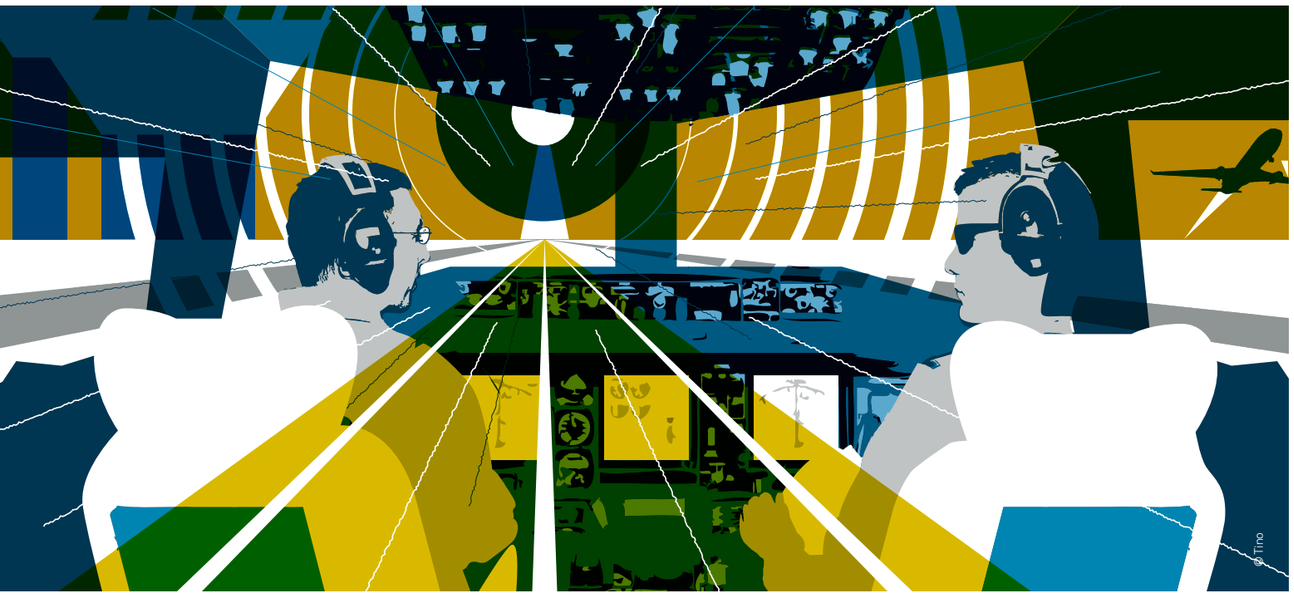
ELECTRONICS

MORE ELECTRIC AIRCRAFT, TO SPEC

To meet the challenge of developing "more electric" aircraft, Safran is pooling its strengths in the Safran Power Electronics Center, or SPEC, which also calls on outside expertise.



Air transport faces two daunting challenges today, namely rising oil prices and environmental constraints. One of the solutions chosen by industry is the "more electric" aircraft, in which electrically-driven systems replace the hydraulic or pneumatic systems traditionally used. This ambitious project demands a transformation in our conception of these systems, as well as their constituent components. "Safran created the SPEC center of expertise in 2004 to enhance our overall efficiency," says Régis Meuret, head of the center. Bringing together experts from eleven Safran group companies*, SPEC immediately identified five major areas of research: electrical networks, power electronics cooling and environment, power components and converter design, electrical drive architectures, and integration of power electronics in the jet engine environment. These were further broken down into 15 flagship initiatives. Over the course of its research work, and during its biannual symposiums – the fourth is slated for November 2011 – SPEC established relations with the worlds of academia and research, starting with the French scientific research agency CNRS, then research labs in Switzerland, Germany and North America. Today, it is actively involved in over 20 partnerships.

SPEC UNDER TEST

While these technologies will be nurtured and developed through SPEC, a Safran program dubbed Amperes, French for "more electric modular aircraft", will demonstrate their maturity. Amperes is a Group-wide initiative designed to optimize architectures and integrate innovative solutions in tomorrow's aircraft, especially for the engines, landing gear, flight controls and energy management.

At the same time, SPEC experts are forming partnerships with manufacturers in Europe, to meet three main objectives: benefit from research in the most advanced sectors, identify partners able to produce the required components, and perform tests. Carried out in close collaboration with European programs such as Joint Technology Initiatives (JTI), this approach has breathed new life into Copper Bird (see box), the test rig dedicated to the integration and characterization of aircraft electrical networks.

MULTIDISCIPLINARY

Over the last year, SPEC has also formed ties with Safran's purchasing, marketing and market intelligence departments, to plan ahead for future developments. "Buyers help us quickly contact suppliers and evaluate the risks inherent in the different solutions we are developing," explains Régis Meuret. "At the same time, they track emerging technologies."

Thanks to the marketing efforts by R&T teams, SPEC hopes to make aircraft manufacturers more aware of its solutions, so that they will be incorporated in development road maps. The marketing intelligence teams are a sort of radar. As Meuret says: "They help us know where our competitors stand, and can indicate new paths to follow, which allows the management committee to make timely decisions." In fact, timeliness is one of the keys to this trend. The first company to offer the best solutions will have a clear head start in establishing its market domination. ■

* Aircelle, Hispano-Suiza, Labinal, Messier-Bugatti, Messier-Dowty, Sagem, Snecma, Snecma Propulsion Solide, Techno-fan, Techspace Aero and Turbomeca.

→ **HERVÉ MOREL**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What's the aim of your research?
We're working on high-temp power electronics, high operating voltages and energy management in integrated circuits. Our research will be used to help replace the hydraulic systems and controls used in aircraft engines and brakes.

What kind of materials are you using to meet this goal?
We've already developed silicon carbide-based components capable of functioning several hours at a temperature of 300°C. Eventually, we hope to use these materials to form the core of power electronics. Since silicon carbide is both difficult and costly to use, we're also working on a technology known as SIO, for silicon on insulator, already widely used in the aerospace and automotive sectors. It should help us develop stable control circuit prototypes more quickly. The first systems of this type could be flying towards 2015.

Are there a lot of players in this sector?
A number of manufacturers are in fact interested, and many European research programs focus on this area. A market for high-temp components is emerging, because they could be used in multiple sectors.

27
doctoral theses at Safran on "more electric" aircraft technologies.

190
participants at the SPEC symposium in November 2009.

12
demonstrators shown at the last SPEC symposium.

Copper Bird, a test rig for Europe

Europe initiated a major aeronautical R&D program in 2002, called the Power Optimized Aircraft, or POA. As part of this program, Group company Hispano-Suiza built Europe's first HVDC (high-voltage direct-current) electrical system integration test rig, dubbed Copper Bird, at its plant in Colombes, near Paris. For the next two years program partners took turns checking out prototypes of their newly developed electrical equipment. In 2008, the vast Clean Sky research program breathed new life into this test rig. Upgraded to simulate the entire electrical network architecture on smaller aircraft (business and regional aircraft, helicopters), Copper Bird now hosts teams from throughout Europe, including EADS-Casa from Spain, AgustaWestland and Alenia from Italy, the Fraunhofer Gesellschaft research organization from Germany and Dassault and Eurocopter from France. "Copper Bird played a pivotal role in establishing Safran's credibility for the development of 'more electric' aircraft," says Jean-Jacques Charrier, head of R&T and Strategy at Hispano-Suiza.