More-electric aircraft: to power the future

The increasing electrification of functions on board aircraft is a formative and irreversible change that will move faster and intensify with future programmes. The aviation industry has made a commitment to revolutionise energy systems on board aircraft, which will see hydraulic and pneumatic power gradually being replaced by electricity.

On board aircraft electricity has become the order of the day, first of all at low voltages and now going so far as to offer effective solutions in order to produce the energy required and distribute it throughout the entire aircraft.

Share of electrical power in the five main aircraft functions

Power generation management, passenger comfort, air pressurization and conditioning, configuration management or flight control and operations: all of these functions make use of a lot of power on board an aircraft. For many years, aviation has depended on hydraulic power to carry out these tasks: an effective solution that nonetheless has some disadvantages. Indeed, the circuit connections are damaged by the aircraft’s movement which gives rise to a risk of leaks. The circuits are also interdependent and if a circuit breaks down, the other circuits cannot take over: In addition, hydraulic fluid is corrosive and inflammable.

Faced with these risks, the choice of a new energy source now appears critical. Electricity, which has always been present in the aircraft and reserved until now for low to medium consumption equipment is arousing interest. In fact, it has many advantages, both in terms of safety and the environment. It contributes to reducing aircraft mass, fuel consumption and greenhouse gas emissions. Finally and above all, the introduction of electrical systems leads to a reduction in the costs of assembly and maintenance of aircraft and improves their availability.

The move towards a more electric aircraft therefore involves replacing the hydraulic and pneumatic systems equipping current aircraft with electrical systems, and requires a significant increase in the power of the electricity generation and distribution systems. Progress in research in this area and the experience acquired in the most recent programmes, particularly the A380 and Boeing 787, make it possible to foresee for future generations a radically transformed on-board energy chain, mainly based on electrical systems. This major technological breakthrough will consist of replacing the current multimodal circuits (mechanical, hydraulic and pneumatic) with electrical circuits controlling all functions of the aircraft, both on the ground and in flight. The new entity Labinal Power Systems is ready to take up this challenge.

In programmes, electricity is gaining ground

Since the Airbus A320 and the Boeing 777 were fitted with electrical flight controls, electrification of aircraft has been increasing in all aviation programmes. High-power electricity first really appeared in large commercial aircraft in the early 2000s with the removal on board the Airbus A380 of one of the three traditional hydraulic circuits and its replacement with 100% electrical circuits dedicated to the redundancy of flight controls. The programme has also adopted an electrically actuated thrust reverser. The Boeing 787 Dreamliner has meanwhile introduced electrical systems to replace the pneumatic circuit and in the brakes.