48 MiG-29s, with the total number to reach 76 until 2015. The upgrade will extend the service life of the MiG-29 fleet to 35–40 years since their manufacture. “Thus, we will extend the MiG-29s’ service life for another 15–16 years,” Col.-Gen. Toropchin underlined. In all, UAF operates about 200 MiG-29 fighters fielded with four fighter air brigades in Ivano-Frankovsk, Vasilkov, Ozernoye and Belbek.

Preparations for MiG-31 fleet upgrade under way

Completion of the first stage of the upgraded MiG-31BM interceptors’ official trials became a high-profile event last year. Two aircraft, which had been modernised by the Sokol plant in Nizhny Novgorod in 2005 under a contract with the MiG Corp., logged a sufficient number of flights. Late November 2006 saw the release of the preliminary report on the first stage of the trials, which allows the beginning of the so-called ‘series’ upgrade of the MiG-31s operated by

RusAF’s combat units. The prime contractor for the programme is the Sokol plant that signed as far back as 2005 a protocol with the Defence Ministry’s 514th aircraft repair plant on the cooperative upgrade of combat-unit MiG-31s at the same time with overhauling them and extending their service life. Tikhomirov NIIP is to develop and deliver the upgraded avionics under the MiG-31 upgrade programme.

A multiyear governmental contract is in the pipeline, under which Sokol could kick off the

modernisation of the combat-unit MiG-31 interceptors as early as 2007.



Sokol plant

Attack aircraft land on motorway

Early in the morning on 14 April 2007, the Belarusian Air Force (BelAF) practiced for the first time since the collapse of the Soviet Union, with two Sukhoi Su-25UB attack aircraft with the 206th Attack Air Base in Lida landing on the so-called airfield section of the motorway. The first aircraft was flown by Maj.-Gen. M. Levitsky, deputy commander of BelAF and Air Defence Force, and Col. I. Golub, officer commanding the 206th Attack Air Base. The second warplane was operated by



of a Belarus high-speed dual carriageway with asphalted shoulders of the road and a divider.

To cover the two attack aircraft, the 927th Fighter Air Base at the Beryozha airfield allocated a MiG-29UB fighter that practiced a landing approach down to 50 m, too, and then returned to base. The aerial coverage of the airfield section

of the motorway area was also provided by a pair of Mi-24V attack helicopters with the 181st Helicopter Base stationed at the Zasimovichi airfield.

40 min following the landing on the motorway, the attack aircraft were preflighted and ready for a bombex mission to the Ruzhany bombing range.

Col. A. Zimin, D/OC, 206th Attack Air Base, and Maj. V. Sloboskoy, a deputy squadron commander.

The Air Force component of the Belorussian Military District began practicing landings on narrow runway stretches as far back as the 1960s. Virtually all tactical aircraft's air bases featured white lines painted along the runways for pilots to practice. The lines would limit the runways to a width of 21 m. A narrow, 21 m metal runway was assembled at the Cherleny backup airfield in 1965. Once a week, a squadron of the 968th Fighter Air Regiment on MiG-21 fighters would operate from the runway round the clock.

The recent landing on the motorway was conducted under the Belarus Air Force and Air Defence Force's combat training plan. Extensive preparations preceded the event. The pilots conducted ground school on arranging and conducting flights from and on airfield sections of motorways, honed conjunction with ground

command posts and refined the navigation support. The military cooperated with the civilian executive authorities to facilitate the training. A few days before the event, the pilots trained landing approaches to the airfield section of the motorway without actual landing and without disruption the vehicular traffic.

The airfield section of the motorway selected was a 2,500 m stretch



The Sukhoi company pins its near future at the global fighter market on the advent of the Su-35 super-maneuvrable multirole fighter – a heavily upgraded Flanker-family member intended to fill the gap between various today's versions of the Su-30MK fighter and a fifth-generation fighter whose deliveries might kick off in the later 2010s. "The Su-35 is a Generation 4++ aircraft embodying numerous Gen. 5 technologies. They ensure the Su-35's superiority over all other Gen. 4 fighters under development throughout the world. During 2009–2015, the cutting-edge technologies will make the Su-35 superior to all future multifunction fighters on the global market", Sukhoi officials say. The plant in Komsomolsk-on-Amur is now building three Su-35 prototypes the first of which is due to kick off its flight trials as early as this summer. What kind of aircraft is the latest fighter and how does it differ from the Su-27 and Su-30 that are all the rage nowadays?

Andrey FOMIN

SU-35

A STEP AWAY FROM
THE FIFTH GENERATION

New aircraft under the old name

The designation Su-35 has long been known in the world of aviation. Upgraded Su-27M fighters developed on order by the Russian Air Force have been displayed at international air shows repeatedly since 1992 under that name. On the verge of the new millennium, Su-35 competed in the tenders issued by the South Korean and Brazilian air forces, with aircraft made as far back as the early '90s acting as technology demonstrators. With the passage of time, it became clear that the aircraft needed a drastic upgrade of both its avionics and weapons to its airframe and powerplant for the aircraft to penetrate the global market and put up competition to the up-to-date and future foreign fighters. The latter was to be ensured by a considerable increase in the fighter's service life. As a result, a concept of a comprehensively upgraded fighter of the Su-27 family, retaining the Su-35 designation, had matured by the middle of the first decade of the new century.

So, what is new in the Su-35's design? Firstly, the fighter shall be given an improved airframe featuring more titanium alloys, which is to result in a sizeable extension of the plane's service life up to 6,000 hours or 30 years of operation, with the time before the first reconditioning and between overhauls growing to 1,500 hours or 10 years of operation. The Su-35's aerodynamic configuration is the same as that of the Su-27. Unlike the Su-30MKI, it will not have the canards but will feature the pitch, yaw and roll fly-by-wire control system without any mechanical control linkage. The fighter's flight performance and manoeuvrability is to hike owing to the advanced KSU-35 fly-by-wire system under development by the MNPk Avionika company and handling the job used to be

done by several individual systems on board the Su-27 – fly-by-wire system, automatic control system, stall warning and barrier, air data, landing gear wheel braking and nose-wheel control systems. At the same time, the KSU-35 will handle proactive safety functions.

Of the Su-35's design features, mention also should be made of the lack of the Su-27's typical upper air brake, due to its functions taken over by the differentially deflected rudders. Owing to an increase in the Su-35's takeoff weight, its landing gear has been beefed up, with the nosegear made twin-wheel. The airframe embodies the radar abruption technologies slashing the fighter's X-band radar cross-section within the $\pm 60^\circ$ sector.

The redesigned airframe internal volumes allowed an increase in the Su-35's fuel capacity by more than 20 per cent to 11,500 kg over 9,400 kg of the production Su-27. In addition, the aircraft can carry two drop tanks 1,800 litres each on under-wing stores. With the drop tanks, the total fuel capacity measures 14,300 kg. The aircraft is also fitted with the drogue-and-hose mid-air refuelling system with the retractable refuelling probe on the port side of the nose section. The fuel transfer ratio is 1,100 litre/min.

Fighter's "heart"

Another key feature distinguishing the Su-35 from its Su-27-family predecessors is its powerplant comprising deeply upgraded enhanced-thrust engine developed by NPO Saturn and dubbed 'Product 117S'.

As far as the engine's design is concerned, it is a derivative of the production AL-31F, using the fifth-generation technology. It mounts the fan with a 3% larger diameter (932 mm over 905 mm), advanced high- and low-pressure turbines and all-new digital

control system. A provision has been made for using the thrust vector control nozzle similar to that of the AL-31FP. The upgrade has resulted in thrust hiking by 16% to 14,500 kgf in afterburner mode and totalling 8,800 kg in the maximal non-afterburning mode. Compared to the current AL-31F, the new engine's service life is to surge by 2–2.7 times, with the time between overhauls increasing from 500 hours to 1,000 hours, time before first overhaul standing at 1,500 hours and assigned life spiking from 1,500 hours to 4,000 hours.

Five prototype engines have been made under the Product 117S test and debugging programme. The first of them entered rig tests in 2003, with two more having been used in flight trials as part of the powerplant of the Su-27M No. 710 flying testbed. The test flight began in March 2004. About 30 test missions were flown at their first stage, including five on two engines. Then, the fourth example of Product 117 replaced the first prototype on the test bench while the fifth prototype was used as a backup during the flight tests.

The rig tests have proven that the measures taken resulted in a much higher performance of the 117S engine compared with its prototype, with the thrust and specific fuel consumption requirements having been met in spades. Saturn's division at the Lytkarino Machinebuilding Plant in the Moscow region launched the endurance bench tests of the 117S engine in support of the maiden flight of the Su-35, and one more engine of the type will undergo a set of special tests there.

The production of the 117S is to be run by the Ufa Engine Production Association (UMPO) in the city of Ufa and NPO Saturn in the city of Rybinsk. The partners decided that all work on the 117S engine would be shared by Saturn and UMPO on parity

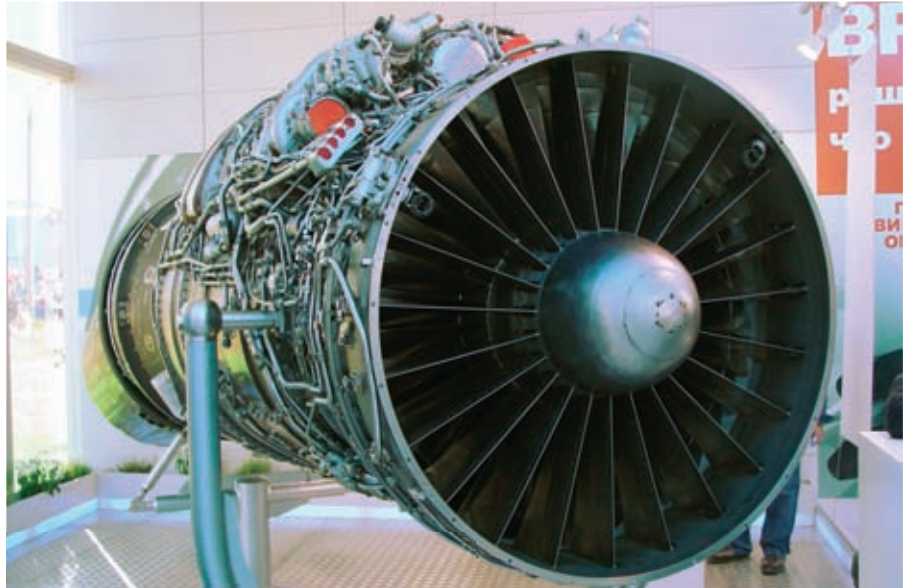


basis. The Sukhoi design bureau, Saturn and UMPO has funded the programme out of their own pocket (40, 30 and 30 % respectively).

Saturn built the first two production 117S engines and shipped them to KnAAPO for flight tests on board of the first Su-35 flying prototype earlier this year.

Advanced avionics suite

It looks like the key feature of the Su-35 is going to be its cutting-edge avionics suite wrapped around the information and control system designed for the functional, logical, informational and software integration of the avionics systems into a single suite and ensuring an interface between the crew and the equipment. The



NPO Saturn 117S turbofan unveiled at MAKS 2005 was tested onboard Su-27M No 710 flying testbed in 2004-2006

Andrey Fomin

information and control system comprises two central digital computers, switching and data-processing gear and 'glass cockpit' display system.

The Su-35's cockpit management system comprises two huge MFI-35 full-colour multifunction liquid crystal displays (LCD), multifunction control panel with an in-built display processor, IKSh-1M wide-angle collimator HUD and control display unit.

The MFI-35 multifunction displays with integral display processors measure 9x12" (15" diagonally) and have the 1,400x1,050-pixel

Predecessors

Development of the Su-27M single-seat multirole high-maneuvrability fighter, which export variant was dubbed Su-35 in 1992, kicked off for the Soviet Air Force and Air Defence Force in the mid-1980s as a comprehensive upgrade of the production Su-27. The upgrade comprised fitting the aircraft with a new avionics suite, introducing advanced medium-range air-to-air active radar homing missiles and guided air-to-ground weapons, modifying the aerodynamic configuration through introducing the canards and 3D fly-by-wire control system, extending the flight range by beefing up the internal fuel capacity and introducing the in-flight refuelling system, etc.

The first Su-27M prototype – the T10M-1 (No 701) – was derived from a production Su-27 and flown for the first time by the Sukhoi design bureau's test pilot Oleg Tsoy on 28 June 1988. The second prototype joined the tests in January 1989, and the late '80s saw the KnAAPO plant start preparations for launching the preproduction batch of the Su-27M. The fly-out of the lead Su-27M made by KnAAPO – the T10M-3 (side number 703) – took place on 1 April 1992. In September of the same year, the aircraft was unveiled at the air show in Farnborough, the UK, under a new designation of Su-35 assigned to the export version of the Su-27M.

To test the new avionics, three more Su-27M prototypes (numbers 705 through 707) were derived from production Su-27s, and KnAAPO in 1993–95 built five more preproduction Su-27Ms (numbers 708 through 712) for the official trials and three early production aircraft for the Air Force. The latter were handed over to the Defence Ministry's State Flight Test Centre (GLITs) in Akhtubinsk in 1996 for Air Force crews to learn to fly them.

Two last preproduction Su-27Ms (No 711 and 712) were used in the mid-'90s to test an advanced phased-array radar, the N011M, that later served the base for the Bars radar now mounted on



Mikhail Kuznetsov

Su-27M first flying prototype (T10M-1)



The first Su-27M (Su-35) built at KnAAPO (T10M-3)



Su-27M preproduction fighter (T10M-9)



resolution. They are designed to receive, process and display in numerous windows graphic, numerical/letter and symbolic information, television imagery fed by onboard TV sensors and overlaid with numerical/letter and symbolic synthesised data as well as generate and feed digital video signals to the video recorder system. The multifunction display with the integral display processor is intended to show relevant information and issue commands by pushing buttons around it throughout the flight. The IKSh-1M collimator HUD with the integral processor is designed for the crew to watch the collimated display of sighting data in the form of marks, digits and other symbols. The HUD's field of vision is 20°x30°.

Control of the Su-35's avionics, systems and weapons in its new cockpit is exercised by buttons and switches on the control stick and throttles and around the multifunction panels and displays. Thus, the fighters features the HOTAS concept. The Ramenskoye Design Company and other members of the Technocomplex corporation handle the development of the displays and some other of the Su-35's avionics.

"Eyes" and "ears"

The fighter's fire control system is based on the advanced Irbis-E phased-array radar system boasting the unique target acquisition range. The Irbis-E was developed by the Tikhmirov NIIP institute as a derivative of the Bars radar that fits the Su-30MKI, Su-30MKM and Su-30MKA fighters. The



Su-35's new glass cockpit first shown at Farnborough 2006

Piotr Butowski

Irbis-E is an X-band multifunction radar with a 900 mm passive phased array mounted on a hydraulic actuator operating in azimuth and banking the promising computing system based on the Solo-35 digital computer. The passed array electronically scans 60° sectors in azimuth and elevation, while the hydraulic actuator additionally steers the array mechanically to 60° in azimuth and to 120° in banking. With electronic control and mechanical steering of the array, the maximum beam angle increases to 120° in azimuth.

The Irbis features a simultaneous 30-target acquisition and tracking capability in the track-while-scan mode. It engages two targets simultaneously with two semi-active radar homing missiles and up to eight targets with eight active radar homing missiles, including four of the targets out at 300 km or more. In the ground-attack mode, the radar handles terrain mapping (both ground and water) and ground target acquisition in the low-resolution 'real-beam', medium-resolution Doppler beam sharpening (DBS)

the Su-30MKI and Su-30MKM. Soon, Aircraft 711 was taken off the programme, converted to the demonstrator of the Su-37 fighter's export version and then turned into an experimental supermanoeuvrable fighter featuring thrust vector control. In 1996, it was equipped with AL-31F TVC version and a modified fly-by-wire control system with the side-mounted stick that allowed the fighter to pioneer the principles of supermanoeuvrability. The maiden flight of the improved aircraft took place on 2 April 1996. The Sukhoi design bureau's test pilot Yevgeny Frolov conducted test flights and numerous demonstrations at international air shows as the Su-37 in 1996–2000. In 2001

the aircraft was fitted with regular AL-31F engines, upgraded fly-by-wire control system and advanced cockpit management system. Its trials with Yuri Vaschuk at the controls had continued until December 2002.

To promote the Su-35 on the global market, particularly, by offering them at the tenders held by the South Korean and Brazilian air forces, KnAAPO developed and built a prototype of the Su-35UB two-seat combat trainer (side number 801). The Su-35UB first flew on 7 August 2000. Later, the aircraft was used in testing various avionics, in particular, the Zhuk-MSE radar.

When the official tests of the Su-27M were suspended in the mid-'90s, the rest of preproduction fighters of the type were used under various special test programmes. Five Su-27M (Su-35) preproduction and production aircraft were assigned to the Air Force's Russian Knights display team and ferried to Kubinka AFB in the Moscow Region.

In all, Sukhoi and KnAAPO have built 17 Su-27M (Su-35) fighters, including five Su-27M-based prototypes, two static-test airframes, six preproduction and three production aircraft as well as one Su-35UB prototype.

Su-37 (T10M-11) supermanoeuvrable experimental fighter



Su-35UB twinseater prototype



Su-35 fighters of the Russian Knights team



Tikhomirov NIIP



Irbis-E phased-array radar is being tested onboard the Su-30MK2 No 503 flying testbed since early 2007

Mikhail Kuznetsov



and high/extra-high-resolution adaptive synthetic aperture focusing modes. Operating against aerial and ground threats at the same time, the Irbis-E maps the ground while keeping an eye on airspace or tracking an aerial threat with precision sufficient for attacking it with active radar homing missiles.

The system features a head-on acquisition range of at least 350–400 km for aerial targets with the 3 sq.m radar cross-section (RCS) and a pursuit acquisition range of at least 150 km with a target traveling at 10,000 m or higher. The Irbis-E spots ‘super-low-observable’ threats with the 0.01 sq.m RCS out at 90 km.

As a derivative of the Bars radar, the Irbis features far superior characteristics than its predecessor, namely an operating frequency band that has been expanded more than two-fold, the aerial target acquisition and azimuth tracking zone that grew from 70° to 120°, a far greater range, enhanced ECM immunity, etc. In these terms, the Irbis is on a par with the



Tikhomirov NIIP

latest foreign designs, surpassing most of US and west European passive and active phased-array radars.

The Irbis PAR has been under development by NIIP since 2004. To date, its prototypes have passed their rig tests, and the first of them has been fitted to the Su-30MK2

No 503 flying testbed for flight trials. The first flight of the flying testbed, which included the activation of the Irbis, took place at the Gromov LII flight research institute earlier this year, with the radar performing well in the air-to-surface mode. In April, the flying testbed was ferried to Akhtubinsk for com-

prehensive flight trials. The basic objective of the first stage of testing the Irbis on board the aircraft are to test the new software and hardware, evaluate new operating modes and prove the design acquisition range characteristics. This phase of the trials is to be completed before year-end.

Meanwhile, Tikhomirov NIIP and the GRPZ State Ryazan Instrument Plant are preparing the first Irbis sets for installation on Su-35 prototypes. Two radars are being prepared for fitting the second and fourth examples of the advanced fighter. The first of the two is slated for installation as early as August, with the radar to fit the other fighter to be ready before the end of the year.

Another advanced subsystem of the Su-35's fire control system is the OLS-35 infrared search-and-track (IRST) system combining a heat-seeker, a laser rangefinder/designator and a TV camera. The up-to-date electronic componentry, advanced algorithms and latest software predetermined the superiority of the OLS-35 over the IRSTs of other Su-27 and Su-30 families' aircraft in terms of range, precision and reliability. The target search, acquisition and automatic tracking zone measures $\pm 90^\circ$ in azimuth and $+60/-15^\circ$ in elevation. The aerial target acquisition range (in non-afterburner mode) in the front hemisphere is at least 50 km and that in the rear hemisphere is at least 90 km. The laser rangefinder ranges aerial targets out at 20 km and ground targets out at 30 km with a precision of 5 m.

In addition, to ensure effective ground attack, the aircraft can carry an electro-optical pod – a laser/TV sighting system capable of acquisition, tracking, ranging and laser illumination of ground threats. The podded optronic system can be used, in particular, to cue laser-guided bombs to the target.

Other advanced avionics of the Su-35 include new navigation system, communica-



Sukhoi Su-35 fighter
in production configuration

KnAAPO

tion systems ensuring operations as a package of fighters, and a very effective electronic countermeasures (ECM) system, which composition and specific elements are subject to the customer's requirements.

Weapons

In addition to eight R-27ER1, four R-27ET1 or R-27EP1 and twelve RVV-AE medium-range AAMs as well as six R-73E dogfight missiles, the Su-35's weapons suite will comprise five advanced long-range air-to-air missiles. The air-to-surface warload includes six Kh-29TE or Kh-29L tactical missiles, six Kh-31A antiship and Kh-31P antiradiation missiles, five advanced Kh-59MK long-range antiship missiles as well as five Kh-58USHe extended-range antiradiation missiles, three Club-family long-range antiship missiles (3M-14AE/3M-54AE1) and a Yakhont heavy long-range antiship missile. The guided bombs include up to eight TV-guided KAB-500Kr (OD), latest satellite-guided KAB-500S-E and laser-guided LGB-250 weapons as well as up to three KAB-1500Kr or KAB-1500LG

TV or laser-guided bombs. The Su-35's choice of bombs and rockets is the same as the one of the Su-30MK, but in the future it can employ improved or brand-new 500 kg and 250 kg bombs 80, 122 and 266/420 mm rockets, including those with laser guidance. The Su-35's maximum payload on 12 external hardpoints stands at 8,000 kg.

State of the programme

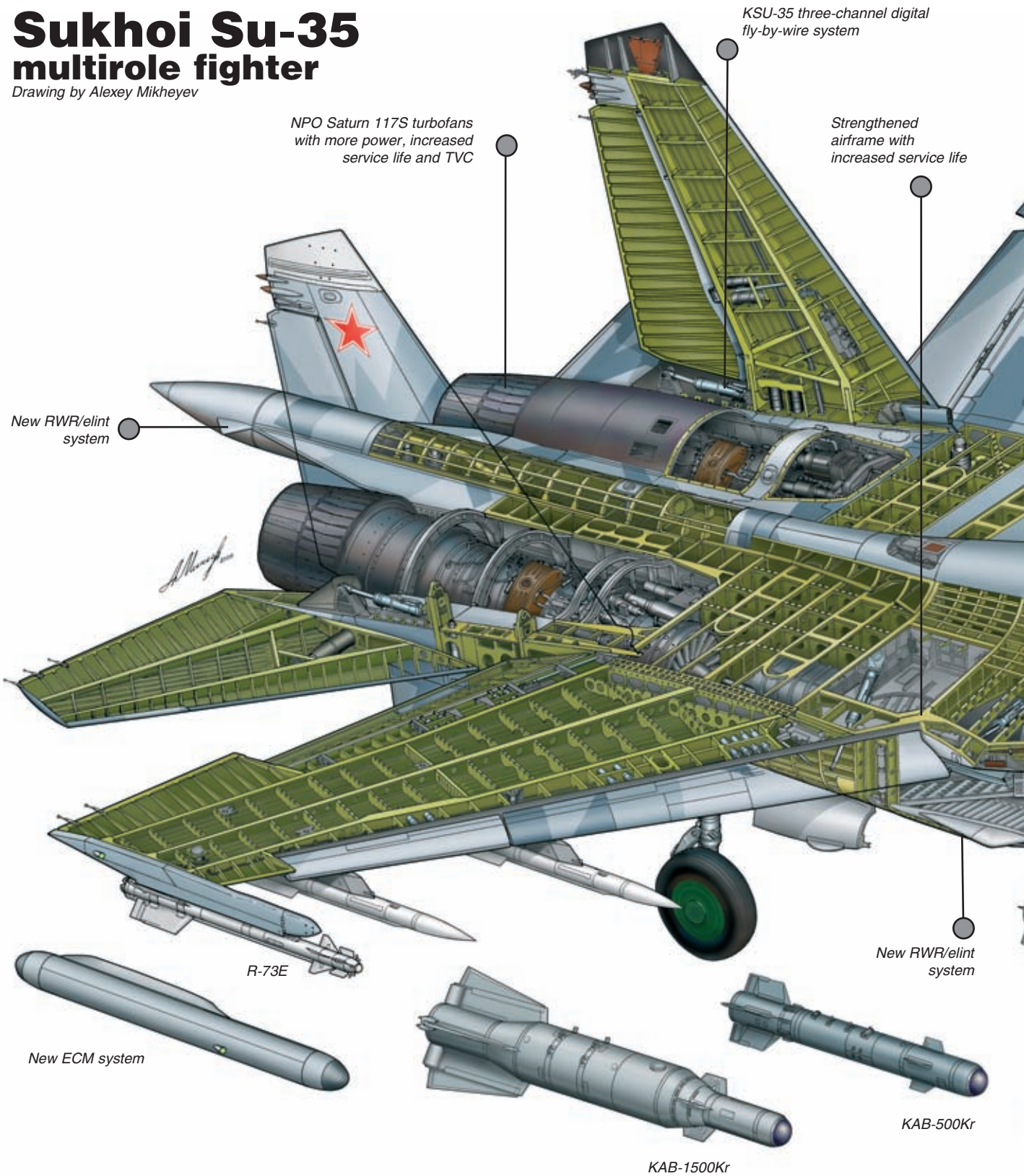
The first Su-35 flying prototype has been completed and is in the final stages of its ground tests in the run-up of its flight trials. Its maiden flight is scheduled for this summer, and the aircraft is to be unveiled at the MAKS 2007 air show in late August. Two more Su-35 prototypes have followed the first example at the assembly line. They are to join the test programme in the later 2007 or earlier 2008. At the same time, several flying testbeds derived from various Su-27 versions are used in the trials. The Su-35's full-rate production and delivery are expected to commence as early as 2009 to continue until a fifth-generation fighter hits the market.

Su-35 main data

Length, m.....	21.9
Wing span, m.....	15.3
Height, m.....	5.9
Take-off weight, kg:	
- normal	25,300
- max	34,500
Combat load, kg.....	8,000
Fuel, kg:	
- internal tanks	11,500
- with two drop tanks	14,300
Max speed, km/h:	
- at sea level	1,400
- at high altitude	2,400
Max Mach number.....	2.25
Service ceiling, m.....	18,000
G-load	9
Range, km:	
- at sea level	1,580
- at high altitude	3,600
- ferry range with two drop tanks	4,500
Powerplant type.....	Saturn 117S
Take-off thrust, kgf	2x14,500

Sukhoi Su-35 multirole fighter

Drawing by Alexey Mikheyev



NPO Saturn 117S turbofans
with more power, increased
service life and TVC

KSU-35 three-channel digital
fly-by-wire system

Strengthened
airframe with
increased service life

New RWR/elint
system

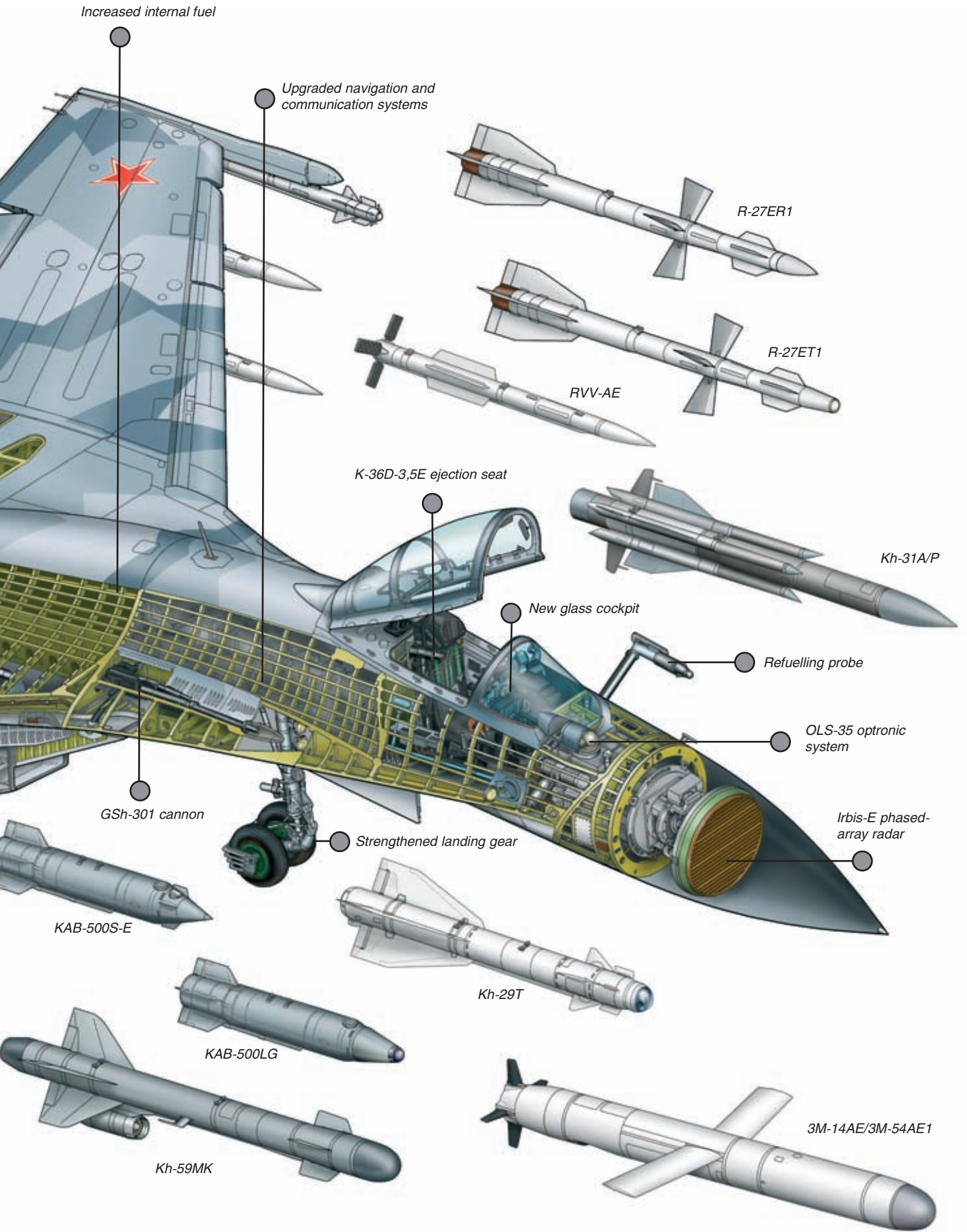
New RWR/elint
system

R-73E

New ECM system

KAB-1500Kr

KAB-500Kr



Increased internal fuel

Upgraded navigation and communication systems

R-27ER1

R-27ET1

RVV-AE

K-36D-3,5E ejection seat

Kh-31A/P

New glass cockpit

Refuelling probe

OLS-35 optronic system

GSh-301 cannon

Strengthened landing gear

Irbis-E phased-array radar

KAB-500S-E

Kh-29T

KAB-500LG

3M-14AE/3M-54AE1

Kh-59MK

Khrunichev Centre grows into holding company

Russian President Vladimir Putin issued two executive orders authorising the establishment of another space holding company. One put the Polyot company in Omsk, Voronezh Mechanical Plant and Chemical Bureau of Engineering Design (Khimmarsh) in Korolyov off the strategic company list. The other subordinated them, along with the Dlina company in Moscow, to the Khrunichev Centre. This is to enable Khrunichev to serve the base for a major Russian space rocket holding company to be set up in 2007 and drive its income to \$1 billion in 2008.

The space rocket industry development strategy approved by the Russian government in summer 2006, there will have been 10 integrated corporate entities set up by the industry by 2010, with three or four major corporations to have absorbed the industry's all companies by 2015. According to Khrunichev's head Vladimir Nesterov speaking at a news conference, the integration will take some time, since the Federal Property Management Agency has to take stock of the companies' property and complete other legal procedures for their reassignment to Khrunichev.

The reorganisation will allow the production and technological capabilities of the companies to be retained and, further down the road, bolster the financial standing of Khrunichev and its affiliates. Nesterov emphasised that the ability to increase investments are to grow with the growth of proceeds from sales. In this connection, the production facilities renovation is the highest priority of the holding company. According to Nesterov, the production facilities were upgraded last time at the time of the Energiya programme, hence, advanced spacecraft have to be manufactured using the equipment dating back to the '60-s and '70s. Khrunichev plans to secure the cutting-edge production capabilities by means of annual investment into production capability update. In excess of 5 billion rubles will be spent to this end in 2008, of which the Voronezh Mechanical Plant is to receive about 900 million rubles, Khimmarsh – 1 billion rubles and Polyot 750 million rubles, with the rest to go to Khrunichev itself and its affiliates.

Within the holding company, Khrunichev will assume general management while remaining the prime contractor for the Rockot, Proton-M,



Angara, Baiterek and other programmes on development, production and launch support of space rockets. The company will carry on with developing and launching small comms and remote-sensing satellites. Polyot has been tasked with R&D on mini- and microsattelites, small satellite production on the base of the Yakhta space platform as well as production of parts and components for the Proton, Rockot and future Angara LVs. The Khimmarsh design bureau will continue making liquid-fuel rocket engines – sustainers for the Breeze-M, Breeze-KM and Frigate upper stages, Angara LV and Indian oxygen/hydrogen booster 12KRB. The Voronezh Mechanical Plant will run the full-rate production of the liquid-fuel engines for the Proton's second and third stages and sustainers of three stages of the Angara family of LVs. The Dlina company will take up deliveries of purchased components.

Nesterov said that, as a result of setting the holding company, Khrunichev will handle about 65 per cent of the work on the Proton as opposed to mere 30 per cent earlier. "Now we can guarantee our customers that virtually everything is made at the same place," Khrunichev's boss underlined, "We have made ourselves

secure against possible bankruptcy of subcontractors."

As far as the companies' own programmes are concerned, Nesterov said that the affiliates would operate "with enough independence but under the single strategy". For instance, Polyot is independently fulfilling a contract it signed with Germany on SAR-Lupe radar surveillance satellite launches on Cosmos-3M LVs. It is possible, however, that the company will have to wrap up the rocket's production next year, since it is deemed to be a rival of Khrunichev's Rockot. "There are several orders for commercial launches. They will be completed," Nesterov assured, "However, the problem of upgrading the Cosmos has not been resolved yet. We will proceed from the economic efficiency of such an upgrade."

Aircraft manufacture is supposed to be resuscitated within the framework of the holding company. "We have plans to develop the T-411 Aist plane," Nesterov said, "It is undergoing certification now. The plane will be made by Polyot in Omsk, the maker of the An-3. The two aircraft are very similar, so the switchover to the new plane will not cost us much."

Khrunichev's plans for near future

Khrunichev plans to conduct six commercial Proton launches in 2007, of which the first one took place on 10 April, with a Proton-M with the Breeze-M upper stage orbiting Canadian telecommunications satellite Anik F3. A Rockot is going to be launched as well this year to insert EU spacecraft GOCE in coming December. Several more launches are to be ordered by the government.

In February, Khrunichev snagged three new launch contracts from foreign customers. One was awarded by ILS for launching Canadian telecommunications satellite Ciel-2 weighing 5,575 kg and built by Alcatel Alenia to geostationary orbit on a Proton-M with the Breeze-M upper stage in the fourth quarter of 2008. This is the first contract made in 2007 under the new pricing policy," a Khrunichev spokesman said without specifying the increase in the Proton's price.

The second contract landed by Khrunichev in February from Eurockot Launch Services provides for a Rockot LV to loft the second Japanese satellite SERVIS into a 1,200 km Sun-synchronous orbit from the Plesetsk launch centre in 2009. The first SERVIS-series satellite was orbited by a Rockot smoothly in October 2003. On 21 February, Khrunichev and ILS announced that they had signed another contract – this time for launching a US direct satellite broadcasting service provider's telecommunications satellite by a Breeze-M upper-staged Proton-M launch vehicle.

AUGUST 21-26



MAKS
2007

**INTERNATIONAL
AVIATION AND SPACE MOSCOW REGION
SALON ZHUKOVSKY**

AVIASALON JSC
FLIGHT RESEARCH INSTITUTE ZHUKOVSKY
Moscow Region, 140182, Russia

Phone: +7 (495) 787-66-51
Fax: +7 (495) 787-66-52

E-mail: maks@aviasalon.com
expofor@aviasalon.com
www.aviasalon.com

Dnepr launches resume

An RS-20 rocket blasted off from Silo 95 of Launch Pad 109 of the Baikonur space centre on 17 April 2007 under the Dnepr conversion space programme. The rocket lofted 14 satellites in orbit.

It was the first launch the Kosmotras company conducted since the failure of the RS-20 in summer 2006 under the Dnepr programme. At the time, the faulty hydraulic actuator of Combustor 4 of the first stage engine resulted in the failure, with the rocket's fragments hitting the ground in Kazakhstan and 18 satellites lost, including the first satellite for the future Belarusian constellation. Launches were put on the backburner, and Kosmotras was allowed to resume its operations only after it had compensated Kazakhstan for the damage done.

At first, the new RS-20 was slated for lift off on 27 March, since the rocket had passed initial tests including mating the nose body to

the rocket. However, at the final stage of the trials, a fault in the telemetry cable network of the booster stage was spotted, and the launch had to be put off. Soon, Kosmotras reported the replacement of the cable, and the prelaunch preparations resumed.

The rocket blasted off smoothly at 10.46 hr Moscow time on 17 April. At 11.02 hr, it inserted its payload in the 98.09° Sun-synchronous orbit. Among other things, the payload included the EgyptSat-1 – the first satellite of the Egyptian constellation, weighing 157 kg and designed for remote sensing. The data it is going to provide are supposed to be used for civil applications only, such as climate monitoring, climate change forecasting, desert research, etc. Egypt ordered the satellite designed by the Yuzhnoye design bureau and made by the Yuzhmash plant in Dnepropetrovsk, Ukraine. The ground control facility

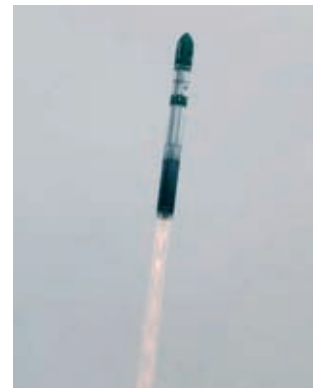
was developed by the Yuzhnoye design bureau, NIIRI joint stock company and Dneprococosmos state-owned company, with one element of the facility situated in Ukraine and the other in Egypt. The first communications session with the EgyptSat-1 took place at the flight control centre vic. Yevpatoriya on the launch day from 12.24 hr to 12.33 hr Moscow time.

In addition, the launch vehicle orbited six Saudi satellites – the SaudiSat-3 and five SaudiComSat-series birds. The SaudiSat is the third in the row of experimental spacecraft developed by the Space Research Institute of the King Abdulaziz Centre of Science and Technology. It carries remote-sensing gear with the 15 m resolution. SaudiComSat satellites, each weighing 15 kg, were developed by the same institute and included in the existing constellation. In the future, the constellation is to be 24 satellites strong, which will ensure coverage of a sizeable portion of the Earth's surface. The

constellation is to transmit packet data between portable, stationary and mobile subscribers and the ground-based central station.

Seven university-made CubeSats in P-Pod containers piggybacked on the RS-20. The PolySat-3 and PolySat-4 were orbited on order by Cal Poly (US), CAPE-1 by University of Louisiana, Libertad-1 by Columbian University, AeroCube by the AeroSpace Corp., CSTB-1 by Boeing and MAST by Stanford University.

The current insertion has been the eighth launch of the converted RS-20 ICBM under the Dnepr programme. Another RS-20 is to loft Bigelow Aerospace's second Genesis-2 satellite from the area of operations of the Yasnenskaya Missile Division of Russia's Strategic Missile Force. It is to be another phase in Bigelow Aerospace's programme on developing the first orbital 'hotel'. The first Genesis-series satellite was lobbed into orbit by an RS-20, too, in June 2006.



Sergey Sergeev/kosmodrombaikonur.ru

Soyuz-Kourou launch site construction begins

At the Kourou space centre in French Guiana, ESA's Jean-Jaques Dordain, Roscosmos's Anatoly Perminov, CNES's Yannick d'Escatha and Arianespace's Jean-Ives Le Gall kick-started the development of a launch site for Russian-made Soyuz LVs on 26 February.

According to a Roscosmos spokesman, the representatives of the Soyuz-Kourou programme inaugurated a plaque on site and

set a marker stone brought from the launch pad at Baikonur, from which Yuri Gagarin flew in 1961. This symbolised the continuity of the two launch centres – one launching Russian Soyuz LVs and the other gearing up for that.

By the time the construction kicked off at Kourou, Russia had launched over 1,710 Soyuz LVs in various versions. Soyuzes had orbited 1661 satellites and 91 Russian and 40 foreign cosmo-

nauts. The Soyuz-ST derivative from Samara-based TsSKB Progress is to be used for Kourou operations. The booster was derived from the Soyuz-2 upgraded LV. According to the Roscosmos spokesman, from the very first Soyuz launch from Kourou slated for late 2008 Guiana's proximity to the equator will be used for beefing up the rocket's capabilities to lob geostationary-orbit telecommunications satellites, EU's Galileo navsats,

polar-orbit remote-sensing satellites and interplanetary probes.

The Guiana launch site construction inauguration ceremony was preceded by several years of legal and technical preparations of the programme and several months of earthwork. The foundations of the flight control post and assembly/test facility had been laid and roads built by the time the high-ranking officials got to Kourou.