Fuel cells: green energy on board

Powerful, compact, reliable and eco-friendly, fuel cells naturally interest aircraft manufacturers. These cells could be used to power many different electrical systems on an aircraft, without using its jet fuel. Safran Power Units is already hard at work exploring this potential energy source, as explained by CEO François Tarel.

How does a fuel cell function, and where could it be used on aircraft?

In addition to propulsion, an aircraft needs energy to power various onboard functions, such as engine startup, flight controls, ventilation, lighting, cooking meals and in-flight entertainment systems. We call this "non-propulsive" energy. Today, this energy is provided by the plane's auxiliary power unit (APU), a small turbine which uses the plane's jet fuel, and by batteries on board.

The fuel cell offers a third source, capable of backing up or even replacing the current sources of electrical power. Its operating principle is based on a chemical reaction between oxygen and hydrogen, which produces an electrical current, water and heat. It's simple... and very reliable!

Discovered in 1839, this technology sparked new interest in the early 2000s with the advent of skyrocketing oil prices, environmental concerns due to greenhouse gas emissions, and the increasing electrification of aircraft. Safran has already built several demonstrators, at different power ratings, to better assess its potential.

What are the advantages of fuel cells?

There are quite a few! It's a "clean" energy source that only consumes the oxygen in the air and gaseous hydrogen, has no toxic releases, and is perfectly silent. It also offers long endurance, and can function throughout a flight, including for long-haul flights at high altitude. It also features high efficiency and great operational flexibility, compared with current systems providing constant power. Fuel cells cover a wide variety of power requirements, from a few watts up to a megawatt. They are light and compact, and require little wiring, since they can be installed near the equipment to be powered.

What's the current state of your research?

We have proven the performance of fuel cells in the lab. Now we have to test it in flight and show that it can be integrated in an
aircraft. We're already in contact with the main manufacturers of commercial and business aircraft. By 2019-2020, fuel cells will be ready for their first commercial applications. For the moment, we're focusing on lower-power systems (in-flight entertainment, meal preparation, etc.). But they could eventually be used for more power-hungry and critical uses, such as the emergency system that supplies onboard energy in case of an engine failure, or starting jet engines on the ground, in a hybrid configuration with the APU.

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