The aerospace materials of the future

Lighter, stronger and increasingly efficient, composite materials have only just begun to revolutionize the aerospace sector. Employed by Safran for more than thirty years, they are subject to a continuous innovation drive, supported by Safran Composites. Here is a closer look at a technology which offers the Group a decisive competitive advantage.

Reducing the weight of aircraft is a constant challenge for the aerospace industry. The ultimate goal is to cut fuel consumption and associated CO₂ emissions with a view to providing more economical and "greener" air transport. But this is not the only constraint facing manufacturers. "The materials used must be lightweight, of course, but they also need to be rigid and strong enough to withstand intense mechanical stress. They also need to withstand impact from hailstones and bird strikes in the case of engine parts," explains Jean-Pierre Poitevin, Vice President of Safran Composites, Safran Tech's R&T center devoted to Polymer Matrix Composites (PMCs). "For all of these reasons, PMCs provide the best possible compromise compared to metallic materials for temperatures below 150°C."

Towards new applications

Having employed polymer matrix composite materials since the 1980s, Safran is now a trailblazer in this field. The main applications include the LEAP engine which features blades and a fan casing made out of 3D woven RTM¹ composite material. This ultimately results in a weight reduction of almost 450 kg for single-aisle medium-haul aircraft! As regards nacelles, layered composite materials reduce both weight and sound emissions.

To push its competitive advantage in relation to strategic technology even further, Safran relies on the expertise and resources developed by Safran Composite teams, in conjunction with the Group's companies. Their primary missions are to improve the performance of materials (robustness, durability, thermal resistance, fire resistance, etc.) and optimize manufacturing processes, especially through automation and simulation. One of the lines of research is to be able to use PMCs for parts that are currently made out of metal in order to reduce their weight and cost. "Our ever-growing expertise is opening up new doors for broader applications as regards both propulsion systems and equipment," explains Jean-Pierre Poitevin. "I'm thinking about future engine architecture, such as that for the UHBR², but also for landing systems and, in the longer term, for helicopter engines too."
Partner suppliers

For this innovation drive, Safran is relying on its suppliers to develop materials that meet very specialized specifications. Agreements have therefore been signed with its main partners: Hexcel, Solvay, 3M and, more recently, Toray. “By engendering trust over the long term, these agreements forge the conditions for success,” says Jean-Pierre Poitevin. “It provides a means of boosting progress in this booming sector.”

Learn more

Composites by Safran

- The Polymer Matrix Composites (PMCs) currently used within the Group are mainly based on thermosetting polymer and carbon fiber materials.
- These materials can withstand temperatures up to between 100 and 150°C (up to 250°C for resins and very specific applications). One of Safran Composite’s areas of innovation is to increase their temperature range while retaining their properties.
- For parts exposed to higher temperatures (combustion chambers, turbine and nozzle parts, exhaust cones, etc.), only Polymer Matrix Composites (PMCs) developed by Safran Ceramics can be used.

Step into the world of innovation at Safran

1 Resin Transfer Molding: a process that involves injecting resin into a mold made of 3D woven carbon fiber.
2 Ultra High Bypass Ratio: a ducted turbofan engine configuration with an ultra-high bypass ratio.