Technische Universität Braunschweig

IFAS Institut für Flugantriebe und Strömungsmaschinen

Aerodynamic design of a fuel cell pod using CFD

Studien/Masterarbeit

The aviation industry is under increasing pressure to reduce its carbon footprint due to environmental concerns. Introducing fuel cells could play a key role in achieving emission reduction targets and addressing the industry's impact on climate change. The fuel cell pod configuration is one among the innovative aircraft concepts proposed by Airbus engineers as part of the ZEROe initiative. The concept is a distributed fuel cell propulsion system, using power generated from fuel cells to drive propellers via an electric motor. The proposed student thesis deals with the aerodynamic design of the fuel cell pod for such an application using CFD. The definition of the aero-lines of the pod would be accomplished using the Class Shape Transformation approach, previously implemented at IFAS.The study would focus on the cruise phase of the flight with the objective to reduce the aerodynamic drag of the pod. The thesis would also address the design of the intake to the fuel cell component. The design challenge for the intake would be to efficiently decelerate air from the cruising speed of Mach 0.6 to Mach 0.15 at the entry to the fuel cell. Different intake concepts such as the S-duct intake would be considered for the most efficient diffusion. A preliminary design of the exhaust duct aft of the fuel cell would also be part of the thesis. Finally, an optional task would be to investigate the aerodynamic performance of the pod with a propeller integrated to the front of the pod. This would be done using a simplified actuator disk model.

Desirable technical expertise :

1. Programming experience with MATLAB
2. CAD skills and experience with CATIA
3. Prior experience with CFD would be a plus

Start from : September/October, 2023
Thesis Language : English

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