Nacelles with plenty of panache

Safran engineers were successful in making a lighter and more aerodynamic nacelle. This technological feat – and world first – was awarded the Safran Grand Prize at the Safran Innovation Awards in April 2013.

How we reduce the weight of nacelles when they are being made lighter and lighter all of the time with the use of composite materials? This was the question Aircelle (Safran) faced when it came to designing and developing a revolutionary single-piece "O-duct" type composite nacelle. Nexcelle, a joint venture between Aircelle and Middle River Aircraft Systems (GE Aviation), was able to validate its technical maturity and visibility with its Panache demonstrator. A world first!

Innovative architecture

"The ultimate goal was to achieve weight savings of 10% compared to an A320 benchmark nacelle," explained Jérôme Lescure, Aircelle C919 Technical Project Manager. "We therefore decided to simplify its design and eliminate a number of interfaces. This effectively meant that we moved from a conventional "D-duct" type nacelle design to a single-piece "O-duct" type design, offering better aerodynamics." The innovative design meant that engine access and how it was actually fixed under the wing needed to be rethought from scratch. "The nacelle no longer opens in the middle. Instead, the external part slides back, giving access to the engine," explained Bertrand Coconnier, Technical Manager of the Panache Demonstrator, and the current A320neo Technical Project Manager at Aircelle. In order to achieve greater weight savings and therefore cut fuel consumption, the nacelle features electrically controlled thrust reversers which improve propulsion system performance significantly. The overall weight saving is around 100 kg per nacelle.

Team work

Nexcelle was able to harness its different partners' wealth of expertise and resources in order to improve efficiency. As such, Aircelle took charge of the external structure of the nacelle and the thrust reversers, while Middle River Aircraft Systems supplied the pylon connecting the engine to the wing, Snecma (Safran) supplied a CFM56-5C engine, which was specially adapted for the new nacelle, and GE provided its ground testing facilities in Peebles (Ohio). This highly innovative new design has already been selected by the Chinese manufacturer Comac for its forthcoming C919 featuring the CMF LEAP engine as the sole western powerplant.

Do you know your nacelles?
The term "O-duct" refers to the front view of a nacelle diagram showing an O-shaped duct. The term "D-duct", however, refers to a nacelle design featuring two semi-circle sections, which look like two Ds back to back.