Above, a 3D computer view of the LEAP-X engine. Right, the open rotor layout.

RESEARCH. The LEAP-X engine, successor to the famous CFM56, will be ready by 2016. It will enable airlines to meet increasingly stringent economic and environmental requirements.

LEAP-X, A TRAILBLAZER FOR TOMORROW'S AERO-ENGINES

Snecma (Safran Group) and General Electric, already partners for 34 years on the best-selling CFM56 jet engine, announced the extension of their partnership to 2040 at the Farnborough air show in England last summer.

The two engine-makers clearly signaled their intention of building solid foundations for the future by launching the LEAP-X, a new-generation turbofan engine that will take over for the CFM56. In particular, LEAP-X will incorporate the technical innovations proven in the LEAP56™ technology development program, launched in 2005. The expected performance improvements are largely a result of lightening the engine and increasing its efficiency, without penalizing the extraordinary reliability that has earned the CFM56 family its worldwide reputation.

"A demonstrator will make its first ground runs in 2012 and the LEAP-X engine will be certified in 2016," according to Olivier Savin, head of CFM56 programs. "This will be a highly innovative engine, enabling us to meet the expectations of both aircraft manufacturers and airlines. At the same time, we're continuing to work on the open rotor concept, which could be considered a disruptive technology, involving various technical challenges. It would enable us to significantly increase engine efficiency, but we will still have to demonstrate its feasibility in the near future. The LEAP-X engine will consume less fuel and generate less pollution, so that we can meet and even exceed future environmental regulations. In fact, we've set some very ambitious goals in these areas."

The nacelle for the new engine, being developed by fellow Group company Aircelle, will also help achieve these results (see box).

Ambitious objectives

"LEAP-X will be a turbofan engine with a bypass ratio of about 10:1, a fan diameter of 70 to 74 inches and a high compression ratio," notes Jérôme Friedel, future product engineering manager. Snecma and GE will split the work along the same lines as for CFM International: Snecma will design and manufacture the fan module and low-pressure turbine, while GE will be in charge of the core, or high-pressure section. The improvement in performance over current engines will come from significantly optimized thermodynamics, enhanced understanding of 3D design, wider use of composite materials (organic and ceramic matrix composites, titanium aluminide), and the use of innovative industrial processes (such as 3D woven parts along with resin transfer molding).

"These innovations will be incorporated on the fan housing and blades, as well as the low-pressure turbine, which will be fitted with CMC blades for the first time," adds Friedel. "The fan module and LP turbine should generate weight savings of 200 and 125 kilos, respectively, compared with CFM56 technology."

General Electric is working on the core, and the first demonstrator is slated to start bench tests in the summer of 2009. Like the other parts of LEAP-X, the core will feature third-generation 3D aerodynamic design, along with new materials for the combustor.

Assembly of the fan module, core and low-pressure turbine is expected in 2012, followed by first ground tests of the complete engine. It should be certified in 2016, giving aircraft manufacturers a brand-new engine perfectly suited to the next generation of short/medium-range single-aisle commercial jets. ■

VIEWPOINT


© Brauner

JEAN-PIERRE COJAN,
CHAIRMAN AND CEO OF AIRCELLE

An innovative nacelle for LEAP-X

"The LEAP-X nacelle with be lighter and more streamlined to help reduce aircraft fuel consumption and overall weight. Aircelle will deliver a demonstration nacelle for the new engine by 2012. The targeted weight savings will be achieved by using composite materials for about 80% of the nacelle. Furthermore, a new fan housing and inlet design will provide more efficient secondary airflow. Other research is under way, aimed at electrifying certain functions, enhancing the sizing of some structural parts, and using a variable geometry nozzle."

ENVIRONMENTAL OBJECTIVES AT A GLANCE

- Fuel consumption: 16% better than current engines
- Noise: 15 to 20 dB better than Stage IV standard
- NOx emissions: 60% better than CAEP6 standard