

Sukhoi Superjet 100 Program

SUKHOI SUPERJET 100 AIRCRAFT

The Sukhoi Superjet 100 (SSJ100), certified model RRJ-95B and RRJ-95LR-100, is a state-of-the-art 100-seat new generation regional jet. Designed, developed and built by Sukhoi Civil Aircraft Company (SCAC), a Russian Sukhoi Aviation Holding and Italian Finmeccanica-Alenia Aermacchi Company.

The SSJ100 is an advanced and cost-effective commercial aircraft, built with state-of-the-art technologies in aerodynamics, engine and aircraft systems. The Sukhoi Superjet 100 can be operated through short-to-medium range routes.

The first SSJ100 prototype was **rolled out** from SCAC's final assembly shop at Komsomolsk-on-Amur (Russia) in September 2007. The first flight was successfully accomplished in May 2008. In spring 2011 the aircraft operated its **first commercial flight**.

Certain requirements of the world leading airlines to the product have become the starting point for the SSJ100 design. The aircraft has been fully developed based on the digital technologies.

Wide scale retrofitting of plants in Komsomolsk-on-Amur and Novosibirsk was implemented. New technologies in aircraft production have been implemented such as jiggles construction, automatic stitching of aircraft details, automatic riveting and others.

The Sukhoi Superjet 100 is equipped with two SaM146 turbofan engines produced by PowerJet, a joint venture between French Snecma and Russian Saturn. The engine was specially developed and built for the Sukhoi Superjet 100 aircraft.

The SSJ100 incorporates the best of all the most modern Western technology: Thales for avionics; Messier-Bugatti-Dowty (Safran group) (landing gear); Honeywell (auxiliary power unit); Liebherr (flight control system), Intertechnique (fuel system), Parker (hydraulic system) and B/E Aerospace (interior) and others.

Enhanced takeoff and landing performance, high cruising speed, operations in wide range of environmental conditions allow to plan flexibly route network, increasing the number of destinations. The SSJ100 can be used both at regional and mainline routes.

The Sukhoi Superjet 100 cruises at a Maximum Operating Speed of **Mach 0.81** and at 40.000 ft / 12.200 m.

The maximum cruising speed of Mach 0.81 in SSJ100 (860 km / h) allows SSJ100 to operate at the same flight levels as the most common types of short-haul aircraft, thereby optimizing not only airlines' fuel costs but also the time required for the flight.

Long Range version has a longer, compared to the SSJ100 Basic, range of up to 4578 km (2470 nm), Maximum Take Off Weight – 109.019 lb / 49 450 kg and strengthened wings for increased weight. The SSJ100 LR is equipped by SaM146 engine with increased by 5% takeoff thrust performance. The first Sukhoi Superjet 100 LR was delivered to Russian airline Gazpromavia in the 90-seat economy class configuration.

SSJ100 can be efficiently operated in a wide range of climate conditions like those of Central Russia, its Far North, South East Asia and Mexican high-mountains regions. The aircraft operates at the range of temperatures varying from minus 54 to plus 45 degrees.

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SSJ100: The Right Choice for Airlines

- it is the ideal **complement for narrow-body operators**
- **replacement of aircraft with larger capacity** (such as the A320, B737) operated with low passenger payload during seasonal downturn. SSJ100 may substitute both aircraft of larger capacity for a long period in a “low” season and during a day;
- it offers the **comfort of a narrow-body**
- SSJ100 is an **active component in the concept of hubs**, which allows airlines to optimize their costs, delivering passengers by a smaller aircraft in an airline base airport.

SSJ100: The Right Choice for Passengers

The comfort of the SSJ100 cabin is comparable with medium and long-haul aircraft:

- **the height** of passenger compartment in the central aisle is 83.46 inches / **212 cm**;
- comfortable **wide seats**, comparable to those being usually installed on medium and long-haul aircraft;
- wide central aisle;
- **significant living space** for each passenger: an increased seat pitch in SSJ100 basic configuration (32 inches / 81.28 cm) allows even tall passengers to feel comfortable on-board;
- large windows for natural light and better outside view;
- **spacious** 78.74 inches / 2 m length **overhead bins** without inside partitions for convenient accommodation of hand luggage;
- LED lighting system with warm light of the lamps;
- roomy toilets, the one in the rear service area is adapted **for people with reduced mobility**, in addition, it is equipped with a wide diaper board;
- boarding to SSJ100 can be performed **through a mobile stairway and a boarding bridge** as well.

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TECHNICAL PERFORMANCE

CAPACITY

Flight Crew	2
Minimum Cabin Crew	2
Passengers	up to 103

EXTERNAL DIMENSIONS

Wings Span	m(ft)	27.80 (91.20)
Length	m (ft)	29.94 (98.23)
Height	m (ft)	10.28 (33.73)

BAGGAGE CAPACITY

Cargo Volume	m ³ (ft ³)	21.76 (768.55)
Checked Baggage per Pax	m ³ (ft ³)	0.22 (7.84)
Total Baggage Capability (checked and unchecked)	m ³ (ft ³)	28.86 (1.019.18)
Total Baggage per Pax	m ³ (ft ³)	0.27 (10.4)

PERFORMANCE

		Basic	Long Range
Maximum Range (98 Pax. @ 100 kg)	km (nm)	3.048 (1.645)	4.578 (2.470)
Maximum Cruise Speed	M	0.81	0.81
Takeoff Field Length (TOFL) [ISA, SL, MTOW]	m (ft)	1.731 (5.679)	2.052 (6.732)

WEIGHTS

Maximum Takeoff Weight (MTOW)	kg (lb)	45.880 (101.150)	49.450 (109.019)
Maximum Landing Weight (MLW)	kg (lb)	41.000 (90.390)	41.000 (90.390)
Maximum Zero Fuel Weight (MZFW)	kg (lb)	40.000 (88.185)	40.000 (88.185)
Maximum Fuel Weight	kg (lb)	12.690 (27.976)	12.690 (27.976)
Maximum Payload	kg (lb)	12.245 (26.995)	12.245 (26.995)

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The Engine SaM146

The SaM146 is produced by PowerJet, a Company owned 50/50 by Snecma of France and NPO Saturn of Russia, and endows the Sukhoi Superjet 100 aircraft with economic performance.

An optimized air-frame design concept led to the development of the SaM146 advanced turbofan engine.

The regional jet market demands purpose-built engines, designed for frequent flights and quick turnaround, with no unscheduled down time.

The new modular SaM146 engine combines proven CFM56 experience with new technology and 20% reduction in components to dramatically reduce operating and maintenance costs, while maintaining industry-leading performance, reliability and operability.

Description:

- Latest third-generation, redundant Full Authority Digital Engine Control (FADEC) optimizes mission performance while reducing fuel consumption.
- Engine interchangeability with Common Right and Left (CRL) design reduces spares requirement.
- Engine nacelle clamshell doors facilitate access to engine Line Replaceable Units (LRUs)
- Fewer stages and parts in the high-pressure compressor (six stages including two blisks) of the single-stage high-pressure turbine reduce maintenance costs, fuel consumption and weight.
- Optimal geometry of fan blade using 3D design ensures minimum blade stress and maximum fan efficiency

Engine Characteristics	1S17	1S18
Thrust class (APR)	17.300 lbf	17.800 lbf
Takeoff thrust	15.400 lbf	16.100 lbf
Bypass ratio	4.43	4.43
Maximum climb thrust	3.740 lbf	3.740 lbf
Fan diameter	48"2	48"2
Engine overall length	3.590 mm	3.590 mm

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PARTNERSHIP STRUCTURE

Sukhoi Civil Aircraft Company (SCAC)

The Company's shareholders are the Russian Sukhoi Aviation Holding and, since April 7, 2009, the Italian Finmeccanica-Alenia Aermacchi Company. Sukhoi Civil Aircraft Company was founded in 2000 to develop new regional aircraft projects. SCAC is in charge of the aircraft development, certification and production as well as marketing, sales and after-sales support. Headquartered in Moscow, SCAC has a production branch seated in Russian city of Komsomolsk-on-Amur and a representative office in Ulianovsk. Sukhoi Superjet 100 is the main project of the Company.

SuperJet International (SJI)

SuperJet International (SJI) is a joint venture between Finmeccanica-Alenia Aermacchi and Sukhoi Aviation Holding. Incorporated in July 2007, SuperJet International is headquartered in Venice (Italy), close to the Marco Polo International airport, with a branch in Moscow. The Company is responsible for customization and sales of the Sukhoi Superjet 100 regional jet. SJI is also in charge of training and after sales support worldwide.

PowerJet

PowerJet, founded in July 2004, is a joint venture of Snecma (Safran) of France and NPO Saturn of Russia. The company manages the SaM146 engine program, including development, production, marketing and sales, as well as customer support and MRO services. In April 2003, the SaM146 engine was selected to power Sukhoi Superjet 100 aircraft.

SSJ100 PRODUCTION

Production Facilities

Production is performed by the Komsomolsk-on-Amur Branch of Sukhoi Civil Aircraft Company (KnAF) with direct participation of other plants located in Russia where SSJ100 parts are being produced. Finished components are delivered to KnAF where their final assembly is performed.

Komsomolsk-on-Amur:

- *"Sukhoi" Company (JSC) Branch - "KNAAZ named after Y.A. Gagarin"*
Wing, high-lift devices, center-section and F2, F3, F4 production. System installation
- *Komsomolsk-on-Amur Branch of Sukhoi Civil Aircraft Company*
Fuselage assembly, final assembly, system installation and SSJ100 testing

Novosibirsk:

- *"Sukhoi" Company (JSC) Branch - «Novosibirsk aircraft production association named by V.P. Chkalov»*

Empennage and F1, F5, F6 fuselage parts production

Voronezh:

- *Voronezh Aircraft JSC*
Composite parts of SSJ100 production

Ulianovsk:

- *Aviastar-SP*
Interior installation
- *Spektr-Avia*

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SSJ100 Painting

Zhukovsky:

- SCAC Flight Test Center
Ground and in-flight testing
- SCAC Delivery center
SSJ100 delivery to customers

Venice (Italy):

- Completion and Delivery center for the Western customers
Painting, Ground and In-Flight testing

Komsomolsk-on-Amur Branch of Sukhoi Civil Aircraft Company

Komsomolsk-on-Amur Branch of SCAC was established in 2005 to build the new regional aircraft Sukhoi Superjet 100. It took just five years to manufacture the first production aircraft in 2010 since the Branch had been established.

Komsomolsk branch of SCAC now includes: Fuselage Assembly Shop with four working stations, Final Assembly Shop with seven working stations and Flight-Test Section with two working stations.

The branch uses lean technologies to the fullest extent. These technologies are used for production efficiency increasing and production planning. Modern techniques, procurement optimization, minimization of labour costs and time expenditures are the foundation of lean technologies.

Presently the production capacity of the plant allows for manufacturing of up to 50 aircraft annually.

CERTIFICATION

In January 2011 the Sukhoi Superjet 100 obtained IAC AR Type Certificate from the Russian Certification Authority. The Certificate **confirmed compliance of the SSJ100 with the airworthiness regulations and authorized commercial operations of the aircraft and its safety.**

In February 2012 - the Sukhoi Superjet 100 (model RRJ-95B) received its Type Certificate from the European Aviation Safety Agency (EASA). This certificate recognizes that the SSJ 100 aircraft demonstrated compliance with the EASA airworthiness and environmental requirements. The recognition allows the European airlines, as well as those airlines operating in countries which use EASA regulations as a reference standard, to accept and operate the SSJ100 aircraft. The Sukhoi Superjet 100 is **the first ever Russian passenger "Large Airplane" to achieve the EASA CS-25 Certification.**

In May 2012 Supplement to the SSJ100 TC on expanding operational conditions at the high outside air temperature up to +45 C was awarded by IAC AR.

In November 2012 Supplement to the Certificate was issued on expanding operational conditions in the high north latitude area. The flight tests proved the proper functioning of the aircraft avionics, most notably the inertial reference system and the satellite navigation systems GPS and GLONASS, in flights in high north latitude area (up to 78 degree) and temperature – up to 54 below zero.

In June 2013 the first Europe export certificate was issued.

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In August 2013, Aviation Register of the Interstate Aviation Committee (IAC AR) issued a Supplement to the Type Certificate for RRJ-95LR aircraft – Long Range version of Sukhoi Superjet 100.

In March 2014 Aviation Register of the Interstate Aviation Committee (AR IAC) issued a Supplemental Type Certificate for Sukhoi Superjet 100 aircraft, which confirms that this type of aircraft can perform flights under Area Navigation in RNAV 1 and P-RNAV systems.

In June 2014 Aviation Register of the Interstate Aviation Committee (AR IAC) issued a Supplemental Type Certificate confirming that SSJ100 can operate in **CAT IIIa** environment, including landing with crosswind conditions and on narrow 30-meter-wide runways.

In October 2014 Sukhoi Civil Aircraft Company received a Supplemental Type Certificate, which allows Sukhoi Superjet 100 to perform reduced thrust takeoff. Operating mode with engines working with a reduced engine speed and lower turbine gas temperature allows to reduce engine load and to extend engine lifetime, so this, in turn, minimizes aircraft maintenance cost.

*In November 2014 **first ever in Russia*** the Aviation Register of Interstate Aviation Committee (IAC AR) issued a Supplemental Type Certificate for the Sukhoi Superjet 100 (SSJ100), permitting the usage of Vertical Navigation (VNAV) functionality at all stages of flight. VNAV functionality of Sukhoi Superjet 100 significantly decreases crew workload and ensures compliance with all applicable restrictions.

In November 2014 Aviation Register of the Interstate Aviation Committee confirmed the possibility to equip the Sukhoi Superjet 100 aircraft with the enhanced comfort passenger cabin interior. This Major Change Approval to the baseline Sukhoi Superjet 100 Type Design, issued by IAC AR In late November 2014, confirms the safe operation of this aircraft type in the VIP configuration submitted for certification.

In December 2015 European Aviation Safety Agency (EASA) issued a Supplemental Type Certificate for the Sukhoi Superjet 100 (SSJ100), which confirms that this type of aircraft can perform flights under Area Navigation in RNAV 1 and P-RNAV systems

In January 2016 European Aviation Safety Agency (EASA) issued a Supplemental Type Certificate for the Sukhoi Superjet 100 (SSJ100), confirming that SSJ100 can operate in **CAT IIIa** environment

TRAINING ACTIVITIES

Training for flight and technician staff of the SSJ100 customers is conducted by SuperJet International (SJI).

The SJI Training Organization manages two facilities: one in Venice (Italy) and one in (Zhukovsky) Moscow, Russia.

The SJI Training Center has been certified since 2008 as a Flight and Maintenance Training Organization (FTO & MTO) by the Italian Aviation Authority ENAC (EASA) and all certifications have been endorsed by Russian authorities as well. Recently, the FTO was upgraded to meet the certification requirements for the new EASA ATO.

Both centres offer the complete cycle of training for flight crews and technicians of SSJ100 customers and operators.

Two advanced SSJ100 Full Flight Simulators (FFS level V), manufactured by Thales Training & Simulation are currently in service for customer training at both SJI Training centres in Moscow and Venice.

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The two centres are also equipped with the most advanced training tools and devices, including Computer Based Training (CBT), Flight Procedure Training Device (FPTD), Flight Training Device (FTD LV), and a Cabin Emergency Evacuation Trainer (CEET).

SSJ100 IN OPERATION

First deliveries of Sukhoi Superjet 100 were started in 2011. As of **March 2016** the number of SSJ100 being operated by the customers are **65**. The aircraft in service operated more than **165 000** flight hours totally for more than **113 000** revenue flights.

Russian Aeroflot, Yakutia Airlines, RusJet, Red Wings Gazpromavia with Long Range version, Russian Government structures as well as Mexican Interjet operates SSJ100 all over the world.

REVISED BUSINESS PLAN

In October 2015 a new business plan was approved by the shareholders. It envisages 595 aircraft sold from 2015 to 2031, including those already delivered. The new figures were presented on the basis of the analysis made by international expert agency Ascend. This is a conservative estimate, reflecting the real situation in the market, opportunities and competitive advantages of SCAC.

New business plan:

- 595 aircraft, including those already delivered in the period from 2011 to 2031 years:
- 82 - basic version (B)
- 33 - long range (LR)
- 42 - business version (VIP / SBJ)
- 140 - increased passenger capacity (SV)

INCREASED PASSENGER CAPACITY (SV - Stretched Version)

The project is at the design definition stage. Upon its completion, it can be presented to potential customers to start negotiations on firm orders. Certification of the aircraft is scheduled for 2019. The first deliveries might be seen in 2020. This aircraft for up to 120 seats will have high lift-to-drag ratio due to the new wing with higher aspect ratio increasing lift power

BUSINESS VERSION

Business version of SSJ100 featuring interior of increased comfort has already been implemented: it is operated by RusJet. Development and certification of additional fuel tanks, integral airstairs and other necessary attributes of business aviation in the near future will lead to the creation of long range business version of the aircraft - Sukhoi Business Jet (SBJ). Its certification is expected in 2016, SBJ will allow flight to a distance of 6000 km, while SCAC will proceed working on ensuring the range of the business version of SSJ100 reaching up to 8 000 km destinations.