# HELIDES: Helicopter drag prediction using Detached-Eddy Simulation

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Reduction of aerodynamic drag is central to the ACARE 2020 goal of reducing fuel consumption in air transportation. For rotorcraft in forward flight, the majority of the drag occurs due to extensive flow separation around the fuselage and rotor hub. Alongside experimental measurements, computational fluid dynamics (CFD) is becoming an increasingly important tool for the aerodynamicist seeking insight into the flow physics, with the ultimate aim of reducing the aerodynamic drag. However, such highly unsteady, separated flows present significant challenges for standard CFD techniques in terms of solution fidelity and computational expense.

A new family of hybrid RANS/LES techniques addresses this conflict by mixing pure modelling (RANS) and partial resolution (LES) of the turbulent motion to provide an optimal trade-off between predictive accuracy and computational cost. Of these, the well-established detached-eddy simulation (DES) method has perhaps the highest maturity and inherent suitability for helicopter fuselage flows.

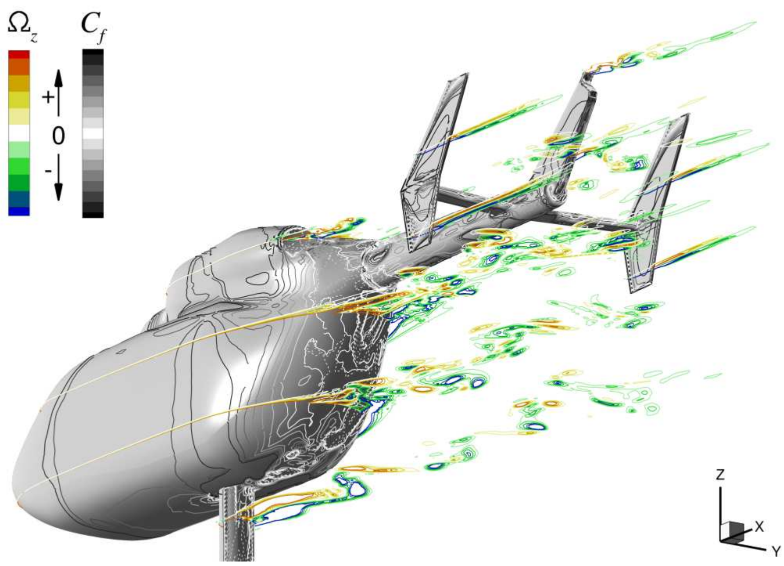


**Figure 1: Snapshot of DES of a generic helicopter fuselage (geometry provided courtesy of Eurcopter Deutschland GmbH), computed by TUB as part of the ongoing EU project ATAAC.**

Within the framework of the EU-funded CleanSky Joint Undertaking[1], the upcoming HELIDES project[2] aims to employ state-of-the-art DES methods together with unstructured CFD solver methodologies to predict the drag and unsteady interactional effects for realistic helicopter configurations. A further important goal is the assessment of the feasibility and readiness date for these computationally demanding methods for routine industrial application.

Within HELIDES, Technische Universität Berlin (TUB) is tasked with the conduction of a series of ambitious DES computations of helicopter configurations. TUB's high degree of expertise with such methods (including in application to helicopter fuselage simulations, see Figure 1) will be combined with the unstructured open-source CFD software OpenFOAM in order to accomplish the challenges posed by the HELIDES project. In order to conduct such upstream research on "near-future" methods today, the computational requirements required naturally push the frontiers of available resources. The provision of the computational resources of the HLRN-II is therefore of critical importance to the success of the HELIDES project.

[1] www.cleansky.eu
[2] Call SP1-JTI-CS-2010-04, project ID 278415, time frame 05/2011 – 04/2013.