	INTERNSHIP 5-6 MONTHS **YEAR 2022**
Internship tutors: Emmanuel BENARD - ISAE emmanuel.benard@isae-supaero.fr Sébastien DEFOORT Sebastien.Defoort@onera.fr	Internship with ISAE SUPAERO – Toulouse Location: ISAE-SUPAERO (ONERA Toulouse) Targeted level: final year of Diplôme d'Ingénieur or MSc in Aerospace-Mechanical Engineering

Development of a preliminary aircraft design for Blended Wing Body configuration

Context:

ISAE-SUPAERO is an institute dedicated to aerospace engineering higher education and research. ISAE-SUPAERO develops a research focused on the future needs of aerospace or high-tech industries. The ISAE-SUPAERO Department of Aerospace vehicles design and control (DCAS) supports activities related to the design and development of aerospace systems. The internship subject is within the scope of the chair AIRBUS-ISAE CEDAR II for Eco-Design of Aircraft. This chair is intended to conduct different actions 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 …).

The use case in the proposed project is the conceptual level optimization of a hydrogen-powered flying wing, a concept recently selected by Airbus, for example. This configuration has the potential to combine high aerodynamic performance with the specific constraints related to the loading of large volumes of hydrogen, a very constraining context on the overall design.

The generation of a new aircraft concept requires the use of aircraft pre-dimensioning tools (OAD approach for Overall Aircraft Design). In this context, ONERA and ISAE-Supaero are jointly developing the open source software FAST-OAD [1], a modular multidisciplinary process for the sizing and optimization of transport and general aviation aircraft. The developments of the internship will thus be based on the development of a version of FAST-OAD corresponding to the hydrogen powered flying wing, on the basis of an early version [2].

Objectives:

- Update of the literature on (i) BWB, (ii) H2 aircraft, (ii) multifidelity optimization;
- Critical assessment of a BWB legacy code;
- Modification of the FAST-OAD code [3] to include specific BWB features;
- Implementation of a basic multifidelity optimization for a given discipline (aerodynamics, structure…);

If successful the internship will be extended to a PhD on a similar subject, with emphasis on multi-fidelity approaches based on surrogate models, uncertainty propagation in a multidisciplinary framework, MDO formulations based on metamodels, dynamic management of fidelity. The PhD will be co-funded between CEDAR II and ONERA.

[1] David, C., Delbecq, S., Defoort, S., Schmollgruber, P., Benard, E., & Pommier-Budinger, V. (2021). From FAST to FAST-OAD: An open source framework for rapid Overall Aircraft Design. In IOP Conference Series: Materials Science and Engineering (Vol. 1024, No. 1, pp. 012062). IOP Publishing.

[2] Sgueglia, A. (2019). Exploration of dimensioning and optimization priorities in aircraft design with application to a flying wing with distributed electric propulsion, thesis defended in December 2019, ISAE-SUPAERO.

[3] https://github.com/fast-aircraft-design/FAST-OAD

REQUIRED SKILLS

Skills : Python programming (essential) and code documentation, knowledge of Aircraft Design (essential), reporting (English)

Soft skills : Autonomy, Curiosity, Innovation, Aviation