

[Aviation Expo China 2009]





C O N T E N T S

☪ **Snecma news in Aviation Expo China 2009..... p. 1**

Engine programs news

☪ **CFM56..... p.3**

☪ **LEAP..... p.5**

☪ **SaM146..... p.6**

☪ **M88..... p.8**

☪ **TP400..... p.9**

☪ **Space engines..... p.10**

☪ **MRO news..... p.11**

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News



Snecma Xinyi Airfoil castings Co, Ltd plant

Snecma's strategy in China

Snecma has established close ties with Chinese industry over the past 20 years, reflecting its commitment to bolstering collaboration with Chinese partners on major aviation programs.

Two new plants in China

In mid-2008, Snecma opened two new industrial plants in the country: Snecma Suzhou Co and Guiyang. Both are now up and running.

Snecma Suzhou Co Limited is located in Suzhou Industrial Park, Jiangsu Province, 80 kilometers west of Shanghai. This new 14,000 square meter facility houses engine procurement and manufacturing operations.

Snecma Xinyi Airfoil Castings Company Limited and Guizhou Xinyi Machinery Factory (AVIC I group) have set up a new production plant in Guizhou Province, near Guiyang. This new facility is dedicated to the manufacture of blade and vane castings for aircraft engines. It also provides general technical support to the Chinese aviation industry. Snecma and Xinyi first started collaborating on blade manufacture for commercial aircraft engines back in 1997.

Snecma has also developed very successful teaming arrangements with other plants in China. The company currently teams up with Shenyang Liming Engine Manufacturing Corporation, Xian Aero-Engine Corporation, Guizhou Liyang Aero-Engine Corporation, and Beijing Aero-Lever Precision, as well as the companies Baimtec, Hongyuan and Baoji.

CFM56 engines in Greater China

Commercial aviation is booming in China, supporting the economic development. Today, nearly 2,000 CFM56 engines are in service in the country, powering Boeing 737, Airbus A320 and A340 jetliners. Most airlines in Greater China use our engines, including major, independent and regional carriers: Air China, Cathay Pacific, China Airline, China Eastern, China Sonangol, China Southern, China United, Donghai, East Star, Hainan, Honk Kong Express, Juneyao, Lucky Air, Mandarin Airline, Okay, Postal, Shandong, Shanghai, Shenzhen, Spring, United Eagle, Xiamen, Yangtze River Express.

CFM applies a special support strategy in China, as shown by the CFM56 Aero-Engine Maintenance Training Center (AEMTC) in Chengdu, Sichuan Province. Created ten years ago by Snecma and General Electric in conjunction with Chinese civil aviation authorities, this school has already trained nearly 8,000 airline technicians.

First CFM56-powered A320 assembled at Airbus Final Assembly Line China (FALC)

In July 2009, Airbus delivered the first CFM56-powered A320 twinjet assembled at its Final Assembly Line China (FALC) in Tanjin. Snecma, operating through CFM International, provides full support to the Airbus Tanjin plant, including a dedicated team. This latest initiative reflects another long-term partnership with China.

Overview



News

Snecma's MRO services in China

Chinese airlines have long counted not only on Snecma's products, but also on its services (MRO, on-wing support). In 1999, Snecma teamed up with partner Air China to set up a CFM56 engine maintenance center near Chengdu Shuangliu International Airport. This facility offers a wide range of MRO (maintenance, repair and overhaul) services for the CFM56 engine family.

Sichuan Snecma Aero Engine Maintenance started operation in 2000 and has expanded its range of capabilities over the last 10 years. It now has 227 employees and provides MRO and Mobile Engine Services for the CFM56-3, CFM56-5 and CFM56-7. Sichuan Snecma Aero Engine Maintenance has also been certified by the CAAC, FAA, EASA and DGAC Indonesia. Sichuan Snecma to date has repaired up to 350 CFM56 engines.

Joint research and educational programs

Snecma has operated in China for many years, and is investing in the future by collaborating with China's excellent universities and laboratories. Snecma and the Ecole Centrale de Lyon engineering school have an agreement with the three top Chinese aeronautical universities to train Chinese engineers in France: Beijing University of Aeronautics and Astronautics (BUAA), Northwestern Polytechnic University (Xi'an) (NWPU) and Nanjing University of Aeronautics & Astronautics (NUAA). The Safran group recently took part in the creation of the "Ecole Centrale de Beijing", in partnership with the University of Beihang, and the creation of a Chinese-European institute of engineering, in partnership with the Tianjin University of Civil Aviation. These agreements open new prospects for collaboration in Research & Technology, by setting up joint programs with Chinese research organizations in key disciplines for Snecma. Snecma is very pleased to participate in these projects, and to take an even more active role in Chinese education and research.

SNECMA IN GREATER CHINA AT A GLANCE

- **Suzhou industrial plant: procurement and manufacturing operations for engines and landing gear, plus general technical support to the Chinese aviation industry.**
- **Guiyang industrial plant, dedicated to the manufacture of blade and vane castings for aircraft engines.**
- **Nearly 2,000 CFM56 engines in service in Greater China.**
- **Nearly 8,000 airline technicians trained in the CFM56 Maintenance Training Center in Chengdu, Sichuan Province.**
- **Investment in the future by collaborating with China's universities and laboratories.**



News



CFM56 engine

The world's best-selling commercial aircraft engine

CFM International has confirmed its leadership in the engine market for mainline commercial jets (over 100 seats).

CFM is the preferred supplier of commercial aircraft engines, with products that set the industry standard for reliability and total cost of ownership. Nearly 20,000 CFM56 engines have been delivered to date to more than 500 customers around the globe.

CFM Tech Insertion brings lower fuel burn, longer on-wing life

CFM International's advanced CFM56 Tech Insertion configuration delivers lower fuel consumption, longer on-wing life, lower maintenance costs and lower emissions to some 180 operators worldwide. By the end of May 2009, more than 2,200 Tech Insertion engines had been delivered and the fleet had logged more than 6 million flight-hours and 3.5 million flight cycles.

CFM56 Tech Insertion gives operators a reduction of up to 1 percent in specific fuel consumption, along with longer time on wing through an equivalent 15 - 20° C additional exhaust gas temperature margin; and from 5 to 15 percent lower maintenance cost (depending on the thrust rating) through enhanced durability. The engine also meets the new International Civil Aviation Organization (ICAO) Committee of Aviation Environmental Protection standards (CAEP /6) that took effect in early 2008.

CFM56-7BE certification program on schedule

CFM plans to complete extensive ground certification tests of the new CFM-7BE standard in the third and fourth quarters of 2009, including performance and acoustics testing. In early 2010, the -7BE configuration will begin flight tests at GE Aviation facilities in Victorville, California, paving the way for engine certification in the third quarter of that year. Flight tests on the Next-Generation 737 are planned for later in 2010, followed by aircraft certification and entry into service in mid-2011.

CFM launched the new CFM56-7BE engine enhancement program on April 28, 2009, for service entry in mid-2011 to coincide with Boeing Next-Generation 737 airframe improvements. The CFM56-7BE-powered Next-Generation 737 will provide a 2 percent improvement in fuel consumption, which in turn means a 2 percent reduction in carbon emissions. Furthermore, the enhanced -7B will reduce maintenance costs by up to 4 percent, depending on the thrust rating.



News

TRUEngine™ quality label

CFM's TRUEngine program has grown since its launch in mid-2008, in terms of both industry acceptance and additional value to the qualifying airline fleets. To date, more than 3,000 CFM56 engines in service with over two dozen operators worldwide have met the TRUEngine qualification criteria. In addition to the inherent configuration-based benefits of enhanced asset value and optimal supportability, the TRUEngine program features extended new part guarantees and increased lease pool support for customers with qualified engines. New parts installed during shop visits will come with extended material replacement coverage. This will be transferable to secondary engine owners, if TRUEngine status is maintained.

The TRUEngine designation is available to all CFM56 engines meeting the criteria. To qualify for TRUEngine status, the engine configuration, engine overhaul practices, spare parts and repairs used to service the engine must be consistent with CFM requirements for that engine model. The qualification data is obtained through a combination of operational and maintenance records for the fleet.

BACKGROUND INFORMATION

- **CFM56, the world's best-selling commercial aircraft engine.**
- **Dispatch reliability of nearly 100%.**
- **More than 500 customers around the world.**
- **A CFM56-powered aircraft takes off somewhere in the world every 3 seconds!**
- **CFM continuously improves CFM56 engines by incorporating the latest technologies.**
- **CFM integrates evolving market requirements, especially for lower noise and emissions, a key to its success and global reputation.**

LEAP PROGRAMME



News



RTM fan blade test on a CFM56-5C

A new engine for the next generation of commercial jets

Snecma and its partner General Electric are developing within CFM, the LEAP-X, an entirely new baseline turbofan engine to power the next generation of single-aisle commercial jets.

The new LEAP-X engine concept is largely based on advanced aerodynamics, environmental and materials development programs. It will feature revolutionary technologies including 3-D woven resin transfer molding (RTM) composite fan and case and an advanced core (featuring an 8-stage compressor, advanced Twin-Annular Pre-Swirling mixer (TAPS II) combustor, and single-stage high-pressure turbine).

Tests under way

On June 12, 2009 the first core in CFM International's LEAP-X development program began its 100-hour ground test program in a special altitude test chamber at GE Aviation facilities in Evendale, Ohio. At the same time, the full-scale LEAP RTM composite fan is completing extensive cross-wind and acoustics tests at GE's unique outdoor test facility in Peebles, Ohio. CFM successfully carried out a series of full-scale fan demonstrator tests with the 3-DW RTM fan blades in March 2009. The RTM demonstrator has completed its first extensive performance tests at Snecma facilities in Villaroche, France, and in May 2009, it carried out performance, operability, acoustic and crosswind testing at GE's outdoor test facility in Peebles, Ohio.

The innovative new RTM composite technology reduces engine weight by approximately 400 pounds and fan blade count by 25 percent.

Open-Rotor configuration

CFM is currently conducting studies on four aspects of the open rotor configuration: aerodynamic and acoustic studies for fan blades, mechanical design studies, including the rotary mechanisms for the fan blades, and studies on the installation of this type of engine on an aircraft, as well as certification methodologies. Tests of a demonstrator to validate the advanced technologies has started in 2009 and will continue until 2011. The open rotor concept aims to reduce fuel burn by 26 percent compared to today's CFM56 engine.

LEAP-X GOALS

The goals for LEAP-X include reducing the engine's contribution to aircraft fuel burn by up to 16% compared to current CFM56 Tech Insertion engines. Additional fuel burn improvements will be achieved once this engine is paired with new aircraft technology. This will bring a comparable improvement in CO2 emissions. LEAP-X is also designed to reduce NOx emissions by 50 to 60 percent compared to the current International Civil Aviation Organization (ICAO) CAEP/6 limits.

The first complete demonstration engine is scheduled to run in 2012, and the LEAP-X should be certified by 2016.

SaM146



News



On track for certification

2009 is a pivotal year for the SaM146, with certification by the European Aviation Safety Agency (EASA).

The SaM146-powered Sukhoi Superjet 100 was in the spotlight for its first public appearance at the 2009 Paris Air Show in June. This appearance marked a major milestone in the SaM146 program, while also proving the engine's maturity. Last August, the SSJ100 also featured in flight demonstrations at MAKS 2009 in Zhukovsky, Russia.

Headed for certification

Eight SaM146 engines are now being used for the development and certification test programs. Six compliance engines are currently powering the three Sukhoi Superjet 100 test aircraft. Production-standard parts are already being manufactured in preparation for the service entry of the SSJ100. The SaM146 has now completed 90% of its certification program. PowerJet is gearing up for the remaining tests, including blade loss, ice and bird ingestion and endurance under ultimate operating conditions (block test).

Focus on SaM146 engine tests

At July 31, 2009, the SaM146 had logged 4,200 hours of testing, including 1,600 on the flying testbed and the SJJ100. All tests to date have shown exemplary engine behavior and performance in line with specifications. In addition to its extensive ground and flight testing program, the SaM146 has demonstrated its ability to power the aircraft on long flights, comparable to those in revenue service. The engine's performance and maturity show that it is ready to start commercial operation. On July 25, 2009, the third Sukhoi Superjet 100 prototype made its first flight at Komsomolsk, further energizing the flight test program. SSJ100 test aircraft have accumulated more than 300 flights to date.

First SaM146 customer support agreement with Armavia

PowerJet signed its first customer support agreement in June 2009 with the airline Armavia. This contract covers the SaM146 propulsion system on the airline's upcoming fleet of Sukhoi Superjet 100 regional jets.

PowerJet has set up a complete support organization to meet all airline requirements, including a Customer Support Management Team, Customer Support Center (24/7), training and flight operations support. As the single point of contact for the entire propulsion system, PowerJet will set a new standard in Customer Support, thanks to its responsiveness, global network and efficient local support.

SaM146



News

Marketing & Sales

PowerJet is taking part in SSJ100 marketing & sales initiatives along with Sukhoi Civil Aircraft Company (SCAC) and Superjet International (a Sukhoi/Alenia Aeronautica joint-venture). At June 30, 2009, Sukhoi had recorded a total of 122 firm orders for the SaM146-powered Sukhoi Superjet 100.

Industrial collaboration between Snecma and NPO Saturn

The VolgAero plant, inaugurated in October 2005, is a state-of-the art production facility in Rybinsk, Russia. It spans some 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 & LP turbine casings, bearing supports, 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, shotpeening, sand-blasting, etc.).

Snecma and NPO Saturn built an open-air test cell in Poluevo, Russia (near Rybinsk) in 2007 to handle certification tests for the SaM146. This test rig covers three types of testing: performance, certification tests (operation in cross-wind, water, ice and bird ingestion), and acoustic certification of the propulsion system. This is the only open-air test cell for this type of engine in Russia and all of Europe, it is also suitable for tests of other engines types.

SAFRAN Group companies involved in the SaM146/SSJ100 program :

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

BACKGROUND INFORMATION

- **A complete propulsion system, comprising engine, nacelle, thrust reversers.**
- **Purpose-designed to meet the requirements of the regional jet market**
- **Reduced total cost of ownership.**
- **A single engine for a family of aircraft (70 – 120 passengers).**
- **Modern architecture, based on Snecma's extensive experience with military and commercial engines.**



M88 engine at Snecma Villaroche plant

State-of-the-art combat engine

The M88 is the first member of a family of new-generation engines designed to power advanced combat and training aircraft for the 21st century. It is especially well suited to low-altitude penetration and high-altitude interception missions.

The M88-2 is a state-of-the-art combat aircraft engine, with non-polluting combustor, single-crystal turbine blades and powder metallurgy disks. The M88 features a highly modular state-of-the-art design (comprising 21 major modules), for quick return-to-service after maintenance, since the module in question can be removed for maintenance or overhaul without grounding the aircraft. Furthermore, the M88 is the only engine of its kind that can be returned to service after changing modules without requiring a new ground acceptance test – all it needs is a simple leaktightness test.

M88 engines have logged more than 100,000 flight hours to date on Rafale fighters in service.

M88 "TCO pack"

French defense procurement agency DGA (Délégation Générale pour l'Armement) announced its selection of Snecma in January 2008 for the "TCO Pack" (Total Cost of Ownership package) contract for the M88-2 engine, to support the development and production of upgrades to M88-2 engine parts. The first "TCO Pack" standard M88 engines will be delivered in 2011. Upgrades are planned to the high-pressure compressor and high-pressure turbine, and are derived from various technologies tested during the ECO development program.

The M88 TCO Pack program is on track, with the first development engine now on test at Snecma's Villaroche facility. The First Engine To Test (FETT) is scheduled for September 2009.

M88 ECO PROGRAM

The M88 ECO program, designed to demonstrate new technologies that could reduce operating costs and increase dispatch reliability, was completed at the end of 2007. It met all initial objectives, including longer engine parts life, lower cost of ownership (including reduced operating costs) and higher performance (4,000 total accumulated cycles/TAC).



TP400 on its C-130 Flying test bed

TP400 continues its flight tests

Europrop International is continuing performance, mechanical and endurance tests on the TP400 turboprop engine, leading to certification.

The TP400 turboprop engine has passed the mark of 3,500 hours of ground testing, using six dedicated test stands in Europe (closed or open-air test cells), with or without the propeller mounted on the engine.

A Marshall Aerospace C-130 Hercules flying testbed fitted with a TP400 engine made a successful first flight in December 2008, marking a major step forward in the A400M program. Early September 2009, the C-130 flying testbed with the TP400 had logged more than 45 hours of testing without issues.

These flights have demonstrated engine performance up to maximum power, along with different ratings and maneuvers, windmill relights and the vibration stress survey to clear the new Ratier-Figeac/Hamilton Sundstrand propeller.

The engines have had ground clearance since March 2009.

TP400 engine performs now flying tests hours with A400M clear for flight main objective.

BACKGROUND INFORMATION

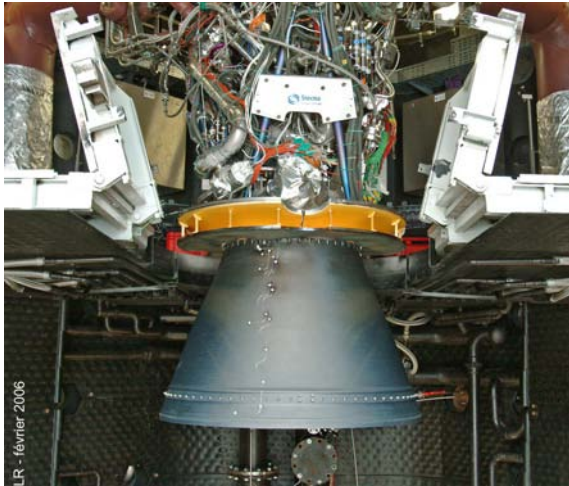
Europrop International GmbH (EPI) was created by four leading European aero-engine companies – Industria de Turbo Propulsores, MTU Aero Engines, Rolls-Royce and Snecma (SAFRAN group) – to manage the TP400 engine program.

Designed to power the Airbus Military A400M military transport, the TP400 will be the most powerful turboshaft engine in the West. It features a three-shaft configuration and will deliver a maximum of 11,000 shaft horsepower. More than 800 engines will be required for the 192 A400M aircraft ordered to date by nine countries.

Space engines



News



Vinci® engine at the test bed

The best balance of performance, reliability and cost

Over the last three decades Snecma has developed a number of international partnerships and alliances with leaders in the space industry.

High Thrust Engine Demonstrator contract with ESA

In June 2009, Snecma signed a contract with the European Space Agency (ESA) concerning a planned High Thrust Engine Demonstrator for the first stage of the next-generation Ariane launcher.

This project encompasses a broad array of technology developments for advanced subsystems to meet ambitious cost and reliability objectives. Various cryogenic propulsion development and system studies within the scope of ESA's Future Launchers Preparatory Program (FLPP) federate the efforts of European industry and pave the way for upcoming decisions on the next generation of launchers.

Vinci® development phase

The new Vinci® upper-stage cryogenic engine has successfully completed all tests to date and has achieved major development milestones: proven expertise in the expander cycle, nominal thrust, demonstration of restartability, deployment test of the ceramic matrix composite (CMC) nozzle, and more than 2,300 seconds of firing tests on a single engine (three times the normal length of a mission). In early 2009, Snecma resumed Vinci® engine tests, especially concerning the deployment of the CMC nozzle. For Snecma, the main objective now is a ground test of the engine and its nozzle in 2011, using a near flight-standard configuration.

Over 40 years of experience in satellite propulsion

Snecma has developed, integrated and tested satellite propulsion systems for over 40 years, with the support of both ESA and French space agency CNES. Today, Snecma is specialized in plasma propulsion, a technology it pioneered in Europe more than 15 years ago, in conjunction with Russian partner EDB Fakel. The PPS®1350 stationary plasma thruster is used for both orbit control and transfer on satellites and space probes. Its major advantage is its high specific impulse, which considerably reduces the weight of spacecraft compared with those using conventional chemical propulsion. It also offers an excellent thrust-electrical power consumption ratio, which limits the activation time needed for each maneuver.

BACKGROUND INFORMATION

Snecma leads 40 partners in 12 ESA countries to produce the Vulcain 2 and HM7B cryogenic engines for Ariane 5, while also working on development of the new Vinci® upper-stage cryogenic engine.



Servicing a CFM56-5C

A global player

Snecma's major objectives: extend engine life on-wing, enhance performance and reduce operating cost.

Market trends

Engine MRO is an extremely competitive market, with growth driven by increases in air traffic, as well as expanding and aging fleets. In the specific case of the CFM56 turbofan family, market growth is tempered by the increasing reliability of each succeeding generation, which stretches out the average time between shop visits.

We believe that the number of CFM56 shop visits worldwide will show steady growth from 2009 to 2013, as the CFM56-3 is gradually withdrawn from service, while the number of CFM56-5B and -7B engines continues to grow.

Snecma maintained its position as the No. 2 CFM56 service provider worldwide in 2008. We are adapting our industrial capacity to better meet market needs, and we listen to our customers to offer solutions custom-tailored to their requirements. Snecma opened a new CFM56 repair shop last year in Queretaro, Mexico, Snecma America Engine Services, joining existing facilities in Belgium, Morocco and China.

Industrial performance

- After implementing various Lean-Six Sigma improvement measures to enhance customer satisfaction, the Saint Quentin plant has decreased turnaround time (TAT) for CFM56 overhauls to about 60 days.
- The Châtellerault plant has launched a project to restructure its military engine and parts repair areas to adapt to the growth in demand from the civil sector.

RAMPING-UP THE INTERNATIONAL NETWORK

- **Snecma Morocco Engine Services delivered its 200th engine in 2008.**
- **Sichuan Snecma Aero Engine Maintenance expanded its range of capabilities.**
- **Snecma America Engine Services serviced and delivered its first engines in Q1 2009.**
- **Propulsion Technologies International will move to new premises at the end of 2009 to keep pace with growing workload.**
- **Snecma Services Brussels will extend its capabilities to include the CFM56-7B.**
- **Tarmac Aerosave, in which Snecma is a partner, has been certified to PART 145 and is gearing up to start operations.**