Interest in composites starts to heat up

Light, shock resistant and able to withstand temperatures of well over 1,000°C, thermostructural composite materials are fast becoming the next big thing in the aerospace industry. Herakles (Safran) is leading the way internationally.

Herakles delivered the first thermal protection components for the IXV(1) space vehicle in March 2014. The parts will make up the craft's nose, lower surface and leading edges and act as a shield as it reenters the earth's atmosphere. During this twenty-minute phase, they will have to resist temperatures of up to almost 1,600°C! All of the components are built using ceramic matrix composites (CMC), a variant of thermostructural composites combining carbon fibers and a silicon carbide matrix. For Herakles, November's flight will provide a unique opportunity to test just how resistant its parts are in a full-scale exercise.

Time-tested expertise

As Marc Montaudon, Aeronautics and Composites Business Unit Director at Herakles, explains, "The first thermostructural composites we developed almost 40 years ago were made from a carbon matrix reinforced by carbon fibers. They replaced the extremely heavy metallic alloys previously used in the hottest zones of missile engines. Then we extended their use to other fields, like in telescope tubes for observation satellites and the nozzle for the American Delta IV space launchers. Carbon-carbon composites are now mainly found in aircraft brakes. Messier-Bugatti-Dowty has become the world number 1 in the field, in no small part because of the technology we developed at Herakles."

From carbon-carbon to CMC

"We were the first worldwide to introduce CMCs to mass production on an aircraft with the Rafale's nozzle flaps," continues Montaudon. "We then capitalized on our know-how by diversifying our range. For instance, we produced the hot gas valves used to steer the American SM-3 anti-ballistic missile. We're currently working with Snecma on the extendible nozzle for its Vinci engine, which will power the future Ariane 5 ME and Ariane 6 launchers. Our main challenge in the years to come will be extending the benefits of CMCs to aircraft engines. We are on the brink of a real industrial turning point for these materials."

Having mastered the entire design and manufacturing chains and a diverse range of applications, Herakles is positioned as one of the world leaders in thermostructural composite materials. "With almost 200 employees working in the sector, unparalleled resources and solid partnerships all here in Bordeaux, we're definitely a Safran center of excellence," says Montaudon.

(1)IXV (Intermediate eXperimental Vehicle) is an experimental space vehicle intended to validate atmospheric reentry technologies to be used as part of the European Space Agency's reusable launcher.

*The extended nozzle accelerates the gases to a supersonic speed of up to 4,000 m/s.*