



PowerJet

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1/. PowerJet overview

The regional market is expected to log the highest growth rate of any air transport segment in the next twenty years. To meet the specific needs of this market, Snecma and NPO Saturn are offering the purpose-designed SaM146 engine.

In July 2004, the two companies created a 50/50 joint company called PowerJet, to handle all aspects of the SaM146 program management, including development, production, marketing and sales, as well as customer support and MRO services.

The partnership between Snecma and NPO Saturn goes back several years already, first through subcontracting for CFM56 engine parts, and now for the SaM146 propulsion system destined to the regional aircraft market. Snecma and NPO Saturn decided to team up on a new regional jet engine in 2002. This move reflected both confidence in the market (estimated at a potential of 5,000 aircraft in the 70-120 seat category over the next 20 years), and long-standing mutual trust between the two partners.

In April 2003, the SaM146 was selected by Sukhoi Civil Aircraft Company (SCAC) for the Superjet 100 regional aircraft, which will be the first application for the SaM146.

2. A new player in the regional jet market

PowerJet structure, location and role

The PowerJet joint venture, created in July 2004, is equally owned by Snecma and NPO Saturn. It is in charge of all SaM146 program management tasks, spanning design, production, marketing, support and services.

Responsibilities

Within this entity, Snecma is in charge of the core engine, control system unit, accessory drive (accessory gearbox, transfer gearbox), overall propulsion system design integration and flight testing. NPO Saturn is responsible for the components of the low-pressure section, engine production assembly and ground testing. Aircelle (SAFRAN Group) is in charge of the nacelle.

PowerJet will therefore deliver a complete propulsion system, comprising engine, nacelle and equipment.

Robust financing plan

Due to their high credit rating and the strength of the SaM146 business case, PowerJet shareholders enjoy the support of the French and Russian governments and banks to finance the development and investments linked to the programme.

3. The SaM146 engine

The SaM146 engine has all the advantages needed to enter a very competitive market, with very demanding customer requirements in terms of low cost of ownership, high dispatch reliability, maintainability and environmental friendliness. The SaM146 incorporates proven advanced technologies, to give airlines economical operation in commercial service.

A new concept

- It is a complete propulsion system, comprising engine + nacelle + equipment, which means PowerJet is the single point of contact for customers..
- It is the only engine designed and developed from the very beginning for the regional aircraft market.
- It ranges in thrust from 13,500 to 17,500 lb. Therefore, with a single engine powering an entire family of aircraft, the airlines will reap the benefits of commonality and economies of scale.

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- It offers comprehensive services covering an extensive range of tailored support and maintenance services. The SaM146 capitalizes on Snecma's and Saturn's vast experience with product support. SaM146 MRO will be provided exclusively by PowerJet, through the global networks of Snecma Services (CFM56) and NPO Saturn.

Advantages

- Airlines can simply adjust the thrust level via the engine control system unit and benefit from Engine Management Optimization.
- The SaM146 will meet the most stringent environmental standards both in terms of emissions and noise.
- It features a modern architecture, based on experience with the CFM56 (the most reliable and economical engine in its class), and using a single-stage high-pressure turbine. The SaM146 high-pressure compressor has fewer stages and fewer parts than all its competitors, which helps reduce maintenance costs as well as engine weight and fuel consumption. The upshot is a significant reduction in cost of ownership.
- It ensures the airlines of the best product value through an optimized cost of ownership thanks to engine reliability, low parts count, easy flight-line maintenance and reduced repair costs, with a 20% reduction target over current engines in this class;
- PowerJet is setting up a complete support organization, designed to meet all daily and long term airline expectations through Customer Support Management Team, a Customer Support Center (24/7), training support, flight operational support, etc.
- PowerJet offers a wide range of services for the SaM146 propulsion system well suited to customer needs.

4. Other cooperation activities between Snecma and NPO Saturn

Parts production: VolgAero, a Western showcase in Russia

The VolgAero plant, inaugurated in October 2005, includes over 10,000 square meters of workshops, plus another 2,500 square meters of offices.

VolgAero primarily makes parts for the SaM146: fan disk, low-pressure spool, HP compressor casing, HP and LP turbine casings, supports for bearings, intermediate casing, exhaust casing and all accessory components.

The plant has three product lines: rotating parts; mechanical and mechanically-welded casings; and engine accessory components. It also offers shared facilities for chemical, thermal and surface treatments (plasma, shot-peening, sand-blasting, etc.).

Open-air test cell

On June 7, 2007, the SaM146 carried out its first ground tests on the open-air test cell located in Poluevo (Russia, Rybinsk area). This test rig covers three types of testing: performance, certification tests (operation in cross-wind, water and ice ingestion), and acoustic certification of the propulsion system.

Cenco International, a subsidiary of Techspace Aero (SAFRAN Group) has designed the open-air test bed, while NPO Saturn was in charge of building the pylon. A special joint venture has been created to manage this test cell.

5. Program update, sales & marketing

PowerJet is progressing with development testing of the SaM146 engine. A total of eight engines will be used for the certification tests and 10 compliance engines to support aircraft certification flight tests. Certification is slated for 2008.

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Test series

On June 7, 2007, the SaM146 carried out its first ground test on the open-air test cell in Poluevo near Rybinsk, Russia. This test rig is used for three types of tests: performance, certification (crosswind, water and ice ingestion), and acoustic testing of the complete propulsion system.

Following the first ground test, announced at the Farnborough Airshow in 2006, the SaM146 has logged more than 800 hours of operation to date. It has demonstrated sound mechanical and dynamic performance, and temperature map are in line with expectations. Core and high-pressure compressor tests have provided excellent results, as has FADEC operation. The engine has already demonstrated takeoff thrust in excess 18,000 pounds.

On December 6, 2007 the SaM146 started its flight test campaign on an Il-76LL flying laboratory provided by Russian LII Gromov flight research institute. This is the first of the two scheduled steps of engine flight tests. The first part is taking place in Zhukovsky, Russia. The second part of the tests will be carried out in Snecma flight testing center in Istres, in the South-East of France.

The flight test campaign objectives are: engine performance and operability, engine system operations under various flight conditions, engine start within the range of expected operating conditions and engine control systems.

Sales and Marketing

PowerJet is taking part in sales & marketing initiatives along with Sukhoi Civil Aircraft Company (SCAC) and Superjet International (a Sukhoi / Alenia Aeronautica joint-venture), to offer integrated proposals.

Launch customer Aeroflot, the Russian airline, has ordered 30 95-passenger versions of the Superjet 100 in the standard configuration. Other orders have been received from: Finance Leasing Company (10 aircraft), Air Union (15 aircraft), Dalavia (6 aircraft), Armavia (2 aircraft) and ItAli Airlines, the first Western customer (10 aircraft). Sukhoi Superjet 100 firm order portfolio totals 73 aircraft.

6/. PowerJet's parent companies

- **Snecma**

The world's broadest choice of aircraft and rocket engines

Part of the SAFRAN Group, Snecma is one of the world's leading aerospace propulsion companies, offering the broadest choice of aircraft and rocket engines.

Snecma designs and produces commercial engines that are leaders in their thrust class, such as the CFM56, the world's best selling and most reliable commercial aircraft engine. CFM56 engines, produced in partnership by Snecma and General Electric, power 7,200 Airbus and Boeing aircraft for some 500 customers and operators worldwide, and have set a new standard of reliability and operating cost in commercial jet propulsion. Snecma is also a partner to General Electric on various large turbofan engines: the CF6, GE90 and GP7200.

Snecma is active in all three segments of the military aircraft market – combat, training and transport – with the M88-2 (Rafale), the M53-P2 (Mirage), the Larzac® for trainer aircraft and the TP400-D6 turboprop engine for the A400M military transport aircraft.

Snecma is the propulsion prime contractor on Europe's Ariane space launchers. It develops and produces a wide range of propulsion systems and equipment for launchers, space vehicles and satellites (Vulcain®2, HM7B, PPS®1350, etc.).

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Partnerships with Russian aerospace industry

Over the past few years, Snecma has embarked on a policy of collaboration with Russian partners, especially for the production of CFM56 engine parts. And CFM56 engines power some 110 jetliners for 16 airlines. Snecma also teams up with Russian company Fakel to develop plasma thrusters for spacecraft.

In addition to this industrial teaming, Snecma has established scientific and technical partnerships with Russian universities, the aeronautical labs CIAM, TsAGI, VIAM and the flight testing specialist LII Gromov.

- **NPO Saturn**

At the cutting edge of Russian engine technology

NPO Saturn is the main Russian designer and manufacturer of gas turbines for aviation and industry. The company produces engines for both civil and military aircraft, along with turbogenerator sets for electric power plants and gas pumping stations, and engines for unmanned aerial vehicles. Deploying an extensive array of state-of-the-art production and R&D resources, NPO Saturn develops and produces advanced gas turbine solutions.

NPO Saturn has two main strategic objectives in its development of aircraft engines: continuous upgrades to engines throughout aircraft service life, and working with leading companies around the world to develop new engines. More than 4,000 D-30KU/KP commercial engines are operated by 139 Russian and international airlines and have logged over 40 million flight-hours.

NPO Saturn engines power the world-famous Sukhoi fighters, such as the AL-31FP engine that powers the advanced multipurpose 4+ generation Su-37 and Su-MKI fighters. These aircraft are in operation in the air forces of the Russian Federation and other countries around the world. In addition, NPO Saturn makes helicopter turboshaft engines and turbofan engines for small unmanned aerial vehicles.

The SaM146, a strategic challenge

Aiming to establish its position in the global civil aviation market, NPO Saturn actively supports international collaboration with industry leaders, including Snecma. Through the SaM146, NPO Saturn will enter the civil aviation market with a very modern product, designed to be certified to standards set by EASA (Europe) and the FAA (United States). The SaM146 offers a major opportunity for the Russian aviation industry, at the very moment when it is ready to re-enter the global aviation market.

7/. SAFRAN Group companies involved in the SaM146/Superjet 100 program

Snecma: SaM146 engine
Aircelle: nacelle & thrust reversers
Hispano-Suiza: engine control system
Microturbo: air turbine starter
Sofrance: engine filtration system
Techspace Aero: engine lubrication unit
Snecma Services: engine maintenance, repair and overhaul
Cenco Inc.: open-air test cell
Sagem Défense Sécurité: engine over speed unit
Messier-Dowty: Superjet 100 landing gear system
Snecma Propulsion Solide: mixed flow nozzle

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