SPEC. The traditional hydraulic and pneumatic circuits used on aircraft are gradually being replaced by lighter, more efficient electrical systems. The Safran Power Electronics Center (SPEC) is leading the drive towards tomorrow's "electric" aircraft.

TOWARDS MORE ELECTRIC AIRPLANES

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Hispano-Suiza's Copper Bird test platform, designed to check out new "more electric" aircraft system technologies, complements the SPEC research initiative.

Jetliners that take to the skies in 2015-2020 will be using electricity for a growing number of functions. The latest Airbus A380 and Boeing 787 widebodies are paving the way for the next generation of single-aisle twinjets. There are three main reasons behind the trend towards "more electric" aircraft, starting with the eternal goal of reducing aircraft weight and thus fuel consumption. Wires are lighter than pipes to begin with, and electrical systems offer more design flexibility than hydraulic systems for further weight savings. Secondly, this design flexibility also means that systems can be customized to a heretofore unknown degree. Last but not least, maintenance will be more efficient, since electrical systems allow real-time monitoring and are easier to troubleshoot than having to find a hydraulic fluid leak.

But despite these clear advantages, wires and electric motors will not replace hydraulic pumps and pipes overnight. The increased use of onboard electrical power is indeed a revolution, but to realize the full benefits the entire aircraft architecture has to be taken into consideration. And because aircraft design is a long-term process, all partners and suppliers have to work together from the outset to develop tomorrow's airplanes.

Fostering disruptive technologies

The Safran Power Electronics Center was launched in 2004 to develop the technology building blocks, which will be gradually integrated in robust new solutions. Hispano-Suiza is the Group leader for this program. "SPEC was initiated with the electrically actuated thrust reverser for the A380, the first time we faced the challenges of power electronics on this type of equipment," explains Serge Bérenger, Vice President, Strategy and R&T at Hispano-Suiza. "SPEC was created as an incubator to foster the emergence of disruptive technologies and share this knowledge with the 11 Group companies concerned by more electric aircraft. It draws on a vast network of university labs to leverage our own research efforts. In fact, the success of SPEC depends on striking a balance between the worlds of industry and research, as well as on the leadership qualities of its managing director, Régis Meuret."

SPEC has a two-pronged mission: developing the technologies required, and managing the risks associated with these technologies. Both of these aspects are based on TRL, or Technology Readiness Levels, a process which expresses different levels of technical maturity for emerging technologies in relation to the stipulated deadlines and imperatives of risk management.

"SPEC is the 'upstream' technology facet of this process," adds Bérenger. "There is another program called Amperes, managed by Didier-François Godart at the Research & Technology division, that is responsible for the design and development of the system architectures that will make use of the technologies developed through SPEC [see box]. SPEC will allow us to investigate the array of possibilities before making choices and starting the more concrete and costly maturation phase."

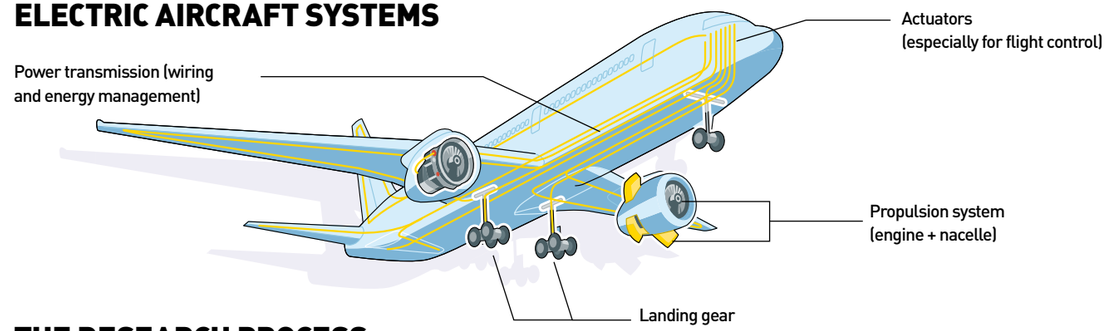
Compact, reliable and thermally efficient

SPEC's goals for 2010-12 are to make these systems more compact (four-fold decrease in weight and volume) increase the reliability of electrical systems and enhance the thermal efficiency of aircraft and engine systems. A symposium organized at the end of 2007 came up with a progress roadmap. "For the moment we have achieved equivalent weights for conventional and new technologies, but our electrical architectures already offer better reliability," notes Bérenger. The main question is project feasibility, which is the goal of the Amperes demonstration program. In two years, we'll be ready for a new progress review, as the first product demonstrators are rolled out.

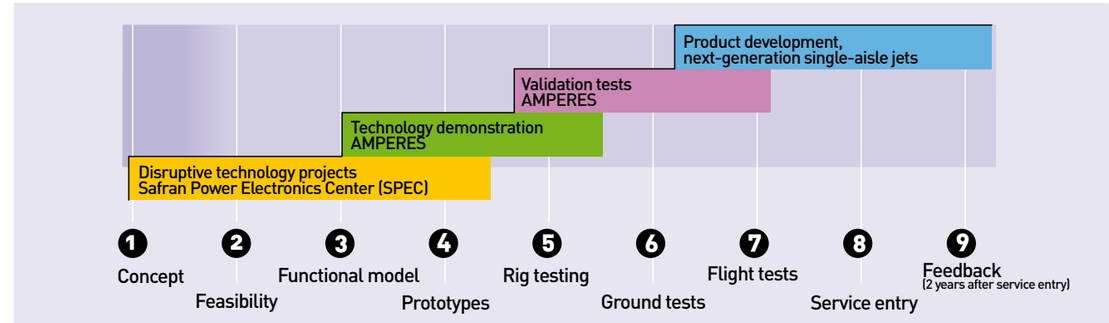
P. FRANÇOIS

›11 GROUP COMPANIES ARE WORKING ON "MORE ELECTRIC" AIRCRAFT: Aircelle, Hispano-Suiza, Labinal, Messier-Bugatti, Messier-Dowty, Safran, Sagem Défense Sécurité, Snecma, Technofan, Techspace Aero, Turbomeca.

ELECTRIC AIRCRAFT SYSTEMS



THE RESEARCH PROCESS



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TRL (Technology Readiness Level) process: each stage in the cycle is carried out continuously and irrigates the other stages in line with program requirements.

FOCUS ON AMPERES

"Integrating electrical systems on aircraft means we have to optimize the overall architecture to take advantage of the specific advantages of electrical power," explains Didier-François Godart, Amperes project manager at the Safran R&T division. These projects involve the collaboration of several Group companies. Four projects are now under development: Power Plant System (Snecma, Hispano-Suiza, Aircelle); Landing System (Messier-Dowty, Messier-Bugatti, Hispano-Suiza, Sagem Défense Sécurité); All-electric Wing Flight Actuation (Sagem Défense Sécurité, Hispano-Suiza); Electrical Wiring Interconnection System (Labinal). Amperes and SPEC are complementary: SPEC develops the technologies, and Amperes the architectures. "The aim is to demonstrate the technical maturity and robustness of our solutions by 2010-11, the expected kickoff date for the development of new medium-haul jetliners," adds Godart. "Because of the major challenges involved in these programs, with the potential number of sales and quick ramp-up in production, we have to start working with the airframers today, so they can integrate Safran's work in their design studies. This type of approach is fully in line with aircraft manufacturers' current objective of encouraging major equipment suppliers such as Safran to take greater responsibility in the supply of integrated work packages."