isae — Institut Supérieur de l'Aéronautique et de l'Espace	**INTERNSHIP 5-6 MONTHS** **YEAR 2021**
Internship tutors: Emmanuel BENARD emmanuel.benard@isae-supaero.fr Brendan COYLE brendan.coyle@isae-supaero.fr	Internship with ISAE SUPAERO – Toulouse Location: **TBD** Grant: standard ISAE rates, approx. 600 euros/ months

Development of a design methodology for CFD analysis and advanced post-processing of future aircraft.

Context:

ISAE-SUPAERO is an institute dedicated to aerospace engineering higher education and research. ISAE-SUPAERO develops research strategies focused on the future needs of aerospace and other high-tech industries. The ISAE-SUPAERO Department of Aerospace Vehicle Design and Control (DCAS) supports activities related to the design and development of aerospace systems.

The proposed internship falls within the scope of the AIRBUS-ISAE CEDAR II for Eco-Design of Aircraft Research Chair. The focus of this Chair is to conduct research in order to contribute to the sustainable development of future air transportation, taking into account the many dimensions of that ambition (environment, society, economic & industrial issues …). **Objectives**:

The goal of this internship is to complete an entirely open source analysis of a reference aircraft configuration. A specific point of interest is to benchmark the results of open source meshing (Gmsh, TetGEN or OpenFOAM) with commercial options (ICEM or starCCM+) in order to compare farfield analysis values (ISAE-SUPAERO Epsilon Tool). A key aspect will be to explore the interfacing of this CFD procedure with the ISAE-ONERA FAST-OAD aircraft design tool. (https://github.com/fast-aircraft-design/FAST-OAD).Following successful completion of the project, the candidate will have acquired experience of 3D mesh generation and advanced CFD analysis for the study of aircraft performance at transonic conditions.

Missions:

- Develop aircraft geometry in ESP (SBW, BWB) – approx. 1 month.
- Mesh candidate aircraft using open source (ex. gmsh) and commercial tools (ex. ICEM) – approx. 1 month.
- Benchmark CFD (SU2) results of open source meshes against the commercial reference– approx. 1 month.
- Justify the solver type selection (Euler or RANS) with respect to farfield analysis results. The candidate will conclude based on farfield analysis whether full RANS is necessary.
- Complete far-field analysis (Epsilon) within Paraview;
- Propose a computational chain, from pre-processing to post-processing, with reference to aircraft design requirements;
- Explore the possibility of generating surrogate-models using the CFD data generated – approx. 1 month.
- If the work is of quality, writing-up of a conference paper could be attempted.

[1] Aeronautic and aerospace European platform website, https://aerospace-europe.eu/case-studies/a-common-platform-for-validation-of-aircraft-drag-reduction-technologies/definition-of-the-test-case/

PADRI Configuration from [1]

REQUIRED SKILLS

Skills : Linux, Python 2 or Python 3, basic knowledge of CFD (spatial schemes, convergence criteria, turbulence modelling), ICEM/StarCCM, Paraview, knowledge of surrogate-models would be a plus.
Soft skills : Autonomy, Communication, Curiosity, Innovation, Aviation