	INTERNSHIP 6 MONTHS **YEAR 2023**
Internship tutors: Florent LUTZ - Joel JEZEGOU	Internship with ISAE SUPAERO - Toulouse Location: **ISAE SUPAERO - Toulouse** Starting Date: between 01/03/2023 and 01/05/2023 Duration : 6 months

Computation of environmental emissions for CS-23 airplanes during preliminary aircraft design

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 DCAS researchers belong to three research groups:

- Aerospace vehicle design
- Decision and Control
- Neuro-ergonomics and human factors

The research groups collaborate on the following topics:

- Design and operation of safer aircraft
- Integrated multidisciplinary design of aircraft
- Advanced space concept.

The internship is related to the multidisciplinary design of innovative CS-23 aircraft architectures, as part of research chair ISAAR (Innovative Solutions for Aircraft Architectures & Regulation). The intern will be integrated in the Aircraft Design research team of DCAS Department.

The purpose of the internship is to develop models to compute environmental emissions during preliminary aircraft design stage. The developed models will be integrated in the ISAE-SUPAERO FAST-OAD-GA (Future Aircraft Sizing Tool for General Aviation) overall aircraft design software. Models will cover noise (for propeller-driven airplane with conventional engine and with electric motor), CO_2 emissions in flight, and other pollutants emissions.

FAST-OAD-GA is a software coded in Python, within the OpenMDAO framework, for multidisciplinary analysis and optimization of CS-23 airplanes. It's publicly available at https://github.com/supaero-aircraft-design/FAST-GA

The objectives of the internship are :

- To complete a literature review to determine models and database publicly available;
- To define, code in FAST-OAD-GA, and test a methodology to compute CO_2 and other pollutants emissions of a light airplane accounting for various fuels (*e.g.* Avgas, Diesel, SAFs) and engines (internal combustion, turboprop);
- To define, code in FAST-OAD-GA, and test a methodology to compute noise emission of a light airplanes accounting for various engine options;
- To understand the existing structure of FAST-OAD-GA software (models, aircraft design loops, structure of variables, …) coded in Python in an OpenMDAO framework and to integrate the developed emissions models;
- To write a technical report detailing the developed models, and to appropriately document the code.

REQUIRED SKILLS

Skills: engine and aircraft emission, aircraft design, knowledge of EASA CS-23, CS-34, CS-36 and CS-CO2

IT skills: Strong knowledge in Python coding and GitHub environment – Knowledge of OpenMDAO is desirable

Soft skills : autonomy, curiosity, proactivity to propose solutions to address a research problematic

APPLICATION FOR INTERNSHIP

To apply : CV and motivation letter to be send by email to Florent LUTZ (Florent.LUTZ2@isae-supaero.fr) and Joël JEZEGOU (joel.jezegou@isae-supaero.fr)

For further information: please contact the above mentioned contacts.