A world first for the ARCOCE plug, a ceramic matrix composite (CMC) exhaust cone designed by Safran, which completed its first flight on board an Air France A320 aircraft in early summer. More resistant and lighter than conventional metal alloys, CMCs play a part in reducing the weight of aircraft, and mitigating their environmental footprint. Yann Richard, "CMC Exhaust" Program Manager at Herakles (Safran), talks us through the development and applications of this technology.

Developed and Manufactured by Herakles (Safran), the Ceramic Matrix Composite (CMC) exhaust cone, also referred to as the ARCOCE plug (whose name is derived from the French initials for ceramic composite afterbody), represents a huge achievement and historic milestone in this civil aviation technology. Intended for the manufacture of nozzles, especially for Ariane launchers, as well as Rafale fighter jets and M51 missiles, the application of CMC exhaust cones in the civil sector required additional developments. The lifespan of a commercial aircraft is twenty times that of a military aircraft, so the materials used in the engines must have much greater resilience.

What stage is the program at?

Following the first round of tests conducted in 2012 on an A320, the CMC exhaust cone demonstrator was certified on April 22, 2015 by the EASA* to be used on board commercial flights. This certification confirms the ability of Safran to manufacture CMCs adapted to the requirements of civil aviation. The project is also receiving funding from the French government ("Fonds Unique Interministériel" and Future Investment Program”) and the Aquitaine Regional Council.

What does the installation of the ARCOCE plug on a commercially operated aircraft represent?

Installed on an Air France A320 powered by two CFM56-5B engines, the ARCOCE plug successfully completed its first commercial flight between Paris and Saint Petersburg on June 16, 2015. The tests are set to take place for a period of twenty months, which equates to around 5,000 flight hours. In October, the important milestone of logging 1,000 flight hours was achieved. This means we will be able to see how the part behaves in real-life conditions and harness this data for the work conducted on CMCs.

What is the outlook for Safran in the CMC field?

With its subsidiary Herakles, which has spent the last twenty or so years developing and marketing CMCs for aerospace, military and industrial applications, Safran boasts world-class expertise in CMCs. CMCs are light,
capable of withstanding very high temperatures and extreme environments. These materials are based on carbon or ceramic fibers and matrices, which makes them both strong and light and boosts engine performance significantly. Safran aims to finalize the development of this technology to incorporate it into future developments for which the target parts are turbines, combustion chambers and exhausts. The work on the ARCOCE plug and the success of its testing as part of a commercial implementation (with over 1,000 flight hours logged by end-September 2015) enable Safran to improve its expertise in the area of CMCs, and thus to better prepare for future developments in aeronautics.

*European Aviation Safety Agency

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