INNOVATION. Composites are emerging as the material of choice for aircraft engine nacelles. Aircelle has therefore opened a new composites laboratory to consolidate its cutting-edge position in this richly promising market.

NACELLES: THE FUTURE LOOKS COMPOSITE

Tomorrow's nacelles will inevitably be made of composite materials. "In the 1980s, aircraft like the DC8 had all-metal nacelles," explains Pascal Marchant, Research & Technology program manager at Aircelle (Safran Group). "Today, the nacelles on the Airbus A380 contain about 60% composite materials." There are several reasons behind this development.

First, composite materials are about half as dense as aluminum, enabling significant weight savings for propulsion systems and the aircraft as a whole. "Reducing aircraft weight means lower fuel consumption," stresses Marchant. Secondly, composite components can be made as single-piece parts, and integrated in a single step, unlike yesterday's multi-part assemblies. This goes hand-in-hand with another benefit: there are no restrictions on component geometry. "We have a range of processes that allow us to deliver literally any feasible geometry," adds Marchant. Complex configurations like double curves are now possible. A further significant advantage is that composite materials enhance acoustic performance in a way that metal does not. The A380, for example, has been dubbed "the silent giant", notably due to the acoustic qualities of the nacelle, which makes the new Airbus super-jumbo almost as quiet as a single-aisle aircraft one-third its size.

Improvements in the intrinsic properties of nacelles through the use of composite materials, and the associated fuel savings, make the new technology extremely attractive to airlines and planemakers. Composite nacelles can also increase resistance to fatigue, thereby helping reduce maintenance requirements.

Still a lot to learn...

As part of its drive to deliver low cost of ownership solutions, Aircelle – a leading supplier of composite components to the aircraft industry – is investing heavily in research and development to optimize the composite material production process and thus offset the additional costs that are still associated with their use.

Generally made of a fiber-based reinforcement (glass or carbon fiber) and a binder (epoxy type resin, for instance), composite materials have not yet yielded all of their secrets. Aircelle's ongoing efforts to grow its expertise through research were given a renewed boost in November 2007 with the opening of a dedicated composites laboratory at Le Havre. "The technical resources have been in place for several years, but they were previously spread around the site," explains Frédéric Joubert, head of organic composites research at the R&T department. "The new lab project, launched 18 months ago, was aimed at bringing together all of our composite materials R&D resources – people and equipment – under one roof."

Armed with these newly focused capabilities, the laboratory has already begun work on the next generation of nacelles. "We have the ability to develop a nacelle that is more than 60% composite materials by weight" confirms Pascal Marchant. "By 2015, structural components now made of metal will be replaced by composites." Composites could even change the architecture of propulsion systems, as Marchant explains, "We are currently working with aero-engine manufacturers to investigate a better distribution of mechanical loads over the engine/nacelle structure." ■

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Composite materials are only half as dense as aluminum.

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Read the Webmag article on the new composites lab:
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SKILLS FROM SPACE

Snecma Propulsion Solide, a fellow Safran Group company headquartered in Bordeaux, took its first steps in the composite aircraft nacelles segment as recently as 2005, but things have moved fast since then. Under partnership agreements with Aircelle, SPS is manufacturing composite skins for the internal fixed structure (IFS) of the Airbus A380 nacelle, and the mixed flow nozzle (MFN) for the SaM146 engine, which will power the Sukhoi Superjet 100 regional jet. The MFN is being produced under a proportional risk and revenue sharing partnership between SPS and Aircelle. "This is the first time we have entered into a design-through-production agreement in the civil aviation sector, and we are right on schedule," says Jean-Michel Georges, civil aviation programs manager at SPS.

"Aircelle chose SPS because of our expertise in composite materials. The MFN for example, contains 70% composites. But it was also thanks to our willingness to enter into a risk-share, which showed our commitment to making headway in the civil aviation market." By applying technologies and skills developed for solid rocket motors to the aviation industry, SPS is looking to move into a new growth sector to compensate for a flat space propulsion market. "We are confident that the expertise offered by Bordeaux in the design, engineering and production of composite components will find additional outlets in the aviation market," concludes Jean-Michel Georges. "It would have been a shame if all this potential were only available to customers in the space market."