

per cent) Kaskol Group (15.67 per cent) and Vostokvneshtorg Group (7.00 per cent) are remaining major shareholders. Current or recent products include the MiG-29UB (from kits supplied from Moscow), MiG-31 and Yak-130 jet trainer; 90 per cent of Yak-130 tooling in place by mid-2000 and first preproduction aircraft completed in mid-2003. It is also responsible for supplying kits for upgrading 125 Indian Air Force MiG-21s to MiG-21-93 standard, with an initial order for 36. Agreement reached in July 2000 on upgrading half of Russian Air Forces' 280 MiG-31s.

Civilian programmes include manufacture of the Myasishchev M-101 Gzhel six-seat turboprop light aircraft, a

prototype AeroRIC Dingo amphibious aircraft with air cushion landing gear and Avia Accord twin-engined light multipurpose aircraft; plans also exist for Myasishchev M-202 production. M-101 marketing is first task of New Regional Aircraft Company (NORS), formed 18 April 2001 by Sokol, Myasishchev and Kaskol financial group. AeroRIC Research-Industrial Company is co-located with Sokol; by 2001 its Dingo project was in suspension because of financial shortfall.

Plans to build MiG-110 twin-turboprop transport apparently not overtaken by announcement in early 2000 of its reallocation to MAPO and discussions on continued participation in programme under way with RSK MiG in

mid-2000. Agreement of 2001 covers production of wings and noses for navalised MiG-29K, plus complete MiG-29KUB trainers. Production of the Eurospace F-15-F Excalibur four-seat touring aircraft was halted at an early stage when a contract for almost 100 was cancelled; some 20 airframes remained at Nizhny Novgorod in June 2000, when 10 sold to Turbine Design in USA.

Other products, in conjunction with AeroRIC, include Volga-2 WIGE craft, air cushion vehicles and Sokol 330 hydrofoil. Offers 'familiarisation' flights in MiG-29UB, MiG-21U and L-29 Delfin. Employment (including part-time) was 9,000 in 2001.

UPDATED

STRELA

STRELA PROIZVODSTVENNOYE OBEDINENIE (Strela Production Association)

ulitsa Shevchenko 26, 46005 Orenburg  
Tel: (+7 3532) 35 72 09 and 35 61 74  
Fax: (+7 3532) 35 54 60

The wholly state-owned Strela plant previously built the Il-10M, Mi-1, Po-2, UT-2 and Yak-14. Currently manufactures UAVs and Kamov Ka-226 helicopter; assembled prototype Ka-226; plans for Ka-226 series manufacture included first three or four production helicopters in 2001, but production investment of Rb300 million was not announced until January 2002, first two

Ka-226s being complete by late March 2002. Factory has orders for 27 Ka-226s including 22 for Gazprom, of which Nos. 3 to 13 were under construction in August 2003. It has produced replica Yak-3/Yak-9s and Mitsubishi A6Ms (Zeros) for export (23 of all built by late 2003). A replica Yak-7 was under construction in 2003.

UPDATED

SUKHOI (AVPK SUKHOI)

GOSUDARSTVENNOYE UNITARNOYE PREDPRIYATIE AVIATSIONNYI VOYENNO-PROMYSHLENNYI KOMPLEKS SUKHOI (State Unitary Enterprise, Aviation Military-Industrial Complex Sukhoi)

a/ya 604, ulitsa Polikarpova 23A, 125284 Moskva  
Tel: (+7 095) 941 76 87  
Fax: (+7 095) 945 68 06  
Web: http://www.sukhoi.org

GENERAL DIRECTOR: Mikhail A Pogosyan  
PRESS OFFICER: Yury Chervakov

AVPK Sukhoi was created, under presidential decree, in August 1996, to bring together the Sukhoi and Beriev design bureaux, the production plants at Irkutsk (IAPO), Komsomolsk-on-Amur (KnAAPO), Novosibirsk (NAPO) and Taganrog (TANTK), and two banks, Oneximbank and Inkombank. The grouping was formally inaugurated on 30 December 1996. As originally constituted, the group comprises the wholly state-owned KnAAPO and NAPO; plus

Sukhoi OKB (see following entry), IAPO and TANTK/Beriev, APVK Sukhoi having a controlling interest in three last-mentioned.

In October 2001, decree by Russian president created Sukhoi Aviation Holding Company, which to become successor to AVPK Sukhoi. New structure initially envisages KnAAPO and NAPO as joint stock companies (held 74.5 per cent each by Sukhoi and balance by Russian state), with IAPO to follow after its flotation.

UPDATED

OPYTNYI KONSTRUKTORSKOYE BURO SUKHOGO AOOT (Sukhoi Experimental Design Bureau JSC)

ulitsa Polikarpova 23A, 125284 Moskva  
Tel: (+7 095) 941 01 30  
Fax: (+7 095) 945 55 70  
CHAIRMAN: Yury Koptev  
DEPUTY CHAIRMAN: Vladimir Chernov  
GENERAL DESIGNER: Mikhail Petrovich Simonov  
CHIEF DESIGNER: Vladimir Babak

OKB, which is 57 per cent owned by AVPK Sukhoi, named for Pavel Osipovich Sukhoi, who headed it from 1939 until his death in September 1975. It remains one of two primary Russian centres for development of fighter and attack aircraft, and it is notable that 60 per cent of front-line Russian Air Forces' aircraft are of Sukhoi design. Bureau has widened its activities to include civilian aircraft, under *konversiya* programme. This offsets the drastic reduction in combat aircraft production and competition in the upgrade and overhaul market.

Sukhoi Advanced Technologies  
GENERAL DIRECTOR: Boris V Rakitin

This division is responsible for promotion and sales of Sukhoi light aircraft, such as the Su-29, Su-31, Su-38L and Su-49. It intended to relocate Su-29 and Su-31 production to KAPO at Kazan from 2002. Related activities include conversion of Su-26s and Su-29s with SKS-94 extraction systems.

Nauchno-Proizvodstvennoe Kontsern Shturmoviki Sukhogo (Sukhoi Stormovik Scientific-Production Concern)

GENERAL DIRECTOR: Vladimir Babak

Offers of upgrades of Su-25 'Frogfoot' to Russian and export customers.

Sukhoi Civil Aircraft  
GENERAL DIRECTOR: Andrey Il'in

Subdivision formed May 2000; on 5 June 2000 signed agreement with Alliance Aircraft Corporation (which see in US section) for joint development and production of StarLiner regional airliner. However, Sukhoi unilaterally cancelled agreement on 2 November 2000. In August 2001, Sukhoi revealed RRJ (Russian Regional Jet) programme in collaboration with Boeing. This selected in 2003 for production.

UPDATED

SUKHOI Su-27

NATO reporting name: Flanker

TYPE: Air-superiority fighter.

PROGRAMME: Development of long-range heavy fighter to meet PFI (*perspektivnyi frontovoy istrebitel*): advanced

| Su-27 PROTOTYPES |     |          |  |
|------------------|-----|----------|--|
| Batch            | Qty | Identity | Remarks  |
| -                | 1   | T10-1    | 'Flanker-A' AL-21 engine                       |
| -                | 1   | T10-2    | 'Flanker-A' AL-21 engine; lost 7 July 1978     |
| 1                | 1   | T10-2    | 'Flanker-A' AL-31 engine; first KnAAPO-built   |
| 1                | 1   | T10-4    | 'Flanker-A' AL-31 engine                       |
| 2                | 1   | -        | Static test airframe                           |
| 2                | 1   | T10-5    | 'Flanker-A' AL-21 engine                       |
| 2                | 1   | T10-6    | 'Flanker-A' AL-21 engine                       |
| 2                | 1   | T10-9    | 'Flanker-A' AL-21 engine                       |
| 3                | 1   | T10-10   | 'Flanker-A' AL-21 engine                       |
| 3                | 1   | T10-11   | 'Flanker-A' AL-21 engine                       |
| 4                | 2   | -        | Static test airframes                          |
| 4                | 1   | T10-7    | T10S; first 'Flanker-B'; lost 3 September 1981 |
| 4                | 1   | T10-8    | Static test airframe                           |
| 4                | 1   | T10-12   | Lost 23 December 1981                          |
| 4                | 1   | T10-14   | Static test airframe                           |
| 1                | 1   | -        | 'Flanker-C' static test airframe               |
| 1                | 1   | T10U-1   | 'Flanker-C'; first KnAAPO-built two-seat       |
| 2                | 1   | T10U-2   | 'Flanker-C'; became T10PU-6                    |
| 2                | 1   | T10U-3   | 'Flanker-C'                                    |

| Su-27 PRE-SERIES |     |          |   |
|------------------|-----|----------|---|
| Batch            | Qty | Identity | Remarks                                       |
| 5                | 1   | T10-15   | Later P-42                                    |
| 5                | 1   | T10-17   | Lost 1983                                     |
| 5                | 1   | T10-21   | Lost 1983                                     |
| 5                | 1   | T10-16   |   |
| 5                | 1   | T10-20   | Later T10KTM                                  |
| 5                | 1   | T10-18   |   |
| 6                | 1   | T10-22   |   |
| 6                | 1   | T10-23   |   |
| 6                | 1   | T10-25   | Hook; lost 11 November 1984                   |
| 7                | 1   | T10-24   | Canards; naval trials; lost 20 January 1987   |
| 7                | 1   | T10-26   | Su-27LL-KS                                    |
| 7                | 1   | T10-27   |   |
| 1                | 1   | T10U-4   | Irkutsk-built; became Su-27LL-OS              |
| 1                | 1   | T10U-5   | Became Su-27PU (Su-30) T10PU-5, then Su-30MKK |
| 2                | 1   |          | Static test airframe                          |
| 2                | 1   | T10U-16  | Became Su-27UB,-PS                            |
| 2                | 1   | T10U-6   | Became T10PU-6, then Su-30MKI                 |

frontal fighter) requirement began 1969 under leadership of Pavel Sukhoi; augmented in high-low mix by Mikoyan LPFI (later MiG-29). T10 based on 'integral' layout of unbuilt T4MS. Construction of prototype began in 1974 under Mikhail Simonov's supervision, and it was flown 20 May 1977 by Vladimir Ilyushin. Development undertaken by nine flying Su-27 'Flanker-As': four prototypes (T10-1 and T10-2) produced in OKB workshops; T10-3 and T10-4 built by Komsomolsk plant and assembled by OKB); five

development (T10-5, -6, -9, -10 and -11) and one static test airframe at Komsomolsk. Individual prototype designations duplicated some competing unbuilt T10 configurations. Prototypes had curved wingtips, rearward-retracting nosewheel and tailfins mounted centrally above engine housings.

Some variation between prototypes; T10-1 originally flew with 'clean' wing; four fences then added, followed by anti-flutter weights on wingtips and fins; inboard fences





Sukhoi Su-27s of the Russian Air Forces' operational development centre at Savostleyka (Yefim Gordon)  
NEW/0552733

subsequently removed. T10-3 (first flight 23 August 1979) and T10-4 (first flight 31 October 1979) used AL-31F engines, others had AL-21F-3s. Canted tailfins from T10-3. T10-5, -6, -9, -10, and -11 had eight pylons (two below each wing) and -9 and -11 had long-chord ogival radomes; these five aircraft collectively known as T10-5 subvariant. Original configuration revealed poor controllability with inadequate stability in roll and yaw, and with poor high AoA capability; two pilots lost their lives before major airframe redesign resulted in T-10S production configuration (known internally as T10 junior).

Construction of new model began 1979, with first flight of prototype (T10-7) 20 April 1981, followed by second prototype (T10-12); T10-8 was T10S-0 static test airframe; series production by KnAAPO at Komsomolsk began with T10-15, first flown 2 June 1982; entry into service 22 June 1985 with air defence regiment co-located with Komsomolsk factory airfield; official type acceptance 23 August 1990 (Council of Ministers decree); ground attack role observed in 1991. Following purchase of complete aircraft, China signed licensed production agreement on 6 December 1996, covering further 200. Production continues for export. In late 1999, Sukhoi quoted 567 of Su-27 family in service in eight countries; foresees total of 760 sales by 2005.

**CURRENT VERSIONS:** **Su-27** ('Flanker-B'): Single-seat land-based production version for air defence force (PVO); full-span leading-edge flaps, trailing-edge flaperons, 5 per cent increase in wing area, straight leading-edges, new aerofoil, square wingtips, carrying anti-flutter weights which doubled as AAM launchers; wider-spaced, uncanted tailfins outboard of engine housings; flatter canopy of reduced cross-section; extended tailcone instead of flat 'beaver-tail'; forward-retracting nosewheel; first flown (T10-7) 20 April 1981. Standard radar tracks 10 targets simultaneously, engages only one. There was early, but probably erroneous, speculation that PVO aircraft were designated Su-27P, with **Su-27S** designation applied to Frontal Aviation aircraft. All aircraft can carry Sorbtsya-S active ECM jammer pods on wingtips in place of wingtip launch rails. **Su-27S** designation little used, but differentiates production (Series) from prototype and preproduction. By 2003, Su-27S designation being used to identify those aircraft which were awaiting Su-27SM modifications. Four initial production aircraft (T10-15, -17, -18 and -22) used for State Acceptance Tests were part of small initial batch featuring horizontally cropped fin caps.

Detailed description applies to the above version, except where indicated.

**'Su-27RV'** ('Flanker-B'): Six replacement aircraft for Russian Knights aerobatic team feature GPS and Western-compatible communications equipment.

**Su-27SK** ('Flanker-B'): Export version of basic Su-27, using air-to-ground capabilities not exploited by Soviet/Russian Su-27s and using same weapons options and downgraded avionics. Armament, totalling up to 4,000 kg (8,818 lb), includes 250 kg and 500 kg bombs, B-8M1 packs of 20 × 80 mm rockets, B-13L packs of five 122 mm rockets, S-250FM 250 mm rockets, KMGU-2 cluster bombs, or podded SPPU-22 30 mm gun with optional downward-deflecting barrel for air-to-ground and air-to-air use. Dimensions, weights and performance generally similar to Su-27 but with reinforced landing gear giving increased (33,000 kg; 72,752 lb) MTOW. Chinese aircraft locally designated **J-11**, though this strictly applies only to locally manufactured examples. First Chinese-assembled aircraft flight tested in December 1998. Some later export aircraft may have upgraded radar and 6,200 kg (13,670 lb) weapon load, or even 8,000 kg (17,637 lb) according to some manufacturers' brochures.

**Su-27SM:** Mid-life update configuration in parallel to Su-27UBM and Su-30KN. First conversion of Su-27S for Russian Air Forces flew at Komsomolsk on 27 December 2002; second to follow; both for military trials at Akhtubinsk. Upgrade adds two MFI-9 178 × 127 mm (7 × 5 in) LCDs, A737 satellite navigation and new radar computer and software for compatibility with AA-12 'Adder' AAMs and several ASMs/LGBs. Second stage upgrade planned for 2005, adding L175 Khibiny EW system, 'quiet' radar and electro-optic targeting pod. Initial 20 first-stage upgrades to have been completed by end of 2003, when

IOC was scheduled, although year-end target had fallen to '10 to 12' according to mid-2003 announcement.

**Su-27SMK:** Single-seat multirole fighter based on the basic Su-27SK, and not the Zhuk-equipped Su-27SM; revealed 1995. Compared with Su-27SK, has 12 instead of 10 hardpoints; 8,000 kg (17,637 lb) weapon load; state-of-the-art nav system, including long-range radio nav, GPS, multichannel comms and latest ECM; larger internal wing fuel tanks and provision for two 2,000 litre (528 US gallon; 440 Imp gallon) underwing tanks; flight refuelling and buddy refuelling capability; retains N001 radar. Most improvements already introduced on other Su-27 series aircraft, enabling virtually full-standard Phase One Su-27SMKs to be offered for immediate delivery. These would be configured for air-to-air roles, with the new wings containing increased internal fuel, provision for underwing tanks, flight refuelling, 12 hardpoints and RVV-AE (R-77; AA-12 'Adder') AAM capability. Su-30KI demonstrator (see below) is regarded as Phase One standard. Phase Two aircraft, with improved avionics and weapon systems for air-to-surface missions, theoretically available later; weapons options to include Kh-29 and Kh-31 ASMs, plus KB-500 LGBs although this seems unlikely without much more extensive upgrade. Dimensions as Su-27, except wing span over wingtip R-73E missiles 14.95 m (49 ft 0½ in). Weights and performance: see tabulated data.

**Su-27PD:** Long-endurance test aircraft with retractable AAR probe, offsetIRST and recontoured tail 'sting'; sometimes described as single-seat Su-30, originally Su-27P. Probably stripped of weapons system for research at Gromov Flight Research Institute and demonstration flying. Added satellite navigation; no radar or weapon control system; PC 486 with LCD for flight assessment of indication formats. At least one aircraft (3720 '598', last known Russian military Su-27); by early 1998, this was marked 'Su-27 Upgrade' and undertaking development flying for **Su-30KI**, later Su-30KM programme (which see). Duties included two flights to North Pole in July and September 1999, testing SRNK satnav system. Another Su-27P (3711 '595') lacked AAR probe. On 25 January 2002, 3711 made first flight with AL-31F-M1 turbofan as initial stage in development of upgraded engine for PAKFA fifth-generation fighter. Fitted with thrust-vectoring nozzles by 2003.

**Su-30KI** The Su-30KI prototype (4002, wearing the basic Chinese dark grey colour scheme, but with a disruptive camouflage superimposed on the wings, tailplanes and outer surfaces of the tailfins) first flew on 28 June 1998, and was then sent to Chkalov Flight Test Centre at Akhtubinsk, where it was evaluated and used for launch trials of the RVV-AE (AA-12 'Adder') AAM, and for avionics and refuelling probe verification. The Su-30KI was described as a 'single-seat Su-30', and was tailored to meet an Indonesian requirement, before the Asian economic crisis halted that programme. Extent to which the aircraft incorporated the 'extended endurance' features of the Su-30 (apart from refuelling probe, GPS and Western VOR/DME navigation equipment) remains uncertain, however. Su-30KI also used as basis of Sukhoi's latest proposal to upgrade Russia's in-service Su-27s, replacing Su-27SM.



The unique Su-30KI demonstrator 4002

Upgrade programme still confusingly referred to by Sukhoi as the Su-30KI, although Russian Air Forces understood to use neither the Su-30 designation nor the KI suffix.

**Su-27UB** ('Flanker-C'): Tandem two-seat trainer version of 'Flanker-B' with full combat capability (Sukhoi designation T10U); four prototypes (first of which for static testing) built at Komsomolsk; first flown 7 March 1985 (T10U-1). Series manufacture by Irkutsk Aircraft Production Association began 1986; first production UB (T10U-4) flew on 10 September 1986. Instructor in raised rear seat with 6° view forward over the nose; taller fin; length same as 'Flanker-B'; overall height 6.36 m (20 ft 10¼ in), maximum combat load 8,000 kg (17,637 lb). 1,500 kg increase in empty weight, no reduction in internal fuel capacity. Export version is **Su-27UBK**.

**Su-27UBM:** Russian Air Forces upgrade. First modified Su-27UB (1201 '20') delivered from Irkutsk plant to LII at Zhukovsky 6 March 2001; further seven conversions planned before end of same year; two completed by September 2001; parallel programme to Su-30KN upgrade. Equipment includes new computer, GPS, three 152 × 203 mm (6 × 8 in) MFDs, RVV-AE (AA-12) missiles and ground mapping mode for N001 radar. Later improvements may include radar-absorbent paint and refuelling probe.

**'Aircraft 02-01'** ('Flanker-C'): Second Su-27UB flying prototype (Komsomolsk 0201) converted as in-flight refuelling systems testbed with retractable probe and provision for centrelines 'buddy' pod; first flown 6 June 1987. Later became Su-27PU.

**Su-27M:** Advanced development of Su-27. Still the official designation for the aircraft known to the OKB as the Su-35. See **Su-35**.

**Su-27/Su-30 (Su-30KI Minor Modernisation):** Proposed upgrade for export Su-27SK, bestowing same multirole standard as Su-30MKK, with inflight refuelling probe, glass cockpit, N-011M radar, GPS, VOR, DME, new mission computer, new navigation system with GPS, expanded EW and provision for new targeting pods. Development undertaken by Su-27PD 3720 '598' and, later, by Su-30KI 4002, first flown 28 June 1998. Phase I of upgrade is known in Russia as Su-30KI, despite the two-seat and Indonesian connotations of that designation. In February 1998, Su-27PD 3720 '598' was displayed at the Singapore Air Show marked 'Su-27 Upgrade' and – notwithstanding the fact that it is a single-seat aircraft – stated to be undertaking development work for a variant to be designated Su-30KI. Latter is phase one of Su-27SMK programme, duties of trials aircraft 4002 including satellite-based navigation; upgraded computers; RVV-AE AAMs; Kh-29T, Kh-31P and Kh-59M ASMs; KAB-500 and KAB-1500 TV-guided bombs; and multifunction cockpit displays.

**Su-27/Su-30 Major Modernisation:** Proposed advanced upgrade configuration bringing any 'first-generation' 'Flanker' to virtual Su-27M/Su-30MKI standards, with a new MIL-STD-1553B-based avionics system, N011M radar with a phased-array antenna, and with the option of adding thrust vectoring and/or canard foreplanes. To be undertaken on Russian Su-27s from 2005 onwards; designation **Su-27BM** (*bolshaya modernizatsiya*: big modification).

**Su-27LL-KS:** Su-27 (T10-26; 0702) with axisymmetric afterburner nozzle. Also known as Su-27LLUV(KS) (*upravlyayemyy vektor tyagi*; *krugloye soplo*: thrust vector control; axisymmetric nozzle) or Su-27-KSI. Evaluated against two-dimensional nozzle testbed, described below. First flew 21 March 1989.

**Su-27UB-PS:** Su-27UB (Irkutsk 0202; '08') modified in 1990 for thrust-vectoring development, with large two-dimensional box nozzle on port tailpipe. Also known as Su-27LL-PS or Su-27LL-UV(PS) (*upravlyayemyy vektor tyagi*; *ploskoye soplo*: thrust vector control; flat nozzle).

**Su-27LMK:** CCV (*lyotno-modeliruyushchy kompleks*: flight simulation complex) conversion of production aircraft 2405 with FADEC and side-stick, and fitted with spin-recovery rockets, tested subsequently with axisymmetric nozzle on starboard tailpipe. Trials at Zhukovsky test centre, under direction of TsIAM and Saturn/Lyulka OKB, began 1990. Advanced control testbed, 2001.



Su-27 EXPORT PRODUCTION

| Country | Type     | Qty | First Aircraft | Remarks   |
|---------|----------|-----|----------------|---|
| China   | Su-27SK  | 24  | '01'           | Batch 38 and 39; 1991-92                                  |
|         | Su-27SK  | 14  |                | Batch 39; 1995-96   |
|         | Su-27SK  | 80  |                | Local assembly in progress                                |
|         | Su-27UBK | 2   | '26'           | Delivered 1991-92   |
|         | Su-27UBK | 10  |                | 1995-96   |
|         | Su-27UBK | 28  |                | 2000-02   |
| Vietnam | Su-27    | 5   | 6001           | Two lost in airfreight delivery<br>Replacements for above |
|         |          | 6   |                |   |
|         |          | 1   |                |   |
|         | Su-27UBK | 4   | 8521           |   |
|         |          | 2   |                |   |

Note: China to assemble further 120 Su-30s

Su-27 CIS (USSR) PRODUCTION

| Batch                     | Qty | Remarks                                     |
|---------------------------|-----|---|
| 'Flanker-B' at Komsomolsk |     |   |
| 8                         | 20  | Full quantity unconfirmed                   |
| 9                         | 20  | Including T10-30 (0906)                     |
| 10                        | 20  | 1003 with sidestick controller              |
| 11                        | 20  |   |
| 12                        | 20  |   |
| 13                        | 20  | Some to Ukraine                             |
| 14                        | 20  | Some to Ukraine                             |
| 15                        | 20  |   |
| 16                        | 20  | 1602 to prototype Su-27M                    |
| 17                        | 20  | Some to 582 IAP                             |
| 18                        | 20  |   |
| 19                        | 20  | Some to 582 IAP                             |
| 20                        | 20  | Some to 159 and 582 IAP                     |
| 21                        | 20  | Some to 159 IAP                             |
| 22                        | 20  | Some to 159 IAP                             |
| 23                        | 20  | Some to 159 IAP                             |
| 24                        | 20  | 2404/T10-41; 2405 Su-27LMK; Some to 159 IAP |
| 25                        | 20  |   |
| 26                        | 20  | Some to 159 and 582 IAP                     |
| 27                        | 20  | Some to 159 and 582 IAP                     |
| 28                        | 20  |   |
| 29                        | 20  |   |
| 30                        | 20  | Some to 61 IAP                              |
| 31                        | 20  | Some to 237 GvTsPAT                         |
| 32                        | 20  |   |
| 33                        | 20  |   |
| 34                        | 20  | Some to 61 IAP                              |
| 35                        | 20  |   |
| 36                        | 20  |   |
| 37                        | 20  | 3711 Su-27P; 3720 Su-27PD                   |
| 'Flanker-C' at Irkutsk    |     |   |
| 03                        | 10  | Some to Ukraine                             |
| 04                        | 10  |   |
| 05                        | 10  |   |
| 06                        | 10  |   |
| 07                        | 10  | Some to 582 IAP                             |
| 08                        | 10  | Some to 237 GvTsPAT                         |
| 09                        | 10  | Some to 61 and 582 IAP                      |
| 10                        | 10  |   |
| 11                        | 10  | Some to 582 IAP                             |
| 12                        | 10  | Some to 582 IAP; 1201 first Su-27UBM        |
| 13                        | 10  |   |
| 14                        | 10  |   |
| 15                        | 10  |   |
| 16                        | 10  | Some to 237 GvTsPAT                         |

Note: Data from unofficial sources. Batches 9 and 10 may have contained fewer aircraft. IAP is Interceptor Air Regiment; GvTsPAT is Guards Centre for Display of Aviation Equipment

Su-27LL-OS: Missile testbed; 1989 conversion of first production Su-27UB 0101 (T10U-4).

Su-27K: Described separately.

Su-27IB: Described separately.

Su-27PU: Two prototypes only; described in 1993-94 *Jane's*. In production as Su-30 (which see).

P-42: Specially prepared Su-27 (T10-15; first production Su-27; originally flown 2 June 1982); set 31 official world records between 1986 and 1988, including climb to 12,000 m (39,370 ft) in 55.542 seconds, and to 22,250 m (73,000 ft) with 1,000 kg (2,205 lb) payload; some records are in FAI category for STOL aircraft.

CUSTOMERS: Approximately 567 in service by December 1999. About 395 in service with Russian Air Forces (or 340 plus 10 with training units by mid-2000, according to some sources); these reports refer to active inventory; evidence suggests that main production batches for former USSR contained up to 600 Su-27s and 140 Su-27UBs.

China received 26 (24 Su-27SK single-seat, two Su-27UBK two-seat) in 1991-92, followed by 24 more (14 single-seat, 10 two-seat) in 1995-96; original agreements called for licensed manufacture of 200 as J-11, at planned rate of 50 a year, in new purpose-built factory (owned by Shenyang Aircraft Company, which see) from 1998 (when first two shipsets delivered from Komsomolsk; first

Chinese-assembled Su-27 rolled out December 1998; only eight delivered by late 2000, following considerable quality control problems, leading to the procurement of 28 extra Russian-built Su-27UBKs, delivered 2000-02, first four on 14 December 2000, second four in December 2000; to Nanjing/Yuxikou air base, where 10 supplied in 2001 and balance of 10 following in 2002. China's licence agreement does not allow exports. The first 50 aircraft are being assembled from Russian-supplied kits of diminishing completeness and the Chinese aircraft will always include at least 30 per cent Komsomolsk content; first 10 kits stated to have been 100 per cent complete but, by 2000, China seeking more in this state to expedite deliveries. No licence has been granted for Chinese production of the AL-31 engine. China's 50 Su-27s were initially based at Wuhan, with the 9th Fighter Regiment, 3rd Air Division though 24 subsequently moved to Liancheng, where 17 were damaged (three beyond repair) in an April 1997 hurricane. Two more were written off in accidents. Production will now cease after 80 J-11s, thereafter switching to the Su-30MKK.

Vietnam has first batch of about six (including one Su-27UB, although further two UBs delivered by airfreight on 1 December 1997 and second pair, representing balance of follow-on order, destroyed in An-124 crash six days later, but replaced by 'Su-30s'); second batch of six now delivered, bringing in-service total to seven Su-27SKs and five Su-27UBK/Su-30Ks; 24 more on order. Upgrade expected, since Vietnam requires aircraft to use R-77 AAMs, Kh-29, Kh-31 and Kh-59 ASMs. Kazakhstan is receiving 32 from Russia, most recently six in 1997, four in January 1999 and four during 2000 (with 12 then outstanding), as compensation for return of Tu-95s and for alleged environmental and ecological damage. Belarus has 22 or 23 (though these may have been sold-on, perhaps to Angola); Ukraine 66 to 70 and Uzbekistan 30; others reportedly went to Armenia, Azerbaijan and Georgia; Syria has requested 14 (some reports suggest 17 in service others that only four were in service by mid-2000, two at Minkah AB and two at Damascus).

Ethiopia received the first of eight second-hand from Russia in late 1998 and Yemen is negotiating for 'a squadron'. In late 1999, there were reports that Angola had taken delivery of eight Su-27s at Catumbela in August, with the balance of seven expected imminently. Pilots had reportedly trained in Belarus, the presumed source of the aircraft, though technical support came from Ukraine. Indonesia announced in March 2003 that two Su-27s and two Su-35s would be purchased immediately as prelude to acquisition of total of 48 'Flanker' versions over following four years. Japan has been reported to be interested in two aircraft for evaluation/aggressor use, but Sukhoi unwilling to sell less than six. Two Japanese pilots underwent a US\$300,000 46-day training programme on the Su-27 in early 1998, however. More recently Malaysia was reportedly 'considering' an Su-27 purchase, while the aircraft was also offered to New Zealand as an alternative to its intended second-hand F-16 buy. Sukhoi offered an Su-30 10-year lease, with targeting pods, PGMs and support, for a quoted cost of NZ\$124.8 million (US\$68.8 million). On 26 November 1995, the first of two Su-27s was delivered to the USA inside an An-124 for an unknown purpose, believed to be support of military training exercises.

DESIGN FEATURES: Developed to replace Yak-28P, Su-15 and Tu-28P/128 interceptors in APVO, for dual-role ground attack/air combat and to escort Su-24 deep-penetration strike missions; basic requirement was effective engagement of F-15 and F-16 and other future aircraft and cruise missiles; exceptional range on internal fuel made flight refuelling unnecessary until Su-24s received probes when more range was required in the escort role; external fuel tanks still not considered necessary; all-swept blended fuselage/mid-wing configuration, with long curved wing leading-edge root extensions, lift-generating fuselage, twin tailfins and widely spaced engines with wedge intakes; rear-hinged doors in intakes hinge up to prevent ingestion of foreign objects during take-off and landing; integrated fire-control system with pilot's helmet-mounted target designator; exceptional high-Alpha performance; basic wing sweepback 42° on leading-edge, 37° at quarter-chord; no dihedral or incidence.

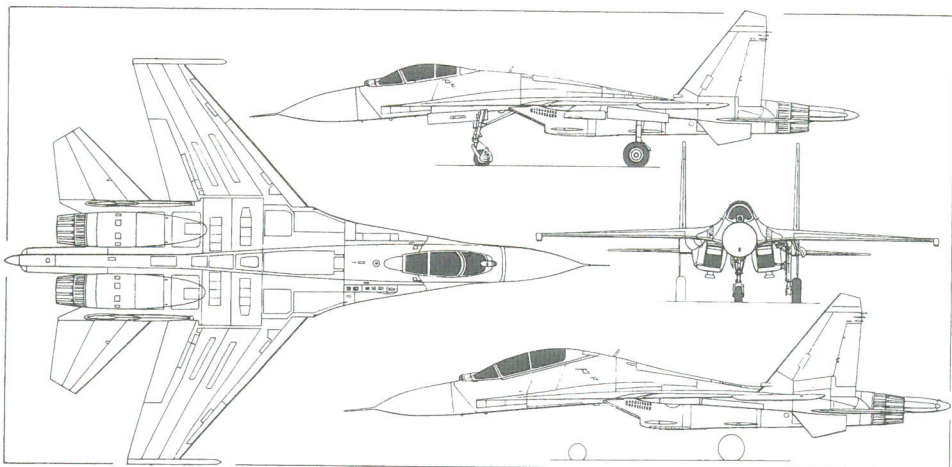
FLYING CONTROLS: Four-channel analogue SDU-27 fly-by-wire, with no mechanical back-up; artificial feel; relaxed longitudinal stability; no ailerons; full-span leading-edge flaps and plain inboard flaperons controlled manually for take-off and landing, computer-controlled in flight; differential/collective tailerons operate in conjunction with flaperons and rudders for pitch and roll control; flight control system limits *g* loading to +9 and normally limits angle of attack to 30 to 35°; angle of attack limiter can be overruled manually for certain flight manoeuvres; large door-type airbrake in top of centre-fuselage.

STRUCTURE: All-metal, with extensive use of aluminium-lithium alloys and titanium but no composites; comparatively conventional three-spar wings; basically circular section semi-monocoque fuselage with load-bearing spine, sloping down sharply aft of canopy; cockpit high-set behind drooped nose; large ogival dielectric



Chinese Sukhoi Su-27SK

NEW/0552884



Sukhoi Su-27P, with added side elevation (bottom) of two-seat Su-27B (*Jane's*/Dennis Punnett)





First upgraded Sukhoi Su-27UBM ('Flanker-C') two-seat operational trainer (Paul Jackson)

0525036

nosecone; long rectangular steel blast panel forward of gun on starboard side, above wingroot extension; two-spar fins and horizontal tail surfaces; uncanted vertical surfaces on narrow decks outboard of engine housings; fin extensions beneath decks form parallel, widely separated ventral fins.

**LANDING GEAR:** Hydraulically retractable tricycle type, made by Hydromash, with single wheel on each unit; KT-156D mainwheels turn 90° while retracting forward into wingroots; hydraulically steerable non-braking KN-27 nosewheel, with mudguard, also retracts forward; mainwheel tyres 1,300x350, pressure 12.25 to 15.70 bar (178 to 227 lb/sq in); nosewheel tyre 680x260, pressure 9.30 bar (135 lb/sq in); hydraulic carbon disc brakes with two-signal anti-skid system; electric brake cooling fan in each mainwheel hub; further brake in nosewheel; brake-chute housed in fuselage tailcone.

**POWER PLANT:** Two Saturn/Lyulka AL-31F turbofans, each 122.6 kN (27,557 lb st) with afterburning. Large spring-loaded auxiliary air intake louvers in bottom of each three-ramp engine duct near primary wedge intake; two rows of small vertical louvers in each sidewall of wedge, and others in top face; fine grille of titanium hinges up from bottom of each duct to shield engine from foreign object ingestion during take-off and landing.

Fuel in four integral tanks: three in fuselage and one split between each outer wing. Max internal fuel capacity approximately 11,775 litres (3,110 US gallons; 2,590 Imp gallons); normal operational fuel load 6,600 litres (1,744 US gallons; 1,452 Imp gallons). Higher figure represents internal auxiliary tank for missions in which manoeuvrability not important. No provision for external fuel tanks, except in versions where specifically indicated. Pressure or gravity fuelling. Flight refuelling capability optional; Su-27UB operated as buddy tanker during development of system.

**ACCOMMODATION:** Pilot only, on Zvezda K-36DM Series 2 zero/zero ejection seat, under large rear-hinged transparent blister canopy, with low sill; 14° view downward over the nose.

**SYSTEMS:** Automatically regulated cockpit air conditioning. Two independent, duplicated, hydraulic systems, pressure 275 bar (4,000 lb/sq in), for actuation of control surfaces, airbrake, landing gear, wheel brakes, air intake ramps and FOD screens. Electrohydraulic (flight control) parts of system quadruplicated. APU in top of rear fuselage for ground and emergency in-flight power. Pneumatic system pressure 210 bar (3,045 lb/sq in) for back-up landing gear extension avionics bay pressurisation and canopy operation and sealing. Electrical supply 27 V DC, 115 V and 200 V 400 Hz AC; two type NKBN-25 Ni/Cd batteries. AC supplied by two integral engine-driven generators with three-phase and single-phase converters. Gaseous oxygen for 4 flight hours.

**AVIONICS:** Systems integrated by NPO Elektroavtomatika. **Communications:** R-800 UHF radio, R-864 HF, intercom and cockpit voice recorder. SO-69 ATC transponder; various IFF fits, according to production batch.

**Radar:** RLPK-27 radar sighting system with NIIP N001 Mech (Sword, NATO 'Slot Back') track-while-scan coherent pulse Doppler look-down/shoot-down radar (long-chord twist-cassegrain antenna diameter approximately 1.0 m; 3 ft 4 in) with search range of up to 54 n miles (100 km; 62 miles), tracking range 35 n miles (65 km; 40 miles), in forward hemisphere against MiG-21 size target (ability to track 10 targets and engage two simultaneously in current Su-27SK/UB upgrade configurations) and TsVM-80 computer.

**Flight:** PNK-10 flight instrumentation and navigation suite encompasses the usual, traditional flight instruments (the IK-VSP altitude and speed data system), SAU-10 autopilot, Ts-050 computer, ARK-19 or ARK-20 ADF, a radio altimeter and A-317 Uron SHORAN. Aircraft capable of ICAO Cat. I autoland.

**Instrumentation:** Integrated fire-control system enables radar,IRST and laser range-finder to be slaved to pilot's helmet-mounted target designator and displayed on wide-angle HUD; autopilot able to restore aircraft to right-side-up level flight from any attitude when 'panic button' depressed.

**Mission:** Duplex SUV-27 weapons targeting complex integrates radar and OEPS-27 electro-optic sighting

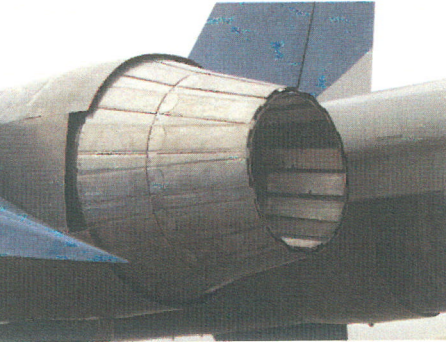
system with Model 36Sh OLS-27 IR search/track (IRST) sensor, range 27 n miles (50 km; 31 miles), collimated laser range-finder, range 4.3 n miles (8 km; 5 miles), functioning through common optics in transparent housing forward of windscreens and NSTs-27 Schchel-3U helmet-mounted sight. Beryuza tactical/GCI datalink. Provision for reconnaissance pod on centreline pylon.

**Self-defence:** SPO-15LM Beryuza 360° radar warning antennas, outboard of each bottom air intake lip and at tail. Gardeniya active ECM jamming system. Three banks of APP-50 chaff/flare dispensers (total 96 cartridges) in bottom of long tailcone extension and top of tailsting. Tailcone widened to provide extra chaff/flare dispensers from batch 18 (mid-1987).

**ARMAMENT:** One 30 mm Gryazev/Shipunov 9A-407IK GSh-30-1 gun in starboard wingroot extension, with 150 rounds. Up to 10 AAMs in air combat role, on tandem pylons under fuselage between engine ducts, beneath each duct, under each centre-wing and outer-wing, and at each wingtip. Typically, two short-burn semi-active radar homing R-27R (NATO AA-10A 'Alamo-A') in tandem under fuselage; two short-burn IR homing R-27T (AA-10B 'Alamo-B') on centre-wing pylons; and long-burn semi-active radar homing R-27ER (AA-10C 'Alamo-C') or IR R-27ET (AA-10D 'Alamo-D') beneath each engine duct. The four outer pylons carry either R-73A (AA-11 'Archer') or R-60 (AA-8 'Aphid') close-range IR AAMs. R-33 (AA-9 'Amos') AAMs optional in place of AA-10s. Up to eight 500 kg bombs, sixteen 250 kg bombs or four launchers for S-8, S-13 or S-25 rockets.

DIMENSIONS, EXTERNAL (Su-27):

|                                 |                           |
|---------------------------------|---------------------------|
| Wing span                       | 14.70 m (48 ft 2 3/4 in)  |
| Wing aspect ratio               | 3.5                       |
| Length overall, excl nose probe | 21.94 m (71 ft 11 1/2 in) |
| Height overall                  | 5.93 m (19 ft 5 1/2 in)   |
| Fuselage: Max width             | 1.50 m (4 ft 11 in)       |
| Tailplane span                  | 9.88 m (32 ft 5 in)       |
| Distance between fin tips       | 4.30 m (14 ft 1 1/4 in)   |
| Wheel track                     | 4.36 m (14 ft 3 3/4 in)   |
| Wheelbase                       | 5.88 m (19 ft 3 3/4 in)   |



Close-up of engine nozzles of Su-27PD '595' (Yefim Gordon) NEW/0558788



Su-27PD testbed '595' with thrust-vectoring nozzles (Yefim Gordon)

NEW/0558787

AREAS:

|                                  |                         |
|----------------------------------|-------------------------|
| Wings, gross                     | 62.04 m² (667.8 sq ft)  |
| Wing leading-edge flaps (total)  | 4.60 m² (49.51 sq ft)   |
| Flaperons (total)                | 4.90 m² (52.74 sq ft)   |
| Fins (total)                     | 11.90 m² (128.10 sq ft) |
| Rudders (total)                  | 3.50 m² (37.67 sq ft)   |
| Horizontal tail surfaces (total) | 12.30 m² (132.40 sq ft) |

WEIGHTS AND LOADINGS (A: Su-27, B: Su-27UB, C: Su-27SK, D: Su-27SMK):

|  |                               |
|--|-------------------------------|
| Operating weight empty: A              | 16,380 kg (36,110 lb)         |
| B                                      | 17,500 kg (38,580 lb)         |
| Max fuel weight: A                     | 9,400 kg (20,723 lb)          |
| Normal T-O weight: A                   | 23,000 kg (50,705 lb)         |
| B                                      | 24,140 kg (53,220 lb)         |
| D, with two R-73 and two R-27 missiles | 23,700 kg (52,250 lb)         |
| Max T-O weight: A, C, D                | 33,000 kg (72,750 lb)         |
| B                                      | 33,500 kg (73,850 lb)         |
| Max wing loading: A, C, D              | 531.9 kg/m² (108.94 lb/sq ft) |
| B                                      | 540.0 kg/m² (110.60 lb/sq ft) |
| Max power loading: A, C, D             | 135 kg/kN (1.32 lb/lb st)     |
| B                                      | 124 kg/kN (1.22 lb/lb st)     |

PERFORMANCE:

|                  |   |
|------------------|---|
| Max level speed: |   |
| at height:       |   |
| A, B             | M2.35 (1,350 kt; 2,500 km/h; 1,550 mph) |
| C                | M2.3 (1,319 kt; 2,443 km/h; 1,518 mph)  |
| D                | M2.17 (1,241 kt; 2,300 km/h; 1,429 mph) |

at S/L:

|      |                                     |
|------|-------------------------------------|
| A, B | M1.1 (725 kt; 1,345 km/h; 835 mph)  |
| C, D | M1.14 (756 kt; 1,400 km/h; 870 mph) |

Stalling speed: A 108 kt (200 km/h; 125 mph)

Acceleration (D):

|  |      |
|--|------|
| from 324 to 594 kt (600 to 1,100 km/h; 373 to 683 mph)   | 15 s |
| from 594 to 701 kt (1,100 to 1,300 km/h; 683 to 808 mph) | 12 s |

Rate of roll: A approx 270°/s

Service ceiling: A, D

|   |                      |
|---|----------------------|
| B | 18,000 m (59,060 ft) |
| C | 17,500 m (57,420 ft) |
| D | 18,500 m (60,700 ft) |

T-O run: A

|      |                  |
|------|------------------|
| B    | 450 m (1,475 ft) |
| C, D | 550 m (1,805 ft) |
| D    | 650 m (2,135 ft) |

Landing run: A, D

|   |                  |
|---|------------------|
| B | 620 m (2,035 ft) |
| D | 700 m (2,300 ft) |

Combat radius: A, B 810 n miles (1,500 km; 930 miles)

|   |                                   |
|---|-----------------------------------|
| D | 840 n miles (1,560 km; 970 miles) |
|---|-----------------------------------|

Range with max fuel:

|      |                                       |
|------|---------------------------------------|
| A, C | 1,985 n miles (3,680 km; 2,285 miles) |
| B    | 1,620 n miles (3,000 km; 1,865 miles) |

Range (D):

|  |                                     |
|--|-------------------------------------|
| at S/L, internal fuel                            | 745 n miles (1,380 km; 857 miles)   |
| at S/L, with external tanks (dropped when empty) | 894 n miles (1,656 km; 1,029 miles) |

at height, internal fuel

|  |                                       |
|--|---------------------------------------|
|  | 2,046 n miles (3,790 km; 2,355 miles) |
|--|---------------------------------------|

at height, with external tanks (dropped when empty)

|  |                                       |
|--|---------------------------------------|
|  | 2,370 n miles (4,390 km; 2,727 miles) |
|--|---------------------------------------|

max, with flight refuelling 2,807 n miles (5,200 km; 3,231 miles)

g limit (operational): A, B, C, D +9

UPDATED

SUKHOI Su-27IB (Su-32 and Su-34)

NATO reporting name: Fullback

TYPE: Attack fighter.

PROGRAMME: Side-by-side two-seat long-range fighter-bomber (istrebitel bombardiroshchik) Su-27 variant intended as tactical strike/attack replacement for Su-24 and Su-25; project designation T10V; redesignated Su-34 by Sukhoi ('to stress father-and-son relationship') to Su-24), but Russian Air Forces retained Su-27IB, Su-32FN/ Su-32MF assigned to proposed export versions but, in 2000, all Su-34s were redesignated Su-32.

Conceptual design ordered 21 January 1983, production authorised 19 June 1986. Designed under the direction of





T10V-7 displaying at MAKS in August 2003 (Yefim Gordon)

NEW/0558808

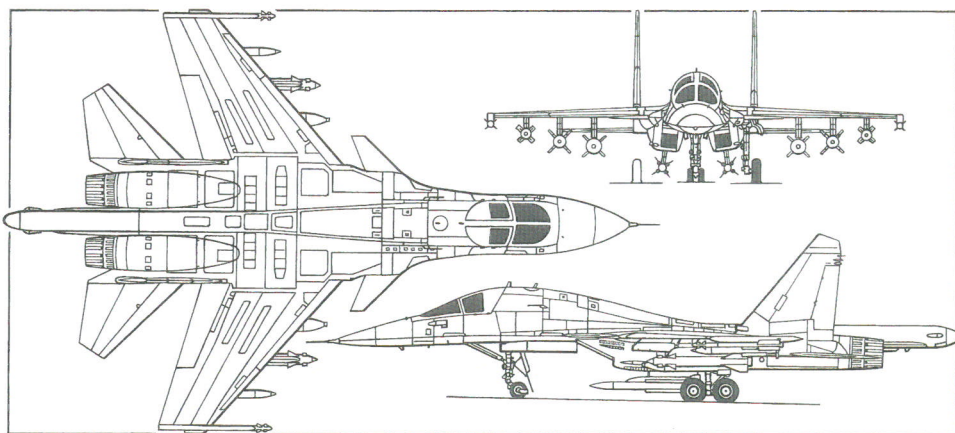
Rollan Martirosov. Prototype (T10V-1 '42') built in Sukhoi's own workshops and first flown 13 April 1990; first seen in Tass photograph showing this aircraft approaching (but not landing on) the carrier *Admiral of the Fleet Kuznetsov*; described as deck landing trainer, but no wing folding or deck arrestor hook; although with foreplanes and twin nosewheels like Su-27K. Designation Su-27KU quoted, though dedicated side-by-side carrier trainer then officially known as T10KM-2 or Su-27KM-2 for which the new side-by-side cockpit had been designed. Russian unofficial name 'Platypus'; exhibited to Russian Federation and Associated States (CIS) leaders at Machulishche airfield, Minsk, February 1992, with simulated attack armament on 10 external stores pylons (under each intake duct, on each wingtip, three under each wing); Kh-31A/P (AS-17 'Krypton') ASMs under ducts, R-73A (AA-11 'Archer') AAMs on wingtips; a 500 kg laser-guided bomb inboard, TV/laser-guided Kh-29 (AS-14 'Kedge') ASM on central pylon and RVV-AE (R-77; AA-12 'Adder') AAM outboard under each wing.

Production originally planned for Irkutsk, but eventually located at Novosibirsk. First series production aircraft flew 28 December 1994. Four were in assembly at Novosibirsk by early 1997. Twelve were once scheduled for delivery by 1998; intention was to replace all Su-24s by 2005; reconnaissance and electronic warfare versions reportedly under development. In September 2000, following increase in funding, Russian Air Forces C-in-C predicted first Su-32 deliveries in 2004, although by early 2002 this had slipped further to 'after 2005'. In mid-2001, Sukhoi predicted completion of State testing of Su-32 by end of 2001, using five aircraft based at Akhtubinsk and Zhukovsky. Trials tempo intensified in 2002, work including tests of Sh141 mission avionics suite as replacement for earlier systems found to have been unsatisfactory.

Side-by-side cockpit to form basis of proposed Su-30-2 long-range interceptor and Su-33UB (Su-27KUB) carrier trainer (which see).

**CURRENT VERSIONS (specific): T10V-1 '42':** First flying prototype; detailed above. Converted from Su-27UB airframe by Sukhoi OKB workshops, with new nose built at Novosibirsk, and reportedly fitted with Su-33 main landing gear.

**T10V-2 '43':** Flown 18 December 1993; first aircraft to be built at Novosibirsk; introduced twin mainwheel bogies. Sometimes described as first production Su-34, in that it had Su-35-type four-hardpoint wing panels and larger internal fuel cells, reinforced wing centre-section, new main landing gear and fixed-geometry engine air intakes.



Three-view drawing of Sukhoi Su-27IB twin-turbopfan theatre bomber (Jane's/Mike Keep)

However, Sukhoi now identifies this aircraft as Su-32 prototype, designed to meet Russian Air Forces requirement of 1998.

**T10V-3:** Static test air frame

**T10V-4 '44':** First flown late 1996. Reported at Leninets radar plant, Pushkino, early 1997; first with full avionics and weapons systems, except EW package. Exhibited at Paris Air Show, June 1997. Also became known as Su-32.

**T10V-5 '45':** First Su-27IB with full Leninets mission avionics fit. Sometimes described as first series-produced T10V. First flew 28 December 1994.

**T10V-6 '46':** First flown January 1998.

**T10V-7 '47':** First flown 22 December 2000. Shown at Moscow in August 2003.

**T10V-8:** By mid-2001, Novosibirsk production stated to be eight, including two static test airframes. Further two under construction in 2002.

**CURRENT VERSIONS (general): Su-27R:** Proposed version to replace Su-24MR and MiG-25RB in tactical reconnaissance roles. BKR (*bortovoi kompleks razvedki*: onboard reconnaissance complex) suite expected to include nose-mounted Pika SLAR and ESM, electro-optical, laser and IRLS reconnaissance equipment.

**Su-27IBP:** Proposed tactical jammer to replace Yak-28PP and Su-24MP.

**'Su-27IB Interceptor':** Proposed ultra-long endurance combat air patrol variant. OKB's internal designation not

known. May be confused reference to Su-33UB-based Su-30K-2 project.

**Su-32:** Initially export version; applied also to domestic version from 2000.

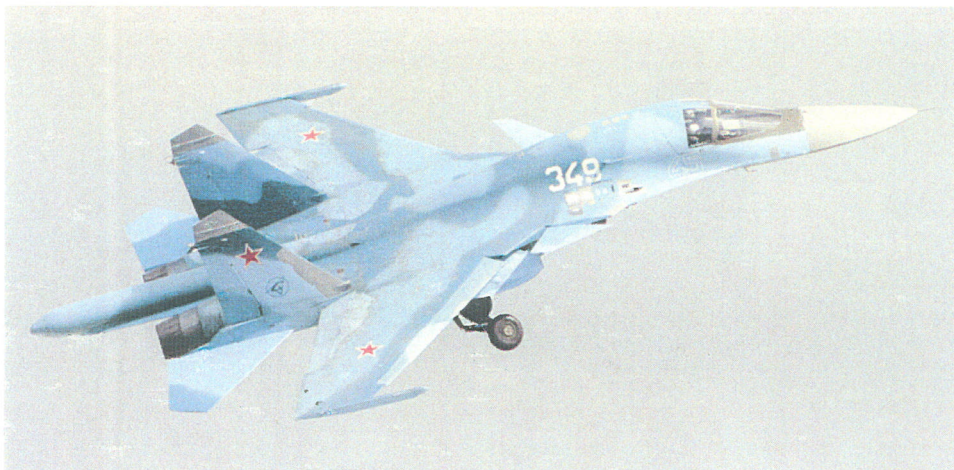
**Su-32FN/MF:** Preseries Su-32FN (T10V-4 '45') first flown 28 December 1994, exhibited at 1995 Paris Air Show; then stated to be in production to replace Su-24s of Russian Naval Aviation; programme reportedly suspended early 1997 before a fully equipped true prototype could fly. Su-32MF designation first appeared in 1999 to describe a 'multifunction', export version. Some French sources suggested that the type had received a new ASCC reporting name 'Fallback', by July 2000.

This version designed to attack hostile submarines and surface vessels by day and night in all weathers, although official drawing shows slightly different shape to nose compared with land attack version; was intended for parallel manufacture at Novosibirsk. Probably common to both types are Su-32MF's active artificial intelligence system to support pilot in critical situations; active gust alleviation smooth-flight system to damp turbulence in low-level flight at high speeds; liquid-crystal EFIS with seven CRTs; and Sorbtsya active ECM jamming pods on wingtips. Planned specialised equipment includes Leninets Sea Dragon avionics suite, with 'Sea Snake' coherent maritime search radar, a ventral sonobuoy pod containing 72 buoys of various types, MAD, IIR, IRTV system and laser range-finder. By early 2002, NIIP offering Osa electronically scanned radar for rear protection and precision weapon targeting because of reported development delays with Leninets suite.

**Su-32 'Escort Jammer':** Proposed in 2001 by Knirti Institute; four podded jammers (including two at wingtips) and two anti-radiation missiles.

**Su-34:** Initially domestic version; discontinued in 2000. Details generally as for single-handem-seat Su-27, except those below.

**DESIGN FEATURES:** One third heavier empty weight, with 50 per cent increase in MTOW, 30 per cent increase in internal capacity, 10 per cent increase in mid-section. Completely new and wider front fuselage built as titanium armoured tub, 17 mm (11/16 in) thick; armour adds 1,480 kg (3,262 lb); new EFIS cockpit containing two seats side by side; side-by-side arrangement avoids some duplication of controls and instruments, while promoting better crew co-operation. New avionics suite integrated by Ramenskoye Instrument-making Design Bureau; wing extensions taken forward as chines to blend with dielectric nose housing nav/attack and terrain-following/avoidance radar; deep fairing behind wide humped canopy; small foreplanes; louvers on engine air intake ducts reconfigured; new landing gear; broader chord and thicker tailfins, containing



Fourth flying Su-32 T10V-5, demonstrating at Moscow Salon (Yefim Gordon)

NEW/0552735



fuel; no ventral fins; and a longer, larger diameter tailcone. This has been raised and now extends as a spine above the rear fuselage to blend into the rear of the cockpit fairing. It houses at its tip a rearward-facing radar to detect aircraft approaching from the rear.

**LANDING GEAR:** Retractable tricycle type; strengthened twin nosewheel unit with KN-27 wheels, tyre size 680×260, farther forward than on Su-27 and retracting rearward; main units have small tandem KT-206 wheels with tyres size 950×400, carried on links fore and aft of oleo. New down-lock fairings. Twin cruciform brake-chutes repositioned in spine to rear of spine/fairing juncture.

**POWER PLANT:** Two Saturn/Lyulka AL-31F turbofans; each 74.5 kN (16,755 lb st) dry and 122.6 kN (27,557 lb st) with afterburning. Later, two AL-31FM or AL-35F turbofans, each 125.5 to 137.3 kN (28,220 to 30,865 lb st) with afterburning. Production version to use 175 kN (39,240 lb st) AL-41F with FADEC and TVC, according to some sources. Additional fuel in tailfins and increased capacity No. 1 tank raising total to 12,100 kg (26,676 lb) plus provision for three external tanks totalling 7,200 kg (15,873 lb). Retractable flight refuelling probe beneath port windscreen.

**ACCOMMODATION:** Two crew side by side on modified K-36DM zero/zero ejection seats with built-in massage function. Access to cockpit via built-in extending ladder to door in nosewheel bay; area protected with 17 mm (⅔ in) thick titanium armour; lavatory and galley with air-stove inside deep fuselage section aft of cockpit.

**AVIONICS:** *Radar:* Leninetz B004 multifunction phased-array radar with high resolution; rearward-facing radar in tailcone.

*Instrumentation:* Colour CRT, multifunction displays and helmet-mounted sight for pilot and navigator.

*Mission:* Built-in UOMZ EOIRST sighting system with TV and laser channels, optimised for air-to-ground use. Separate Geofizika podded thermal imaging system planned. New Argon main computer. Sorbtsya active ECM jamming pods under test on Su-27IB prototype 1995.

*Self-defence:* TsNIRTI electronic warfare system.

**ARMAMENT:** One 30 mm GSh-301 gun with 150 rounds. Twelve pylons for high-precision self-homing and guided ASMs, comprising Kh-59ME Ovod, Kh-31P/Kh-31A(P) (AS-17 'Krypton'), Kh-29T/TE/L (AS-14 'Kedge') and Kh-41/3M80 Moskit; and KAB-500 and KAB-1500 laser-guided bombs with ranges of 0 to 135 n miles (250 km; 155 miles); R-27 (AA-10 'Alamo'), R-73 (AA-11 'Archer') and RVV-AE (R-77; AA-12 'Adder') AAMs.

**DIMENSIONS, EXTERNAL:**

|                        |                           |
|------------------------|---------------------------|
| Wing span              | 14.70 m (48 ft 2 3/4 in)  |
| Wing aspect ratio      | 3.5                       |
| Foreplane span         | 6.40 m (21 ft 0 in)       |
| Length (without probe) | 23.335 m (76 ft 6 3/4 in) |
| Height overall         | 6.50 m (21 ft 4 in)       |
| Wheel track            | 4.40 m (14 ft 5 1/4 in)   |
| Wheelbase              | 6.60 m (21 ft 7 3/4 in)   |

**AREAS:**

|              |                        |
|--------------|------------------------|
| Wings, gross | 62.00 m² (667.4 sq ft) |
|--------------|------------------------|

**WEIGHTS AND LOADINGS (Su-32):**

|                     |                       |
|---------------------|-----------------------|
| Max external stores | 8,000 kg (17,637 lb)  |
| T-O weight: normal  | 38,240 kg (84,304 lb) |
| max                 | 44,350 kg (97,774 lb) |

**PERFORMANCE:**

|                                |  |
|--------------------------------|--|
| Max speed:                     |  |
| at height                      | M1.8 (1,025 kt; 1,900 km/h; 1,180 mph) |
| at S/L                         | M1.14 (756 kt; 1,400 km/h; 870 mph)    |
| Service ceiling                | 15,000 m (49,220 ft)                   |
| Combat radius (internal fuel): |  |
| hi-hi-hi                       | 594 n miles (1,100 km; 683 miles)      |
| lo-lo-lo                       | 324 n miles (600 km; 372 miles)        |
| Range with max internal fuel   | 2,159 n miles (4,000 km; 2,485 miles)  |

**UPDATED**

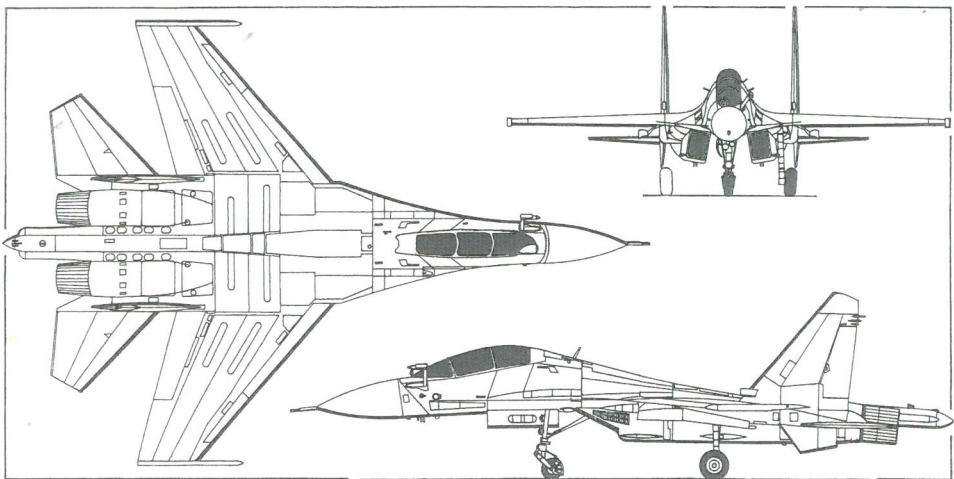
**SUKHOI Su-30 (Su-27PU)**

**NATO reporting name: Flanker-F Variant 1**

**TYPE:** Air superiority fighter.

**PROGRAMME:** Design started 1986; proof-of-concept T10PU (T10U-2 'Aircraft 01-02'; see Su-27 entry) first flew 6 June 1987; construction of two prototypes (T10PU-5 '05' and T10PU-6 '06', converted from Su-27UBs T10U-5 and 0201/T10U-6) began at Irkutsk in 1987, as Su-27PU; first flown 31 December 1989; prototype flew 7,252 n miles (13,440 km; 8,351 miles) in 15 hours 42 minutes non-stop during round trips Moscow-Novaya Zemlya-Moscow and Moscow-Komsomolsk-Moscow. First pre-series Su-27PU flew at Irkutsk on 14 April 1992; initial two aircraft (27596 and 27597 c/ns 0101 and 0102), without military equipment, delivered to 'Test Pilots' aerobatic team at Zhukovsky flight test centre, possibly as Su-27PUDs. By 1999, 27597 was flight-testing MFI-68 152 × 203 mm (6 × 8 in) LCDs for Russian 'Flanker' upgrade programmes while 27596 had been used in support of the Su-30MK programme, renumbered '603'.

**CURRENT VERSIONS:** **Su-30** (Sukhoi T10PU, *Izdelie* 10-4PU): Unofficial OKB designation for basic two-seat long-range interceptor for Russian Air Forces (to which it is still the Su-27PU); deliveries under way by 1996 to 54 Interceptor Air Regiment at Savostleyka advanced training base, though production very limited, and unit relies heavily on



Sukhoi Su-30 two-seat long-range combat aircraft (Paul Jackson)

Su-30 PROTOTYPES AND PRODUCTION

| Batch  | Qty | Identity     | Remarks                                |
|--------|-----|--------------|--|
| Russia |     |              |  |
| -      | (1) | T10PU-5 '05' | Converted from T10U-5; became Su-30MKK |
| -      | (1) | T10PU-6 '06' | Converted from T10U-2; became Su30MKI  |
| 1      | 1   | '596'        | Became '603' for Su-30MK programme     |
| 1      | 1   | '597'        | Testbed at Zhukovsky (LII)             |
| 2/3    | 5   | '50' - '54'  | 54 IAP PVO, Savostleyka                |
| 3      | 1   | '302'        | Upgrade prototype (Su-30KN)            |
| India  |     |              |  |
| PU     | 8   | SB001-008    | Delivered March-April 1997             |
| K      | 10  | SB009-018    | Delivered October 1999                 |

Su-27 and Su-27UB. Apparently, five Su-30s are in frontline use (Red 50, 51, 52, 53 and 54). Designed for mission of 10 hours or more with two in-flight refuellings; systems proved for extended duration sorties, including group missions with four Su-27s; only Su-30 would operate radar, enabling it to assign targets to Su-27s by radio datalink; can carry bombs and rockets but not guided air-to-surface weapons. Su-27UB training capability retained. Canards and thrust vectoring to be optional (see Su-30MKI). Export designation **Su-30K** (T10-4PK). Situation confused by tendency to describe all current Irkutsk-built two-seaters as Su-30s, even standard Su-27UB trainers and by emergence of upgrade using MiG-29SMT cockpit, using the same Su-30K designation. This Su-30K was reported to have been tested at Akhtubinsk by June 2000 but may be the same as the Su-30KM described below. Reported in early 2002 that 'Russian Knights' aerobatic team to convert to Su-30s from Su-27s.

**Su-30K1:** Single-seat configuration for Indonesia, subsequently offered more widely as an upgrade. Described in main Su-27 entry.

**Su-30L:** One foreplane-equipped Su-27PU prototype only; served as Su-30MKI prototype; believed offered as upgrade for Su-27 and as naval trainer, but neither taken up.

**Su-30K-2:** Variant of Su-33UB and described in that entry.

**Su-30KN:** An undelivered production Su-30 (0302 '302') first flew in early March 1999 as the testbed (also referred to as Su-30K and Su-30KM) for a Russian Air Forces upgrade of UB Su-27s and Su-30s. Prime purpose of 'Project 302' was to convert fighter into multirole attack aircraft by adding terrain-mapping and moving target indication to the N001 radar. This achieved by adding new bypass circuit (*obvodnoy kanal*, abbreviated to *Oko* - 'eye'). Cockpit initially unchanged, apart from MFI-55 127 × 127 mm (5 × 5 in) MFDs, an SUV-30K weapons control system comprising a new MVK computer added to existing SUV-27 system (permitting new types of AAM and ASM to be carried) and an A737 GPS; joint venture is undertaken by Sukhoi, Irkutsk (IAPO) and Russkaya Avionika and has high commonality with MiG-29SMT upgrade. Prototype tested at Air Forces Research Institute from mid-1999. State certification awarded 9 November 2001. Added weapons are Kh-29T short-range, or two Kh-59ME long-range TV-guided ASMs; up to six KAB-500KR bombs; four Kh-31P ARMs; and six Kh-31P/A anti-ship missiles. By late 2000, the Su-30KM designation had been replaced by Su-30KN and potential maritime capabilities were being stressed, including possible future compatibility with Kh-59, Yakhont and Alfa ASMs. Up to November 2001, upgrades comprised prototype '302' and three air force aircraft ('51' being the first), all used for trials and modernised at IAPO's expense; order signed by Russian Air Forces in October 2001 for eight upgrades in 2002, 10 in 2003 and 12 in 2004. Su-27UBM and Su-27SM are parallel programmes. 12 Su-30Ks sought by Vietnam believed to be to this standard

with Kh-29, Kh-31 and Kh-59 ASMs, KAB-500 PGMs and R-77 AAMs.

**Su-30KNM:** Subsequent modifications to 0302 involve larger (152 × 203 mm; 6 × 8 in), MFI-68 screens (three for pilot and four for WSO), Pero ('Feather') phased-array radar and equivalent of MIL-STD-1553B databus. Project began in 2002. Upgrade of air force aircraft could begin 2005.

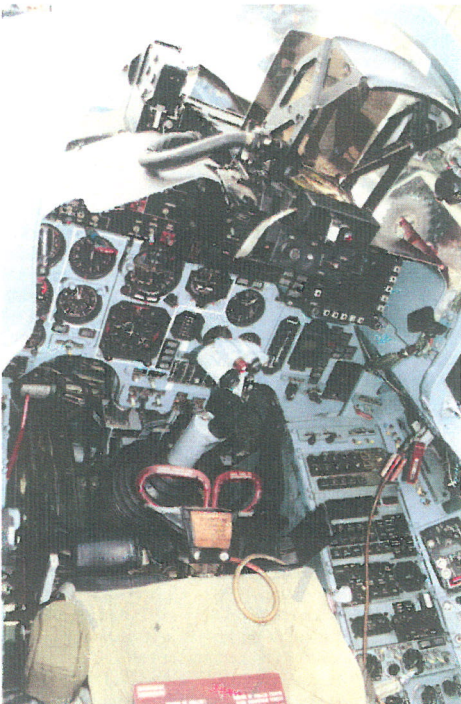
**Su-30M** (Sukhoi T-10PM): Multirole version; described separately.

**CUSTOMERS:** See table. Indian aircraft to be upgraded to Su-30MKI in 2004, according to one report.

**DESIGN FEATURES:** Development of Su-27/27UB, with latter's tandem seating and new avionics, and without Su-35's advanced radar, foreplanes (in basic version), advanced control system and new power plant. Designed for effective engagement of fighters at long distances from base, and to destroy bombers and intercept cruise missiles. Integral configuration similar to Su-27UB, with unstable aerodynamic characteristics. Automatic control system standard.

**FLYING CONTROLS:** As Su-27UB.

**STRUCTURE:** As Su-27UB.



Cockpit of upgraded Su-30 '302', showing new LCD at upper right of panel (Yefim Gordon) 0121094





Russian Air Forces upgrade for the Su-30 was developed in 'Project 302' (Yefim Gordon)

NEW/0552736

LANDING GEAR: As Su-27UB.

POWER PLANT: As Su-27UB, but flight refuelling probe and buddy refuelling capability standard.

ACCOMMODATION: Two crew in tandem in identical cockpits, on K-36DM zero/zero ejection seats, with rear seat raised. SYSTEMS: As Su-27UB, except gaseous oxygen for 10 hours' flight.

AVIONICS: Radar: NIIP N001 Myech ('Slot Back') coherent pulse Doppler look-down/shoot-down radar offered, detection range up to 54 n miles (100 km; 62 miles), tracking range 35 n miles (65 km; 40 miles); ability to track 10 targets and engage two simultaneously; probably not available on current in-service aircraft.

Flight: New navigation system based on GPS, Loran and Omega.

Instrumentation: Integrated fire-control system enables radar,IRST and laser range-finder to be slaved to pilot's helmet-mounted target designator and displayed on wide-angle HUD.

Mission: Provision for fitting foreign-made airborne and weapon systems at customer's request.

Self-defence: SPO-15LM Beryozha 360° radar warning system; chaff/flare dispensers.

ARMAMENT: One 30 mm GSh-301 gun, with 150 rounds; 12 hardpoints for up to six R-27R1E and R-27T1E (AA-10 'Alamo') radar homing and IR long-range AAMs, and six R-73E (AA-11 'Archer') IR close-range AAMs; alternative RVV-AE (R-77; AA-12 'Adder') AAMs; unguided bombs or rockets as Su-27; reconnaissance or EW pods.

DIMENSIONS, EXTERNAL: As Su-27UB

WEIGHTS AND LOADINGS:

|                     |                       |
|---------------------|-----------------------|
| Fuel weight: normal | 5,090 kg (11,222 lb)  |
| max                 | 9,400 kg (20,723 lb)  |
| Max combat load     | 8,000 kg (17,635 lb)  |
| Max external stores | 8,000 kg (17,635 lb)  |
| Normal T-O weight   | 24,550 kg (54,123 lb) |
| Max T-O weight      | 33,000 kg (72,752 lb) |

PERFORMANCE:

|                                      |   |
|--------------------------------------|---|
| Max level speed:                     |   |
| at height                            | M2.35 (1,350 kt; 2,500 km/h; 1,550 mph) |
| at S/L                               | M1.14 (756 kt; 1,400 km/h; 870 mph)     |
| Service ceiling                      | 17,500 m (57,420 ft)                    |
| T-O run                              | 550 m (1,805 ft)                        |
| Landing run                          | 700 m (2,300 ft)                        |
| Combat range: with max internal fuel | 1,619 n miles (3,000 km; 1,865 miles)   |
| with one in-flight refuelling        | 2,805 n miles (5,200 km; 3,230 miles)   |
| g limit                              | +8.5                                    |

UPDATED

## SUKHOI Su-30M

NATO reporting name: Flanker

TYPE: Multirole fighter.

PROGRAMME: Design started 1991; demonstration and development work by Su-27UB 0806 '321' and 0403 '56'; 'Blue 56' first flew in Su-30M configuration on 14 April 1992, but it was not then canard-equipped and did not have full avionics package. Conversion of first true prototype ('06') began 1993, using 0201/T10PU-6; 0101 '603' (formerly first prototype Su-27PU-5) first demonstrated at Berlin Air Show 1994; thrust vectoring and canards under development as options 1997. Canards and AL-37FP engines first flown on '56' 1 July 1997, this regarded by Sukhoi as first flight of Su-30MK; second prototype (06) flew 23 April 1998. In production for India.

Su-30M designation initially associated with canard fitment. However, this now appears to identify multirole aircraft with upgraded airframe capable of 38,800 kg (85,539 lb) MTOW, irrespective of aerodynamic

configuration. Chinese Su-30MKs are described by Sukhoi as Su-30MK family members, despite having twin nosegears and square-topped fins previously regarded as Su-35 features.

CURRENT VERSIONS: **Su-30M** (Flanker-F Variant 2): Basic version.**Su-30MK**: Irkutsk-built. As Su-30M, for export.

**Su-30MK**: Designation re-used for advanced two-seater derived from Su-27SK by KnaAPO plant and combining two-seat Su-30 concept with avionics, canards and thrust vectoring of Su-37. Design, under A F Barkovsky, began 1994. Known internally (by KnaAPO) as Su-35UB (T10UBM) and Su-37UB. First and second true Su-30MKs, 01 (produced through the retrofit of canards to '56') and 06 (converted from T10PU-6 in Sukhoi OKB's own workshop) first flown on 1 July 1997 and 23 April 1998, respectively. Equipped with foreplanes and AL-37FP thrust-vectoring engines; demonstrated to Indian officials at Zhukovsky, 15 June 1998 as Su-30MK-1 and Su-30MK-6, respectively. Su-30MK-1 had the new twin-wheel nose gear, which may become a feature of the production MKI, but was lost while displaying at Paris Air Show on 12 June 1999. Additionally, 01 was exhibited at Aero India, December 1998. AL-37FP power plant, as specified for India, extends length by 40 cm (15½ in) and incurs weight penalty of 110 kg (243 lb), engine life remaining unchanged at 5,000 hours (1,000 hours TBO). Nozzle movement is 15° up or down. Flight control system helps pilot to set power and thrust vector for each engine, according to required manoeuvre. Indian radar choice will be between improved version of Phazotron N010 (Zhuk-27) and NIIP N011M multimode, dual-frequency radar with electronically scanned antenna. Expected to be known as Su-30MKR if produced (at Irkutsk) for Russian Air Forces.

**Su-30MKI** (Flanker-H): Version for India in four configurations, initially referred to as Su-30MKI, MKII, MKIII and MKIV. Indian contract signed 30 November 1996. First eight delivered March 1997 to basic Su-30PU (Su-30K or even Su-37UB) standard, with AL-31F engines; eight for 1998 delivery were expected to have French Sextant avionics including VEH 3000 HUDs, high-resolution colour LCD MFDs, a new flight data recorder, a Totem ring laser gyro dual INS with embedded GPS, Israeli EW equipment, a new UOMZ OLS-30 electro-optic targeting system and rearward-facing radar in tailcone; 12 originally to have been delivered 1999 were to add canards, as on Su-37; final 12 (originally scheduled for delivery in 2000) were to have AL-37FP engines with single-axis thrust-vectoring nozzles inclined outwards 32° from the centreline for improved yaw control, especially in

single-engined case. AL-37FP claimed to offer 3-D thrust vectoring, with nozzle actuation via the fuel, and not the hydraulic system.

Completion and delivery of balance of 32 was repeatedly delayed; decision taken that all these would be completed to final standard before delivery. (In interim, India contracted on 18 December 1998 for 10 standard Su-30Ks which had been cancelled by Indonesia; all had been delivered by October 1999.) First prototype full-specification Su-30MKI flew at Irkutsk on 26 November 2000; Irkutsk built four prototypes, last of which handed over to Sukhoi design bureau on 11 August 2001.

First production aircraft flew 28 December 2001. Under renegotiated contract, IAF to receive six full-specification aircraft by 2002 and balance of 26 in batches beginning 18 to 24 months later; thereafter eight 1997-delivery aircraft will be raised to full standard. First two departed Irkutsk inside An-124 transport 22 June 2002. However, 'full-specification' still being received in three standards, first 10 being Stage I; these 10 formally accepted into service by 20 Squadron at Pune 27 September 2002. Stages II and III, (12 in 2003 followed by 10 in 2004), to introduce additional weapons and upgraded flight control system. Licensed production of 140 (since reduced to 120) Su-30MKIs by HAL was agreed in September 2000, followed by contract signature in Irkutsk on 28 December 2000. Sometimes referred to by KnaAPO as Su-35UB.

**Su-30MKK** ('Flanker-G'): Second K stands for *Kitaya*, or China. Two-seat, multirole version, with an N001VE radar (with expanded air-to-ground capabilities, including mapping); 'glass cockpit' with two 178 × 127 mm (7 × 5 in) MFI-9 colour LCD MFDs in front, plus single MFI-9 and 204 × 152 mm (8 × 6 in) MFI-10 in rear; ILS-31 HUD; A737 GPS; expanded EW capability; provision for various new TV- and EO-based targeting pods.

First Su-27PU (T10PU-5) was refurbished and rebuilt to serve as an Su-30MKK development aircraft, first flying in its new guise on 9 March 1999. First KnaAPO-built prototype ('501') flew 19 May 1999 (sometimes reported as 20 February 1999), with second ('502', in basic Chinese camouflage scheme but marked simply as Su-30MK, not MKK) following later in 1999. '501' and '502' representative of planned production configuration, with tall, flat-topped Su-35-type tailfins, retractable in-flight refuelling probes and (according to some sources) Su-35-type radomes. Further pair ('503' and '504') built by mid-2001.

Chinese production of the 'Flanker' will switch from the J-11 to the Su-30MKK after 80 aircraft. However, China reportedly ordered 45 KnaAPO-built Su-30MKKs and placed supplementary order (initially quoted as 24, but later stated to be 40) in June 2001. First batch of 10 Su-30MKKs left Russia on delivery to China on 20 December 2000; nine followed in March/April 2001 and 10 more on 21 August. Later Chinese aircraft, known as Series III, will switch to Zhuk-MS radars. Russian weapon deliveries began in January 2001 with Kh-59ME (AS-18 'Kazoo'), Kh-29T (AS-14 'Kedge') and Kh-31P (AS-17 'Krypton') ASMs and KAB-500Kr guided bombs. Early Su-30MKKs variously reported with 'Three Swords' Air Regiment at Yuxikou, near Nanjing or at Wuhu, Anhui; those delivered in August 2001 were supplied to Cangzhou, Hebei.

**Su-30MKM**: Malaysian version; US\$900 million contract initiated 19 May 2003.

CUSTOMERS: Indian Air Force initial US\$1.8 billion order for 40 signed 30 November 1996; deliveries from Irkutsk began to No. 24 'Hunting Hawks' Squadron at Pune in March 1997; declared operational 11 June 1997; 10 more ordered September 1998. Option taken up on licensed production of 140 more by HAL, India; however statement of November 2002 noted IAF had reduced quantity to 120. On 29 August 1997, Indonesia signed for eight 'single-seat Su-30s' and four two-seat, but this was cancelled on 9 January 1998. Interest reportedly renewed in 2001, and in 2003 plan to acquire 48 of 'Flanker' family was announced, initial purchase being two each of Su-27 and Su-35.



Sukhoi Su-30MKK development aircraft for Chinese version (Yefim Gordon)

NEW/0552737





Sukhoi Su-30MKI of No. 20 Squadron, Indian Air Force (Robert Hewson)

NEW/0552707

Su-30M PROTOTYPES AND PRODUCTION

| Batch | Qty | Identity          | Remarks  |
|-------|-----|-------------------|--|
| -     | (1) | '56'; later '01'  | Lost 12 June 1999  |
| -     | (1) | 06                | Previously T10PU-6   |
| China |     |                   |  |
| MKK   | 38* | 501 <i>et seq</i> | Ordered 1999; first four for trials in Russia. All delivered 2000-01 |
| MKK   | 28  |                   | Ordered June 2001; delivered 2002-03                                 |
| MKK   | 24  |                   | Ordered January 2003; delivery 2003-04                               |
| India |     |                   |  |
| MKI   | 4   | '02' – '05'       | Development, built 2000-01   |
| MKI   | 28  | SB019-046         | Production at Irkutsk 2001-03  |
| MKI   | 120 |                   | Production in India 2004-13  |

\*Variously quoted as 38, 40 and 45.

COSTS: Indian aircraft quoted as US\$20 million each (flyaway, 1998), with US\$8 million extra per aircraft to integrate Indian-specific systems and avionics. Chinese order for 40 Su-30MKs valued at US\$1.5 billion (2002).

Description refers to two-seat Su-30MK which generally as for Su-30, except as follows:

DESIGN FEATURES: Improvement on combat capabilities of Su-30 by compatibility with high-precision guided air-to-surface weapons with standoff launch range up to 65 n miles (120 km; 75 miles), in addition to Su-30's ability to engage two airborne targets simultaneously.

POWER PLANT: Two Saturn/Lyulka AL-35F turbofans, each 123 kN (27,558 lb st).

AVIONICS: In addition to standard Su-30 systems, Su-30M has more accurate navigation system, a TV command guidance system, a guidance system for anti-radiation missiles, a larger monochrome TV display system in rear cockpit for ASM guidance, and ability to carry one or two pods, typically for laser designation or ARM guidance in association with Pastel RWR and APK-9 datalink. Western avionics, guidance pods and weapons can be fitted optionally. Sextant Avionique package for Indian aircraft includes VEH3000 or Elop HUD, Totem or Sigma 9SN/MF INS/GPS and liquid-crystal multifunction

displays (six 127 × 127 mm; 5 × 5 in MFD 55 and one 152 × 152 mm; 6 × 6 in MFD 66 per aircraft).

ARMAMENT: One 30 mm GSh-301 gun, with 150 rounds; 12 external stations for 8,000 kg (17,635 lb) of stores, including FAB-250, FAB-500, OFAB-250-270, OFAB-100-120 and guided KAB-500KR and KAB-1500KR bombs; B-8M-1 (20 × 80 mm), B-13L (5 × 130 mm) and O-25 (single 266 mm) rocket packs; up to six R-27ER (AA-10C 'Alamo-C'), R-27ET (AA-10D 'Alamo-D') or RVV-AE (R-77; AA-12 'Adder') medium-range AAMs; or two R-27ETs and six R-73E (AA-11 'Archer') IR homing close-range AAMs; and a variety of air-to-surface weapons such as four ARMs, six guided bombs or short-range missiles with TV homing, six laser homing short-range missiles, or two long-range missiles with TV command guidance; these include Kh-29L/T (AS-14 'Kedge'), Kh-31A/P (AS-17 'Krypton') and Kh-59M; (AS-18 'Kazoo') with APK-9 pod.

DIMENSIONS, EXTERNAL: As Su-27 except: Height overall 6.355 m (20 ft 10¼ in)

WEIGHTS AND LOADINGS (Su-30MK): Weight empty 17,700 kg (39,022 lb) Max external weapon load 8,000 kg (17,637 lb) Max internal fuel weight 9,640 kg (21,253 lb)

T-O weight: normal 24,960 kg (55,027 lb) max 34,500 kg (76,059 lb) overload 38,800 kg (85,539 lb)

PERFORMANCE (Su-30MK): Max level speed: at height M2.0 (1,144 kt; 2,120 km/h; 1,317 mph) at S/L M1.14 (729 kt; 1,350 km/h; 839 mph) Max rate of climb at S/L 13,800 m (45,275 ft)/min Service ceiling 17,300 m (56,760 ft) T-O run, normal weight 550 m (1,805 ft) Landing run with parachute 750 m (2,460 ft) Combat range: internal fuel 1,620 n miles (3,000 km; 1,865 miles) with one in-flight refuelling 2,805 n miles (5,200 km; 3,230 miles) g limit +9

UPDATED

SUKHOI Su-33UB (Su-27KUB)

TYPE: Multirole fighter.

PROGRAMME: Su-33 (Su-27K 'Flanker-D') single-seat naval fighter flew 17 August 1987; some 18 built in early 1990s for service aboard *Admiral of the Fleet Kuznetsov*; no further production.

Need for dedicated trainer for Su-33 became increasingly clear, and development of T10KM-2-based **Su-27KUB** (*korabelnyi uchebno boevoi*: as T10KU shipborne fighter trainer) began in late 1990s. Formally acknowledged 21 October 1998. Probably being developed as a private venture, with no firm commitment from Russian Navy. Likely to become **Su-33UB**, following redesignation of carrierborne single-seat Su-27K as Su-33.

Three prototypes, with noses built by KnAAPO, as T10KU-1, -2, and -3, incorporating lessons from the *Kuznetsov*'s 1996 Mediterranean cruise. Construction of T10KU-1 began in 1998 mating a new nose and new wings and tailplanes to an existing T10K prototype (T10K-4). Powered by AL-31F engines, the aircraft first flew on 29 April 1999 and made first arrested landing on dummy deck at NIUTK ('Nitka') test centre, Saki, 3 September 1999; first take-off from deck ramp followed on 6 September; first landing and take-off from carrier *Kuznetsov* on 6 October 1999. T10KU-2 and -3 reported to be under construction in 1999, perhaps using new-build airframes, but had not been seen by January 2001. T10KU-1 test flown by Indian pilots, September 1999, but Su-27 judged too large for planned carriers. Further test series at Saki begun December 2000.

Any production is likely to be by KnAAPO; baseline variant due to be extrapolated to produce trainer, reconnaissance and AEW versions, the last-mentioned with a phased-array mounted on the spine, between the composites antenna tailfins. Increased thrust, thrust-vectoring AL-31FP, AL-31FM or AL-41F engines mooted for production version.

CURRENT VERSIONS: **Su-33UB**: As described.

**Su-30K-2**: Two-seat interceptor version based on Su-33 fuselage under construction at Komsomolsk, late 1999; due to fly late 2000, but no further reports received.

DESIGN FEATURES: Has navalised features of Su-33, including folding wing (with fold further outboard and with a larger



Sukhoi Su-30MKI third development aircraft, pictured in August 2003 and wearing tail number '716' from Su-35 sequence (Yefim Gordon)

NEW/0558789

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Sukhoi Su-27KUB in naval colour scheme (Yefim Gordon)

NEW/0552871

fold angle). Some sources suggest that the Su-33UB's tailplanes do not fold, since they reach only as far as the new outboard wing fold. Double slotted flaps, unslopped, 'adaptive' leading-edge, arrester hook, datalink and carrier landing system. However, compared with Su-27IB, forward fuselage is slightly narrower, with seats closer together and has much less pronounced dorsal hump. New 'glass cockpit' with five colour LCD displays (one 53 cm; 21 in diagonally; rest 38 cm; 15 in) with provision for central or sidestick and with helmet-mounted sighting system. Aircraft has OBOGS and OBIGGS and so does not need oxygen or nitrogen bottles. N014 solid-state, phased-array radar, with enhanced air-to-ground and over-water capabilities, planned eventually, but prototypes have ballast or Zhuk-MS and production aircraft may initially use NIIR N610-27 (Zhuk 27); circular-section radomes replace flattened 'platypus' nose associated with Su-27IB. Some reports suggest that the Su-33UB's new wing is 12 per cent larger in span (16 m; 52½ ft) and area (70 m²; 750 sq ft), as are the canards and tailplanes. Production Su-27KUB will feature a higher set, square-section, lengthened tail-sting, possibly mounting rear warning radar; tailcone folds (upwards) to reduce stowed length; prototypes have the standard Su-33 tailcone.

UPDATED

SUKHOI Su-35 and Su-37 (Su-27M)

NATO reporting name: Flanker

TYPE: Multirole fighter.

PROGRAMME: Development of Su-27M authorised on 29 December 1993 by Council of Ministers. Experimental version of Su-27 with foreplanes (T10-24) flew May 1985; improved FBW system and refuelling probe tested by T10U-2. Five prototypes produced by conversion of

| Su-35 PROTOTYPES AND PRODUCTION |     |               |   |
|---------------------------------|-----|---------------|---|
| Batch                           | Qty | Identity      | Remarks   |
| -                               | (1) | T10M-1 '701'  | Previously Su-27 1602   |
| -                               | (1) | T10M-2 '702'  | Previously Su-27  |
| -                               | (1) | T10M-5 '705'  | Previously Su-27  |
| -                               | (1) | T10M-6 '706'  | Previously Su-27  |
| -                               | (1) | T10M-7 '707'  | Previously Su-27  |
| 10                              | 1   | T10M-4        | Static test airframe  |
| 10                              | 1   | T10M-3 '703'  | First Komsomolsk-built  |
| 11                              | 1   | T10M-8 '708'  |   |
| 11                              | 1   | T10M-9 '709'  |   |
| 11                              | 1   | T10M-10 '710' |   |
| 11                              | 1   | -             | Static test airframe  |
| 11                              | 1   | T10M-11 '711' | Converted to Su-37; reverted to Su-35; crashed 19 December 2002 |
| 12                              | 3   | '86' et seq   | Production  |
| n/k                             | 1   | T10M-12 '712' | Radar testbed   |
| n/k                             | 1   | '801'         | Su-35UB   |

Note: Former Su-27 aircraft may include 2209 and 2219

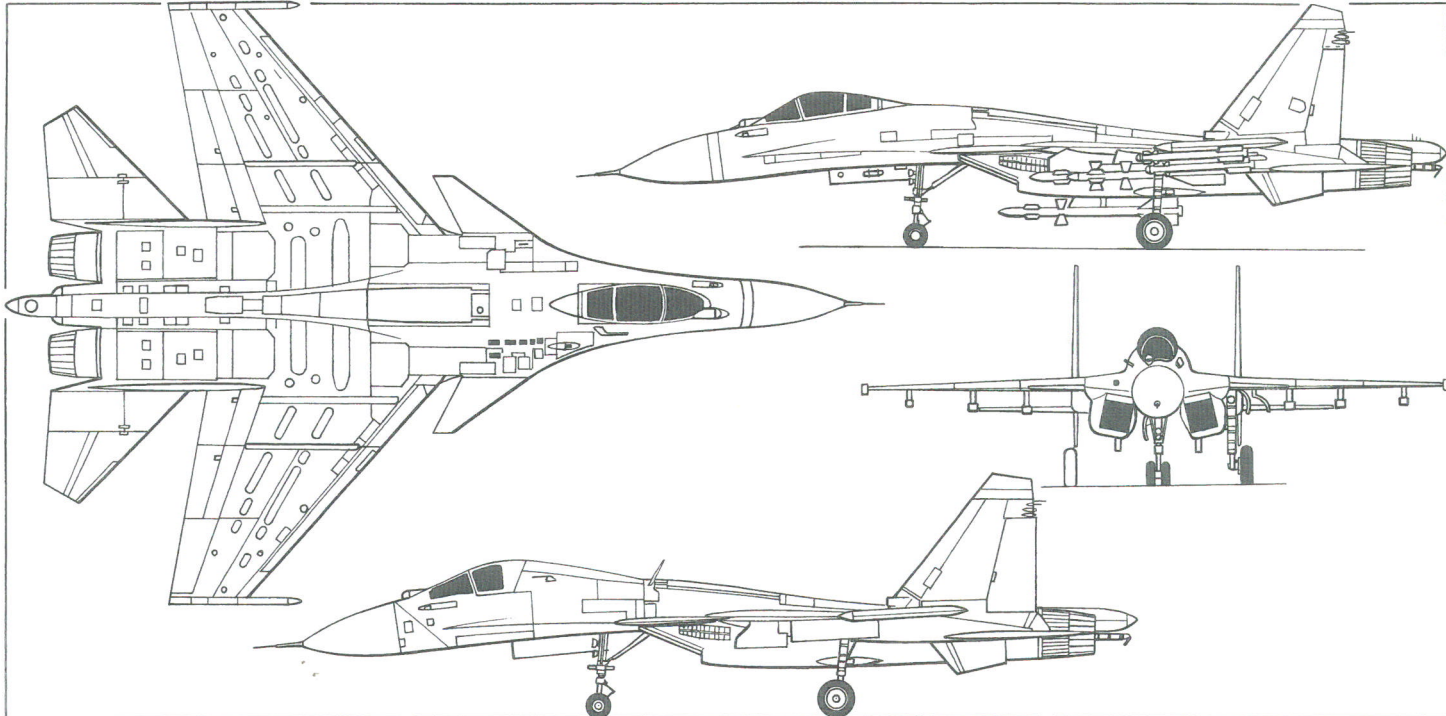
production Su-27s, retaining single nosewheel and standard tailfins: T10M-1 '701' (ex-1602), then lacking radar and weapon control system (successively T10S-70, T10M, Su-27M, Su-35) flew 28 June 1988; T10M-2 flown 18 January 1989; T10M-5, T10M-6 '706' and T10M-7 '707'; used mainly by NII VVS at Akhtubinsk, flown by service pilots.

Production at KnAAPO, Komsomolsk, beginning with static test airframe T10M-4; first flight (T10M-3 '703') 1 April 1992; latter exhibited at 1992 Farnborough Air Show. Of further six ordered (T10M-8 to 13; '708' to '713'), final aircraft was cancelled. NIIP N011M Bars

phased-array radar tested in '711' and '712'. Large-scale series production originally planned 1996-2005 as interim fighter pending availability of (also cancelled) Mikoyan MFI.

Three production aircraft (Blue 86, 87 and 88) delivered to Akhtubinsk from Komsomolsk in 1996 or 1997. In November 2002 it was announced that six Su-35s would be delivered to 237th Aviation Display Regiment at Kabinka, Moscow.

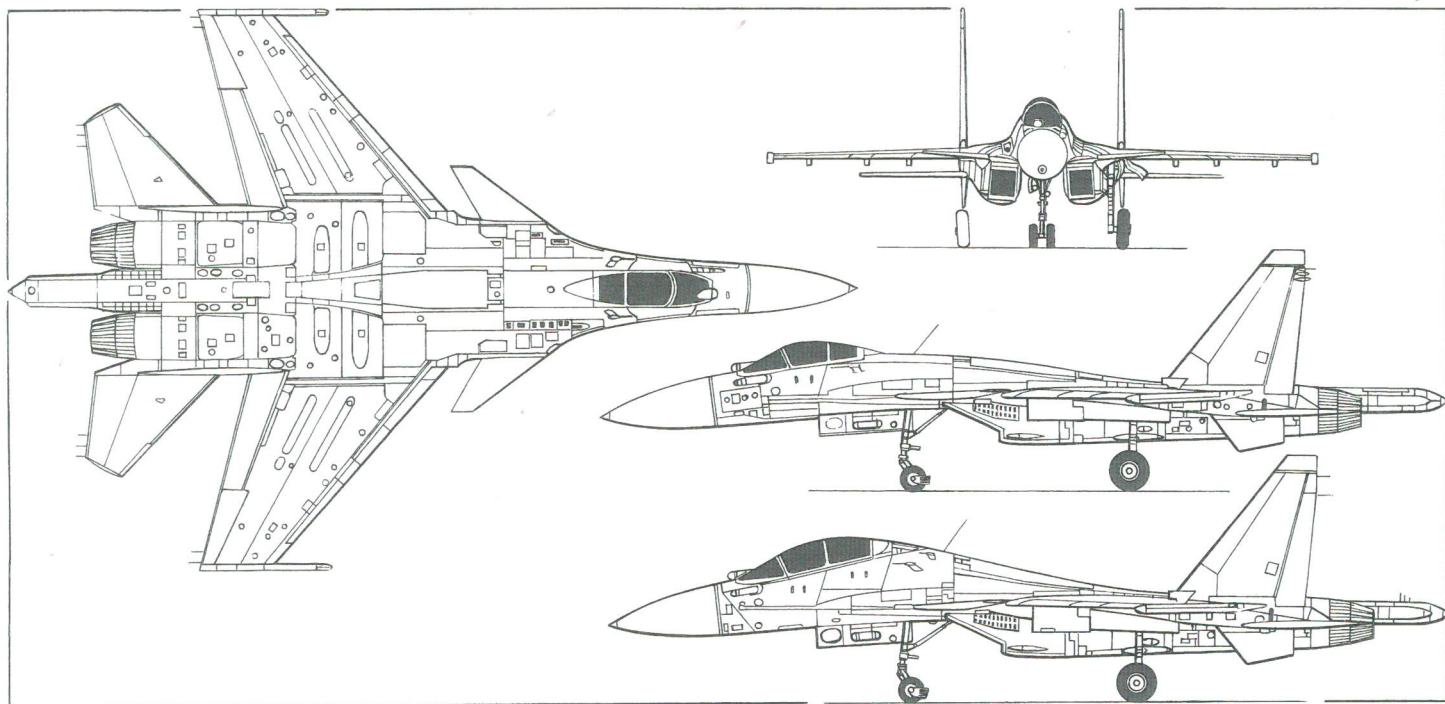
KnAAPO revealed in 2001 that production Su-35s and Su-35UBs will have thrust vectoring AL-31FP engines, thereby negating Su-37 designation.



Sukhoi Su-33 single-seat carrierborne fighter, with additional side view (lower) of two-seat Su-33UB operational trainer (James Goulding)

0075937





Sukhoi Su-35 single-seat counter-air and ground attack fighter, with additional side view (lower) of Su-35UB (James Goulding)

0525932

CURRENT VERSIONS: **Su-35** (Flanker-E Variant 1): Baseline single-seater; as described.

**Su-35UB:** Two-seat (tandem) derivative of the Su-35 with same FCS, canard foreplanes, tall square-topped tailfins, 12-pylon wing, Zhuk main AI radar and N012 rearward-facing, tailcone-mounted radar. Developed as a demonstrator and trainer for the Su-35, the construction of the prototype (Blue 801) at Komsomolsk may have been prompted by the needs of Sukhoi's campaign to sell the Su-35 to South Korea. The aircraft first flew on 7 August 2000 and was reported to be undergoing trials at Akhtubinsk in October 2000. Has 123 kN (27,558 lb st) AL-31FP (AL-31F) thrust-vectoring engines.

Su-35UB has 38,800 kg (83,775 lb) MTOW; 8,000 kg (17,637 lb) combat load; 12,400 litres (3,276 US gallons; 2,728 Imp gallons) internal fuel load; 1,090 kt (2,020 km/h; 1,255 mph) max speed; 1,619 n mile (3,000 km; 1,864 mile) unrefuelled range; wing span 14.70 m (48 ft 2 3/4 in); length overall 21.94 m (71 ft 11 1/2 in) (shorter tailboom); and height overall 6.355 m (20 ft 10 1/4 in).

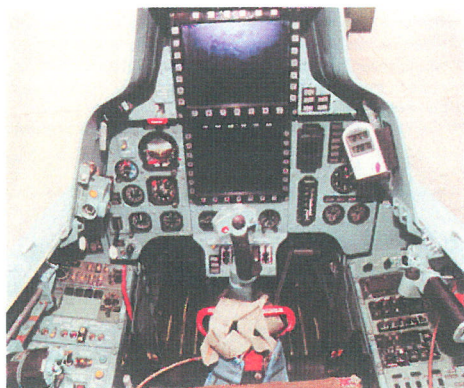
**Su-37** (Flanker-E Variant 2): Technology demonstrator for proposed production fighter resulting from vectored-thrust programme of the Su-27UB-PS, Su-27UBL, Su-27LMK No. 2405 and the penultimate prototype Su-35 ('711') which made its first flight, with nozzles fixed, on 2 April 1996 (or 12 April, according to some sources). This aircraft had previously been first of two N011M radar testbeds, flying in blue/grey camouflage. Designated Su-37 by Sukhoi bureau. By September 1996, when demonstrated at Farnborough Air Show (Western debut), in tropical camouflage, '711' had made 50 flights with hydraulically actuated nozzles able to move  $\pm 15^\circ$  in pitching plane at rate of  $30^\circ/\text{s}$  under control of aircraft's flight control system. Probably toed-out  $32^\circ$  from the centreline, like Su-30 MKI, generating powerful yawing moment when actuated differentially. An emergency pneumatic system returns the nozzles to level flight setting in the event of system failure.

Any production Su-37 was expected to feature uprated AL-31FU engines (142.2 kN; 31,967 lb st). In 1999, Sukhoi was using designation Su-37MR for proposed production version, apparently reflecting a major avionics upgrade then under way. By 2001, '711' had been retrofitted with non-vectoring AL-31F engines, revised Ramenskoye instrumentation and a new flight control system which was stated to provide TV-type agility without recourse to vectoring; used in trials for Indian Su-30MKI Stage 3.

Second Su-37 reportedly converted from T10M-12 and first flew in mid-1998, initially powered by AL-31F; installation of thrust-vectoring AL-37FPs was expected in late 1998; status of this aircraft, if still extant, remains unclear. Development of AL-31F engine being undertaken unilaterally by MMPP Salyut, version promising 10 to 15 per cent extra thrust having first flown on 24 January 2002 (on Su-27 testbed and lacking Klivit thrust vectoring nozzle).

**CUSTOMERS:** Once scheduled for entry into Russian Air Forces service as Su-27M from 1995 onwards, for effective operation until 2015-2020; programme in suspension. Indonesia announced imminent purchase in March 2003 of two Su-35s and two Su-27s, to be followed over four years by further 44 'Flankers' of undisclosed type.

**COSTS:** Estimated US\$35 million to US\$40 million (2002).



Su-35UB rear cockpit

0525047

**DESIGN FEATURES:** Advanced multirole development of Su-27 to counter latest versions of USAF F-15 Eagle and F-16 Fighting Falcon, with better dogfighting characteristics, higher AoA limits, lighter weight and new BVR armament; proposed to include 216 n mile (400 km; 248 mile) range AAM-L (one AAM-L contender was Novator KS- 172). Also planned to have greater autonomy from GCI control. Airframe, power plant, avionics and armament all upgraded; quadruplex digital fly-by-wire controls under development by Avionika, though prototypes retain analogue system; longitudinal static instability; 'tandem triplane' layout, with foreplanes; double-slotted flaperons; taller, square-tip twin tailfins with integral fuel tanks; reprofiled front fuselage for larger-diameter radar antenna; enlarged tailcone for rearward-facing radar; twin-wheel nose landing gear; axisymmetric thrust-vectoring nozzles under development for use on production aircraft (see Su-37).

**STRUCTURE:** Higher proportion of carbon fibre and aluminium-lithium alloy in fuselage; composites used for components such as leading-edge flaps, nosewheel door and radomes.

**POWER PLANT:** Production Su-27M planned to use two Saturn/Lyulka AL-35FP turbofans; each 123 kN (27,558 lb st)

with afterburning; prototypes retain standard AL-31F. Increased internal tankage through use of welded aluminium-lithium tanks and new tanks in tailfins and finroots. Total fuel capacity 12,900 litres (3,408 US gallons; 2,838 Imp gallons). Retractable flight refuelling probe on port side of nose.

**ACCOMMODATION:** Pilot(s), on Zvezda K-36D-3.5E zero/zero ejection seat, this now angled back  $30^\circ$ .

**AVIONICS:** **Radar:** Originally planned to incorporate NIIP N011 Zhuk-27 multimode low-altitude terrain-following/avoidance radar, search range up to 54 n miles (100 km; 62 miles) against advancing target, 30 n miles (55 km; 34 miles) against retreating target; able to track 15 targets and engage four to six simultaneously. Phazotron Zhuk-Ph phased-array radar under development as alternatives or for retrofit; search range for fighter-size targets 75 n miles (140 km; 87 miles) with simultaneous tracking of 24 air targets and ripple-fire engagement of six to eight; N012 rearward-facing radar, range approximately 2 n miles (4 km; 2.5 miles), may enable firing of rearward-facing IR homing AAMs.

**Flight:** Fully automatic flight modes and armament control against ground, maritime and air targets, including automatic low-altitude flight and automatic target designation. RPKB nav system includes laser-gyro INS and Glonass GPS.

**Instrumentation:** Two-seat variant has side-by-side MFI-10-5 screens and HUD in front cockpit; vertically stacked MFI-10-5 screens in rear.

**Mission:** New-typeIRST moved to starboard; small external TV pod; all combat flight phases computerised. Shown at Farnborough with GEC-Marconi TIALD (thermal imaging airborne laser designator) night/adverse visibility pod fitted for possible future use.

**Self-defence:** Entirely new integrated EW suite with ECM, including active jammer and wingtip Sorbtsa-S G-or J-band ECM/ESM pods; Pastel RWR; Mak IR-based MAWS.

**ARMAMENT:** One 30 mm GSh-30 gun in starboard wingroot extension, with 150 rounds. Mountings for up to 14 stores pylons, including R-27 (AA-10 'Alamo-A/B/C/D'), R-40 (AA-6 'Acrid'), R-60 (AA-8 'Aphid'), R-73E (AA-11 'Archer') and RVV-AE (R-77; AA-12 'Adder') AAMs, Kh-25ML (AS-10 'Karen'), Kh-25MP (AS-12 'Kegler'),



Prototype Su-35UB two-seat version (Paul Jackson)

NEW/0552713





'703', the first new-built Sukhoi Su-35 (Paul Jackson)

NEW/0552712

Kh-29T (AS-14 'Kedge'), Kh-31P (AS-17 'Krypton') and Kh-59 (AS-18 'Kazoo') ASMs, S-25LD laser-guided rockets, S-25IRS IR-guided rockets, GBU-500L and GBU-1500L laser-guided bombs, GBU-500T and GBU-1500T TV-guided bombs, KMGU cluster weapons, KAB-500 bombs and rocket packs. Maximum weapon load 8,200 kg (18,077 lb).

DIMENSIONS, EXTERNAL:

|                         |                        |
|-------------------------|------------------------|
| Wing span over ECM pods | 15.16 m (49 ft 8¼ in)  |
| Wing aspect ratio       | 3.5                    |
| Length overall          | 22.185 m (72 ft 9½ in) |
| Height overall          | 6.36 m (20 ft 10¼ in)  |

AREAS:

|              |                        |
|--------------|------------------------|
| Wings, gross | 62.04 m² (667.8 sq ft) |
|--------------|------------------------|

WEIGHTS AND LOADINGS:

|                            |                               |
|----------------------------|-------------------------------|
| Weight empty               | 17,000 kg (37,479 lb)         |
| Max fuel weight            | 10,250 kg (22,597 lb)         |
| Max combat load            | 8,500 kg (18,739 lb)          |
| T-O weight: normal max     | 34,000 kg (74,957 lb)         |
| overload                   | 38,800 kg (85,539 lb)         |
| Max wing loading (normal)  | 548.4 kg/m² (112.32 lb/sq ft) |
| Max power loading (normal) | 139 kg/kN (1.36 lb/lb st)     |

PERFORMANCE:

|                               |   |
|-------------------------------|---|
| Max level speed:              |   |
| at height                     | M2.35 (1,350 kt; 2,500 km/h; 1,555 mph) |
| at S/L                        | M1.14 (756 kt; 1,400 km/h; 870 mph)     |
| Service ceiling               | 17,200 m (56,440 ft)                    |
| Balanced runway length        | 1,200 m (3,940 ft)                      |
| Range: with max internal fuel | 1,835 n miles (3,400 km; 2,112 miles)   |
| with flight refuelling        | 3,401 n miles (6,300 km; 3,914 miles)   |
| g limit                       | +9                                      |

UPDATED

## SUKHOI Su-47 BERKUT

NATO reporting name: Firkin

The S-37 multirole fighter technology demonstrator was redesignated Su-47 in 2000. Although no further production is planned (and the Irkutsk-built second flying prototype will not be completed) the sole Su-47 continues to fly as a technology demonstrator for a future generation of Russian combat aircraft.

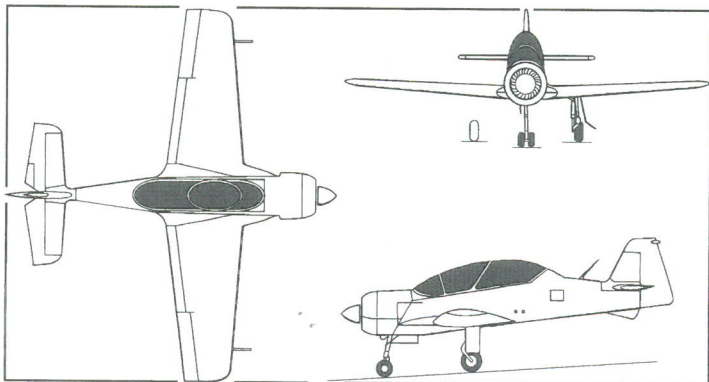
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## SUKHOI Su-49

TYPE: Basic prop trainer.

PROGRAMME: Design of military derivative of Su-26 and Su-29 aerobatic aircraft, to meet trainer requirement, started July 1992, under former designation Su-32; designation changed to Su-39 in 1995, Su-49 in 1996. Construction of prototype began 1994; first flight scheduled second half of 1996, but continually delayed.

Design further refined by mid-1997 to include LERX, raised rear portion of canopy and twin nosewheels. P&W Rus PK6A-25 turboprop reportedly considered as replacement for M-9 (M-14 previously intended) piston engine in at least a proportion of production aircraft; this to be tested from early 2002 in modified Su-29KS. In October 2001 was named winner of competition against Yak-152



Sukhoi Su-49 primary trainer (Paul Jackson)

0525378

## SUKHOI Su-52

TYPE: Advanced jet trainer.

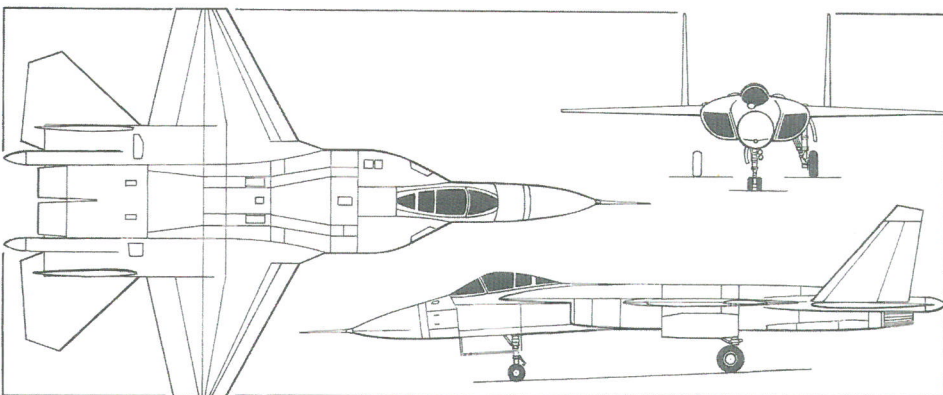
PROGRAMME: Announced in December 2002, when Su-52UTS revealed to be under study as single-engined design with forward-swept wings intended to come between Su-49 and combat-training Yak-130 in pilot instruction course. Unit cost 1½ to two times cheaper than Yak-130; operating cost less than US\$1,000 per hour.

In May 2003, it was reported that Russian Air Forces was preparing to launch a competition for such an aircraft. However, this had not been announced by late 2003, at which time Sukhoi revealed that development work had ended short of a design able to participate in any competition.

NEW ENTRY



T-50's fuselage will resemble the Sukhoi Su-47 Berkut technology demonstrator (Yefim Gordon) NEW/0567235



Provisional general arrangement of Sukhoi T-50 PAKFA (James Goulding)

NEW/0567236



Model of Sukhoi Su-49 (Paul Jackson)

0525049

## SUKHOI T-50 PAKFA

TYPE: Multirole fighter.

PROGRAMME: Successor programme to original quest for fifth-generation fighter, for which MiG 1.42 and Sukhoi S-37/Su-47 Berkut demonstrators were built. Development began in 1998 to meet Russian Air Forces TTZ (tactical technical assessment) of the same year. Sukhoi-led co-operative project launched May 2001; initially termed LFS (*legkiy frontovoy samolet*: Light Frontline Aircraft), although competition also known as LFI (*legkiy frontovoy istrebitel*: Light Frontline Fighter). Air Forces' project name is PAKFA (*perspektivnyi aviatsionnyi kompleks frontovoi aviatsyi*: Prospective Aviation Complex for Frontal Aviation).

Examining committee established 10 January 2002 to assess competing bids from RSK 'MiG' and AVPK Sukhoi, each of which nominated Yakovlev as associate. On 26 April 2002, Russian Federation Ministry of Industry, Science and Technology declared Sukhoi as lead developer of new aircraft, to be assisted by RSK 'MiG' and Yakovlev as subcontractors. In May 2002, development agreement signed by AVPK Sukhoi, Sukhoi OKB, State Research Institute of Aviation Systems (GosNIIAS), Central Aero- and Hydrodynamic Institute (TsAGI), Research Institute of Aero Engine Technology and Production (TsIAM), Central Research Institute of Material (VIAM), National Institute of Aviation Technologies (NIAT), Lyulka/Saturn engine bureau, Ramenskoye Instrument Design Bureau (RPKB), Aviapribor holding company, Aviakosmicheskoye Oborudovaniye and Vypel and Strela weapon companies. Several manufacturing plants expected to join at later stage. Participation of KnAAPO production plant was agreed in June 2002.

Timetable for PAKFA is draft design by end of 2002; first flight in 2006; production from 2010. Official funding equivalent to US\$1.5 billion promised for R & D, but this considered inadequate, representing some 20 per cent of needs, excluding production investment. Unit cost expected to be US\$35 million to US\$40 million (2002 prices), based on production of between 500 and 600 aircraft.



Parameters believed to include 20 tonne MTOW – between MiG-29 and Su-27 types it is due to replace – supersonic cruising speed, low observables, high manoeuvrability and short-field performance. Engine choice yet to be made, but NPO Saturn is offering a derivative of AL-41F1, which was due to begin bench testing in 2002.

In January 2003, India discussed terms of invitation by Russia to join PAKFA design team. Preliminary details and a probable configuration were unofficially circulating by mid-2003, showing an aircraft similar to the Su-47 Berkut, apart from more conventional wings.

|                       |                                       |
|-----------------------|---------------------------------------|
| DIMENSIONS, EXTERNAL: |                                       |
| Wing span             | 15.5 m (51 ft)                        |
| Length overall        | 23.0 m (75 ft)                        |
| WEIGHTS AND LOADINGS: |                                       |
| T-O weight: normal    | 24,000 kg (53,000 lb)                 |
| max                   | 33,000 kg (72,750 lb)                 |
| PERFORMANCE:          |                                       |
| Max level speed       | 1,350 kt (2,500 km/h; 1,553 mph)      |
| Supercruise speed     | M1.6+                                 |
| Radius of action      | 647 n miles (1,200 km; 745 miles)     |
| Ferry range           | 2,159 n miles (4,000 km; 2,485 miles) |

UPDATED

SUKHOI Su-29

TYPE: Aerobatic two-seat sportplane.

PROGRAMME: Announced at Moscow Air Show '90; design started 1990; construction of first of three prototypes and two static test airframes began 1991; prototype first flew 1991, first production aircraft May 1992; entered service July 1992. AP-23 type certificate awarded in 1994. Assessed by Russian Air Forces experimental centre at Akhtubinsk in 1996-97, but no orders placed.

Following structural failure of Su-29 wing in 1996, remedial manufacturing practices in place and recertified by 1998. Resumed civilian export production now featured M-14PF engine and new propeller, but M-9F engine introduced in 1999. Retrospective installation of SKS-94 pilot's emergency extraction system offered by Sukhoi from 2000.

Production transferred to LAPIK division of RSK 'MiG' (formerly LMZ) at Lukhovitsy from early 2001, earlier aircraft having been built by Sukhoi Advanced Technologies using components manufactured by LMZ, Dubna and others. Only one built in 2001.

CURRENT VERSIONS: **Su-29:** Basic two-seat training/aerobatic aircraft.

Description applies to baseline Su-29.

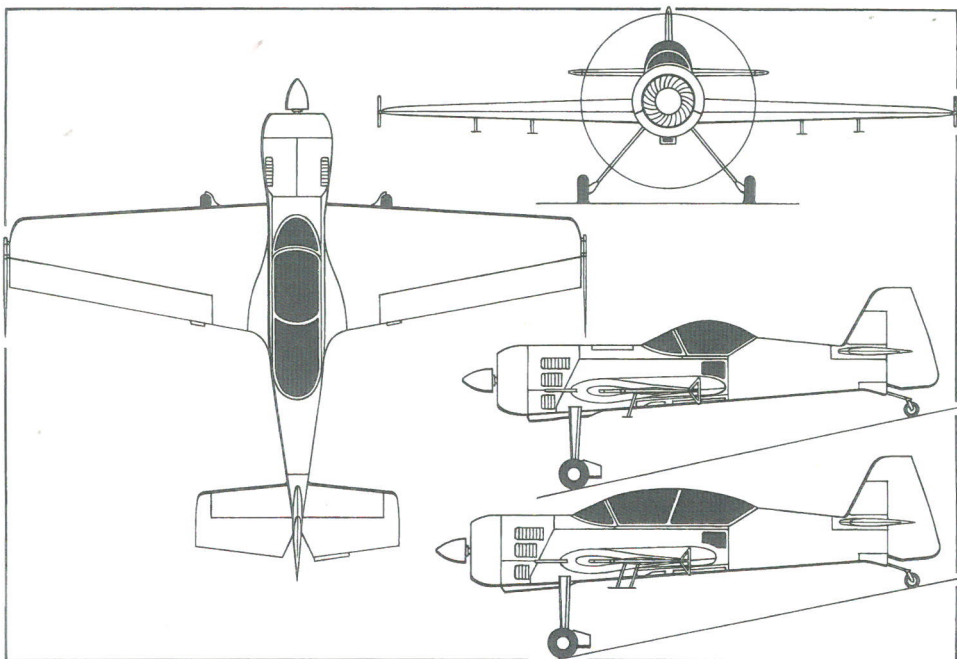
**Su-29AR:** Aircraft for Argentina have German propeller, Swiss canopies and US wheel assemblies and avionics, including GPS.

**Su-29KS:** Development vehicle for Zvezda SKS-94 lightweight crew extraction system. Weight empty, equipped 800 kg (1,764 lb). First exhibited at 1994 Farnborough Air Show. One only (RA-01485); carries designation 'Su-29KS'.

**Su-29M:** Production version from 1999 (initial series of 10 under construction); M-9F engine; weights as Su-29; no extraction system.

**Su-49:** Military trainer (which see).

CUSTOMERS: Total 52 basic Su-29s and one Su-29KS built and sold by 1997; many exported to Pompano Air Center, Florida, USA, for reassembly and delivery worldwide (including eight in 1992; 12 in 1993; seven in 1994 and four in 1995); others to Australia (three), Italy, South Africa (two) and UK. Relunched production from 1999 (initial batch of 10). Eight ordered by Argentine Air Force, for training, March 1997; delivery between September 1997 and August 1998 to Escuadrilla Cruz del Sur (Southern Cross Squadron) based at Mendoza AFB. By mid-2001, Sukhoi had built 166 aerobatic light aircraft of the Su-26/29/31 series, of which all but 10 had been exported, including 80 to the USA. Sukhoi presented two to ruler of unspecified Gulf state, but these not used and eventually sold. Deliveries scheduled in 2002 to customers



Sukhoi Su-29 with additional side view (upper) of Su-31T (Jane's/Mike Keep)

0015120

in the Czech Republic, Germany, Russia, South Korea and Switzerland.

COSTS: US\$220,000 to US\$260,000 (2002).

DESIGN FEATURES: Typical aerobatic competition aircraft; mid-wing of specially developed symmetrical section, variable along span, slightly concave in region of ailerons to increase their effectiveness; leading-edge somewhat sharper than usual to improve responsiveness to control surface movement. Two-seat development of Su-26M single-seat aerobatic competition aircraft; wing span and overall length increased; improved aerodynamics and reduced stability margin for enhanced manoeuvrability. Service life 1,250 hours.

Wing leading-edge sweepback 3° 28', symmetrical section, thickness/chord ratio 16 per cent at root, 12 per cent at tip, dihedral 0°, incidence 0°.

FLYING CONTROLS: Conventional and manual. Elevators and rudder horn-balanced; elevator trim; two suspended triangular balance tabs under each aileron. Later Su-29s have Su-31-type wing with ailerons extending to wingtips. No flaps.

STRUCTURE: Composites comprise more than 60 per cent of airframe weight; one-piece wing, covered with honeycomb composites panels; foam-filled front box spar with CFRP booms and wound glass fibre webs; channel section rear spar of CFRP; titanium truss ribs; plain ailerons have CFRP box spar, GFRP skin and foam filling; fuselage has basic welded truss structure of VNS-2 high-strength stainless steel tubing; lower nose section of truss removable for wing detachment; quickly removable

honeycomb composites skin panels; light alloy engine cowlings; integral fin and tailplane construction same as wings; rudder and elevator construction same as ailerons; titanium exhaust, battery box and firewall; forged magnesium control linkages. Aircraft assembled by Sukhoi from components produced by LMZ, Dubna (DMZ) and NPO Technologia (at Omsk).

LANDING GEAR: Non-retractable tailwheel type; arched cantilever mainwheel legs of titanium alloy; mainwheels size 400x150, with hydraulic disc brakes; steerable tailwheel, on titanium spring, connected to rudder. Optional composites fairings for mainwheels.

POWER PLANT: One 265 kW (355 hp) VOKBM M-14PT or 294 kW (394 hp) M-14PF nine-cylinder radial engine; three-blade MT-Propeller MTV-3-8-S/L250-21 or MTV-9-260 propeller. Current production employs VOKBM M-9F (M-14 derivative) rated at 309 kW (414 hp). Steel tube engine mounting. Fuel tank in fuselage forward of front spar; capacity 63 litres (16.6 US gallons; 13.8 Imp gallons); tank in each wing leading-edge; capacity 106.5 litres (28.15 US gallons; 23.4 Imp gallons); total fuel capacity 276 litres (72.9 US gallons; 60.6 Imp gallons); gravity fuelling. Oil capacity 20 litres (5.3 US gallons; 4.4 Imp gallons). Fuel and oil systems adapted for inverted flight; pneumatic engine starting system.

ACCOMMODATION: Pilot only for aerobatic competition, two persons in tandem for training. Canopy normally opens sideways to starboard; but upward and rearward in emergency to jettison. Dual controls standard. Space for 5 kg (11 lb) baggage in rear fuselage.

SYSTEMS: Electrical system 24/28 V, with 3 kW generator, batteries and external supply socket.

AVIONICS: Comms: Briz VHF radio; optional Becker or Bendix/King com/nav and Garmin GPS.

EQUIPMENT: Optional provision for smoke generation.

DIMENSIONS, EXTERNAL:

|                            |                           |
|----------------------------|---------------------------|
| Wing span                  | 8.20 m (26 ft 10 1/4 in)  |
| Wing chord: at root        | 1.985 m (6 ft 6 1/4 in)   |
| at tip                     | 1.04 m (3 ft 4 1/4 in)    |
| Wing aspect ratio          | 5.5                       |
| Length overall             | 7.285 m (23 ft 10 1/4 in) |
| Height overall             | 2.885 m (9 ft 5 3/4 in)   |
| Tailplane span             | 2.90 m (9 ft 6 1/4 in)    |
| Wheel track                | 2.40 m (7 ft 10 1/2 in)   |
| Wheelbase                  | 5.08 m (16 ft 8 in)       |
| Propeller diameter         | 2.50 m (8 ft 2 1/2 in)    |
| Propeller ground clearance | 0.425 m (1 ft 4 3/4 in)   |

DIMENSIONS, INTERNAL:

|                 |                        |
|-----------------|------------------------|
| Cockpit: Length | 2.60 m (8 ft 6 1/4 in) |
| Max width       | 0.82 m (2 ft 8 1/4 in) |
| Max height      | 1.05 m (3 ft 5 1/4 in) |

AREAS:

|                   |                        |
|-------------------|------------------------|
| Wings, gross      | 12.20 m² (131.4 sq ft) |
| Ailerons (total)  | 2.32 m² (24.97 sq ft)  |
| Fin               | 0.28 m² (3.01 sq ft)   |
| Rudder            | 0.90 m² (9.69 sq ft)   |
| Tailplane         | 0.98 m² (10.55 sq ft)  |
| Elevators (total) | 1.56 m² (16.79 sq ft)  |

WEIGHTS AND LOADINGS (two persons):

|                            |                             |
|----------------------------|-----------------------------|
| Weight: empty              | 735 kg (1,620 lb)           |
| empty, equipped            | 780 kg (1,720 lb)           |
| Max fuel                   | 207 kg (456 lb)             |
| Max T-O weight: pilot only | 860 kg (1,896 lb)           |
| two persons                | 1,200 kg (2,645 lb)         |
| Max wing loading           | 98.4 kg/m² (20.15 lb/sq ft) |
| Max power loading: M-14PT  | 4.53 kg/kW (7.45 lb/hp)     |
| M-14PF                     | 4.09 kg/kW (6.71 lb/hp)     |
| M-9F                       | 3.89 kg/kW (6.39 lb/hp)     |



Sukhoi Su-29KS ejection system testbed, modified with separate windscreens (Yefim Gordon) 0525051



Sukhoi Su-29 two-seat sportplane (Paul Jackson)

NEW/0547747





Sukhoi Su-31T single-seat aerobatic competition aircraft with separate windscreen and canopy (Paul Jackson)

NEW/0547748



Single-piece canopy identifies the extraction system-equipped Sukhoi Su-31M (Paul Jackson)

NEW/0547749

#### PERFORMANCE (M-14PT engine):

|                          |                                   |
|--------------------------|-----------------------------------|
| Never-exceed speed (VNE) | 242 kt (450 km/h; 279 mph)        |
| Max level speed          | 175 kt (325 km/h; 202 mph)        |
| Landing speed            | 65 kt (120 km/h; 75 mph)          |
| Stalling speed           | 62 kt (115 km/h; 72 mph)          |
| Max rate of climb at S/L | 960 m (3,150 ft)/min              |
| Service ceiling          | 4,000 m (13,120 ft)               |
| Max rate of roll         | 360°/s                            |
| T-O run                  | 120 m (395 ft)*                   |
| Landing run              | 380 m (1,250 ft)*                 |
| Range with max fuel      | 647 n miles (1,200 km; 745 miles) |
| g limits                 | +12/-10                           |

\*at 914 kg (2,015 lb) AWW

UPDATED

### SUKHOI Su-31

TYPE: Aerobatic single-seat sportplane.

PROGRAMME: Design started 1991; prototype construction began 1992, flew June 1992 as Su-29T, demonstrated at 1992 Farnborough Air Show; followed by two more prototypes and two static test airframes; first production aircraft by Sukhoi Advanced Technologies (RA-01405) flown 1994. Su-31M2 introduced in 1999. Manufacture transferred to RSK 'MiG' (LAPIC at Lkhovitsy) in early 2001; two Su-31Ms, one Su-31 built in 2001; contract for 10 Su-29s/Su-31Ms for an undisclosed buyer pending in early 2002.

In XXI World Aerobatic Championships, June 2001, Su-31s gained first place and seven of next 14 places.

CURRENT VERSIONS: **Su-31**: Basic version; non-retractable landing gear. Alternatively known as **Su-31T** (Turnirnyi: Competition). See Su-29 drawings for side view.

**Su-31M**: As Su-31T but with Zvezda SKS-94 pilot's extraction system under modified canopy with deeper frame. Empty weight 760 kg (1,676 lb); normal T-O weight 880 kg (1,940 lb). Prototype RA-01486 converted from Su-31T.

**Su-31M2**: Improved version of Su-31M with larger wing, airframe weight reduced by approximately 80 kg (176 lb), ergonomically redesigned cockpit, and upgraded Zvezda SKS-94M pilot's extraction system. Prototype scheduled to fly in mid-2003.

**Su-31X**: Export version of Su-31T.

**Su-31U**: As Su-31T but retractable landing gear. None yet built.

**Su-31ChM**: Improved version of Su-31M2 under development in 2003 for World Aerobatic Championships competitions; features include airframe weight reduced by 25 kg (55 lb), and 313 kW (420 hp) VOKBM M-9F engine.

CUSTOMERS: Total 25 (including five Su-31Ms) built by late 1998 and exported to Australia, Brazil, Italy, Lithuania,

South Africa, Spain, Switzerland, Ukraine, UK and USA. Su-31Ms operated in Italy, Russia and Switzerland. Production batch of five Su-31M2s, 1999-2000, of which at least two to USA; RSK 'MiG' to build initial batch of nine at its LAPIC division (three Su-29s and six Su-31s). Total of six Su-31s were scheduled for delivery in 2002, including two Su-31Ms for the Czech Republic and one Su-31M for a Swiss customer. Production in 2003 includes two for UK dealership.

COSTS: US\$220,000 to US\$260,000 (2003).

DESIGN FEATURES: Basically single-seat version of Su-29 with uprated engine; new landing gear; 35° inclination of seat enables pilot to employ repeatedly a g load of +12/-10, giving advantages in controlling aircraft within limited flying area and to perform very complicated manoeuvres; improved field of view; two baggage compartments.

STRUCTURE: More than 70 per cent composites by weight; centre-fuselage is welded truss of high-strength stainless steel tube, with detachable skin panels of honeycomb-filled composite sandwich; rear fuselage is semi-monocoque of composites with honeycomb filler; one-piece two-spar wing with carbon fibre main spar, titanium ribs, covered with honeycomb sandwich skin; tail unit is all-composites; mainwheel legs titanium.

POWER PLANT: One 294 kW (394 hp) VOKBM M-14PF nine-cylinder radial engine in Su-31T/M; MTV-9 three-blade propeller. Basic fuel capacity 78 litres (20.6 US gallons; 17.2 Imp gallons), in fuselage tank; provision in Russian version for 210 litre (55.5 US gallon; 46.2 Imp gallon) centreline drop tank for ferrying; alternatively, in export

version, two tanks in wings, total capacity 200 litres (52.8 US gallons; 44.0 Imp gallons).

ACCOMMODATION: Pilot only; windscreen and separate canopy, opening as Su-29, except single-piece windscreen/canopy and pilot extraction system in Su-31M and Su-31M2.

#### DIMENSIONS, EXTERNAL (Su-31T):

|                            |                         |
|----------------------------|-------------------------|
| Wing span                  | 7.80 m (25 ft 7 in)     |
| Wing chord: at root        | 1.99 m (6 ft 6 1/4 in)  |
| at tip                     | 1.04 m (3 ft 4 1/4 in)  |
| Wing aspect ratio          | 5.2                     |
| Length overall             | 6.83 m (22 ft 4 1/4 in) |
| Height overall             | 2.76 m (9 ft 0 1/4 in)  |
| Tailplane span             | 2.90 m (9 ft 6 1/4 in)  |
| Wheel track                | 2.40 m (7 ft 10 1/2 in) |
| Wheelbase                  | 4.90 m (16 ft 1 in)     |
| Propeller diameter         | 2.50 m (8 ft 2 1/2 in)  |
| Propeller ground clearance | 0.425 m (1 ft 4 1/4 in) |

#### AREAS (Su-31T): As Su-29 except:

|              |                                    |
|--------------|------------------------------------|
| Wings, gross | 11.83 m <sup>2</sup> (127.3 sq ft) |
|--------------|------------------------------------|

WEIGHTS AND LOADINGS (Su-31T, except where otherwise indicated):

|                             |   |
|-----------------------------|---|
| Weight: empty               | 680 kg (1,499 lb)                       |
| empty, equipped: Su-31T     | 740 kg (1,631 lb)                       |
| Su-31M                      | 750 kg (1,653 lb)                       |
| Max fuel: internal          | 53 kg (117 lb)                          |
| external                    | 209 kg (461 lb)                         |
| T-O weight: normal          | 835 kg (1,841 lb)                       |
| max                         | 968 kg (2,134 lb)                       |
| Max wing loading            | 82.0 kg/m <sup>2</sup> (16.80 lb/sq ft) |
| Max power loading: Su-31T/M | 3.25 kg/kW (5.34 lb/hp)                 |

#### PERFORMANCE (Su-31T):

|                          |                                 |
|--------------------------|---------------------------------|
| Never-exceed speed (VNE) | 243 kt (450 km/h; 280 mph)      |
| Max level speed          | 178 kt (330 km/h; 205 mph)      |
| Stalling speed           | 61 kt (113 km/h; 71 mph)        |
| T-O speed                | 60 kt (110 km/h; 69 mph)        |
| Landing speed            | 62 kt (115 km/h; 72 mph)        |
| Max rate of climb at S/L | 1,440 m (4,725 ft)/min          |
| Service ceiling          | 4,000 m (13,120 ft)             |
| Max rate of roll         | 400°/s                          |
| T-O run                  | 110 m (360 ft)                  |
| Landing run              | 300 m (985 ft)                  |
| Range, internal fuel     | 156 n miles (290 km; 180 miles) |
| Ferry range              | 432 n miles (800 km; 497 miles) |
| g limits                 | +12/-10                         |

UPDATED

### SUKHOI Su-38L

TYPE: Agricultural sprayer.

PROGRAMME: Design started, as Su-38, under Boris Rakitin.

August 1993; originally based closely on Su-29 sportplane; construction of prototype began January 1994 but curtailed due to financial situation in Russia. Promotion resumed in 1998, under S-38L designation and with considerable change of detail design, including replacement of VOKBM M-14P radial engine. Announced June 2000 that order signed to build prototype, now known as Su-38L. Prototypes fabricated by SmAZ; target of five complete (including two static test) aircraft by second quarter of 2002; first two under assembly at Sukhoi OKB workshops by September 2000. First flight (01) 27 July 2001; public debut at Moscow Salon, 14-19 August 2001, when 01 shown with (static) and without (flying) winglets and then unflown 02 exhibited statically. Compared with earlier drawings and mockup, prototypes have increased length due to additional fuselage plug ahead of wings. By June 2002 two (of three planned) prototypes had completed 60 missions of projected 100- to 150-sortie flight programme, intended to lead to initial certification in September or October 2003. Third prototype's maiden flight delayed from August 2002 to end 2002/early 2003. Initial production by SmAZ with target of 20 in 2003, rising to 40 in 2004, and potential for up to 100 aircraft per year. Second production line intended by Razdanmash AOZT of Armenia, subject to acquisition of US\$23 million for flight test and tooling.

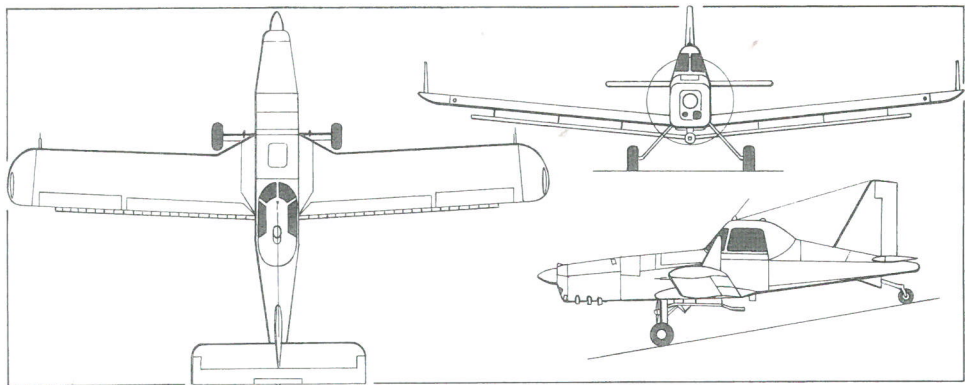
CUSTOMERS: Initial orders for 20 anticipated by December 2002; estimated market for 500 in Russia.



Sukhoi Su-38L second prototype flying with winglets removed (Yefim Gordon)

NEW/0552044





Sukhoi Su-38L agricultural aircraft (James Goulding)

0121659

**COSTS:** Unit cost US\$100,000 to US\$150,000 (2002); direct operating cost US\$300 per hour (2001).

**DESIGN FEATURES:** Conventional low-wing monoplane. Constant-chord wings swept slightly forward and with winglets and root ribs; sweptback fin, plus underfin doubling as tailwheel mount. Chemical hopper between engine and cockpit, capacity 500 litres (132 US gallons; 110 Imp gallons). Service life 3,000 hours/10 years.

**FLYING CONTROLS:** Conventional and manual. Horn-balanced single-piece elevator and rudder; trim tab in elevator; trailing-edge flaps.

**LANDING GEAR:** Tailwheel type; fixed. Mainwheel size 8.00-6, tailwheel size 310x135. Hydraulic brakes.

**POWER PLANT:** One 184 kW (247 hp) LOM M337S six-cylinder engine operating on a 1:2 mix of A-76 and A-92 mogas; LOM B-546 three-blade ground-adjustable propeller. Plans for updated, 186 kW (250 hp) version in production aircraft. Fuel tank in each wing; total capacity 210 litres (55.5 US gallons; 46.2 Imp gallons).

**ACCOMMODATION:** Pilot only on energy-absorbing seat; baggage shelf behind seat. Cockpit is pressurised to prevent ingress of chemicals, and incoming air is filtered.

**EQUIPMENT:** Transland underwing spraybar. Cable cutter/deflector standard.

**DIMENSIONS, EXTERNAL:**

|                |                         |
|----------------|-------------------------|
| Wing span      | 11.53 m (37 ft 10 in)   |
| Length overall | 8.10 m (26 ft 6 3/4 in) |
| Height overall | 2.655 m (8 ft 8 1/2 in) |

**WEIGHTS AND LOADINGS:**

|                               |                     |
|-------------------------------|---------------------|
| Normal T-O and landing weight | 1,200 kg (2,646 lb) |
|-------------------------------|---------------------|

**PERFORMANCE (estimated):**

|                            |                                     |
|----------------------------|-------------------------------------|
| Operating speed            | 81-97 kt (150-180 km/h; 93-112 mph) |
| Stalling speed             | 41 kt (76 km/h; 48 mph)             |
| Typical operating altitude | 1 to 15 m (3 to 50 ft)              |
| Ferry range:               |                                     |
| with spraybars             | 486 n miles (900 km; 559 miles)     |
| without spraybars          | 648 n miles (1,200 km; 745 miles)   |

UPDATED

**SUKHOI Su-80**

**TYPE:** Twin-turboprop transport.

**PROGRAMME:** First, largest and most advanced design by Sukhoi under *konversiya* programme of former Soviet industry; to replace L-410, An-28, Yak-40 and An-24; certification intended to FAR Pt 25, JAR 25 and AP-25. Work began 1989 on medical evacuation aircraft, then designated S-80, under order from Ministry of Public Health, by Sukhoi-Europe/Asia joint stock company, with founder members Sukhoi Design Bureau ASIC, KnAAPO (which see), Rybinsk Motor Engineering Design Bureau, Ramenskoye Instrument Engineering Design Bureau, and Instrument Engineering R&D Institute. Included in government's civil aviation plan, but minimal funding by public money. Model displayed 1989 Paris Air Show; funding ended with collapse of USSR; project revived 1992, with priority on more marketable passenger and passenger/cargo variants, with imported engines, propellers and avionics.

Manufacture of flying prototype and test airframe under way at KnAAPO's Komsomolsk-on-Amur plant by 1993; Rybinsk TVD-500 turboprop engines originally intended; agreement with General Electric to fit CT7-9 turboprops early 1995; design further refined and military versions reintroduced 1996; first flight scheduled second half 1996 but repeatedly postponed; prototype (RA-82911, in Su-80GP configuration) shown on production line on 15 May 1998 to representatives of Border Guards, MoD, and Magadan, Khabarovsk and Petropavlovsk-Kamchatski airlines; was handed over to Sukhoi for flight test preparation in January 2000 and relocated to Zhukovskiy; first flight 4 September 2001; had flown 40 sorties by May 2002. Second prototype was due to follow in early 2002, but unreported by mid-2003; two static airframes (02 and 04) for structural testing, of which first was delivered to SIBNIA at Novosibirsk in early 1998 and second was to have been completed in third quarter of 2001. By early 2002, had been redesignated Su-80. 900-sortie certification flight test programme will lead to Russian AP-25 and FAR Pt 25 in 2004. First four production aircraft being manufactured at KnAAPO by early 2002; these have

1.40 m (4 ft 7 in) fuselage stretch, compared with prototype, increasing passenger capacity from original 26 to 30.

**CURRENT VERSIONS:** **Su-80GP:** Basic cargo/passenger (*gruzov/passazhirski*) version.

*Detailed description applies specifically to Su-80GP; generally to all versions.*

**Su-80M:** Medical evacuation (10 casualties) version.

**Su-80P:** Passenger (*passazhirski*) version.

**Su-80PT:** Patrol transport, embodying Leninets Strizh (martin) avionics suite, with undernose 360° search radar and rotating electro-optic (FLIR/LLTV) sensor turret under centre-fuselage; one operator's console in cabin. Able to perform 6 to 9 hour patrol missions over sea and land frontiers up to 189 n miles (350 km; 217 miles) from base; personnel and cargo transportation; and airdropping up to 20 paratroops and/or cargo. Flight crew of two or three.

**Su-80TD:** Troop, paratroop (total 21), freight and medevac transport, generally similar to civil S-80GP, but with mechanised cargo-handling equipment.

**CUSTOMERS:** Market for 160 to 200 domestic sales estimated in 2001. Interest from 15 domestic customers in late 2002; export prospects include Argentina, China, Czech Republic, Indonesia, Malaysia, Thailand and Vietnam. Proposed for Russian Air Forces' future tactical military transport aircraft requirement and for Malaysian maritime patrol aircraft requirement. Total of 64 orders held by late 2002.

**COSTS:** Notionally funded by Russian Federation government but, by early 1997, KnAAPO had invested over Rb20 billion in development, compared with Rb1.5 billion received from official sources. Of US\$20 million expended by mid-2000, two-thirds provided by KnAAPO; thereafter, Sukhoi providing funds for flight test programme, estimated as further US\$20 million. Flyaway price US\$5.5 million to US\$6 million (2002 estimate).

**DESIGN FEATURES:** Utility freighter with unobstructed rear access for loading and wide track landing gear. Basically conventional high-wing, podded fuselage, twin-boom, rear-loading configuration, but with short tandem-wing surfaces between each tailboom and rear fuselage; unswept wings of high-aspect ratio with no dihedral or anhedral; large-span constant chord inner panels; small sweptback winglets on tapered outer panels; sweptback vertical tail surfaces, toed slightly inward, with bridging horizontal surfaces. Systems, accessories and components of Su-25, Su-27 and Su-35 embodied in Su-80. Automatic built-in systems testing.

**FLYING CONTROLS:** Conventional and manual. Actuation by rods and cables; flaps in three sections per wing with one section inboard of boom; split ailerons with two trim tabs on port side and one on starboard, electrically actuated; electrically actuated trim tab in each rudder.

**STRUCTURE:** Materials used in construction comprise 70 per cent aluminium alloy, 8 per cent composites, 6 per cent steel, 6 per cent titanium, 2.5 per cent stainless steel, 7 per cent other non-metals and 0.5 per cent other metals. Fuselage reinforcement band in line with propellers.

**LANDING GEAR:** Retractable tricycle type; main units retract rearwards and are enclosed by four sequenced doors per side; nose unit retracts rearwards with two sequenced doors; twin wheels on each unit; main units retract into tailbooms; mainwheel tyre size 660x200-356; nosewheel tyres 500x170-254; nosewheels steerable ±38°.

**POWER PLANT:** Two 1,305 kW (1,750 shp) General Electric CT7-9B turboprops; production aircraft with engines built locally by GE-Saturn Aero Engines; Hamilton Sundstrand 14RF-35 feathering and reversible-pitch four-blade propellers. Provision for engine to function as APU with propeller stationary. Two fuel tanks, total capacity 3,656 litres (966 US gallons; 804 Imp gallons).

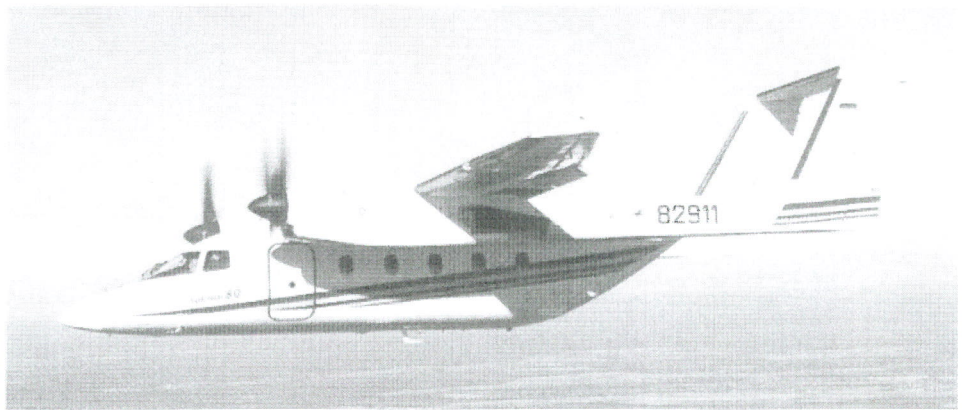
**ACCOMMODATION:** Two pilots and 30 passengers in four-abreast seating at 76 cm (30 in), or 3,300 kg (7,275 lb) of freight or mission equipment. All accommodation pressurised and air-conditioned. Baggage space, lavatory, wardrobe or galley at front, as specified by customer. Rear ramp space utilised for luggage racks. Available in 'Salon' configuration with nine, 12 or 16 passenger seats. Typical freighter has a row of seats behind flight deck and unobstructed main hold for a small vehicle or cargo. Door at centre of cabin on port side; hydraulically actuated; rear-loading ramp; emergency door on starboard side, opposite main door.

**SYSTEMS:** Electrical system developed by Lucas Aerospace and Auxilec. Anti-icing system by Goodrich. APU for autonomous operation at remote, unprepared sites.

**AVIONICS:** Integration by Elektroavtomatika.

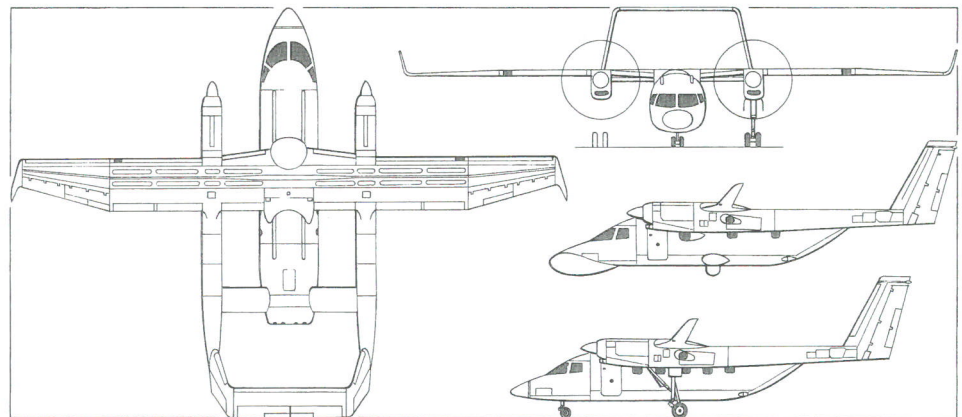
**Comms:** Com/nav, identification and ATC equipment. VOR/DME/ILS for ICAO Cat. II operation of Russian manufacture.

**Flight:** Elektroavtomatika PNK-80 navigation system. AFCS and autopilot and satellite nav system of Russian manufacture.



Sukhoi Su-80 prototype on an early test flight near Zhukovskiy

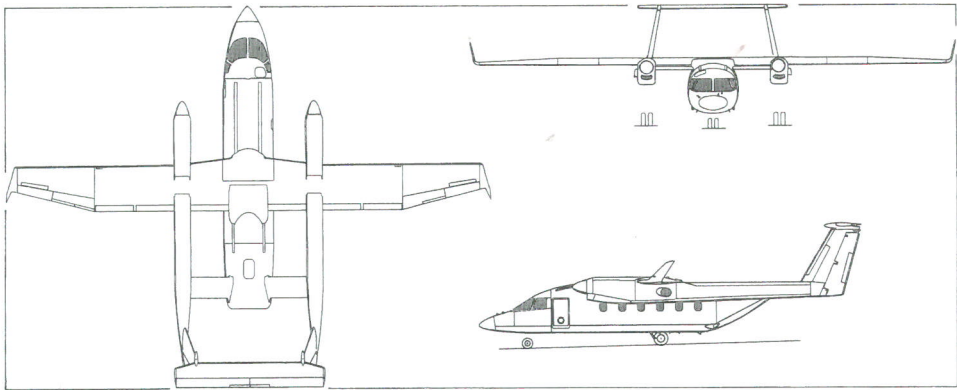
0525056



Prototype Sukhoi Su-80GP, with additional side view (upper) of Su-80PT patrol transport (James Goulding)

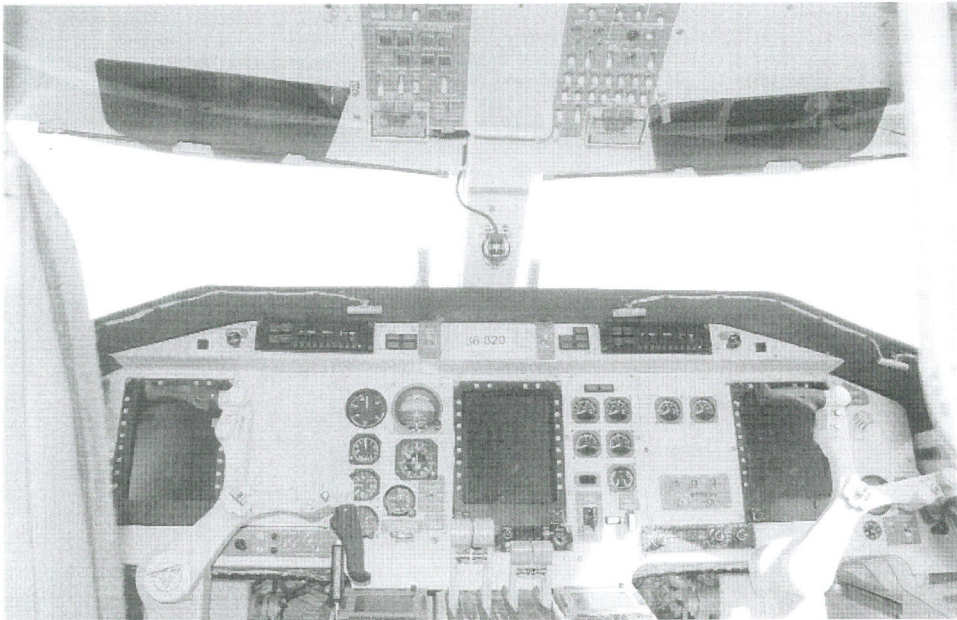
0121656





Production version of Sukhoi Su-80

0100419



Three-screen EFIS of the prototype Sukhoi Su-80 (Sebastian Zacharias)

NEW/0567709

**Instrumentation:** Russian-manufactured five-screen EFIS proposed for production aircraft.

**EQUIPMENT:** Options include equipment for air photography.

**ARMAMENT (Su-80PT):** Typically 23 mm GSh-23L gun pod pylon-mounted on starboard side of cabin; four underwing pylons for electro-optical ASM, 20-round rocket pack, cluster of eight Vikhr tube-launched missiles and R-60 (AA-8 'Aphid') self-defence AAM.

**DIMENSIONS, EXTERNAL:**

|                                    |                           |
|------------------------------------|---------------------------|
| Wing span                          | 23.17 m (76 ft 0 1/4 in)  |
| Wing chord: at root                | 2.16 m (7 ft 1 in)        |
| at tip                             | 1.20 m (3 ft 11 1/4 in)   |
| Wing aspect ratio                  | 12.2                      |
| Length overall                     | 18.26 m (59 ft 10 3/4 in) |
| Height overall                     | 5.52 m (18 ft 1 1/4 in)   |
| Tailplane span                     | 7.00 m (22 ft 11 1/2 in)  |
| Wheel track                        | 6.30 m (20 ft 8 in)       |
| Wheelbase                          | 6.34 m (20 ft 9 3/4 in)   |
| Propeller diameter                 | 3.35 m (11 ft 0 in)       |
| Propeller ground clearance         | 1.10 m (3 ft 7 1/4 in)    |
| Distance between propeller centres | 6.30 m (20 ft 8 in)       |
| Passenger door/rear loading ramp:  |                           |
| Height                             | 1.82 m (5 ft 11 1/4 in)   |
| Width                              | 1.89 m (6 ft 2 1/2 in)    |
| Crew door/Type II emergency exit:  |                           |
| Height                             | 1.275 m (4 ft 2 1/4 in)   |
| Width                              | 0.76 m (2 ft 6 in)        |
| Type II emergency exits (each):    |                           |
| Height                             | 1.315 m (4 ft 3 3/4 in)   |
| Width                              | 0.51 m (1 ft 8 in)        |
| Type III emergency exits (each):   |                           |
| Height                             | 0.915 m (3 ft 0 in)       |
| Width                              | 0.51 m (1 ft 8 in)        |

**DIMENSIONS, INTERNAL:**

|                          |                               |
|--------------------------|-------------------------------|
| Cabin: Length, excl ramp | 7.75 m (25 ft 5 in)           |
| Max width                | 2.17 m (7 ft 1 1/2 in)        |
| Max height               | 1.82 m (5 ft 11 1/4 in)       |
| Volume, incl ramp        | approx 30.65 m³ (1,082 cu ft) |

**AREAS:**

|                             |                        |
|-----------------------------|------------------------|
| Wings, gross                | 44.36 m² (477.5 sq ft) |
| Ailerons (total)            | 3.72 m² (40.04 sq ft)  |
| Trailing-edge flaps (total) | 7.10 m² (76.42 sq ft)  |
| Fins (total)                | 5.75 m² (61.89 sq ft)  |
| Rudders (total)             | 2.55 m² (27.45 sq ft)  |
| Horizontal tail surfaces    | 8.17 m² (87.94 sq ft)  |
| Elevators (total)           | 3.22 m² (34.66 sq ft)  |

**WEIGHTS AND LOADINGS (A: Su-80GP passenger; B: Su-80GP cargo):**

|                |                     |
|----------------|---------------------|
| Max payload: A | 2,730 kg (6,019 lb) |
| B              | 3,300 kg (7,275 lb) |

|                          |                              |
|--------------------------|------------------------------|
| Max fuel: A, B           | 2,870 kg (6,327 lb)          |
| Payload with max fuel: A | 1,280 kg (2,822 lb)          |
| B                        | 1,630 kg (3,594 lb)          |
| Max T-O weight: A, B     | 14,500 kg (31,967 lb)        |
| Max landing weight: A, B | 14,350 kg (31,636 lb)        |
| Max wing loading: A, B   | 326.8 kg/m² (66.95 lb/sq ft) |
| Max power loading: A, B  | 5.56 kg/kW (9.13 lb/shp)     |

**PERFORMANCE (estimated):**

|                                     |                            |
|-------------------------------------|----------------------------|
| Max cruising speed                  | 254 kt (470 km/h; 292 mph) |
| Normal cruising speed               | 232 kt (430 km/h; 267 mph) |
| Max certified altitude              | 6,000 m (19,685 ft)        |
| Service ceiling                     | 7,600 m (24,934 ft)        |
| T-O run                             | 930 m (3,051 ft)           |
| T-O balanced field length           | 1,300 m (4,265 ft)         |
| Landing run with propeller reversal | 640 m (2,100 ft)           |

**Range: with max payload:**

|   |                                   |
|---|-----------------------------------|
| A | 702 n miles (1,300 km; 807 miles) |
| B | 567 n miles (1,050 km; 652 miles) |

**Range with max fuel: A, B**

|                |                                       |
|----------------|---------------------------------------|
| A              | 1,673 n miles (3,100 km; 1,926 miles) |
| Ferry range: A | 1,754 n miles (3,250 km; 2,019 miles) |
| B              | 1,776 n miles (3,290 km; 2,044 miles) |

**OPERATIONAL NOISE LEVELS:** Designed to conform to FAR Pt 36 standards

UPDATED



Model of RRJ-75 with SM146 turbofans (Robert Hewson)

NEW/0567790

**SUKHOI RRJ**

**TYPE:** Regional jet airliner.

**PROGRAMME:** In early 2001, Rosaviakosmos and The Boeing Company agreed to joint development and marketing of the Russian Regional Jet (RRJ; transliterated into Cyrillic as RRZh, but also known by Sukhoi as *grazhdanskie samolët*: Civil Aircraft). At the Paris Air Show on 21 June 2001 it was announced that AVPK Sukhoi (Sukhoi Civil Aircraft) will lead the design and manufacture of the aircraft, with Ilyushin holding responsibility for certification, and Boeing handling marketing, sales, leasing and after-sales support. Three firms signed agreement 20 July 2001. Provisional configuration and specification announced 13 August 2001, on eve of Moscow Salon. Initial phase of feasibility studies between June and December 2001; second phase completed in July 2002. Announced as winner of Russian Aviation & Space Agency (*Rosaviakosmos*) tender on behalf of Russian government for 200 regional jets on 12 March 2003. First flight is expected in 2006, with Russian AP-25 and FAR/JAR-25 certification and service entry in 2007.

**CURRENT VERSIONS:** **RRJ-60:** Formerly RRJ-55. Shrunk version; two fuselage sections, of 1.00 m (3 ft 3 1/2 in) and 1.50 m (4 ft 11 in) respectively, removed fore and aft of wing.

**RRJ-60LR:** Long-range version.

**RRJ-75:** Baseline version.

**RRJ-75LR:** Long-range version.

**RRJ-95:** Stretched version; two plugs, one of 1.50 m (4 ft 11 in) and one of 2.00 m (6 ft 6 3/4 in) respectively, inserted fore and aft of wing.

**RRJ-95LR:** Long-range version.

**CUSTOMERS:** Aeroflot has initial requirement for up to 30, having signed MoU in August 2001. Russian market estimated as 150; additional 500 export sales possible by 2022.

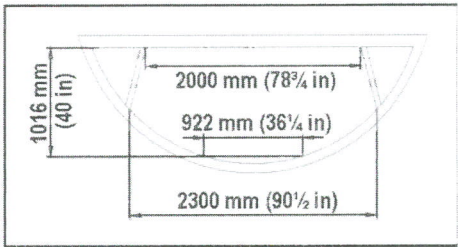
**COSTS:** Development costs estimated at US\$600 million, plus US\$600 million to US\$700 million for engine (both 2003). Unit cost estimated at US\$10 million to US\$20 million (2003).

**DESIGN FEATURES:** Low-mounted, sweptback wings with podded engine on each. Sweptback horizontal and vertical tail surfaces. Airframe design optimised on RRJ-75 with goal of maximum commonality across the range of models.

**LANDING GEAR:** Retractable tricycle type. Twin wheels on each unit, with option of four-wheel bogey on main units.

**POWER PLANT:** Two Snecma/NPO Saturn SM146 turbofans, with FADEC, pod-mounted beneath wings, each rated at 62 to 71 kN (14,000 to 16,000 lb st), according to version. Fuel capacity 13,135 litres (3,470 US gallons; 2,889 Imp gallons).

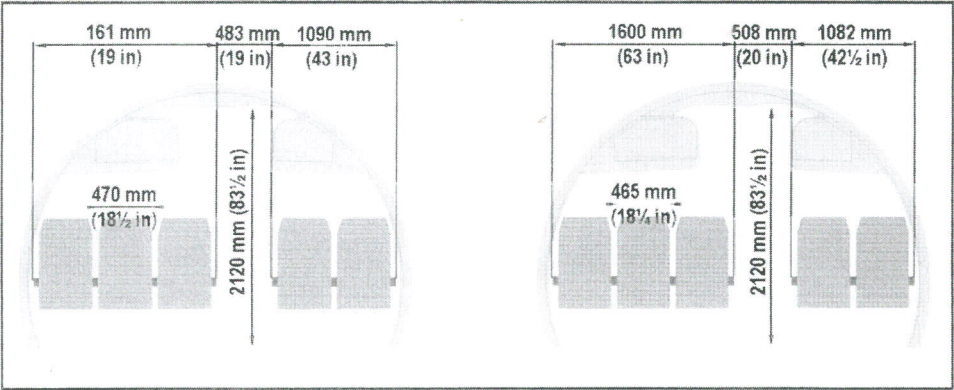
**ACCOMMODATION:** RRJ-60 seats up to 63 passengers; RRJ-75 seats up to 78 passengers; RRJ-90 seats up to 98 passengers, all in single-class accommodation at 81 cm (32 in) seat pitch, five abreast. Narrow- and wide-aisle configurations available. Alternative two-class configuration for baseline RRJ-75 has eight first class seats in forward section and 62 tourist class seats in main cabin. Underfloor baggage compartments beneath front and rear of cabin.



Cross-section of RRJ's underfloor baggage holds

NEW/0547141





Cabin cross-sections of RRJ series, showing narrow- and wide-aisle options NEW/0547139

All data are provisional.

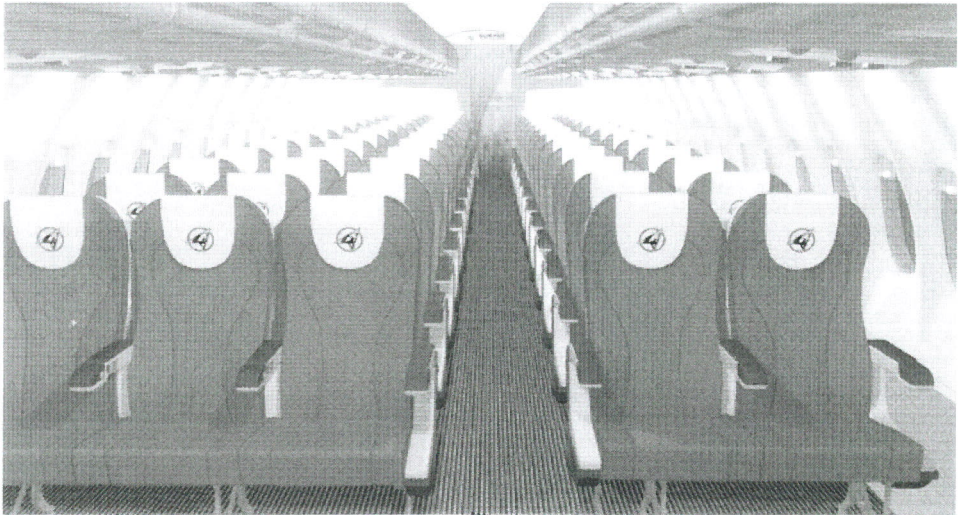
|                                     |                           |
|-------------------------------------|---------------------------|
| DIMENSIONS, EXTERNAL:               |                           |
| Wing span                           | 27.50 m (90 ft 2 3/4 in)  |
| Wing aspect ratio                   | 9.8                       |
| Length overall: RRJ-60              | 24.50 m (80 ft 4 1/2 in)  |
| RRJ-75                              | 26.50 m (86 ft 11 1/4 in) |
| RRJ-95                              | 30.00 m (98 ft 5 in)      |
| Height overall                      | 10.02 m (32 ft 10 3/4 in) |
| Tailplane span                      | 10.03 m (32 ft 10 3/4 in) |
| Wheel track                         | 5.50 m (18 ft 0 3/4 in)   |
| Wheelbase: RRJ-60                   | 8.77 m (28 ft 9 3/4 in)   |
| RRJ-75                              | 9.77 m (32 ft 0 3/4 in)   |
| RRJ-95                              | 11.30 m (37 ft 0 3/4 in)  |
| Main passenger door (port, fwd):    |                           |
| Height                              | 1.83 m (6 ft 0 in)        |
| Width                               | 0.86 m (2 ft 9 3/4 in)    |
| Passenger door (port, rear):        |                           |
| Height                              | 1.83 m (6 ft 0 in)        |
| Width                               | 0.76 m (2 ft 6 in)        |
| Service doors (stbd, fwd and rear): |                           |
| Height                              | 1.65 m (5 ft 5 in)        |
| Width                               | 0.76 m (2 ft 6 in)        |
| Baggage doors: Height               | 0.89 m (2 ft 11 in)       |
| Width                               | 1.22 m (4 ft 0 in)        |

|                               |                                     |
|-------------------------------|-------------------------------------|
| DIMENSIONS, INTERNAL:         |                                     |
| Cabin: Length: RRJ-60         | 14.65 m (48 ft 0 3/4 in)            |
| RRJ-75                        | 17.15 m (56 ft 3 3/4 in)            |
| RRJ-95                        | 20.65 m (67 ft 9 in)                |
| Max width                     | 3.26 m (10 ft 8 3/4 in)             |
| Max height                    | 2.12 m (6 ft 11 1/2 in)             |
| Overhead bins (per passenger) | 0.06 m <sup>3</sup> (2.12 cu ft)    |
| Baggage compartment volume:   |                                     |
| forward: RRJ-60               | 4.97 m <sup>3</sup> (175.51 cu ft)  |
| RRJ-75                        | 6.98 m <sup>3</sup> (246.50 cu ft)  |
| RRJ-95                        | 10.00 m <sup>3</sup> (353.15 cu ft) |
| rear: RRJ-60                  | 6.11 m <sup>3</sup> (215.77 cu ft)  |
| RRJ-75                        | 9.12 m <sup>3</sup> (322.07 cu ft)  |
| RRJ-95                        | 13.40 m <sup>3</sup> (473.22 cu ft) |

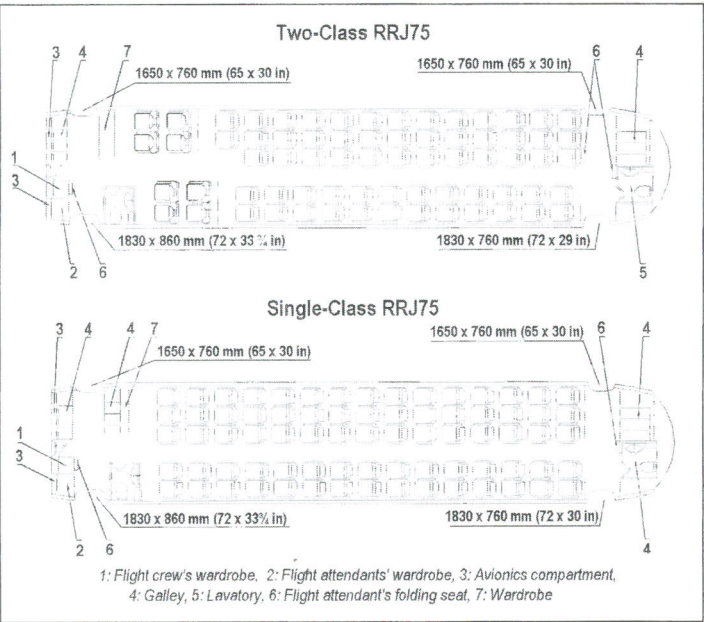
|               |                                     |
|---------------|-------------------------------------|
| AREAS:        |                                     |
| Wings, gross  | 77.00 m <sup>2</sup> (828.8 sq ft)  |
| Flaps (total) | 13.90 m <sup>2</sup> (149.62 sq ft) |
| Fin           | 15.40 m <sup>2</sup> (165.76 sq ft) |
| Tailplane     | 19.60 m <sup>2</sup> (210.97 sq ft) |

|                         |                       |
|-------------------------|-----------------------|
| WEIGHTS AND LOADINGS:   |                       |
| Basic operating weight: |                       |
| RRJ-60, RRJ-60LR        | 21,900 kg (48,281 lb) |
| RRJ-75                  | 22,910 kg (50,508 lb) |
| RRJ-75LR                | 23,170 kg (51,081 lb) |

|                        |                        |
|------------------------|------------------------|
| RRJ-95                 | 24,470 kg (53,947 lb)  |
| RRJ-95LR               | 24,715 kg (54,487 lb)  |
| Max payload:           |                        |
| RRJ-60, RRJ-60LR       | 7,100 kg (15,653 lb)   |
| RRJ-75, RRJ-75LR       | 9,140 kg (20,150 lb)   |
| RRJ-95, RRJ-95LR       | 11,870 kg (26,169 lb)  |
| Max T-O weight: RRJ-60 | 35,615 kg (78,517 lb)  |
| RRJ-60LR               | 38,585 kg (85,065 lb)  |
| RRJ-75                 | 38,770 kg (85,473 lb)  |
| RRJ-75LR               | 42,275 kg (93,200 lb)  |
| RRJ-95                 | 42,505 kg (93,707 lb)  |
| RRJ-95LR               | 45,885 kg (101,159 lb) |
| Max landing weight:    |                        |
| RRJ-60, RRJ-60LR       | 31,620 kg (69,710 lb)  |
| RRJ-75, RRJ-75LR       | 34,960 kg (77,073 lb)  |
| RRJ-95, RRJ-95LR       | 39,385 kg (86,829 lb)  |
| Max zero-fuel weight:  |                        |
| RRJ-60, RRJ-60LR       | 29,000 kg (63,934 lb)  |
| RRJ-75                 | 32,050 kg (70,658 lb)  |
| RRJ-75LR               | 32,310 kg (71,231 lb)  |
| RRJ-95                 | 36,340 kg (80,116 lb)  |
| RRJ-95LR               | 36,585 kg (80,656 lb)  |



Preliminary design for RRJ series cabin interior NEW/0547140



Alternative single- and two-class interior configurations for RRJ-75 NEW/0547138

|                          |   |
|--------------------------|---|
| Max wing loading: RRJ-60 | 462.5 kg/m <sup>2</sup> (94.73 lb/sq ft)  |
| RRJ-60LR                 | 501.1 kg/m <sup>2</sup> (102.63 lb/sq ft) |
| RRJ-75                   | 503.5 kg/m <sup>2</sup> (103.13 lb/sq ft) |
| RRJ-75LR                 | 549.0 kg/m <sup>2</sup> (112.45 lb/sq ft) |
| RRJ-95                   | 552.0 kg/m <sup>2</sup> (113.06 lb/sq ft) |
| RRJ-95LR                 | 595.9 kg/m <sup>2</sup> (122.05 lb/sq ft) |

|                                       |                            |
|---------------------------------------|----------------------------|
| PERFORMANCE:                          |                            |
| Cruising speed: max                   | M0.81                      |
| normal                                | M0.78                      |
| Approach speed at max landing weight: |                            |
| RRJ-60, RRJ-60LR                      | 120 kt (222 km/h; 139 mph) |
| RRJ-75, RRJ-75LR                      | 127 kt (235 km/h; 146 mph) |
| RRJ-95, RRJ-95LR                      | 135 kt (250 km/h; 155 mph) |
| Initial cruise altitude               | 10,670 m (35,000 ft)       |
| Max certified altitude                | 12,497 m (41,000 ft)       |
| T-O field length: RRJ-60              | 1,360 m (4,462 ft)         |
| RRJ-60LR                              | 1,595 m (5,233 ft)         |
| RRJ-75                                | 1,612 m (5,289 ft)         |
| RRJ-75LR                              | 1,645 m (5,397 ft)         |
| RRJ-95                                | 1,685 m (5,528 ft)         |
| RRJ-95LR                              | 1,980 m (6,496 ft)         |
| Landing field length:                 |                            |
| RRJ-60, RRJ-60LR                      | 1,313 m (4,308 ft)         |
| RRJ-75, RRJ-75LR                      | 1,404 m (4,606 ft)         |
| RRJ-95, RRJ-95LR                      | 1,525 m (5,003 ft)         |

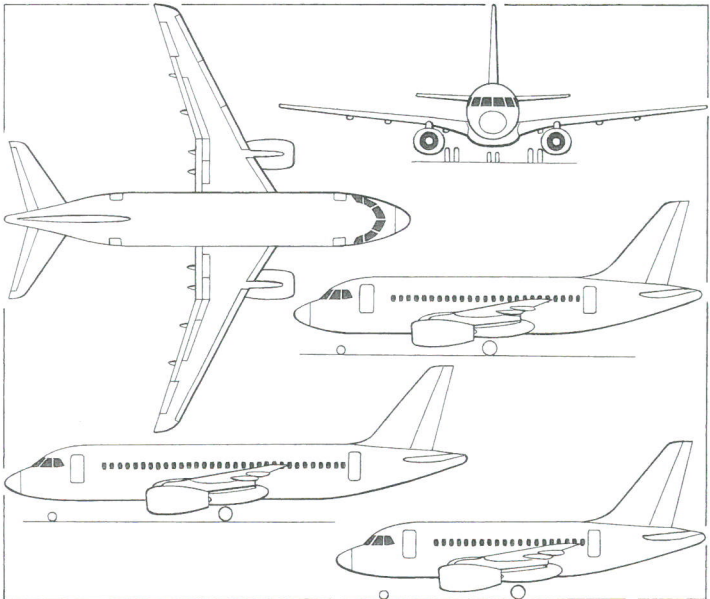
|                         |                                       |
|-------------------------|---------------------------------------|
| Range with max payload: |                                       |
| RRJ-60                  | 1,915 n miles (3,546 km; 2,203 miles) |
| RRJ-60LR                | 2,810 n miles (5,204 km; 3,233 miles) |
| RRJ-75                  | 1,815 n miles (3,361 km; 2,088 miles) |
| RRJ-75LR                | 2,767 n miles (5,124 km; 3,184 miles) |
| RRJ-95                  | 1,771 n miles (3,279 km; 2,038 miles) |
| RRJ-95LR                | 2,495 n miles (4,620 km; 2,871 miles) |

UPDATED

SUKHOI Su-XX

In 2001, Sukhoi, in conjunction with its UK-based sales agent Richard Goode Aerobatics, was reported to be developing a new Unlimited category competition aerobatic aircraft under the provisional designation Su-XX. This emerged in 2003 under the designation Su-31ChM.

UPDATED



Sukhoi RRJ-75, with additional side views of RRJ-95 (centre) and RRJ-60 (bottom) (James Goulding) NEW/0546837