

FACTS &
FIGURES

137
orders
booked

11
Safran companies
participating

95
seats
on largest version
of Superjet 100

Safran designed and produces the Superjet 100's SaM146 engine in partnership with NPO Saturn.

SUPERJET 100, SUKHOI'S LATEST



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PARTNERSHIP. The Sukhoi Superjet 100 represents the future of regional aviation. Snecma and NPO Saturn teamed up through PowerJet to develop a new propulsion system purpose-designed for this market segment.

POWERJET, AN AUDACIOUS FRENCH-RUSSIAN PARTNERSHIP

Like any large-scale project, the Sukhoi Superjet 100 and its SaM146 engine began with a few rather simple ideas: a response to market demand for a modern aircraft and engine, a search for partners to share costs and provide solid commercial foundations. For the engine, this led to the creation of PowerJet, a joint venture between the French engine manufacturer Snecma (Safran group) and Russian counterpart NPO Saturn.

"The birth of PowerJet was the result of several factors," says company head Jean-Paul Ebanga. "Our initial analysis, still applicable, was based on three central ideas: the favorable outlook for regional jets over the next twenty years; Russia's growing role in the global aviation industry; and Snecma's goal of expanding its scope of expertise by taking full charge of a commercial jet engine. Furthermore, the development of this type of engine had to go hand in hand with an equally modern platform. So we offered our new engine for the projected Superjet 100 regional jet, and it was selected in May 2003."

The teaming arrangement between Snecma and NPO Saturn is based on the same general principles as the CFM56, a very successful joint venture by Snecma and General Electric that reaches back more than 30 years.



Sukhoi officially selected the SaM146 to power its new regional jet in 2003.

On track

Six years after the official launch of the SaM146, the program is right on track: eight development engines and six pre-production engines have been built, and certification tests are under way. PowerJet is responsible for all aspects of the SaM146, including marketing, development, production, sales and support. There are complementary entities as well, including the VolgAero plant that manufactures engine parts, and Poluevo Invest, in charge of an open-air engine test cell in Russia.

Top-flight performance

"Results to date are excellent," notes Jean-Paul Ebanga. "The engine has

BREAKTHROUGH IN THE COMMERCIAL AIRPLANE MARKET



SVETLANA ISSAEVA, VICE PRESIDENT SALES & MARKETING, SUKHOI CIVIL AIRCRAFT COMPANY.

Having made its first flight on May 19, 2008, the Superjet 100 could well be one of the stars

at the 2009 Paris Air Show. "We want to win about 17 percent of the regional aircraft market in the next 20 years," says Svetlana Issaeva. "We estimate the market, now dominated by Embraer and Bombardier, at 6,100 aircraft. Our aim is to sell more than 1,000 Superjets."

The current economic crisis means that airlines need to make their fleets more efficient than ever. With its reduced fuel consumption and maintenance costs, the Superjet is the right solution. Sukhoi has logged 137 orders to date. Aeroflot, a member of the Skyteam alliance, is the launch customer. This is a major success for the aircraft manufacturer, which was able to adapt very quickly to Western standards in terms of certification, financing and marketing. It also marks a successful diversification for Sukhoi, much better known around the world for its fighters.

logged several thousand hours of operation, and continues to demonstrate its excellent performance and reliability." But any program this ambitious also runs into its share of difficulties, as Ebanga explains: "Not only did we develop a new engine, which is already a very complex undertaking, but we were also setting up a new international partnership. This program forced us to develop some brand-new solutions, in particular to resolve certain fiscal and legal problems inherent in any trade relationship between France and Russia."

In addition to the many people working on the SaM146 in France, about 50 technicians and engineers

from Snecma are seconded to the various production and test sites in Russia. Collaborating with Russia on this program has reinvigorated the company's teams through new challenges. Results are equally positive at NPO Saturn, where everybody is doing their utmost to design and produce a new engine that meets Western standards.

"Our collaboration reflects a long-haul relationship between France and Russia, since this airplane and its engine will be in operation for the next forty years!" notes Jean-Paul Ebanga. "By meeting today's challenges, we will realize the outstanding promise that this program harbors in the years to come." ■

PROPULSION. Innovative yet simple, the SaM146 perfectly meets the requirements of the regional aviation market. Here we take a closer look at this engine that delivers excellent performance for the Superjet 100.

POWERPLANT FOR THE 21ST CENTURY

The SaM146 marks the first time Safran is managing the development of a complete propulsion system, including the engine itself, plus the nacelle and thrust reverser. The engine is under the responsibility of a joint venture called PowerJet, created by Safran company Snecma and the Russian engine manufacturer NPO Saturn. The worksplit is clear, with the Russian partner in charge of the low-pressure section, assembly and final testing, and the French partner in charge of the engine core (high-

“Engine development went very quickly,” recalls program manager Robert Vivier. “The first ground test was on July 9, 2006, and the engine reached nominal power. We carried out the first flight test using a flying testbed on December 6, 2007, and six months later the Superjet 100 made its first flight, powered by two SaM146s.”

Performance and simplicity

The SaM146 is technically sophisticated and yet simple, to ensure that its maintenance costs are signifi-

PHILIPPE PERRIN,
AIRBUS TEST PILOT

FLIGHT-DECK FEEDBACK

Philippe Perrin, a former fighter pilot and astronaut, is a test pilot at Airbus. He was also alternate test pilot for Snecma on the SaM146 program, and kept a close eye on the development of the new engine. Perrin co-piloted the Ilyushin IL-76 flying testbed for the maiden flight of the new engine. “The SaM146 was a fascinating adventure, based on a very tight-knit collaboration between French and Russian teams. During the test flights, I was struck by how we all spoke the same language: of technicians from two countries with a great tradition in aeronautics. During some 45 hours of testing on the IL-76, we were able to completely open the flight envelope and explore the engine’s handling qualities. In the end, we delivered a safe, responsive engine, which played a key role in the successful first flight of the Superjet 100.”

specific fuel consumption targets,” says Robert Vivier, “and the engine satisfies all environmental standards with room to spare.” Based on the SaM146’s performance, the Superjet 100 should carve out an excellent position in the highly competitive market for regional jets. Building on this initial success, the engine may well be chosen to power other new commercial airplanes. ■



SaM146 engine under the wing of the Ilyushin IL-76 flying testbed, in August 2007.

pressure section), control system, accessories and integration. Each partner is responsible for the design and development of the equipment under its responsibility. As the systems integrator, Snecma is coordinating the program, in association with NPO Saturn.

cantly lower than competing engines. For example, the core developed by Snecma largely draws on the company’s experience with the M88, the engine powering the Rafale fighter, as well as extensive work on its DEM21 core demonstrator program.

“We have met our performance and



Messier-Dowty designs and produces the complete landing gear system for the Superjet 100.

EQUIPMENT. In addition to the propulsion system, Safran provides other systems and equipment on the Superjet 100, starting with the landing gear and nacelles.

SAFRAN, MAJOR EQUIPMENT SUPPLIER ON THE SUPERJET 100

The Sukhoi Superjet 100 is a major program for Messier-Dowty, a Safran group company. This landing gear specialist has mainly worked on business aircraft and large commercial jetliners until now, but with the Superjet 100 it bolsters its position in the regional aviation market. “We were selected by Sukhoi in 2003,” recalls Carole Petit-Marty, program manager at Messier-Dowty. “When Sukhoi opted for a main gear with dual struts in 2005 we had to accelerate the pace of development.”

Design work was a concurrent effort by Messier-Dowty’s Canadian plant in Toronto, for the main landing gear, and the French plant in Vélizy, for the nose gear. Another plant, at Bidos in southwest France, will manufacture



Aircelle makes a complete nacelle system, including the thrust reversers, air inlets, nozzle, fan cowls, etc.

the shock struts and carry out final assembly of the nose landing gear.

The Superjet 100 is also the first regional jet to be fitted with fly-by-wire flight controls. This feature actually affects the landing gear, since it interfaces with about 50 other aircraft systems. As Carole Petit-Marty points out, "The control unit for landing functions is under the responsibility of Safran Electronics."

Because of the fast-paced development of the aircraft, a preproduction version of the landing gear was used on the Superjet 100 during its maiden

flight on May 19, 2008. "We're still working on development of the production-standard landing gear, optimized in terms of the weight budget, which will be certified at the same time at the airplane," adds Petit-Marty.

Qualification tests started back in November 2008 and fatigue tests will continue until 2014. "Most tests will be carried out in Toronto, except the fatigue tests for the main gear, conducted by the SibNIA research institute in Novosibirsk," notes Petit-Marty. "Static and fatigue tests

require the use of a wing section rigidity simulator. Loads are applied to this wing section during simulations of takeoffs, landing and taxiing. Russian certification authorities have also requested 'multi-drop' endurance tests, including a demonstration of sustained shock attenuation, and this is a first at Messier-Dowty."

Total responsibility

Fellow Group company and nacelle specialist Aircelle, selected by PowerJet at the end of 2003, is also logging a number of firsts.

the pylon, is a first for Aircelle. "This is the first time we've designed these parts, which means we had to start working with the engine-maker very early in the process," says David.

Aircelle is also in charge of final integration of the nacelle, a task known as podding. "The podding was performed by an Aircelle team based near the assembly line in Komsomolsk-on-Amur," says David. "We'll be delivering complete propulsion assemblies, so that the aircraft manufacturer just has to attach them under the wings."

The nacelle itself boasts aerodynamic and acoustic performance on a par with the latest Boeing and Airbus jetliners, a first for a regional jet in this class. "We're applying advanced technologies," adds David, "such as a single-piece acoustic panel for the air inlet. Large acoustic panels are also

used for the fan cowls, nozzle and thrust reversers." Aircelle has made wide use of composite materials to reduce overall weight, including on the nozzle.

Entering production

Sukhoi plans to deliver the first production Superjet 100 at the end of the year. Which means that Messier-Dowty, Aircelle and other Safran companies are stepping up the pace to meet this tight deadline. Messier-Dowty has already delivered the first landing gear shipset, and expects to deliver a few more by the end of the year. Aircelle is moving forward at the same rate, and will complete manufacture and podding of nacelles for all test aircraft by the beginning of the summer. Its plants will then make the transition to production-standard equipment. ■

SAFRAN'S CONTRIBUTION TO THE SUPERJET 100

ENGINE

SNECMA (VIA POWERJET)
• SaM146 propulsion system

ENGINE EQUIPMENT

TECHSPACE AERO
• Lubrication systems

MICROTURBO
• Air starter

HISPANO-SUIZA
• Electrical equipment
• Hydromechanical equipment
• FADEC (via Fadec International)
• Engine control system components

TECHNOFAN
• Fans

SAGEM
• Engine overspeed controller

AIRCELLE
• Thrust reversers
• Nacelles

SOFRANCE
• Engine injector upstream filter
• Main fuel filter

SNECMA PROPULSION SOLIDE
• Mixed flow nozzle (MFN)

OTHER EQUIPMENT

MESSIER-DOWTY
• Landing gear