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Title

The Common Inlet Configuration: An Advanced Boundary Layer Ingestion Engine Integration Concept

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Abstract

This paper aims at presenting the aircraft design activities at ONERA on the Common Inlet Concept performed within the frame of the Clean Sky 2 Airframe ITD platform. The Common Inlet features two turbofans fed by a common circular inlet around the fuselage, split in two parts, one half for each engines (Figure 1). The purpose of that kind of inlet is to ingest the whole boundary layer around the fuselage, in order to assess the performance benefit of such an extreme BLI concept. This concept is the final one selected through a step-by-step down-selection process for Boundary Layer Ingestion Technology (BLI). Other BLI concepts have already been studied in the past in other frameworks, such as the Nautilius concept in [1]. The previous activities [2][3] done within Clean Sky 2 have demonstrated an important potential of the Common Inlet but with important uncertainties especially regarding the aerodynamic design of the air inlet. Thus the purpose of this work was to perform the aerodynamic study of such air inlet with high fidelity CFD, to reduce the initial uncertainties and have a detailed aerodynamic analysis to confirm the potential of the concept at aircraft level.

The Common Inlet concept was further investigated thanks to the use of high-fidelity 3D CFD simulations coupled with a dedicated Overall Aircraft Design Process. The final paper will describe the overall sizing procedure, the aerodynamic design steps using CFD as well as the associated exergy-based analysis applied to determine the efficiency of this disruptive BLI concept with the use of the PSC (Power Saving Coefficient) metric. In a second step, the final results at aircraft level using high-fidelity modules for the computation of the PSC will be detailed for two top level aircraft requirements (Short Medium Range-like a Low-Speed Business Jet). Finally, conclusions will be drawn summarizing the potential of the concept for both missions while describing the main remaining technical challenges to be addressed to mature the concept and the underlying technologies.

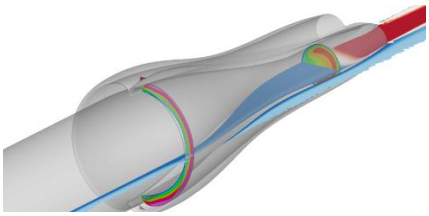

Figure 1: Overview of the Common Inlet BLI Concept.

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